Conduit® AP

MTCAP-LSP3 User Guide for Sprint

Conduit AP MTCAP-LSP3 User Guide for Sprint

MTCAP-LSP3-915-041A, MTCAP-LSP3-915-041L

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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

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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.

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Chapter 1 – Product Overview

Overview

Conduit AP (MTCAP) 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-LSP3-915-041L	LTE Cat 4 mLinux Programmable Access Point with external LoRa antenna and US Accessory Kit (Sprint)
MTCAP-LSP3-915-041A	LTE Cat 4 AEP Programmable Access Point with external LoRa antenna and US Accessory Kit (Sprint)

Note:

- The complete product code may end in .Rx, where R is revision and x is the revision number. For example, MTCAP-LSP3-915-041L-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.

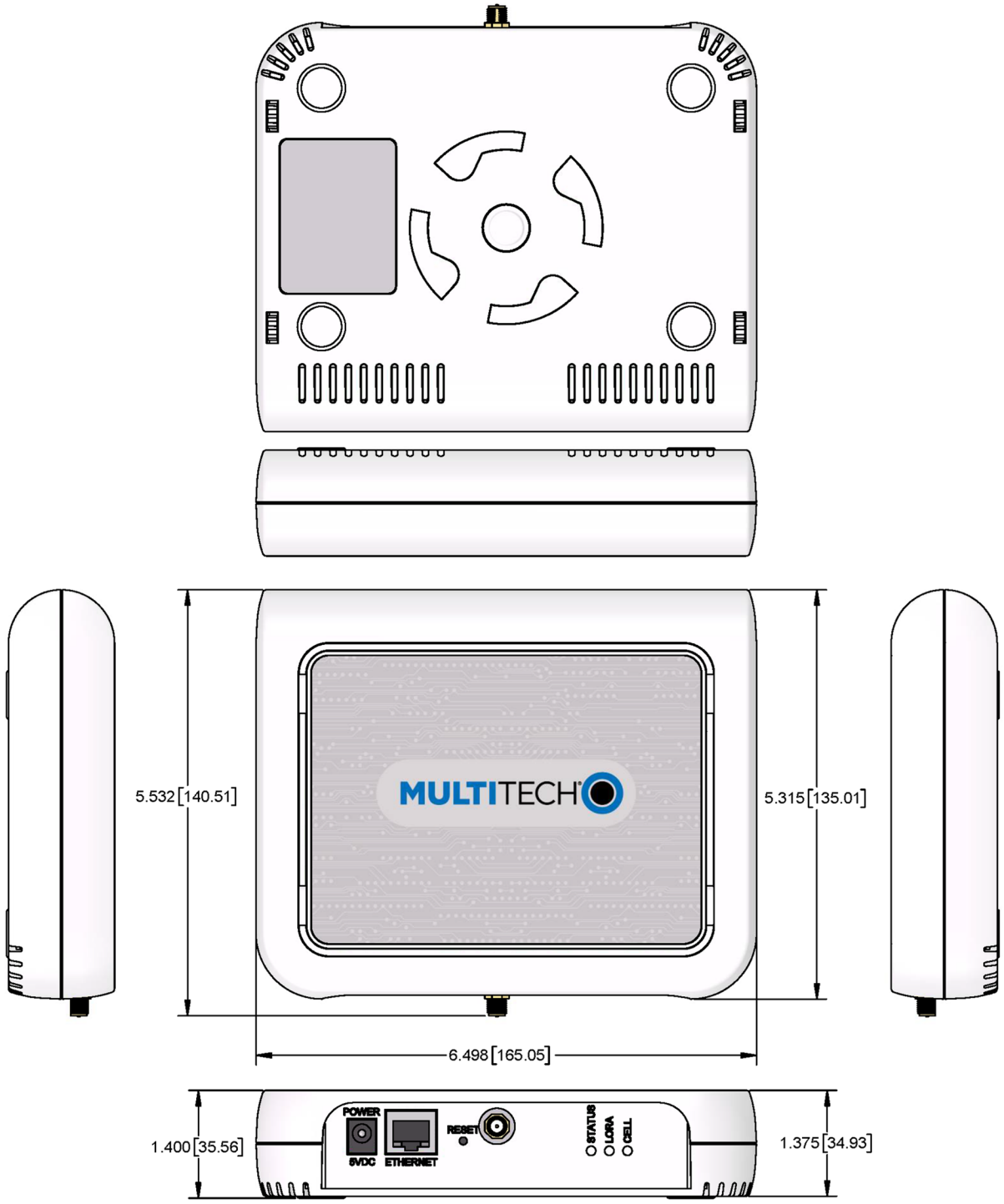
Document	Description	Part Number
Conduit AP MTCAP-LSP3-915-041 User Guide for Sprint	This document. Hardware, regulatory, and getting started information.	S000704
Conduit AP MTCAP for mLinux Quick Start	Steps for getting started with mLinux models. Ships with the device and is available online.	82102350L
Conduit AP MTCAP for AEP Quick Start	Steps for getting started with AEP models. Ships with device and is available online.	82104300L
Telit LE920x4/LE910Cx Series AT Commands Reference Guide	For LSP3 devices, lists AT Commands and parameters used to communicate with your device.	80490ST10778A
Telit Sprint OMA DM AT Commands	OMA-DM AT Commands	S000729

