

SANITAG RTLS TECHNOLOGIES

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Healthcare - Real Time Location System (HRTLs)



SETTING UP DEVICES & RF NETWORK

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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 Sanitag 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 adaptor is 110/220V AC

1.2. Introduction

Sanitag 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.

Sanitag'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.

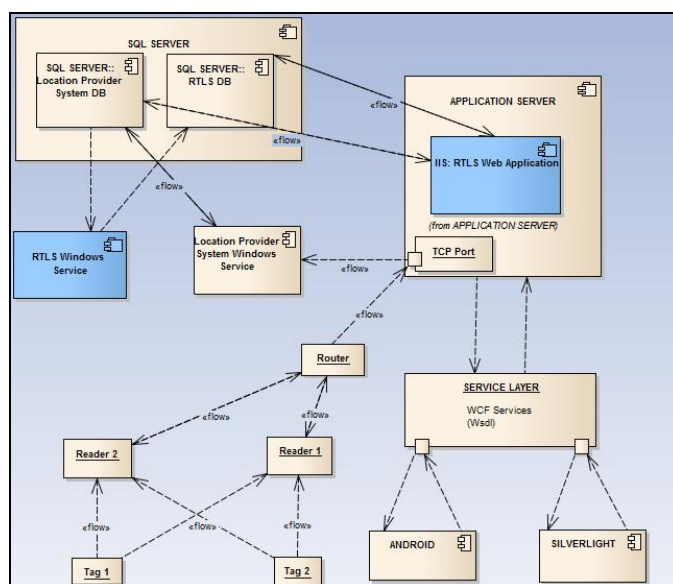


Figure 1- Component Interoperability

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. Sanitag 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, fountains |

Table-1 RF Obstacles Found Indoors

1.1. Device Definitions

1.1.1. Sanitag AC-001-LAN (Wireless Router)

Router is hierarchically the top-most Node of 802.15.4 RF Network . It forms/manages RF Network, collects all RF Network data and behaves as a gateway from RF Network to upper media. There are two type of Router:

- **Router with Ethernet Interface:** Redirects RF network traffic to a predefined “IP:Port” over ethernet via TCP/IP protocol.
- **Router with USB Virtual Com Port Interface:** Redirects RF network traffic to Serial Port.

Router device has blue leds on itself.

- If leds blink, it means that the router device tries to form Rf network.
- If leds lighten constantly, it means that the router device forms Rf Network succesfully.

Sanitag AC-001-LAN device has RF propagation that 2.5 dBm output power level and it has 2,4 GHz uFl transmitter antenna which is has 2dBi gain.

Also, AC-00-H device has UWB module that has 3.1 ~ 8 GHz monopole antenna. We operation at 4.4GHz due to special reason. UWB Module output power is fully adjustable from 0 dBm to 15.5 dBm via firmware.

The antenna that using on Sanitag AC-001-LAN is wire antenna which is fixed on PCB, That's why It cannot change reorient and relocate.The device's antenna type is omnidirectional. Therefore, the Sanitag AC-001-LAN can take signal every direction. If Sanitag AC-001-LAN obstructs by obstacle of in Table 1. The device's RF signal will decrease as stated in Table 1.

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 UNDESIRE 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.

1.1.2. Active RFID Room Level Reader (Sanitag Model No: AR-001-HLR) & Active RFID Long Range Reader (Sanitag Model No: AR-002-HLR)

These devices are hierarchically below Router or upper level Reader on network. It collects Mobile Beacon Messages and also sub-level Reader messages and then routes them to the upper level Reader or Router. It has also blue leds on itself.

If leds blink, it means that the reader device searches to join Rf network. So it implies that the reader is not joined any Rf network yet.

If leds lighthen constantly, it means that the reader device joins Rf Network succesfully.

Sanitag AR-001-HLR device has RF propagation that 2.5dBm output power level and it has 2,4 GHz uFI transmitter antenna which is has 2dBi gain. Sanitag AR-002-HLR device has RF propagation that 22dBm output power level and it has 2,4 GHz uFI transmitter antenna which is has 2dBi gain.

Also, AR-001-HLR and AR-002-HLR devices have UWB module that has 3.1 ~ 8 GHz monopole antenna. We operation at 4.4GHz due to special reason. UWB Module output power is fully adjustable from 0 dBm to 15.5 dBm via firmware.

The antenna that using on Sanitag AR-001-HLR and Sanitag AR-002-HLR are wire antenna which is fixed on PCB, That's why It cannot change reorient and relocate. The device's antenna type is omnidirectional. Therefore, the Sanitag AR-001-HLR and Sanitag AR-002-HLR can take signal every direction. If devices obstruct by obstacle of in Table 1. The device's RF signal will decrease as stated in Table 1.

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- 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.

1.1.3. Active RFID Tag for Patients (Sanitag Model No: AT-001-H)

It has two leds (Blue, Yellow) If device is powered up, Blue led blinks by each wake/sleep cycle. There is no led indication in stand-by mode. It has one button with following functions:

- Button Short Press/Release : Send Emergency Message / Wake-up the device if in stand-by
- Button Press for 5 Seconds: Enter to standby mode.

