ULP Tracker User Guide

On-Ramp Wireless Incorporated
10920 Via Frontera, Suite 200
San Diego, CA 92127
U.S.A.

ULP Tracker User Guide

010-0088-00 Rev. B

May 1, 2012

Contents

Figures

Revision History

Revision	Release Date	Change Description
A	March 30, 2012	Initial Release.
B	May 1, 2012	Added a block diagram and an appendix for regulatory considerations.

1 Introduction

This document describes On-Ramp Wireless' Ultra-Link Processing™ (ULP) Tracker and its use within a ULP wireless packet data network. It also provides information about the hardware and software interfaces. The On-Ramp Wireless ULP Tracker is a test device used to support network coverage verification and demonstration.

Supporting documents for this guide are:

- *KMS User Guide (010-0062-00)*
- *LKS User Guide (010-0059-00)*
- *NPT User Guide (010-0060-00)*
- *CIMA Operator Guide (010-0046-00)*
- *EMS Operator Guide (010-0045-00)*
- *eNode User Manual (010-0002-00)*
- *appHost Data Sheet (009-0023-00)*

2 Ultra-Link Processing Overview

The Ultra-Link Processing ™ (ULP) wireless packet data network, comprised of eNodes and Access Points (APs) operates at a breakthrough receive-sensitivity of -142 dBm. This dramatic increase in receive sensitivity allows for a 2,000 mile wireless range in free space and 25x the range (600x the coverage) of typical wireless sensor systems while maintaining a small and low-cost form factor with multi-year battery operation.

The ULP eNode is designed to easily integrate, via standard interfaces, with sensors enabling robust wireless communication with one or more Access Points interfaced with a customer's local or wide area network.

Each Access Point supports tens of thousands of sensors and can simultaneously demodulate signals from up to a 1000 sensors using a unique patented multiple access scheme. With 172 dB of total allowable path loss (FCC/IC regulatory regions) the ULP network can easily be deployed using a star topology.

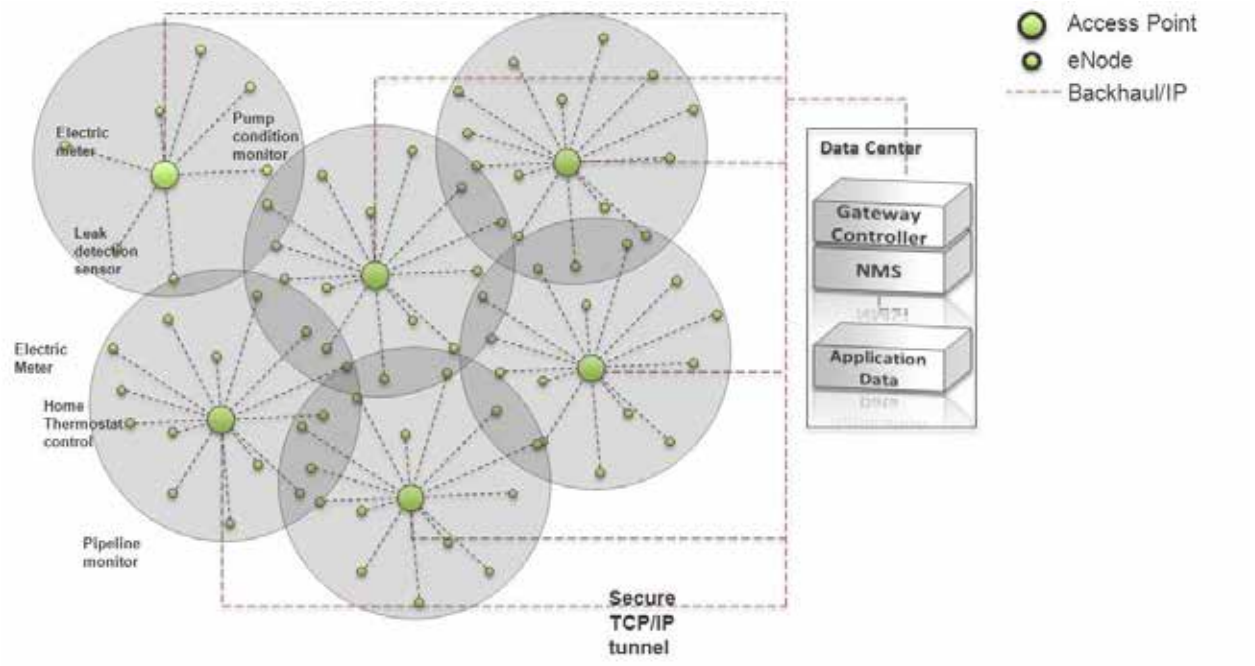

Figure 1. On-Ramp Wireless ULP Network

3 ULP Tracker

The ULP Tracker is intended as a representative example for integrating the ULP eNode and an application processor to create a simple sensor—in this case, a GPS location sensor. The ULP Tracker example can also be used to support network coverage verification and demonstration.

