Conduit® AP

MTCAP-LNA3-915-041 and MTCAP-915-041 User Guide

Conduit AP MTCAP-LNA3-915-041 and MTCAP-915-041 User Guide

Models: MTCAP-915-041A, MTCAP-915-041L, MTCAP-LNA3-915-041A, MTCAP-LNA3-915-041L

Part Number: S000725, Version 1.2

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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 https://www.multitech.com/legal/warranty. For other warranty options, visit www.multitech.com/es.go.

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Chapter 1 – Product Overview

Overview

Conduit AP (MTCAP and MTCAP2) connects thousands of IoT assets to the cloud using the LoRaWAN® protocol. It expands LoRa network coverage to difficult to reach areas and is capable of packet forwarding user data between LoRa end points and a centrally located network server on the cloud, in a data center, or a public network.

Note: Check for an updated version of this document at https://www.multitech.com/brands/multiconnect-conduit-ap/.

Product Build Options

Product	Description
MTCAP-LNA3-915-041L	LTE Cat 1 mLinux Programmable Access Point with external LoRa antenna and US Accessory Kit (AT&T/Verizon)
MTCAP-915-041L	mLinux Programmable Access Point with external LoRa antenna and US Accessory Kit
MTCAP-LNA3-915-041A	LTE Cat 1 AEP Programmable Access Point with external LoRa antenna and US Accessory Kit (AT&T/Verizon)
MTCAP-915-041A	AEP Programmable Access Point with external LoRa antenna and US Accessory Kit

Note:

- The complete product code may end in .Rx, where R is revision and x is the revision number. For example, MTCAP-LNA3-915-041L-R1.

Package Contents

Your device ships with the following:

1 – MTCAP

1 – 5 Volt, 2.5 Amp power supply

1 – RJ45 Ethernet cable

1 - LoRa antenna

1 – Quick Start

Important: Contact MultiTech Systems if a replacement power supply is needed. Using a different power supply may damage the device and voids the warranty.

Documentation Overview

The following documents are available at http://www.multitech.com/brands/multiconnect-conduit-ap. Select your model to find the documents specific for that device.

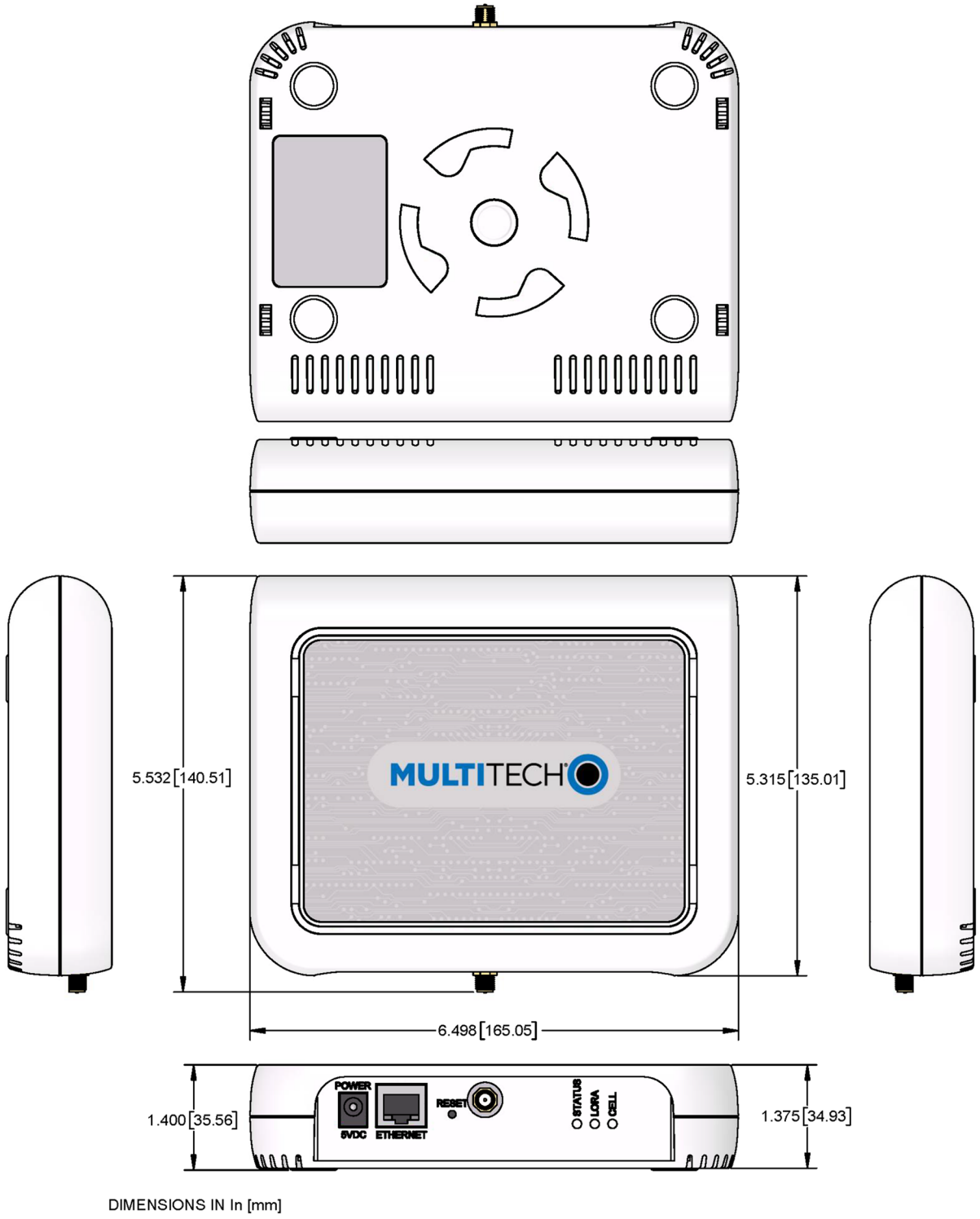
Document	Description	Part Number
Conduit AP MTCAP-LNA-915-041x and MTCAP-915-041x User Guide	This document. Hardware, regulatory, and getting started information.	S000725
Conduit AP MTCAP for mLinux Quick Start	Steps for getting started for mLinux models. Ships with the device and is available online.	82104200L
Conduit AP MTCAP for AEP Quick Start	Steps for getting started for AEP models. Ships with the device and is available online.	82104300L
Telit LE910 AT Commands Reference Guide	For LNA devices, lists AT Commands and parameters used to communicate with your device.	80407ST10116A

