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Real Time Location System Hardware Guide (RTLS)

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1. SETTING UP DEVICES & RF NETWORK

Rest of the manual guides you through the steps necessary for setting up and configuring your Wipelot devices. Please read this manual before system setup.

1.1. Safety

The device must be used solely with its original power adaptor. Please note that the adapter is 110/220V AC

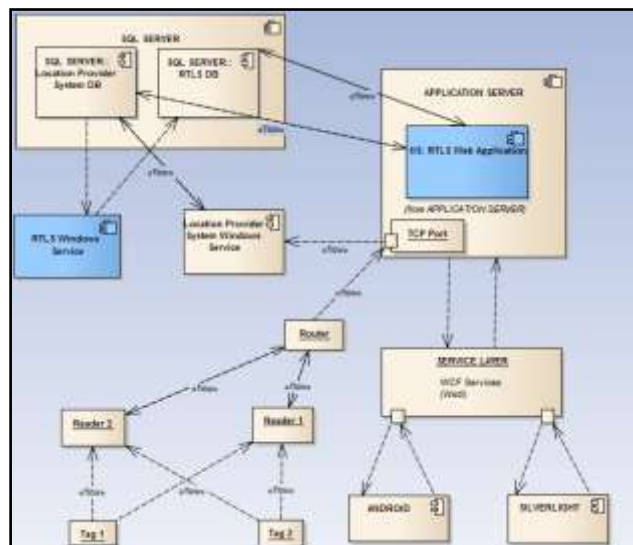
1.2. Introduction

Wipelot devices are based on 2.4GHZ IEEE 802.15.4 compliant RF wireless network. To form a minimal 802.15.4 RF Network, you should have at least 1-Router, 1-Reader and Mobile Devices.

Main coordinator (router) establishes a mesh network once it is installed. Each plugged reader (receiver), attends this network automatically and relays data for the network. All reader nodes cooperate in the distribution of data in the network.

Wipelot's small sized newborn baby tag is affixed to the ankle of the newborn infant to be tracked. The tag contains an RF transmitter circuit. It transmits message signal, comprising unique identity information, to receivers which are strategically placed within the hospital. The message is propagated along a path by hopping from node to node until it reaches the port which is being listened by the Location Provider Service software.

Location Provider Software calculates tags' positions by using RSSI (received signal strength indicator) levels, dimensions of the region to be tracked and fixed position information of the receivers on that region.



Component Interoperability



Calculated positions are being written on the Location Provider System database. These positions can also be used in real time by remoting technology. This architecture provides flexibility in integration with third party softwares. Wipelot H-RTLS application comprises an independent service which listens the Location Provider System database. It interpretes fetched information and applies some business rules on it prior to UI interaction.

Tags comprise a conductive security element attachment having two ends, whose electrical state will change when stretched, severed, or removed by parting the end. When the electrical state changes an alarm code will be generated and sent to receivers. This information will then be processed as explained above.

Built in motion sensor is able to detect unnatural movements like falling, being idle for a certain period of time etc. Alarm will be generated as soon as this kind of movement is detected.

1.3. RF affecting factors

All devices's RF signals can affect some material some extent. If our devices's RF signal encounter some material especially high-level obstacle severity material as stated in Table 1. Router, Reader and Tags will be decreased range of distance. For this reason, all device have to position as far as possible from especially obstruction of high level obstacle severity material as in Table 1.

Obstruction	Obstacle Severity	Sample Use
Wood / Wood paneling	Low	Inside a wall or hollow door
Drywall	Low	Inside Walls
Furniture	Low	Couches or office partitions
Clear glass	Low	Windows
Tinted glass	Medium	Windows
People	Medium	High-volume traffic areas that have consirable pedestrian traffic
Ceramic tile	Medium	Walls
Concrete blocks	Medium/High	Outer wall construction
Mirrors	High	Mirror or reflective glass
Metals	High	Metal office partitions, doors, metal office furniture
Water	High	Aquariums, rain, fauntains

Table-1 RF Obstacles Found Indoors



1.4 Collision Avoidance Device (Wipelot Model No: FT-05FL)

Wipelot FT-05FL Collision avoidance is high tech device which is measured distance of between vehicle and personal tags or forklift so that prevent collisions . Actually Collision Avodiace product has created safe zone for personal and other devices

It has two part;

- First part is Collision avoidance alarm center which can give visual and buzzer warning and has display which can adjuct measurement between reader and personal tags or forklift via buttons. That is safe zone distance is adjucted with Collision Avoidance Alarm center. First part we named Collision Avoidance Alarm center operates vehicle operator.
- Second part is Collision Avoidance Reader which gives Radio frequently (RF and UWB) signal out. It detects personal and vehicle on safe zone. If there are any personal on safe zone, Collision Avoidance Reader send message to Alarm center. Alarm center give warning.

These two part that Collision Avoidance Reader and Collision avoidance alarm center works together. Thats why it is named one model no: FT-05FL

FT-05FL powers up with vehicle voltage source. Feed voltage of feed can be 12V or 24V. It is preferable. Blue cable is pozitif side, brown cable is ground side. Distance of safe zone can adjust and monitor on display.

- If there are any personal or vehicle on safe zone that adjusted, Red led turn on continuously.
- If there are any personal or vehicle on double safe zone that adjusted, Yellow led turn on continuously.
- If there are no personal or vehicle on double safe zone that adjusted, Green led turn on continuously. This zone is safety.

