



OXTS

RT-XLAN

RT-XLAN IP67

USER MANUAL

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Introduction

The RT-XLAN and RT-XLAN IP67 are long-range radios that extend and improve the communication between vehicles in an RT-Range application. RT-Range is a system that can measure the range from one vehicle to other vehicles in real time and output its measurements on the CAN bus. It is used for the development of active safety systems in cars.

While the RT-XLAN and RT-XLAN IP67 have some minor differences in specification, they broadly function the same as each other and are operated in the same way. The manual states clearly where instructions apply specifically to the RT-XLAN or the RT-XLAN IP67; otherwise you can assume that the instructions in this manual apply to both products. For convenience, unless talking specifically about the RT-XLAN IP67, we will use the term “RT-XLAN” to refer to both products.

The RT-XLAN is designed for easy connection to the RT-Range systems. It is also possible to use it with both the standard RT-Range and RT-Range S systems. The RT-XLAN radios are specifically designed for outdoor use and have a robust, weatherproof design that can operate within a wide temperature range. They also feature a low-loss integrated N-type RF connector replacing the need for radio-to-antenna cable connections that can become a weak link. The RT-XLAN is capable of reliably improving the data communication throughout the range and will also extend the distance between vehicles to around 1 km.

Features

There are several features that make the RT-XLAN ideal for use on vehicles with the RT-Range. These include:

- + Robust connection where there is line-of-sight between vehicles.
 - o RT-XLAN range: Around 1 km
 - o RT-XLAN IP67 range: Over 500m
- + Highly reliable link with very few dropped packets, even at the longer ranges.
- + Superior latency so that it is very rare for packets to take longer than 10 ms between vehicles.
- + Powerful suction mount secures the unit onto vehicles, and a retention strap is provided for additional security.
- + Wide temperature range, making the RT-XLAN suitable for use in winter and summer conditions.
- + Uses standard 2.4 GHz or optional 5 GHz radio frequency so can be used licence-free in many countries.

Models

There are two models in the RT-XLAN family. A base unit is needed to set up the network and then multiple client units connect to the base-unit. The base unit acts as an access point and all the clients connect to this access point to share their data.

Scope of delivery

The RT-XLAN is supplied with all the parts that are needed for use with the RT-Range. Both the base unit and the client unit come with the same parts. Table 1 and Table 2 list the parts that are delivered with an RT-XLAN and Figure 1 shows the RT-XLAN and its components.

Qty	Description
1	RT-XLAN WLAN unit (either base or client, 2.4 GHz or 5 GHz)
1	2.4 GHz antenna or 5 GHz antenna (depending on configuration required)
1	Base-to-antenna extension pole
1	Antenna L bracket
1	Pump cup suction vehicle mount
1	RT-XLAN retention strap
1	PoE Ethernet to M12 cable
1	RT-XLAN user manual

Table 1:
Summary of the RT-XLAN components

A base unit and a client unit can be identified by a sticker on the side. The IP address is also shown.

Qty	Description
1	Y cable for RT-Range or standalone RT
1	Cigar plug adapter cable

Table 2:
Additional RT-XLAN Y cable components (where ordered)



Figure 1:
RT-XLAN components

Specification

The specifications for the RT-XLAN are shown in Table 3.