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



DIMENSIONS IN In [mm]

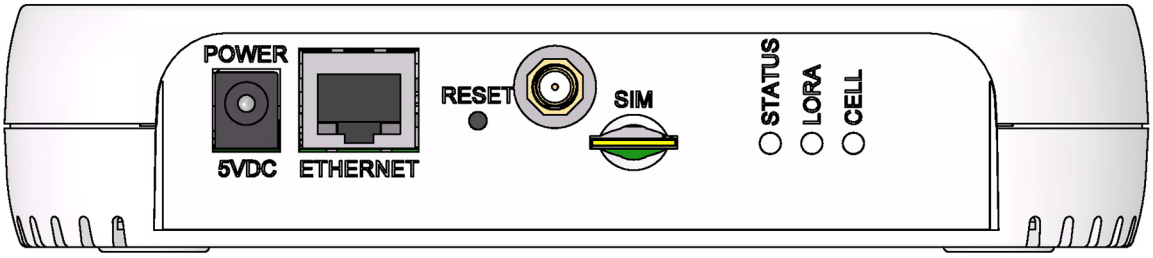
MTCAP Specifications

Category	Description		
General			
Standards	LoRaWAN 1.0.2 specifications		
	LTE FDD Cat 1, 3GPP release 10 compliant		
RAM	256MB		
Flash	256MB		
Radio Frequency			
ISM Band	915 MHz ISM band for US and Canada		
4G/LTE	1900 (B2/B25) / AWS 1700 (B4) / 850 (B5/B26) / 700 (B12)		
Physical Description			
Weight	1.36 kg		
Dimensions	Refer to Mechanical Drawings for Dimensions.		
Chassis Type	PC-ABS		
Environment			
Operating Temperature[1]	-10° C to +65° C		
Storage Temperature	-40° C to +85° C		
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		
	Cellular Radio	FCC Part 22H, 24E, 27, 90	RSS 130, 132, 133, 139
	LoRa Radio	IC: RSS-237	FCC: 15.247:2018
		FCC: 15.107:2018	FCC: 15.109:2018
Safety Compliance	UL 60950-1 2nd ED		
	cUL 60950-1 2nd ED		
	IEC 60950-1 2nd ED AM1 and AM2		

[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 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.* 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-LSP3-915

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 a GSM850 transmission burst period or HSDPA/LTE connection. The transmission burst duration for GSM850 can vary, depending on what transmission scheme is being deployed (GPRS Class 8, Class 10, GSM, etc.).
- **Inrush Charge:** The total inrush charge at power on.

Radio Protocol	Sleep Mode Current	Cellular Call Box Connection, No Data	Average Measured Current at Maximum Power	TX Pulse (AVG) Amplitude Peak Current for LTE	Total Inrush Charge Measured in Millicoulombs	Total Inrush Charge DURATION during Powerup
5.0 Volts						
LTE Band 4 1732.5 Mhz	N/A	174 mA	1.2 A	1.36 A	1.26 mC	1.33 mS

Antenna

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

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	$\leq$ 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.
- 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.
- 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).

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 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