Related Documentation

This manual provides the basics for getting started with mLinux or AEP. For addition information, visit our developer site at http://multitech.net and select Software > mLinux.

Chapter 2 – Specifications and Hardware Information

Dimensions



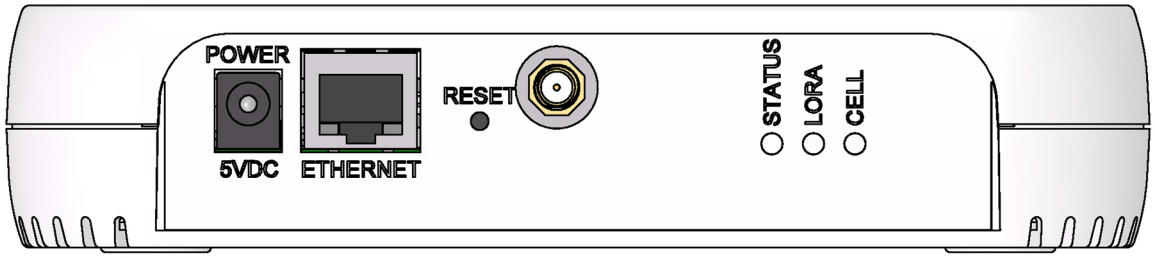
Specifications

Category	Description
General	
Standards	LoRaWAN 1.0.2 specifications
	LTE 3GPP Release 9
	HSPA+ with GPRS fallback
RAM	256MB
Flash	256MB
Radio Frequency	
ISM Band	915 MHz ISM band for US and Canada
4G/LTE	1900 (B2) / AWS 1700 (B4) / 850 (B5) / 700 (B12/13)
3G	1900 (B2) / 850 (B5)
Physical Description	
Weight	1.36 kg
Dimensions	Refer to Mechanical Drawings for Dimensions.
Chassis Type	PC-ABS
Environment	
Operating Temperature[1]	-0° C to +70° C
Storage Temperature	-40° C to +85° C
Storage Temperature	-10° C to +25° C +/-5° C up to 1 year
Humidity	20%-90% RH, non-condensing
Power Requirements	
Operating Voltage	5Vdc, 1.4A
Certifications and Compliance	
EMC and Radio Compliance	FCC Part 15 Class B
	EN 300-220
	EN 300-440
Safety Compliance	UL 62368-1 2nd Ed , Battery: UL 62133-2
	cUL 62368-1 2nd Ed , Battery: cUL 62133-2
	IEC 62368-1 2nd Ed , Battery: IEC 62133-2

