Rugged Long Range Radio (LoRa) Transmitter

- Range
  - LORA Mode 7 upto **16km**
  - LORA Mode 1 upto **5Km**
  - FM Mode upto **4Km**
- 1—8 Switch Options
- Optional "Acknowledge" Signal from Receiver
- Compatible with RF Solutions Receiver "LoRa" Receivers
- Waterproof to IP66
- Internal Rechargeable Battery
- Recharge via either:
  - uUSB C Socket
  - Wireless Recharging
- Supplied Ready to Go
- 868/915MHz/2.4GHz Technology
- RED (CE) Compliant.
- FCC Certified.

Applications

- Industrial Remote Switching
- Reliable Remote Switching
- Long Range Control

Description

Taurus is a rugged RF Transmitter which can operate with many RF Solutions receivers to generate a Range Remote Control System. Taurus can operate in several Modes of operation, providing short or longer range. It can be optionally set to request feedback from the receiver to provide the user with visual feedback, and can also provide an automatic background "Watchdog" Transmissions.

Housed in a IP66 rated waterproof enclosure, TAURUS has an internal rechargeable Lithium battery which can be recharged via either the external microUSB socket (type C) or wireless recharging pad (using a standard QI, Apple or Samsung Wireless compatible). Custom versions are available on request

TAURUS FM/LoRa Transmitter

Part Numbers

1 Switch	
TAURUS-8T1	868MHz
TAURUS-9T1	918MHz
TAURUS-24T1	2.4GHz

3 Switch	
TAURUS-8T3	868MHz
TAURUS-9T3	918MHz
TAURUS-24T3	2.4GHz

4 Switch	
TAURUS-8T4	868MHz
TAURUS-9T4	918MHz
TAURUS-24T4	2.4GHz

8 Switch	
TAURUS-8T8	868MHz
TAURUS-9T8	918MHz
TAURUS-24T8	2.4GHz

Also Included

Transmitters ship with Lanyard and USB Charging Cable

Optional Accessory

WCHARGEPAD-3COIL
Triple Coil desktop Charging pad with USB Cable
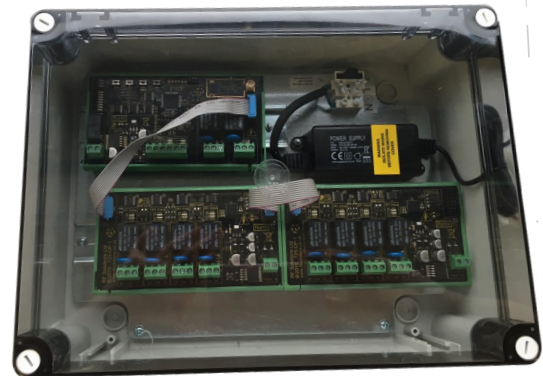
TAURUS FM/LoRa Transmitter

Compatible Receivers

TAURUS Transmitter is compatible with all RF Solutions LoRa Receivers.

PRO Series Receiver Units

IP65 Receiver with DIN Rail Modules

4, 8, 16 Channels Changeover Contacts

expandable to 250 using add-on Relay modules

110-230Vac or 12-30Vdc supply

725 DIN Rail Module

DIN Rail Receiver

2 Channels Relay changeover contact outputs
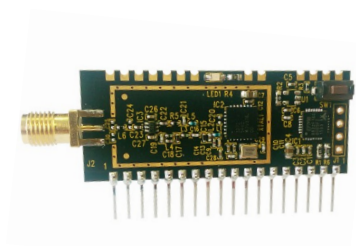expandable to 250 using add-on Relay modules

12-30Vdc supply

SLIMDIN Receiver

Compact DIN Rail Receiver

4 Channels Relay outputs

12-30Vdc supply

GAMMA-OEM RF Module

RF module with 8 Digital and serial outputs

SMT or DIP versions

TAURUS FM/LoRa Transmitter

Operation

Press any of the switches to operate.
The Transmitter will auto sleep between operations to save power

The LED's indicate the following:

RF Transmit GREEN LED operates when Taurus is transmitting an RF signal

RF Acknowledge (if configured) :

GREEN LED will Flash at high speed to indicate that an acknowledgment **has** successfully been received back form the receiver

RED LED will Flash at high speed to indicate that an acknowledgment **has not** been received back form the receiver

Low Battery: If battery requires recharging Low Battery LED illuminates for 3 seconds after each operation.