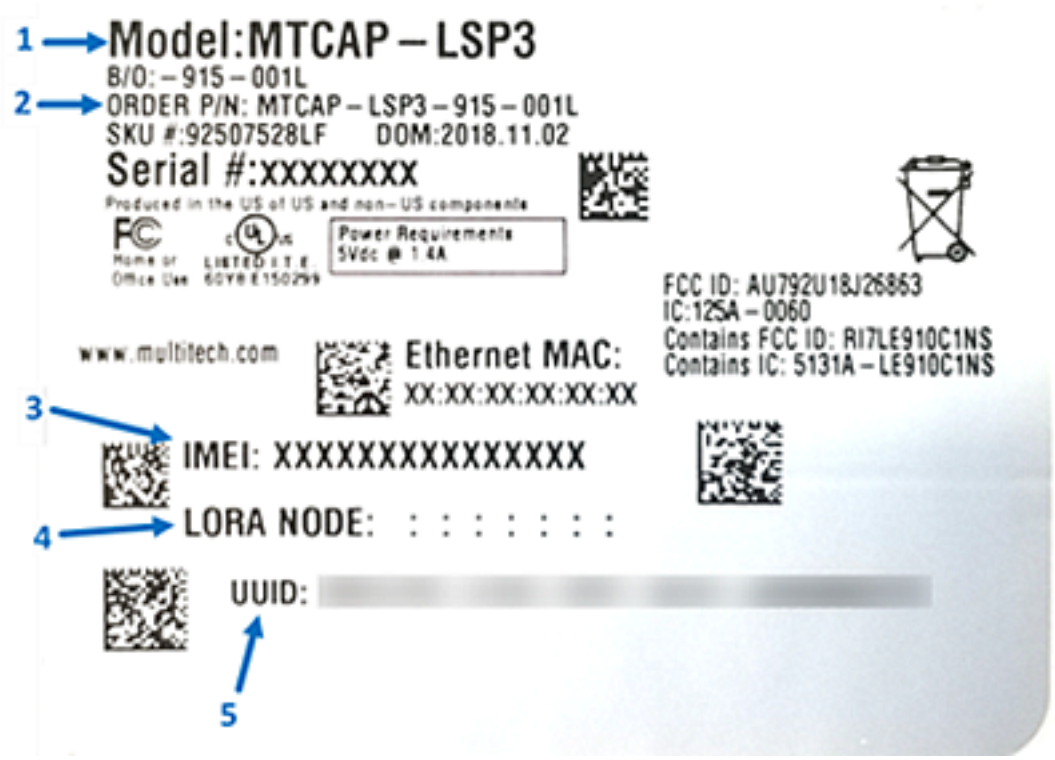
Note: Actual labels vary depending on the regulatory approval markings and content.

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 – Sprint Networks

Sprint has two networks. Which network you are using determines whether or not you need to set the APN manually.

Sprint IoT Network / Platform (Curiosity)

- Does not support OMA-DM.
- Accounts provisioned using Curiosity require the user application to set a data APN "internet.curiosity.sprint.com".
- IMSI starting with 311882 = Curiosity. First 6 digits of IMSI are the MCC/MNC. Query via AT+CIMI.

Sprint Legacy Network / Platform (Sprint Command Center and Sprint Vision/Ensemble)

- Supports OMA DM.
- Accounts provisioned using Command Center or Vision/Ensemble acquire APN OTA via OMA. The user/application do not set the APN.
- IMSI starting with 310120 = Command Center. First 6 digits of IMSI are the MCC/MNC. Query via AT+CIMI.
- IMSI starting with 312530 = Vision/Ensemble. First 6 digits of IMSI are the MCC/MNC. Query via AT+CIMI.

Sprint Activation and OMA-DM Commands (LSP3)

All applications interacting with Sprint approved MultiTech devices must be written in a manner where they do not interfere/interrupt the Sprint Hands-Free Activation (HFA) process or OMA-DM processes.

For additional information refer to:

- *S000729 Telit Sprint OMA-DM AT Commands* available at www.multitech.com/documents/publications/reference-guides/S000729_Telit_Sprint_DG_OMADM-AT_commands.pdf
- For mLinux models, go to: http://www.multitech.net/developer/software/mlinux/using-mlinux/mlinux-cellular-connection/lsp-device-sprint-lte-activation/

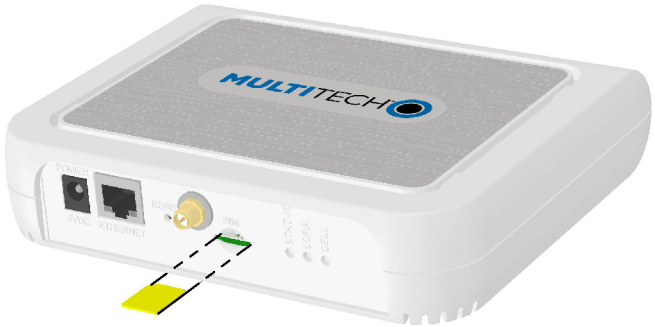
Chapter 6 – Setting Up Hardware

Installing a SIM Card

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

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 7 – Getting Started with mLinux Models

Accessing the Terminal Interface

After connecting Ethernet and power, access the terminal interface:

1. On your PC, configure a static IP address for the network interface that is connected to the device within the following range:

   `192.168.2.2 - 192.168.2.254`

2. Open an SSH connection and log in.

   Default IP address: (DHCP is disabled)
   `192.168.2.1`
   Default credentials for mLinux version 4: username:
   `mtadm`
   and password:
   `root`

Note: The above credentials do **NOT** have root privileges. As a result, many commands may not work unless you use **sudo** (for super user permissions).

