

Mote Installation Instruction

This user guide will give you all the essential information needed for installing a Wildlife Computers Mote.



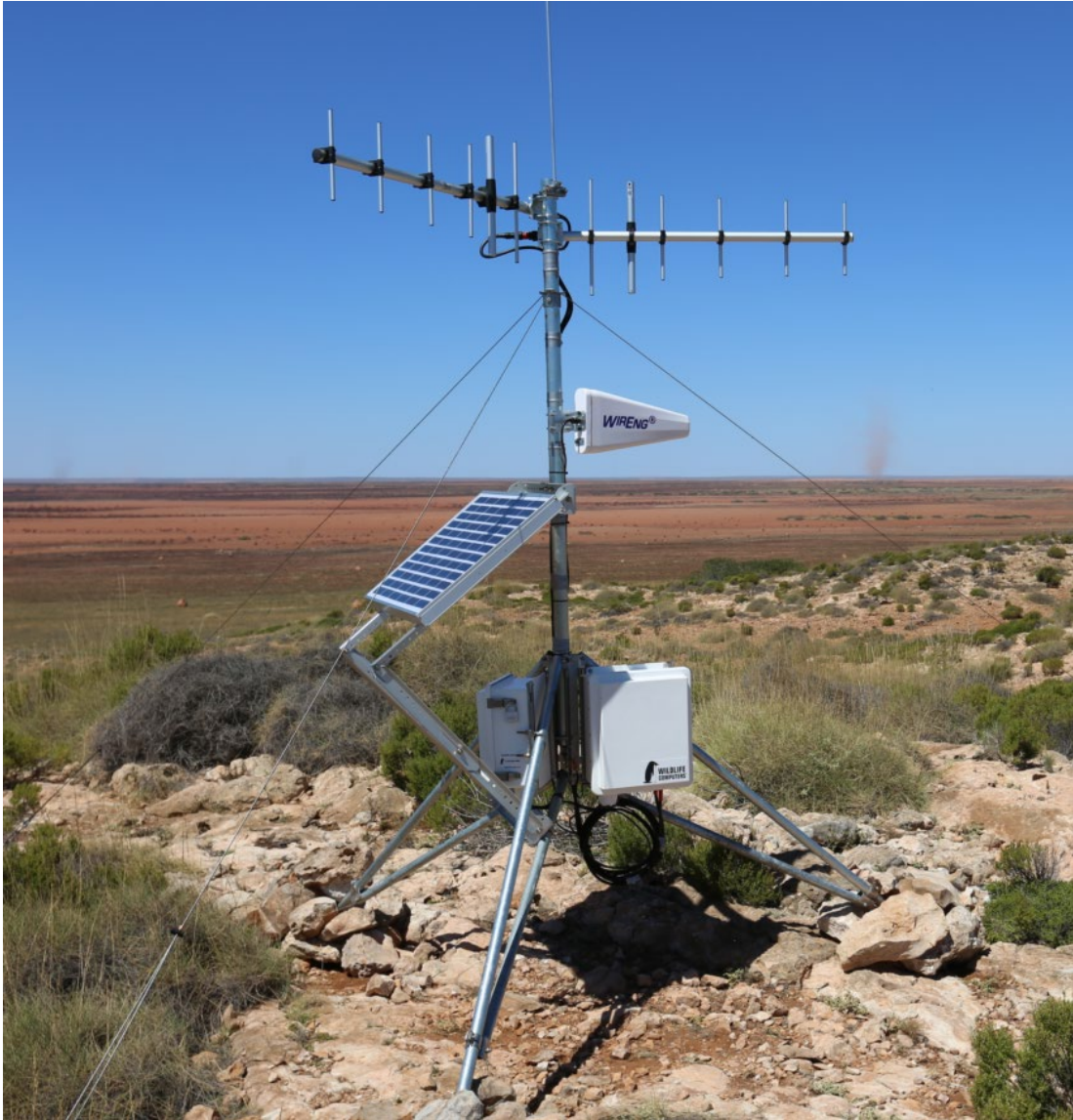
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Introduction

This guide applies to any Mote sold by Wildlife Computers. Please note, your specific installation may vary depending on your site or application.



