Rochester Sensors™

Engineering Innovative Solutions™

TEK 880 LTE Radar level Sensor

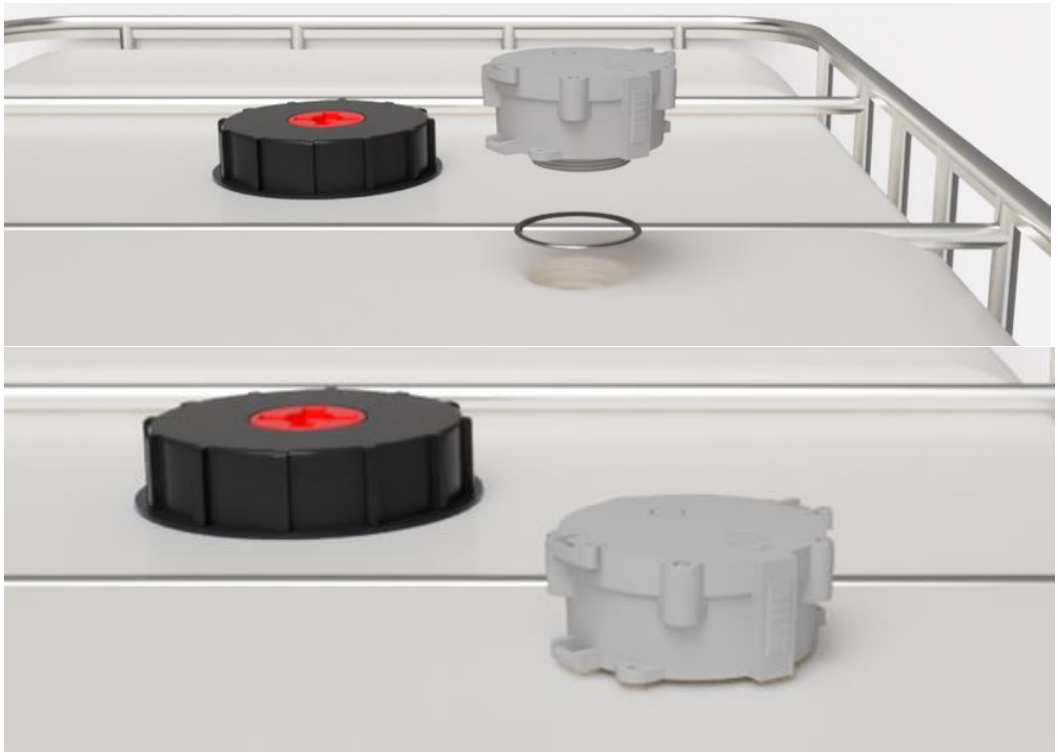
Installation Guide

1. Installation / user guide of the TEK 880 Radar device

This document provides guidance of the physical installation of the TEK 880 Radar device and how to connect to and activate the sensor.

The TEK 880 Radar level measurement sensor uses high frequency radar pulses to determine the ullage distance (or headspace) in a tank, by measuring the time of flight from the bottom of the device to the surface of the liquid. The tank % full volume can be inferred from this figure. This sensor has Bluetooth communication module (BLE 5.0) module to provide for easier setup and activation via a cell phone iOS or Android application.

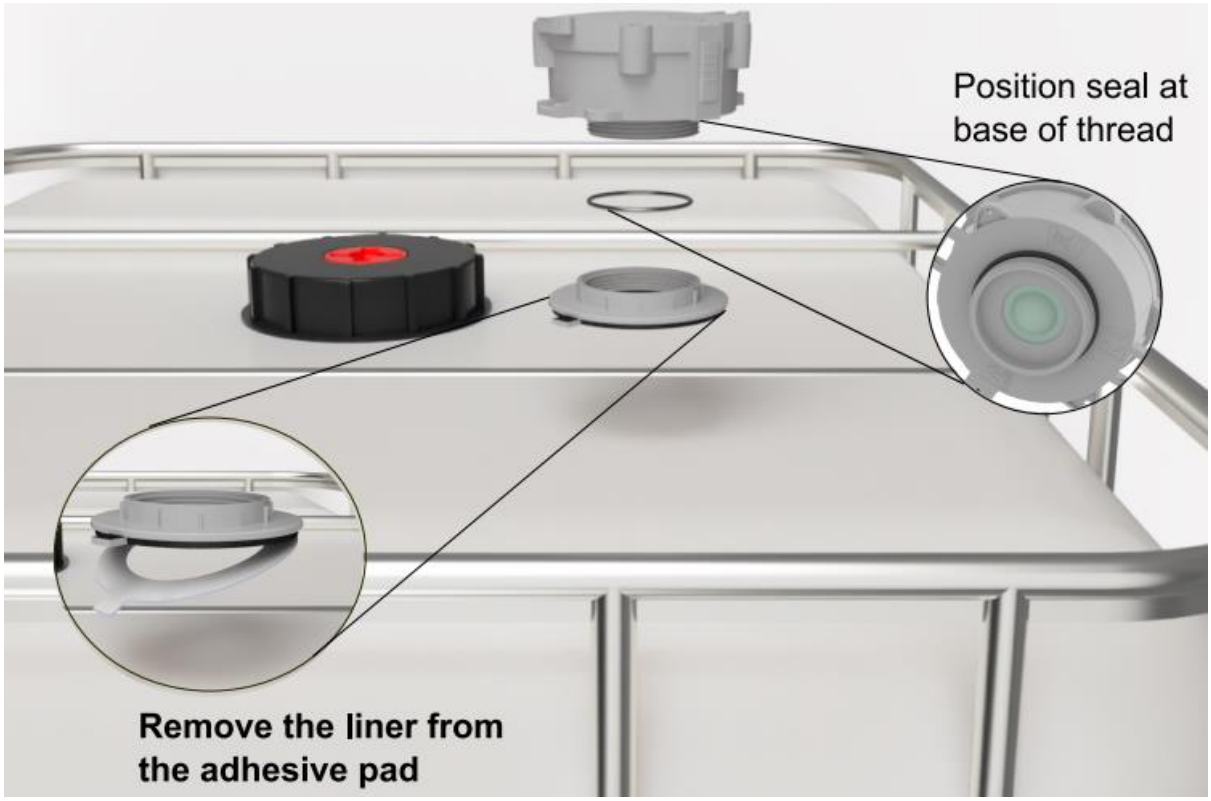
Invasive installation
TEK 880 device has a 2" BSP threaded opening to allow it to be screwed into an existing 2" opening of a tank. An O-ring is supplied and should be used to ensure a watertight seal.



