

NEON Proximity Unit

Hardware Model: NEON-PR8U

User Manual

NEON™ Proximity App

Version 1.0

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1. Important Information

1.1 Software License and Warranty Information

Please refer to the Appendices of this document to find information about the TRX Software License and Warranty Agreement and the TRX Limited Hardware Warranty. The terms of the TRX Software License and Warranty must be read prior to using the TRX Proximity Unit. By using the TRX Proximity Unit you are acknowledging acceptance of the terms described therein.

1.2 Technical Support

TRX Systems provides technical support for the NEON Products and components including

- NEON™ Proximity Units,
- NEON™ Proximity App,
- NEON™ Proximity Unit ICD

For technical support, please visit our online help desk at <https://support.trxsystems.com/> or contact TRX Systems by email at support@trxsystems.com. In the event of detection of any system security vulnerabilities (including suspected illicit code, malware, or other vulnerabilities) customers should contact TRX Systems support immediately.

2. Use of Proximity System

This User Manual provides information about how to configure, use, and maintain the NEON™ Proximity Unit NEON-PR8U with the NEON™ Proximity App.

2.1 Proximity Unit

The proximity unit includes ultra-wideband ranging along with the following sensors: 3-Axis Gyroscope and 3-Axis Accelerometer, 3-Axis Magnetometer and a Barometric Pressure Sensor.

The proximity unit uses ultra-wideband ranging technology which provides **sub-meter ranging accuracy over distances of up to 90 meters** line of sight. It provides stable range performance indoors in high multipath environments while the user is in motion (i.e. no need to wait for the signal to stabilize). The proximity unit is able to range through standard office construction walls (however, as with all radio frequency technologies, signals will not pass through metal and will be severely attenuated by cinderblock and concrete rebar construction). In addition to ranging, the beacon is also able to **provide relative elevation**.

In normal operation, the proximity units create an ad-hoc network. They range to another proximity units in the network about once every 1.5 seconds and rotates through their range list. Each time a proximity unit ranges to another proximity unit, the ranges are shared with both devices.

The range information is displayed in the NEON Ranging App's list view. If a proximity unit does not respond to range requests after several consecutive passes through the range list, it is dropped from the range list. Each range message contains device ID, still time, range, relative elevation, relative elevation error (see table below). Proximity units send out beacon messages every 3 seconds so that if it goes out of range, it will quickly be picked up when it is back in range.

