USERS MANUAL

NEXAWAVE VIBRALINK

Model EWN-01/05/10V

TUNNELS   HYDROELECTRIC   CONSTRUCTION   STRUCTURAL   METRO & RAIL   BRIDGES   MINING

Encardio-Rite Group - India | Bhutan | Bahrain | Qatar | Saudi Arabia | UAE | Peru | Greece | Spain | UK | USA

Encardio-Rite Electronics Pvt. Ltd. A-7,Industrial Estate, Talkatora Road, Lucknow, UP-226011, India | geotech@encardio.com | www.encardio.com

CONTENT

CONTENT

To make the manual more useful, we invite valuable comments and suggestions regarding any additions or enhancements. We also request you, please let us know of any errors that are found while going through the manual.

NOTE: Installation personnel must have a background of good installation practices and knowledge of fundamentals of geotechnics. Novices may find it very difficult to carry on installation work. The intricacies involved in installation are such that even if a single essential but minor requirement is ignored or overlooked, the most reliable instruments will be rendered useless.

           A lot of effort has been made in preparing this instruction manual. However, best instruction manuals cannot provide for every condition in a field that may affect the sensor's performance. Also, blindly following the instruction manual will not guarantee success. Sometimes, depending upon field conditions, installation personnel will have to consciously depart from written text and use their knowledge and common sense to find solution to a particular problem.

NOTE: The sensor is normally used to monitor site conditions and will record even a minor change that may affect behaviour of structure being monitored. Some of these factors amongst others, are, seasonal weather changes, temperature, rain, barometric pressure, nearby landslides, earthquakes, traffic, construction activity around site including blasting, tides near sea coasts, fill levels, excavation, sequence of construction and changes in personnel etc. These factors must always be observed and recorded as they help in correlating data later on and also may give an early warning of potential danger or problems.

2   GENERAL DESCRIPTION

2.1   Model EWN-01/05/10V Vibrating wire node

Model EWN-01/05/10V wireless vibrating wire node consists of a small, self-contained unit equipped with a sensor module that excites the vibrating wire sensor and reads the resonance frequencies, a radio-transceiver with an antenna, a processor that controls the two modules, and a power source.

The VW node collects the sensor data and transmits it wirelessly to Gateway. The unit is mounted inside a compact, weatherproof enclosure. The data is transmitted through the long-range (LoRa), low-power radio frequency network to the Gateway without any signal degradation.

The Node is available in variants to connect a single (model EWN-01V) to five (model EWN-05V) or ten (model EWN-10V) sensors with an inbuilt thermistor. The complete range of vibrating wire sensors can be connected to a wireless Node, including:

- Piezometers and water level sensors

- Strain gages

- Pressure cells

- Temperature meters

- Displacement sensors, extensometers, crack meters, joint meters

- Settlement monitoring sensors

Depending on site requirements, the nodes can be configured to scan and transmit data at any frequency between 2 minutes to 2 hours. The system automatically mitigates well-known wireless problems like signal blockages and interference, allowing the sensors to send their data to the Gateway every time. Every radio transmission in the system is secured using AES-128 encryption to maximize the security of the sensor data gathered by the system.

2.2   Model EWG-01 gateway

Encardio-rite model EWG-01 wireless gateway is the main networking hardware, which uploads data gathered from all the VW nodes (connected to vw geotechnical sensors) to the Encardio-rite cloud server or a third-party server. In addition, it passes control messages through the network to ensure seamless operation.

The Gateway is ideally installed at a location with the cellular network, in line of sight of the installed nodes. It serves as an exit point/central hub for wireless data obtained from the sensors as the readings pass through or communicate with the Gateway before being routed to an FTP or cloud server.

2.3   System components

Provided by Encardio-rite

- Model EWN-01V- Wireless vibrating wire node with antenna

- Model EWG-01 Gateway with antenna

- Gateway and Node mounting accessories

- RS-232 Bluetooth modem/ USB to RS-232 FTDI cable

- Application software for Android Smartphones

- Application software for Windows

To be arranged by the Client

- Laptop or Android Smartphone

- Activated data SIM card (for Gateway)

- D-Cell Li-SOCl2 3.6 V 14.5 Ah batteries nominal Voltage - 2 no. per Node and 2 no. for Gateway

- Power supply unit 9-30 V, 1 A for Gateway (12 V, 1 A power supply readily available can be used)

3   TECHNICAL SPECIFICATION

Basic	
Internal Battery	2X3.6V Li-Ion Battery (D-cell ER34615M)
External Power	9V Standard adaptor or EBS-01(available on order)
Operating Current	25 mA (max)
Dimension	120X100X81.5(LXWXH) without antenna 159X100X187(LXWXH) with antenna
Weight	0.807 Kg (Without Battery) 1.0045 Kg(With Battery)
Storage	3 Million data points
Primary Sensor	
Sensor Type	Vibrating Wire Sensor
No. of VW Channel	01, 05, 10
Accuracy	± 0.1% FS
Sensor Excitation Freq	400-6000 Hz
Excitation Voltage	5V
Temperature Sensor	
Sensor Type	3K thermistor
Accuracy	0.1°C
Range	-20°C to +70°C
Enclosure	
Material	Aluminium-Alloy Die casting 12(Epoxy Polyester Powder Coating)
IP Rating	IP-65(IS-60947 Part-1:2004)
Fire Proof	Approved
Protocol	
ER Protocol	Proprietary Encardio Protocol
Radio	
LoRa Chipset	SX1276 Global Sat