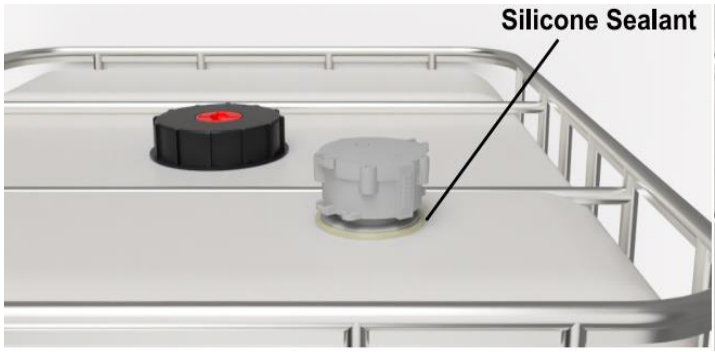
Non-invasive installation
Plastic tanks allow a non-invasive installation as an option. It is used where either a mounting hole is unavailable or where it is undesirable to cut a mounting hole in the tank. It involves installing an adapter on the top surface of the tank and mounting the sensor on this adapter.
Note - *this option only applies for non-metallic, or tank made from materials which do not block the passage of a radar signal.*
The tank area where the non-invasive adapter is to be installed should be clean, free of grease or water and dry. The adapter (with the liner removed) is mounted onto the tank and firmly pressed down to form a good seal with the tank.
The TEK 880 device is threaded and screwed onto the adapter firmly to make a good seal. The O-ring shown below seals the non-invasive adapter to the bottom of the sensor main enclosure (the O-ring is positioned on the 2" thread).

It is important to ensure that water or any other substance does not ingress inside the cavity formed by the adapter and the sensor enclosure.
The location of the non-invasive mounting should be carefully chosen to avoid internal obstacles and other obstructions that would interfere with the radar signal reaching the internal contents of the tank.

Notes: The maximum recommended plastic wall thickness for non-invasive mounting is 10mm. The radar sensor signal ullage measurement will also show an offset due to the radar signal transit time through the plastic.
The sensor should not be installed in a location where standing pools of water are to be expected.

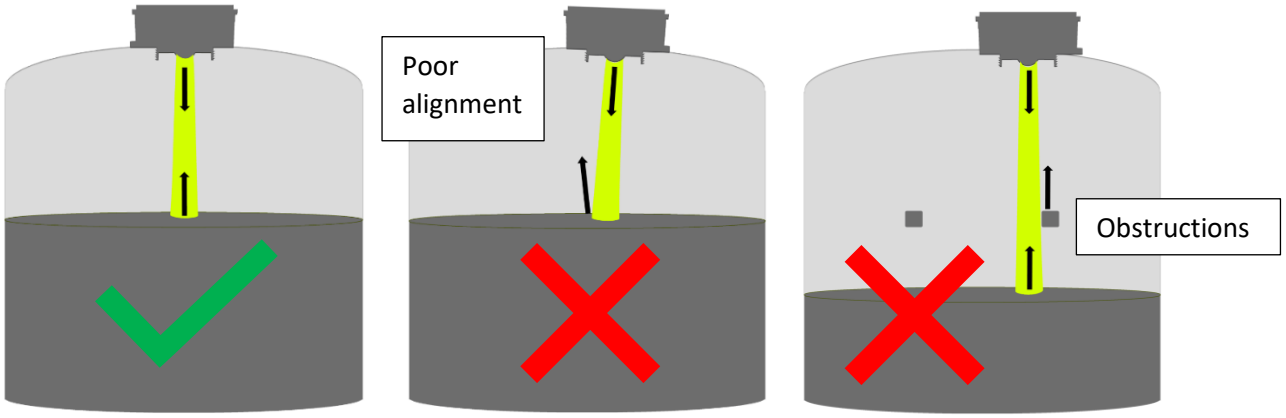


Note - It is recommended, especially in cases where water can temporarily lodge near one side of the sensor, to add waterproof sealant near that side of the unit. The result should look as follows. Note: this should **not be** added around the full circumference of the unit.