Parameter	RT-XLAN	RT-XLAN IP67
Voltage	Up to 24 V	Up to 24 V
Power	~7 W	~7 W
Power method	Passive power over Ethernet	Passive power over Ethernet
Operating temperature	-40 °C to +80 °C (suction mount -10 °C to +°45 C)	-40°C to +70°C (suction mount -10°C to +°45 C)
Wireless LAN radio range	1 km line-of-sight	750m line-of-sight (500m for 5GHz version)
Wireless LAN delay	<10 ms RMS	<10 ms RMS
Networking interface	1 X 10/100 BASE-TX	1 X 10/100 BASE-TX
Approvals	FCC Part 15.247, IC RS210	FCC Part 15.247, IC RS210
RoHS compliance	YES	YES
Operating humidity	5 to 95 % condensing	5 to 95 % noncondensing
Shock and vibration	ETSI300-019-1.4	ETSI300-019-1.4
Dimensions (RT-XLAN unit, antenna and mount)	52.5 cm x 15 cm Ø	52.5 cm x 15 cm Ø
Dimensions (RT-XLAN unit, including antenna)	37.2 cm x 3.7 cm Ø	37.2 cm x 3.7 cm Ø
Weight (RT-XLAN and antenna)	~0.24 kg	~0.24 kg
Weight (total including mount)	~1.08 kg	~1.08 kg

Table 3:
Specifications

Installation

The installation here assumes that the RT and any RT-Range systems have been installed in the vehicle already according to the instructions in their manual(s). The installation here covers the RT-XLAN and how to attach it to the vehicle and to the RT3000 v3 or RT-Range S.

For any installation it is essential to have one RT-XLAN base unit. This would normally be in the hunter vehicle but it can be in any vehicle. One or more RT-XLAN client unit(s) can be installed in other vehicles; normally these would be installed in the target vehicles.

In environments where more than one RT-Range is being used the RT-XLAN bases will interfere with each other. It is essential to only have one RT-XLAN base unit at any one location. When more than one RT-Range system is being used at the same location and two RT-XLAN bases are needed, contact OXTS support for further help.

Mounting to the vehicle

The base of the RT-XLAN is a pump cup suction mount that can be attached to any flat non-porous surface such as glass or vehicle bodywork. This surface can either be metallic or non-metallic, making the mount ideal for a wide variety of vehicle placement options. To maximise signal and range, we recommend mounting the R-XLAN on the roof of the vehicle if possible. Please refer to the drawings in Figure 2 which show the mounting and removal process.

To attach the device to the vehicle:

1. Wipe the mounting surface on the vehicle to ensure it is free from scratches, dust or dirt.
2. Remove the plastic protection plate from the bottom of the cup.
3. Wipe the base of the suction pad to ensure that it is thoroughly clean.
4. Place the suction pad firmly onto the mounting surface.
5. Repeatedly press the plunger until the red line disappears into the housing
Please note: It is recommended to regularly check that the red line does not re-appear on the plunger. If it does, repeatedly press the plunger again until it disappears.

To release:

1. Hold the RT-XLAN tight with one hand
2. With the other hand, lift the black tabs on the side of the base to firmly break the seal then carefully pull the device away from the vehicle.

Note: Care should be exercised when removing the device, there may still be a strong vacuum seal holding it to the mounting surface.

The plastic protection plate should be retained and replaced on the cup when not in use to protect the surface from damage.

Although the RT-XLAN is weather resistant, we strongly recommend that the N-Type connector from the device to the antenna is covered with self-amalgamating tape to help protect it from moisture.

Please note: It is the customer's responsibility to carry out a risk assessment for use of the RT-XLAN. OXTS recommends regular safety inspections and testing of the device and suction cup mounting solution. Replacement components, including suction cups, can be purchased from OXTS if needed.

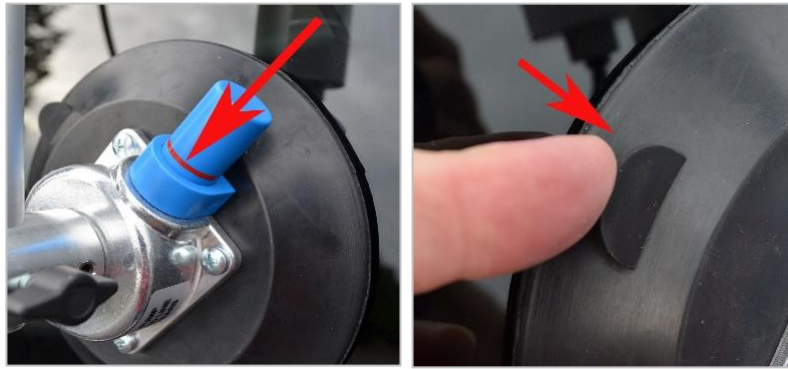


Figure 2:
Attaching and removing the pump cup

NOTE: When removing the pump cup from the vehicle, please take extra care to fully break the seal on the base using the tab before attempting to pull the device away.

