rpr-IoT-T01 User Manual
Temperature Node

Issue 4

029SL022_4

Please check that you have the latest version of this manual by visiting r-p-r.co.uk

1 Contents

2 Table of Figures

3 Document History

Issue	Notes	Date
01	Original version	November 2022
02	Additions and corrections	December 2022
03	Additions and corrections	January 2023
04	Additions and corrections	March 2023

Our products are in continuous development and therefore this manual and specifications may be subject to change and design improvements may be implemented without prior notice. Please visit our web site www.r-p-r.co.uk for the most up to date information on our products.

4 Description

The rpr-IoT-T01 is a battery powered temperature sensor node that communicates using long range radio compatible with LoRaWAN and The Things Network. The low power electronics are housed in a rugged IP67 enclosure suitable for outdoor and industrial applications. A sealed connector is used for the temperature probe.

5 Application Example

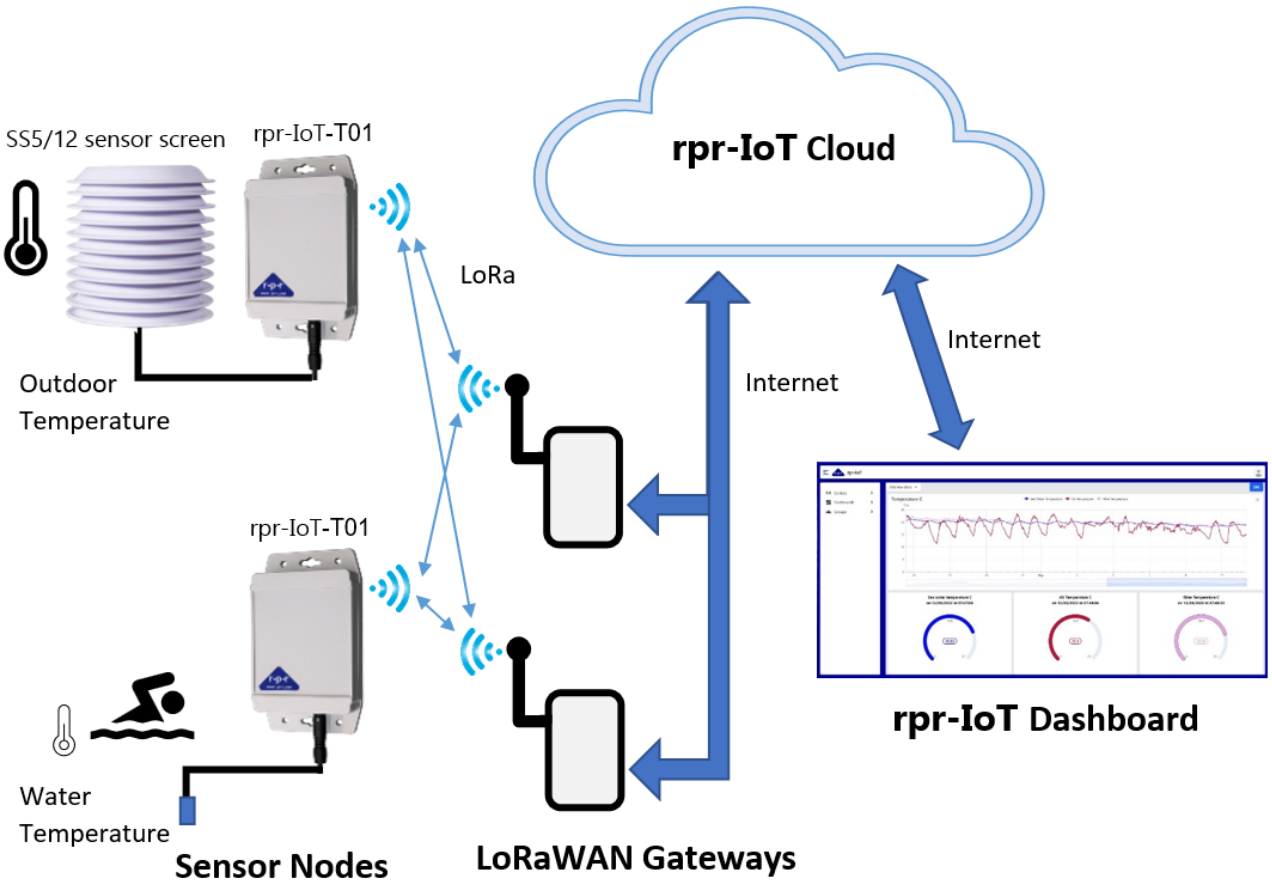


Figure 1 Application Example

6 Getting started

6.1 Gateways

The rpr-IoT-T01 has been designed to be simple to use but first you should check or arrange that there is a suitable gateway within range. The locations of gateways can be seen on the map at https://ttnmapper.org/heatmap/

If you are setting up your own gateway there is information on this at https://www.thethingsindustries.com/docs/gateways/

6.2 Activate the node

To activate the node, connect the temperature probe by aligning the white markings on the connectors and push the connector on. Note DO NOT twist the connector.