Installation Tools Required

It is important to have all the tools you need for the installation. Here is a list of required tools to build and complete your Mote installation:

- 1 x 7/16" open-ended wrench
- 1 x 1/2" open-ended wrench
- 1 socket set ratchet with 7/16", 1/2" and 10mm deep sockets. (~2" deep)
- Battery drill/driver with 1/4" adaptor to take deep sockets—useful
- Battery drill and 3/8" drill bit to expand holes in the stake so it takes guy wire turnbuckles
- 7/16" and 1/2" ratchet wrenches—useful
- 8mm nut-driver or 6" adjustable spanner—for stay-wire adjustment nuts
- Zip ties, 12" or longer—25 needed per Mote
- Small 1/8" wide flat-blade screwdriver for the electrical connector blocks in the power supply
- 3/8" wide flat-blade screwdriver to tighten lightning rod and earth wires
- Large side-cutting pliers to cut up to 10 mm copper wire
- Box-cutter knife to cut tape and strip copper ground wire
- Small level for ensuring mast is vertical
- A satellite tag for testing to verify Mote operation
- A magnet to enable/disable the test tag

Additional Equipment Required per Mote

These items may be required depending on your site and which optional parts were selected. For example, the pre-assembled tripod from Campbell includes spikes, a grounding rod, ground rod clamp and grounding wire.

- 3-6-star pickets or metal stakes to anchor guy wires and possibly Mote feet into ground
- 2 padlocks to lock cabinets
- Moth balls, camphor sticks, or similar if insects are a likely problem
- Rubbing alcohol and rags to wipe down cables, and latex gloves to wear during installation—see Campbell Scientific document regarding rodents
- Approximately 1/8" soft galvanized binding wire for anchoring guy wires to stakes
- Earth rod and wire clamp for earthing—standard residential 4' or 5' copper/steel earth rod and clamp
- 3 m x 10 mm insulated cable for earth wire
- 2 rolls of 3M Super88 or similar high-quality electrical PVC tape
- Sledgehammer to insert metal stakes and ground rod
- A Windows-based laptop is required for setup if the installation includes a WiFi or GSM connection

Mote Installation Instructions

Off-Site Pre-Assembly and System Test

You can achieve best results by setting up and testing the entire system before going onsite at the intended location. Not only will this familiarize you with the assembly procedure but it will highlight any deficits in your tool kit. You can also confirm that your data recovery path is functional via either thumb drive, cellular modem, or WiFi. We highly recommend you read all the appropriate manuals and user guides provided by Campbell Scientific for other important details about the Mote assembly.

- Tripod—<https://s.campbellsci.com/documents/us/manuals/cm106b.pdf>
- Tripod kit with user-supplied tubing—
<https://s.campbellsci.com/documents/us/manuals/cm106bk.pdf>
- Solar panels—<https://s.campbellsci.com/documents/us/manuals/sp50-sp90.pdf> and
<https://s.campbellsci.com/documents/us/miscellaneous/extended-mount-bracket.pdf>
- CH200 charging regulator—<https://s.campbellsci.com/documents/us/manuals/ps200.pdf>
- Protecting enclosures from weather and pests—
<https://s.campbellsci.com/documents/us/technical-papers/pests.pdf>

Tripod Assembly

The majority of Motes are supported by tripods, however, other options such as mounting the antenna mast and enclosures onto existing structures are available. Contact Wildlife Computers for information on other mounting options. Tripods are provided pre-assembled and ready for transportation to the Mote site.

Follow the instructions in Section 6 of the attached [cm106b Tripod document](#).