A number of mounting options are available, some of which are shown in Figure 3.



Figure 3:
Mounting options

The pole for the antenna can be fixed either vertically or horizontally to the base and can be adjusted to suit the vehicle and environment. By adjusting the mounting location and antenna angle it may be possible to improve the signal strength of the vehicle-to-vehicle communication.

RT-XLAN retaining strap

For added safety, it is recommended that when installing the RT-XLAN for use on any moving vehicle, the RT-XLAN retaining strap must always be used. (See Figure 4 below.)

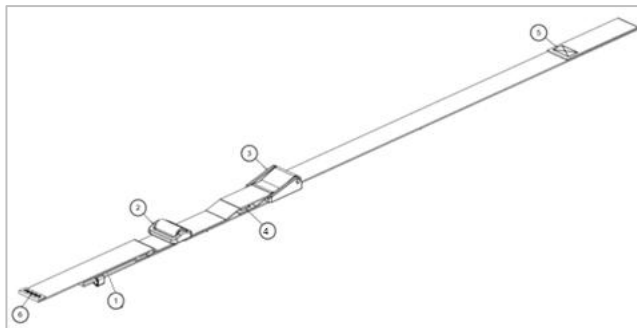


Figure 4:
RT-XLAN retaining strap

RT-XLAN retaining strap installation

To install the RT-XLAN retaining strap, the suction cup should be removed from the extension pole. First pass the strap through a secure point in the vehicle such as a grab handle, Isofix loop or boot hinge. Pull the end marked 6 (see Figure 4) through the loop marked 5 until the strap is secured to the vehicle.

Next, pass the loop marked 1 over the central metal housing of the suction cup. The extension pole can then be installed onto the suction cup with the rest of the RT-XLAN installed as before.

The buckle 2 and clasp 3 can be used to remove as much slack as possible before installing the suction cup on the vehicle.

Connection to an INS via the auxiliary connector

For OXTS INS models such as the RT3000 v4 and RT500, Connecting the RT-XLAN to the INS is simple. First, ensure that the auxiliary user cable is connected to the INS and then connect the 110-00274-301 PoE Ethernet to M12 cable from the RT-XLAN to the dedicated socket on the Auxiliary cable. This is socket J2 in Figure 5. This dedicated socket powers up the RT-XLAN as well as handling the Ethernet link.