The ULP Tracker consists of:

- ULP eNode. For details about the eNode, refer to the *eNode Product Brief (006-0003-00).*
- appHost Processor Board. For details about the appHost, refer to the *appHost Product Specification (014-0013-00*).
- Trimble Silvana 67650-10 GPS Antenna Companion Module with internal and external antenna capability. For details about the specifications of this module, refer to: http://www.trimble.com/embeddedsystems/antenna-companion-modules.aspx?dtID=overview&
- Three "C" cell battery pack
- Pelican Micro Case # 1020 water resistant, crushproof, and dust proof enclosure http://www.pelican-case.com/1020-clear-black.html

The ULP Tracker comes with the antennas listed below:

- L-com HG2402RD-RSF 2.4 GHz 2.2 dBi (omni –directional) "Rubber Duck" Antenna with RP-SMA (M) connector. Used for ULP network communications.
- TAOGLAS AA.105.301111 GPS Antenna AA.105 with 3M RG174 cable, SMA (M) connector, 30 dB gain amplifier, and magnetic mount. Optionally used for remote mounting of GPS antenna.

Figure 2. ULP Tracker

3.1 Installation and Setup

3.1.1 Electrical Characteristics (Batteries)

The ULP Tracker requires three “C” size alkaline cells for operation. There is no on/off switch. Simply install the cells to enable operation of the device.

3.1.2 USB Host Interface

The ULP Tracker USB Host Interface provides communication with an external host (PC) via a micro USB connector. This interface is used to setup/verify the communications (flash) parameters of the embedded eNode, and may be used to monitor communication operation.

In order to use the USB interface, the battery pack must temporarily be moved as pictured below.

Figure 3. Micro USB Interface

3.1.3 Communications Parameters

The communications parameters (channel, system ID, etc.) of the eNode must be configured to match the ULP network to enable communications. This process (known as commissioning), may be done at the factory with default values, or may be done in the field to match the particular values of your system. It is accomplished using the USB Host interface, along with the tools and procedures described in the following documents:

- *KMS User Guide (010-0062-00)*

- *LKS User Guide (010-0059-00)*
- *NPT User Guide (010-0060-00)*

3.2 Operation

Operation of the ULP Tracker is simple.

1. Attach the ULP "Rubber Duck" antenna to the RP-SMA connector as shown in the Figure 5.
2. Install batteries.
3. Close the cover.

Status LEDs provide feedback on the current state of the ULP communications link and the GPS receiver as illustrated in Figure 4. In general, normal operation consists of cycling through the startup, scanning, tracking colors, and GPS satellite acquisition colors until both LEDS are flashing green. This process could take one or two minutes. When both LEDs are flashing green, the ULP Tracker begins transmitting location through the ULP network to the head-end application. If the optional external GPS antenna is used, install it as shown in Figure 5.

NOTE: GPS acquisition generally requires a clear view of the sky, and may not work in-building.