Frequency	EU	US	ROA
	863-870 MHz	902-928 MHz	920-928 MHz
Transmit Power	863-870 MHz (EU)	902-928 MHz(US)	920-928 MHz(ROA)
	14 dBm	20 dBm	20 dBm

Baud Rate	9600 bps(Max)
Receiver Sensitivity	-132 dBm
Transmission Distance	(1 ~ 15 KM)*

* 800 meter in urban areas

4   PRE-INSTALLATION PREPARATIONS

4.1   Pre-installation checks

- Before installation, please check the VW node and Gateway for any physical damage.
- Open the Node and gateway box to check if the internal wirings are intact.

4.2   Setting up the Gateway and vibrating wire nodes location

Selecting the correct locations for the Gateway and Node is essential, especially if more than one Node is installed at the site and connected to a single gateway.

The initial task involves placing the Gateway in a position where it has a clear line of sight to all installed Nodes or, at the very least, to most of the Nodes. The optimal placement should be decided on-site. It is advisable to ensure a robust connection between the Gateway and the Node to achieve optimal performance, ideally with a signal strength exceeding -100 dBm. It's important to emphasize that stronger signal strength will yield superior results.

4.3   Setting up the Gateway & Node

It is recommended that nodes and Gateway be set up and configured before mounting them at respective installation locations.

The gateway configuration needs to be done before nodes are configured. Also when the Node is being configured, it must be ensured that the Gateway is in switched "ON" position.

For setting up and configuring the Gateway, refer to User's Manual # WI6002.117 on Gateway.

The configuration of vibrating nodes is discussed in Section 6 of this manual.

For convenience, a "Quick Start Guide" is included in Section 5 to give a brief and quick idea.

4.4   Sampling Interval for Vibrating Wire Node

When configuring the Encardio-rite wireless system, it is crucial to select appropriate sampling intervals to ensure the network operates smoothly without any data loss.

The table below provides guidance on sampling interval selection for vw nodes based on the network size:

Number of Nodes	Minimum Sampling interval(Minutes)
1	4
10	6
50	16
100	28
150	41
200	53

The General formula to calculate the Sampling interval for the vibrating wire node is:

Sampling Interval (Seconds) = (15*No. VW Node) + 180

5   QUICK START GUIDE

Below is a quick start guide for setting up and configuring Gateway and VW Node. Please note that the Gateway must be configured first.

5.1   Gateway Setup

Step 1:   Open the gateway box. Insert the 4G SIM card. Connect both antennas to their respective connector.

Step 2:   Insert the battery into battery holder with the correct polarity.

Step 3:   Connect any standard DC Power (9-30 V, 1 A) into the connector named "IN" on the PCB with the correct polarity.

Step 4:   Switch on the Gateway and wait for 1 minute.

Step 5:   Install the EWA-01 apk file (provided with supply) into an Android phone and allow all the permissions asked during apk installation. After installation, close the application.

Step 6:   Go to Android phone's Settings>>Connections

Step 7:   Turn ON the Smartphone Bluetooth

Step 8:   Press on the Scan option to search nearby Bluetooth devices

Step 9:   Press on "EWG-01 Serial Number" found from the scanned device list. Gateway serial no. is written on the PCB.

Step 10:   Pair the Gateway with an Android phone using passkey = 6982698076

Step 11:   Now open the EWA-01 application on an Android phone

Step 12:   Select the paired Gateway to connect the application with the Gateway.

Step 13:   Once connected, go to Config Gateway >> Edit

Enter Gateway ID, Installation date, and select Network ID, Frequency plan

Enter Latitude and Longitude information either manually or through the map.

Note down the Network ID.

Click on the save button.

Step 14:   Go to Cellular Setup>>Turn on modem to check for the signal strength, then >>Turn off the modem

Go to EDIT enter the FTP credentials for data upload, and then UPDATE

Go to EDIT enter the FTP credentials for two-way communication, and then UPDATE

Enter APN of the network service provider and UPDATE

Click the FTP TEST tab to verify the communication between Gateway and the FTP server

Step 15:   Go back to the previous screen and Click on Scheduler Setup>> Update Date/Time or Sync with Phone to set the clock of the Gateway.

Click on the Erase Gateway Memory to erase residual data if any.

Configure the Next Scan start time and scan interval by clicking on the clock icon's provided in line with them and then update. Go back to the home screen and press the back button to disconnect the Gateway from mobile phone.

With this, the basic configuration of Gateway is completed. Do not switch off the Gateway. Now, we will move forward to configure the Node.

5.2   VW Node Setup

Step-by-step procedure to configure the VW Node is shared below. **Ensure that the Gateway is still in Switched "ON" position.**

Step 1:   Open the node box. Connect the RF antenna (Provided with supply).