RF Transmit
(Green LED)

Low
Battery

RF Acknowledge
From Receiver
(Green / Red LED)

TAURUS FM/LoRa Transmitter

Recharging the Battery

Taurus contains an internal Lithium battery which can be recharged via the USB connector or, via a QI standard wireless charging pad.

When Charging the Battery **RED LED** gives a slow Flash indicates charging is in progress.

When fully charged the **GREEN LED** is illuminated

LED Flashes while recharging

Fully Charged

## Recharging uUSB Type C Connector

Wireless Recharging

Taurus is compatible with the QI standard (e.g. Apple or Samsung standard Wireless charging pads)

TAURUS FM/LoRa Transmitter

Configuring Modes of Operation

To configure the modes of operation, unscrew the six enclosure fixing screws to access the internal circuit board.

The SET switch is used to configure the operating modes
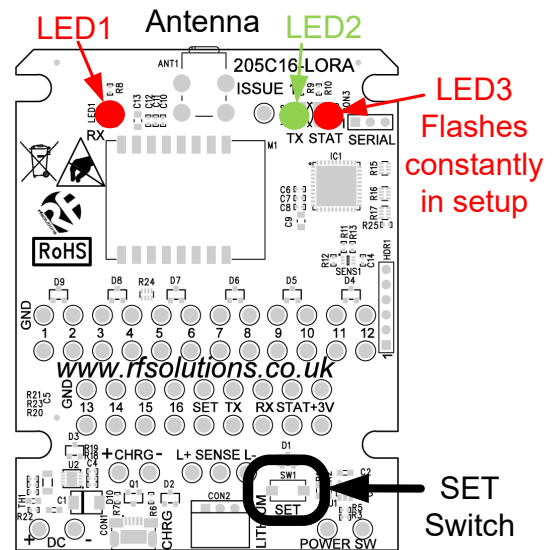
The Following Modes can be configured using the SET Switch

1. RF Mode of Transmission (FM or LORA Mode)
2. Acknowledgement back from the Receiver
3. Automatic Watchdog Transmissions
4. Continuous or State Change Transmission

TAURUS Transmitters are factory Shipped with the following Settings

RF Transmission	FM
Acknowledgment	OFF
Watchdog	OFF
Transmission Type	Continuous

Restoring TAURUS to Factory Default

Press SET Sw
1X

↓

LED1
flashes 1x

↓

Press SET Sw
For 10 Secs

TAURUS FM/LoRa Transmitter
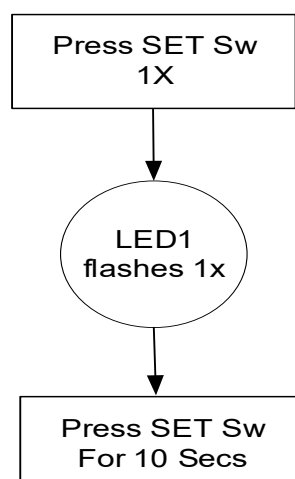
To Set the RF Transmission MODE

