The wireless border router manages the formation and configuration of the 6LoWPAN wireless network and provides network connectivity via wired Ethernet to a local area network (LAN). Wireless REED (powered)/Routing devices connect to the border router to establish mesh routing paths. The border router also provides key information about the health of the mesh network in the form of signal quality, device status, network status, and other real-time network information such as energy monitoring. The border router allows cloud connectivity, which can be used to update firmware in all connected wireless devices, as well as the LMBR-650 itself.

MOUNTING AND INSTALLATION

Each border router ships with the following components:

- LMBR-650 border router
- LMPB-100 Power Supply
- DC power adapter cable, DC barrel to RJ45 jack
- T-shaped mounting bracket
- Self tapping screws x 3
- Cable tie

Not included:
- LMRJ cable connection between power adapter cable and LMPB-100
- CAT5e network cable for connection to LAN, DLM Management software, and other BACnet devices

If the site will only have a single LMBR-650, it should be mounted as described below. If there are multiple LMBR-650s, one of them will be designated as the Primary LMBR and all others will be Secondary LMBRs. It is Wattstopper best practice that the Primary LMBR be used only for communication with other LMBRs and not have any wireless devices assigned to its network. Therefore, the Primary LMBR will often be mounted in a network enclosure and will only communicate via ethernet cable and not with its wireless radio.

A single (or secondary) LMBR-650 is intended to be mounted in a central location for optimal communication with wireless devices. It is rated for installation in plenum or non-plenum ceiling spaces. The LMBR-650 should be mounted to a vertical surface, using the included T-shaped bracket, for optimum efficiency of wireless transmission/reception. For projects designed by Wattstopper services, check drawing for optimal border router placement. Wattstopper recommends a minimum of 10' between the LMBR-650 and another LMBR will often be mounted in a network enclosure and will only communicate via ethernet cable and not with its wireless radio.

1. Using T-shaped mounting bracket, locate a suitable vertical surface to mount the T-shaped bracket with the two screw holes facing down (T upside down orientation as shown). Use provided self tapping screws to mount the T-adapter.
2. Once T-adapter is secure, locate the mounting holes on back side of border router and T-shaped adapter. With the border router network connections facing upward align the border router over the mounting pegs and slide down to lock into place.

NOTE: Typical coverage is a diameter of 100'. Wattstopper recommends that a single or secondary LMBR-650 not be installed in an enclosure. If code requires this, then the coverage area for the router is reduced by up to 25%.
Determine the best power source for the border router.

**DLM IRB powered (preferred, easiest method, plenum rated)**
1. Connect the barrel end of the DC power adapter cable into the back of the border router.
2. Connect the LMRJ45 end of the adapter cable to the LMPB-100 Power Booster, using an LMRJ cable.
3. Connect a standard network cable to the LMBR-650. The other end should be connected to the switch in a Network cabinet or RACCESS cabinet, if using, or another switch or PC, if not.
4. Secure the cables to the square loop with a cable tie, to provide strain relief.
5. Once the DLM room network is powered up, the border router will begin to power on.
   - If the border router does not power on, check that the LMPB-100 is powered on and that cables are fully inserted.
   - If the border router still does not power on, confirm that there are not too many connected devices in the DLM room network.
6. Once powered on, device will begin boot sequence illuminating LEDs.

**Optional 120VAC powered (not suitable for plenum spaces)**
1. A 2 prong AC power adapter (NB-PS) with 4ft length cord can be purchased separately.
2. Install electrical box with receptacle where border router will be installed. (Note: ensure receptacles are not switched.)
3. Connect the barrel connector to the back of the border router and plug in the AC wall adapter to power on the device.
4. Connect a standard network cable to the LMB-650. The other end should be connected to the switch in a RACCESS cabinet, if using, or another switch or PC, if not.
5. Secure the cables to the square loop with a cable tie, to provide strain relief.
6. Once powered on, device will begin boot sequence illuminating LEDs.

**CONNECTION WITH DLM LOCAL NETWORKS AND DLM MANAGEMENT SOFTWARE**

The LMBR-650 provides wireless communication with an LMBC-650 wireless bridge or LMRC-611MCC room controller, connected to a local DLM Network. The LMBR-650 can communicate with up to 50 room controllers / bridges and 250 room devices. Maximum distance between REED/routing devices is 100 ft.

If more than one LMBR (and up to 11) are being installed at a site, it is Wattstopper best practice that one LMBR (the Primary) be used only for communication with the other LMBRs (for a maximum of 10) and not have any wireless devices assigned to its network. In this case, each LMBR should be connected to a wireless switch via ethernet cable. The Primary LMBR can be installed in the network enclosure, since it will not communicate directly with any wireless devices.

**NOTE:** If a bridge is installed inside a J-box, the coverage decreases to around 75'. (The room controller does not mount inside a J-box.) The minimum distance between bridges is 6”. However, unlike wired bridges, where it can make sense to install several of them next to each other for ease of wiring, Wattstopper recommends installing each bridge a distance close to or in the room it is controlling, instead of bunched together.

The LMBR-650 connects with DLM Design and Programming software (LMCS-100), DLM DashBoard, RACCESS, or other BACnet devices by either connecting them directly with a Cat5e network cable, or by including an NB-Switch, as shown below.

