RT-UPS

Uninterruptible
Power Supply

User Manual

Confidently. Accurately.

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Introduction

The RT-UPS is an uninterruptible power supply designed to prevent brown-out and black-out conditions affecting our inertial navigation system (INS) products in real-world applications. It supplies 12 volts at two amps for up to two minutes in vehicles during engine cranking or if the driver stalls the engine and the ignition is turned off. The RT-UPS is suitable for use with all INS products from OxTS.

Product features

Benefits of using an RT-UPS are:

- Wide range of input voltage (9–48 V)
- Brown-out and black-out protection during cranking
- No need to re-initialise and warm-up system if power is accidentally cut
- Internal battery charges while supplying the output
- Isolated output
- Transient protection for equipment

Description

The RT-UPS activates when power is applied to its input. If the input supply is subsequently interrupted, or drops too low, the RT-UPS continues to output a constant 12 volts for up to two minutes using its internal battery. This prevents brown-outs during vehicle cranking, and black-outs if the auxiliary power socket is accidentally disconnected. In this way the INS continues to operate and there is no need to re-initialise or perform additional warm-ups.

When the input power supply is absent a warning buzzer will sound and the RT-UPS will continue to supply power to the output. If the RT-UPS does not detect a load on the output the RT-UPS will turn off immediately and the buzzer will stop.

If the input power supply is restored within two minutes, the RT-UPS will revert back to the vehicle's power supply and charge the battery (if necessary). If the input power supply is absent for longer than two minutes, the RT-UPS will stop the output power and the "No Power" LED will illuminate for up to 10 minutes.

If the internal temperature of the enclosure exceeds approximately 75°C, then output power will be turned off and the RT-UPS will enter standby for five minutes. It is not possible to exit this mode—except by waiting five minutes.

The RT-UPS will try to charge its internal battery whenever an input power supply is present and charging is necessary. The internal battery is protected against charging outside of its specified charging temperature range.

If the battery temperature exceeds approximately 65°C, charging will be suspended until the temperature falls to around 60°C. If the battery temperature falls below approximately 0°C, charging will be suspended until the temperature reaches approximately 5°C.

If the battery temperature approaches the lower threshold, the fan is temporarily disabled to avoid unnecessary cooling that might prevent charging by actually holding the battery at a low temperature.

Scope of delivery

Table 1 lists the parts that are delivered with an RT-UPS.

Table 1. Summary of components delivered with an RT-UPS

Qty	Description
1	RT-UPS unit
1	RT-UPS user manual

Connecting and disconnecting the internal battery

Air transportation regulations require that battery products are disconnected while in transit. The RT-UPS is shipped with the internal battery disconnected. The battery will need to be connected before the RT-UPS can be used. These instructions can be used to connect and disconnect the battery.

There are two versions of the RT-UPS. Newer models can be identified by the large battery isolation switch on the top panel. This switch connects and disconnects the internal battery. In normal operation the switch should remain in the on position “I”, however, when being transported by air, the switch should be set to the off position “0” to isolate the battery.

Older versions of the RT-UPS require some disassembly in order to access the battery. Although the RT-UPS does not need to be opened in a full electrostatic free environment, you should take care to discharge yourself by touching the metal case before touching any of the internal components.

To open the older model RT-UPS, undo the four front panel screws using a No.1 Philips screwdriver as shown in Figure 1. Occasionally the two screws on the rear panel also need to be undone to remove the lid.

Figure 1. Removing the front panel screws on the older model RT-UPS

Remove the front panel and slide the lid off the RT-UPS, as shown in Figure 2.