Step 2:   Connect the vibrating wire sensor to the designated connector accurately.

Step 3:   Insert the batteries into the battery holder with their correct polarity.

Step 4:   **Optional -** Connect any standard DC Power (9V, 1A) into the " EXT " connector on the Node PCB with the correct polarity.

Step 5:   Switch on the Node and wait for 30 sec.

Step 6:   **Connecting the Node to the phone:**

1. Through Bluetooth Modem

- Insert the RS-232 Bluetooth Modem (provided with supply) into the DB9 connector and switch on the Bluetooth modem.
- Go to Android phone's Settings>>Connections
- Turn ON the Smartphone's Bluetooth
- Press on the Scan option to search nearby Bluetooth devices
- Press on "ERB-01 Serial Number" found from the scanned device list. Node serial no. is written on the PCB.
- Pair the Node with an Android phone using passkey = 6982698076
- Now open the EWA-01 application on an Android phone
- Select the paired Node to connect the application with the Node.

2. Through RS-232 –USB-OTG Cable

- Switch on the Node and connect it to the Smartphone using the FTDI to OTG adaptor provided with the supply. Once connected, a prompt window will appear. Tap the FTDI button, and the Home screen of Node will appear. Refer to section 6.2.2 of this user manual for more details.

Step 7:   Once connected through any one method explained in Step 5, go to Config Node >> Edit

Enter Node ID and Installation date and select Network ID (same as Gateway network ID) and Frequency plan(Same as selected in Gateway).

Enter Latitude and Longitude information either manually or through a map. Click on the Save button.

Step 8:   Go to Node Diagnostic >> Start Test to see the signal strength and test packet status, and then Stop the test.

Step 9:   Go back to the previous screen and Click on System Setup>> Update Date/Time or Sync with Phone to set the Node's clock.

Click on the Erase Node Memory to erase residual data, if any.

Click on Edit under Edit Sensor Parameter to enable/disable the parameter to report along with their units of choice, and click Save.

For 5 or 10-channel VW nodes, click on Edit under sensor settings to select the channel, enable/disable the parameter to report along with their units of choice, and click on Save.

Step 10:   Click "VW SENSOR SETTINGS" and enter the sensor ID and comments. Select the sensor manufacturer, sensor model etc. After that, click the "NEXT" button and enter the sensor polynomial coefficients per the sensor calibration certificate. Also, select the thermistor type from the drop-down. Click on the "SAVE" button.

Step 11: Go back to the previous screen and click on Sensor Reading >>Start to monitor the parameters selected in Step 9. After monitoring, click on the >> Stop

Step 12: Go back to the Home screen, click on Register Node at Gateway, and wait for some time. If everything has been followed per the steps stated above, the Node will successfully register to the Gateway.

With this, we have completed the basic configuration of Encardio-rite wireless systems (nodes and Gateway). The user can close the box.

6   CONFIGURING VW NODE

6.1   Setting up the VW node

▪ Open the top cover with a screwdriver. A description of each part of the Node is given in the figure 6-2

RF Antenna connection

Phillips head screws
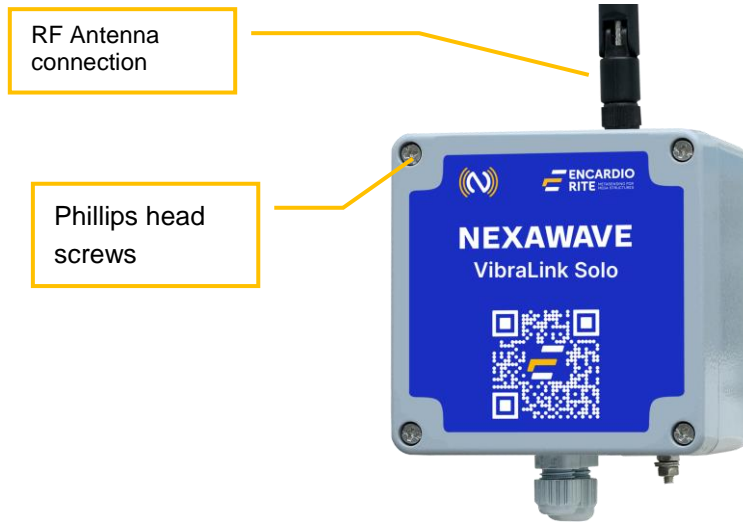
Figure 6-1 EWN-01V Single channel VW node

DC Input (Ext)

On/Off Switch

Battery wire

Battery holders (on lid)

