RT-Backpack

Vehicle-to-Pedestrian Tracking

User Manual

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System Overview

The RT-Backpack is a collection of small and lightweight components that transform any RT sensor into a wearable RT-Range target object. This makes it ideal for testing and validating advanced driver assistance systems (ADAS), especially where there is a need to track pedestrians, cyclists or motorcyclists.

While the RT-Backpack is packaged differently, the principal of operation is the same as an RT-Range target. RT-Range hunters do not differentiate between data received from target RT-Ranges or RT-Backpacks, and treat both as mobile targets. For that reason only information unique to the RT-Backpack is covered in this manual. All other relevant information can be found in the RT-Range manual.

Scope of Delivery

Table 1 lists all standard items delivered with the RT-Backpack. Table 2 lists optional components.

Table 1. Standard RT-Backpack Components

Qty	Description
1	Backpack
1	Frame including fasteners
1	50 cm pole including fasteners
1	RT Backpack Bolt Pack –Qty 5 x M4x8 hex bolts & washers, 3 mm & 4 mm hex key
1	Survey grade antenna for multi-path rejection
1	1 m TNC-TNC GPS antenna cable
1	7 Ah, 12 volt battery
1	14C0077B user cable
1	RT-XLAN (client) Wireless LAN radio and PoE cable
1	2.4 Ghz antenna
1	Base-to-antenna extension pole and L bracket (RT-XLAN)
1	Wiring harness
1	Mains powered battery charger
1	RT-Backpack user manual

Table 2. Optional RT-Backpack Components

Qty	Description
1	Radio modem for DGPS signals (country specific)
1	Radio antenna (country specific)

Warranty

Oxford Technical Solutions Limited warrants the RT-Backpack products to be free of defects in materials and workmanship, subject to the conditions set forth below, for a period of one year from the Date of Sale.

'Date of Sale' shall mean the date of the Oxford Technical Solutions Limited invoice issued on delivery of the product. The responsibility of Oxford Technical Solutions Limited in respect of this warranty is limited solely to product replacement or product repair at an authorised location only. Determination of replacement or repair will be made by Oxford Technical Solutions Limited personnel or by personnel expressly authorised by Oxford Technical Solutions Limited for this purpose.

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Specification

Table 3. RT-Backpack Technical Specifications

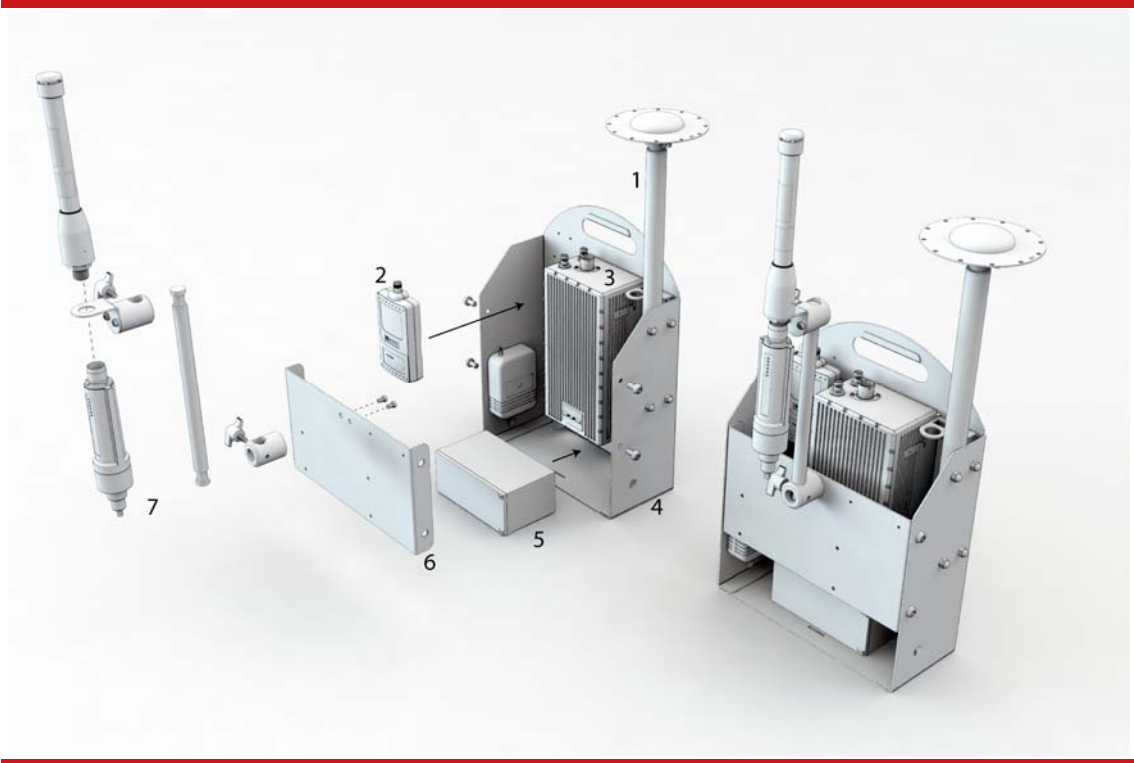| Parameter	Specifications
RT-XLAN Radio Range—Line of Sight (m)	>500
RT-XLAN Delay (ms) RMS	<10
Temperature Range (°C)	-10 to 50
Dimensions (mm)	$340 \times 270 \times 180$
Mass (kg)	5