Connecting the probe will cause the node to exit hibernation mode and if there is a gateway within range send data through the Things Network.

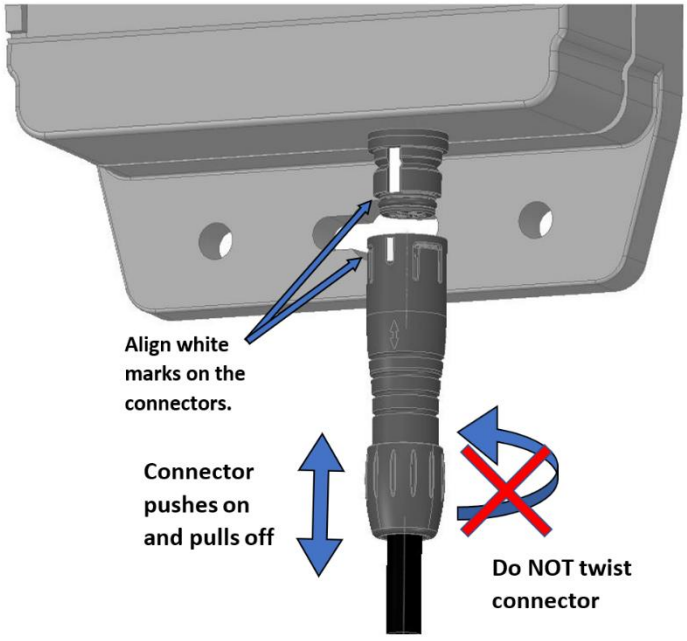
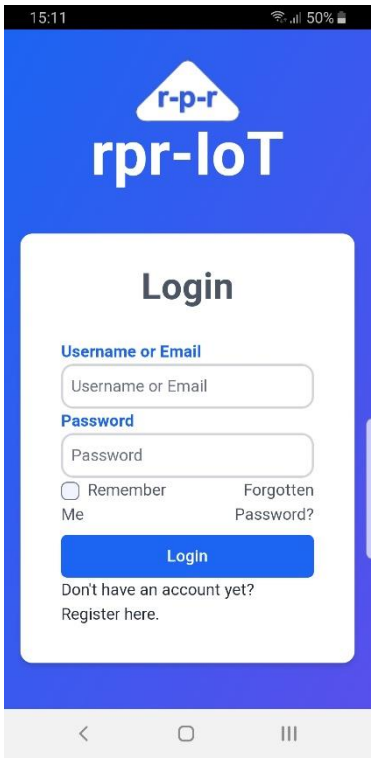


Figure 2 Temperature Probe Connector

After the node is activated if there is not a gateway within range the node will have repeated attempts to send data but lengthen the time between successive attempts.

