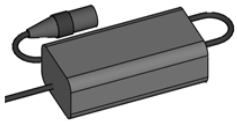
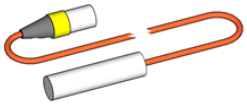
TUHF Timekeeping System – Owner's Manual

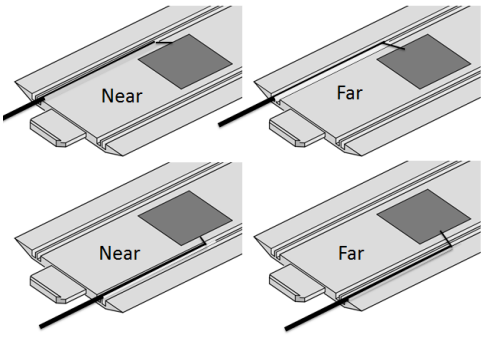
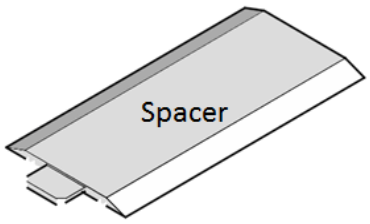
TUHF Reader with Rugged Case Package

The following items ship with the TUHF Reader:

	TUHF Reader with rugged case x 1 *Rugged Case is used to protect all reader parts from impact, rainwater, and general use in the field. Accessories can also be stored in the case for protection.*
	Smart Charger x 1
	External Buzzer x 1
	TUHF Tag x 200 *The TUHF Tags are in a rolled in sequential order with every two tags having the same unique number.* *You will need the unique Batch # ID on the front of each Tag package for creating a Tag ID List. Do not throw out this bag prior to creating this list.*

TUHF Timekeeping Line Package

The following Items ship in 1 Timekeeping Line Package:

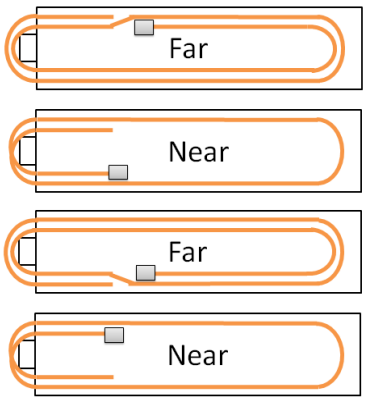
	1x Carry Case for lines
	2x 1m Timing Line Pieces w/ 2.5m tails (**Near**) 2x 1m Timing Line Pieces w/ 4m tails (**Far**)
	4x 0.5m Spacers

See below for Best Practices for Timing Line set ups.

Storing your Timekeeping Lines

We recommend storing your Timekeeping Lines in the Carrying Case between each Event. In order for all of the Timekeeping Lines to fit appropriately into the Carrying Case, you will need to make sure that your lines are reeled accordingly.

Reeling your Timing Lines



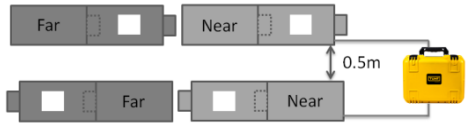
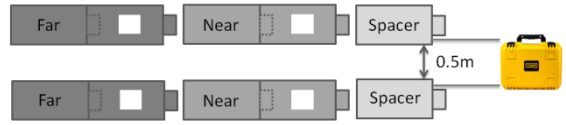
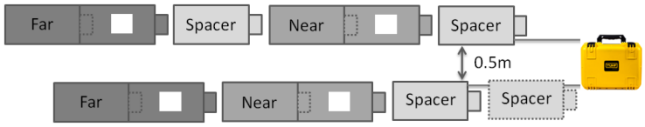
Tails must be reeled according to the figure on the left before being put into the carry case

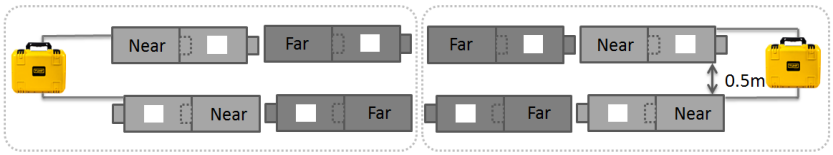
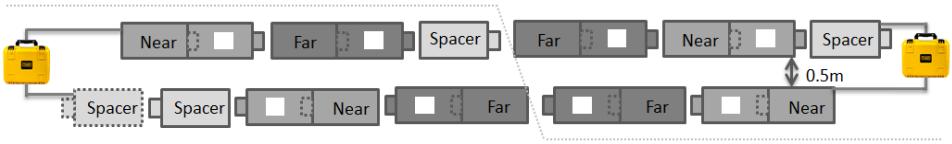
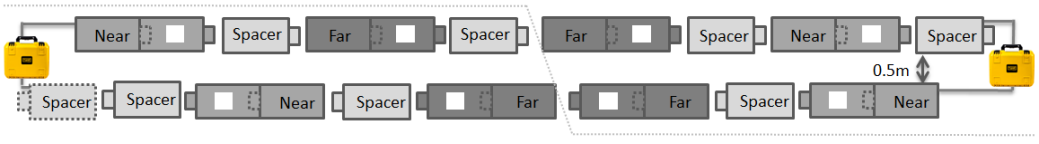
The case contains 4 layers of 1m lines and 2 layers of 0.5m spacers.

The dimensions (height+ width +length = 158cm) satisfies **IATA travel limits** of hold baggage

Optimal Timekeeping Line Layout @different width

For the best performance and highest accuracy, use the figures on the following page to setup your Timekeeping Lines:

	**2m**
	**2.5m**
	**3m**

	**4m**
	**5m**
	**6m**

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Getting Started Using your TUHF Reader

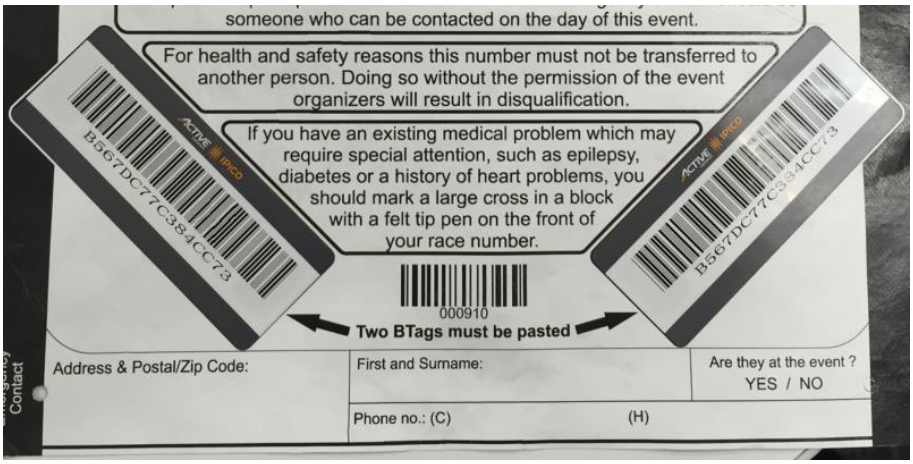
Picture	Press **Power ON** button for 3 seconds to switch on the reader
	**Battery Status indicator** will light up to show the remaining battery capacity in percentage

	**Smart LEDs** • **Status/Tags read** screen contains 6 LEDs that light up from left to right during start up • All 6 LEDs will light up when **Trigger** button is pressed • While tracking TUHF bib scans, number of lit up LEDs indicates number of TUHF tags passing timing lines
	**Power supply** • TUHF Reader has an internal battery that can work standalone for up to 4 hours • To sustain longer charge time, reader can be plugged into an **External Battery** or **AC Charger** while on

	**Connecting the Timekeeping Lines to the reader** • Connect Timekeeping lines to Reader **through TNC connectors** (*found at tail end of time keeping lines*) to antenna ports on Reader • **Antenna indicators** have same layout as antenna ports • Indicator light of antenna port will turn **ON** when timekeeping line is connected correctly
	**External Buzzer** should be plugged into **Buzzer** socket The buzzer will beep for each valid TUHF Bib identified

TUHF Bibs

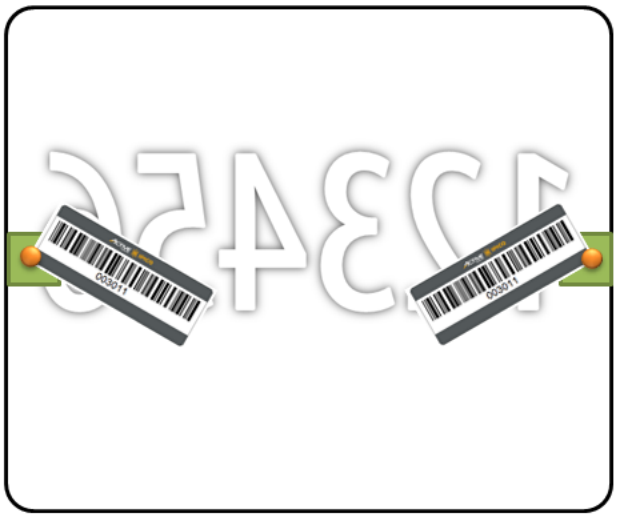
Two **TUHF Tags** with the same tag number are placed on the back of each TUHF Bib. For the best performance and highest accuracy, it is recommended to always place the bib on the participants' chest during the event.