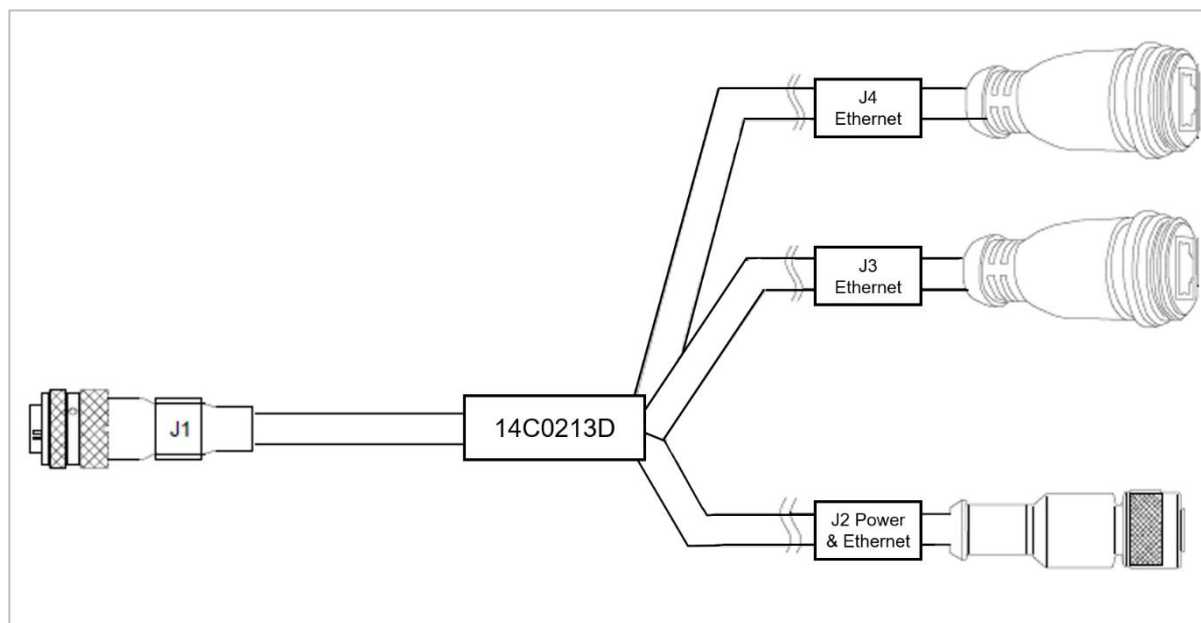


Figure 5:
RT500 / RT3000 v3 Auxiliary cable drawing 14C0213

Connection to RTs without an Auxiliary connector

If the RT-XLAN is to be used with an INS that does not have an auxiliary connector, then it will be necessary to supply power and Ethernet to the RT-XLAN via the Y cable converter kit (ordered separately). The kit contains two cables: 14C0147A (Y cable) and 14C0149A (cigar plug adapter). Drawings of these cables are shown in Figure 6 and Figure 7.

To use the Y converter cable with the RT-XLAN it must first be coupled to the PoE Ethernet to M12 cable (supplied with the RT-XLAN) to complete the solution.

See Figure 8 for a schematic of this connection.

Note: Do not be tempted to extend the Ethernet cable to the RT-XLAN as this may result in damage if the connections are crossed over.