Figure 1—cm106b tripod with guy wires and lightning rod

Tripod Assembly Tips

1. Assemble the tripod without inserting the mast which is fitted after the antennas have been attached to it. Do not tighten the six bolts at the top of the tripod legs
2. Spread the feet wide to ensure the enclosure clamps will fit onto the legs
3. The mast can be fitted and then removed to ensure that the tripod is level and correctly positioned
4. Use a spirit level to confirm the mast is vertical

Tripod Assembly for User-supplied Masts and Legs

See [cm106b Tripod document](#) for user-supplied mast and leg assembly instructions.

The tubes are schedule-5 galvanized steel and consist of:

- **Mast:** 1 x 40mm x 181.6cm length tube. Schedule 5. Outside diameter (OD) should be ~47.8 mm
- **Legs:** 3 x 25mm x 179.1cm tube. Schedule 5. OD should be ~33.6 mm
- **Leg Braces:** 3 x 25mm x 119.4cm tube. Schedule 5. OD should be ~33.6 mm

Holes in Legs and Mast

The legs and mast must be drilled with 5/16" (8.3 mm) holes for mounting bolts.

Legs and leg braces: Drill 5/16" (8.3 mm) holes in both ends of all six tripod legs, 1/2" (13 mm) from each end. The holes must be parallel with each other. Using a drill press works best and then inserting

a rod through the first hole. Set the vertical with a level to ensure the second hole is drilled in the same plane.



Mast: The guy kit supplied requires a 5/16" hole, 15" (381 mm) from the top of the mast. This hole goes right through the mast horizontally for the nut and bolt to hold the guy bracket in place—see *Figure 8 below*.

Tripod Anchoring

The tripod should be anchored to the ground using stakes or, in unhospitable ground, anchored via the guy wires to rocks or other natural features.

5. The guy wires can be attached to the tripod feet as shown in Figure 1 or they can be attached to stakes or fixed objects between the tripod feet. The tripod feet should also be tied to stakes
6. May need to use 3/8" drill bit to expand holes in stakes to accept turnbuckle hooks. This should be done prior to going into the field
7. Hook the turnbuckles supplied to the tripod feet or stakes at ground level. Use the 8-mm nut driver to loosen wire clamps and adjust guy wire lengths and tighten screws. Use turnbuckles to set even firm tension on all three guy wires
8. Rocks can be piled onto tripod feet for additional stability
9. Stakes can be doubled up and wired to each other in series, from the bottom of one to the top of the next, to increase holding strength in sandy ground

Antenna Assembly

It is recommended that antennas be assembled prior to transportation to the Mote site. Assembly includes the fitting of lightning arrestors and coaxial cables. Cover the free end of the coaxial cables with tape to keep out dirt until installation.

Yagi Antennas

1. Carefully remove the antennas from their cardboard boxes.
2. Note the orientation on the antenna as there is an 'UP' marking.
3. Slide the antenna clamp over the end of the antenna and fit the two nuts and bolts.
4. Position the two "U" clamps into the bracket so they are parallel with the antenna boom.

Note: If the antennas are assembled before transportation to the Mote site, the following steps are to be done once at the site.

1. Slide the antenna bracket onto the mast, 6" from the top. Align the antenna elements so they are vertical (parallel to the mast), and tighten the clamp and 'U' clamp nuts.
2. If you are using two Yagi antennas, repeat step one for the second antenna but position it below the first antenna. Typically, the antennas will be positioned 90-120° apart.



Figure 2—Yagi antenna mast clamp

Omni-directional Antennas

1. Carefully unpack the antenna.
2. Fit the cross-arm bracket to the antenna mast and tighten.
3. At the end of the cross-arm, assemble and fit the antenna mounting bracket near the end of the cross-arm.

4. Tighten the clamp with the antenna vertical.



Figure 3—Omni-directional antenna

Lightning Arrestors

In-line lightning arrestors are fitted to each antenna between the antennas and coaxial cables. Lightning arrestors for Yagi antennas do not need to be earthed as the antenna is metal, however, fiberglass omni-directional antennas require an earth wire to be fitted.