Assembly Instructions

Assembly of the RT-Backpack is not complicated, but requires care to avoid damaging components.

Please follow this process while referring to the diagram in Figure 1:

1. Mount the RT sensor [3] in the frame [4] using the M4 × 8 mm cap head screws and 3 mm hex driver. For non-permanent installations the RT sensor can be mounted using only three screws as access is restricted to the screw nearest the main switch in the frame. The screws should be tightened firmly to prevent movement, but not overly tight.

2. If the optional DGPS radio [2] is being used for differential corrections, this should be fitted using the supplied hook and loop strips.

3. Use the U-bolts and dome head nuts to fix the mounting pole and antenna [1] into the frame. A flat washer and spring washer should be fitted under each nut. The supplied antenna may differ from the one shown in the diagram but will provide equivalent or superior performance.

4. The frame front plate [6] can now be attached to the main frame using four M6 × 12 mm button head screws.

5. The RT-XLAN [7] should be attached to the Base-to-Antenna Extension Pole fixed to the boss on the frame front plate. The RT-XLAN can then be height adjusted for maximum performance.

6. The user cable can now be connected. Start by attaching it to the RT sensor. Route the other wires carefully through the frame to their respective components. This is clearly marked on the loom.

7. Connect the user cable to the battery [5]. Connect the positive terminal first, then the negative one.

8. The RT-Backpack is turned on using the toggle switch mounted near the top of the RT sensor [3].

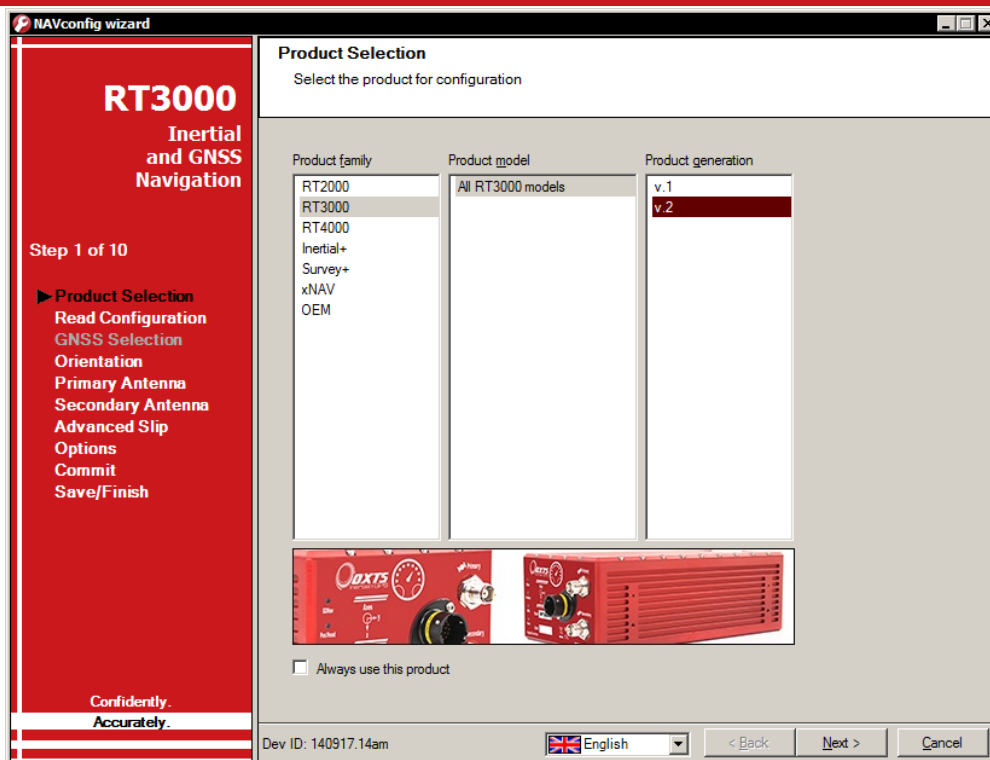**Figure 1. Assembly of the RT-Backpack**
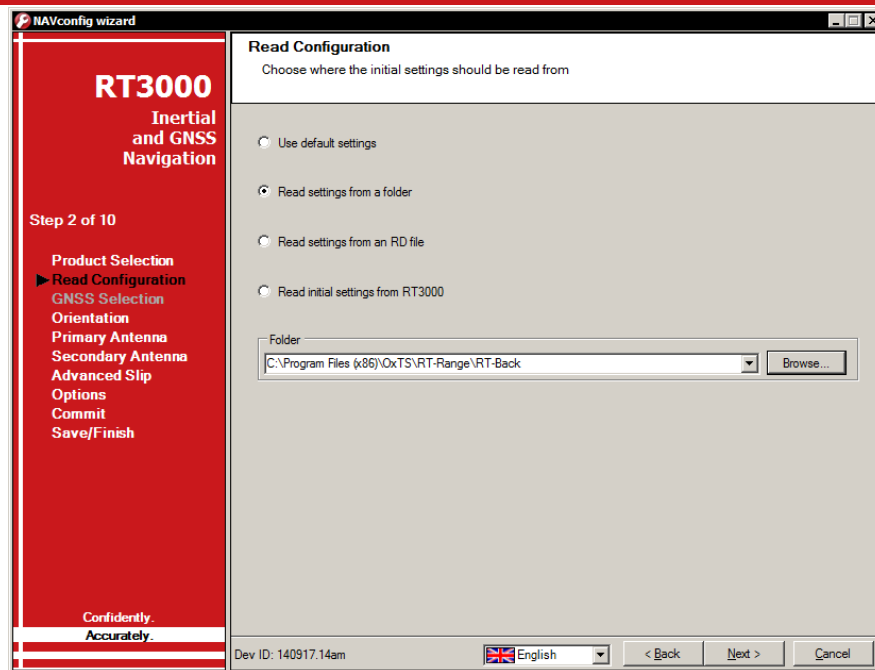
Configuring the RT-Backpack

NAVconfig settings

Some RT models have different options. These are set when the correct model is selected in step one of NAVconfig (Figure 2). Settings can be prepared in advance as NAVconfig does not require a device to be connected.