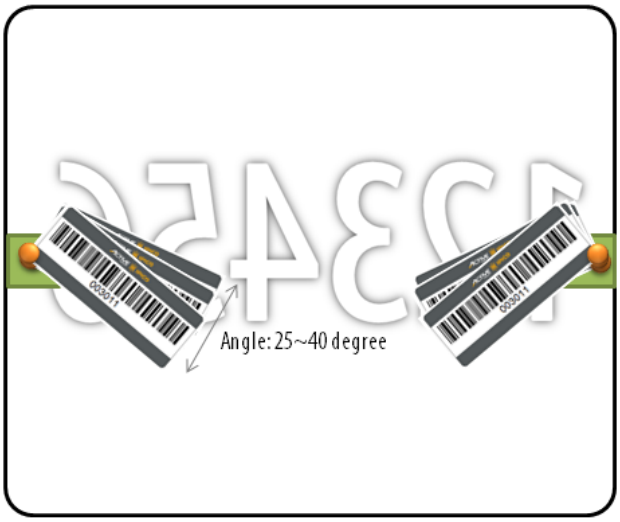


Most Optimal Placement of the TUHF Tags

The **Sweet Zones** (Diameter = 20mm) on a Bib are located in the middle area of the sides. The figure on the left shows where you will find the Sweet Zones.

The bottom corner of the TUHF Tags should be placed in the Sweet Zones of the Bib. Please see figure on the right for further reference.





Its recommend that the **Inclined Angle** of the TUHF Tags be set from 25 to 40 degrees. The **Inclined Angle** is the degree at which the tag tilts up towards the outer edge of the Bib (as shown in the figure on the left).

Important Tips

- All 6 LEDs will light up when **Trigger** button is pressed for 3 seconds, then turn off in descending order; at this time all read records for Event are compiled and transferred through **Designated Data Channel**
- Do **NOT** switch off reader before it is confirmed that data has been received successfully onto computer or into Timing Software
- Designated Data Channel can be set up as LAN, WIFI or 3G/4G; Reader can be controlled through LAN or WIFI even if Designated Data Channel is different
- List of WIFI networks show the IP address used for TCP/IP LAN connection of the reader.

TUHF_READER_67 *is the unique name that identifies WIFI connection of current reader*

IP designation of TCP/IP LAN connection is 192.168.1.67

Default TCP/IP port is always 10000

- The 3G/4G function can only be configured within 15 seconds of pressing the 3G/4G button on the TUHF Reader.

First Seen (FS), Last Seen (LS) Tag Reads

As soon as the TUHF bib tag enters into the detectable area of the timekeeping line, it is identified by the reader immediately. The First Seen (FS) record is then created with a time stamp and sent out to your timing software. The reader will continue to compare the Radio Signal Strength Indication (RSSI) of the same tag ID and save the record with max RSSI and the latest record of the same tag ID by using their identifying timestamps. When the latest record doesn't change for a **silent duration** (such as 1 second), the FS and LS records are then sent out accordingly.

There may be some reflections and obstructions that conflict with the detectable area of the timekeeping line. If an object does obstruct the detectable area, more than one group of tag read records (FS + LS) may be collected by the TUHF Reader for certain tags.

In the event that more than one group of tag read records are collected by the same reader, the following is suggested:

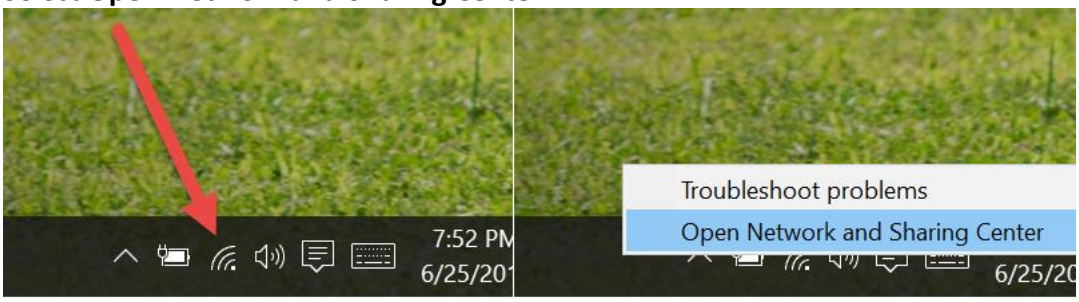
- Use the **Last LS** read record for the Tag ID at the start line
- Use the **First LS** read record for the Tag ID at the finish line

Setting the IP Address of your PC to be in the same Subnet as TUHF Reader

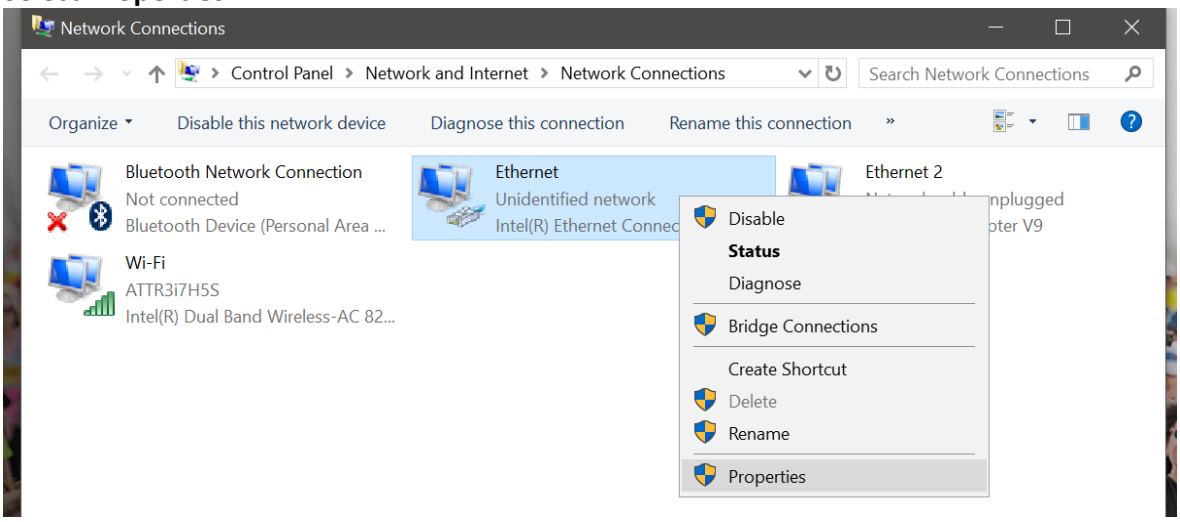
In order to connect your PC to the TUHF reader, it may be required that you set the IP address of your PC to be in the same subnet as the TUHF Reader. The TUHF Reader has a standard IP address labeled on your device. You will need to change the IP Address within the Network Settings of your PC to the same subnet as the TUHF Reader.