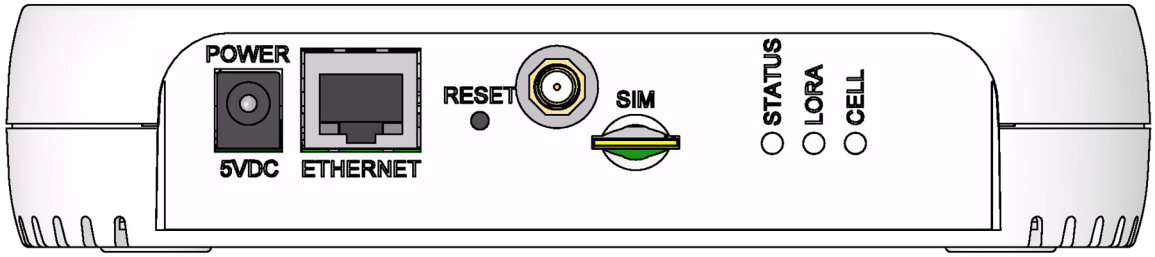
[1] UL listed at 40° C, limited by AC power supply. Product has been tested to +70° C excluding power supply.

Connectors and LEDs

LoRa only models



LoRa and cellular radio models



Item	Description
Connectors	
Power	5 Volt power jack.
Ethernet	RJ45 Ethernet jack.
Reset	Reset button. Reboots device or restores factory defaults. Refer to *Resetting the Device* for details.
(No label)	SMA Connector for external LoRa antenna.
SIM	*Cellular models only.* Micro (3FF) SIM slot. Refer to *Installing SIM Card* for details.
LEDs	
STATUS	Blinks when operating system is fully loaded.
LORA	Lights when LoRa software is active.
CELL	*Cellular models only.* Lights when there is power to the radio. Blinks when the SIM is registered with the carrier.
WIFI	Reserved for future use.
Ethernet Link	Left LED on the Ethernet connector. Blinks when data is sent or received on the Ethernet link. Steady light when there is a valid Ethernet connection.
Ethernet Speed	Right LED on the Ethernet connector. Lit when the Ethernet is linked at 100 Mbps. If not lit, the Ethernet is linked at 10 Mbps.

Resetting the Device

You need:

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

To reset the device:

1. Find the hole labeled RESET. The reset button is recessed into the case.
2. Use the pin to press and release the RESET button as follows:

   Reset options:
   - To reboot, press RESET for less than 3 seconds.
   - To reboot and restore user-defined defaults (if previously set), press RESET for 3 to 29 seconds.
   - To reboot, restore factory settings, and erase user-defined defaults, press RESET for 30 seconds or longer.

     The device restarts in commissioning mode. The system automatically removes all user accounts.

     Enter a new username and password to create your new administrative account. (Refer to **User Accounts** in the appropriate software guide for details on username and password requirements.)

Note: The device reboots when restoring settings.

Power Measurements

MTCAP-LNA3-915

Note:

- Multi-Tech Systems, Inc. recommends that you incorporate a 10% buffer into the power source when determining product load.
- **Maximum Power:** The continuous current during maximum data rate with the radio transmitter at maximum power.
- **Tx Pulse:** The average peak current during an LTE connection.
- **Inrush Charge:** The total inrush charge at power on.

Radio Protocol	Cellular Call Box Connection, No Data	Average Measured Current at Maximum Power	TX Pulse (AVG) Amplitude Current for GSM850 or Peak Current for LTE	Total Inrush Charge Measured in Millicoulomb	Total Inrush Duration
5.0 Volts					
WCDMA	195 mA	1.18 A	1.27 A	1.19 mC	1.28 mS
LTE	192 mA	1.05 A	1.14 A	1.19 mC	1.28 mS

MTCAP-915-041

Note:

- Multi-Tech Systems, Inc. recommends that you incorporate a 10% buffer into the power source when determining product load.
- **Maximum Power:** MTCAP LoRa connection to MTXDOT running TXP =20 and at+txdr=2. The MTXDOT was initialized to send packets by joining MTCAP and rapidly sending packet to the MTCAP.
- **Tx Pulse:** The average peak current.
- **Inrush Charge:** The total inrush charge at power on.