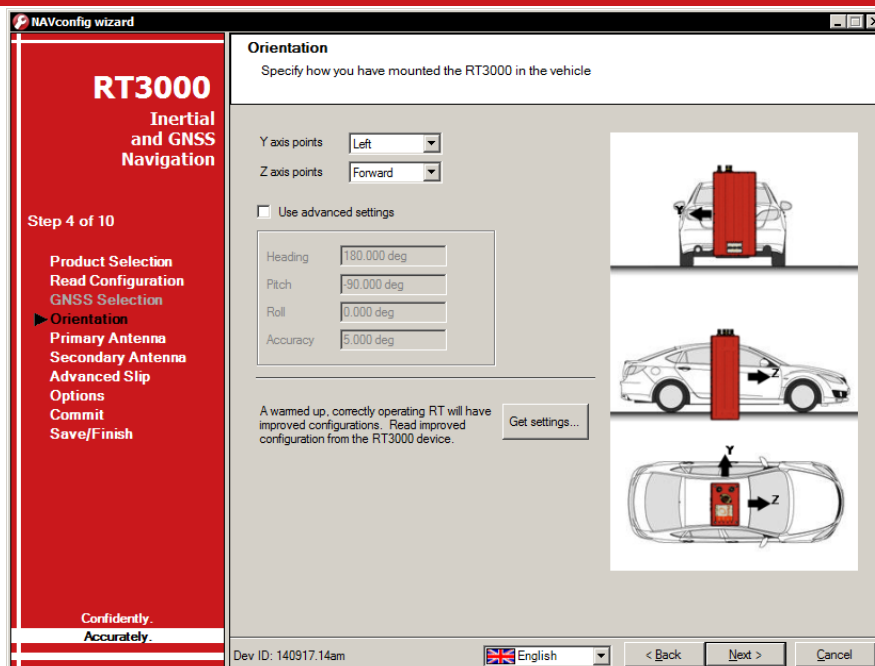**Figure 2. NAVconfig Step 1—Product Selection**

A predefined setting for the RT-Backpack is included with NAVconfig. This is normally located at C:\Program Files (x86)\OxTS\RT-Range\RT-Back. Use the *Read Settings from a Folder* option to locate it. See Figure 3.

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Figure 3. NAVconfig Step 2—Read Configuration

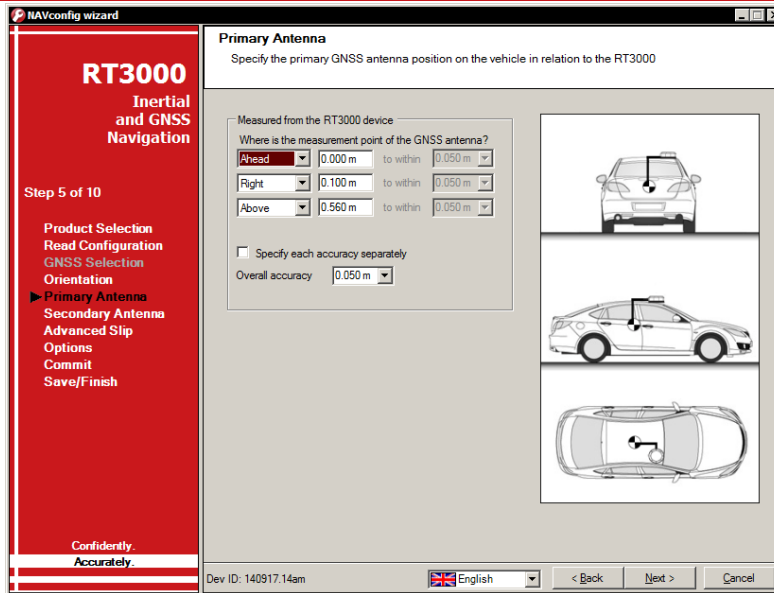

In an RT-Backpack application the *y*-axis always points left and the *z*-axis always points forwards (Figure 4). This is set automatically from the predefined settings file.

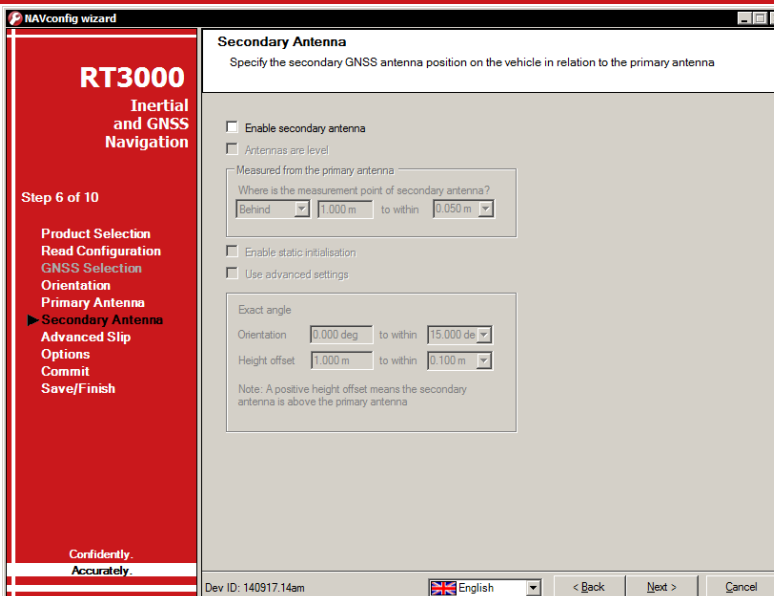**Figure 4. NAVconfig Step 3—Orientation**