Bluetooth Dongle/ RS-232 connector

VW sensor input

Mounting holes
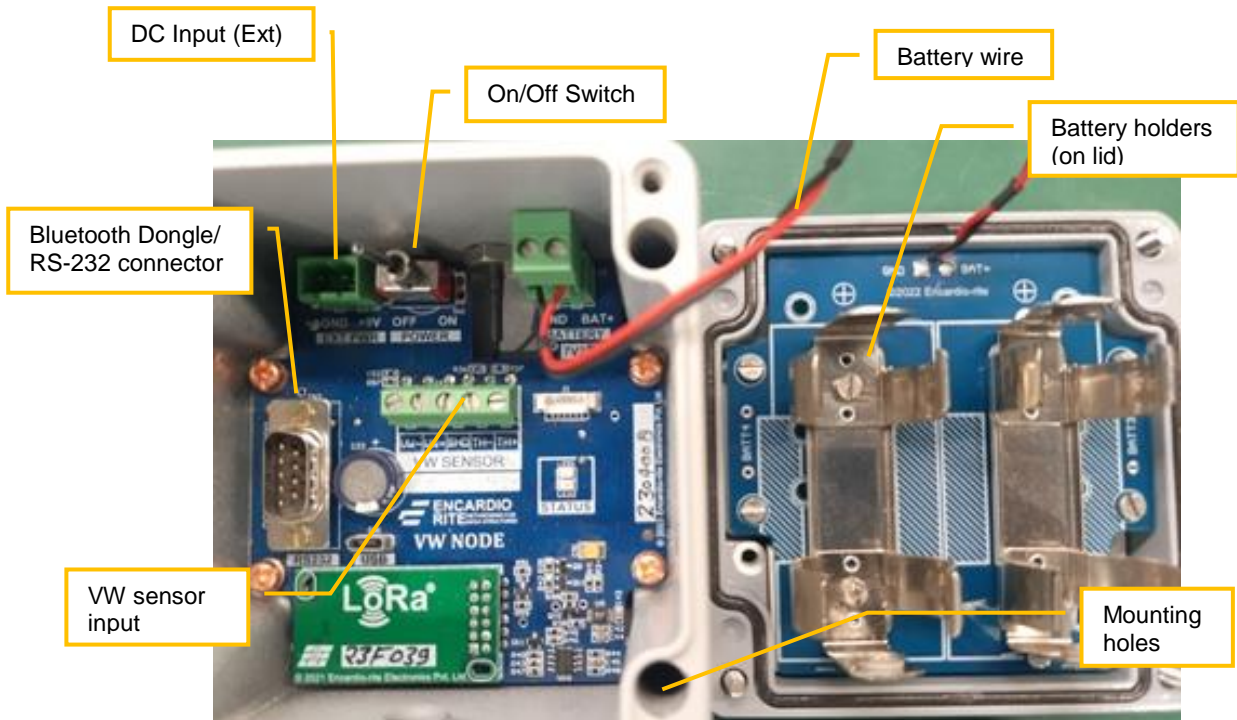
Figure 6-2 EWN-01V Single channel node details

▪ Connect the RF antenna (provided with supply) to the Node properly.

▪ Connect the vibrating wire sensor cable to the designated Connector in Node as shown in Figure 6-3: VW+, VW-, SHD, T+, T-
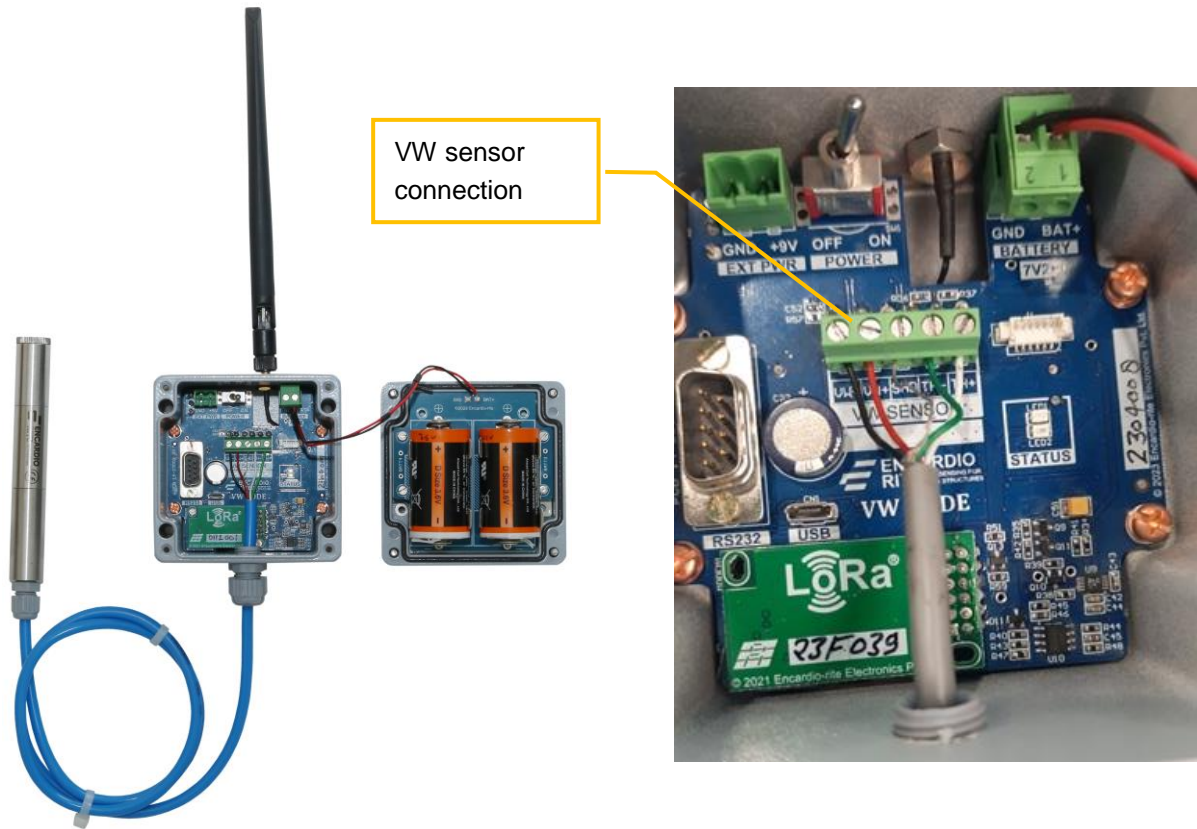
Figure 6-3 VW sensor connection to EWN-01V single channel VW node

