

# EM4XXX Datalogger V2 – User Guide



## Electrical Characteristic

		MIN	NOM	MAX	UNIT
$V_{IN\ USB}$	Input voltage (USB)	4.5	5.0	5.5	V
$I_{IN\ USB}^{(1)}$	Input current (USB)			3	A
$I_{CHG}^{(1)}$	Charging current	0.5		2.4	A
$V_{BAT}$	Battery voltage	2.5	3.65	4.2	V
$BAT_{CAP}$	Internal battery capacity		10.67		Ah
$CHG_{TIME}$	Charging time (Battery fully discharged)	5			h
$T_A$	Recommended operating ambient temperature	-20		45	°C
$I_{DISCHG}^{(2)}$ (WiFi Mode)	Current consumption (WiFi ON, RFID ON)	260		385	mA
$I_{DISCHG}^{(2)}$ (Logging Mode)	Current consumption (WiFi OFF, RFID ON)	55		180	mA
$I_{DISCHG}^{(2)}$ (Night Mode)	Current consumption (WiFi OFF, RFID OFF)		3		mA

### Note (1)

The device contains USB data lines (D+/D-) based input source detection to set the input current limit at the USB port. The D+/D- detection includes standard USB BC1.2 and a non-standard adapter. When an input source is plugged in, the device starts standard USB BC1.2 detection. The USB BC1.2 can identify Standard Downstream Port (SDP) and Dedicated Charging Port (DCP). When the Data Contact Detection (DCD) timer expires, the nonstandard adapter detection is applied to set the input current limit. The non-standard detection is used to distinguish vendor specific adapters (Apple and Samsung) based on their unique dividers on the D+/D- pins. If an adapter is detected as DCP, the input current limit is set at 2.4 A. If an adapter is detected as unknown, the input current limit is set to 2.4A.

### Note (2)

Overall current consumption strongly depends on Polling time set on the Settings page. Highest consumption is when Polling is set to 0.1 second. In practice it means that the RFID field is constantly turned ON. Lowest current consumption is achieved with 5 second Polling time.

Since Firmware v2.0.1, the device can be set to Night Mode where both, Logger and RFID units are in

the deep sleep condition for the user selected time with total current consumption down to 3mA during this period.

## Overview

The EM4xxx datalogger system is fully IP68 rated. It consists of 4 main elements.

1. Loop antennas. These are available currently in 3 diameters (45mm, 65mm and 80mm). All antennas come with 1.5m of cable. Antennas can be single or double, depending upon the RFID unit ordered being single or double.
2. RFID Unit. This unit can be a single antenna or double antenna version. It is IP68 rated and comes with two connectors. One to the antenna(s) and one to the datalogger/battery unit. The unit contains a small amount of memory where 100 detections are stored. Once more than 100 detections occur, the data is transferred to the datalogger/battery unit where it is stored as a CSV file.
3. The datalogger/battery unit. This contains the storage memory for the tag detections and a rechargeable lithium ion battery pack. This is charged by a 5V power supply (USB) and is connected by a mini USB connector.
4. Connection cables. To connect the datalogger to the RFID unit. These are available in the following sizes and can be either armoured (if extra cable protection is required) or not armoured:
  - a. 2m
  - b. 5m
  - c. 10m

## Getting Started

### Charging the Battery/ Datalogger Unit

The units can be charged by connecting a suitable USB power supply (we recommend 2.4A capacity for quickest charging times).

### Range checking the RFID units/antennas with some of your tags

1. Connect the antenna(s) to the RFID unit and tighten the nut to hold the antenna securely in place.
2. Lay the antenna(s) out flat on a work area. Separate the antennas by 10cm or so if it is a 2-antenna system.



