Smart Radio Telemetry Module

Features
- Simple and low cost
- 4 channel receiver module
- 4 digital outputs
- Serial Data output
- Minimal external components
- Secure data protocol
- Ultra low power 1.8—3.6V
- Easy pairing process
- -121dBm Receive Sensitivity
- Range when used with:
  - *FOBBER* Keyfob up to 150metres
  - *TRAP* Handset up to 1000metres
  - *SABRE* Handset up to 2000metres
- SMT or SIL package
- Incorporates self test mode
- CE compliant for EU licence free use

**Description**
The ZPT receiver module provides an easy “plug and Play” Remote Control feature for any application.
Compatible with many RF Solutions Transmitters the ZPT provides a serial and digital output when the transmitter is operated. When used with one of the many RF Solutions Transmitters a versatile secure radio Telemetry switch can be created.

**Ordering Information**

<table>
<thead>
<tr>
<th>Part No</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZPT-4RD</td>
<td>Radio telemetry module DIL package 433MHz</td>
</tr>
<tr>
<td>ZPT-4RS</td>
<td>Radio telemetry module SMT package 433MHz</td>
</tr>
<tr>
<td>ZPT-8RD</td>
<td>Radio telemetry module DIL package 868MHz</td>
</tr>
<tr>
<td>ZPT-8RS</td>
<td>Radio telemetry module SMT package 868MHz</td>
</tr>
</tbody>
</table>
ZPT Telemetry Receiver Module

Compatible Transmitters
The ZPT module can be used with the transmitters below. The transmitter handset will affect the maximum achievable range of operation.

**FOBBER Keyfob**
Compact rugged handset. Waterproof to IP68
1, 2, 3, 4, 6, 8 button Options
Operating up to 150m

**TRAP Handset**
A medium sized rugged handset. Available as
1, 2, 3, 4, 6, 8, 16 buttons
Operating up to 1000m

**SABRE Handset**
A rugged IP68 industrial handset
1, 2, 3, 4, 8 buttons
Operating up to 2000m.
## Pin-out

![ZPT Telemetry Receiver Module Pin-out Diagram]

### Pin Description

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Name</th>
<th>Direction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ANT</td>
<td>In</td>
<td>Antenna input/output 50ohm impedance</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>In</td>
<td>Connect to ground</td>
</tr>
<tr>
<td>3</td>
<td>SLEEP</td>
<td>In</td>
<td>to GND, Module active Connect to Vcc, Module Enters SLEEP</td>
</tr>
<tr>
<td>4</td>
<td>Vcc</td>
<td>In</td>
<td>Supply voltage</td>
</tr>
<tr>
<td>5</td>
<td>LED/LRN</td>
<td>Out/In</td>
<td>Learn switch input and LED output Learn switch input, normally high momentarily connect to GND to enter Learn Mode.</td>
</tr>
<tr>
<td>6</td>
<td>SERIAL O/P</td>
<td>Out</td>
<td>Serial Data output to Host micro</td>
</tr>
<tr>
<td>7</td>
<td>N/C</td>
<td>-</td>
<td>No Connect</td>
</tr>
<tr>
<td>8</td>
<td>MOM/LATCH</td>
<td>In</td>
<td>Set outputs as momentary or latching in operation. Internally tied high Connect to GND for momentary Disconnect for latching Once status has been changed, the power must be cycled in order for the change to take effect.</td>
</tr>
<tr>
<td>9</td>
<td>O/P4</td>
<td>Out</td>
<td>Digital Output</td>
</tr>
<tr>
<td>10</td>
<td>O/P3</td>
<td>Out</td>
<td>Digital Output</td>
</tr>
<tr>
<td>11</td>
<td>O/P2</td>
<td>Out</td>
<td>Digital Output</td>
</tr>
<tr>
<td>12</td>
<td>O/P1</td>
<td>Out</td>
<td>Digital Output</td>
</tr>
</tbody>
</table>
ZPT Telemetry Receiver Module

Operation
The ZPT module will remain in a low power listening mode at all times when power is present and the Sleep Input is Low. When a valid RF signal is received ZPT will wake and process the RF packet. If the received RF Packet is from a Transmitter that has been “Paired” to the ZPT module, the Digital Telemetry outputs are asserted accordingly. The RF Packet Data is always presented at the Serial data output to the host.

Pairing Process
This process creates a paired link between an input button on a transmitter with one of the ZPT Digital Telemetry outputs. Any input from any transmitter can be paired to any output of the ZPT module.

1. Briefly GND Pin 5, the LED will flash once - this shows OP1 is selected
2. GND Pin 5 again after release the LED will flash twice to show OP2 is selected
3. Repeat above process to select OP3 or 4
4. With the desired output selected (and before a 10sec timeout)
5. Press the button or activate the input on the transmitter to be paired.
6. This will complete the pairing and the LED will flash twice to confirm memory, maximum storage is 30 pairings.

Erase
To erase the ZPT memory and remove all stored transmitter input pairings you must connect the Learn Pin (S) to Ground for 10 seconds. The Learn LED will illuminate while the pin is grounded and after it is disconnected will flash 3 times to confirm memory erase has been completed.

