Request for grant of Modular Approval (MA) for the Axiometric MeshStamp® II

The Axiometric MeshStamp® II is a general-purpose module which functions in a MeshPlus® wireless mesh networking system or a StarPlus® wireless star networking system. MeshPlus® and StarPlus® are proprietary frequency hopping spread spectrum (FHSS) networks operating in the unlicensed 902 MHz to 928 MHz ISM band

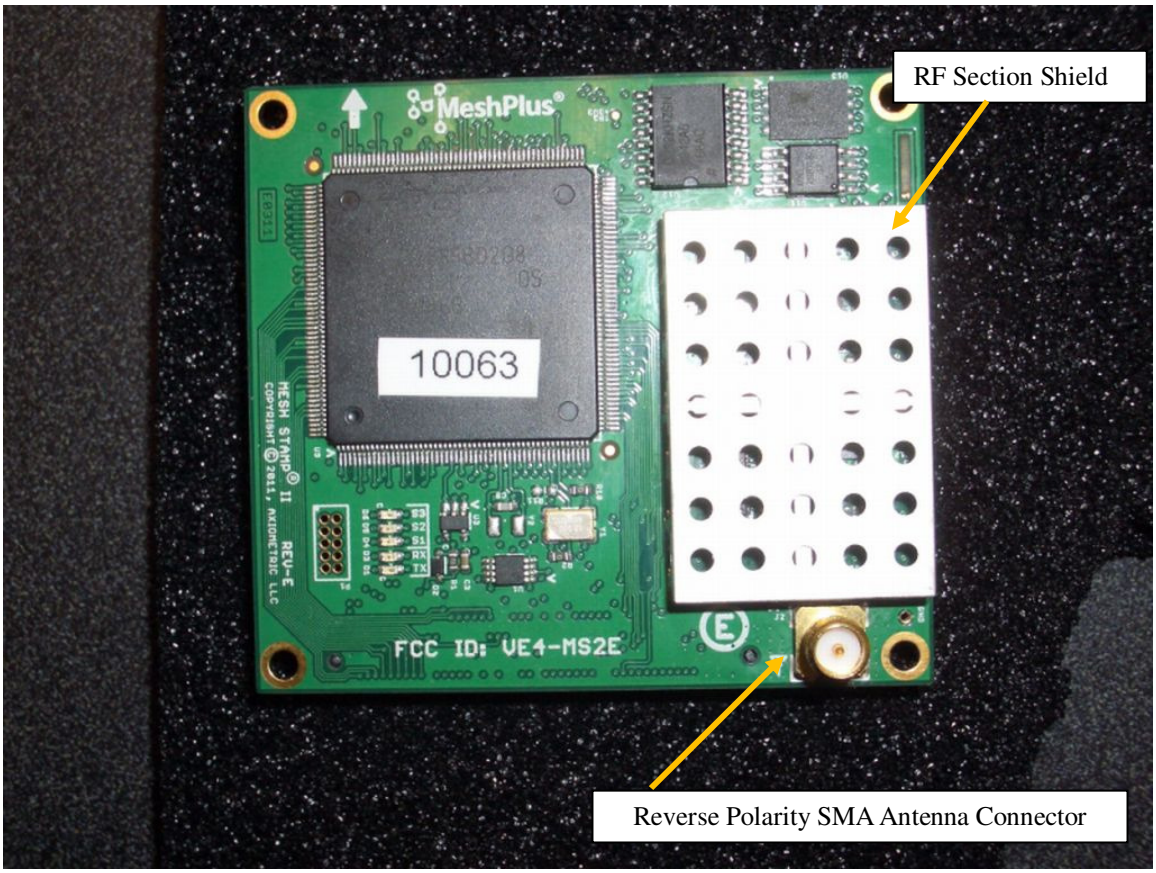
MeshPlus® and StarPlus® wireless networks are used in commercial and industrial applications such as automatic utility meter reading, municipal lighting, and commercial agriculture systems. MeshPlus® and StarPlus® networks use proprietary communications protocols and only interoperate with other MeshPlus® and StarPlus® devices designed by Axiometric. They are not marketed to the general public for consumer applications.

Axiometric designed the MeshStamp® II to meet the requirements for Modular Approval (MA). Axiometric intends to design and obtain type acceptance for products incorporating the MeshStamp® II. These products, such as MeshPlus® Gateways and Repeaters will be part of the MeshPlus® wireless systems sold for commercial and industrial applications. The MeshStamp® II units will be used exclusively by Axiometric for incorporation into Axiometric designed end products and will not be sold as a stand alone product. Axiometric retains complete control of the end to end design of all products containing the MeshStamp® II and can therefore ensure compliance to all regulations. The end products are shipped complete with antennas which were verified in the compliance tests. All MeshPlus® wireless systems are professionally installed.