Following is an example of a DLM network with a single LMBR-650, a network enclosure with an NB-Switch, and multiple DLM rooms. Wattstopper recommends a minimum of 10’ between the LMBR-650 and any wireless bridges or wireless room controllers.
**COMMISSIONING AND CONFIGURATION**

Certified Startup Technician Information

**Initial Wireless Operation**

1. At power on, led indicators on front of device will begin to illuminate.
2. Upon first use, the border router is configured with default network settings. During this initial state, the wireless network is ready to be commissioned by a Wattstopper authorized field technician.
4. Using LMCS, authorized startup technicians will discover all border routers and then provision the network.
5. During the provisioning process the network will be secured and wireless encryption keys and Network ID will be updated.
6. Final steps are to configure DLM parameters as needed.

**LMBR-650 LED Indicators**

<table>
<thead>
<tr>
<th>LED</th>
<th>Flashing</th>
<th>Solid</th>
<th>Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Processor boot up SUCCESS</td>
<td>Processor boot up SUCCESS</td>
<td>Processor boot up ERROR</td>
</tr>
<tr>
<td>Orange</td>
<td>Off line data logging SUCCESS</td>
<td>Off line data logging ERROR</td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td>Only applies during device reset or power-up</td>
<td>Only applies during device reset</td>
<td>Not On during normal operation</td>
</tr>
<tr>
<td>White</td>
<td>Network running (LMBR talking to other devices)</td>
<td>Searching for a network</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>Power connection SUCCESS</td>
<td>Power connection ERROR</td>
<td></td>
</tr>
</tbody>
</table>

**NETWORK AND SECURITY SETTINGS**

By default the wireless network is secure out of the box. All communication is encrypted via AES 128bit encryption. Each border router ships with a unique MAC address printed on the product label. This address is used to identify the border router when configuring with LMCS.

During system startup and commissioning, the LMCS software is used to securely connect and set network settings by changing from default to unique settings that are shared by all devices connected to the border router.

Network and security settings can be reset to factory defaults and reconfigured. Contact support for assistance as needed.

At default, the LMBR-650 is configured for DHCP and requires DNS to provide it with a IP address before you can even connect to it. Therefore, all LMBR-650s (as well as the computer) must be connected to a router when you initially discover it within LMCS. If you do not plan to have the router permanently connected to the network, you must switch the LMBR-650 to a static IP address, once it has been discovered. If there are multiple LMBR-650s, set each one to a different IP address and they will all be able to communicate both with LMCS and with each other.

**DEVICE RESET**

To perform a hardware reset:

Each border router has two recessed buttons located near the network and USB ports. You will need a paper clip to press the buttons.

- The left reset button, labeled “A”, enables a hard power cycle of the device. To initiate a power reset, press and hold for 2 seconds. This functions the same as unplugging and then replugging the cable used to provide power (AC power adapter, or LMRJ 45 cable if using an LMPB-100 for power). **Warning**—Wattstopper recommends that the reset button not be pressed repeatedly during startup of the device.
- The right reset button, labeled “B”, allows you to manually set the LMBR-650 to Static IP, or if changed to Static IP to switch back to DHCP, or to reset the router to the default Network and Channel. To access these functions, first enter “Config” mode by pressing and holding the B button for 3 seconds. After three seconds, the White LED will begin to blink. Release the B button. At this point the following options are available, by pressing and releasing the B button to cycle through the choices: If yo cycle past your choice, keep pressing until that option is selected again.
  - Option 1: When you first enter Config mode, the Blue LED will display solid. This option will set the router to DHCP.
  - Option 2: Press and release the B button once to set the router to Static IP. The Orange LED will display solid to indicate this choice.
  - Option 3: Press and release the B button a second time to exit “Config” Mode without making any changes. The Green LED will display solid to indicate this choice.
  - Option 4: Press and release the B button a fourth time to completely reset the router. The Blue, Yellow, and Green LEDs will all display solid to indicate this choice. This will set the Network ID and Channel to the default values. If the router was previously communicating with any room controllers or bridges on anything other than the default profile, it will no longer communicate with them, and you will need to set it back to the previous Network and Channel (via LMCS), or reset those other devices.
If you select Options 1 through 3, then press and hold the B button for 3 seconds to commit to the choice. If you select Option 4, press and hold the B button for 15 seconds. While holding the button, for the first three seconds the white LED will blink and then all the LEDs will start blinking. After 15 seconds, the LEDs will briefly blink more quickly indicating the LMBR-650 will be reset. Release the B button. The LMBR-650 will then reboot.

NOTE: If you are on option 4 and press and release the B button without holding it for the 15 seconds, the unit will cycle back to choice 1, as indicated by the LEDs.

Reset via LMCS:

Once an LMBR has been commissioned within LMCS, it can be reset through LMCS. From the Networks Tab, expand the tree, and highlight the LMBR in the tree. Click the Factory Reset button in the information section. As with a reset via button press on the unit, you will then need to rediscover the LMBR in LMCS and return it to its previous Network ID and Channel in order to reestablish communication with the devices that are on that network.

FCC REGULATORY STATEMENTS

The design of LMBR-650 complies with FCC and IC safety levels of radio frequency (RF) exposure for Mobile devices. This device is only authorized for use in a mobile application. At least 20 cm of separation distance between the LMBR-650 device and the user’s body must be maintained at all times.

CAUTION: Any changes or modifications not expressly approved by The Watt Stopper Inc. void the user’s authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Contains FCC ID: Q4B-LMBR-600. The enclosed 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.

IC REGULATORY STATEMENTS

Contains IC: 20256-BR1 This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: 1) this device may not cause interference, and 2) this device must accept any interference, including interference that may cause undesired operation of the device.

<table>
<thead>
<tr>
<th>WARRANTY INFORMATION</th>
<th>INFORMATIONS RELATIVES À LA GARANTIE</th>
<th>INFORMACIÓN DE LA GARANTÍA</th>
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<tr>
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