Note: Before installing lightning arrestors, apply PVC tape over the N-type connectors at one end of the coaxial cables to keep dirt out during installation.

Lightning Arrestor Installation Instructions

1. Screw the lightning arrestor onto the N-type antenna connector (Figure 4).



Figure 4

2. Screw on the coaxial cable (Figure 5).



Figure 5

3. For all antennas, fit an earth wire from the terminal on the lightning arrester to under the washer of the antenna mounting bracket (Figure 6).



Figure 6

4. Wrap the lightning arrester and the N-type connectors with PVC tape. Be sure to leave the drain hole(s) at the bottom of omni-directional antenna clear (Figure 7).



Figure 7

Guy Kit

The guy kit consists of a collar to hold the 3 guy wires, 2 guy brackets and a nut and bolt.

- Insert the “ball” end of each guy wire into the bracket slots.
- Slide the guy collar up the mast to above the mast hole.
- Attach the guy brackets and tighten the nut and bolt.

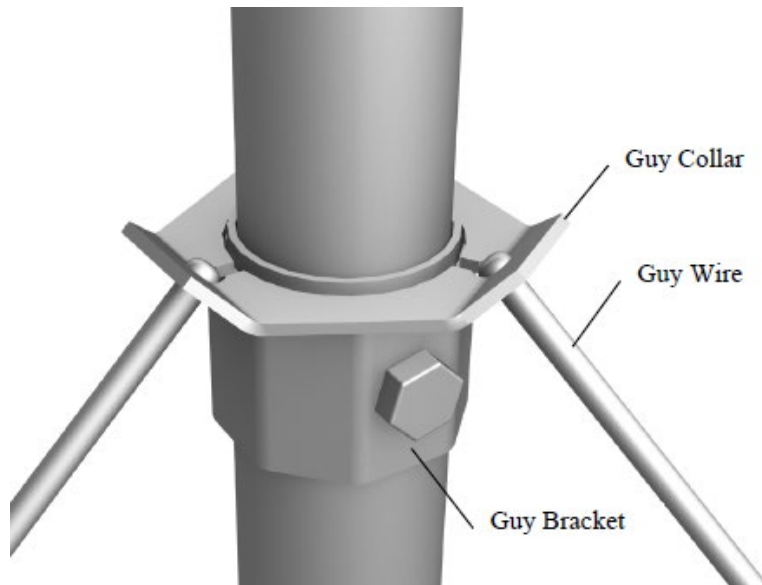


Figure 8—Guy mounting to mast

Coaxial Cables

1. Mark the end of each coaxial cable with some tape to determine which antenna is connected to each cable. When standing behind the Mote facing the direction of the tags (to sea), antenna A is on the right and antenna B is on the left. These labels will be used when the coaxial cables are connected to the Mote.
2. Use cable ties to attach the coaxial cables to the mast every 12" until 3' below the guy bracket. Leave some slack to ensure coaxial cable bends are gentle and not sharp which could damage the cables. As in Figure 9, leave room for the guy bracket to move without damaging the coaxial cables.
3. Cut off the cable ties and cover them with five turns of PVC tape.



Figure 9—Coaxial cable fed around guy bracket

Lightning Rod Mounting

Mount the lightning rod into the supplied 'U' clamp with a large screwdriver and the notched end of the rod. Then bolt onto the top of the mast. **See the tripod mounting instructions for further information.**

Mast Erection

The mast can now be placed into the loosened tripod base. It will be a tight fit but if the six bolts at the top are loose, the mast should slide into the tripod base.

1. Now is the time to adjust the direction of the antennas. If they are not at the correct angles, remove the mast from the base, loosen the antenna bolts and change the angle of the antennas.
2. Once the antennas are pointing in the desired direction, tighten all six tripod nuts and bolts and ensure all the tripod fittings are tight.
3. Check the mast is vertical using a spirit level.