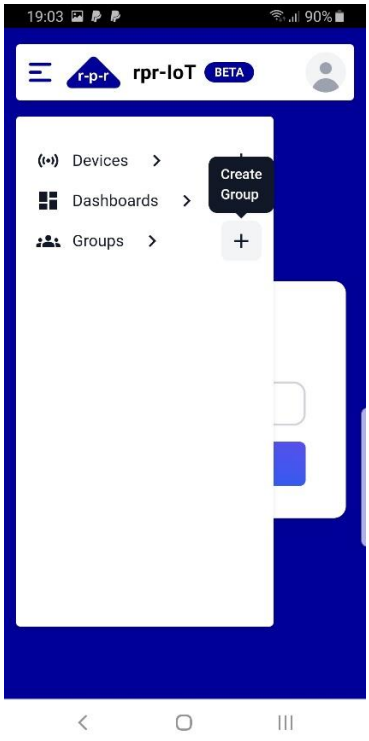
6.3 Login to the rpr-IoT dashboard

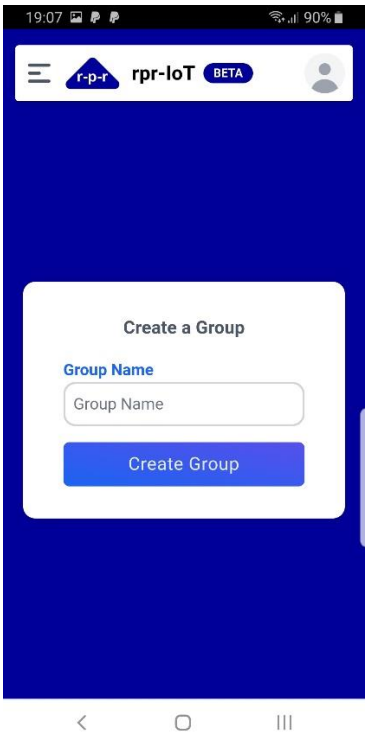
Go to rpriot.com and follow the link to the dashboard at the top of the page or scan the QR code that came with your node. If you do not have an account, then register by following the link at the bottom of the Login screen.



6.4 Create a Group

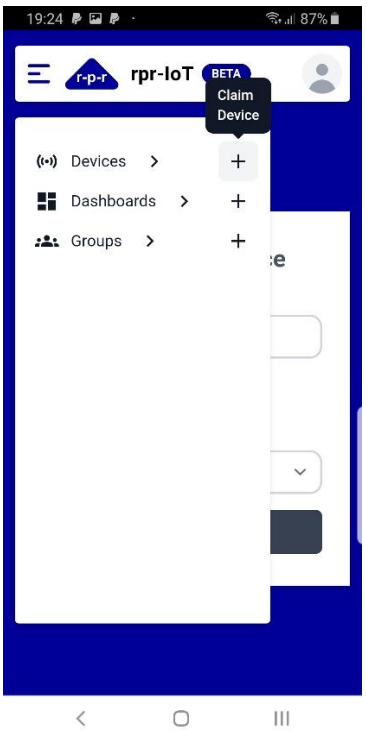
If you have already created a Group, then you can skip this and go straight to Claiming a device.

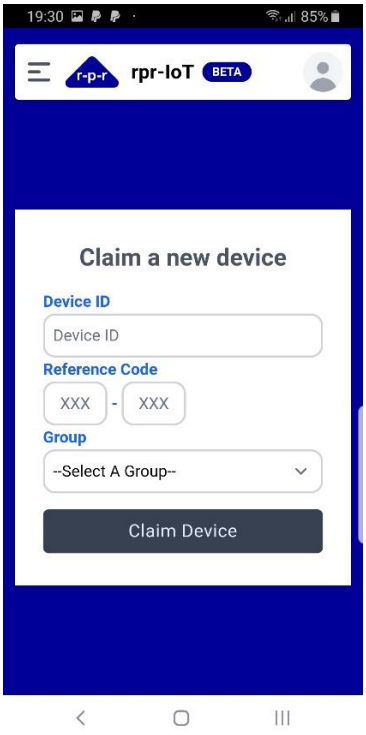




6.5 Claim a Device

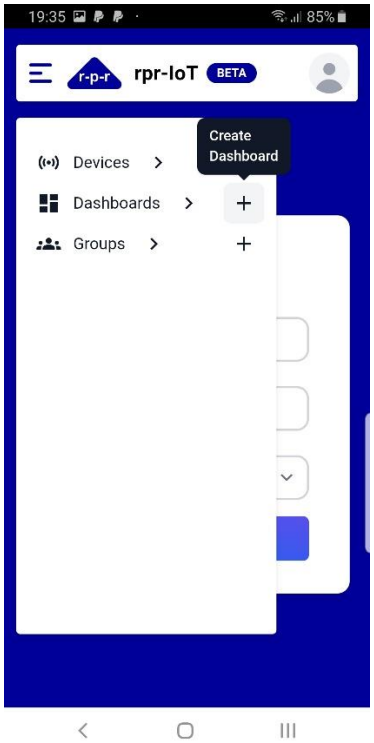
Enter the 16-character Device ID (EUI) and the 6-character Reference Code that came with your node. Select a Group from the dropdown menu and click the Claim Device button.