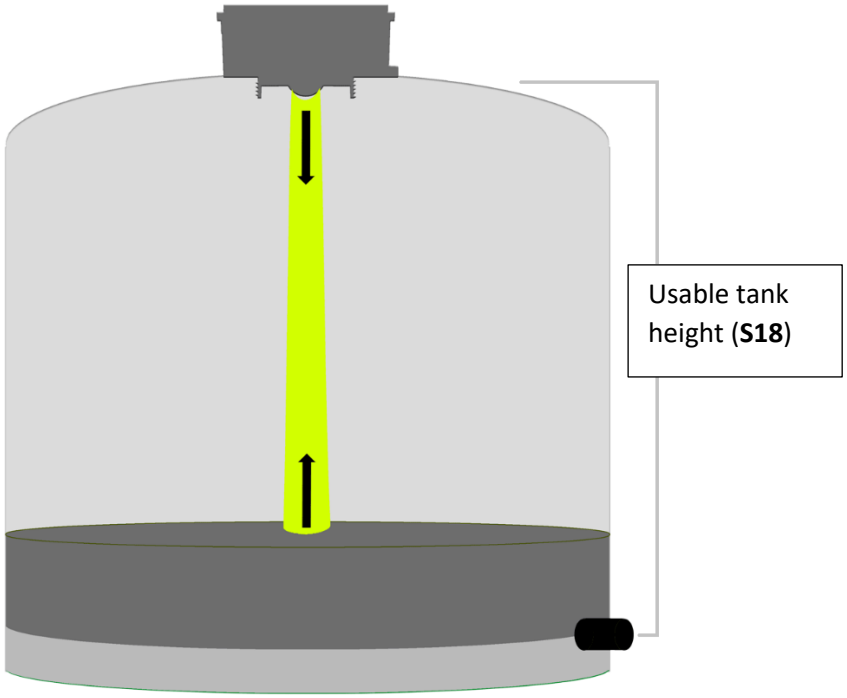
Sensor mounting

The mounting position of the TEK 880 device is important for best results. The sensor should be mounted horizontally with a direct view of the liquid inside the tank without any obstructions. It should also not be mounted too close to the edge or near metallic objects. Please also see Appendix. Once the sensor is installed on a tank – the next steps will involve waking the sensor from dormant mode and starting communications and making measurements.



Once the sensor is mounted, it is important to carefully measure the usable tank height. This is because the radar sensor needs to know the overall scanning distance to protect the battery and prevent any erroneous reflections from pooling water from being generated.

The installation engineer should take a measurement from the underside of the sensor to the lowest level of the usable liquid (typically the tap/outlet).



2. TEK 880 Sensor activation:

A magnet is supplied with the device to activate and start cell module communications with the internal Bluetooth communication module (BLE) module. The magnet is held over the Tekelek Logo 'hotspot' for approximately 2 seconds until a double-beep repeating approximately every second is heard from the internal beeper. The magnet is then removed.

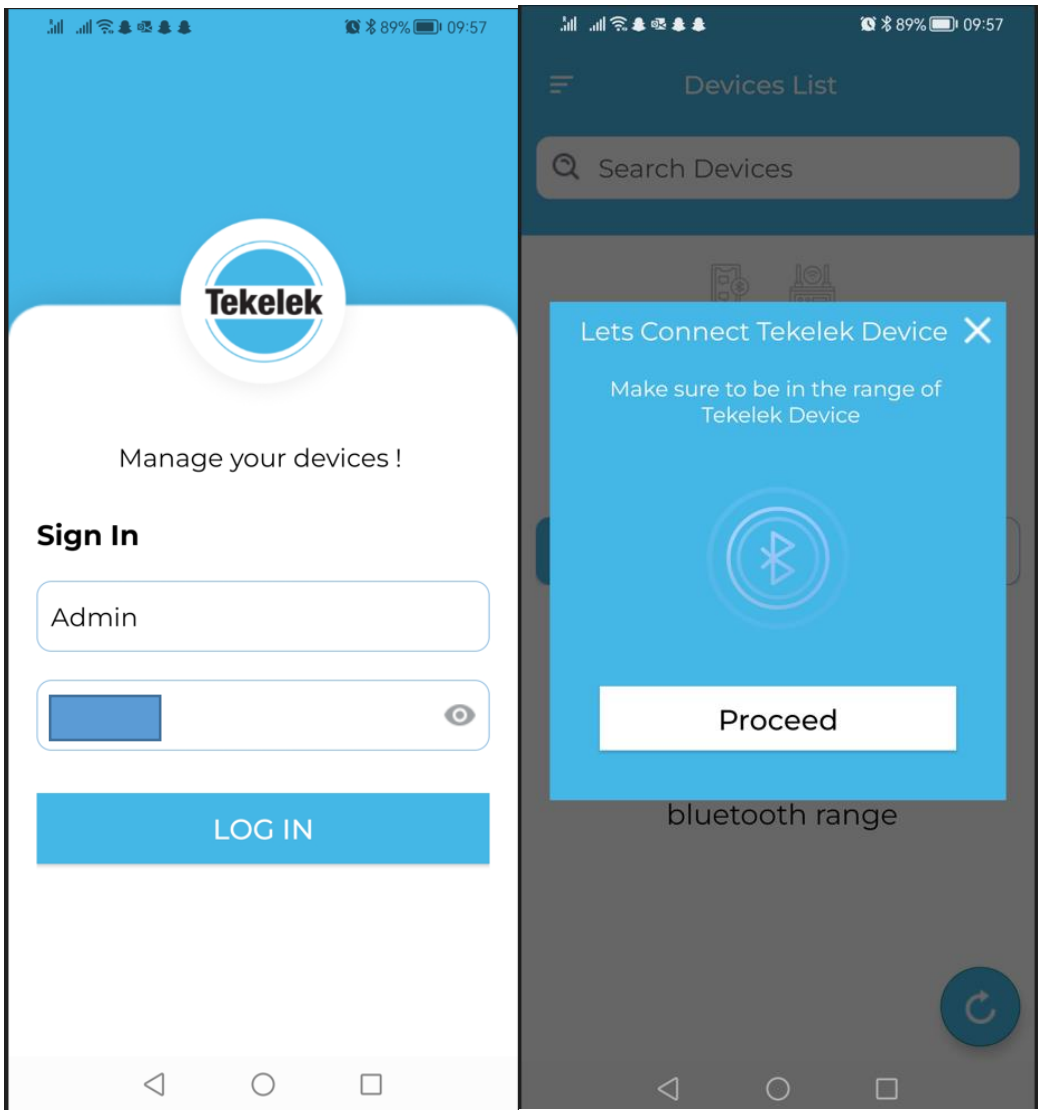
Note -
If a Bluetooth device is not available, then the magnet can be held to the 'hotspot' for approximately 5 seconds.