Enclosure Mounting

Most Motes will have two enclosures, a Mote box and a battery box. Mount the Mote box on the lugs as shown in Figure 10.



Figure 10—Enclosure mounting tabs

Next, fit the 'U' bracket to the top tripod leg as shown in Figure 11.

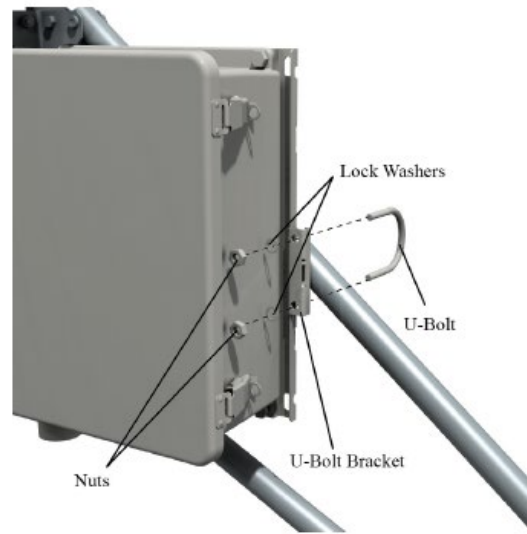


Figure 11—Enclosure U-bolt mounting

Mount the battery enclosure on the adjacent tripod leg as in Figure 12.



Figure 12—Enclosure mounting

Solar Panel Mounting

The solar panels are mounted onto the mast and tripod legs as shown in Figure 13 and 14. Solar panels are provided with full installation instructions, including mounting angles.

- Be very careful not to damage solar panel surfaces. Use the cardboard box to protect the front surface while fitting the mounting brackets.
- Cover the red (+) and black (-) wires in tape to ensure that they do not short together during installation. Larger panels may have a brown wire (+) and blue wire (-).



Figure 13—Solar panel mounting

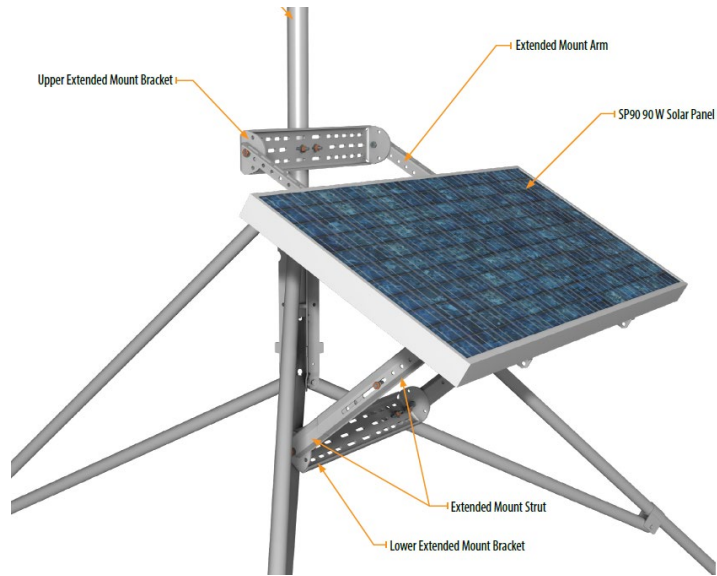


Figure 14—Solar panel mounting

Mote Wiring

Mote wiring consists of connecting the antennas, solar panel, and wiring between the battery enclosure and the Mote enclosure. The wires between enclosures run underneath and up through the enclosure conduit.

Note: Before starting ensure that the switch on the regulator in the battery enclosure is set to off. See Figure 15 below.