6.2   Battery Installation

▪ Open the device by unscrewing the four Phillips head screws on the front of the enclosure.

- Align the positive (+) side of the batteries with the + indicator in the battery holder.

Positive (+) side

Insulated sleeves
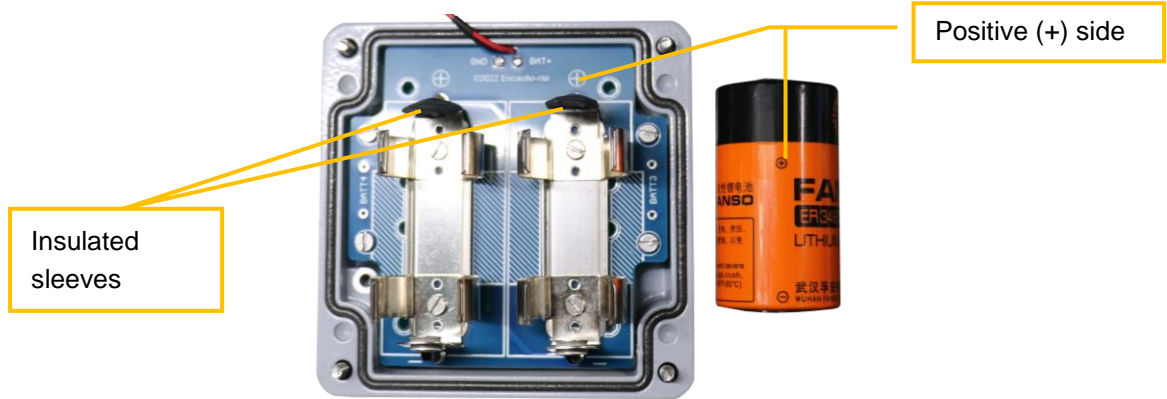
- Slide the positive end of the battery inside the compartment first. Installing the positive end first allows the battery to slide into the compartment more easily. Just push the positive end of the battery into the lever, flattening it down into the holder. Apply a bit more pressure, if necessary, to snap the negative end of the battery securely into place.
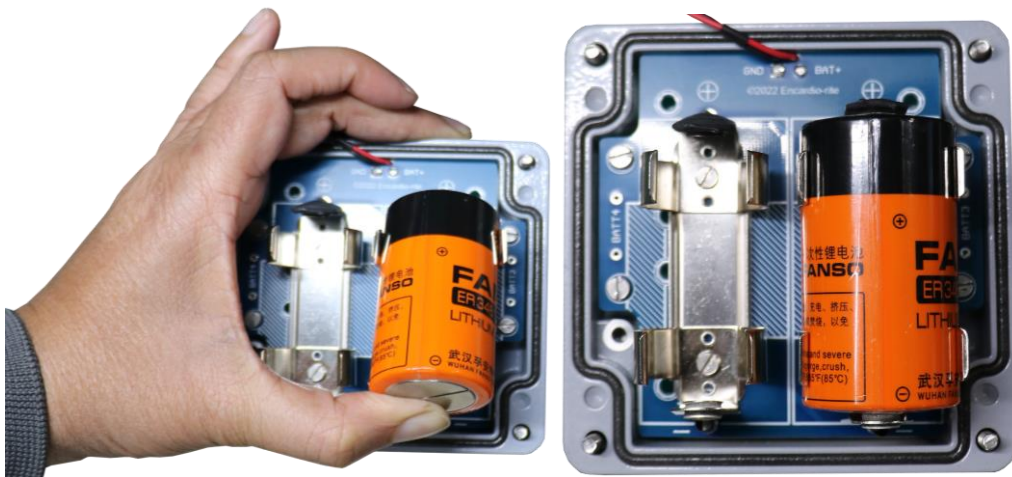
- Check for any looseness in the positive and negative clip terminals of the holder. If they are loose, press them down to ensure proper contact with the battery.
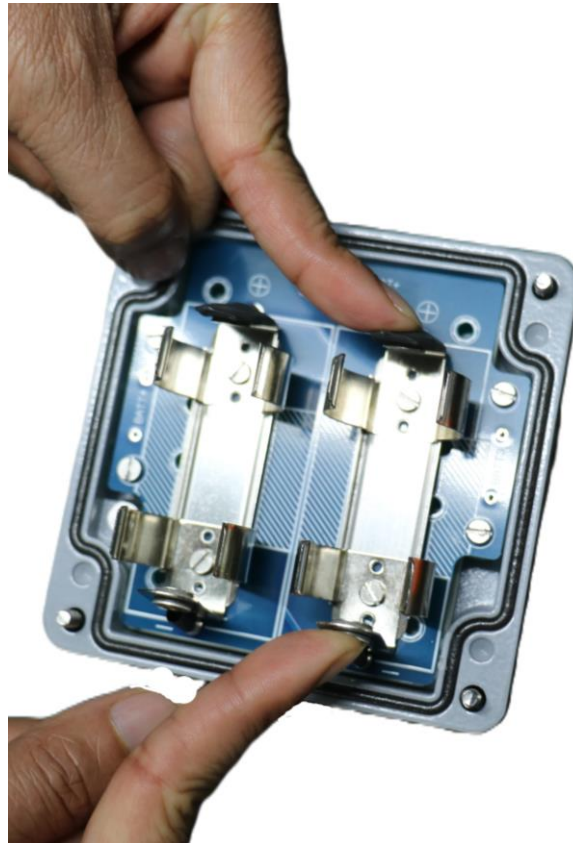
- In case fast scanning is required, connect any standard DC power adaptor (9 V, 1 A) to "DC Input".