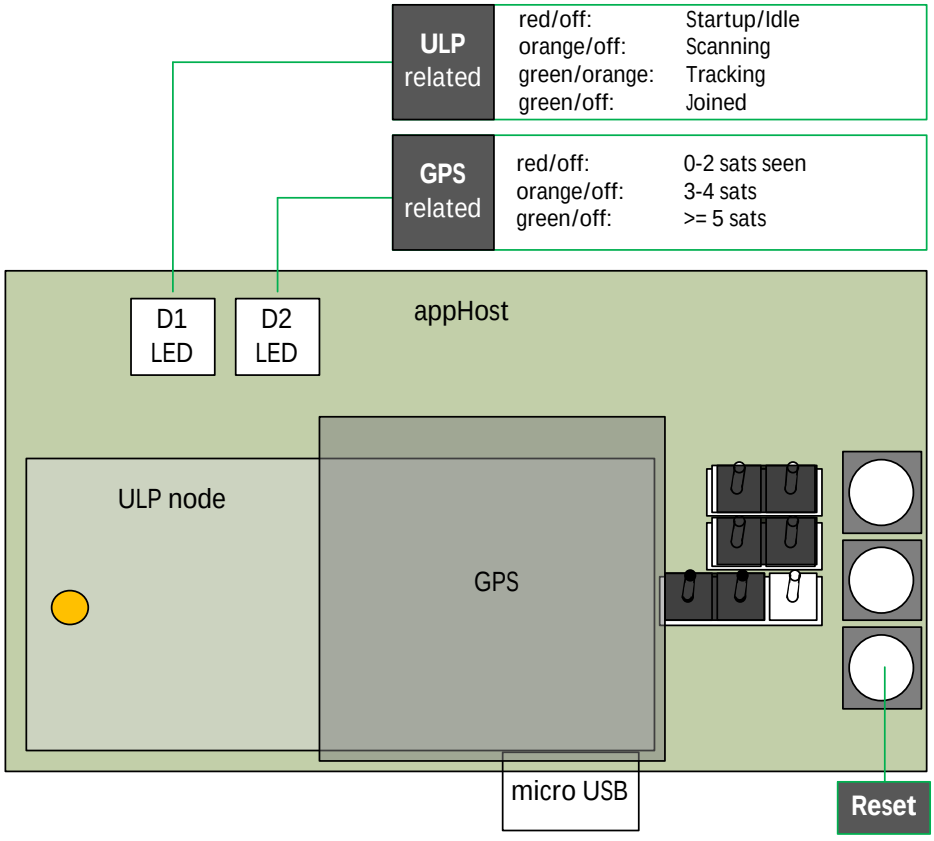

Figure 4. ULP Tracker and appHost Status LEDs

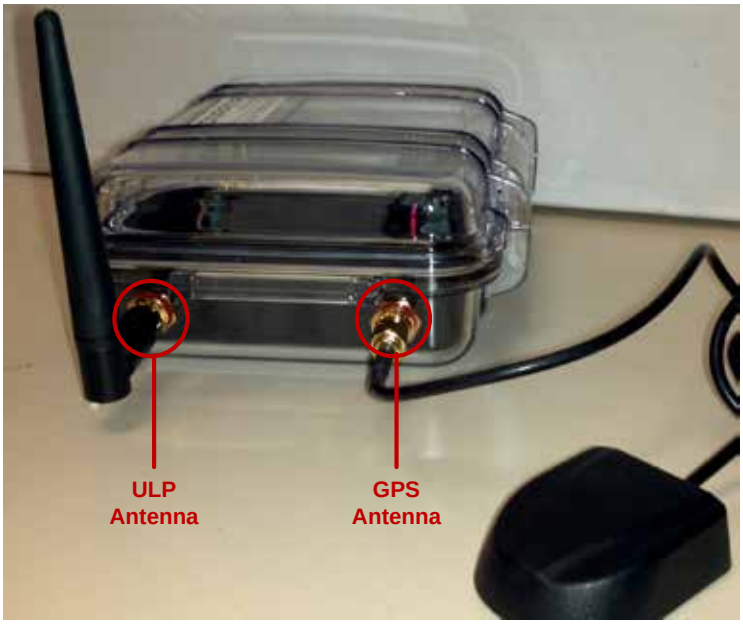

Figure 5. Installation Location of ULP and GPS Antennas

3.3 Application Interface (CIMA, EMS)

The data sent by the ULP Tracker, along with network/element management information, can be displayed real-time, or historically using the ULP Critical Infrastructure Monitoring Application (CIMA) and Element Management System (EMS) application as illustrated below.

NOTE: For further details about network and element management, refer to the *CIMA Operator Guide (010-0046-00)* and the *EMS Operator Guide (010-0045-00)*.