3. Connect the lead for the datalogger/battery unit to the RFID unit:



4. Now connect the other end of the data/power cable to the datalogger/battery unit. Once



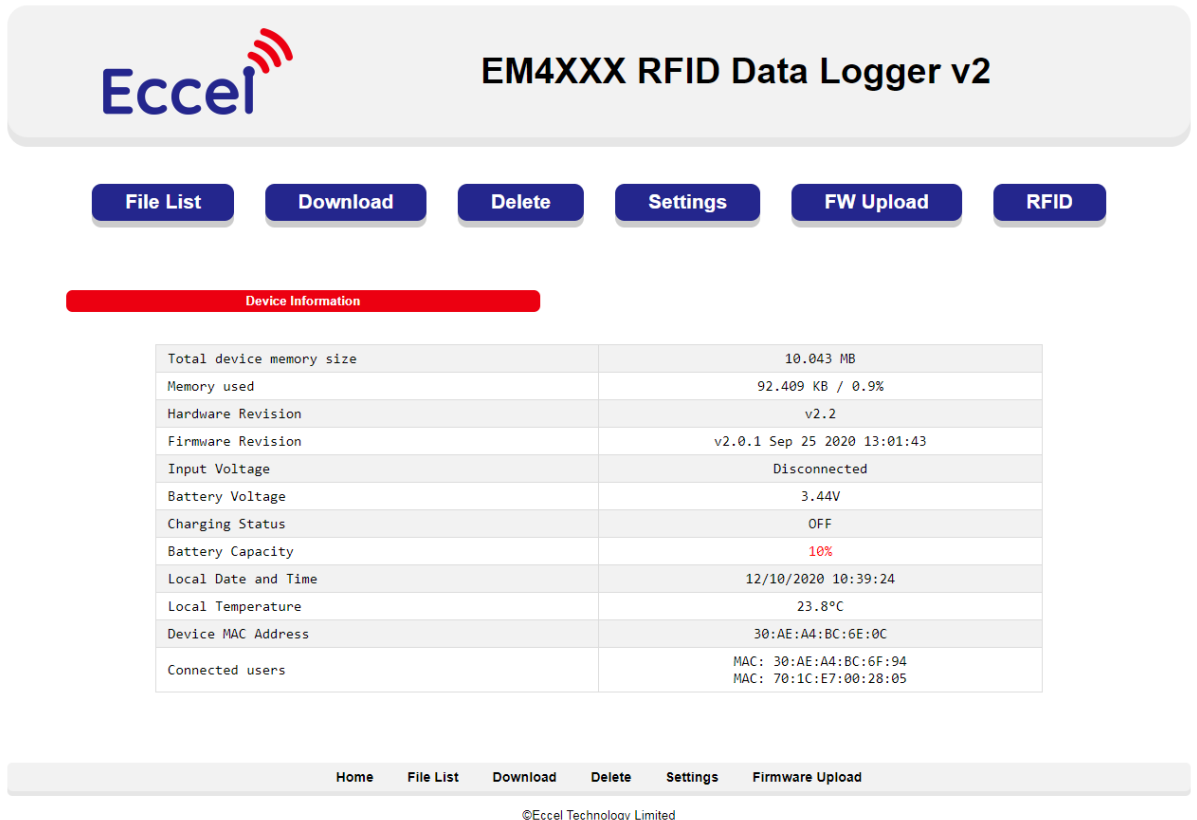
this connection is made, the system will be running and looking for tags at the user selected polling rate from 0.1 to 5 seconds (Settings page).

5. The range test can now be performed by connecting over Wi-Fi to the Logger unit from a PC or tablet by firstly powering up the Wi-Fi of both the RFID unit and the datalogger/battery

unit by pressing and holding the button on the datalogger/battery unit for at least 3 seconds.


The red LED in the button will illuminate when the Wi-Fi is enabled.

Access to the RFID unit is made via the Logger unit WiFi network since v2.0.1 firmware.



Device Information	
Total device memory size	10.043 MB
Memory used	92.409 KB / 0.9%
Hardware Revision	v2.2
Firmware Revision	v2.0.1 Sep 25 2020 13:01:43
Input Voltage	Disconnected
Battery Voltage	3.44V
Charging Status	OFF
Battery Capacity	10%
Local Date and Time	12/10/2020 10:39:24
Local Temperature	23.8°C
Device MAC Address	30:AE:A4:BC:6E:0C
Connected users	MAC: 30:AE:A4:BC:6F:94 MAC: 70:1C:E7:00:28:05

- Now in the list of available networks on the PC/tablet etc, connect to the “Logger XX:XX:XX” wireless network. The network password key is “EccelTechnology”. The network will come up as “limited access “or “No Internet Access” with an exclamation mark on the icon. This is normal and you can ignore it.
- Using your chosen browser, navigate to the IP address shown on the label on the bottom of the product (192.168.4.1). You should see the screenshot above.
- Click on the RFID button and you will see the RFID section webpage. **If after the range testing you wish to switch back to the main home page of the logger unit, you will need to change the address in the address tab of your browser back to the logger IP address (normally 192.168.4.1.)**