The sensor will activate, make a measurement, and connect to the pre-set endpoint server to drop the data. The unit will respond a series of beeps from the internal buzzer to indicate the sensor status (refer to User manual for further detail). This may take a few minutes to execute, depending on the local LTE network. The sensor will then return to sleep mode until the next scheduled communication is due to occur.

However key parameters such as the tank height will need to setup on the device via the endpoint server and use of an BLE interface is strongly recommended.

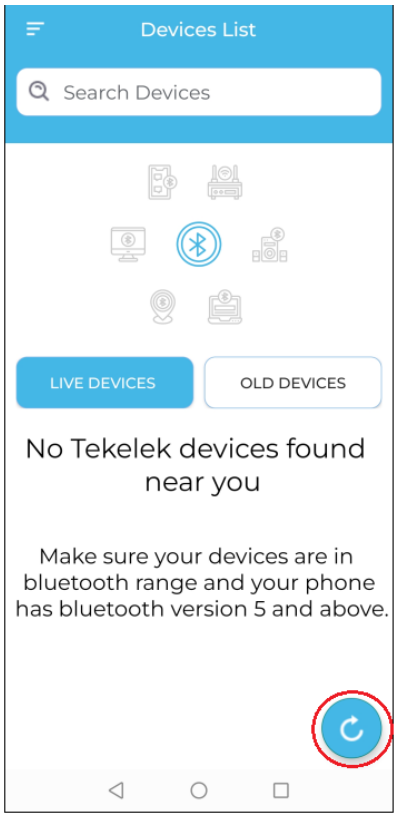
3. TEK 880 Bluetooth (BLE) sensor communication

The TEK 880 sensor has a BLE 5.0 module and requires an appropriate cell phone that is compatible and has Bluetooth turned on.
Once the sensor is in Bluetooth advertising mode (via magnet). Start the 'Tekelek Radar App' (iOS or Android as required). Using the provided login details, please login as shown below.

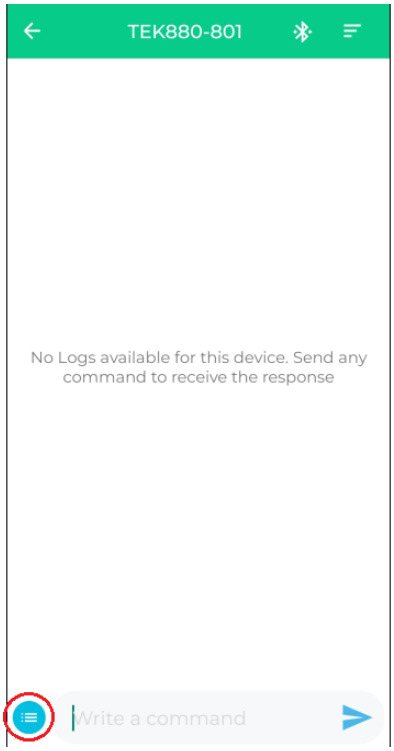


The devices list screen should appear.
Click on the refresh button or Scan devices button to show the list of local BLE devices as shown below.
Then select the TEK 880 sensor that you wish to connect to (highlighted in yellow below).
Note *- the TEK 880 sensor high tone (double) beeping will cease to indicate that the cell phone and TEK 880 are connected.*

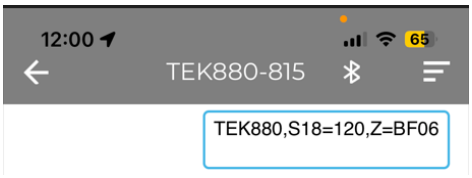
Note – *You may be prompted to enable some permissions such as Location Services in order to use the app.*



The Tekelek BLE app should connect to the TEK 880 sensor and display a screen similar to below (A green header indicates an active connection). This is the main display for the communication between the Tekelek phone app and the TEK 880 Radar unit and shows the interactions between the two devices.