Press SET Sw
1X

↓

LED1
flashes 1x

↓

Wait 3
Seconds

↓

LED 1 & 2
Flashes 1x

↓

Wait 3
Seconds

↓

LED 1 Flashes
Indicating
Current MODE

↓

**Repeat Press SET Sw
To select Mode**

1x = FM
2x = LORA Mode 1
3x = LORA Mode 2
4x = LORA Mode 3
5x = LORA Mode 4
6x = LORA Mode 5
7x = LORA Mode 6
8x = LORA Mode 7
After selecting wait for timeout
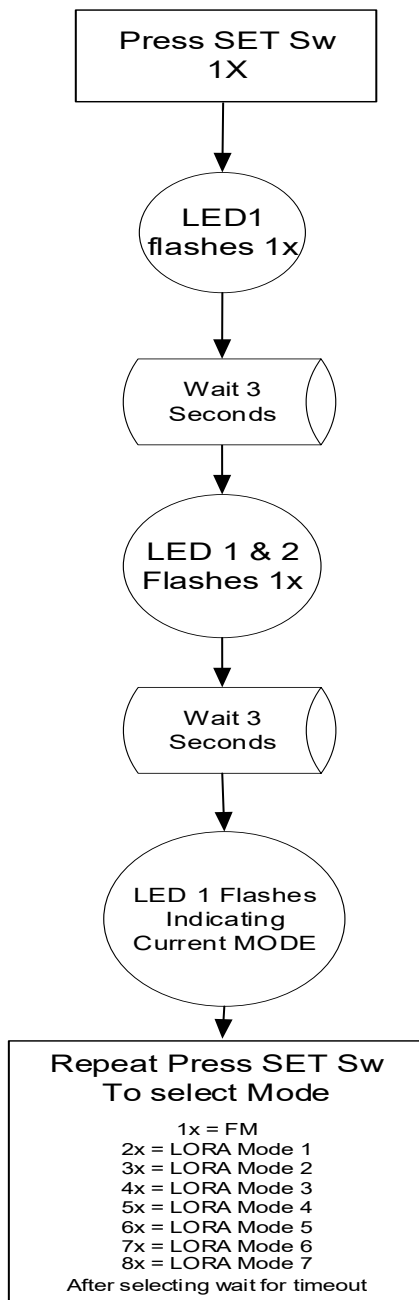
This sets the type of RF Transmission.

Possible options are FM, or LORA Modes 0 - 7

FM or LORA mode 0 provides the quickest response; from Transmitter sw pressed to Receiver Relay output.
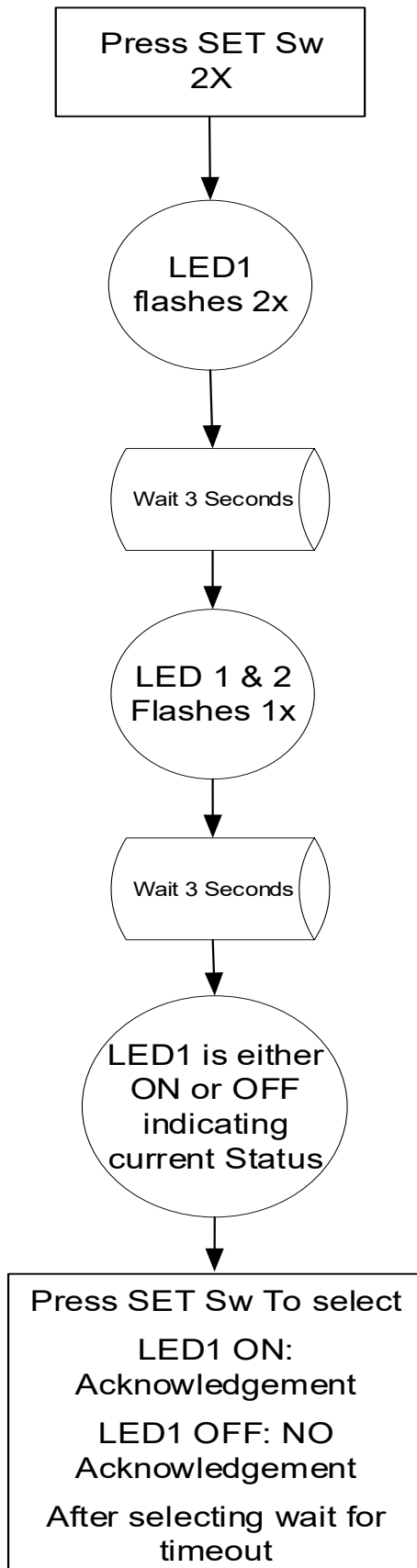
LORA mode 7 provides the longest operating range but with the longest time delay of from button press to receiver relay actuation..