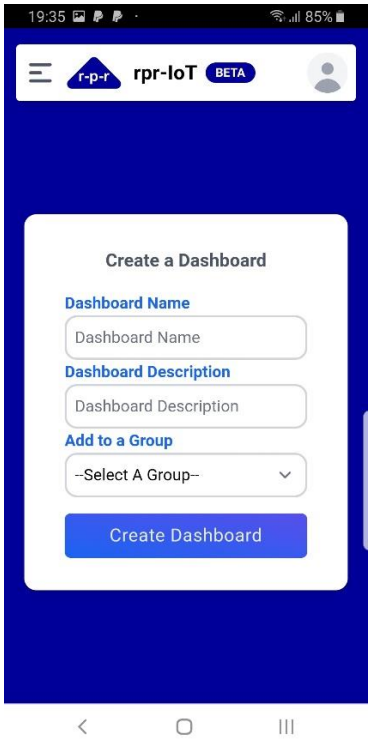




6.6 Create a Dashboard

Once a dashboard has been created graphs and gauges can be added to it by selecting the dashboard and clicking the Edit button.





7 Message interval

The rpr-IoT-T01 will adhere to the Things Network's public community network fair use policy and adjust the minimum uplink message interval depending on the Data rate / Spreading Factor as shown in the following table:

Data rate	Spreading factor	Minimum up message interval
DR5	SF7	3 minutes
DR4	SF8	6 minutes
DR3	SF9	10 minutes
DR2	SF10	20 minutes
DR1	SF11	45 minutes
DR0	SF12	90 minutes

The spreading factor is determined by the Adaptive Data Rate (ADR) mechanism implemented in The Things Stack which is based on the signal to noise ratio (snr) of the received signal. When first switched on the node will join with a spreading factor of 12. By default, the minimum uplink message interval is 5 minutes. To optimise battery usage this can be set to a longer value. It is not recommended that the node be used in mobile applications where the ADR mechanism may not be able to cope with rapidly or continuous changes in radio channel attenuation and signal to noise levels.

8 Temperature Sensor Identification

Each temperature sensor has a unique 64-bit serial code which can be seen on the rpr-IoT dashboard under device information as an eight-character hexadecimal value followed by four zeros. The serial code is sent as the first data message after a probe is connected or the node powered on.

9 Battery state indicator

The temperature node outputs a value indicate the state of the battery which can be displayed on the dashboard. This is not the battery voltage but a temperature compensated value between 0 and 15 which gives a better indication of the state of the battery.

10 Replacing the battery

The state of the battery, on a scale 0 to 15 is one of the parameters sent to the dashboard and can be monitored by the user. The node uses a 3.6V 'A' size Lithium Thionyl Chloride (LiSOCl2) battery. The following table gives details of some compatible batteries.

Make	Part No.
Saft	LS17500
EVE	ER17505
RS-PRO	183-5726

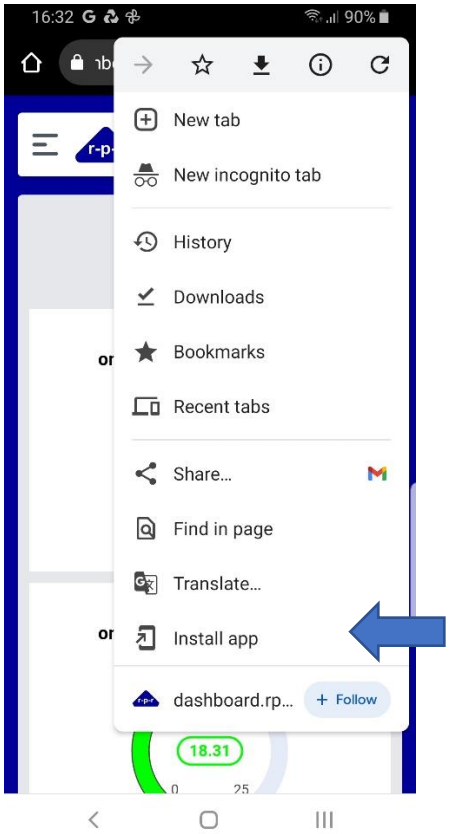
Battery replacement should only be done in dry conditions preferably indoors. The inside of the node is accessed by undoing the four screws on the back of the unit. If there is a retaining cable tie this will need to be cut before removing the battery (see Figure 3). If the unit is likely to be subjected to any vibration or shock, it is recommended that a new cable tie is fitted after the new battery is inserted.

Before closing the unit ensure that the seal is undamaged and clean. Note: Batteries must not be recharged, crushed, disassembled, heated above 85°C, incinerated, or the contents exposed to water.

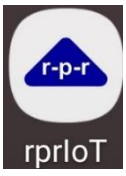
Figure 3 Battery

11 Adding the Dashboard to the Home Screen on an Android device

Using Chrome go to your dashboard and login. Using the menu at the top of the screen by the tab number select Install app and confirm Install in the popup.