To change the IP address of your PC to be in the same subnet as the TUHF reader, complete the following steps:

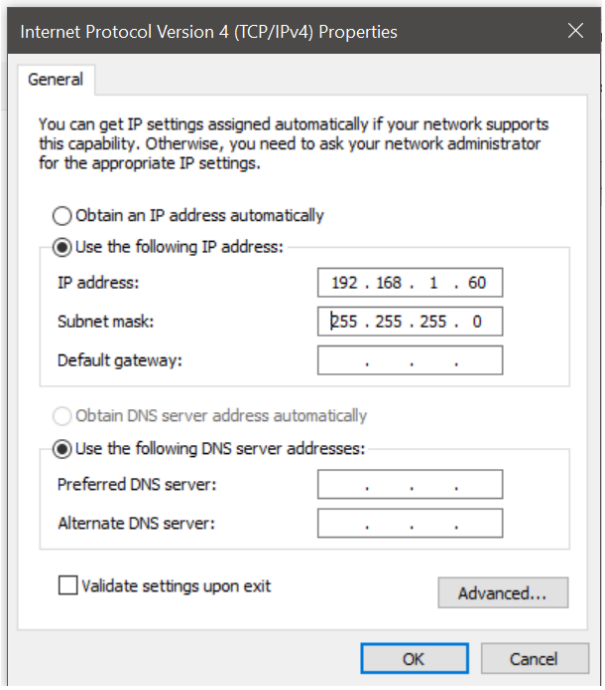
1. At bottom right corner computer Desk Top, right-click on **Internet Connection** Icon
2. Select **Open Network and Sharing Center**



3. At top left corner, select **Change Adapter Settings**
4. Right-click on appropriate **Network Connection**
    - ***Note:*** *If you are unsure which Network is connected to the TUHF Reader, disconnect the Reader from the Network and identify which Network disengages within the Network Connections page. Connect the TUHF Reader back to the Network and proceed to the next step.*
5. Select **Properties**



6. Double-click on **Internet Protocol Version 4(TCP/IPv4)**
7. In **IP Address** and **Subnet mask** fields, enter in appropriate information
    - ***Note:*** *You will need to know the IP Address of your TUHF Reader. For this example, we will assume the TUHF Reader has the following IP Address: 192.168.1.66. The new IP Address within the* ***Internet Protocol Version 4(TCP/IPv4)*** *settings would need to be 192.168.1.XXX where XXX is any 1 to 3-digit number NOT equal to 66. After changing the IP Address, delete all values within the Subnet Mask field. Now, by clicking on the empty Subnet Mask field, the appropriate subnet number will autofill.*



8. Select **OK**
9. Select **OK**

Using the ***Active TUHF Config*** software

The ***Active TUHF Config*** software tool was developed to assist our customers in configuring the TUHF reader and pulling the read record data.

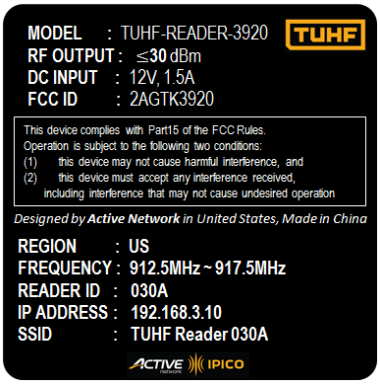
The **Active TUHF Config** software tool will help you achieve the following:

1. Get reader time
2. Synchronize reader time with computer time
3. Resolve the live reads or pulled reads
4. Save the live reads or pulled reads into spreadsheet or raw-format
5. Get the number of reads for this time and the number of reads in the memory
6. Delete the memory
7. Pull reads from the memory
8. Select the channel of sending live reads
9. Setup the remote server of 3G/4G
10. Reset the reader to factory default

Connect

On the *product label of the TUHF Reader*, locate IP Address.

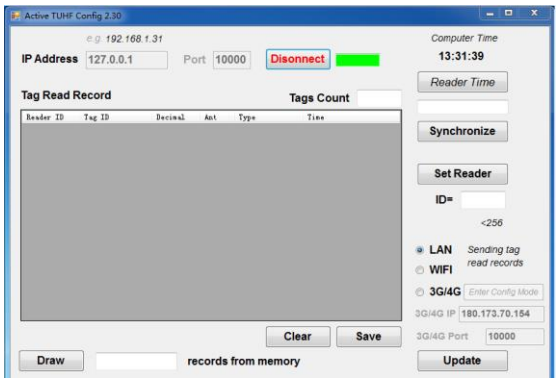
Product Label:



Note: *You will need to set the IP Address of your PC to be in the same subnet of the TUHF Reader*

To connect your TUHF Reader to the ***Active TUHF Config*** software, complete the following steps:

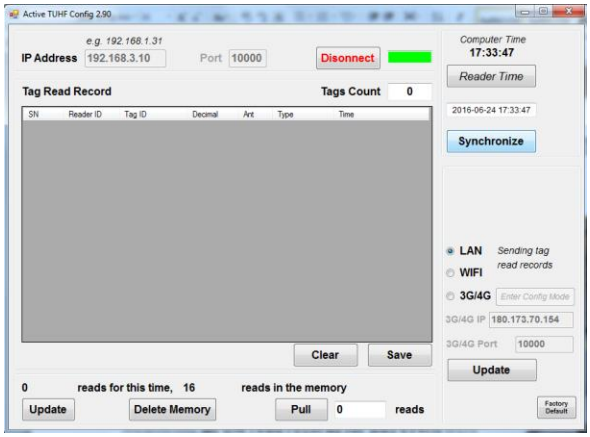
1. Connect PC to Reader by Ethernet cable
2. Run ***Active TUHF Config*** software
3. In **IP Address** field, enter TUHF Reader IP Address
4. Select **Connect**
    - ***Note*****:** *If successful, the red status bar will turn to green*



Time

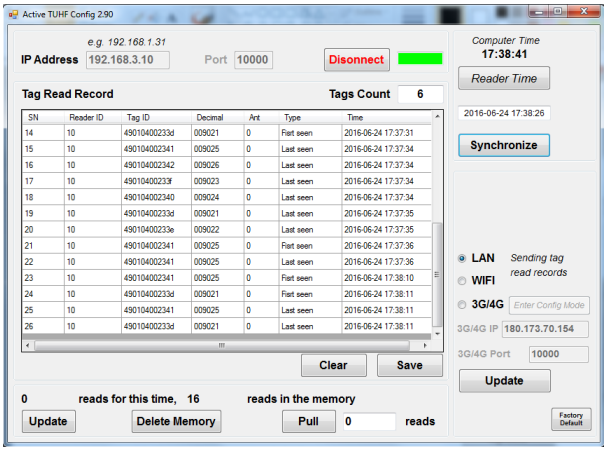
The **Reader Time** button is used to obtain the current time set in the TUHF Reader.

Click **Synchronize** button to change the reader time to be the computer time.
Please see figure below

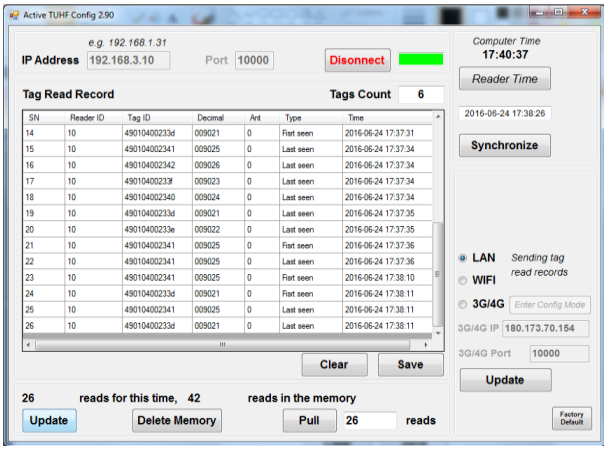


Live Reads

During an event, the **Active TUHF Config** tool monitors the **Tag Read Records** as they are captured.



The **Tag Read Record** window shows the time stamp, which antenna port the tags are read by, as well as the decimal numbers printed on the TUHF tags.



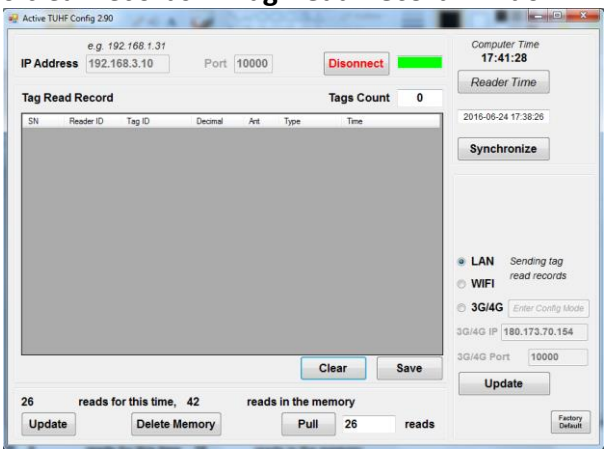
On the bottom right corner, click **Update** button to update all read records in the Tag Record window. The **reads for this time** field represents all reads after the TUHF Reader has been powered-on. **The reads in the memory** field represents all records saved in the Memory of the TUHF Reader, including the records captured prior to powering on the device.