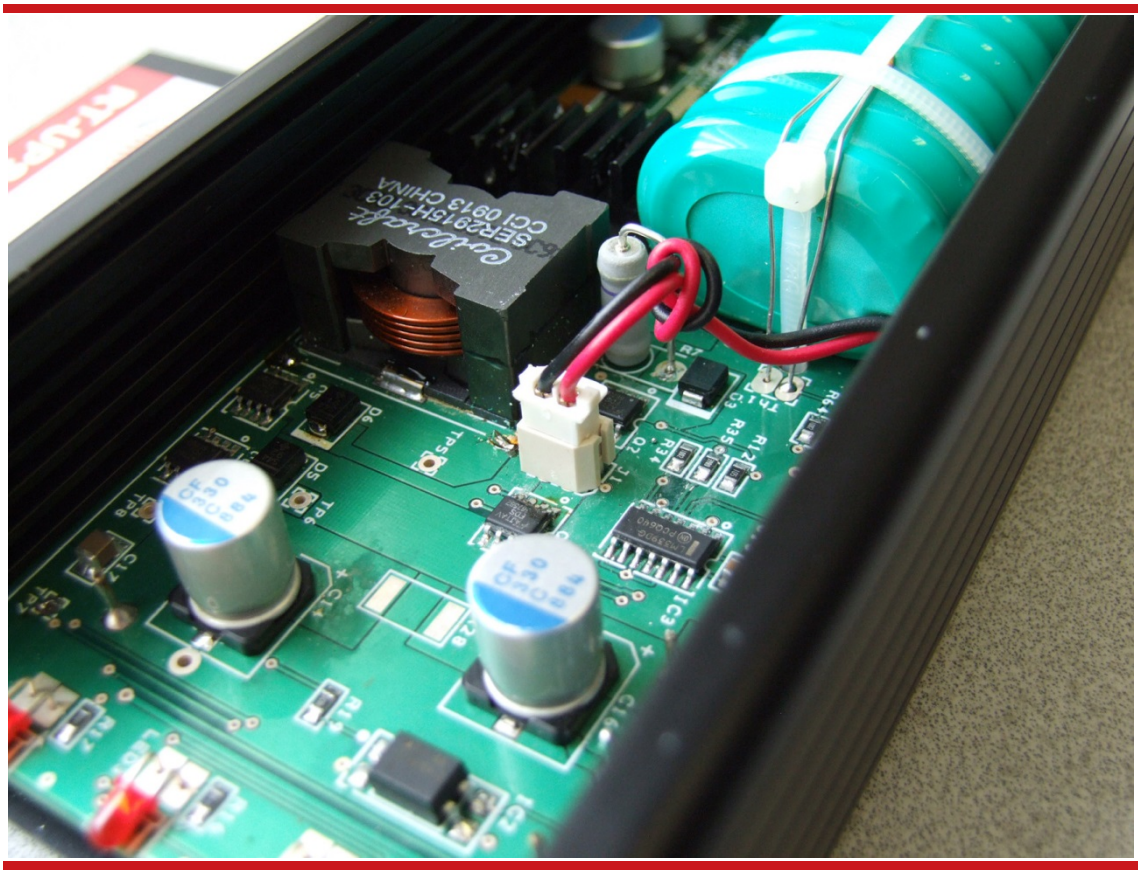
Figure 2. RT-UPS showing the battery connector

Connect the battery wires to the socket on the circuit board as shown in Figure 3. The connector can only be fitted one way round; take care not to force it incorrectly. Slide the lid back in place, fit the front panel and replace the four screws. The battery will now be connected correctly.

Before transporting by air disconnect the battery.

The battery should only be replaced by OxTS because the temperature sensor needs to be fitted correctly.

Figure 3. Battery connector fitted correctly



Connections

The RT-UPS has two leads that need to be connected for correct operation. The pin connections are shown in Table 3 and Table 4.

The auxiliary power plug fitted to the RT-UPS's input cable contains a five amp fuse, which is required as part of the input protection circuit. If the fuse in the plug needs to be replaced, it should be replaced with the Littelfuse model specified in Table 2.