# EM4XXX RFID Reader v2

**FW Upload**

**Device Information**

Hardware Revision	v2.2
Firmware Revision	v2.0.1 Sep 25 2020 13:02:13
Local Date and Time	12/10/2020 10:42:57
Local Temperature	25.9°C
Device MAC Address	30:AE:A4:BC:6F:94
Antenna 1 tag ID	
Antenna 2 tag ID	

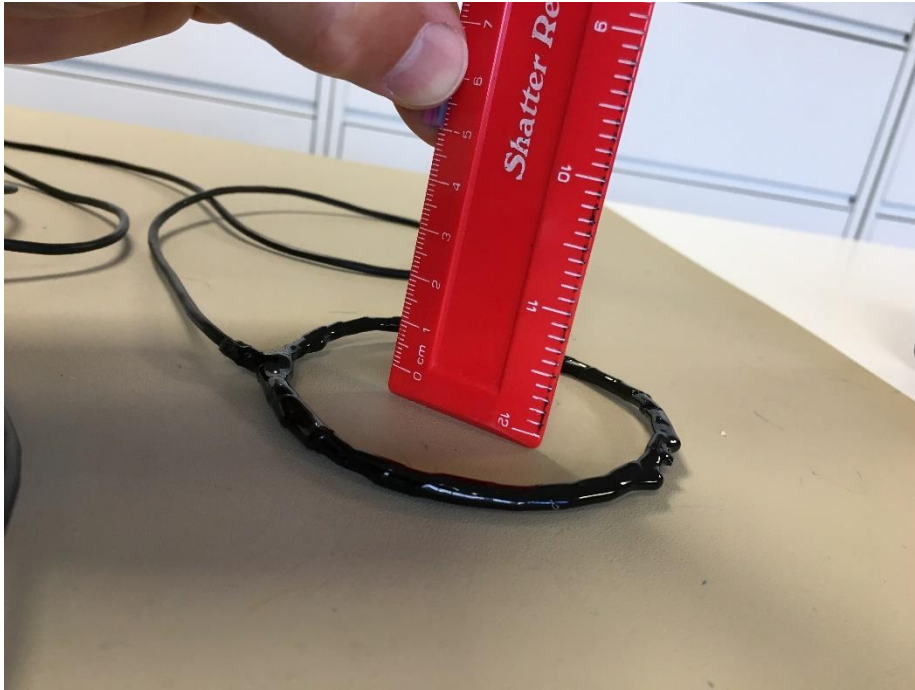
**BACK**

[Home](#)   [Firmware Upload](#)

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- Now if you use a ruler and a test tag as shown below, you can lower the tag slowly a few mm at a time until you see the tag ID appear in one of the antenna tag ID lines on the screen. You can then see the range by reading the ruler and do the same for the other antenna if it is a 2-antenna system. (The tag ID will flash intermittently because the default polling is 0.25 seconds and the ignore last tag timeout is 1 second.)  
 These tag readings will not be stored in a file for download because the WiFi is powered up. **Tag detections are only stored when the WiFi is off, just like in normal detect mode out in the field. If you wish to check on the bench file creation and download of a tag detection file, you will need to power off the WiFi, insert some tags one at a time into the range of an antenna, then after a few detections power up the WiFi again, connect to it and do a file download.**