Your dashboard can now be opened by selecting the icon.



The advantage of doing this apart from ease of access to your dashboard is that more of the screen is used as the address bar is no longer displayed.

12 Glossary

ADR	Adaptive Data Rate. The Adaptive Data Rate mechanism is used to control the Spreading Factor (SF)
DR	Data Rate
Device ID	A unique 64-bit value that is used to identify a node or device. Normally written as 16 Hexadecimal characters. It can be found on the devices serial number label.
EUI	Extended Unique Identifier is the same as the Device ID.
Frame Count	value that is incremented each time the node sends a message
Gateway	A Gateway receives LoRa messages from end devices and forward them to the Network Server using the internet. Messages can also be sent from the Network though the Gateway to the end device.
LoRa	LoRa is a wireless modulation technique that encodes information on radio waves using chirp pulses. It is robust against disturbances and can be received over great distances.
LoRaWAN	LoRaWAN is a Media Access Control (MAC) layer protocol built on top of LoRa modulation. It is a software layer which defines how devices use the LoRa hardware, for example when they transmit, and the format of messages.
RSSI	Received Signal Strength Indicator
SF	Spreading Factor. The SF indicates the speed of data transmission. A larger SF increases the time on air, which increases energy consumption, reduces the data rate, and improves communication range. The Adaptive Data Rate (ADR) mechanism adjusts the SF between 7 and 12.
SNR	Signal to Noise Ratio

13 Specification

Physical	
Enclosure dimensions including flanges but excluding sensor	160.8mm x 90.8mm x 38 mm
Mounting holes	4 off 5 mm dia. 140.8 mm x 50.8 mm
Mounting key holes	2 off 8.5 mm dia. 4.6 mm slot, 140.8 spacing
Flange thickness	6.5 mm
Enclosure material	Polycarbonate, Light Gray (RAL 7035)
Enclosure flammability rating	UL94 5VA @ 3mm
Weight	245g
Temperature Probe	See probe datasheet
Wireless/network Connectivity	
Frequency band	863-870 MHz
LoRa Channel	EU868
Networking Protocol	LoRaWAN, Class A
LoRaWAN End-Device Type	Over-the-Air (OTA) activated
Aerial	Internal Meandering Monopole circuit board mounted

Uplink Message Interval	By default, the interval is dependent on the Spreading Factor and The Things Network's public community network Fair Use Policy.
Range	Up to 10km Line of sight dependent on environment
Power	
Battery type	A size Lithium Thionyl Chloride (LiSOCl2)
Nominal Battery Capacity	4000mAh
Nominal Battery Voltage	3.6V
Environmental	
Temperature range	Operating: -10°C to +60°C, Storage: -40°C to +70°C
Relative Humidity	0% to 100%
Enclosure protection	IP67
Compliance	UKCA, CE

The manufacturer reserves the right to amend the specification and therefore the information in this document may be subject to change.

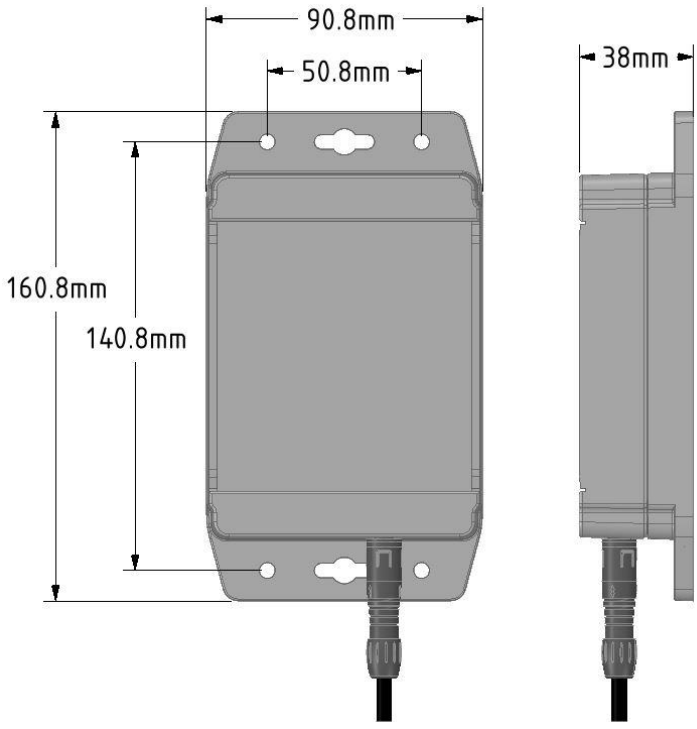


Figure 4 Dimensions

14 Appendix

A1 UK DECLARATION OF CONFORMITY

We, Richard Paul Russell Limited of
The Lodge, Unit 1 Barnes Farm Business Park
Barnes Lane
Milford-on-Sea
Hampshire SO41 0AP
United Kingdom