Wipelot FT-05FL device has 2.4GHz RF propagation (jn5168 chip) that 21.2 dBm output power level and it has 2,4 GHz Pcb antenna. Also, FT-05FL device has UWB module that has 3.1 ~ 8 GHz monopole antenna. We operate at 4.4GHz due to special reason. UWB Module (DWM1000) output power is fully adjustable from 0 dBm to 15.5 dBm via firmware by the manufacturer ONLY.

The device's both of PCB antenna and UWB monopole antenna are omnidirectional. Both of antenna are fixed on PCB, that's why It cannot change reorient and relocate. Therefore FT-05FL can take signal every direction. If Wipelot FT-05FL obstructs by obstacle of in Table 1. The device's RF signal will decrease as stated in Table 1.

FT-05FL can transmit until 200 meters to readers if RF output power is fully.



How to comply with 10 second rule for hand held devices

When the tag is “awake” it sends out a a signal from UWB. We call this “Hello” signal.

If there are anchors (readers) in the area, they send an acknowledgement signal back. When the tag receives this acknowledgement, it sends the “location” signal (actual data) to the anchor and goes into “sleeping” mode.

The tag awakens in determined period and send out a a signal from UWB again.

This cycle is repeated continuously depending on the signaling frequency (in most projects the signaling frequency is 1 signal per second it could go up to 1 signal per 15 seconds)

The whole signaling process takes 5 milliseconds

If there is no acknowledgement response from the anchors, tag goes into deep sleeping mode for at least 1 minute (is parametric, can be set to be longer).

During deep sleeping mode, tags out a signal in every 10 seconds to check if there are any anchors in its range. This signal is not sent on UWB, but it is sent on 2,4 Ghz.

If it receives an acknowledgment response, the cycle starts again.

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:

(1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

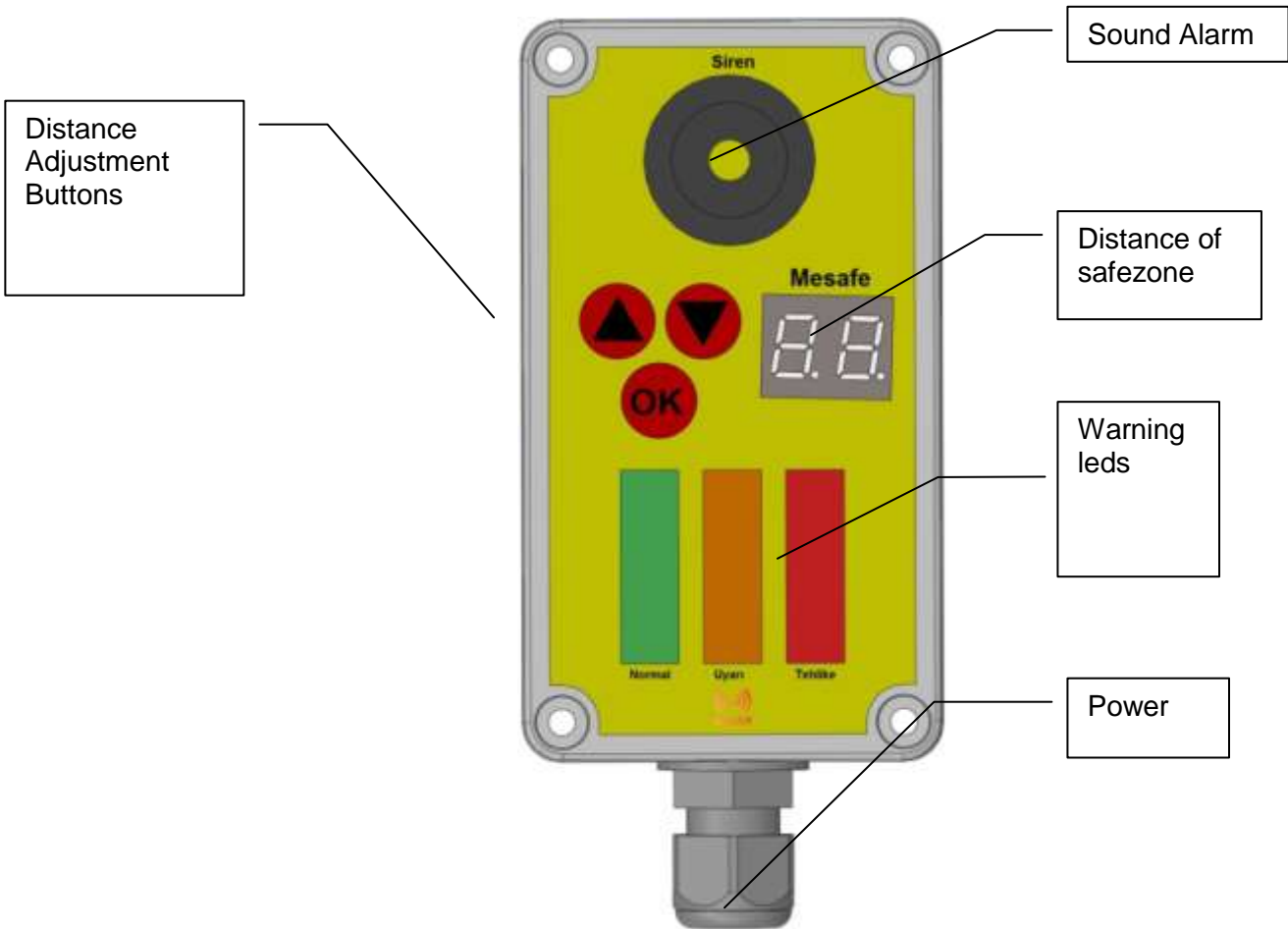


Figure 6: Wipelot FT-02FL Collision Avoidance Alarm Center



Figure 7: Wipelot FT-05FL Collision Avoidance Reader