Compliance of the MeshStamp® for Modular Approval:

1. The modular transmitter must have its own RF shielding. This is intended to ensure that the module does not have to rely upon the shielding provided by the device into which it is installed in order for all modular transmitter emissions to comply with Part 15 limits. It is also intended to prevent coupling between the RF circuitry of the module and any wires or circuits in the device into which the module is installed. Such coupling may result in non-compliant operation.

There is an RF shield covering the complete radio section of the MeshStamp® II.



2. The modular transmitter must have buffered modulation/data inputs (if such inputs are provided) to ensure that the module will comply with Part 15 requirements under conditions of excessive data rates or over-modulation.

No modulation / data inputs are provided. The MeshStamp® II processor directly interfaces with the radio section. The processor controls the data rate and FSK frequency deviation ensuring excessive data rates or over-modulation cannot occur.

3. The modular transmitter must have its own power supply regulation. This is intended to ensure that the module will comply with Part 15 requirements regardless of the design of the power supplying circuitry in the device into which the module is installed.

The MeshStamp® is powered by an input DC voltage of 3.6V to 7.0V. Linear regulators provide 3.3V to the processor section and radio chip. A linear regulator supplies 3.5V to the radio power amplifier.

4. The modular transmitter must comply with the antenna requirements of Section 15.203 and 15.204(c). The antenna must either be permanently attached or employ a "unique" antenna coupler (at all connections between the module and the antenna,

including the cable). Any antenna used with the module must be approved with the module, either at the time of initial authorization or through a Class II permissive change. The "professional installation" provision of Section 15.203 may not be applied to modules.

A unique antenna coupler, a reverse polarity SMA connector, is attached to the MeshStamp® II. Compliance testing was performed with a 8.0 dBi gain vertical antenna.

5. The modular transmitter must be tested in a stand-alone configuration, i.e., the module must not be inside another device during testing. This is intended to demonstrate that the module is capable of complying with Part 15 emission limits regardless of the device into which it is eventually installed. Unless the transmitter module will be battery powered, it must comply with the AC line conducted requirements found in Section 15.207. AC or DC power lines and data input/output lines connected to the module must not contain ferrites, unless they will be marketed with the module (see Section 15.27(a)). The length of these lines shall be length typical of actual use or, if that length is unknown, at least 10 centimeters to insure that there is no coupling between the case of the module and supporting equipment. Any accessories, peripherals, or support equipment connected to the module during testing shall be unmodified or commercially available (see Section 15.31(i)).

The MeshStamp® II was tested for compliance plugged into a mother board which provided power and a computer USB connection. The USB connection provided a method to communicate with the MeshStamp® II to instruct it to transmit on specific frequencies for compliance testing. The mother board is typical of ones which will be used for products incorporating the MeshStamp® II. The mother board was not housed in an enclosure.

6. The modular transmitter must be labeled with its own FCC ID number, and, if the FCC is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: XYZMODEL1" or "Contains FCC ID: XYZMODEL1." Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.

The MeshStamp® has a silkscreened label containing the FCC ID number on its top side. A separate document showing the location of the FCC ID on the MS2E is included with the application. In addition, products manufactured by Axiometric incorporating the MeshStamp® II contain an external label referring to the enclosed module. An example of the external label is shown at the end of this document.

7. The modular transmitter must comply with any specific rule or operating requirements applicable to the transmitter and the manufacturer must provide adequate instructions along with the module to explain any such requirements. A copy of these instructions must be included in the application for equipment authorization. For example, there are very strict operational and timing requirements that must be met before a transmitter is authorized for operation under Section 15.231. For instance, data transmission is

prohibited, except for operation under Section 15.231(e), in which case there are separate field strength level and timing requirements. Compliance with these requirements must be assured.

15.231 is not applicable to the MeshStamp® II.