This button is also used for matching mobile devices.

Sanitag AT-001-H device has 2.4GHz RF propagation that 2.5dBm output power level and it has 2,4 GHz Pcb antenna. Also, AT-001-H device has UWB module that has 3.1 ~ 8 GHz monopole antenna. We operation at 4.4GHz due to special reason. UWB Module output power is fully adjustable from 0 dBm to 15.5 dBm via firmware. 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 AT-001-H can take signal every direction. If Sanitag AT-001-H obstructs by obstacle of in Table 1. The device's RF signal will decrease as stated in Table 1. AT-001-H can transmit until 200 meters to readers if RF output power is fully.

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- 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.

1.1.4. Active RFID Tag for New Born Babies (Sanitag Model No: AT-002-H)

It has two leds (Blue, Yellow) If device is powered up, Blue led blinks by each wake/sleep cycle. There is no led indication in stand-by mode. It has one button with following functions:

- Button Short Press/Release : Send Emergency Message / Wake-up the device if in stand-by
- Button Press for 5 Seconds: Enter to standby mode.

This button is also used for matching mobile devices.

Sanitag AT-002-H device has 2.4GHz RF propagation that 2.5dBm output power level and it has 2,4 GHz Pcb antenna. Also, AT-002-H device has UWB module that has 3.1 ~ 8 GHz monopole antenna. We operation at 4.4GHz due to special reason. UWB Module output power is fully adjustable from 0 dBm to 15.5 dBm via firmware.

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 AT-002-H can take signal every direction. If Sanitag AT-002-H obstructs by obstacle of in Table 1. The device's RF signal will decrease as stated in Table 1. AT-002-H can transmit until 200 meters to readers if RF output power is fully.

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- 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.

1.1.5. Active RFID Tag for Assets (Sanitag Model No: AT-003-H)

It has two leds (Green, Red) If device is powered up , Green led blinks by each wake/sleep cycle. There is no led indication in stand-by mode. It has one button with following functions:

- Button Short Press/Release : Send Emergency Message / Wake the device up in stand-by
- Button Press for 5 Seconds: Enter to standby mode.

Sanitag AT-003-H device has 2.4GHz RF propagation that 2.5dBm output power level and it has 2,4 GHz Pcb antenna. Also, AT-003-H device has UWB module that has 3.1 ~ 8 GHz monopole antenna. We operation at 4.4GHz due to special reason. UWB Module output power is fully adjustable from 0 dBm to 15.5 dBm via firmware.

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 AT-003-H can take signal every direction. If Sanitag AT-003-H obstructs by obstacle of in Table 1. The device's RF signal will decrease as stated in Table 1. AT-003-H can transmit until 200 meters to readers if RF output power is fully.

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- 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.

1.1.6. Active RFID Tag for New Staff/Doctors (Sanitag AT-004-H)

It has two leds (Green, Red) If device is powered up, Green led blinks by each wake/sleep cycle. In stand-by mode, there is no led indication. It has two buttons (Orange, Blue) with following functions:

- Orange Button Short Press/Release: Send Emergency Message / Wake-up the if in stand-by
- Orange Button Press for 5 Seconds: Enter to standby mode.
- Blue button is used for matching mobile devices.

Sanitag AT-004-H device has 2.4GHz RF propagation that 2.5dBm output power level and it has 2,4 GHz Pcb antenna. Also, AT-004-H device has UWB module that has 3.1 ~ 8 GHz monopole antenna. We operation at 4.4GHz due to special reason. UWB Module output power is fully adjustable from 0 dBm to 15.5 dBm via firmware.

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 AT-004-H can take signal every direction. If Sanitag AT-004-H obstructs by obstacle of in Table 1. The device's RF signal will decrease as stated in Table 1. AT-004-H can transmit until 200 meters to readers if RF output power is fully.

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- 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.

1.2. Configuration

1.2.1. Service Manager Software

Service Manager is a PC based console application. It listens a predefined COM Port for incoming connections. Sanitag AC-001-LAN Router connects to this COM Port and then redirects all RF network data traffic to the Service Manager. After connection established, Service Manager dumps received data with human readable format. For instance:

- A line with tag "MID:33000" indicates a data receive from Mobile Device with ID = 33000,
- A line with tag "RNID:201" indicates a data receive from Reader with Device ID = 201

1.2.2. Configuration of Sanitag AC-001-LAN Router

Depending type of AC-001-LAN Router, proceed following steps:

AC-001-LAN With Ethernet Interface: Proceed steps 1.2.3

AC-001-LAN with Virtual Com Port: Proceed steps 1.2.4

1.2.3. Prepare/Configure Sanitag AC-001-LAN Router with Ethernet Interface

- Step 1.** In order to access Router's http page, you need to Connect AC-001-LAN Router to your computer with Ethernet cross cable temporarily.
- Step 2.** The default IP address of Router Ethernet Module is 192.168.1.250 and subnet Mask 255.255.255.0. Open web browser and type the following address "http://192.168.1.250" (You may need also change your computer IP address as "192.168.1.x" and Subnet Mask 255.255.255.0)