Pull Reads

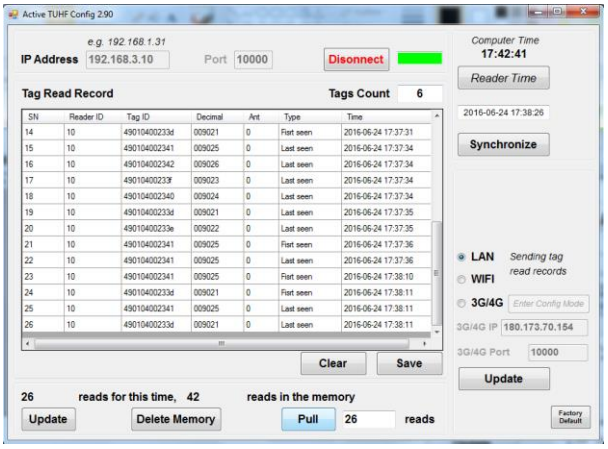
All of the Read Records can be pulled from the memory of the TUHF reader. More than 1Million reads could be saved in the memory.

To **Pull Read Records**, complete the following steps:

1. Click **Clear** button to clear records in **Tag Read Record** window

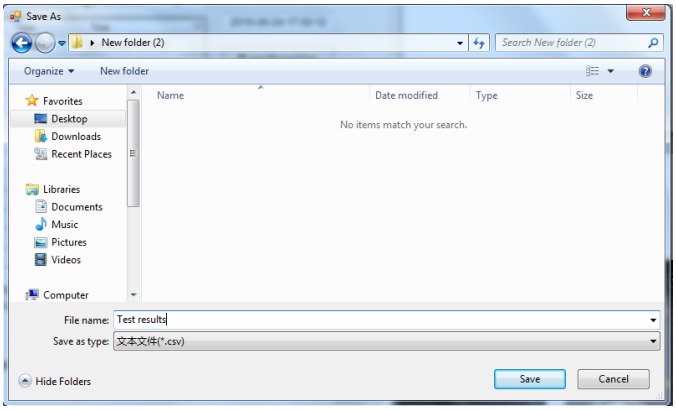


2. In **Pull** field, enter desired amount of reads to pull
3. Click **Pull**
    - ***Note:*** *Please see figure below. All of the reads from this time will show in the Tag Read Record window.*
    - *The **pull rate** is **50ms per record**. For example, it will take 50 seconds to pull 1000 reads.*

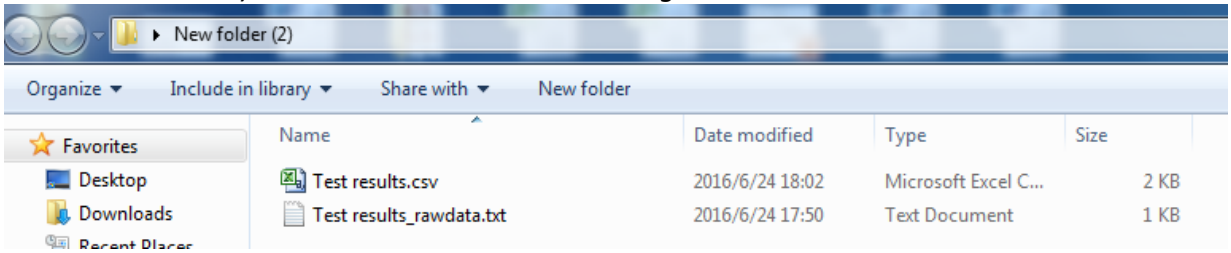


To **Save** the data listed in the Tag Read Record window, complete the following steps:

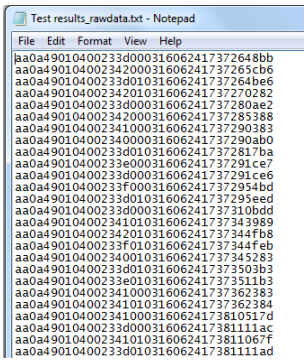
1. Select **Save** button



2. In **File Name** field, enter desired name for data file
3. Select **Save**
    - ***Note:*** *The trimmed data file (ending in ".csv") and the raw data file (ending with ".txt") will be created. Please see image below*



The format of the raw data file is standard and also the same as what was used by the IPICO DF products

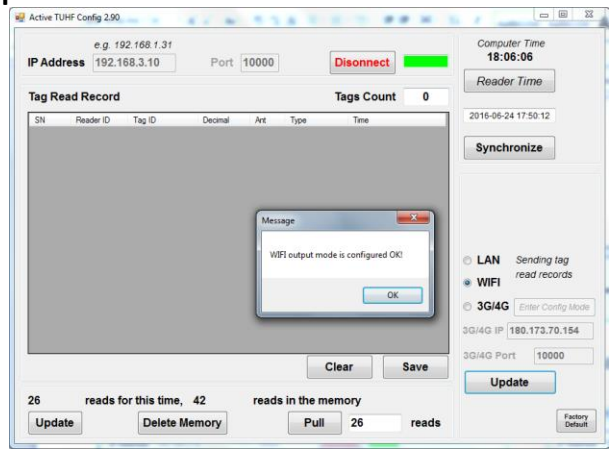


Channel of Live Data Stream

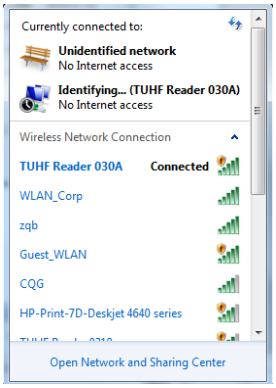
The "Active TUHF config" tool can also be used to change the channel of live reads and data stream from LAN to WIFI. As long as your TUHF Reader stays powered ON while switching Data Stream Channels, your data will not be compromised.

To switch the Channel of Live Data Stream from LAN to WIFI, complete the following steps:

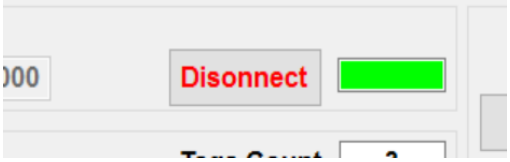
1. Within the Active TUHF config tool, select **WIFI** option
2. Click **Update** button



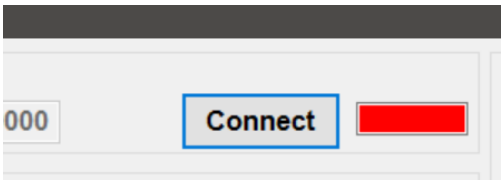
3. On your Desk Top, select Wireless Network icon



4. Select **TUHF_Reader_XX**
5. Select **Connect**
6. Disconnect LAN cable from PC
7. Within Active TUHF config software, select **Disconnect**



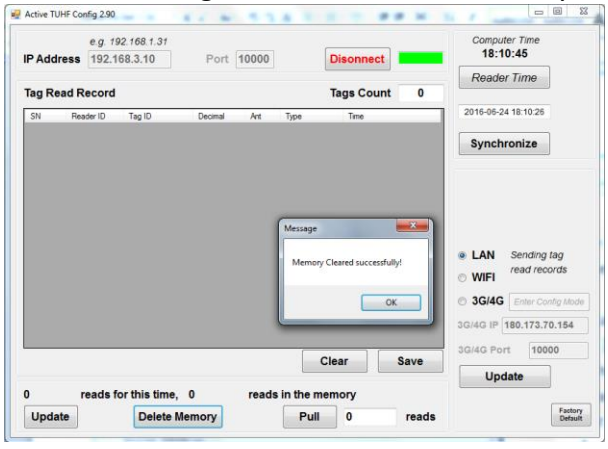
8. Select **Connect**



- ***Note: Connect only one channel to the TUHF Reader at a time****. If both WIFI and LAN are connected at the same time, the reader may not function accordingly.*

Delete Memory

Click **Delete Memory** button to delete all reads in memory. Make sure you have saved all important data before deleting data stored in the Memory.