Idle Current	Average Measured Current at Maximum Power	TX Pulse Peak Current for no radio model	Total Inrush Charge Measured in Millicoulomb
5.0 Volts			
128 mA	397 mA	524 mA	1.33 mC

Antenna

Your device ships with the following antenna. Any replacement antenna should fall with in the same specifications.

ISED Antenna Approval

This radio transmitter 125A-0058 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio 125A-0058 a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Pulse Electronics Antenna

Manufacturer:	Pulse Electronics
Description:	868-928 MHz RP-SMA Antenna, 8"
Model Number:	W1063
MultiTech Part Number:	45009830L

MultiTech ordering information:

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

Antenna Specifications

Category	Description
Frequency Range	868-928 MHz
Impedance	50 Ohms
VSWR	≤ 2.0
Gain	3.0 dBi
Radiation	Omni
Polarization	Vertical

Chapter 3 – Safety Information

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.

Ethernet Ports

CAUTION: Ethernet ports and command ports are not designed to be connected to a public telecommunication network or used outside the building or campus.

Ports Ethernet

CAUTION: Les ports Ethernet et de commande ne sont pas conçus pour être raccordés à un réseau de télécommunications public ou utilisé à l'extérieur du bâtiment.

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.

General Safety

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

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

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

Handling Precautions

To avoid damage due to the accumulation of static charge, use proper precautions when handling any cellular device. Although input protection circuitry has been incorporated into the devices to minimize the effect of static build-up, use proper precautions to avoid exposure to electronic discharge during handling and mounting the device.

Radio Frequency (RF) Safety

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

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

Sécurité relative aux appareils à radiofréquence (RF)

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

- Utiliser l'appareil à proximité d'autres équipements électroniques peut causer des interférences si les équipements ne sont pas bien protégés. Respectez tous les panneaux d'avertissement et les recommandations du fabricant.
- Certains secteurs industriels et certaines entreprises limitent l'utilisation des appareils cellulaires. Respectez ces restrictions relatives aux équipements radio dans les dépôts de carburant, dans les usines de produits chimiques, ou dans les zones où des dynamitages sont en cours. Suivez les restrictions relatives à chaque type d'environnement où vous utiliserez l'appareil.
- Ne placez pas l'antenne en extérieur.
- Éteignez votre appareil sans fil dans les avions. L'utilisation d'appareils électroniques portables en avion est illégale: elle peut fortement perturber le fonctionnement de l'appareil et désactiver le réseau 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).

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.

- 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.

UL Notice

UL Listed at 40° C, limited by power supply. UL Certification does not apply or extend to an ambient above 40° C and has not been evaluated by UL for ambient greater than 40° C. “UL has evaluated this device for use in ordinary locations only. Installation in a vehicle or other outdoor locations has not been evaluated by UL. UL Certification does not apply or extend to use in vehicles or outdoor applications or in ambient above 40° C.”

Spécifications UL

Listé UL à 40° C, limité par l'alimentation. La certification UL ne s'applique pas ou ne s'étend pas à des températures dépassant 40° C, et le produit n'a pas été évalué par UL pour une température ambiante dépassant 40° C. « UL a évalué cet appareil pour une utilisation en zone ordinaire uniquement. Le produit n'a pas été évalué par UL pour une installation dans un véhicule ou en extérieur. La certification UL ne s'applique pas ou ne s'étend pas aux applications dans un véhicule, en extérieur ou en présence d'une température ambiante supérieure à 40° C ».