To use sudo, either execute :
`sudo [command]`
or start the root shell:
`sudo -s`

Then enter the mtadm password. The prompt changes to mtcap:/home/mtadm#

For tips on using sudo, go to http://www.multitech.net/developer/software/mlinux/using-mlinux/log-in-as-an-admin-post-production/.

The following commands require sudo:

```
ln -sf /usr/share ...
hwclock
ifdown
ifup
mlinux-set-apn
pppd
killall
/etc/init.d/lora-packet-forwarder
```

Setting Time Zone, Time, and Date

To set the time zone, date, and time:

1. Create a symbolic link from the zone info file for your location to /etc/localtime:

   ```
   ln -fs /usr/share/zoneinfo/Europe/Zurich /etc/localtime
   ```

2. Update the date and time to the current time:

   ```
   date "2016-12-11 14:58:01"
   ```

3. Update the hardware clock:

```
hwclock -u -w
```

Setting the Custom IP Address, Network Information, and Ethernet Internet Access

Network configuration is defined in /etc/network/interfaces.

1. To change the static IP, change the **address** and **netmask** fields in **/etc/network/interfaces**, (use vi or nano).
2. To apply changes, either reboot the device or issue:

```
ifdown eth0 && ifup eth0
```

Note: You will lose your SSH session by doing this.

3. To enable DHCP with default settings, edit **/etc/udhcpd.conf** (using vi or nano) by entering, starting, and ending IP addresses for DHCP range.

```
mlinux-dhcpd start
```

4. Issue this command to start DHCP:

```
mlinux-dhcpd start
```

Note: To stop or restart, issue:

```
mlinux-dhcpd stop
```

or

```
mlinux-dhcpd restart
```

5. To configure Internet access via the Ethernet port, modify **/etc/network/interfaces** as follows:
   a. Add **gateway 192.168.2.254** beneath the **netmask** line, where **192.168.2.254** is the IP address of your network router.
   b. To apply changes, either reboot the device or issue:

```
ifdown eth0 && ifup eth0
```

Note: You will lose your SSH session by doing this.

   c. Test Internet access with **ping 8.8.8.8**.

Configuring the Cellular Connection

To establish a cellular data link, you must configure and initiate a PPP connection. Sample options, files, and chat scripts are provided in the ppp peers directory **/etc/ppp/peers**. Anything specific to the network or connection should be placed in one of these files. Global options should be placed in **/etc/ppp/options**.

1. Set up a cellular data connection.

Note: With a Sprint SIM, your device uses Sprint's OTA activation to register the SIM to their network. Sprint automatically sets the correct APN values automatically. For more information, go to Sprint Device Activation.

```
# Before establishing PPP connection, modify the file, /etc/ppp/options
sudo -s
echo -e '+ipv6\nipv6cp-use-ipaddr' >>/etc/ppp/options
```

```
# Dial the connection (using /etc/ppp/peers/xxx# config)
# pppd call xxx#
(where xxx# is your radio, LSP3 for Sprint)
```

2. Use the Linux **route** utility to verify ppp0 is up.

```
# route
Kernel IP routing table

Destination Gateway     Genmask         Flags  Metric  Ref    Use    Iface
default     33.140.12.18 0.0.0.0        UG     0       0      0      ppp0
33.140.12.18 *           255.255.255.255 UH     0       0      0      ppp0
192.168.2.0 *           255.255.255.0   U      0       0      0      ethp0
```

The Linux **ifconfig** utility can be used to inspect the ppp0 interface details.

```
# ifconfig ppp0
 ppp0      Link encap:Point-to-Point Protocol
           inet addr:33.140.12.18  P-t-
P:33.140.12.18  Mask:255.255.255.255
           UP POINTOPOINT RUNNING NOARP MULTICAST  MTU:1500  Metric:1
           RX packets:7 errors:0 dropped:0 overruns:0 frame:0
           TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
           collisions:0 txqueuelen:3
           RX bytes:106 (106.0 B)  TX bytes:145 (145.0 B)
```

Additionally, you can view the **pppd** logs in **/var/log/messages** to see the modem dialing and assigned IP address or errors if the connection was unsuccessful.

To Stop a PPP Connection

```
# send SIGTERM to pppd, which causes it to hang up and exit cleanly
# killall pppd
```

Starting Cellular Connection on Boot

Automatically starting pppd on boot requires (1) setting the peer file to use and (2) telling the system to run the ppp init script on boot.

1. To see the available peers files () to set the peer file, issue:

   ```
   ls /etc/ppp/peers
   ```

2. Edit **/etc/ppp/ppp_on_boot** (with vi or sudo) and change:

   ```
   #PPPD call provider
   ```

   to your desired provider (where xxx# is your radio, LSP3 for Sprint.)