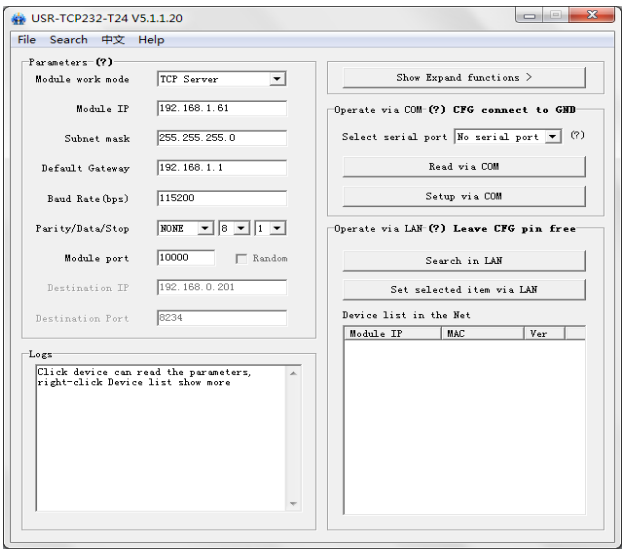


Advanced Operations

The operations below are only for experienced professional users because they may cause some unrecoverable modifications.

LAN Parameters

The **USR-TCP232-T24** software is used to change reader's LAN parameters. The figure below shows the main User Interface.



Use the following link to download the **USR-TCP232-T24** software:

http://www.usriot.com/usr-tcp232-t24-setup-v5-1-1-20/

To change the Reader's LAN Parameters, complete the following steps:

1. Select **Search in LAN**
2. In **Device list in the Net**, under **Module IP**, select appropriate IP Address
3. In **Module IP** field, enter desired IP Address
4. In **Subnet Mask** field, enter appropriate **Subnet Mask** Number
5. In **Module work mode** field, select appropriate **work mode**
    - ***Note:*** *The "work mode" default setting is set to TCP Server. The default setting allows the tag read records to be sent out to the server on internet automatically. If you do not wish to use your PC on the field, "work mode" should be set to TCP Client, and the destination server's IP and port must be filled in.*

6. Click **Set selected item via LAN**

WIFI Parameters

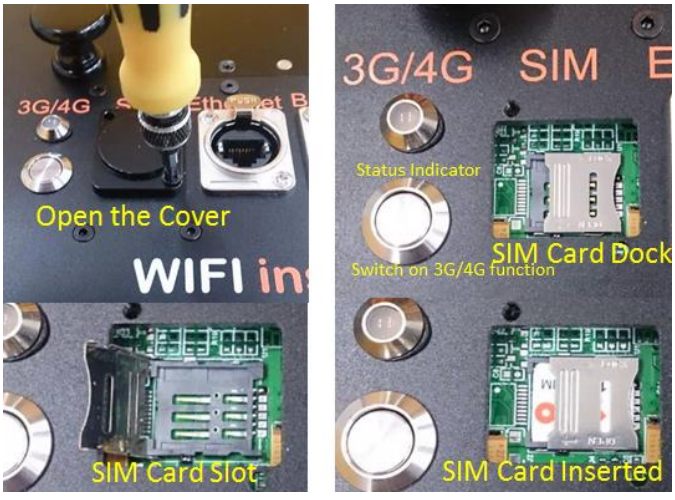
By typing the WIFI IP address in your internet browser, the WIFI parameters can be configured.

3G/4G Access

By connecting the reader to 3G/4G router and setting the **work mode** to be ***TCP Client***, the mobile data network can be accessed. This will allow tag read records to be sent to a remote server on the internet without having to use your PC on the spot.

Setting up your 3G/4G Connection

Before pressing the 3G/4G button, ensure the SIM card has been inserted properly.



Press **3G/4G** button to power on the 3G/4G function

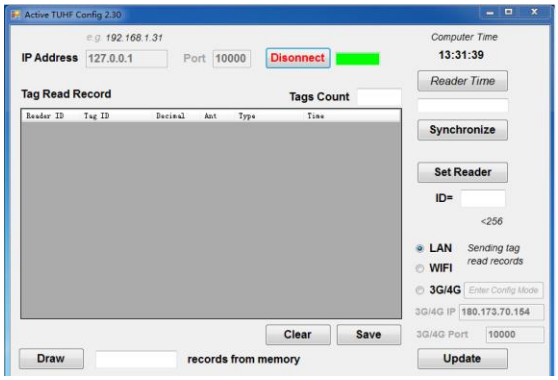
The 3G/4G indicator light will function as followed when your SIM card has been inserted appropriately:

1. **Blink once in green:** Initialization of 4G module is OK
2. **Light turns red:** 4G module boot OK
3. **Light turns green:** Connecting to the server
4. **Light blinks green:** Server is connected

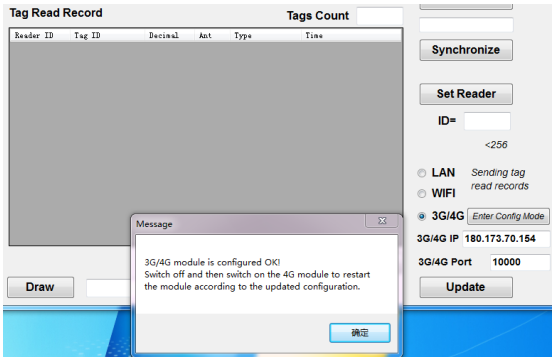
A yellow 3G/4G LED light indicates that there is something wrong with the 3G/4G configuration and may need to be modified using the following steps:

Note: *Make sure your PC and TUHF reader are located in the same IP subnet.*

5. Connect PC to Reader by Ethernet cable
6. Run ***Active TUHF Config 2.80.exe*** software
7. In **IP Address** field, enter TUHF Reader IP Address
8. Select **Connect**
    - ***Note*****:** *If successful, the red status bar will turn to green*



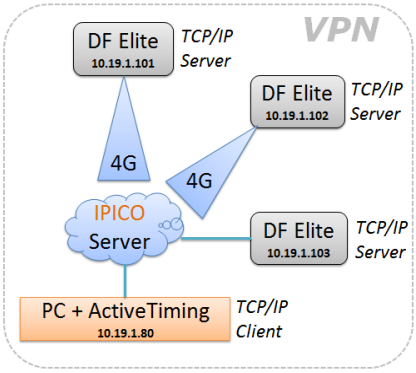
9. On TUHF device, select 3G/4G button
10. Select 3G/4G radio box and
11. Within 15 seconds, click **Enter Config mode** button
    - ***Note:*** *If successful, the 3G/4G indicator will blink in red and the current 3G/4G configuration (IP address/ port no. of the remote server) will show in the software*
12. In text box, modify **IP address** and **port number** of new remote server
13. Select **Update**
    - ***Note:*** *If successful, a message box will pop up*



14. Restart the 3G/4G module
    Note: *The module will boot according to the updated setup*

Network Configuration During Event

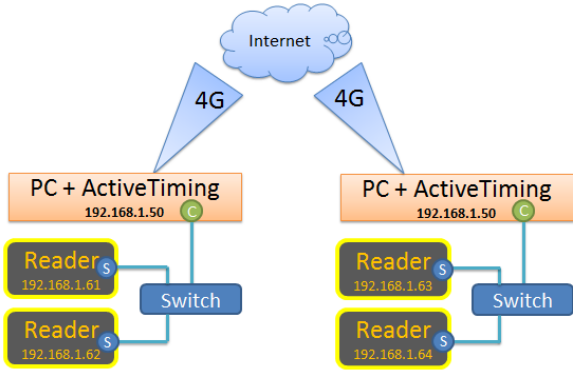
The figure below shows how the IPICO DF Elite readers construct the network during an event. All of the Elite readers and the PC share a same VPN. Each reader or PC has a unique IP address to distinguish its position on the marathon route. The Elite readers work as a TCP/IP server. They listen to the application for socket connection from TCP/IP client of ActiveTiming software.



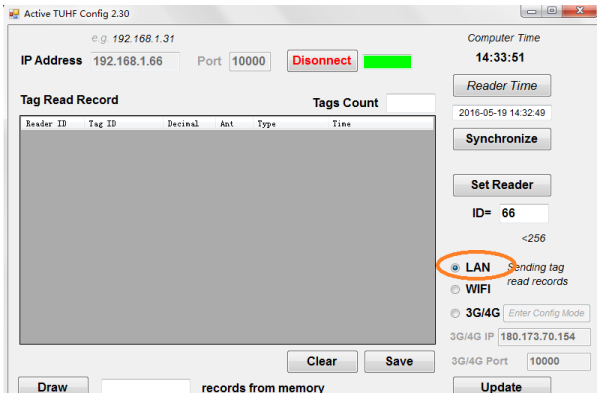
We've found that VPN is not easy to setup and is frequently unstable. So the TUHF readers do NOT use VPN any more.