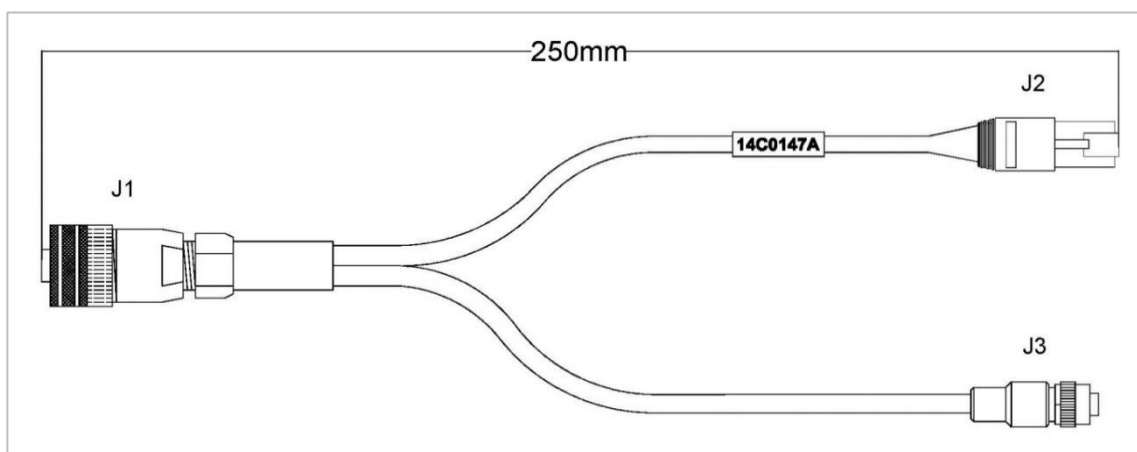


Figure 6:
Y cable drawing 14C0147

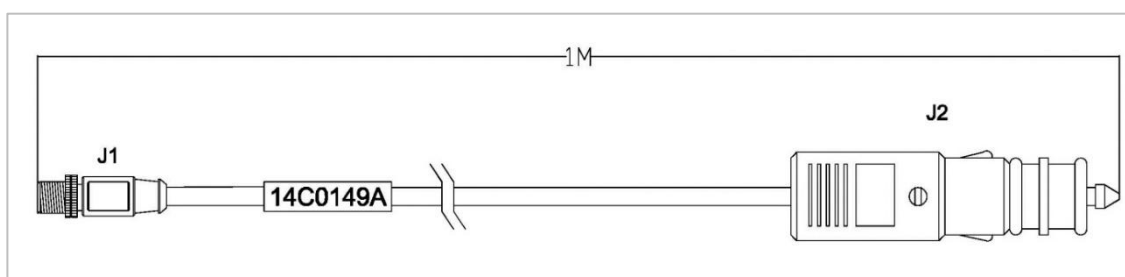


Figure 7:
Cigar plug to M12 4 Pole Male pin 14C0149

For alternative cabling solutions, the pin connections for the 14C0147 and 14C0149 cables are given in Table 4 and Table 5.

Signal Name	Wire Colour	J1	J2	J3
Tx+	Green/White	1	3	N/A
Tx-	Green	2	6	N/A
Rx+	Orange/White	3	1	N/A
Supply	Brown & White	4	N/A	1 & 2
Rx+	Orange	6	2	N/A
Supply Return	Blue & Black	7	N/A	3 & 4

Table 4:
PoE cable connections 14C0147

Signal Name	Wire Colour	J1	J2
Supply	Brown	1	Centre Core
Supply	White	2	Centre Core
Supply Return	Blue	3	Outer Contacts
Supply Return	Black	4	Outer Contacts

Table 5:
Cigar plug to M12 4 Pole Male pin 14C0149

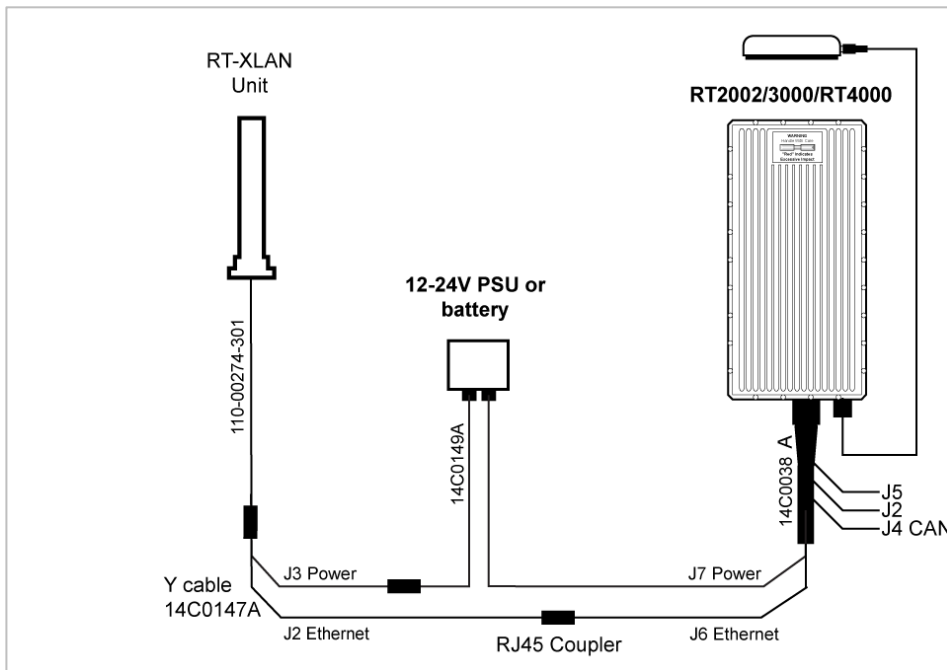


Figure 8:
Wiring diagram for RT1003 / RT2002 / RT3000 / RT4000

Note: connections not relevant to the RT-XLAN are not shown in this diagram. The RT connections shown are for an RT1003 / RT3000 v2 / RT4000 unit. With an RT2002, the RT-Range connections are made directly to the front panel of the RT2002 instead of through the 14C0038 user cable.