Declare under our sole responsibility that the product: **rpr-IoT**
Manufactured by: Richard Paul Russell Limited to which this declaration relates, is in conformity with the Radio Equipment Regulations 2017 S.I. 2017:1206
This Declaration of Conformity is based upon compliance of the product with the following harmonised standards:

Emissions	Radiated emissions (30 MHz to 6.0 GHz)	ETSI EN 301 489-1:V2.2.0:2017 ETSI EN 301 489-3:V2.1.1:2019	CISPR 32:2015
Immunity	Electrostatic Discharge		EN 61000-4-2:2009
	Radiated RF Immunity		EN 61000-4-3:2006
		ETSI EN 301 489-1:V2.2.0:2017	incl A1:2008 & A2:2010
	Fast transient Bursts		EN 61000-4-4:2012
	Conducted Immunity	ETSI EN 301 489-3:V2.1.1:2019	EN 61000-4-6:2014
Radio	EN 300 220-2:V3.2.1 (2018-06)		
WEEE	The Waste Electrical and Electronic Equipment Regulations 2013 (as amended)		
RoHS	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (as amended)		

Signed by:

R.P.Russell

Richard Paul Russell – Director

Date of Issue: 01 January 2021
Place of Issue:
The Lodge, Unit 1 Barnes Farm Business Park
Barnes Lane
Milford-on-Sea
Hampshire SO41 0AP
United Kingdom

A2 CE Declaration of Conformity

EC DECLARATION OF CONFORMITY

ACCORDING TO COUNCIL DIRECTIVE 2014/30/EC

We, Richard Paul Russell Limited of
The Lodge, Unit 1 Barnes Farm Business Park
Barnes Lane
Milford-on-Sea
Hampshire SO41 0AP
United Kingdom

Declare under our sole responsibility that the product: **rpr-IoT**
Manufactured by: Richard Paul Russell Limited to which this declaration relates, is in conformity with the protection requirements of the Radio Equipment Directive 2014/53/EU
This Declaration of Conformity is based upon compliance of the product with the following harmonised standards:

Emissions	Radiated emissions (30 MHz to 6.0 GHz)	ETSI EN 301 489-1:V2.2.0:2017 ETSI EN 301 489-3:V2.1.1:2019	CISPR 32:2015
Immunity	Electrostatic Discharge		EN 61000-4-2:2009
	Radiated RF Immunity	ETSI EN 301 489-1:V2.2.0:2017 ETSI EN 301 489-3:V2.1.1:2019	EN 61000-4-3:2006 incl A1:2008 & A2:2010
	Fast transient Bursts		EN 61000-4-4:2012
	Conducted Immunity		EN 61000-4-6:2014
Radio	EN 300 220-2:V3.2.1 (2018-06)		
WEEE	The Waste Electrical and Electronic Equipment Regulations 2013 (as amended)		
RoHS	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (as amended)		

Signed by:

R.P.Russell

Richard Paul Russell – Director

Date of Issue: 17 January 2020
Place of Issue:
The Lodge, Unit 1 Barnes Farm Business Park
Barnes Lane
Milford-on-Sea
Hampshire SO41 0AP
United Kingdom

CE

A3 WEEE

The WEEE directive places an obligation on all EU-based manufacturers and importers to take-back electronic products at the end of their useful life. Richard Paul Russell Ltd accepts its responsibility to finance the cost of treatment and recovery of redundant WEEE in accordance with the specific WEEE recycling requirements.

This symbol on the product or on its packaging indicates that, within the EU, the product must NOT be disposed of with normal household waste. Instead, it is the end user's responsibility to dispose of their waste equipment by arranging to return it to a designated collection point for the recycling of WEEE. By separating and recycling waste equipment at the time of disposal, natural resources will be conserved and it will be ensured that the equipment is recycled in a manner that protects human health and the environment. For more information about where you can send your waste equipment for recycling, please contact your local council office or visit our website www.r-p-r.co.uk.