- Or, Encardio rite make solar battery charger can also be used (available against order).

- After power up, wait for 30 seconds as during this time tilt meter performs internal operations.

6.3   Connection VW Node to phone

Install the apk file (provided with the supply) for the "EWA-01" app on the phone. App shortcuts will be available in the list of application software, as shown in Figure 6-5 (a). Open the application and allow all the permissions required for proper functioning.

6.3.1   Connection through Bluetooth

The VW node can be connected with mobile by using Bluetooth. Plug Bluetooth modem (provided with supply) at 9 pins D-sub connector of the Node. Ensure that the modem is configured for 115200 baud rate and hardware flow must be OFF. Verify DIP switch settings with the following Figure 6-4.
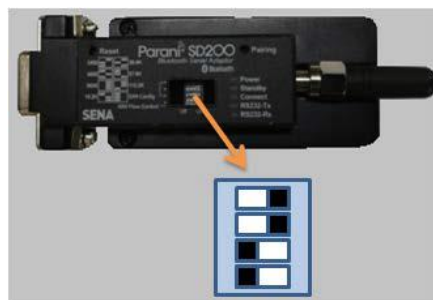
Figure 6-4 Bluetooth modem DIP switch settings

- Turn on the Bluetooth modem by pressing the ON/OFF switch located near the modem's battery compartment. The power indicator of the Bluetooth modem will glow in GREEN color to ensure that the

Bluetooth modem is ON.

▪ Turn on Bluetooth of the Android phone and go to Bluetooth settings. Click on the "scan" button. The phone will show the list of Bluetooth devices found. Find the Node Name and serial number on the phone screen and click for pairing the phone with Node. Once the pairing button is pressed, it will ask to enter the passkey for authentication.

▪ Enter pairing code "6982698076" and then press OK. On successful authentication, it will show that the device is paired. Now, the phone is paired with Node.

▪ Open the "EWA-01" apk installed on an Android phone. It will show the list of paired Nodes as shown in Figure 6-5 (b). Select the Node that you paired earlier from the list. It will take you to the home screen of the Node, as shown in Figure 6-7 (b).

(a)   (b)
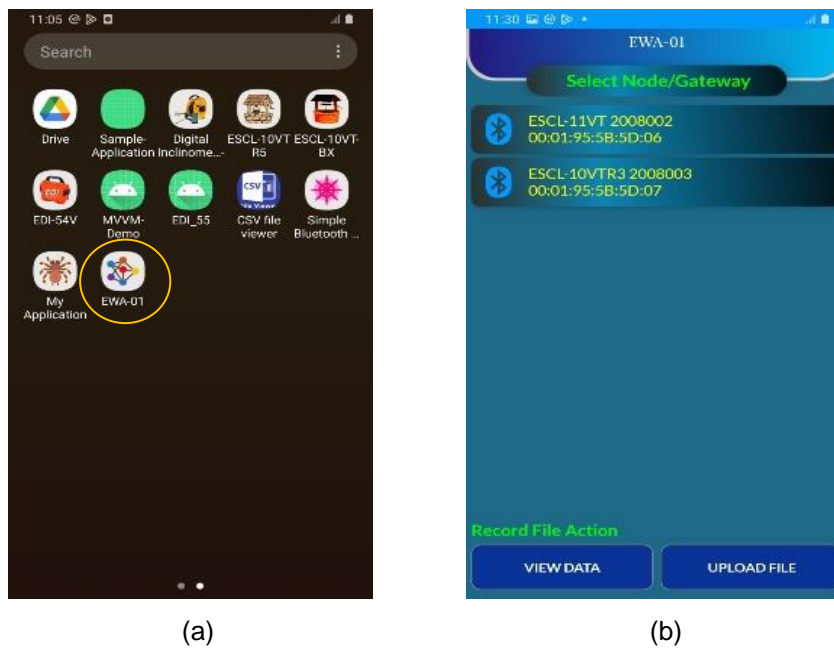
Figure 6-5

6.3.2   Connection through OTG

▪ Switch on the Node and connect it to the Smartphone using the FTDI to OTG adaptor provided with the supply, as shown in Figure 6-6 below.