Step 3. There will be appear login window, leave blank the fields User ID and Password and press OK

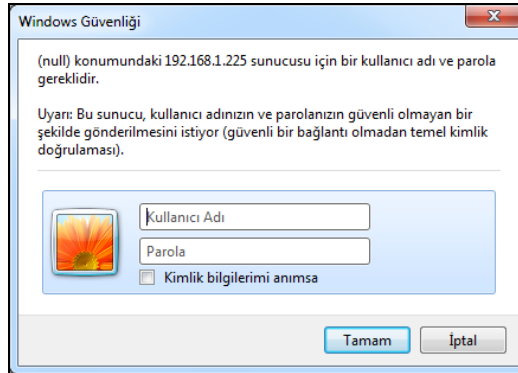


Figure 2 - Component Interoperability

Step 4. In “Network” menu, you can assign “IP/Subnet Mask” to the AC-001-LAN Router in accordance with your Local Area Network (LAN) address segment and subnet mask. Enter following fields and then press “OK”

Address = “Router IP Address”

Subnet Mask = “Subnet Mask”

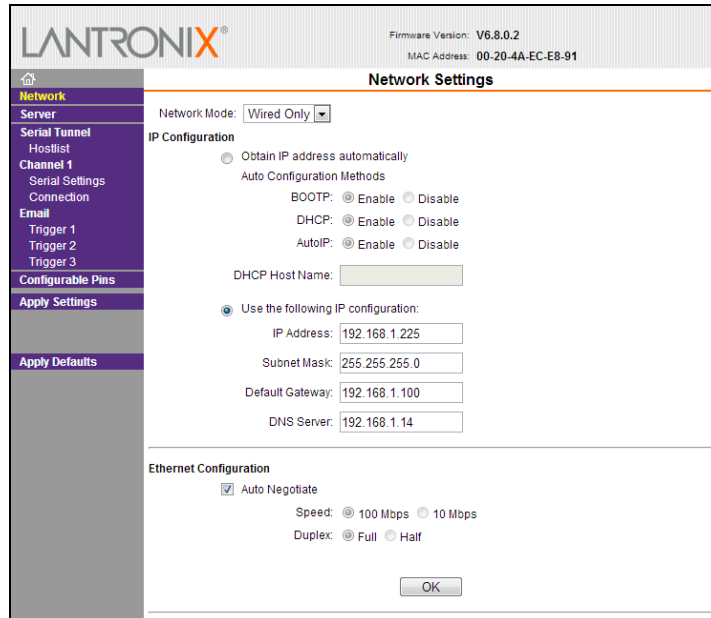


Figure 3- Router Confıg via Ethernet 1

Step 5. In “Server -> Configuration” menu enter following fields as;
Protocol = TCP

Remote Host = “Target computer IP where “Wipelot Service Manager” have been installed”

Local Port = 7021

Remote Port = 7021

Leave others fields with default values.

Press “OK”

Press “Apply Settings” and then Router Ethernet module will reboot with new configuration.

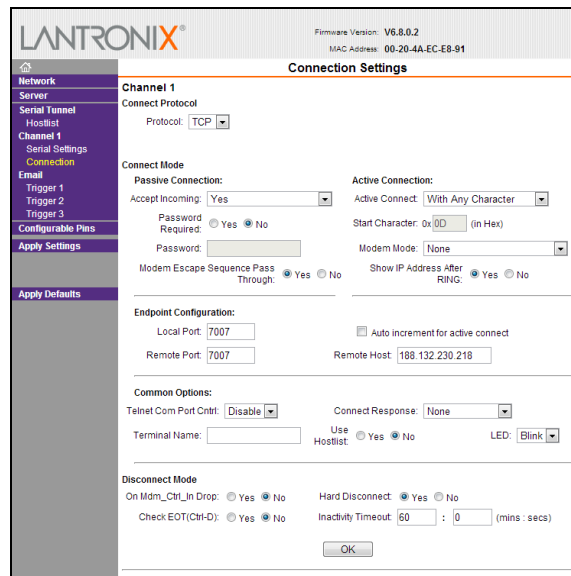


Figure 4- Router Config via Ethernet 2

Step 6. Unplug cross-cable and revert your computer’s IP Address and Subnet Mask back.

1.2.3.1. Install/Configure Wipelot Service Manager Software for Ethernet

Step 7. Connect your PC to the Local Network (LAN).

Step 8. Be sure you correctly assigned to your computer IP address with same address we previously assigned to AC-001-LAN Router

Step 9. Copy folder named “Service Manager” to your computer hard drive.

Step 10. Open following xml file with a text editor like notepad.

[\WipelotService\WipelotServiceManager.exe.config](#)

Step 11. Change following field with the address which previously we assigned it for AC-001-LAN Router; TCPListeningIP = “Router IP Address”

Step 12. Save and close xml file.

Step 13. Run “WipelotServiceManager.exe”

Now, Service Manager will start to listen TCP port 7021. And accepts incoming connection requests.