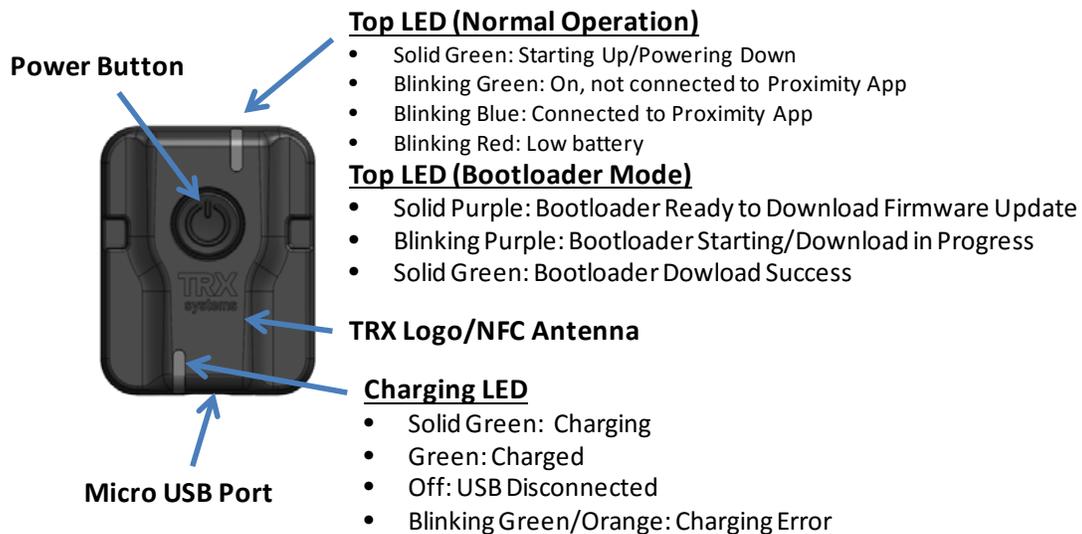


Figure 1. TRX Proximity Unit (Front) - NEON-PR8U

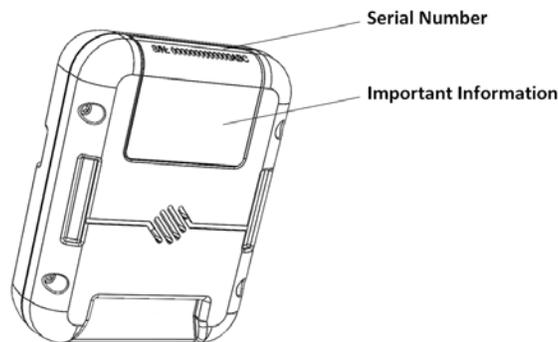


Figure 2. TRX Proximity Unit (Back) - NEON-PR8U

2.2 Connecting the Proximity Unit to an Android Device

The proximity unit connects to an Android device over Bluetooth. There are two ways to pair the proximity unit: by aligning the NFC antenna on the proximity unit to the NFC antenna on the phone, and by using the Bluetooth menu on the Android device.

The NFC antenna is located under the TRX Logo on the Proximity Unit. You may need to check with your phone manufacturer to determine the exact location of the NFC antenna. Typically it is located on the back of the Android device.

Turn on the proximity unit and align the NFC antennas again to pair the proximity unit to the Android device. Follow the on screen instructions to complete the pairing process. Once a proximity unit is paired to the Android device, it will stay paired unless you explicitly remove the device from the Bluetooth settings. The proximity unit automatically connects to the Android device when NEON Proximity App is running.

If your Android device does not support NFC, then you may pair the Proximity Unit through the Bluetooth settings screen. Ensure the Proximity Unit is turned on during the pairing process. The Proximity Unit will show up in the Bluetooth available devices list a "TRX_XXXX" where XXXX is the serial number.

2.3 Proximity App

Once the proximity unit has been paired with the Android, in the App you can choose proximity unit S/N from the list, Figure 3. Recall the S/N is found on the top back label. Once connected to the App, the proximity unit top light turns blue and the Android App opens the main screen and displays information from the proximity unit in the operational range.

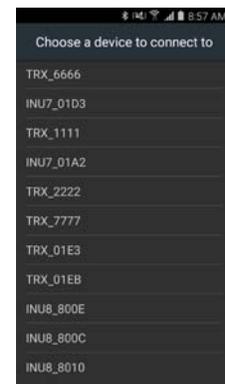


Figure 3. Connect to Proximity App

The Android display screens are shown in Figure 4. In normal mode the, the list view (Figure 4, left screenshot) displays range and connection status. If a proximity unit has not moved for more than 30 seconds, its list element turns red.

Clicking on any item in the list view causes the users proximity unit to "home" to the selected proximity unit only - at twice the ranging frequency. The users proximity unit, stops ranging to the other devices in the range list during homing, however, it continues to respond to range inquiries from other devices and so will still show up in their ranging list view.

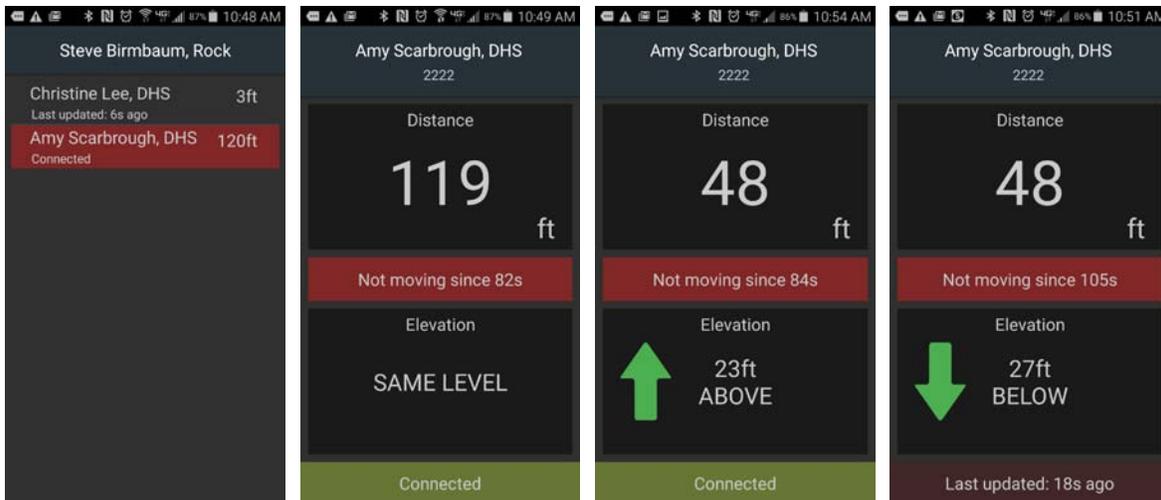


Figure 4. Android App Interface

In homing mode the App displays distance, still time, relative elevation and connection status (Figure 4, right 3 screenshots). If the proximity unit is moving, the central red bar indicating still time disappears. If the elevation error is high because the device offset was not computed¹, relative elevation is not shown (displayed as a -).