Figure 6-6 EWN-01V VW node connected to Android phone with FTDI cable via OTG adaptor

- Once connected, a prompt window will appear, as shown in Figure 6-7 (a). Click on the FTDI button, and the "RF Node" home screen will appear, as shown in Figure 6-7 (b).

- On the home screen, various information about the Node can be seen. A detailed description of each segment required for configuration is given in the subsequent sections.

(a)   (b) Home Screen

Figure 6-7 Home screen

6.4   Config Node

Click on the "CONFIG NODE" tab from the Home screen; a window will appear as shown in the 6-8 (a). Click on the 'Edit' button to input the information as per the requirement.

(a)   (b)

Figure 6-8 Config node

- User can input the "Node ID" of their choice. Try to input some meaningful ID to make it convenient for other users.

- Click on the Calendar Icon shown in Figure 6-8 (b) to enter the "Node Inst. date."

- Users can select the "Network ID" from the drop-down menu. Select the same Network ID that was selected during Gateway configuration.

- Select the "Frequency Plan" from the drop-down, as was selected for Gateway. This depends on the installation location to comply with the local regulations. Users can select the region and associated frequency by tapping the search icon.

- To set the Latitude and Longitude of the respective installation location, click the location icon shown in Figure 6-8 (b). A prompt window will appear as shown in Figure 6-9 (a)

- If the user knows the installation location coordinates, select the button "Set location manually" and enter the Latitude and Longitude information as shown in Figure 6-9 (b). Click on "OK" to set the coordinates manually.

- If the user does not know the installation location coordinates, select the "Set location from map" button for automatic location setup. This needs to be done at the installation site location only. Ensure that the internet connectivity is there in the phone during this process. Once the location is selected, click the "SAVE" button to store all the information inside Node.

    A map will appear (figure 6-9 (c)), on which the exact location of node installation can be selected. Zoom in or out and navigate the map to find the desired location accurately. Once the location is selected, click the "SAVE" button to store all the information inside the Node.
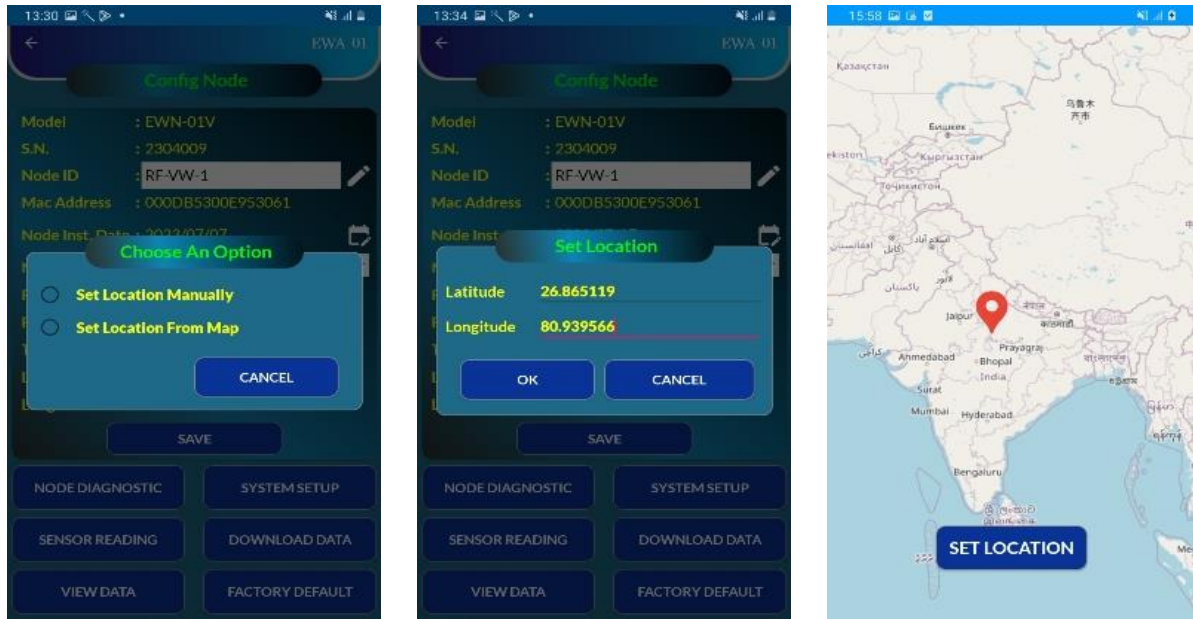
(a)   (b)   (c)

Figure 6-9 Location Coordinates

6.5   System Setup

Clock information can be edited and modified under system setup.