1.2.4. Prepare/Configure Sanitag AC-001-LAN Router for Com Port

- Step 14.** Install FTDI Virtual Com Port Driver. (For up-to date driver please visit <http://www.ftdichip.com>)
- Step 15.** Connect Sanitag AC-001-LAN Router to your Host computer with USB cable. There you will see “Found New Hardware” and then driver will be installed automatically by hardware wizard.
- Step 16.** Verify that a new “Com Port” added to Windows Device Tree.

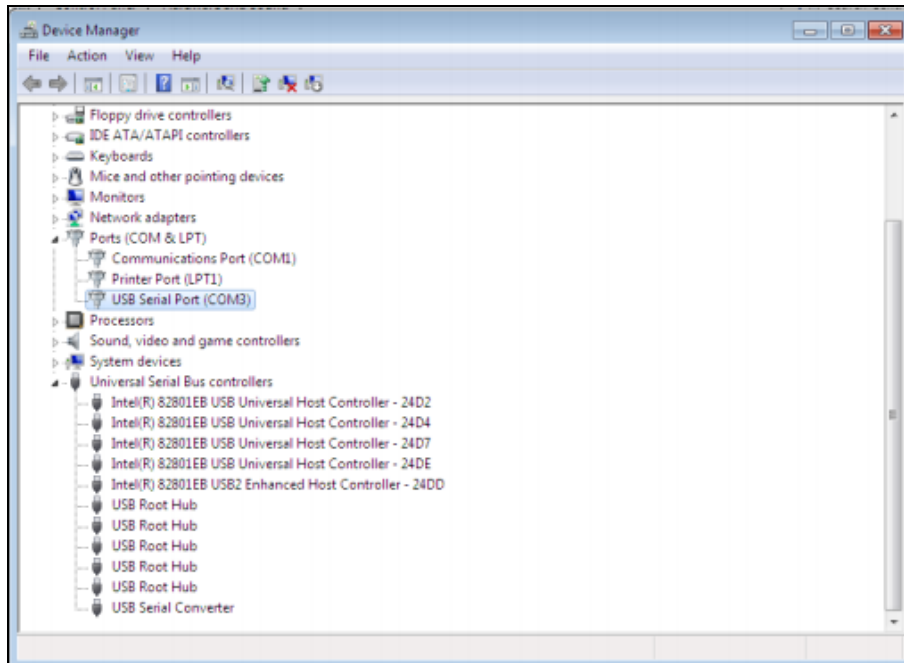


Figure 5- Router Config via Com Port 1

1.2.4.1. Install/Configure Wipelot Service Manager Software for Com Port

- Step 17.** Copy folder named “Service Manager” to your computer hard drive.
- Step 18.** Open following xml file with a text editor like notepad.
[\WipelotService\WipelotServiceManager.exe.config](#)
- Step 19.** Change following fields properly (Use the same Com Port Number which you previously see under Windows Device Tree)
 SerialPortActive = “1”
 SerialPortComPort = “3”
 SerialPortConnectionSpeed =”115200”
- Step 20.** Save and close xml file.
- Step 21.** Run “WipelotServiceManager.exe”

Now, Service Manager will start to listen COM3 with baudrate 115200

1.2.5. Prepare RF Network

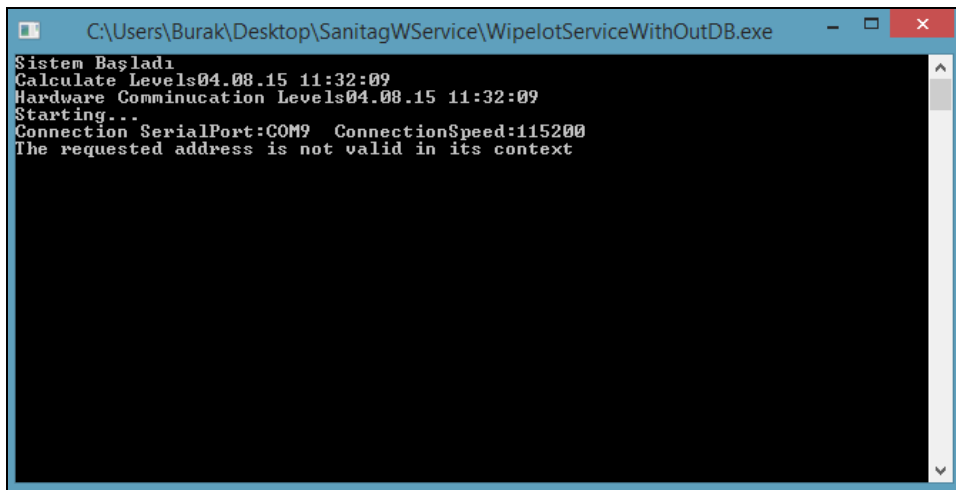
1. Connect Router and Readers’ antennas, screw and fasten.

2. Connect “Sanitag AC-001-LAN Router” to your Local Network (LAN) via Hub/Switch.
3. Plug “Sanitag AC-001-LAN Router” power cable. it creates RF network and blue led will be on permanently.
4. Plug Readers’ Power cables one by one. They will try to join RF network which created previously by Router. The blue led will blink for a while. After finding and joining to the RF network, the blue led will be on permanently.
5. If mobile devices are in standby mode, power them up by pressing power button. You will see led’s power-up indication, and then green led will flash periodically.