Table 2. Replacement fuse

Parameter	Specification
Manufacturer	Littelfuse
Part Number	0214005
Description	5 A Torpedo Type Fuse
Dimensions	25 × 6 mm Ø
Voltage Rating	36 V

Table 3. Input power lead pin configuration

Pin	Direction	Description
1	Input	Power in, 9–48 V dc. This pin is the tip of the connector (red wire).
2	Input	Input ground (black wire).

Connector: Automotive universal fused auxiliary power plug (cigar lighter plug)

Table 4. Output power lead pin configuration

Pin	Direction	Description
1	Output	Power output, 12 V, 2 A (brown wire).
2	Output	Power output, 12 V, 2 A (white wire).
3	Output	Output ground, isolated from input (blue wire).
4	Output	Output ground, isolated from input (black wire).

Connector: Binder Series 763, 4-way, socket, M12

Operation

Mount the RT-UPS so the fan and air vent holes are not covered—allowing heat to be removed from the internal components.

To operate the RT-UPS, connect the output connector (Binder Series 763) to the product that needs a stable 12 V power supply. Insert the input connector (auxiliary power plug) into the vehicle's auxiliary power socket. The input power supply can be disconnected at any time. To stop the output power early, disconnect the INS from the output power connector.

It is not recommended to operate an RT-UPS with an input voltage lower than nine volts as this may result in an unstable operation that could damage the internal battery. When a load is connected, the RT-UPS will warn when under-voltage conditions exist by sounding the internal buzzer.

LED definitions

Table 5 lists the definitions of the LEDs on the RT-UPS. As a special condition, all LEDs flash when the RT-UPS has overheated.

Table 5. LED definitions

LED label	Description
No power	Lit when there is no power available in the internal battery to supply the output.
Discharging	Lit when power is being supplied from the internal battery.
Charging	Lit when charging. Flashing at 1 Hz means fast charging, continuously on means trickle charging. A single fast flash when too cold to charge and a double fast flash when too hot to charge.
Output OK	Output power on.

Note: Older models prior to January 2015 have a slightly different charging definition. These have a slow flash when charging at the fast rate and lit when charging at the standard rate. If you are unsure, please contact OxTS and provide the serial number of your device.

Extended storage

The battery life of the RT-UPS is reduced if it is left discharged for a long period of time. When leaving the RT-UPS for long periods, it should be charged monthly.

RT-Range

When using the RT-UPS with RT-Range S or standard RT-Range products, care should be taken when connecting the systems. The RT-UPS should be connected between the RT-Range Hunter system and the RT. It should not be connected between the power supply and the RT-Range Hunter system as the current draw will be too much and may damage the RT-UPS. Figure 4 illustrates the correct connection set up.

Figure 4. Connection set-up with RT-Range or RT-Range S

Specification

The specifications for the RT-UPS are shown in Table 6.

Table 6. Specifications

Parameter	Value
Operating voltage range[1]	9–48 V dc
Output voltage	12 V dc
No load detection current	200 mA
Maximum output current	2 A
Output power	24 W
Efficiency	>60%
Fuse[2]	5 A (yellow, continental style)
No supply operation	Up to two minute
No supply indication	Up to 10 minutes
Internal battery	Nickel-metal hydride, 12 V nominal (10 × 1.2 V cells, Varta 10V600HR)
Battery charge time	1.5 hours typical
Transient protection	Yes
Short circuit protection	Yes
Supply reversal protection	Yes (will blow fuse)
Dimensions (mm)	170 × 81 × 48 (excluding cables)
Weight	0.9 kg (including cables)
Operating temperature range	-10–50ºC
Internal over heat temperature	75ºC typical
Upper charging temperature	65ºC typical
Lower charging temperature	0ºC typical
Environmental protection	None

[1]The 9 V minimum operating voltage is defined at the connector end of the input cable. Extensions and connections to the source from the connector will increase the voltage dropped in the cabling and consequently the minimum required operating source voltage. The supply should ideally be rated to at least 10 A output.
[2]The 5 A fuse in the auxiliary power plug is rated for 5 A continuous current with 10 A rating under intermittent operation.