Figure 15—Battery enclosure regulator

1. Run the power wire between the Mote and battery enclosures. You must run this first because there is an in-line fuse. Leave it quite loose with a definite “drip loop” so any water will drop off the wires. Excess wire should be neatly coiled up and secured with the small cable ties supplied in the enclosure kit.
2. Plug this wire into the corresponding connector in the battery enclosure.
3. Next, run the COMM wire from the Mote to the battery enclosure. Again, coil up any extra cable and secure it in the battery enclosure before plugging the connector into the regulator COMM port in the battery enclosure.

Solar Panel Connection

1. Run the wire from the solar panel into the battery enclosure. Leave plenty of spare wire so it is not pulled tight and allows for drip loops, particularly behind the solar panel.
2. Once inside the battery enclosure, this wire can be shortened if necessary.
3. Connect the positive (red or brown) wire into “Solar.” Connect the black or blue wire into “G” above—see Figure 15 above.

Coaxial Cable Connection to Mote

1. Continue running the coax cables down the mast being careful to avoid any sharp metal parts that could cut into the cable.
2. Coil any excess coaxial cable neatly under the Mote enclosure and secure it with cable ties. Ensure there is adequate cable to leave a drip loop.
3. Remove the protective tape, check the connector for any dirt, and screw the right-hand antenna—viewed from standing behind the Mote and looking towards the sea—into antenna “A” connector.
4. When tight, wrap the connector with PVC tape—see Figure 16.



Figure 16

5. Insert remaining cable into port “B.”
6. Wrap with PVC tape.

Mote Grounding

Motes should be grounded to minimize damage due to lightning strikes. Current from a lightning strike will flow from the lightning rod, down the mast and to ground via the ground wire and stake.

1. Use a sledgehammer to insert the 4' or 5' earth stake. If the stake cannot be inserted because of hard ground, lay the stake on the ground and cover with rocks if possible.
2. Strip 1" of 3/8" wire and clamp it to the earth stake—see Figure 17.



Figure 17—Earth connection

3. Run the earth wire up to the tripod and cut to length. Strip 1" and fit it to the tripod earth tab using a flat blade screwdriver—see Figure 18.



Figure 18—Earth connection

4. Run another wire and connect it from the second tripod earth tab to the earth tab on the Mote enclosure.

Power Up the Mote

Activate the Mote by turning on the regulator power switch. The Mote GPS LED will cycle from red to orange to green while attempting to get a location. It will turn green when it has a valid time and location. This can take several minutes.

Activate the Argos Test Tag. Any Argos transmission will cause the Argos lights on the receivers to briefly flash green when Argos signals are received.

Mote LED Indicators

The LED's on the Mote front panel indicate the following states:

USB	ARGOS
Off —No USB stick present Red —Error Blinking green —Transferring data Solid green —Transfer complete	Always off ARGOS 1&2 Rx —Blinks green reception Power/Tx —Always green , blinks off during transmission

GPS	NETWORK
<p>Red—Attempting lock</p> <p>Orange—Partial lock (requires up to 15 minutes)</p> <p>Green—Valid lock</p>	<p>Off—No errors</p> <p>Blinking green—Internet communication</p> <p>Red—Network error</p>

Figure 19—LED indicator status

Power Supply LED Indicators

The power supply enclosure contains a battery and Ch200 charge regulator. When a solar panel is connected the CHARGE LED should be flashing green every 4-5 seconds if sunlight is present.

TABLE 3-1. CHARGE LED	
Condition	Color
No Valid Charge Source	Off
Valid Charge Source & Charging Battery	Flashing Green
Valid Charge Source but Battery being Discharged	Flashing Orange
Regulator Fault Detected	Flashing Red
Waiting for New Operating System (Section 6.2.2, <i>SDI-12 Measurements</i>)	Solid Red
Transferring Operating System	Solid Green

TABLE 3-2. CHECK BATTERY LED	
Condition	Color
Battery Voltage > 11.5 V	Off
10.5 V ≤ Battery Voltage ≤ 11.5 V	Flashing Orange
Battery Fault Detected OR Battery Voltage < 10.5 V	Flashing Red



WiFi Setup

Note: A Windows laptop is required for setup if the installation includes a WiFi or GSM connection.