The wireless network is ready to operate.

1.3. An Analogy on an Active Instance of the Location Provider

1. Run WipelotServiceManagerHealth.exe file from the Service Manager (Location Provider Software). After this point, service manager screen will be opened as in Figure 6.



```
C:\Users\Burak\Desktop\SanitagWService\WipelotServiceWithOutDB.exe
Sistem Bařladı
Calculate Levels04.08.15 11:32:09
Hardware Communication Levels04.08.15 11:32:09
Starting...
Connection SerialPort:COM9 ConnectionSpeed:115200
The requested address is not valid in its context
```

Figure 6- Service Manager Screen (Disconnected Network)

* Figure 6 implies that network is not connected. In the beginning of the same figure, serial port and connection speed values can be seen.

2. In order to generate a network, room level readers and mobile devices are activated. Some of them are illustrated in Figure 7, Figure 8, Figure 9.



Figure 7 - AT-001-H

* Figure 7 A- Front view of the AT-001-H type end device which is activated for the purpose of the example

* Figure 7 B- Back view of the AT-001-H type end device which is activated for the purpose of the example



Figure 8 - AT-004-H

* Figure 8 A- Front view of the AT-004-H type end device(Badge Card) which is activated for the purpose of the xample

* Figure 8 B- Back view of the AT-004-H type end device(Badge Card) which is activated for the purpose of the example

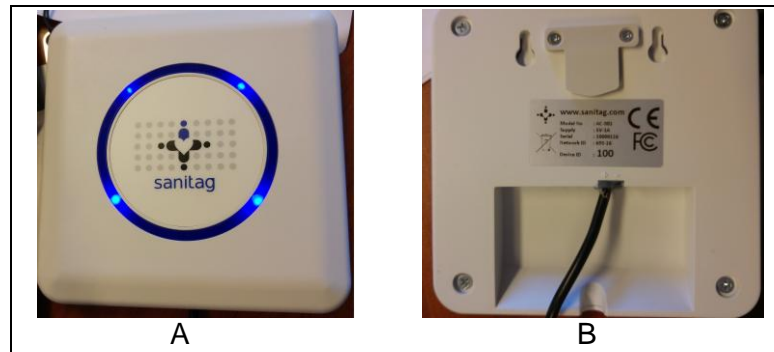


Figure 9 - AC-001-LAN

* Figure 9.A Front view of the coordinator type device which is activated for the purpose of the example

* Figure 9.B Front view of the coordinator type device which is activated for the purpose of the example

3. After the activation of the devices network is constructed as can be seen in Figure 10. So this means that network information can be observed in Figure 10.

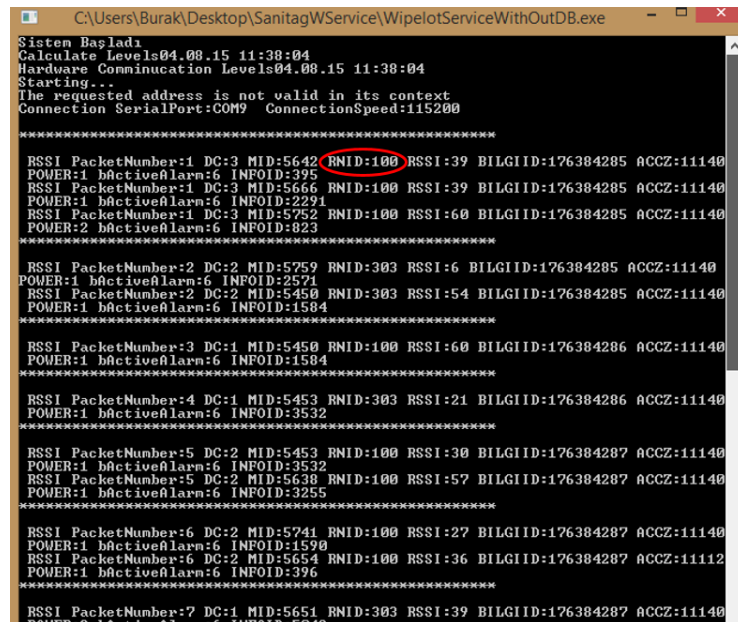
```

C:\Users\Burak\Desktop\SanitagWService\WipilotServiceWithoutDB.exe
Sistem Başladı
Calculate Levels04.08.15 11:32:57
Hardware Communication Levels04.08.15 11:32:57
Starting...
The requested address is not valid in its context
Connection SerialPort:COM9 ConnectionSpeed:115200
*****
RSSI PacketNumber:1 DC:1 MID:5666 RNID:100 RSSI:36 BILGIID:176383979 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1975
*****
RSSI PacketNumber:2 DC:2 MID:5752 RNID:100 RSSI:36 BILGIID:176383980 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:542
RSSI PacketNumber:2 DC:2 MID:5480 RNID:100 RSSI:48 BILGIID:176383980 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:2047
*****
RSSI PacketNumber:3 DC:1 MID:5645 RNID:100 RSSI:39 BILGIID:176383982 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1099
*****
RSSI PacketNumber:4 DC:2 MID:5741 RNID:100 RSSI:48 BILGIID:176383983 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:1309
RSSI PacketNumber:4 DC:2 MID:5651 RNID:100 RSSI:81 BILGIID:176383983 ACCZ:3758
POWER:6 hActiveAlarm:6 INFOID:0
*****
RSSI PacketNumber:5 DC:5 MID:5453 RNID:100 RSSI:27 BILGIID:176383984 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:3266
RSSI PacketNumber:5 DC:5 MID:5494 RNID:100 RSSI:75 BILGIID:176383984 ACCZ:3645
POWER:6 hActiveAlarm:6 INFOID:0
RSSI PacketNumber:5 DC:5 MID:5666 RNID:100 RSSI:48 BILGIID:176383984 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1977
RSSI PacketNumber:5 DC:5 MID:5638 RNID:100 RSSI:90 BILGIID:176383984 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:2965
RSSI PacketNumber:5 DC:5 MID:5752 RNID:100 RSSI:39 BILGIID:176383984 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:544
*****
RSSI PacketNumber:6 DC:1 MID:5456 RNID:100 RSSI:63 BILGIID:176383985 ACCZ:3702
POWER:6 hActiveAlarm:6 INFOID:0
*****