Conformance notices

The RT-UPS complies with the radiated emission limits for 47CFR15.109:2010 class A of Part 15 subpart B of the FCC rules, and with the emission and immunity limits for class A of EN 55022. These limits are designed to provide reasonable protection against harmful interference in business, commercial and industrial uses. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, 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 the receiver

The RT-UPS conforms to the requirements for CE.

Regulator testing standards

- 47CFR15.109:2010 class A (radiated emissions)
- EN 300 440-1:2008, test methods 8.3.2 (conducted emissions) and 8.3.3 (radiated emissions)
- EN55022 class A according to standard EN 301 489-1:2008 (conducted emissions)
- EN6100-4-3 criterion A according to standard EN 301 489-1:2008 (radiated immunity)
- ISO7637-2 criterion B, 12 V and 24 V according to standard EN 301 489-1:2008 (vehicular transients and surges immunity)
- EN60950-1:2006 (safety)
- A11:2009 (safety)

Safety notices

- Do not block the apertures in the box otherwise overheating will occur, which will eventually result in thermal shutdown of the device.
- Do not obstruct the internal fan.
- If the unit becomes excessively hot please unplug the device and allow it to cool.
- Do not replace the fuse in the auxiliary power plug with anything other than a five amp fuse. If another connector is used then make sure that a five amp fuse is included in the positive supply.
- Do not deliberately short circuit the outputs.
- Do not short circuit the internal battery.
- Do not throw or cause impact to the RT-UPS as it contains a battery.
- Do not burn.
- The enclosure will become warm while in use; allow heat to be ejected from the enclosure.
- Do not dispose of in domestic waste.
- Do not ingest the battery.
- Do not allow the product to become wet or immersed in water.
- Recommended storage temperature 20°C.

Battery information

In the event of a faulty battery, a replacement can be sent out from OxTS on request along with instructions on how to change the battery for the user.

The following safety information has been provided by the battery manufacturer.

1. The only battery replacement is a Varta 10V600HR (To Varta drawing no. 074530).
2. Keep out of the reach of children. If swallowed, contact a physician at once.
3. Do not reverse the battery connections. Strictly follow the signs + and – shown on batteries and appliances. If batteries are put in the wrong way they are bound to

become hot very quickly. This can lead to gas or toxic material leakage and/or to a violent rupture.

4. Do not incinerate or mutilate otherwise the batteries may burst or release toxic material. Do not throw battery into open fire. This can cause violent rupture due to the heat.

5. Do not deform batteries. Batteries are not to be crushed, drilled into or damaged in any other way. This can lead to toxic material or gas leakage and/or violent rupture.

6. Do not short circuit the battery. This can lead to toxic material or gas leakage and/or violent rupture.

7. The Battery should be disposed in accordance with local and state regulations.

Transport by sea

For sea transportation of nickel-metal hydride round cells there is an additional requirement:

1. Batteries must not be stored in close proximity of external heating sources.

Transport by air

Any electrical battery or battery powered device, equipment or vehicle having the potential of a dangerous evolution of heat must be prepared for transport so as to prevent:

1. A short circuit. In the case of equipment, by disconnection of the battery and protection of exposed terminals

2. Accidental activation.

The battery must be disconnected before transporting by air.

Disposal / End of Life

For disposal of the battery, take to local authority recycling centre or contact OxTS for advice. The battery waste code is 160605, “Other batteries and accumulators (nickel-metal hydride batteries)”.

Revision history

Table 7. Revision history

Revision	Comments
100816	Initial version (draft only)
110607	First release
130613	Updates, discharge time reduced to one minute
131125	Minor updates, RT-Range disclaimer
140211	Changed input power lead wire colours. Added note about replacement battery.
141204	Updated to show improved discharge specification, notes to advise on operation.
150609	Updated for new battery isolation switch