The Mote has an internal website address for configuring settings. Connect your PC to the Mote using the MiniUSB cable supplied and connect to the Mote internal webserver via a browser such as Internet Explorer or Google Chrome.

On the Mote Configuration page, scan for available networks, and add your network (Figure 20). Networks can be deleted or reconnected to the Mote (Figure 21). The WiFi should connect and transfer Mote data to the Wildlife Computers portal.

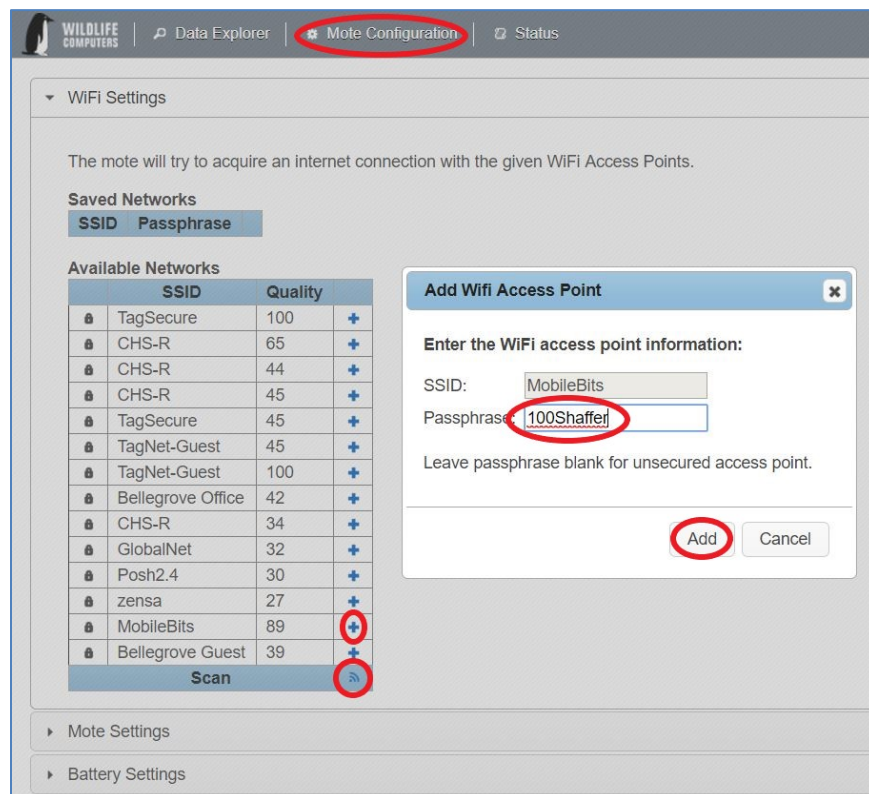


Figure 20—Adding a WiFi network

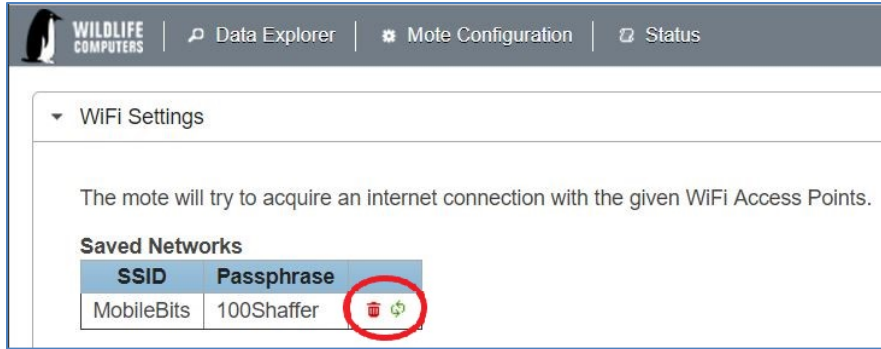


Figure 21—Removing and reconnecting a WiFi network

GSM Setup

GSM modems plug directly into the USB port on the front of the Mote. The modems should be “plug-and-play” with the correct modem and a suitable SIM card. As with setting up the WiFi network, you must connect to the Mote using a Windows 10 device with a USB cable.