Notes

1. Range is dependant on many factors including the mode of transmission. Range can be reduced by 75% in built up areas with poor antenna, and environmental conditions

2. Battery life quoted is approximate based on 30 operations per day.

RF Transmission	Mode (No of LED1 Flashes)	Propagation Time from TX to output Activated (approx)	Operations from a Single battery charge
FM	**1**	20 mS	1Million
LoRa Mode 1	**2**	20 mS	~550K
LoRa Mode 2	**3**	40 mS	288K
LoRa Mode 3	**4**	80 mS	144K
LoRa Mode 4	**5**	160 mS	72K
LoRa Mode 5	**6**	320 mS	36K
LoRa Mode 6	**7**	640 mS	18K
LoRa Mode 7	**8**	1.28 Secs	~9,000

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TAURUS FM/LoRa Transmitter

To Set Acknowledgement Request

Press SET Sw 2X

↓

LED1 flashes 2x

↓

Wait 3 Seconds

↓

LED 1 & 2 Flashes 1x

↓

Wait 3 Seconds

↓

LED1 is either ON or OFF indicating current Status

↓

Press SET Sw To select

LED1 ON: Acknowledgement

LED1 OFF: NO Acknowledgement

After selecting wait for timeout

Acknowledgement Feature provides the user with LED indication that the receiver has successfully received the transmitters signal.
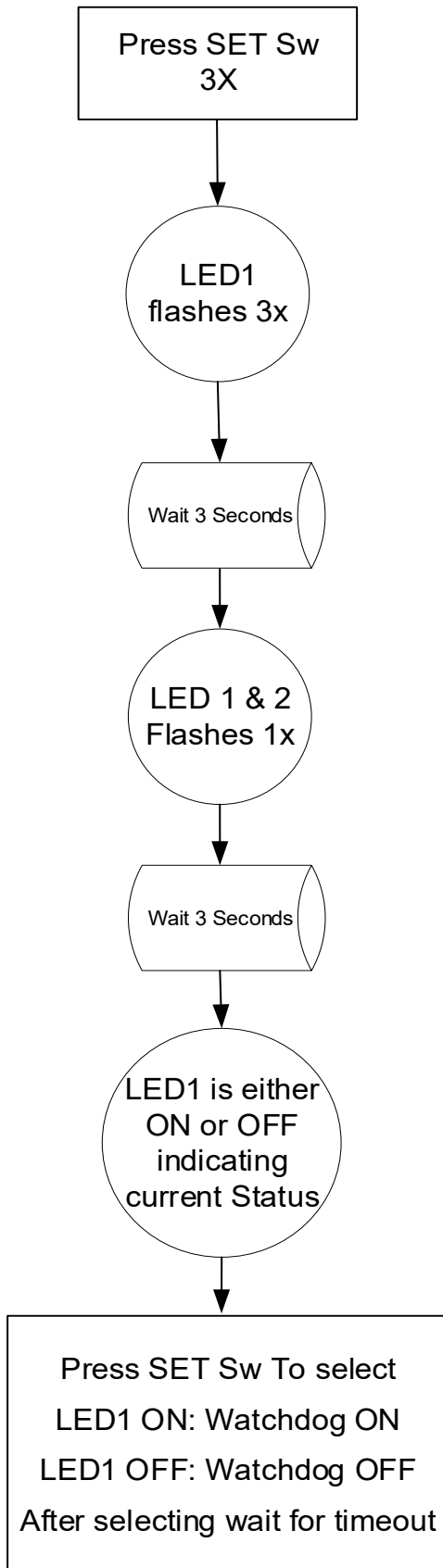
When activated the TAURUS Transmitter includes an acknowledgement request within each radio transmission. .

The response from the receiver is indicated on the transmitter via the RED / GREEN LEDs.

RF Acknowledgment from Receiver - Warning!

When Acknowledgement is ON, TAURUS requests an RF signal back from the receiver. Whilst in theory if an RF signal can be transmitted one way then it can be returned, in practice occasionally the received acknowledgement many not penetrate as well as the Taurus transmitted signal.