User Responsibility

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

Chapter 4 – Labels

Example Labels

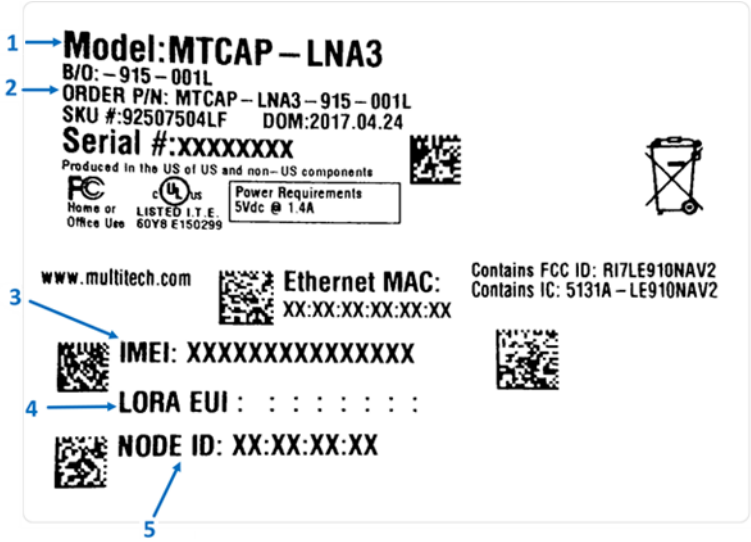
Note: Actual labels vary depending on the regulatory approval markings and content.

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

The label shown is not the actual size.

1 - MultiTech Model Identification.
2 - MultiTech Ordering Part Number.
3 - IMEI Number
4 - Device Node Number
5 - UUID

Example 915 Models Device Label



Chapter 5 – Setting Up Hardware

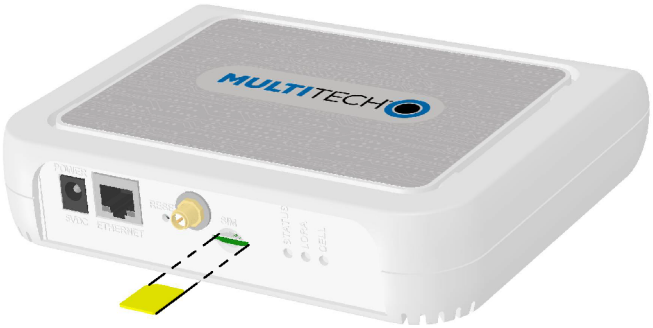
Installing a SIM Card

If your device has a SIM slot, you'll need a micro (3FF) SIM card from your network provider.

Note: -LNA3 models work on both Verizon and AT&T networks. The device detects the carrier based on your SIM card.

To install the SIM card:

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



Removing a SIM Card

To remove the SIM card, push the SIM card in. The device ejects the SIM card.

Attaching the Antenna

To connect the antenna:

- Finger-tighten the antenna to the SMA antenna connector on your device.

Cabling the Device

To cable the device:

1. Connect the Ethernet cable to the Ethernet port on the device and to your computer.
2. Connect the power supply to the MTCAP's power jack and plug it into an electrical outlet. When the operating system is fully loaded, the STATUS LED blinks.

Once your device is cabled, follow the Getting Started chapter for your device:

- For models ending with -001L , go to Getting Started with mLinux
- For models ending with -001A, go to Getting Started with AEP

Chapter 6 – Getting Started

After powering up your device, refer to the following sources for help configuring and using your device.

mPower Models

If your device uses the mPower platform, getting started information is in *mPower Software Guide (S000727)*, available through your model's page at https://www.multitech.com/brands/multiconnect-conduit-ap

mLinux Models

If your device uses the mLinux platform, getting started information is at *http://www.multitech.net/developer/software/mlinux/getting-started-with-conduit-mlinux/*

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: 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 7 – Mounting the Device