Connection to RTs via an RT Range S Hunter or Target Box

When connecting the RT-XLAN to an RT Range S Hunter or Target box, simply connect the PoE Ethernet to M12 cable from the RT-XLAN to the front of the RT-Range S as shown in Figure 9. This provides power to the RT-XLAN as well as Ethernet as in the RT3000 v3.

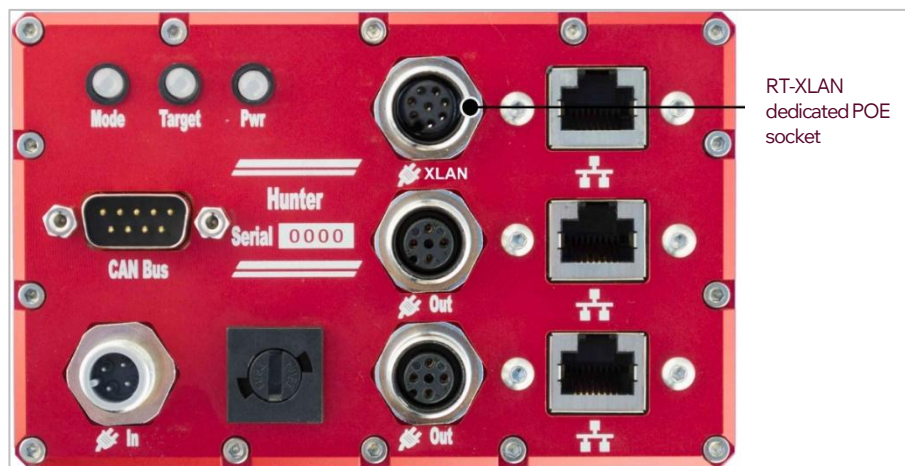


Figure 9:

Wiring connections to the RT-Range S system

Note: Connections to the previous generation RT-Range system are described on page 10 of this manual.

Connection to RTs via an original RT Range system

When using the RT-XLAN with the original RT-Range system it will be necessary to use the Y cable converter kit which can be additionally ordered for this purpose.

To use the Y converter cable with the RT-XLAN it must first be coupled to the PoE Ethernet to M12 cable (supplied with the RT-XLAN) to complete the solution.

To use the RT-XLAN with an original RT-Range system, connect the (J2) RJ45 plug on the Y cable to a spare Ethernet socket located on the front of the RT-Range Hunter or Target unit and the (J3) M12 plug of the Y cable to the spare power output of the RT-Range Hunter or Target unit as shown in Figure 10

Do not be tempted to extend the Ethernet cable to the RT-XLAN as this may result in damage if the connections are crossed over.

It has not been necessary to disable the wireless LAN in the original RT-Range cases in order to use the RT-XLAN. However, there may be times when the internal wireless LAN will conflict with the RT-XLAN. If this happens then the internal wireless LAN in the RT-Range should be disabled. See Appendix for instructions for achieving this.