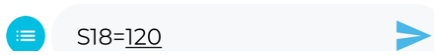


If the TEK 880 sensor bluetooth module times out then the screen header will change to a grey color to indicate that it is no longer connected.

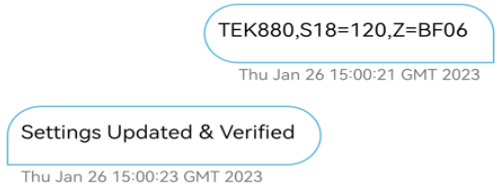


The installation sequence is as follows:

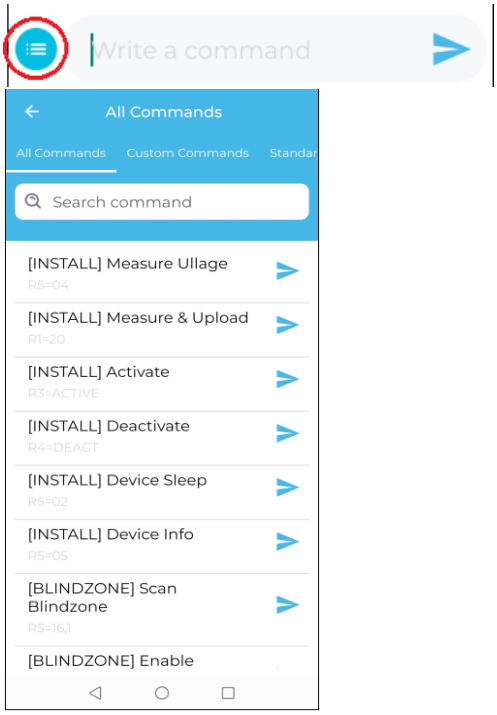
a) The tank height by default is 100cm. This is the height from the base of the TEK 880 sensor to the base of the tank or outlet height. If the tank on which the TEK 880 sensor is to be installed has a different height, then this needs to be correctly set before moving on to the next steps.
To perform this – enter command S18 = xxx cm; example below shows setting tank height to 120cm and click send.



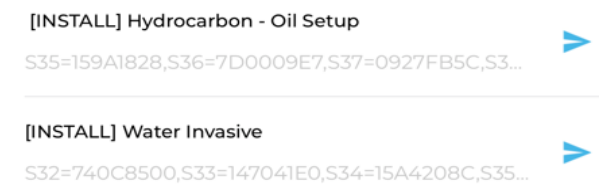
The sensor should acknowledge the command as shown in response.



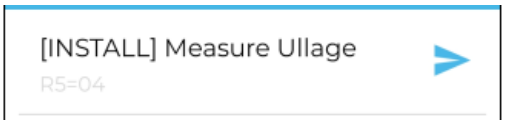
Next, click on the list button at the bottom of the main screen (button circled in red) to see the Command list of action. The command list screen should appear (scroll down to see the full command list).



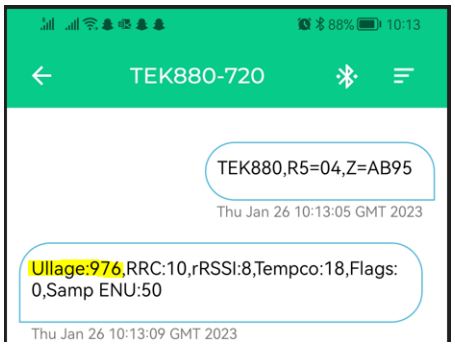
b) Select the correct liquid type and setup to be measured. The sensor uses a series of internal settings /coefficients that optimise its performance for different liquid types. In the example shown below the installer can select “Hydrocarbon - Oil Setup” from the command list to indicate to the sensor that these internal coefficients should be used.
Non-invasive mounting may also have additional settings that apply for aqueous or water-based liquids. Please check the appropriate [INSTALL] Command List that applies to the specific installation.



c) Select the “Measure Ullage” and make an ullage measurement.

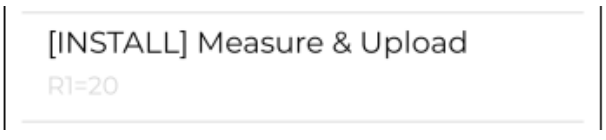


Confirm that this measurement is approximately correct. Note: the highlighted section below is the ullage in mm. Note: RRC should be in the range 8 – 10 and RSSI should be > 6. See appendix for more details.



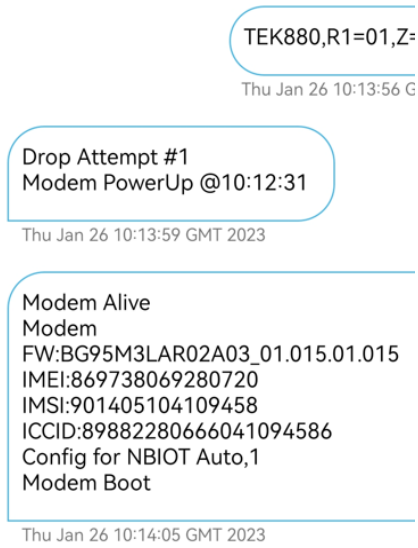
If the ullage value is not correct; then please review the installation and mounting of the sensor to ensure there are no obstructions and that the sensor is mounted horizontally.

d) The next step is to connect the sensor to the end-point server and make a data drop.