The following Network Configuration Options could be used to connect the TUHF Reader:

I. Switch and 4G USB Dongle

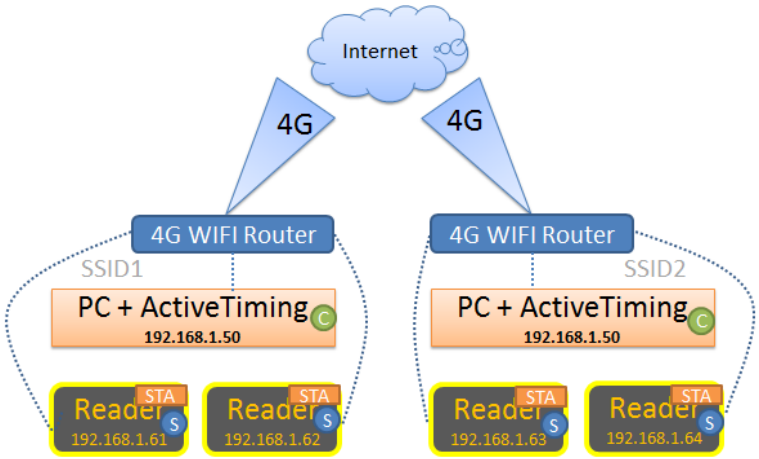


- PC and TUHF readers share a wire LAN connection in each split.
- TUHF readers must use **LAN** to send tag reads



- TUHF readers work as a TCP/IP server. They listen to the socket connection from TCP/IP client of ActiveTiming software.
- ActiveTiming software distinguishes which split the readers are located in by using the IP addresses.

II. 4G WIFI Router



- The 4G WIFI Router works as a WIFI Access Point. With an internal battery that can usually

sustain 4 to 6 hours, the router generates a wireless LAN signal with a configured SSID.
- TUHF readers must be configured into "STA" mode. Be careful to input the appropriate router SSID into the red box below.

- PC and TUHF readers share a wireless LAN connection in each split.
- TUHF readers must use **WIFI** to send tag reads.
- TUHF readers work as a TCP/IP server and listen to the socket connection from the TCP/IP client of the ActiveTiming software.
- ActiveTiming software distinguishes which split the readers are located in by using the IP addresses.

III. Standalone

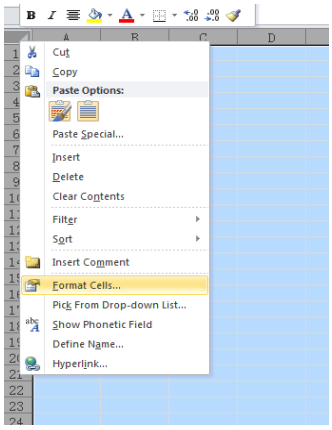
- No laptop is needed at the split.
- After the TUHF Reader establishes a 3G/4G connection, ActiveTiming will use the configured IP address and Port for listening.
- There isn't a fixed IP address for the TUHF readers on the internet. So, ActiveTiming cannot initiate a socket connection. ActiveTiming will act as a TCP/IP server and listen to the socket connection initiated by the TCP/IP client in the TUHF readers
- IP addresses cannot be used to distinguish the location. ActiveTiming should relate Reader IDs to the locations or splits.

  Reader ID can be found in every read records. Such as the above line, 0x64 means Reader ID = 100.

Create Tag ID List by Spreadsheet (Not using Barcode Scanner)

In Excel, ensure that cells are formatted in text form and not scientific notation. To change the Cell Format, follow the steps below:

1. Open Microsoft Excel
2. Select the Entire Table
3. Right Click and select **Format Cells…**

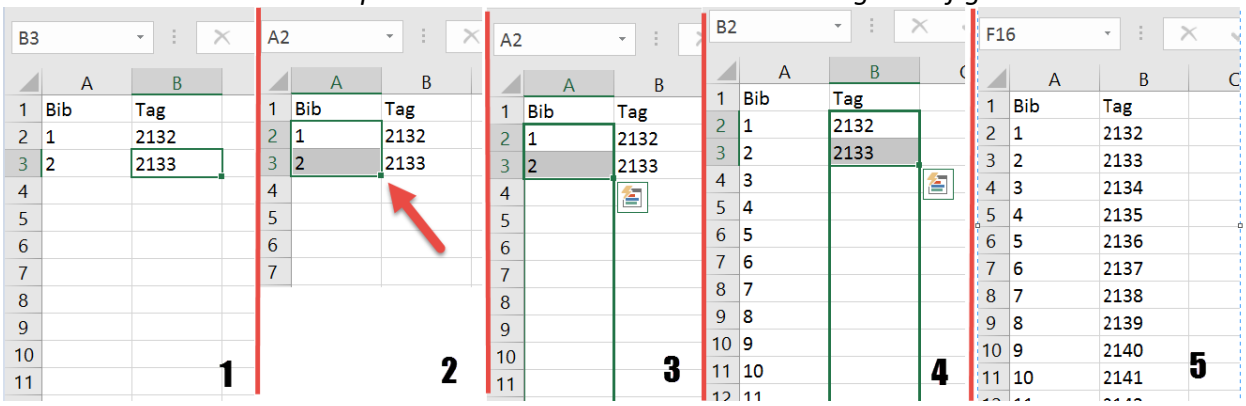


4. Under **Category** section, select **Text**
5. Select **OK**

Once you have followed the steps above, you can begin to create your Tag List via the spreadsheet. Start by relating the first Bib No. to the first Tag No.

To create your Tag List by Spreadsheet, you will need to start by relating the Bib No. to the Tag No. Use the following steps to relate your Bib No. to the Tag no:

1. Label **Column A** in **Row 1:** *Bib No.*
2. Label **Column B** in **Row 2**: *Tag No.*
3. In Column A/Row 2, enter the first Bib No. Value
4. In Column B/Row 2, enter the first Tag No. Value
5. Repeat Steps 3-4 for the second Bib and Tag No.
    a. ***Note:*** *Your spreadsheet should look similar to Image 1 in figure below*



6. Click and drag **A2** and **A3** to select both cells (*Image 2 above*)
7. Click bottom right corner of selected cells and drag down to autofill Bib No. entries (*Image 3 above*)

8. Click and drag **B2** and **B3** to select both cells (*Image 4 above*)
9. Click bottom right corner of selected cells and drag down to autofill Tag No. entries (*Image 4 above*)

Note: *If done correctly, your spreadsheet will look similar to #5 of the figure above*

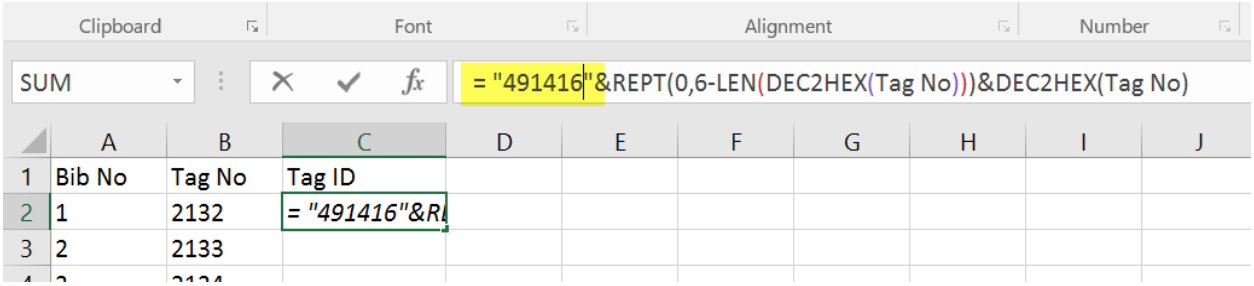
Once the Tag ID and Bib ID are related you must create a Tag ID in Column C. In order to complete this, you will need the Batch No of the tags as well as the Tag ID equation.

The **Batch No.** is a 6-digit number that can be found on the front of the Tag packages, such as "491416" or "490104".