   ```
   #PPPD call xxx#
   ```

3. Manually start the init script and check your Internet connection to test your change.

   ```
   ppp_on_boot
   ```

```
# /etc/init.d/ppp start
```

4. To set init script to auto start, issue:

```
# update-rc.d ppp defaults
```

5. Restart and test your connection.

Stop Automatic Start Up

To stop ppp from automatically starting, issue:

```
# update-rc.d -f ppp remove
```

Sprint Device Activation

After you establish a Sprint account and install the SIM into your device, the device uses Sprint's Over-The-Air (OTA) Activation (otherwise known as OMADM) to automatically register your SIM to their network.

Note: We recommend that you allow Sprint to set the correct APN values automatically via OTA.

Here's how to check your APN and PDP context:

1. Allow the system to set the APN value with Sprint's Over-The-Air update (OMADM). Do not attempt to set the APN on your own.
2. Check the APN value using this command:

   ```
   AT$DEBUG
   ```

   Example output:

   Note: The output includes the data APN after **APN: internet:** . Record this value, you need it for next step.

```
LTE Engineering:

IMSI: "310120052249249"
State: idle
PLMN ID: 310 120
PCI: 121
Band: 25
UL channel:
DL channel:  8109
RSRP: -93dBm
RSRQ: -12dB
RS-SINR: 146dB
RSRP: -93dBm
RSRQ: -12dB
RS-SINR: 146dB
Tx Pwr:
IP - internet:
IP - ota:
Error: 36|
APN: internet: cc.m2m.ispsn  (***Data APN value is here after
internet:****)
OTA : otasn

CONFIGURATION:
```

```
Technology: LTE
1x Diversity: Not Supported
EVDO Diversity: Not Supported
QLIC: Not Supported
PRL: Not Supported
Chipset: MDM9607
AMSS Version: LE.1.0.1
Device Version: 25.00.246
HW Version: 35
Data Status
IP Address (EVDO): Not Supported
1X: Not Supported
Last Error Code: Not Supported

OK
```

3. Issue the following command to view PDP Contexts:

   ```
   AT+CGDCONT?
   ```

   Example output #1:

   ```
   AT+CGDCONT?
   +CGDCONT: 1,"IP","otasn","",0,0,0,0
   <b>+CGDCONT: 2,"IP","cc.m2m.ispsn","",0,0,0,0</b>
   +CGDCONT: 3,"IPV4V6","","",0,0,0,0
   +CGDCONT: 4,"IPV4V6","ims","",0,0,0,0
   ```

   Example output #2:

   ```
   mtcap:/tmp
   # microcom /dev/modem_at1
   AT+CGDCONT?
   +CGDCONT: 1,"IP","otasn","",0,0,0,0
   +CGDCONT: 3,"IPV4V6","n.ispsn","",0,0,0,0
   +CGDCONT: 5,"IPV4V6","ims","",0,0,0,0
   ```

4. For data connection attempts, use the PDP context in the AT+CGDCONT? response matching the APN indicated in AT$DEBUG response. For example #1, **cc.m2m.ispsn** appears in AT$DEBUG output and in PDP context 2 output as illustrated. Therefore, in the first example, PDP context 2 would be used for data connection establishment. In example #2, you would use PDP context 3 instead.

   ```
   AT#SGACT=2,1      If using module internal IP stack

   AT*99***2#        If using external IP stack
   ```

Configuring the LoRa Network Server for mLinux

Note: This section applies to LoRaWAN V1.5 devices only.

To configure the LoRa Network Server:

1. Log in to the console. Refer to http://www.multitech.net/developer/software/mlinux/getting-started-with-conduit-mlinux/ if needed.
2. Issue these commands:

```
# cp /opt/lora/lora-network-server.conf.sample /var/config/lora/lora-network-server.conf
```

3. Edit **/var/config/lora/lora-network-server.conf** and modify these settings as needed (use vi or nano).

Field	LoRa-915 (NA, AU, AS, KR)	LoRa-868 (EU, IN)
lora["frequencyBand"]:	"915"	"868"
lora["channelplan"]:	"US915", "AU915", "AS923", or "KR920"	"EU868" or "IN865"
lora["frequencySubBand"]:	(integer. 1 to 8)	Not applicable
lora["frequencyEU"]:	Not Applicable	default 869500000
		range: [863500000 - 867500000] and [869100000 - 869500000]
network["name"]	Name of your LoRa network (string, 8-character minimum, case-sensitive).	
network["passphrase"]	Security passphrase for your LoRa network (string, 8-character minimum, case-sensitive).	
network["public"]	Choose from 0: Private MTS, 1: Public LoRaWAN or 2: Private LoRaWAN, Private Options use SyncWord 0×12 vs Public SyncWord 0×34.	
network["joinDelay"]:	Set to desired Join Delay, default 5 seconds	

4. Restart the network server.

```
# /etc/init.d/lora-network-server restart
```

5. Start mosquitto client.

```
# mosquitto_sub -t lora/+/+ -v
```

For advanced LoRa settings, go to http://www.multitech.net/developer/software/lora/conduit-mlinux-lora-communication/conduit-mlinux-advance-lora-configuration/.