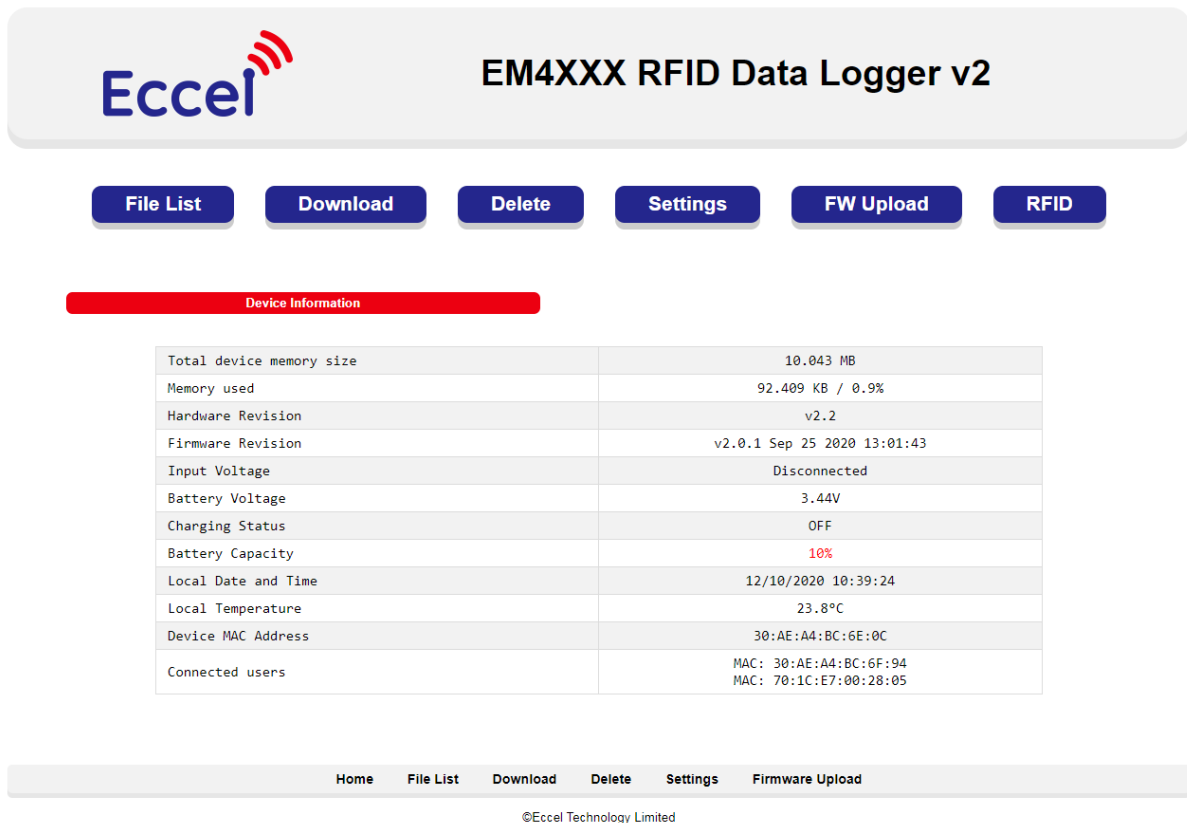




## Setting Up the Datalogger System

You need to connect to the “Logger XX:XX:XX” wireless network in your list of available networks.

Here you can see temperature of the unit, battery status, whether it’s charging etc. You can also select one of the sub menus to download tag detection data files using either the “file list” or “download” options.



The screenshot shows the web interface for the EM4XXX RFID Data Logger v2. At the top left is the Eccel logo. The main title is "EM4XXX RFID Data Logger v2". Below the title are six navigation buttons: "File List", "Download", "Delete", "Settings", "FW Upload", and "RFID". A red bar labeled "Device Information" is visible. Below it is a table with device details. At the bottom, there is a navigation bar with links: "Home", "File List", "Download", "Delete", "Settings", and "Firmware Upload". The footer contains the copyright notice "©Eccel Technology Limited".

Device Information	
Total device memory size	10.043 MB
Memory used	92.409 KB / 0.9%
Hardware Revision	v2.2
Firmware Revision	v2.0.1 Sep 25 2020 13:01:43
Input Voltage	Disconnected
Battery Voltage	3.44V
Charging Status	OFF
Battery Capacity	10%
Local Date and Time	12/10/2020 10:39:24
Local Temperature	23.8°C
Device MAC Address	30:AE:A4:BC:6E:0C
Connected users	MAC: 30:AE:A4:BC:6F:94 MAC: 70:1C:E7:00:28:05

You can also delete the files on the unit when finished with downloading and storing them to free up memory.

We recommend removing files after download because a full memory will slow down the data store process and in consequence increase power consumption and discharge the battery more quickly .

# EM4XXX RFID Data Logger v2

## Device Settings

Date and time	<input type="text" value="rrrr-mm-dd --:--"/> <div style="font-size: small; margin-top: 2px;">Example: 2020-07-30T15:05</div>
Polling rate	<input type="text" value="0.10"/> [s]
Night time <input type="checkbox"/>	<input type="text" value="07:00"/> start <input type="text" value="12:00"/> stop
Ignore TAG with the same ID for:	<input type="text" value="5"/> [s] Range from 1 to 3600 seconds

**Submit**

- Home
- File List
- Download
- Delete
- Settings
- Firmware Upload

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There are four main settings options in Logger unit:

1. Data and time.

Here you can set date and time. We recommend using Chrome, Opera or latest Edge web browsers which enables easy date and time configuration form the menu like below:

Device Settings

Date and time	<input type="text" value="dd/mm/yyyy --:--"/> <div style="font-size: small; margin-top: 2px;">           August 2020 <span style="float: right;">↑ ↓</span> <table style="float: right; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">16</td> <td style="border: 1px solid black; padding: 2px;">24</td> </tr> </table> </div>	16	24
16	24		
Polling rate	<input type="text" value="0.10"/> [s]		
Night time <input type="checkbox"/>	<input type="text" value="07:00"/> start <input type="text" value="12:00"/> stop		
Ignore TAG with the same ID for:	<input type="text" value="5"/> [s] Range from 1 to 3600 seconds		

**Submit**

In Safari, Firefox or Internet Explorer web browsers date and time must be set manually in proper format: yyyy-mm-ddThh:mm for example: 2020-07-30T15:05

2. Polling rate.

Important setting for power consumption and tag activity detection.

For highest detection rates it must be set to 0.1 second but at this setting current consumption is also highest.

Available options:

Device Settings

Date and time	dd/mm/yyyy --:--	
	<small>Example: 2020-07-30T15:05</small>	
Polling rate	0.10 [s]	
Night time <input type="checkbox"/>	0.10	start 12:00 stop
Ignore TAG with the same ID for:	0.25	
	0.50	
	0.75	
	1.00	
	2.00	
	5.00	

Submit

3. Night time

Enables the user to set a repeat daily period where study animal activity is lowest or zero to reduce battery discharge rate and achieve longer battery operation before recharging is required.

To enable this feature, the checkbox must be set first and then hours of start and end times. For example:

Device Settings

Date and time	06/08/2020 16:43	
	<small>Example: 2020-07-30T15:05</small>	
Polling rate	0.10 [s]	
Night time <input checked="" type="checkbox"/>	22:00 start	04:00 stop
Ignore TAG with the same ID for:	3666 [s]	<small>Range from 1 to 3600 seconds</small>

Submit

4. The final setting enables users to set a time when any same tag discovery will be ignored.

Correct values are in range from one second to 3600 seconds (1 hour).

If an invalid value is set, the user will see the notification:

Ignore TAG with the same ID for:	3666 [s] <small>Range from 1 to 3600 seconds</small>
----------------------------------	--

Value must be less than or equal to 3600.

Once you have finished setting up the system and downloading files etc, the Wi-Fi can be turned off to conserve battery life.

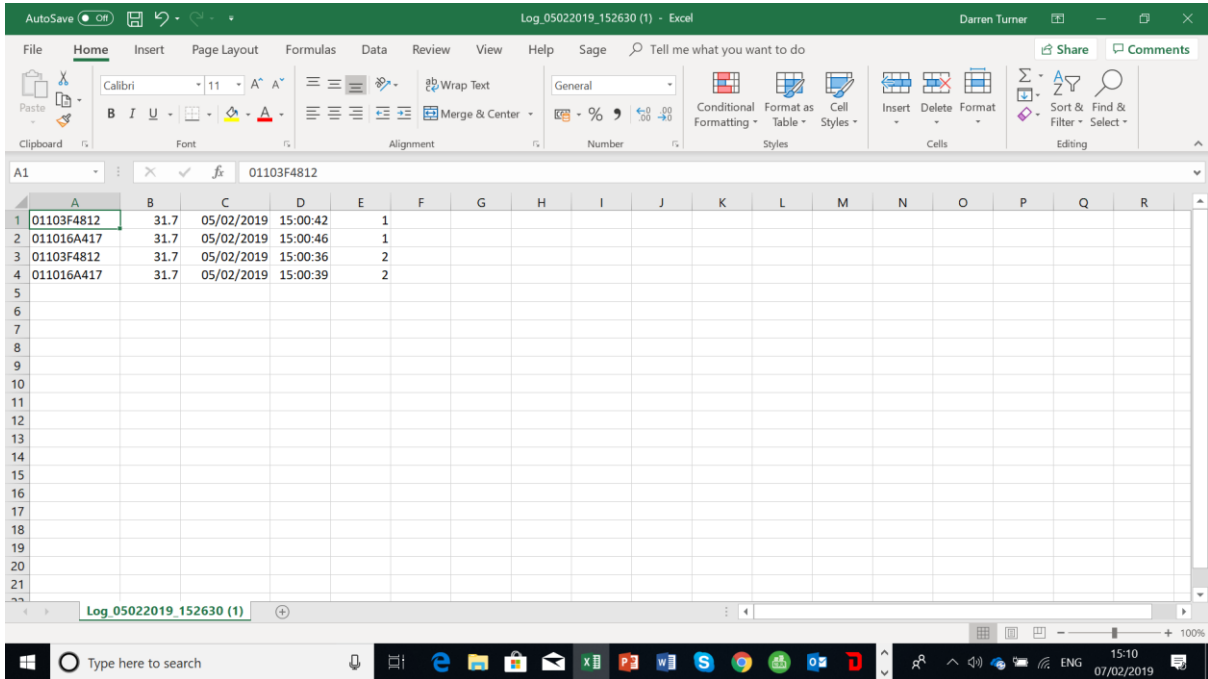
This can be done by pressing and holding the button on the datalogger unit for at least 3 seconds. The LED will go out to show that the Wi-Fi is off. Alternatively, if there is no activity on the Wi-Fi for 10 minutes, it will switch itself off. So, holding the button on the datalogger for approximately 3 seconds, toggles the Wi-Fi on the units on/off.