```

Figure 10 - Service manager screen(Connected network).

- As can be seen from *Figure- 9.B*, Device ID of the reader is (which is coordinator) 100. In Figure 11, RNID number is circled where it is 100. So this means that connection information of the router has been reached by the service manager. RNID represents the reader identity number which is written to backside of every reader device.



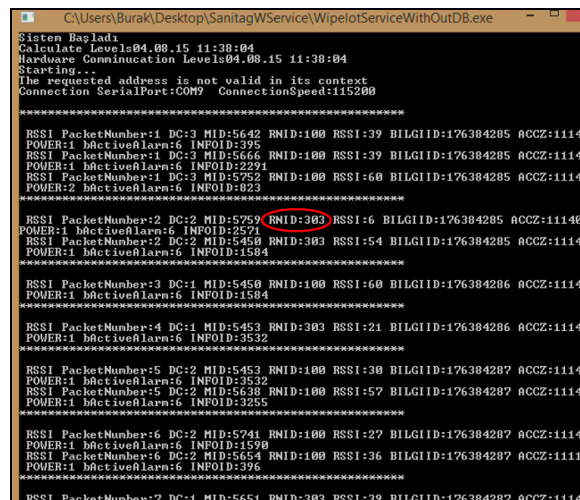
```

C:\Users\Burak\Desktop\SanitagWService\WipolotServiceWithoutDB.exe
Sistem Başladı
Calculate Levels04.08.15 11:38:04
Hardware Communication Levels04.08.15 11:38:04
Starting...
The requested address is not valid in its context
Connection SerialPort:COM9 ConnectionSpeed:115200

*****
RSSI PacketNumber:1 DC:3 MID:5642 RNID:100 RSSI:39 BILGIID:176384285 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:395
RSSI PacketNumber:1 DC:3 MID:5666 RNID:100 RSSI:39 BILGIID:176384285 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:2291
RSSI PacketNumber:1 DC:3 MID:5752 RNID:100 RSSI:60 BILGIID:176384285 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:823
*****
RSSI PacketNumber:2 DC:2 MID:5759 RNID:303 RSSI:6 BILGIID:176384285 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:2571
RSSI PacketNumber:2 DC:2 MID:5450 RNID:303 RSSI:54 BILGIID:176384285 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1584
*****
RSSI PacketNumber:3 DC:1 MID:5450 RNID:100 RSSI:60 BILGIID:176384286 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1584
*****
RSSI PacketNumber:4 DC:1 MID:5453 RNID:303 RSSI:21 BILGIID:176384286 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:3532
*****
RSSI PacketNumber:5 DC:2 MID:5453 RNID:100 RSSI:30 BILGIID:176384287 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:3532
RSSI PacketNumber:5 DC:2 MID:5638 RNID:100 RSSI:57 BILGIID:176384287 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:3255
*****
RSSI PacketNumber:6 DC:2 MID:5741 RNID:100 RSSI:27 BILGIID:176384287 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1590
RSSI PacketNumber:6 DC:2 MID:5654 RNID:100 RSSI:36 BILGIID:176384287 ACCZ:11112
POWER:1 hActiveAlarm:6 INFOID:396
*****
RSSI PacketNumber:7 DC:1 MID:5651 RNID:303 RSSI:39 BILGIID:176384287 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:5642
    
```

Figure 11-Service manager screen- 1(Reader is connected).