<table>
<thead>
<tr>
<th>Mode</th>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal operation</td>
<td>OFF</td>
<td>No RF data is being transmitted/received</td>
</tr>
<tr>
<td></td>
<td>Flickering</td>
<td>Module is receiving data</td>
</tr>
<tr>
<td>Learn and erase</td>
<td>ON</td>
<td>While input is connected to GND (i.e. during button press)</td>
</tr>
<tr>
<td></td>
<td>Flashes</td>
<td>Flashes to show output selection and pairing success</td>
</tr>
<tr>
<td></td>
<td>Flashing twice</td>
<td>Learn mode times out after 10 seconds</td>
</tr>
<tr>
<td></td>
<td>Flashes three times</td>
<td>ZPT pairing successful</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ERASE successful</td>
</tr>
</tbody>
</table>

Outputs
Outputs are LVTTL / LVCMOS at Vcc and are Active high.

Momentary or Latching Function
ZPT actions transmitter button state change only, therefore momentary mode requires receipt of a “button down/input active” packet and a “button up/input not active” packet from a transmitter. In momentary mode on receiving a “button down” the ZPT will hold its output active until a “button up” is received. In latching mode ZPT must see “button down” then “button up” in order to make a state change to assert or relax all output.
ZPT Telemetry Receiver Module

ZPT Receiver module serial data output

The ZPT outputs the serial number, button and battery status of the transmitter encoder. This data may be fed directly to a microcontroller or RS232 type driver circuit which may then be fed directly to a PC serial port. Serial data is output on every packet receipt - this equates to every 1/4 second whilst a button is held down / input active. This data output is valid regardless of whether the Transmitter/Encoder has been learnt or not. The serial data packet contains a learn bit to show if an encoder input is learnt.

Serial data configuration

- Baud Rate: 19,200
- Data bits: 8
- Parity: none
- Stop bits: 1
- Handshaking: none

Serial data format:

<table>
<thead>
<tr>
<th>SN1</th>
<th>SN2</th>
<th>SN3</th>
<th>IP1-8</th>
<th>IP9-16</th>
<th>TXV</th>
<th>STAT</th>
<th>RSSI</th>
<th>CR</th>
<th>LF</th>
</tr>
</thead>
</table>

- 10 bytes of serial data sent
  - Line Feed - $0A (hex)
  - Carriage Return - $0D (hex)
  - RSSI 0 - 255 (hex)
  - Learn status and low battery
  - Tx battery voltage (if available)
  - Input status on Tx
  - 3 byte serial number

Serial number [SN1 SN2 SN3]:

Made up of three 8-bit bytes where the most significant byte is transmitted first.
Example: 12ABAA (hexadecimal) or 00010010 1010 1011 1010 (binary)

Tx inputs [IP1-8 IP9-16]: made up of two 8-bit bytes

The low order byte is sent first representing inputs 8 down to 1 where the MSB is input 8 and the LSB is input 1. The high order byte is sent next representing inputs 16 down to 9 where the MSB is input 16 and the LSB is input 9.
A bit at state 1 represents an encoder input as active.
Using this method inputs can be multiplexed giving maximum versatility.
Example: 00000000 00010000 Shows input 13 active.
10000000 00000000 Shows input 8 active
10000001 10000000 Shows inputs 16, 8 and 1 active

Learn status and low battery:

One 8 bit byte:

Bit0 shows low battery on Tx - where 1 = Low battery
Bit1 shows learn status of Tx - where 1 = Learnt

RSSI

Received Signal Strength Indication.

Bespoke versions

Customised versions of all transmitters, receivers and chipsets are available to provide a bespoke remote chipset for OEM.
Description:
This example shows a ZPT module receiver with all 4 outputs connected.
Note: The external learn switch and learn LED are both shown connected in this example.

ZPT connected with Serial data output via MAX232
Self Test Mode
ZPT module incorporates a self test which is initiated by applying power with the learn button held down.
The module then performs the following functions:

1. All outputs operate in turn ON/OFF twice
2. All outputs flash ON/OFF 5 times - 1&3 and then 2&4
3. Transmits a full power RF signal for 5 seconds while flashing the learn LED
4. Enters RSSI [Received Signal Strength Indication] mode where outputs 1-4 are activated as a bar graph type output according to the strength of a valid RF signal received [from any carrier operating at the appropriate frequency (869.50 MHz)]. 4 Outputs on being maximum strength.
5. To exit RSSI mode cycle power to the module.