In operation, the datalogger unit itself can be updated and downloaded without having to take away the RFID unit. This enables “hot swap” of datalogger/battery units in the field meaning no downtime on detecting activity.

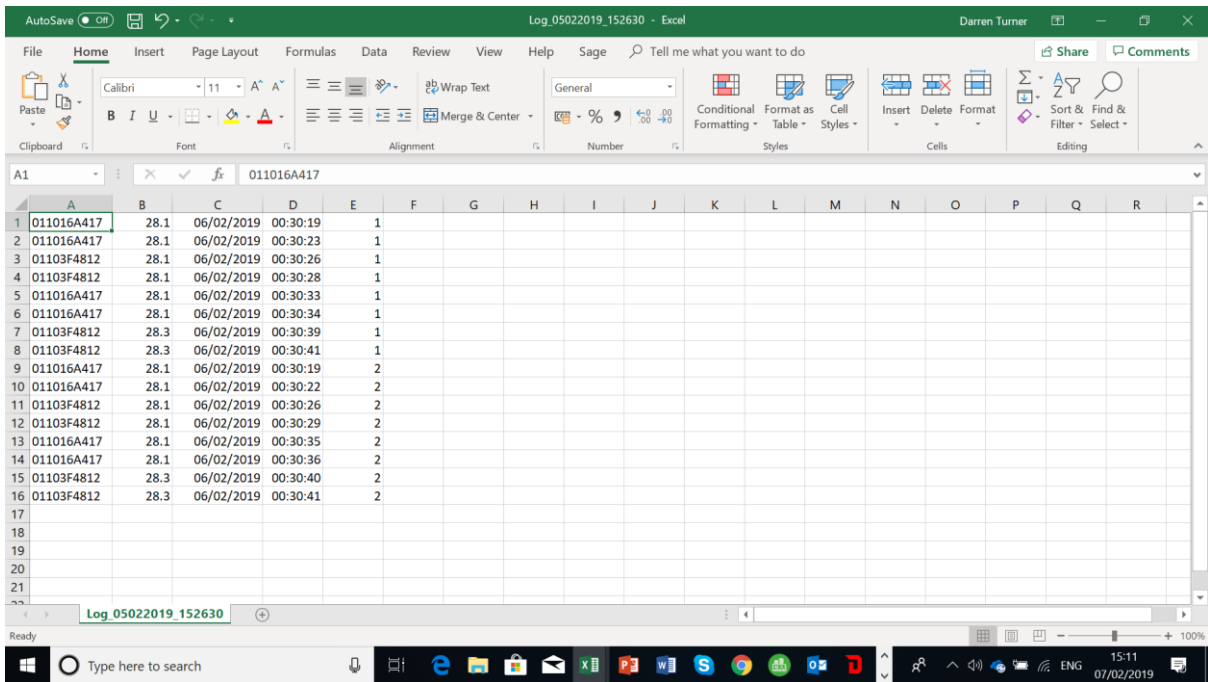
In order to make sure that all detections are transferred to the datalogger unit from the small amount of temporary memory in the RFID unit, the user should power up the Wi-Fi by pressing the button on the datalogger unit for 3 seconds BEFORE disconnecting the datalogger unit from the RFID unit. Once the LED illuminates, any data on the RFID unit will have been transferred to the datalogger unit. The user can then download the data in situ if he is not removing the datalogger unit for recharging (if there is still plenty of battery life left). The user should then power down the Wi-Fi by pressing the button for approximately 3 seconds and seeing the LED switch off. Then the datalogger unit can be disconnected and swapped out or left to run as required. If taken away, the datalogger can then be downloaded by pressing the button for approximately 3 seconds to power up the Wi-Fi.