TAURUS FM/LoRa Transmitter

To Set Watchdog Transmissions

```
┌─────────────────┐
│  Press SET Sw   │
│       3X        │
└─────────────────┘
         │
         ▼
   ╭───────────╮
   │   LED1    │
   │ flashes 3x│
   ╰───────────╯
         │
         ▼
   ┌───────────┐
   │Wait 3 Seconds│
   └───────────┘
         │
         ▼
   ╭───────────╮
   │  LED 1 & 2 │
   │ Flashes 1x │
   ╰───────────╯
         │
         ▼
   ┌───────────┐
   │Wait 3 Seconds│
   └───────────┘
         │
         ▼
   ╭───────────╮
   │LED1 is either│
   │  ON or OFF  │
   │ indicating  │
   │current Status│
   ╰───────────╯
         │
         ▼
┌─────────────────────────┐
│ Press SET Sw To select  │
│ LED1 ON: Watchdog ON    │
│ LED1 OFF: Watchdog OFF  │
│After selecting wait for timeout│
└─────────────────────────┘
```
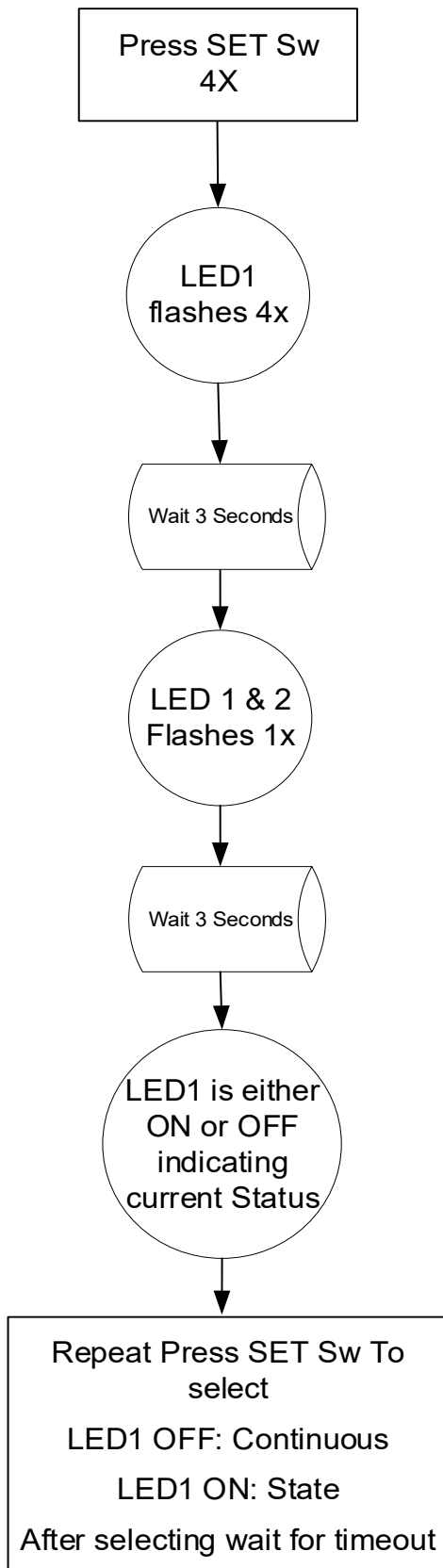
If enabled, TAURUS automatically transmits a background "watchdog" RF Signal approx. every ~45 secs,

RF Solutions Receivers with a Watchdog feature wil hold a Relay contact "ENERGISED" as long as Watchdog is regularly received confirming the transmitter is in range and the system is operating correctly.

When using Watchdog it may be useful to incorporate a Power Switch to avoid premature battery discharge

A power switch can be incorporated If this is required please contact our sales Dept.