Additional LoRa and mLinux Information

For additional information, including how to configure LoRa devices to communicate with your gateway, visit http://www.multitech.net.

- For an introduction to Lora, go to : http://www.multitech.net/developer/software/lora/introduction-to-lora/
- For help using mLinux, go to: http://www.multitech.net/developer/software/mlinux/.
- For additional packet forwarder information, go to: http://www.multitech.net/developer/software/lora/conduit-mlinux-convert-to-basic-packet-forwarder/

Chapter 8 – Getting Started with AEP Models

Logging in to AEP

After connecting and powering up your device, log in to AEP:

1. Open an Internet browser. In the browser's address field, enter the device's default address for the device:

   `http://192.168.2.1`

   The login page appears.

2. Type the default user name: **admin**.
3. Type the default password: **admin**.
4. Click **Login** to start the First Time Setup Wizard.

   NOTE: For AEP firmware, the DHCP client is enabled by default. If no address is acquired within 20 seconds, then the device switches to static IP address 192.168.2.1 for 20 seconds. If no access to the Web UI Initial Setup Wizard is made, then the device tries the DHCP client again for 20 seconds and alternates back and forth like this until either an address is acquired through DHCP or the Web UI is accessed.

Setting the Password

Note: For security reasons, we recommend changing the default password.

To set a new password:

1. Click **Next** on the Welcome panel.
2. In the **Current Password** field, enter the default password, **admin**.
3. In the **New Password** field, enter a new password.
4. Re-type the new password in the **Confirm Password** field.
5. Click **Next**.

Setting Date and Time

To set date and time:

1. Type today's **Date** in the format shown or use the calendar (data picker).
2. Type the current **Time** (24-hour format).
3. Select the **Time Zone** in which the Conduit operates.
4. Click **Next**.

Configuring PPP

Note: For models with cellular radios only.

To configure the Cellular PPP:

1. To use PPP, check **Enable**. When enabled, your device functions as a cellular device.

2. To enable dial-on-demand, check **Dial-on-Demand**. This tells the device to only make a PPP connection when there is outgoing IP traffic, and it brings the PPP connection down after a given idle timeout.
3. The default **Idle timeout** is **180 seconds.** If desired, you can enter a different value.
4. Leave the APN, the radio gets the APN from the carrier when the device registers.

Note: When the LSP3 radio registers, the APN is usually set on dial context #2, but it can be set on context #3. To use the correct context, you need to know which context Sprint set the APN on. By default, the LSP3 script uses context #2.

5. Click **Next**.

Setting Up PPP Authentication

To set up cellular PPP authentication:

1. Select an authentication protocol **Type** used to negotiate with the remote peer: **pap, chap, or pap-chap**. The default is **None**.
2. Type the **Username** for the remote peer to use for authentication. Optional. Username is limited to 60 characters.
3. Type the **Password** for the remote peer to use for authentication. Optional. Password is limited to 60 characters.
4. Click **Next** to exit the wizard.

Entering IP Address and Network Information

Set the IP address and network information for the Ethernet port:

Note: Leave the interface static unless using a DHCP server on the network that the device is connecting to. If you select DHCP client, you need to know which address is assigned to the Conduit. For information on DHCP settings, refer to DHCP in the AEP Help.

1. Type the device's **IP Address**
2. Enter the network **Mask**.
3. Enter the **Gateway** address (optional and not displayed when **Cellular** is enabled).
4. Enter the **Primary DNS** server address (optional and not displayed when **Cellular** is enabled).
5. Enter the **Secondary DNS** server address (optional and not displayed when **Cellular** is enabled).
6. Click **Next**.

Configuring Access

When Cellular is disabled, the default settings enable HTTPRedirect to HTTPs via LAN.

Note: Enabling **HTTPs via WAN** can increase security risk including allowing web users to access the WAN interface.

1. Under **HTTP Redirect to HTTPs,** check **Enabled** to turn on or uncheck to turn off.
2. Enter **Port** or use default value.
3. Check either **Via LAN** or **Via WAN**.
4. Under **HTTPs**, enter **Port** or use default value.
5. Click **Finish**.

Finishing Configuration

Complete the following steps after you have finished entering the basic settings.