- Then the second reader joined into the network with the device Id is equal to 303. Thus service manager shows this device information on the screen as shown in Figure 12 with a red circle. Note that the type of joined devices to the Rf network are reader devices. Therefore RNID values are examined upto now.



```

C:\Users\Burak\Desktop\SanitagWService\WipolotServiceWithoutDB.exe
Sistem Başladı
Calculate Levels04.08.15 11:38:04
Hardware Communication Levels04.08.15 11:38:04
Starting...
The requested address is not valid in its context
Connection SerialPort:COM9 ConnectionSpeed:115200

*****
RSSI PacketNumber:1 DC:3 MID:5642 RNID:100 RSSI:39 BILGIID:176384285 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:395
RSSI PacketNumber:1 DC:3 MID:5666 RNID:100 RSSI:39 BILGIID:176384285 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:2291
RSSI PacketNumber:1 DC:3 MID:5752 RNID:100 RSSI:60 BILGIID:176384285 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:823
*****
RSSI PacketNumber:2 DC:2 MID:5759 RNID:303 RSSI:6 BILGIID:176384285 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:2571
RSSI PacketNumber:2 DC:2 MID:5450 RNID:303 RSSI:54 BILGIID:176384285 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1584
*****
RSSI PacketNumber:3 DC:1 MID:5450 RNID:100 RSSI:60 BILGIID:176384286 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1584
*****
RSSI PacketNumber:4 DC:1 MID:5453 RNID:303 RSSI:21 BILGIID:176384286 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:3532
*****
RSSI PacketNumber:5 DC:2 MID:5453 RNID:100 RSSI:30 BILGIID:176384287 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:3532
RSSI PacketNumber:5 DC:2 MID:5638 RNID:100 RSSI:57 BILGIID:176384287 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:3255
*****
RSSI PacketNumber:6 DC:2 MID:5741 RNID:100 RSSI:27 BILGIID:176384287 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1590
RSSI PacketNumber:6 DC:2 MID:5654 RNID:100 RSSI:36 BILGIID:176384287 ACCZ:11112
POWER:1 hActiveAlarm:6 INFOID:396
*****
RSSI PacketNumber:7 DC:1 MID:5651 RNID:303 RSSI:39 BILGIID:176384287 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:5642
    
```

Figure 12- Service manager screen -2

* *Second reader is connected with device Id:303.*

6. Now, the AT-001-H type of end device will be joined to the Rf network which is shown in Figure 7. The device Id of the mobile device is 50884 as in Figure 7.B. When this mobile device enters the Rf network, MID information has to be read in order to see whether the mobile is connected to the network or not. In Figure 13, this phenomena is illustrated. In this figure, mobile device had been joined to the network with the MID:50884. Remark that the MID is the abbreviation of mobile device identity.

```

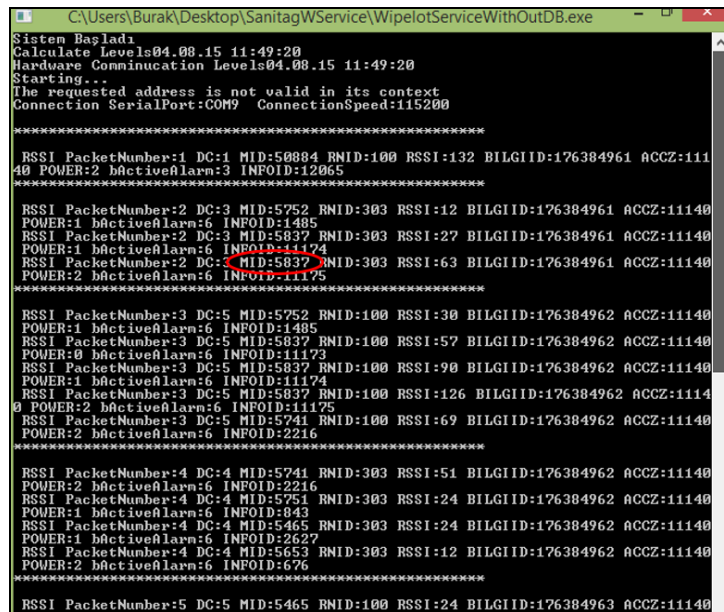
C:\Users\Burak\Desktop\SanitagWService\WipeoutServiceWithOutDB.exe
0 POWER:1 hActiveAlarm:1 INFOID:11745
*****
RSSI PacketNumber:4 DC:4 MID:5465 RNID:100 RSSI:27 BILGIID:176384543 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:2243
RSSI PacketNumber:4 DC:4 MID:50884 RNID:100 RSSI:105 BILGIID:176384543 ACCZ:111
40 POWER:1 hActiveAlarm:1 INFOID:11745
RSSI PacketNumber:4 DC:4 MID:50884 RNID:100 RSSI:72 BILGIID:176384543 ACCZ:1114
0 POWER:0 hActiveAlarm:1 INFOID:11746
RSSI PacketNumber:4 DC:4 MID:50884 RNID:100 RSSI:105 BILGIID:176384543 ACCZ:111
40 POWER:1 hActiveAlarm:1 INFOID:11747
*****
RSSI PacketNumber:5 DC:5 MID:5456 RNID:303 RSSI:15 BILGIID:176384543 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:2269
RSSI PacketNumber:5 DC:5 MID:50884 RNID:303 RSSI:24 BILGIID:176384543 ACCZ:1114
0 POWER:1 hActiveAlarm:1 INFOID:11747
RSSI PacketNumber:5 DC:5 MID:5494 RNID:303 RSSI:42 BILGIID:176384543 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:1944
RSSI PacketNumber:5 DC:5 MID:5645 RNID:303 RSSI:75 BILGIID:176384543 ACCZ:3687
POWER:6 hActiveAlarm:6 INFOID:0
RSSI PacketNumber:5 DC:5 MID:5645 RNID:303 RSSI:12 BILGIID:176384543 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1614
*****
RSSI PacketNumber:6 DC:6 MID:50884 RNID:100 RSSI:69 BILGIID:176384543 ACCZ:1114
0 POWER:0 hActiveAlarm:3 INFOID:11748
RSSI PacketNumber:6 DC:6 MID:50884 RNID:100 RSSI:105 BILGIID:176384543 ACCZ:111
40 POWER:1 hActiveAlarm:3 INFOID:11749
RSSI PacketNumber:6 DC:6 MID:5494 RNID:100 RSSI:54 BILGIID:176384543 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:1944
RSSI PacketNumber:6 DC:6 MID:5645 RNID:100 RSSI:78 BILGIID:176384543 ACCZ:3687
POWER:6 hActiveAlarm:6 INFOID:0
RSSI PacketNumber:6 DC:6 MID:5744 RNID:100 RSSI:36 BILGIID:176384543 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1630
RSSI PacketNumber:6 DC:6 MID:5469 RNID:100 RSSI:36 BILGIID:176384543 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:3700
*****
RSSI PacketNumber:7 DC:2 MID:5640 RNID:303 RSSI:84 BILGIID:176384544 ACCZ:3692
POWER:6 hActiveAlarm:6 INFOID:0
RSSI PacketNumber:7 DC:2 MID:5640 RNID:303 RSSI:15 BILGIID:176384544 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:4864
*****
    
```