TAURUS FM/LoRa Transmitter

To Set Continuous or State Change RF Transmissions

```
┌─────────────────────┐
│   Press SET Sw       │
│        4X            │
└─────────────────────┘
          │
          ▼
   ╭───────────────╮
   │     LED1      │
   │   flashes 4x  │
   ╰───────────────╯
          │
          ▼
   ╭───────────────╮
   │ Wait 3 Seconds│
   ╰───────────────╯
          │
          ▼
   ╭───────────────╮
   │   LED 1 & 2   │
   │   Flashes 1x  │
   ╰───────────────╯
          │
          ▼
   ╭───────────────╮
   │ Wait 3 Seconds│
   ╰───────────────╯
          │
          ▼
   ╭───────────────╮
   │ LED1 is either│
   │   ON or OFF   │
   │   indicating  │
   │ current Status│
   ╰───────────────╯
          │
          ▼
┌─────────────────────┐
│ Repeat Press SET Sw To │
│       select        │
│ LED1 OFF: Continuous│
│  LED1 ON: State     │
│After selecting wait for timeout│
└─────────────────────┘
```

When a switch button is operated TAURUS will transmit a "Button Down" RF Transmission

When a switch button is released TAURUS will transmit a "Button Up" RF Transmission

Continuous Transmit

TAURUS repeat transmits "button Down" in short bursts for as long as switch button is pressed.

If the Acknowledgment is ON the receiver will reply after each RF transmission burst.

This is ideally suited to momentary operation where the receiver output needs to be active as long as the user presses down a TAURUS Button .

State Change Transmit

TAURUS transmits an RF transmission only when the switch button is pressed or released (i.e a state change).

On each of these "state changes" TAURUS transmits upto 4 transmissions, or, "RF packets" (which can be seen by the GREEN LED flashing upto 4 times,

If the Acknowledgment is ON the receiver will reply immediately.

After receiving an Acknowledgment the TAURUS will cease sending any remaining of the 4 transmissions.

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TAURUS FM/LoRa Transmitter

LED Status

<table>
<tr><td colspan="3">Continuous Transmission
Acknowledgement OFF</td></tr>
<tr><td>Operation</td><td>GREEN LED</td><td>RED LED</td></tr>
<tr><td>Button is briefly pressed</td><td>Flashes briefly</td><td></td></tr>
<tr><td>Button is held Down</td><td>Flashes constantly</td><td></td></tr>
<tr><td>Button is released</td><td>Flashes briefly</td><td></td></tr>
</table>

RF Transmitting / Acknowledgment

Acknowedgment Failed

<table>
<tr><td colspan="3">Continuous Transmission
Acknowledgement ON</td></tr>
<tr><td>Operation</td><td>GREEN LED</td><td>RED LED</td></tr>
<tr><td>Button is briefly pressed</td><td>Flashes briefly (TX and RX ack)</td><td>Flashes if no Ack received</td></tr>
<tr><td>Button is held Down</td><td>Flashes constantly (TX and RX ack)</td><td>Flashes if no Ack received</td></tr>
<tr><td>Button is released</td><td>Flashes 2-5X (TX and RX ack)</td><td>Flashes if no Ack received</td></tr>
</table>

<table>
<tr><td colspan="3">State Change Transmission
Acknowledgement OFF</td></tr>
<tr><td>Operation</td><td>GREEN LED</td><td>RED LED</td></tr>
<tr><td>Button is briefly pressed</td><td>Flashes 4X (TX)</td><td></td></tr>
<tr><td>Button is held Down</td><td></td><td></td></tr>
<tr><td>Button is released</td><td>Flashes 4X (TX)</td><td></td></tr>
</table>

<table>
<tr><td colspan="3">State Change Transmission
Acknowledgement ON</td></tr>
<tr><td>Operation</td><td>GREEN LED</td><td>RED LED</td></tr>
<tr><td>Button is briefly pressed
& Receiver, receives OK</td><td>Flashes 2 - 5X (TX and RX ack)</td><td></td></tr>
<tr><td>Button is briefly pressed
& Receiver, receives NOK</td><td>Flashes 4X (TX)</td><td>Flashes 1X</td></tr>
<tr><td>Button is held Down</td><td></td><td></td></tr>
<tr><td>Button is released</td><td>Flashes 2 - 5X (TX and RX ack)</td><td>Flashes if no Ack received</td></tr>
</table>

Range Tests

It is quite difficult to find the open space to perform a LORA range test as the operating distance is so great.