The primary antenna measurements will be read from the predefined settings file when used (Figure 5). It is important to re-check the "*Above*" measurement as the antenna pole may be set to a different height (*z*-axis) to the one used in the settings file.

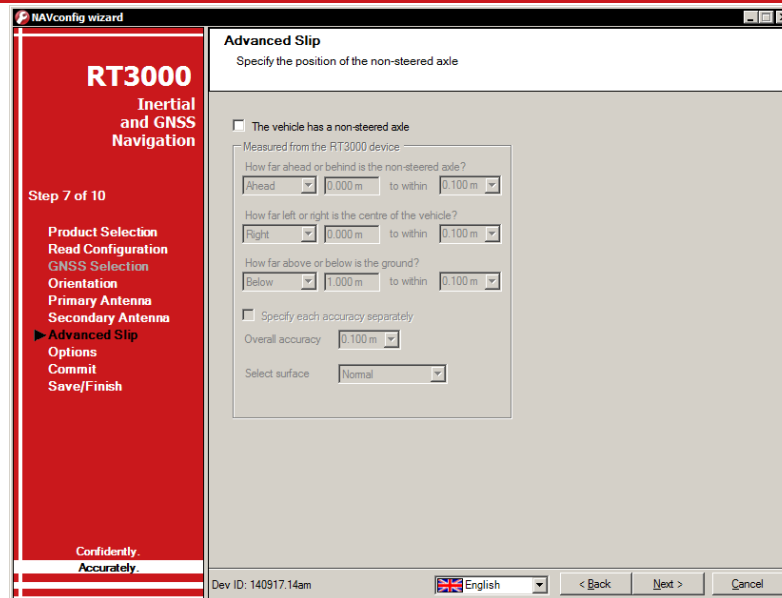**Figure 5. NAVconfig Step 4—Primary Antenna**

The RT-Backpack does not use dual antennas, so make sure that option is disabled (Figure 6).

Figure 6. NAVconfig Step 5—Secondary Antenna
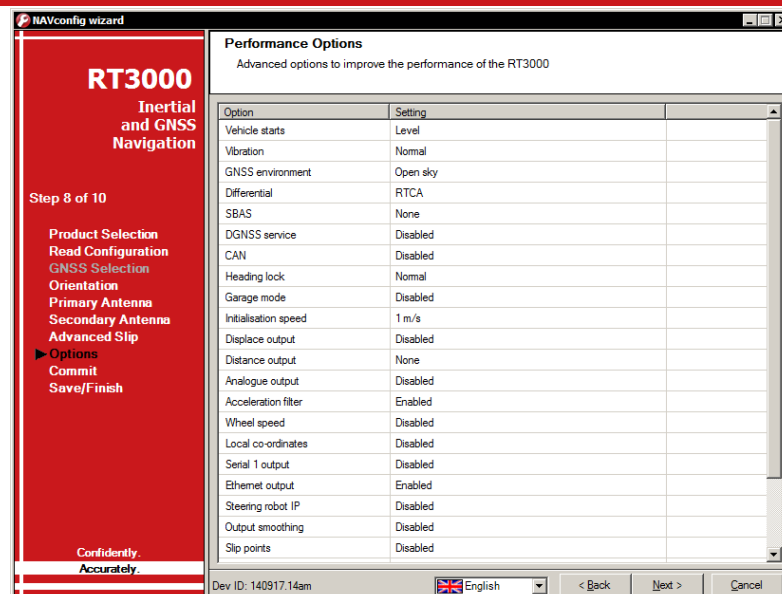
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The advanced slip option (Figure 7) is not applicable to the RT-Backpack. Ensure it is disabled.