1. To save and apply the settings, click **Save and Restart** near the top of the left sidebar. The device restarts.
2. After restart, log back into the AEP interface. On the Dashboard under **Cellular**, the PPP state displays **Link is Up**. You may have to wait for short time.
3. To configure a LoRa Network, refer to Getting Started with LoRa

Using DeviceHQ for Device Management

DeviceHQ is a cloud-based device management tool for remote monitoring, upgrades, and configuration AEP devices. For information on creating and using a DeviceHQ account, go to the http://www.multitech.net/developer/software/devicehq/.

Chapter 9 – Mounting the Device

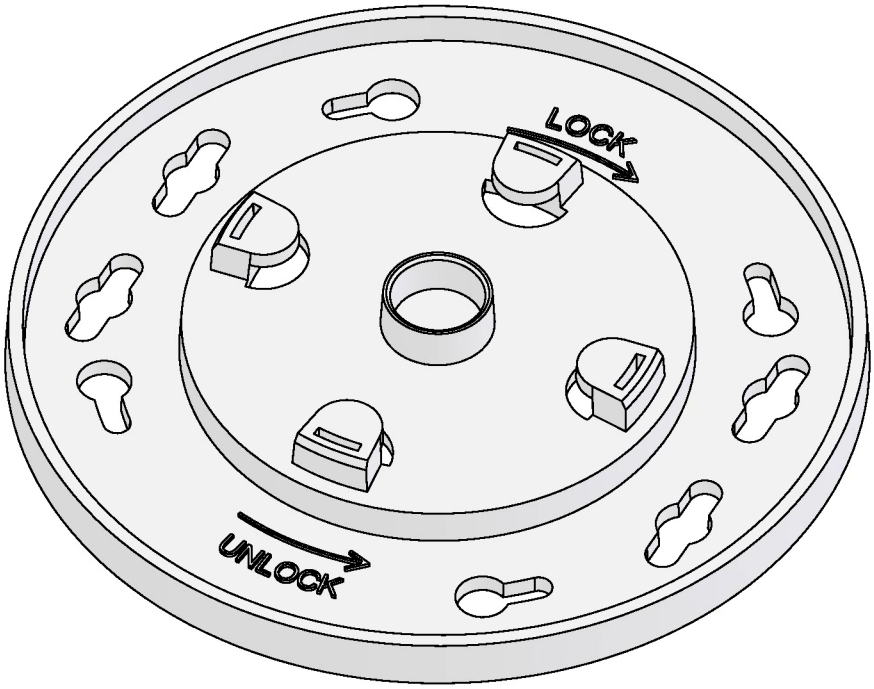
Mounting the Device

The device ships with a mounting bracket.

You will need

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

Mounting Bracket



Determining Location for the MTCAP

Follow these guidelines for best performance:

- For optimal performance, place the MTCAP 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.

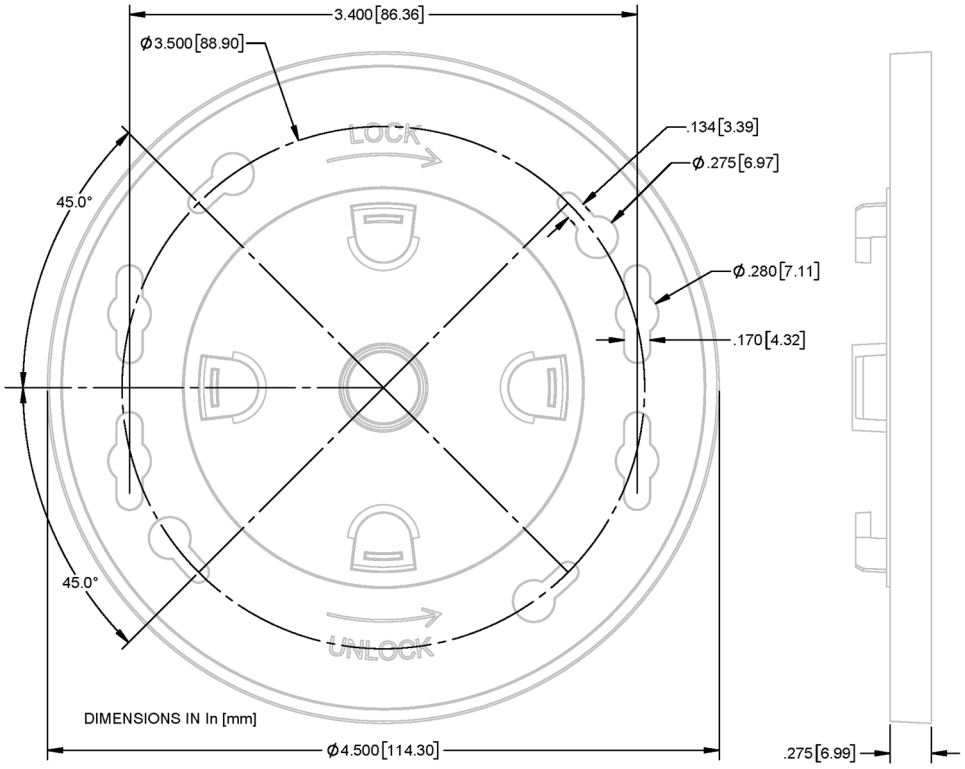
- Select a location central to all devices to be connected to this MTCAP.
- Avoid obstructions.