As soon as the RFID unit is connected to a powered datalogger unit, the system begins to look for tag presence and record it when it has any EM4XXX tag present in range.

Here are a couple of screenshots of test CSV files viewed with Microsoft Excel:



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	01103F4812	31.7	05/02/2019	15:00:42	1													
2	011016A417	31.7	05/02/2019	15:00:46	1													
3	01103F4812	31.7	05/02/2019	15:00:36	2													
4	011016A417	31.7	05/02/2019	15:00:39	2													
5																		
6																		
7																		
8																		
9																		
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18																		
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20																		
21																		



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	011016A417	28.1	06/02/2019	00:30:19	1													
2	011016A417	28.1	06/02/2019	00:30:23	1													
3	01103F4812	28.1	06/02/2019	00:30:26	1													
4	01103F4812	28.1	06/02/2019	00:30:28	1													
5	011016A417	28.1	06/02/2019	00:30:33	1													
6	011016A417	28.1	06/02/2019	00:30:34	1													
7	01103F4812	28.3	06/02/2019	00:30:39	1													
8	01103F4812	28.3	06/02/2019	00:30:41	1													
9	011016A417	28.1	06/02/2019	00:30:19	2													
10	011016A417	28.1	06/02/2019	00:30:22	2													
11	01103F4812	28.1	06/02/2019	00:30:26	2													
12	01103F4812	28.1	06/02/2019	00:30:29	2													
13	011016A417	28.1	06/02/2019	00:30:35	2													
14	011016A417	28.1	06/02/2019	00:30:36	2													
15	01103F4812	28.3	06/02/2019	00:30:40	2													
16	01103F4812	28.3	06/02/2019	00:30:41	2													
17																		
18																		
19																		
20																		
21																		

- Column A is the tag ID.
- Column B is the temperature in the RFID unit.
- Column C is the date. (dd/mm/yyyy).
- Column D is the time (hh:mm:ss).
- Column E is the antenna number.

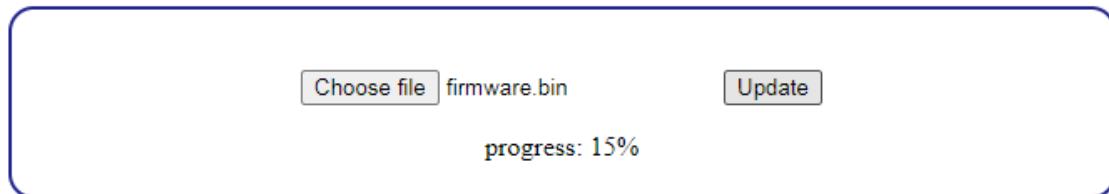
**ECCEL TECHNOLOGY LTD (T/A IB Technology), 198 Station Road, Glenfield, Leicestershire , LE3 8GT, UK**

TELEPHONE N.: +44 (0)1296 821358, EMAIL: [sales@eccel.co.uk](mailto:sales@eccel.co.uk), [www.eccel.co.uk](http://www.eccel.co.uk), VAT No: GB 928 2439 07, Registered in England: 5614911

Director: D J Turner

## Upgrading firmware

On both the datalogger/battery unit and the RFID unit the firmware upgrade procedure is the same. Click on the FW Upload button and select bin file provided by Eccel



Next click on the Update button.

After a while the unit should be updated.

**If the update process hangs at some point, please wait for 30 seconds and try again.**

For RFID and Logger units there are separate bin files since v2.0.1 firmware.

**Please make sure that the RFID unit is upgraded first.**

## Connecting an external Power Bank

For users who expect longer time of work from the battery it might be a solution to use an external Power Bank.

Please just make sure that the output voltage from the Power Bank is in recommended range of 4.5 – 5.5V.

Simply connect the external power bank into the datalogger/battery unit via the mini USB connector.

Beware that with the cap now unscrewed, this connector is no longer waterproof to an IP68 rating. You must take steps to provide the required water ingress protection to the USB charge connector if you do this.