Press ATTN to force a status message to be sent via GSM. Hold the ATTN button down until the Network light flashes green.

Mobile Network Provider

You must inform Wildlife Computers of the chosen mobile network provider for the Mote installation area prior to manufacturing. The correct GSM modem can then be selected and set up. The current mobile network is shown and can be changed on the Mote Configuration page under Mote Settings.

SIM Card

The Mote purchaser must provide the SIM card for installation in the Mote modem. A 1 GB per month plan has proven sufficient for Mote data.

Operation

When the GSM modem is plugged into the USB port, the Network LED on the Mote will flash red until a network connection is established. Once a connection is established the Network LED will flash green. Once data has been sent, the LED will be extinguished.

Note: the modem will only push data to the Wildlife Computers Portal when there is new data to send. It is recommended that you test the GSM modem connection when the system is pre-assembled before heading to the Mote site.

GSM External Antenna

Some GSM Motes are provided with an external GSM booster antenna. These should be used if the GSM modem shows fewer than three signal bars.



Figure 22—GSM external antenna

Antennas are mounted using the included U-bolts on the main mast pointing in the cell tower direction. Run the coaxial cable down the mast and secure it with cable ties and PVC tape. Run the coaxial cable into the Mote enclosure and connect to the GSM modem antenna socket.

Note: there are multiple coaxial sockets. Consult the modem manual for your specific device to determine which socket to use. Typically, the correct socket has an antenna icon or is socket number

Downloading Data via USB Memory Stick

At any time, a USB memory stick can be plugged into the Mote to download the data. Simply plug in the USB stick and the USB LED will flash green. Once download is complete, the LED will stay solid green and the USB stick can be removed.

Protection Against Weather and Pests

It is important to seal the enclosures from pests and the environment. See the Campbell Scientific application note for full instructions about protecting enclosures from pests. Here are the points to remember:

- The enclosures are supplied with bags of silica gel. Leave these in the enclosures
- If insects, like ants, are a potential problem, use mothballs, camphor-sticks, or other insect repellents should be left inside the enclosures
- Seal the enclosure using the sealing putty provided. Push the putty up into the cable conduit as far as possible and spread it around the wires to seal them
- Tape the bottom of the conduit with PVC tape if it is going to be a long deployment
- Do this for all enclosures

- Use padlocks to lock the housings if they are in a public area

Troubleshooting

Mote troubleshooting will normally require the assistance of a Wildlife Computers engineer.

Refer to the LED and Quick Guide included in the Mote enclosure for information about the LEDs and directly connecting to your Mote. If you need a direct connection, use the USB-mini cable in the pouch in the Mote enclosure

If the Mote does not appear to be operating correctly, turn the power switch off in the battery enclosure. After one minute, turn it on again and monitor Mote performance.

The Mote can also be rebooted by pressing and holding the POWER button until the LEDs extinguish.

The ATTN button on the front of the Mote can also be pressed briefly (10 seconds) to send a single status message via the Argos, WiFi or cellular modem. The Argos message will only be received if a satellite is overhead or there is another Mote in the vicinity.

Contacting Wildlife Computers

U.S. and International

Members of the Wildlife Computers technical sales and support team are located in Redmond, WA, USA, and Havelock North, New Zealand, allowing us to cover promptly a wide range of time zones.

Mailing and Shipping

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For Asian Clients

While we welcome your direct correspondence, we recommend that you contact our colleague, Yong Huang, for assistance. Mr. Huang understands the special purchase processes for your countries, and will provide you with the best service for the best price. He also is fluent in Japanese, Chinese, and English.

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