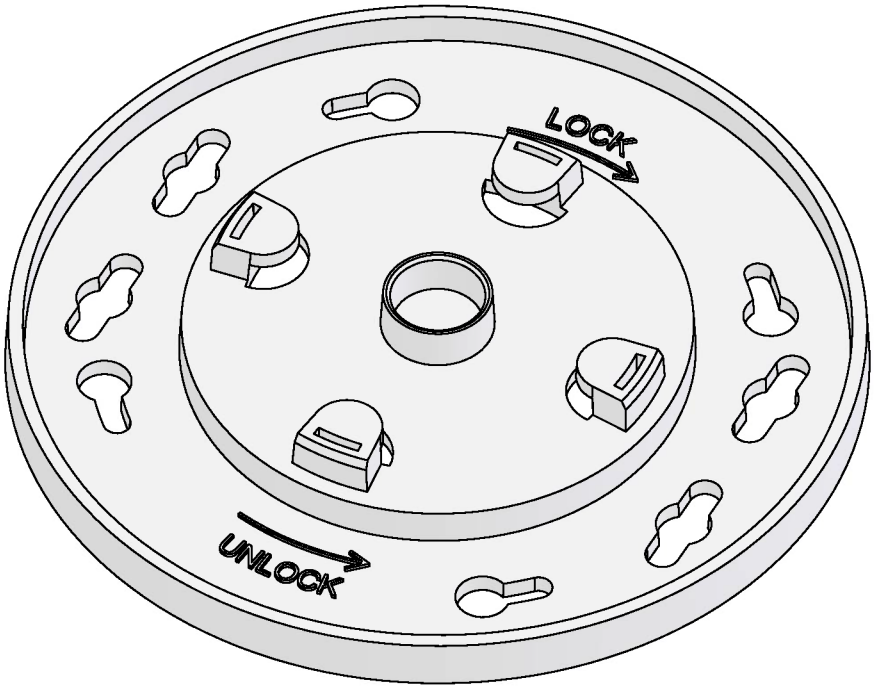
Mounting the Device

The device ships with a mounting bracket.

You will need

- Mounting bracket
- MTCAP2
- Four #6 screws, with anchors (not provided)
- Screwdriver
- Drill

Mounting Bracket



Determining Location

Follow these guidelines for best performance:

- For optimal performance, place the MTCAP2 at a level higher than the end devices.
- Angle the antenna so it is not parallel to the surface. It does not need to be perpendicular to the surface, but it should not be flat.

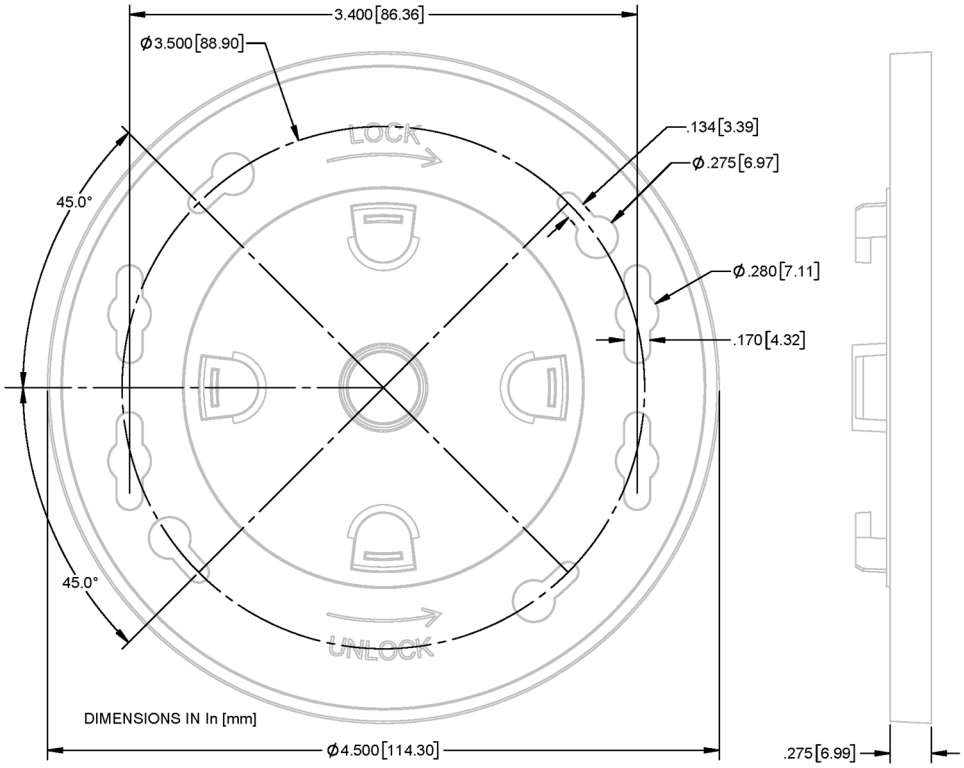
- Select a location central to all devices to be connected to this MTCAP2.
- Avoid obstructions.

Important: Thick walls and reflective surfaces, such as metal, weaken the signal between the MTCAP2 and other devices.