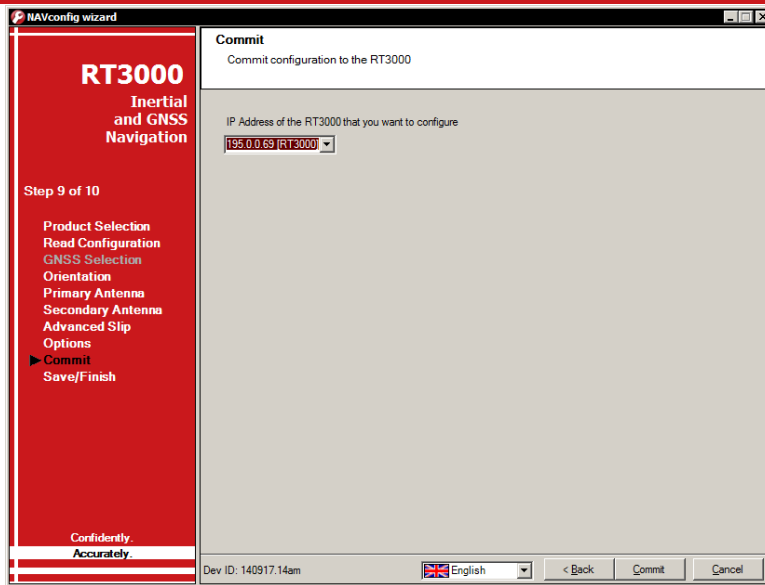**Figure 7. NAVconfig Step 6—Advanced Slip**

Several settings should be checked on the options page (Figure 8). Most importantly, *Displace Output* should be disabled. The RT-Range applies any displacement. For a full explanation of options see NAVconfig Options on page 15.

Figure 8. NAVconfig Step 7—Options

Before committing any settings (Figure 9), make sure the correct RT is selected as several may be available on the network.

Figure 9. NAVconfig Step 8—Commit

It is not necessary to save a copy of any settings (Figure 10) as they can be read from the device using NAVconfig. Several files are created when saving settings, so it is best to create a new folder for each set.

Figure 10. NAVconfig Step 9—Save/Finish

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NAVconfig Options

Many of the options available in step 7 of NAVconfig do not apply when configuring an RT-Backpack. Most default options are suitable with the exception of heading lock, which should be disabled. Only the settings listed here should be reviewed. Care should be taken when reading an existing configuration from the RT device, or using a saved configuration in case settings have been changed accidentally.

- GPS environment—change this to suit the operating environment. An RT sensor will only achieve accuracies that meet its specification in open-sky mode.

- Differential—when using radio modem DGPS corrections, these need setting. See the *Differential Correction Option* section of the RT Manual.

  o SBAS—see *SBAS Option* section of RT manual.

  o OmniSTAR— see *OmniSTAR Option* section of RT manual.

- Heading Lock—this must be disabled in an RT-Backpack application.

- Initialisation Speed—this should be set to the speed of a brisk walk (1 m/s). After initialisation, this value has no effect on the output.

- Displaced Output—this must be disabled. The hunter RT-Range applies any offsets. So any value entered here will cause an error at the RT-Range.

RT-Range Settings

Because the hunter RT-Range does not differentiate between RT-Backpack and RT-Range target objects, the RT- Backpack can be configured in the same way as normal RT-Range targets. See the RT-Range manual for details.

Initialisation and Warm-up

To initialise the RT-Backpack exceed the "initialisation speed" specified in NAVconfig Options (Figure 8, p. 13). It is important to walk forwards and in a straight line the first time the initialisation speed is exceeded.