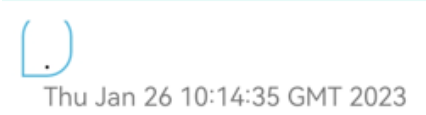


This may take up to 5 minutes to complete for a new installation.
During this time, the sensor will activate the modem and begin the process of establishing a TCP connection. Typically, this occurs over NB-IoT or CAT-M connections depending on your region. If this network connectivity is poor, then the sensor may revert to 2G.

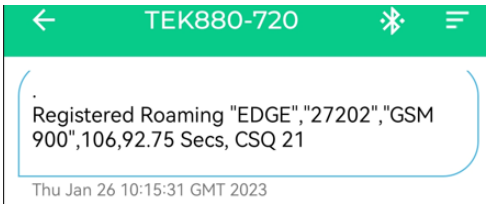
A series of messages will appear on the terminal indicating the progress.



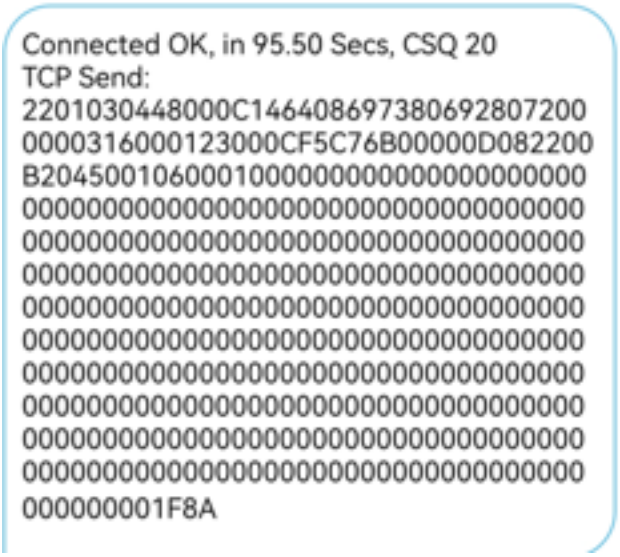
The module responds with multiple …



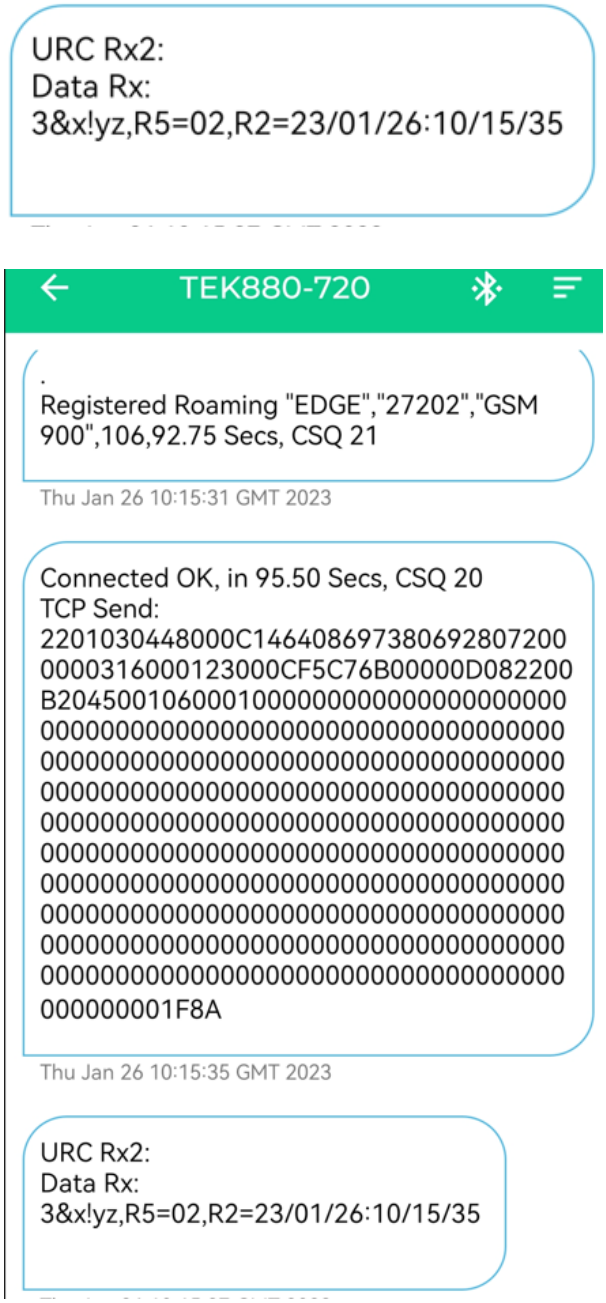
The sensor will register to the network.



It should then send its data to the server.

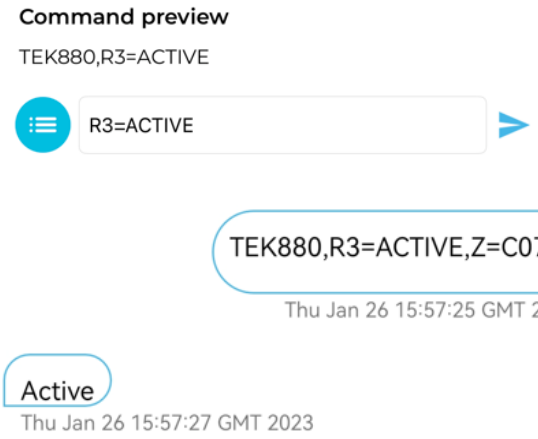


The “Data Rx” received, indicates that the server has received the message and replied with a RTC (real time clock) update to synchronise the sensor to the network time.