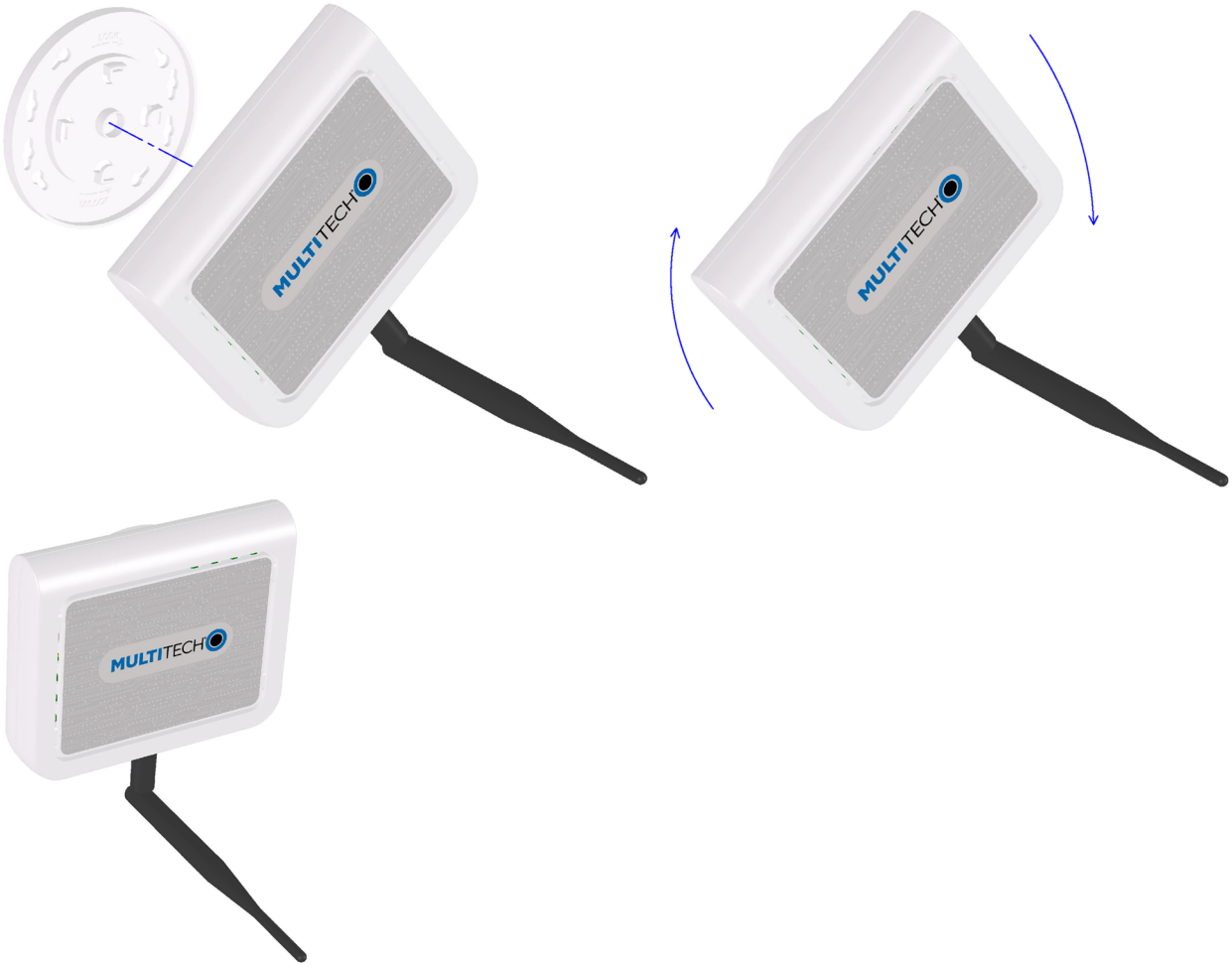
- We recommend conducting a site survey to test the signal strength in different locations before you mount the device.

Mounting the Device

1. Determine where you want to mount the device.
2. Mark where you want the screws to go.



3. Drill holes for the screws and insert anchors.
4. Place the mounting bracket and secure it with screws.
5. Attach the device to the bracket and rotate to lock into place.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Chapter 8 – Regulatory and Environmental 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.

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 Reglement 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.

Industry Canada

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'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Waste Electrical and Electronic Equipment Statement

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

WEEE Directive

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

Instructions for Disposal of WEEE by Users in the European Union

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

July, 2005

REACH Statement

Registration of Substances

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

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

Restriction of the Use of Hazardous Substances (RoHS)

Multi-Tech Systems, Inc.

Certificate of Compliance

2015/863

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

These MultiTech products do not contain the following banned 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.

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。

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