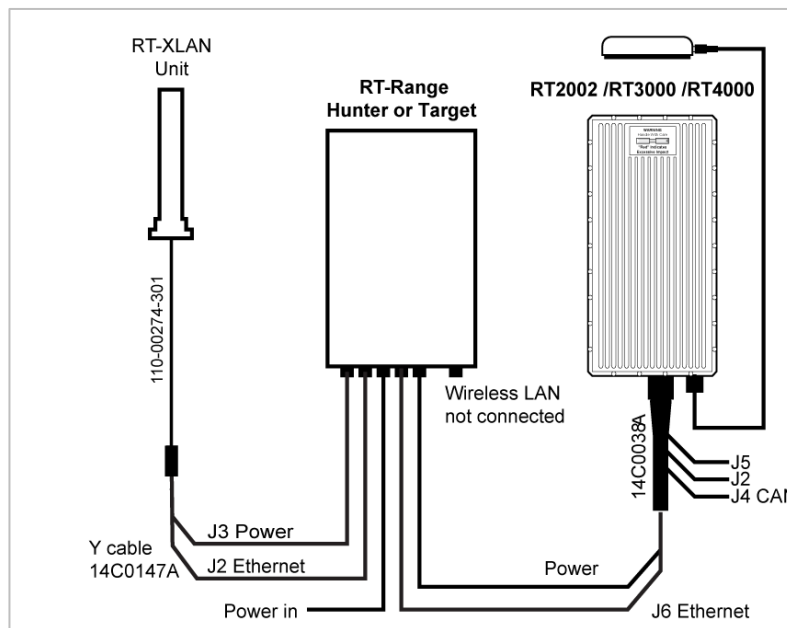


Figure 10:
Wiring diagram for original RT-Range with an RT-XLAN

Note: Connections not relevant to the RT-XLAN are not shown in this diagram. The RT connections shown are for an RT3000 / RT4000 unit. With an RT2002, the RT-Range connections are made directly to the front panel of the RT2002 instead of through the 14C0038A user cable.

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, as best practice, make sure the stickers on the outside of the RT-XLAN are changed to reflect the configuration changes made.

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 (RT-XLAN only)

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 6 .


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

Table 6:
LED indicators

The signal strength indicator is a very useful tool for quickly checking the vehicle-to-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”. NAVdisplay 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 6.

These are loose and will drop off very easily. If they do, ensure they are back in place before doing the panel back up and ensure that the screw holes are lined up accurately.

Once the panel is undone, the back of the WLAN unit can be seen. This is shown in Figure 11. Remove the power jack plug. Cover the jack plug with insulation tape so that it does not short against anything internally. Secure the jack plug with tape so that it cannot flap about inside the RT-Range Hunter. The internal wireless LAN is now disabled.

Appendix

Disabling the RT-Range's wireless LAN

It has not been necessary to disable the wireless LAN in the old style RT-Range cases in order to use the RT-XLAN. However, there may be times when the internal wireless LAN will conflict with the RT-XLAN. If this happens then the internal wireless LAN in the RT-Range should be disabled.

If the internal RT-Range wireless LAN is disabled then, as best practice, clearly label the outside of the box to note that it has been disabled. It is very difficult to diagnose a problem with the wireless LAN so clear marking is essential.

In order to disable the wireless LAN in the RT-Range it is necessary to disassemble it. The instructions for disassembling both the RT-Range Hunter and the RT-Range Target are the same. These instructions can also be used to enable the wireless LAN if the RT-XLAN is no longer being used.

To remove the front panel from the RT-Range Hunter carefully undo the four screws on the front panel. These usually require a 2 mm metric Allen (hex) key; some RT-Range systems have been supplied with screws that require a 2.5 mm Allen key.



Figure 11:
Removing the front panel on the RT-Range Hunter

Do not remove the front panel completely; just raise it high enough to gain access to the internal wireless LAN as shown in Figure 11. Be aware of the metal strengthening bars at the top and bottom; these are loose and will drop off very easily. If they do, ensure they are back in place before doing the panel back up and ensure that the screw holes are lined up accurately.

Once the panel is undone, the back of the WLAN unit can be seen. This is shown in Figure 11. Remove the power jack plug. Cover the jack plug with insulation tape so that it does not short against anything internally. Secure the jack plug with tape so that it cannot flap about inside the RT-Range Hunter. The internal wireless LAN is now disabled.

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