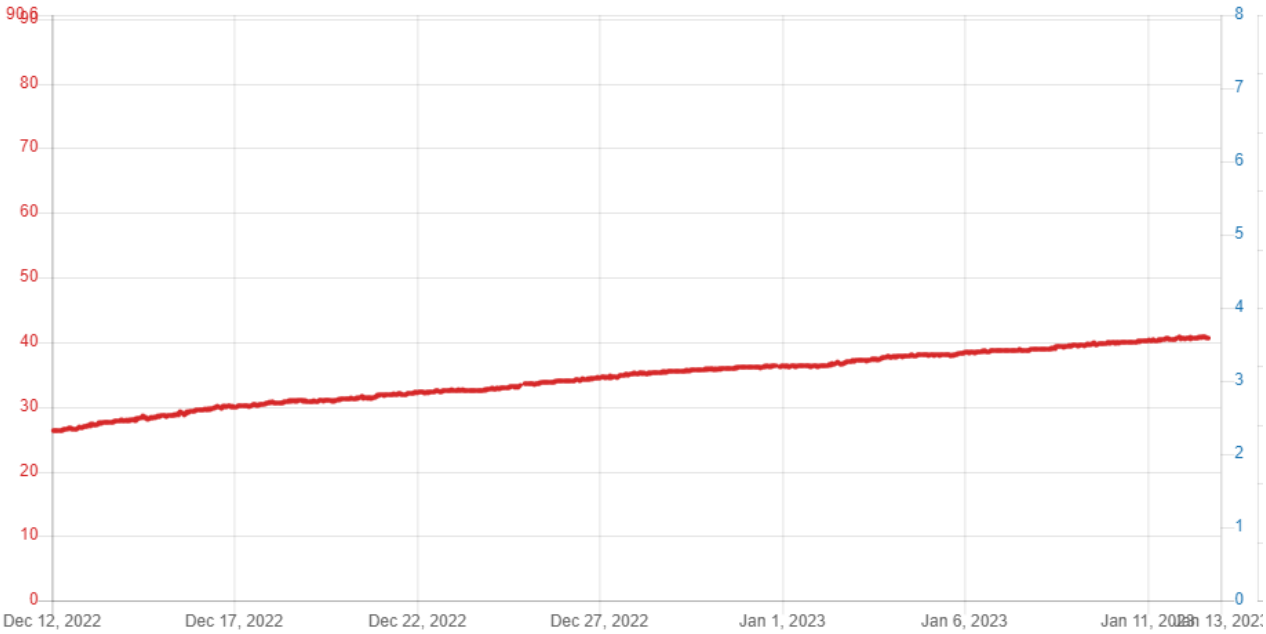
If there are problems at this stage, then the network strength may need to be checked to ensure that there is an adequate signal available.

e) If everything is OK, then the final stage is to activate the unit so that it continues to dial in.



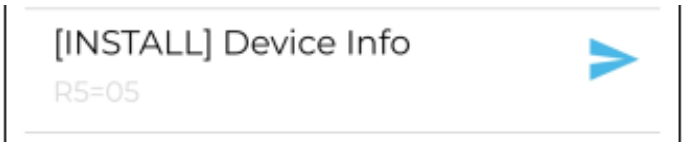
Once this command is complete, then the unit is installed and is correctly communicating with the server and will return to sleep until the next scheduled dial-in.

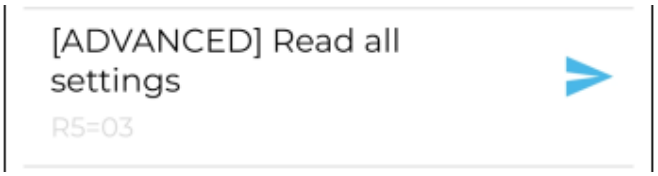
An example below shows the Tekelek server reporting the ullages received from a sensor over a period of a month.