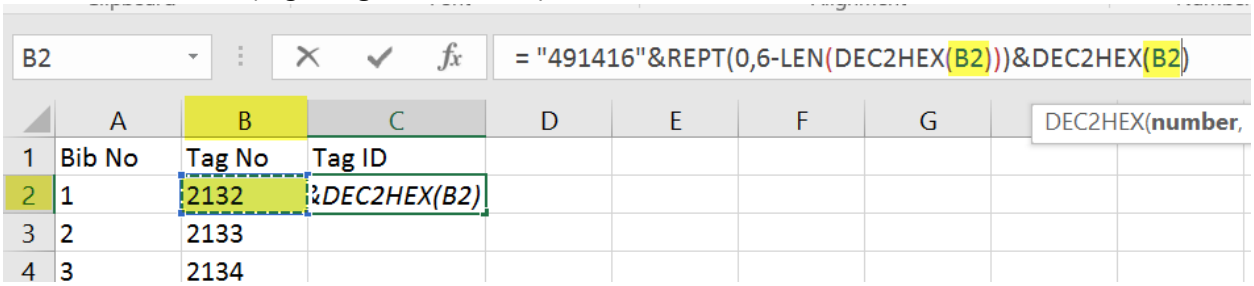
The **Tag ID equation** to copy and paste is: *="**Batch No**"&REPT(0,6-LEN(DEC2HEX(**Tag NoCell**)))&DEC2HEX(**Tag NoCell**)*

Follow the steps below to create the Tag ID equation in Column C:

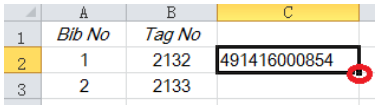
1. Label **Column C** as **Tag ID**
2. In **C2**, enter: *="**Batch No**"&REPT(0,6-LEN(DEC2HEX(**Tag NoCell**)))&DEC2HEX(**Tag NoCell**)*
   - ***Note:*** *Please see figure below.* **Batch No** will be same for all tags from the same package, so where equation notes **Batch No** value will be entered exactly as it appears on the Tag package into the equation



   - ***Note:*** *Tag No will be different for each pair of tags, so if you have completed the steps to create Bib No. and Tag No. above, the cell location will replace **Tag No** in text (e.g., **Tag No Cell = B2**)*

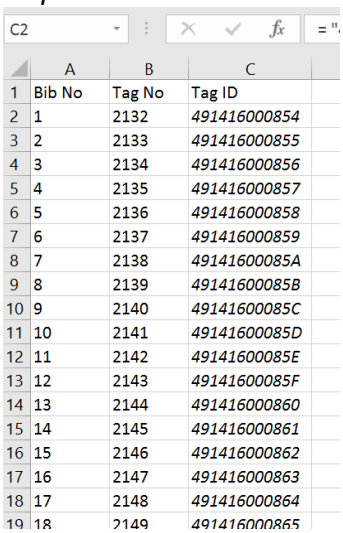


3. Click bottom right corner of highlighted cell and pull down to autofill **Tag ID** entries



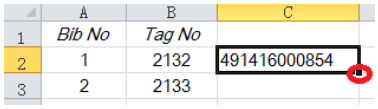
	A	B	C
1	*Bib No*	*Tag No*	
2	1	2132	491416000854
3	2	2133	

- ***Note:*** *Afterwards, the spreadsheet will look like the following image:*



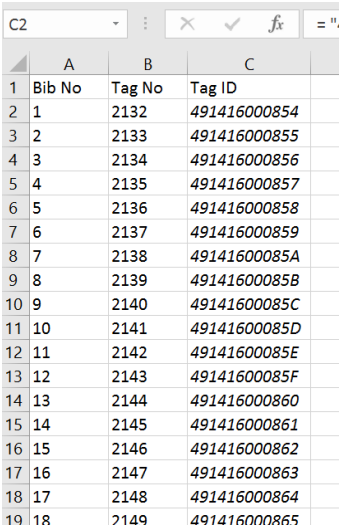
	A	B	C
1	Bib No	Tag No	Tag ID
2	1	2132	*491416000854*
3	2	2133	*491416000855*
4	3	2134	*491416000856*
5	4	2135	*491416000857*
6	5	2136	*491416000858*
7	6	2137	*491416000859*
8	7	2138	*49141600085A*
9	8	2139	*49141600085B*
10	9	2140	*49141600085C*
11	10	2141	*49141600085D*
12	11	2142	*49141600085E*
13	12	2143	*49141600085F*
14	13	2144	*491416000860*
15	14	2145	*491416000861*
16	15	2146	*491416000862*
17	16	2147	*491416000863*
18	17	2148	*491416000864*
19	18	2149	*491416000865*

4. Select **Column C**
5. Copy **Column C**
6. Click bottom right corner of highlighted cell and pull down to autofill **Tag ID** entries



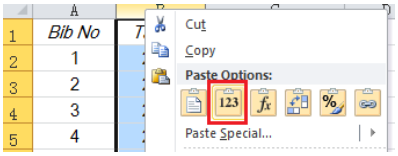
	A	B	C
1	*Bib No*	*Tag No*	
2	1	2132	491416000854
3	2	2133	

- ***Note:*** *Afterwards, the spreadsheet will look like the following image,*



	A	B	C
1	Bib No	Tag No	Tag ID
2	1	2132	*491416000854*
3	2	2133	*491416000855*
4	3	2134	*491416000856*
5	4	2135	*491416000857*
6	5	2136	*491416000858*
7	6	2137	*491416000859*
8	7	2138	*49141600085A*
9	8	2139	*49141600085B*
10	9	2140	*49141600085C*
11	10	2141	*49141600085D*
12	11	2142	*49141600085E*
13	12	2143	*49141600085F*
14	13	2144	*491416000860*
15	14	2145	*491416000861*
16	15	2146	*491416000862*
17	16	2147	*491416000863*
18	17	2148	*491416000864*
19	18	2149	*491416000865*

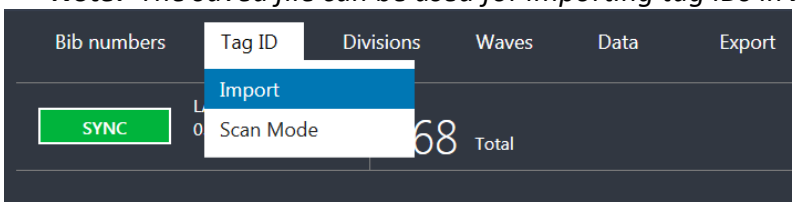
7. Copy **Column C**
8. In **Column B**, right-click and use *Value* **Paste Options** to replace with **Column C** data



9. Delete **Column C**
10. Delete **Row 1**
    - ***Note:*** *Afterwards, the spreadsheet will look similar to the figure below*

	A	B
1	1	491416000854
2	2	491416000855
3	3	491416000856
4	4	491416000857
5	5	491416000858
6	6	491416000859
7	7	49141600085A
8	8	49141600085B
9	9	49141600085C
10	10	49141600085D
11	11	49141600085E
12	12	49141600085F
13	13	491416000860
14	14	491416000861
15	15	491416000862
16	16	491416000863
17	17	491416000864

11. Save file as *CSV (Comma delimited) (*.csv) file type*
    - ***Note:*** *The saved file can be used for importing tag IDs in* ***ACTIVE Timing***



Create Tag ID List by Spreadsheet Using Barcode Scanner

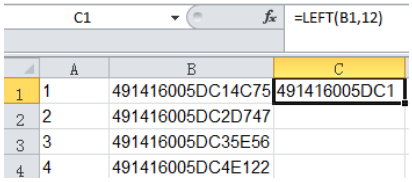
While using barcode scanner to scan tag IDs in spreadsheet, the sheet will always look like the following image:

	A	B	C
1	1	491416005DC14C75	
2	2	491416005DC2D747	
3	3	491416005DC35E56	
4	4	491416005DC4E122	

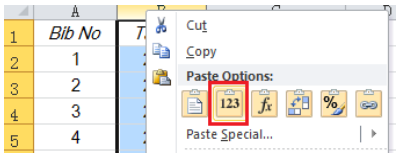
The last four digits of the scanned ID must be removed using the following equation: ***Tag ID*** = *LEFT(**Scanned result**, 12)*

Once all Tags have been scanned in, use the following steps to complete your Tag List setup:

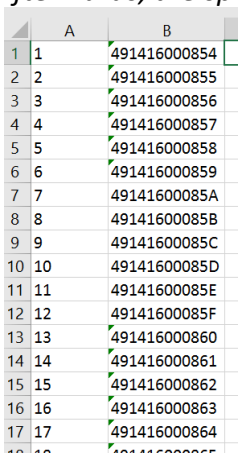
1. In column **C**, enter = *LEFT(**Scanned result**, 12)*
2. In equation, replace **Scanned result** text with cell location



3. Click bottom right corner of highlighted cells and pull down to autofill entries in column **C**
4. Copy column **C**
5. In column **B**, **Paste** data to replace previous data in column **B**.
   - ***Note:*** *When Pasting data, use "Value" option as shown in the figure below.*



6. Delete column **C**
   - ***Note:*** *Afterwards, the spreadsheet will look similar to the figure below*



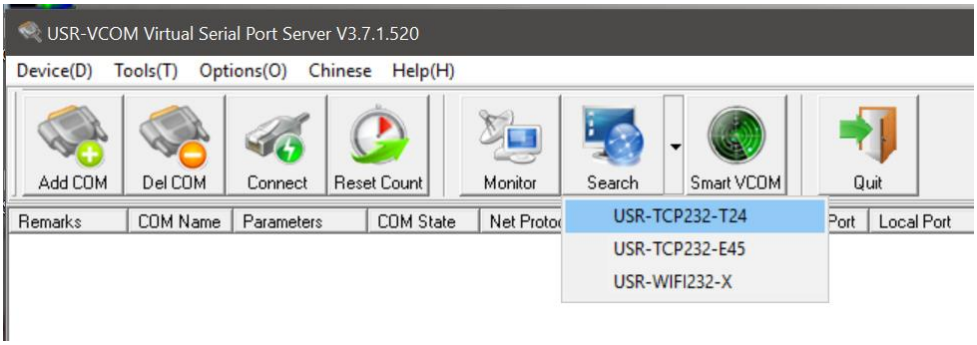
Upgrading TUHF Reader Firmware

Firmware is software that is loaded onto the hardware components of your TUHF Reader device. ACTIVE regularly releases new firmware versions to improve product performance and add new features. It is highly recommended to check and update your reader firmware version periodically.

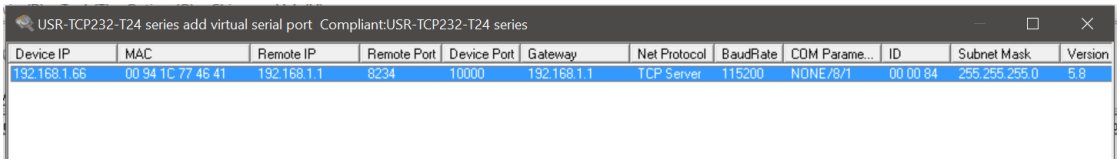
To update your TUHF Reader Firmware, complete the following steps:

Note: *Remember to set the IP address of your computer to be in the same subnet as reader.*

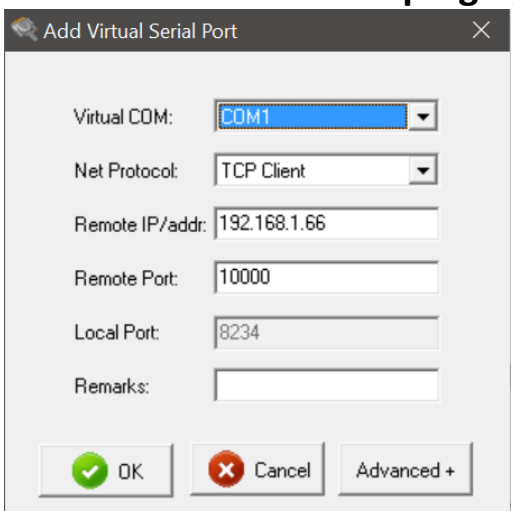
1. Connect your PC to the TUHF reader via Ethernet Cable
2. Run **USR-VCOM** software
3. Select **Search**
4. Select **USR-TCP232-T24**



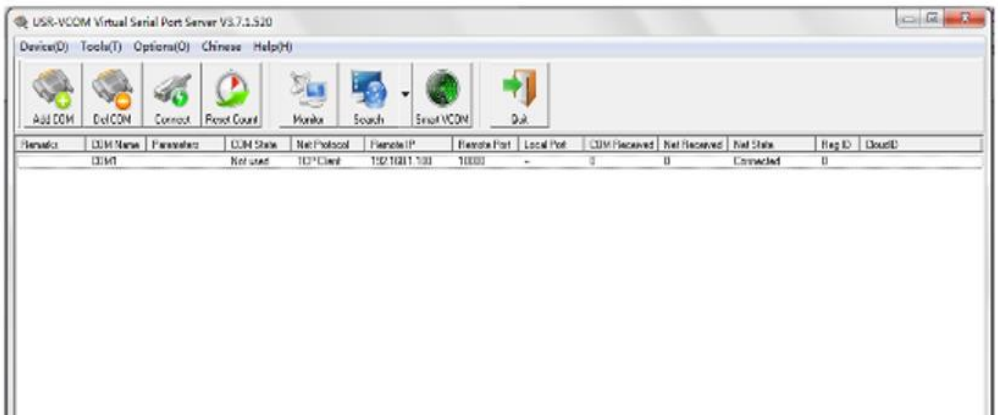
5. In pop up, select the appropriate reader IP



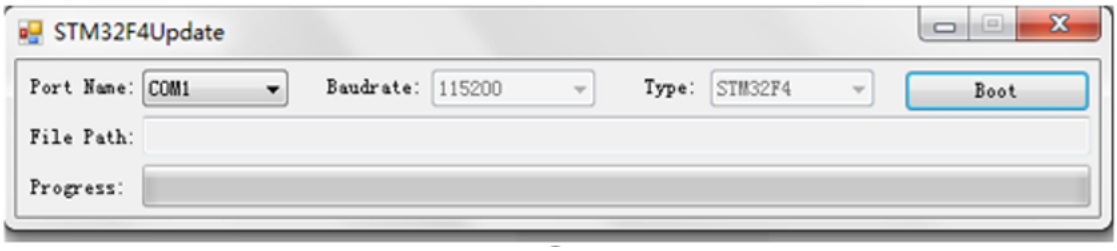
6. Select **Connect Virtual COM**



7. Select a free COM Port
8. Select **OK**
    - ***Note:*** *The virtual COM port will be created and shown in the window below. Do NOT close this window before the upgrade is completed.*

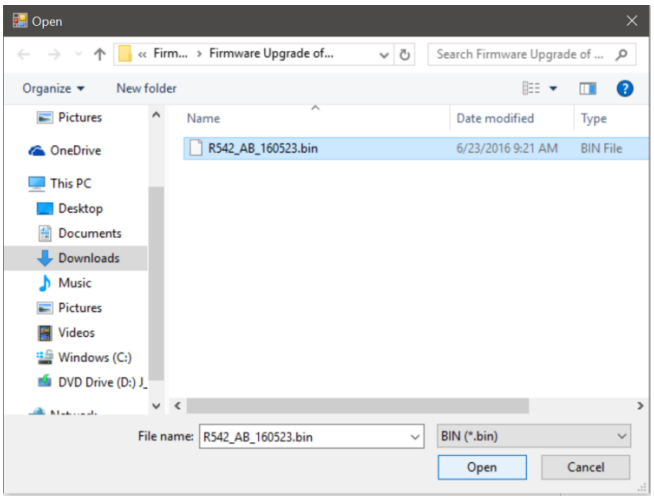


9. Run **STM32F4Update.exe** software

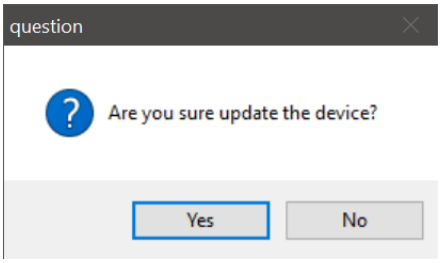


10. In Port Name field, select COM port that was used in step #7

11. Select **Boot**



12. In pop up, search and select appropriate Firmware file
    - ***Note:*** *The firmware file always has the suffix of "bin".*
13. Select **Open**
14. In the pop up, select **Yes**



15. Once the update has finished, in the pop up, select **OK**
16. Restart TUHF Reader