Figure 11. Operating the RT-Backpack

It is important not to turn too quickly when operating the RT-Backpack or the gyros can become saturated. Depending on the model of RT used the maximum speed of rotation should not exceed 100 °/s or 300 °/s

It is important not to spin too quickly when wearing the RT-Backpack as this can saturate the gyros. The RT sensor is designed to work on vehicles, boats and aircraft. Humans can spin much faster and therefore exceed the operating thresholds of the sensors. Care should also be taken when donning the backpack for the same reason. If the specification of the gyros is exceeded, the RT may need to be reset and go through the initialisation and warm-up process again.

Data from the RT-Backpack can also be monitored in the RT-Range software, using the Real-time display window. A full explanation of this can be found in the RT-Range manual in the Real-time display section. It is worth noting that even though the RT-Backpack is transmitting data to the RT-Range, it does not mean the RT-Backpack has achieved its expected accuracy, and care should be taken to check this before any test commences.

During tests it is quite feasible for the person wearing the RT-Backpack to monitor its status using Enginuity and a laptop PC connected wirelessly to the relevant RT device. Doing this will not affect the performance of the RT-Backpack or the data being broadcast to the hunter RT-Range device.

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Charging the Battery

The RT-Backpack is supplied with a maintenance-free, rechargeable lead acid battery and mains powered charger. In ideal conditions the battery should provide approximately three to four hours of use before needing a charge—although it is advisable to start any test with the battery in a fully charged state.

While it is impractical to walk around with the RT-Backpack while charging, configuration changes or bench-tests can be conducted while the system charges. The battery can be charged without powering down the RT-Backpack.

Using the RT-XLAN

The RT-XLAN in the RT-Backpack will come pre-configured as a "client" and will be ready to be used as a target.

For more information about the RT-XLAN please refer to the RT-XLAN user manual which is available at http://support.oxts.com/more/user-manuals

Configuration

There are no user configuration options on the RT-XLAN. However, it is important to make sure that each unit is compatible with the other units in the environment. There are several items to consider.

- Each RT-XLAN will have a label showing its configuration.

- The RT-XLAN labelled "Base" should be used on the Hunter vehicle.

- The RT-XLAN labelled "Client" should be used on the Target vehicle.

- There cannot be two RT-XLAN base units in the same environment.

- There must be one RT-XLAN base unit. The RT-XLAN client units will not communicate with each other unless there is a base present.

- Each RT-XLAN has an IP address. All the units being used must have different IP addresses. Normally the IP address will be in the range from 195.0.0.170 to 195.0.0.175. It is possible to order different IP addresses from OxTS. This IP address range should not conflict with the recommended IP addresses with other OxTS equipment.

- The RT-XLAN will be configured for use in a specific country. Different licensing laws require different frequencies to be used in different countries. RT-XLAN units from one country cannot be used automatically with RT-XLAN units from another country.

It is possible to change the configuration in the field but it is necessary to contact OxTS support for information on how to do this. If any configuration is changed then make sure the stickers on the outside of the RT-XLAN are changed to reflect the configuration changes made.

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Operation

Once everything is connected the RT-Range can be powered up. The RT-XLAN should work automatically and the RT-Range can be used as normal.

LED indicators

Found on the side of the RT-XLAN are a series of LEDs. These provide a quick indication of the status of the RT-XLAN without the need for any software.

The meanings of these LEDs are shown in Table 4.

Table 4. LED indicators

LED Label	Description
Power	Power on
<···>	Link established
	Shows the strength of the signal across four LEDs

The signal strength indicator is a very useful tool for quickly checking the vehicle-vehicle signal strength before attaching a PC to the RT-Range system.

Checking the communication link

It is possible to check that the communication link is working and there are several ways to do this.

- It should be possible to "ping" the IP address of the RT-XLAN. This can be pinged first on the Ethernet side (i.e. without any wireless communication) and then on the remote side (i.e. through one RT-XLAN to another).

- If the RT-XLAN is working then packets from RT systems should be visible from any "node". Enginuity can be used to receive the packets.

- The LED indicators on the RT-XLAN will provide a quick indication of a communication link and the strength of the signal - as shown in Table 4.

Revision History

Table 5. Revision History

Revision	Comments
130208	Initial version.
141027	Revised for RT-XLAN changes

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