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

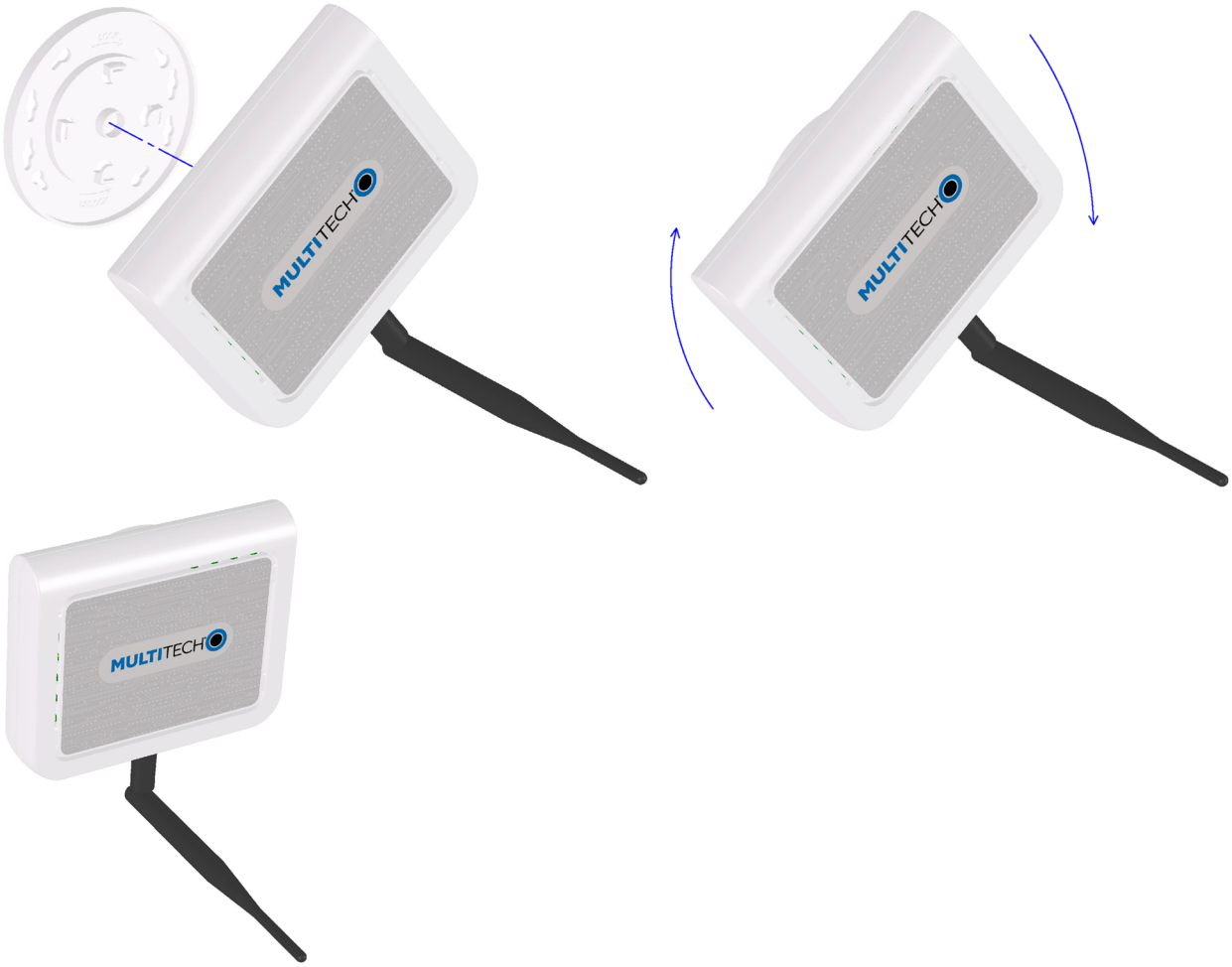
- We recommend conducting a site survey to test the signal strength in different locations before you mount the device.

Mounting the MTCAP

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 10 – Regulatory Information

47 CFR Part 15 Regulation Class B Devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Notice

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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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