



**MineTrax OEM Modem/Tag/Router Module**

**WN-200 User Guide**

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FCC §15.19(a)(3) / RSS Gen 7.1.5- FCC two-part warning statement:

*"The WN-200 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."*

FCC §15.21 warning statement:

*"Changes or modifications not expressly approved by Newtrax Technologies Inc. could void the user's authority to operate the equipment."*

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*The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.*

*The modular transmitter must be labelled with its own FCC ID number, and, if the FCC ID 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: OQ6-WN-200 or "Contains FCC ID: OQ6-WN-200"*

*"Contains Transmitter Module IC: 6314B-WN200 or Contains IC: 6314B-WN200"*

*This device complies with Industry Canada licence-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.*

*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.*

## 2 Introduction

This document describes how the WN-200 MineTrax OEM Modem/Tag/Router Module should be integrated in a product.

## 3 Considerations for an Optimal RF Link

There are simple ways to optimize the quality of a RF link, only by considering the antenna, enclosure and locations of WN-200 nodes in the network.

### 3.1 *Antenna knowledge base*

The antenna performance is affected by its orientation and its polarization and by the ground plane.

#### **Antenna orientation**

The antenna orientation is important in order to maximize the line-of-sight range: antennas of communicating WN-200 nodes should have the same orientation.

However, when the environment is harsh, RF signals coming from reflections dominate such that antenna orientation does not play a significant role.

#### **Antenna polarization**

Polarization refers to the orientation of the lines of flux in an electromagnetic field. It is dependent on the type of antenna and the orientation of the ground plane relative to the antenna.

If the transmitter and receiver's antennas do not have the same polarization, a certain amount of power will be lost.

In order to minimize the effect of polarization on performance, you should use the same type of antenna, oriented in the same direction relative to the ground plane, for all nodes.

#### **Antenna ground plane**

In the case of a quarter-wave antenna, the ground plane acts as a counterpoise to form a centered half-wave dipole. Since this plane is essentially the other half of the antenna, its size and proximity are essential. Often an antenna can appear smaller than its specified wavelength. This is due to internal mechanical tricks, such as helical windings, that can reduce the antenna's physical size. This does not mean that the same size is appropriate for the ground plane. A compromised ground plane can affect antenna pattern and can detune the antenna.

Optimum performance will be obtained from a quarter or half-wave straight whip mounted at a right angle to the ground plane. In many cases, this is not desirable for practical or ergonomic reasons, thus, an alternative antenna style such as a helical, loop, or patch may be used and the corresponding sacrifice in performance accepted.

Figure 3 illustrates various ground plane polarization relative to the antenna and possible trade-offs.

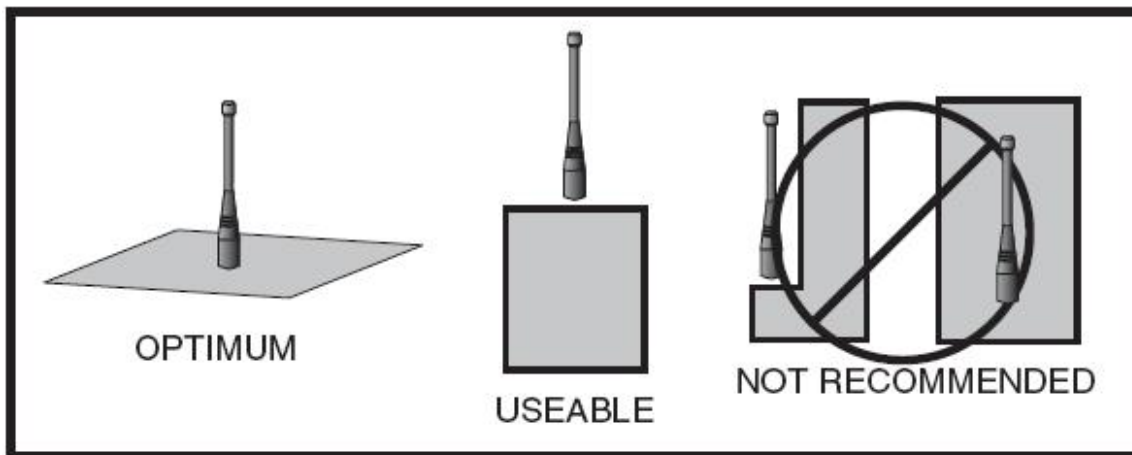


Figure 3: Ground plane polarization

### 3.2 Suggested antenna types

RSS Gen 7.1.4 warning statements:

*“This device has been designed to operate with the antennas listed below, and having a maximum gain of 3 dBi. Antennas not included in this list or having a gain greater than 3 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.”*

- ⑩ 3.0 dBi MAXRAD MLPV800 with coaxial cable and magnetic base
- ⑩ 3.0 dBi MAXRAD MLPV800 with coaxial cable and MAXRAD BMATM-NC Panel-Mount connector

*“To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.”*

## 4 WN-200 Hardware

### 4.1 Power

#### Requirements

- ⑩ 3.6 to 9.0 VDC @ 250 mA minimum unregulated power input into the VBATT input.

#### Recommended batteries

Any Lithium Thionyl Chloride (Li/SOCl<sub>2</sub>) 3.6V battery or rechargeable 3.6 Lithium-ion battery.