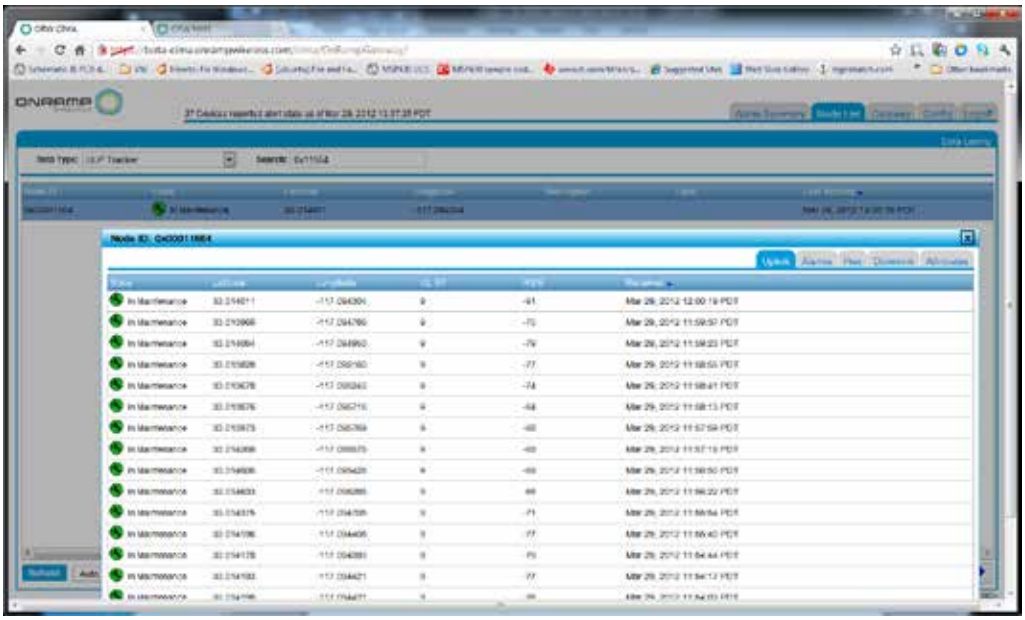

Figure 6. CIMA Node Uplink Status

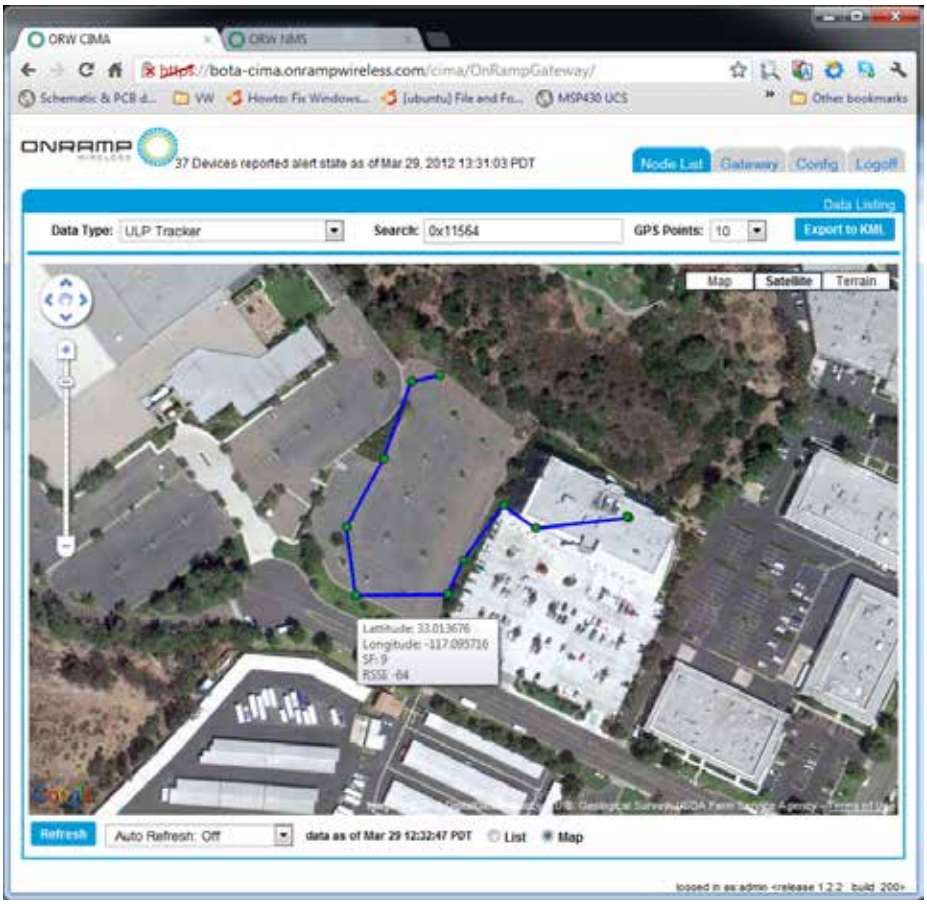

Figure 7. CIMA ULP Tracker Map Screen

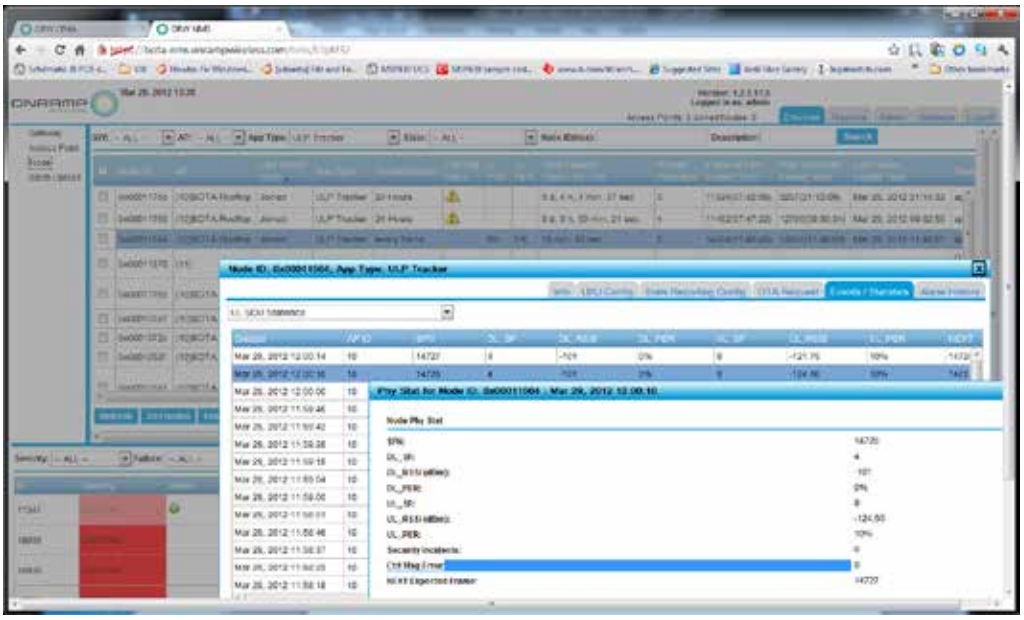

Figure 8. EMS Node PHY Statistics Screen

Appendix A Regulatory Considerations

A.1 Block Diagram

The following figure is a block diagram for the ULP Tracker. Some regulatory domains require a block diagram of the device for their documentation.

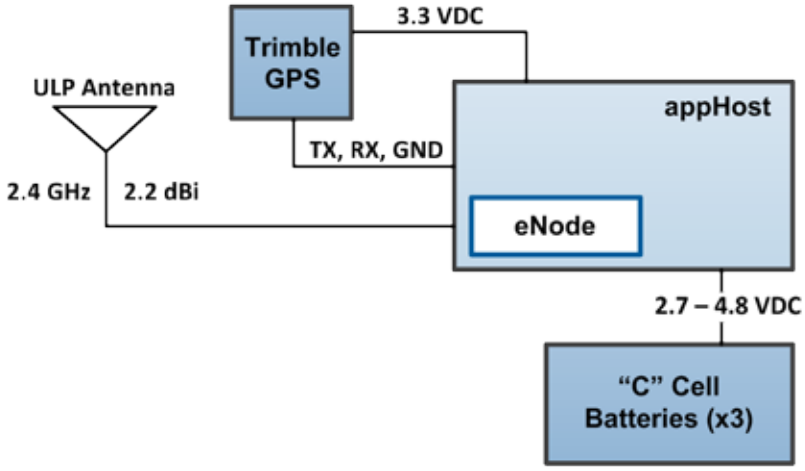

Figure 9. ULP Tracker Block Diagram

NOTE: Block diagrams and details about the appHost and eNode are found in their respective manuals: *appHost Data Sheet (009-0023-00)* and *eNode User Manual (010-0002-00).*

A.2 FCC Warnings

This device complies with part 15 of the Federal Communications Commission (FCC) Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

WARNING: This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, this equipment may cause

harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.