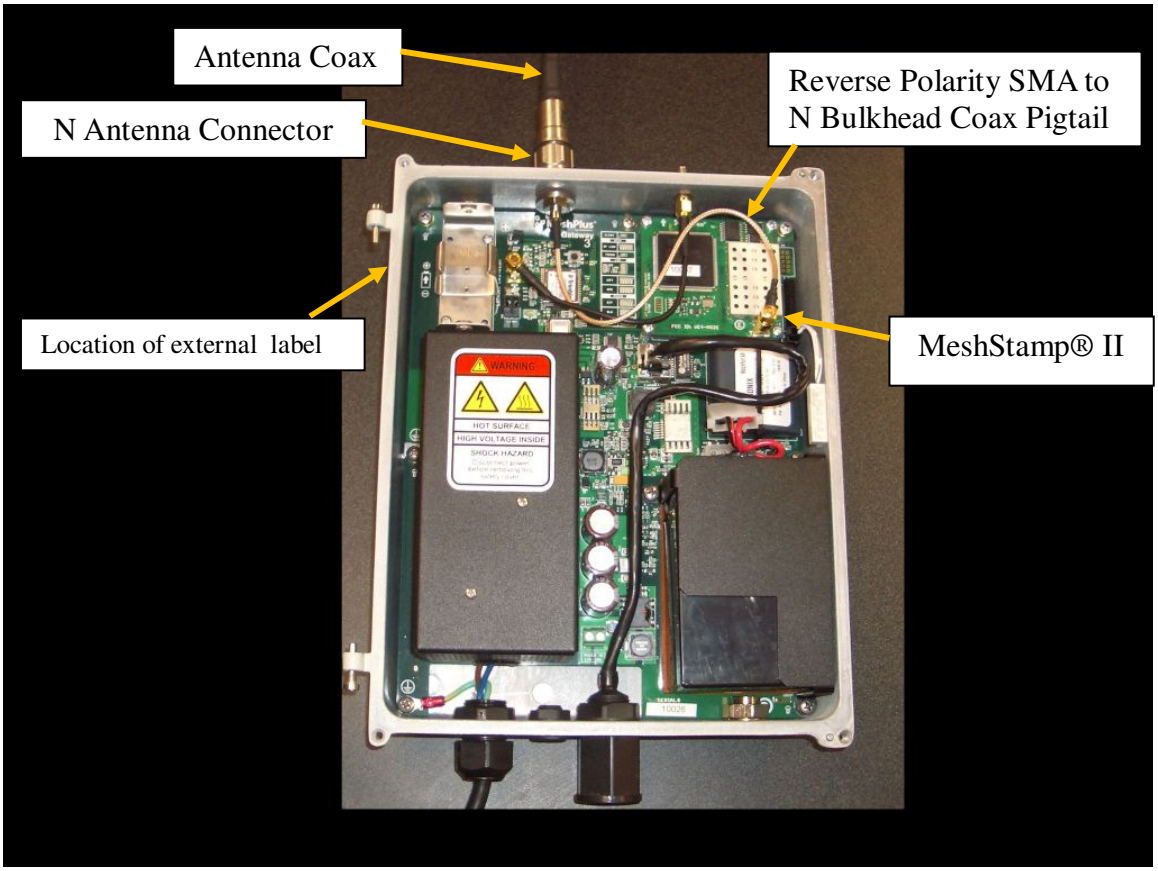
8. The modular transmitter must comply with any applicable RF exposure requirements. For example, FCC Rules in Sections 2.1091, 2.1093 and specific Sections of Part 15, including 15.319(i), 15.407(f), 15.253(f) and 15.255(g), require that Unlicensed PCS, UNII and millimeter wave devices perform routine environmental evaluation for RF exposure to demonstrate compliance. In addition, spread spectrum transmitters operating under Section 15.247 are required to address RF Exposure compliance in accordance with Section 15.247(b)(4). Modular transmitters approved under other Sections of Part 15, when necessary, may also need to address certain RF Exposure concerns, typically by providing specific installation and operating instructions for users, installers and other interested parties to ensure compliance.

Specific instructions for RF exposure are addressed in the user's guide provided for the end products containing the MeshStamp® II. An example of a user's guide for a Gateway3 is included with the application.

Examples of products incorporating the MeshStamp® II

Below is an example of an end product designed by Axiometric utilizing the MeshStamp® II. It is typical of the series of products Axiometric intends to design which will incorporate the MeshStamp® II.

The product is an Ethernet Gateway3.



The MeshStamp II is plugged into the Ethernet Gateway motherboard at the top right of the enclosure. An N bulkhead antenna connector is attached to the top of the enclosure with a coax pigtail which connects to the reverse polarity SMA connector of the MeshStamp II. The remote mounted 8 dBi vertical antenna (the antenna used during compliance testing) is connected to the enclosure bulkhead antenna connector by coax cable.

As stated in the introduction, Axiometric is the exclusive designer of all products that will be incorporating the MeshStamp® II. All of the products are used only in proprietary MeshPlus® or StarPlus® wireless networks intended for industrial and scientific applications, and are professionally installed. Axiometric retains complete

end to end control of the design of the final products ensuring compliance to all regulations. All of the products are shipped complete with antennas to ensure regulation compliance. The User Guides shipped with the end products prohibits the use of antennas not supplied or approved by Axiometric.

Other examples of products intended to incorporate the MeshStamp® II are Gateways, Repeaters, Remote Terminal Units, and Mobile Readers.

Below is an example of the label to be applied to the outside of the enclosure of the Gateway:

Axiometric ***MeshPlus®***

Model GW3-LAN
Contains FCC ID VE4-MS2E

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.