If the Android has Near Field Communications (NFC), it can be used to simplify the Bluetooth pairing and to set a Device “Friendly Name”.

NFC "Touch Pairing" simplifies the standard Bluetooth pairing process with a new phone. An NFC tag in the proximity unit contains the device information needed for pairing. Touch the phone to a proximity unit and it begins the pairing process. The user still needs to enter a PIN '1234'. (NFC "Touch Pairing" does not work on some phones that don't allow simple pairing.)

The App on the phone is also able to read text information from an NFC tag (for example, from an NFC ID badge) by touching the tag to the phone. The text is used to set the Bluetooth paired device's friendly name. Free NFC Tag Writer apps are available on the app store such as NFC TagWriter by NXP. This app enables tags to be written from a standard NFC capable Android phone. A device's friendly name is shared to other devices during the beacon message and used in the App (Figure 4).



Figure 5. NFC TagWriter - NXP

3. Maintenance

The process for charging and firmware updates are detailed below.

¹ Device pressure offset is adjusted automatically when proximity beacons are on and near each other. The offset is reinitialized each time the devices are turned on.

3.1 Charging and Battery Replacement

The proximity unit contains a Lithium Polymer battery. For best battery life, if at all possible, avoid full discharges and charge the battery more often between uses. The smaller the discharge, the longer the battery will last. There is no memory and the battery does not need periodic full discharge cycles to prolong life.

A battery should deliver 100 percent capacity during the first year of service, however, operational environment may affect the life. Lithium batteries suffer from stress when exposed to heat, so does keeping a cell at a high charge voltage. A battery dwelling above 30°C (86°F) is considered elevated temperature and for most Li-ion a voltage above 4.10V/cell is deemed as high voltage. Exposing the battery to high temperature and dwelling in a full state-of-charge for an extended time can be more stressful than cycling.

Batteries should be replaced at least yearly.

3.2 Installing Firmware Updates

From time to time new firmware may be available with upgraded features. To install new firmware, connect the proximity unit to a Windows computer using a micro-USB to USB cable. Press the power button before the top LED stops flashing purple (within two seconds of connecting) to activate boot loader mode. The Proximity Unit will display a solid purple LED when boot loader mode is activated.

A new drive named “BOOTLOADER” will appear. Copy and paste the firmware update software (.hex or .cry file) into the BOOTLOADER folder. The top LED will blink purple as the firmware is loaded onto the Proximity Unit.

Once the firmware download is complete, the Proximity Unit LED will be solid green. Power cycle the unit to install the new firmware.

4. Limitations on System Use

The TRX Proximity Unit delivered is an engineering sample. It is not a life saving device. Each user must decide, independent of the TRX Proximity Unit, what actions to take or not to take in a given incident based on the factors deemed relevant to that incident. Data from the TRX Proximity Unit may be incorrect due to environmental, physical, maintenance, or other factors. Therefore, decisions made during an incident may not be based on the TRX Proximity Unit alone; users should depend upon other available information when making their best decision. Additionally, such other data may be inaccurate,

corrupted, misleading or erroneous due to erroneous assumptions, inaccurate information, or poor choices made by Licensee and others.

The current version of the TRX Proximity Unit is not qualified for use in environments requiring intrinsically safe operation, or for use within extreme environments. Licensee's use of the TRX Proximity Unit under certain conditions, such as fires, explosions, police/military operations, weather systems, mining operations and many other conditions where Licensee or User may be impaired, disoriented, imperiled, injured, etc., can lead to User's injury, further injury or death or to the injury, further injury or death of third parties. All decisions based upon the use of the TRX System are subject to User's verification of the data, content and assessment of dangerous conditions and dangerous environments. All decisions or actions made by User are subject to User's professional judgment and are the sole responsibility of User and not the Company or the TRX Systems Proximity Unit.

The current version of the TRX Proximity Unit has not been FCC certified. Those conducting the tests will be responsible for safe and legal operation.

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(a) Acceptance by Signature. By signature of a duly authorized officer of Licensee in the appropriate signature block below (or the signature block of a purchase order or other agreement

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Last updated as of July 22, 2016