Range Considerations
The antenna choice and position directly affects the system range, keep it clear of any large metal parts.
The best position is protruding vertically from the top of the product. This is often not desirable for practical reasons and thus a compromise may be needed. Note that the space around the antenna is as important as the antenna itself. All radio systems are dependent on a radio signal being received through airspace.
The range quoted is the optimal in direct line of sight without obstacles and in good atmospheric conditions.
Range is affected by many things, for example local environmental conditions, atmospheric conditions, interference from other radio transmitters. For evaluating the local environment please see our RF Meter (DS006).
In very worse case applications the range quoted may be reduced dramatically below the optimal range stated.
ZPT Telemetry Receiver Module

Mechanical dimensions

Surface Mount Package

D Package

PCB pad Layout
ZPT Telemetry Receiver Module

ZPK module re-flow guide

<table>
<thead>
<tr>
<th>Profile feature</th>
<th>Value (lead free)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp up rate</td>
<td>3°C /s</td>
</tr>
<tr>
<td>Pre-heat temperature</td>
<td></td>
</tr>
<tr>
<td>- Temperature Min ($T_{min}$)</td>
<td>150°C</td>
</tr>
<tr>
<td>- Temperature Max ($T_{max}$)</td>
<td>200°C</td>
</tr>
<tr>
<td>- Pre-heat time</td>
<td>60-100s</td>
</tr>
<tr>
<td>Peak temperature ($T_p$)</td>
<td>240°C</td>
</tr>
<tr>
<td>Time at $T_p$</td>
<td>10-20sec</td>
</tr>
<tr>
<td>Ramp down rate</td>
<td>6°C /s</td>
</tr>
<tr>
<td>Time from 25°C to peak</td>
<td>8 mins max.</td>
</tr>
</tbody>
</table>

Zetaplus telemetry module version identification

- Pink dot indicates ZPT module
- Frequency of Operation:
  - Red 433MHz
  - Blue 868MHz
  - Brown 915MHz

- Test: Green Pass

- ZPT Firmware Version:
  - Brown ver 1
  - Red ver 2
  - Orange ver 3
  - Yellow ver 4
  - Green Ver 5
  - Blue ver 6
  - Violet ver 7
  - Grey ver 8
  - White ver 9
# Electrical Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Notes</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature</td>
<td>( T_a )</td>
<td></td>
<td>-20</td>
<td></td>
<td>85</td>
<td>°C</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>( V_{cc} )</td>
<td></td>
<td>1.8</td>
<td></td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>I/O Drive Voltage</td>
<td>( V_{pw} )</td>
<td></td>
<td>1.8</td>
<td></td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Operating Frequency</td>
<td></td>
<td>868MHz version 915MHz version</td>
<td>915 0 0</td>
<td>896 500</td>
<td>915 2 7</td>
<td>MHz</td>
</tr>
<tr>
<td>RX Sensitivity</td>
<td></td>
<td></td>
<td>-121</td>
<td></td>
<td></td>
<td>dBm</td>
</tr>
</tbody>
</table>

# DC characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test condition</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage range</td>
<td>( V_{cc} )</td>
<td></td>
<td>18</td>
<td>3.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Power saving modes</td>
<td>( I_{sleep} )</td>
<td>Module asleep with shutdown pin active, Note all outputs are disabled</td>
<td>–</td>
<td></td>
<td>&lt;1</td>
<td>uA</td>
</tr>
<tr>
<td>RX mode current</td>
<td>( I_{ex} )</td>
<td>Module is in RF Data receive mode</td>
<td>–</td>
<td>16</td>
<td>–</td>
<td>mA</td>
</tr>
</tbody>
</table>

# AC Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Condition</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX channel bandwidth</td>
<td>( BW )</td>
<td></td>
<td>–</td>
<td>60</td>
<td>–</td>
<td>kHz</td>
</tr>
<tr>
<td>Image rejection</td>
<td>( I_{RF} )</td>
<td>Rejection at the image frequency IF = 468kHz</td>
<td>–</td>
<td>-35</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>Spurious emissions</td>
<td>( P_{sp, Rx} )</td>
<td>Measured at RX pins</td>
<td>–</td>
<td>-54</td>
<td>–</td>
<td>dBm</td>
</tr>
</tbody>
</table>
ZPT Telemetry Receiver Module

RF Meter

RF Multi Meter is a versatile handheld test meter checking Radio signal strength or interference in a given area. The Multi-Meter can both transmit and receive signals making it possible to test an installation location for suitability before installing equipment. The Multi-Meter is very hard wearing, long lasting and simple to use. It has 4 selectable frequencies, changeable at the touch of a button. It also has an auto shut off feature for battery saving.

Important European compliance information

This RF Solutions radio module meets the essential requirements of the European Radio Equipment Directive 2014/53/EU and has been tested to European Harmonised Standards and CE marked where space allows. A copy of the EU Declaration of Conformity can be located on the RF Solutions Website, www.rfsolutions.co.uk/certification-53.

When using the module in an end product, continued compliance can only be assured by incorporating the module in accordance with RF Solutions specific installation instructions and in accordance with the published information on the RF Solutions product data sheet. Article 3.1a and 3.1b of the EU Radio Equipment Directive 2014/53/EU should be assessed in the final product.

Failure to follow this guidance may result in a non-compliant product being placed on the European Market, for which RF Solutions cannot accept any responsibility.

Further guidance may be obtained from RF Solutions Technical Support.

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Discard with normal waste, please recycle.

ROHS Directive 2002/95/EC
Specifies certain limits for hazardous substances.

WEEE Directive 2002/96/EC
Waste electrical & electronic equipment. This product must be disposed of through a licensed WEEE collection point. RF Solutions Ltd., fulfils its WEEE obligations by membership of an approved compliance scheme.

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