Our Range Testing was conducted along the coastline of Brighton, UK seafront providing an open Line of Sight Test.

Two TAURUS Transmitters we used with one as a transmitter and the other custom configured to be a Transceiver. When the Transmitter was operated the Transceiver TAURUS received the signal and acknowledged back to the transmitter Thus creating a simple PING PONG between the two.

1. The Transceiver was mounted on railings ~4ft from the ground.

2. We then took the transmitter along the coastline whilts intermittently operating to test the signal along the way

3. As we carried out the test Line of sight was lost along with the signal. A Reliable signal was observed to about 3K range, thereafter the signal became intermittent. When the Transmitter and Receiver regained Line of sight a reliable signal was again observed. This continued for the available distance (about 12KM) at which point the terrain prevented further testing. At the longest available range the signal was 100% reliable.

Test conditions

- T_A = +21 °C

- V_{DD}= +3.3 Vdc

- Dry, Broken Sunshine, Relative Humidity 45%, poor visability ~4KM with considerable ozone

Conclusion

The product performed as expected. Unfortunately we ran out of land to test a LOS beyond 12Km ,so the maximum range is further than tested here.

It is also clear that the product performs considerably better when in LOS.
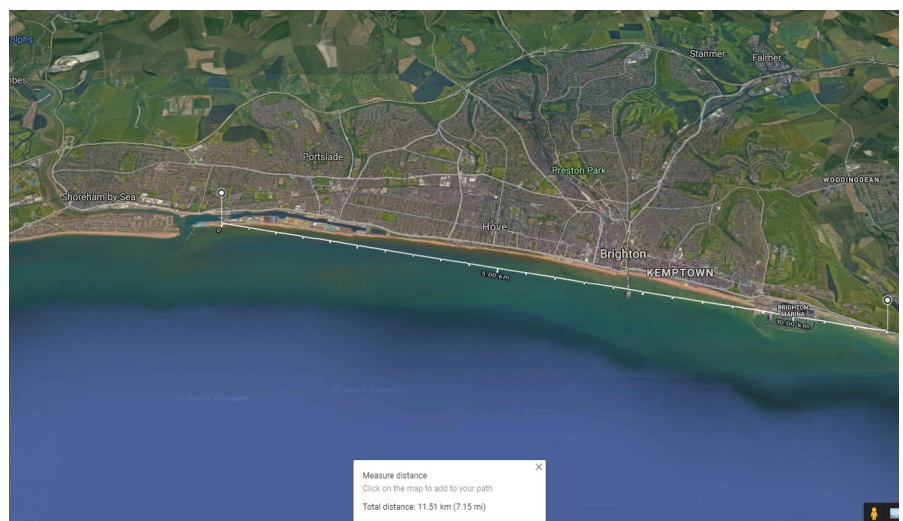
TAURUS FM/LoRa Transmitter

Technical Specifications

Enclosure Rating: IP66

Battery Type: Lithium Polymer 3.7V 980mAH

Operating Temperature –10 to +60 ºC

Electrical Characteristics	Min	Typical	Max	Units
Supply Voltage	3.0	4.5	5	V
Frequency:		869.500 918.000 2400		MHz
RF Output Power (ERP)				dBm
869.50MHz	-		+22	
918MHz			+22	
2.4GHz			+14	

FCC Certification and Australia SRD

At the time of writing the TAURUS is at the Test lab undergoing approvals type testing. This is expected to be completed during 2019

Important European compliance information

This RF Solutions product meets the essential requirements of the European Radio Equipment Directive 2014/53/EU and has been tested to European Harmonised Standards and CE marked accordingly. A copy of the EU Declaration of Conformity can be located on the RF Solutions Website,

www.rfsolutions.co.uk/certification-i59.

RF Solutions Ltd. Recycling Notice

Meets the following EC Directives:

DO NOT : 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.

www.rfsolutions.co.uk

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