Figure 13 - Service manager screen -3

* AT-001-H type mobile device is connected with device Id: 50884.

- Finally, AT-004-H type of end device will be joined to the Rf network which is shown in Figure 8.A. The device Id of the mobile device is 5837 as in Figure 8.B. Since AT-004-H type of end device is a mobile device, MID information has to be read in order to see whether the mobile is connected to the network or not.

As can be observed from the Figure 14, mobile device with MID: 5837 had been entered to the network which is noticed with a red circle.



```

C:\Users\Burak\Desktop\SanitagWService\WipeLotServiceWithoutDB.exe
Sistem Basladı
Calculate Levels04.08.15 11:49:20
Hardware Communication Levels04.08.15 11:49:20
Starting...
The requested address is not valid in its context
Connection SerialPort:COM9 ConnectionSpeed:115200
*****
RSSI PacketNumber:1 DC:1 MID:50804 RNID:100 RSSI:132 BILGIID:176384961 ACCZ:11140
POWER:2 hActiveAlarm:3 INFOID:12065
*****
RSSI PacketNumber:2 DC:3 MID:5752 RNID:303 RSSI:12 BILGIID:176384961 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1485
RSSI PacketNumber:2 DC:3 MID:5837 RNID:303 RSSI:27 BILGIID:176384961 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:11174
RSSI PacketNumber:2 DC:5 MID:5837 RNID:303 RSSI:63 BILGIID:176384961 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:11175
*****
RSSI PacketNumber:3 DC:5 MID:5752 RNID:100 RSSI:30 BILGIID:176384962 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:1485
RSSI PacketNumber:3 DC:5 MID:5837 RNID:100 RSSI:57 BILGIID:176384962 ACCZ:11140
POWER:0 hActiveAlarm:6 INFOID:11173
RSSI PacketNumber:3 DC:5 MID:5837 RNID:100 RSSI:90 BILGIID:176384962 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:11174
RSSI PacketNumber:3 DC:5 MID:5837 RNID:100 RSSI:126 BILGIID:176384962 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:11175
RSSI PacketNumber:3 DC:5 MID:5741 RNID:100 RSSI:69 BILGIID:176384962 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:2216
*****
RSSI PacketNumber:4 DC:4 MID:5741 RNID:303 RSSI:51 BILGIID:176384962 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:2216
RSSI PacketNumber:4 DC:4 MID:5751 RNID:303 RSSI:24 BILGIID:176384962 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:843
RSSI PacketNumber:4 DC:4 MID:5465 RNID:303 RSSI:24 BILGIID:176384962 ACCZ:11140
POWER:1 hActiveAlarm:6 INFOID:2627
RSSI PacketNumber:4 DC:4 MID:5653 RNID:303 RSSI:12 BILGIID:176384962 ACCZ:11140
POWER:2 hActiveAlarm:6 INFOID:676
*****
RSSI PacketNumber:5 DC:5 MID:5465 RNID:100 RSSI:24 BILGIID:176384963 ACCZ:11140

```

Figure 14 - Service manager screen -4

* Service manager screen - AT-004-H type mobile device is connected with device Id: 5837.