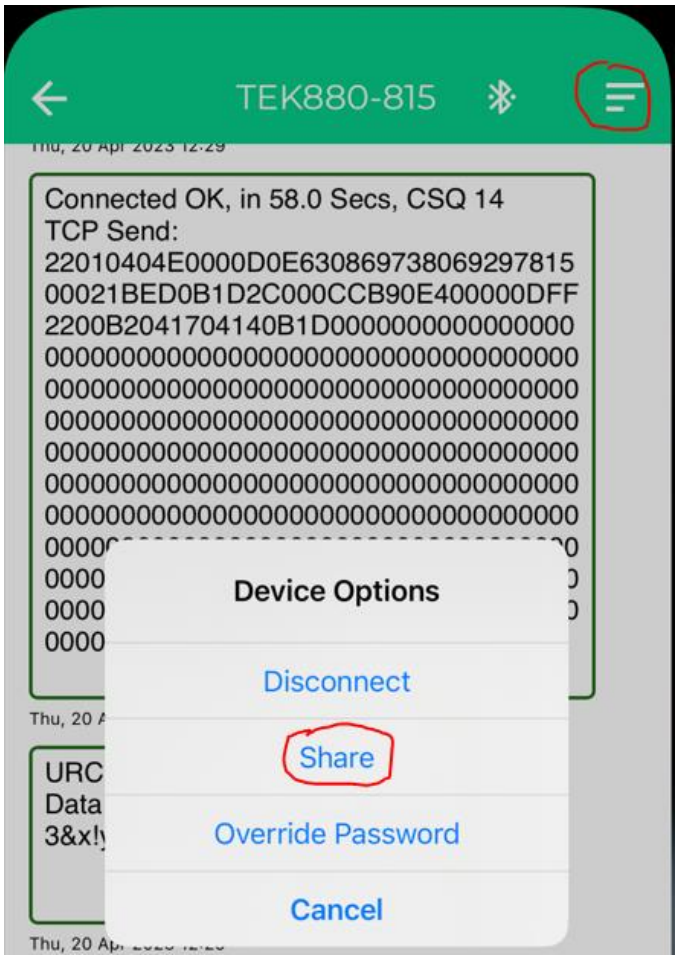
4. TEK 880 Error Handling

For installation cases where the sequence of events as previously described does not occur. Some debugging support may be required. The root cause may be server, connectivity or other issues. To expediate support it can be useful to send the screen logs to Tekelek support for further assistance.
Executing the commands below should be performed and added to the log to assist debugging.





To create the text log file – select the right-hand tab and select share to get a list of options to share the resultant file.



APPENDIX*:*

1. Signal diversion of the radar unit – typically 8 … 10◦.

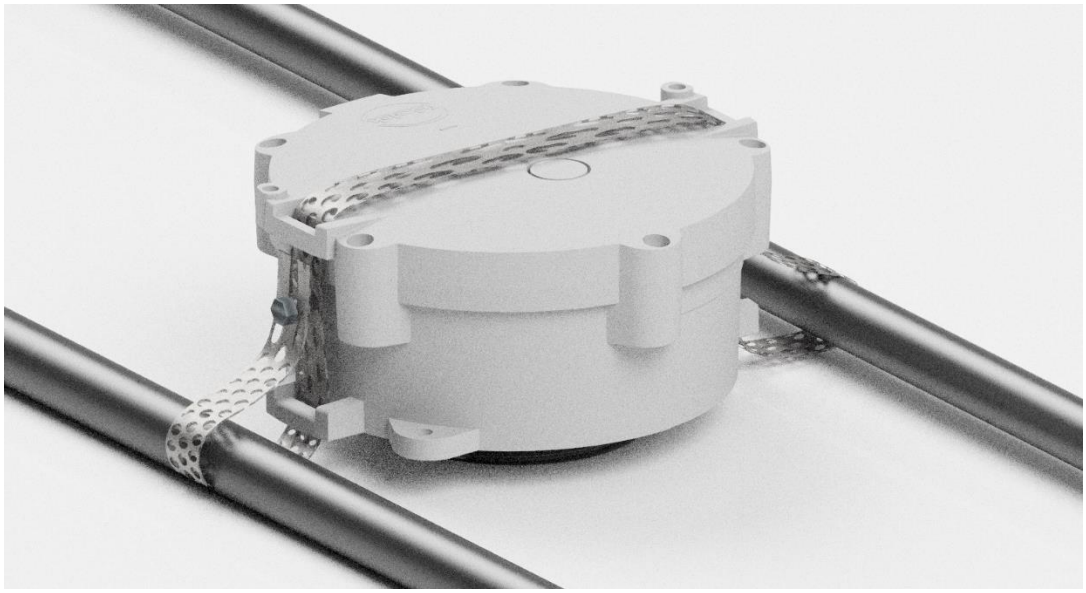
2. The radar mounting position should be positioned to avoid internal obstacles or adjacent to metal parts of tank supports.

3. For metal tanks – setting the tank height is important to avoid picking up reflections off the tank bottom or objects beneath the tank.

4. The sensor should not be mounted at an angle as this gives incorrect readings. On tanks with no available flat surfaces – the use of silicone acting as a levelling compound with the non-invasive adapter can be considered. Consult factory for advice.

5. In step **c**) of the installation above. RRC and RSSI are referenced. These refer to **R**adar **R**esult **C**ode and **R**adar signal strength. These refer to the quality of the measurement and generally are a guide to the installation. Refer to the 9-6251 User guide.

6. There are other methods to fix the TEK 880 sensor to the tank. These include strapping or screwing into position on top of tank. The example below shows a TEK 880 Radar sensor mounted onto a cage around a plastic tank.



CONDITIONS OF USE:

Note: this sensor operates with the following conditions:
Standard temperature range of: -25℃ ….. +50℃ .
The sensor is rated to IP 68. Humidity 10 – 100%.

Notes: for Condition of Use:

1. If the equipment is not used in a way intended by the manufacturer, its safety may be impaired.
2. There are no user serviceable parts. Equipment should be returned to the manufacturer in case of a malfunction.
3. The battery back can be replaced ***only*** by Tekelek P/N: 4-5485. The sensor should be removed from an ATEX Zone prior to battery replacement. The lid should be unscrewed, and the battery tab carefully pulled out from the PCB connector and the new battery inserted into the enclosure battery slot and plugged back into the battery connector. Please take care not to disturb the O-ring which provides ingress (water) protection. A detailed instruction guide is available on request.
4. Please observe the ATEX regulations of safe use.