- Tap the "SYSTEM SETUP" button as shown in Figure 6-8 (b). A new window will appear as shown in Figure 6-10 (a) single-channel VW node and Figure 6-10 (b) 5 or 10-channel VW node.
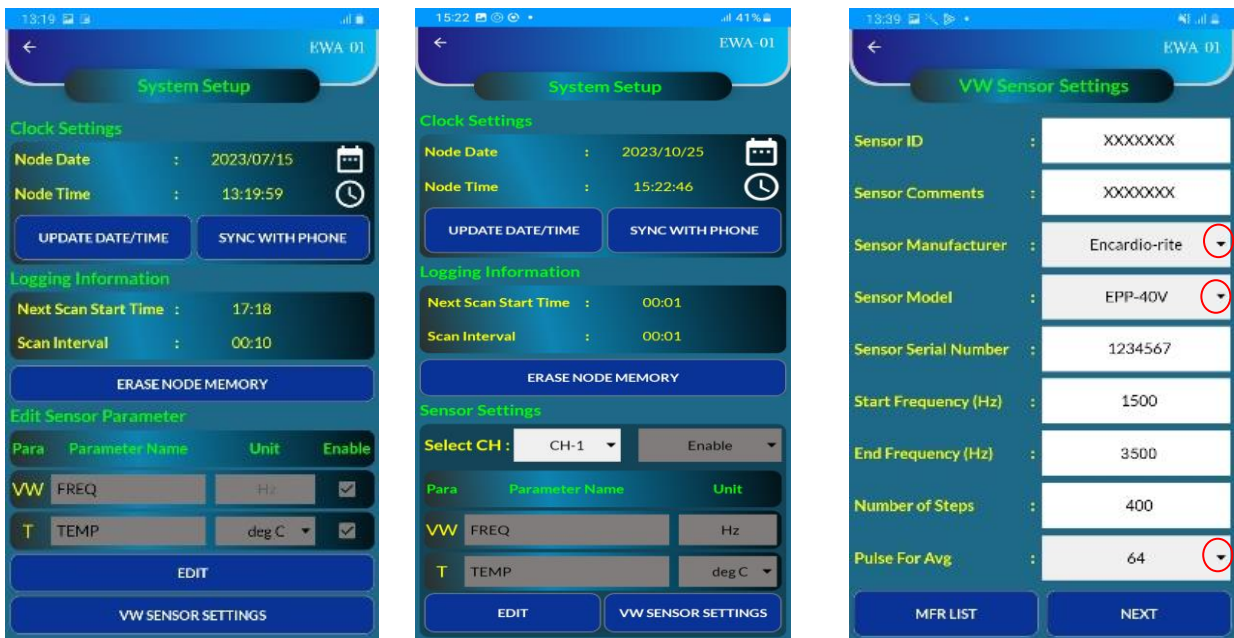
(a)   (b)   (c)

Figure 6-10 System setup & Sensor settings

- Set the "Clock Settings" or RTC (Real-Time small or through auto sync. Remember that the Smartphone must have the updated RTC clock settings during auto synchronization. Once done, apply the changes by clicking the "UPDATE DATE/TIME" button.

- Any previous log can be erased by clicking "ERASE NODE MEMORY." Be cautious, as erased data

cannot be recovered later.

- User can control and configure the parameter along with their units of choice. Click the "EDIT" button. Enter the parameter name, specify the measurement unit, and select the desired temperature unit. Save the changes through the "SAVE" button.

- For 5 or 10-channel VW nodes, click on Edit under sensor settings to select channel no. for configuration of each sensor, enable/disable the parameter to report along with their units of choice, and click on Save.

- Click the "VW SENSOR SETTINGS" tab, figure 6-10 (a) figure 6-10 (b). Screen as shown in Figure 6-10 (c) will appear. This allows to customize the settings related to the VW sensor.

- Input the "Sensor ID," i.e., sensor tag as per project.

- Add comments related to the sensor under "Sensor Comments."

- Select the manufacturer of the sensor using the drop-down list. Encardio Rite's sensors are automatically included, and the user can choose the appropriate model from the drop-down menu.

- Once the sensor model is selected, all necessary parameters associated with that particular sensor will be automatically displayed for convenience.

- "Pulse for Avg" can be selected from the drop-down. If unsure, please get in touch with Encardio Rite for information on the pulse for averaging settings.

- Click on the "NEXT" tab, and a window will appear, as shown in Figure 6-11 (a). Input the polynomial coefficient values: A0, A1, A2, A3, A4, and A5 as provided calibration/test certificate of the sensor. Select the appropriate thermistor type from the drop-down menu. Save inputs by clicking on the "SAVE" button.

- If sensors from other manufacturers need to be connected to the Encardio-rite vw node, select "Any Mfr" from the drop-down under the "ANY MANUFACTURER" tab, as seen in Figure 6-11 (b). Modify the parameters according to the sensor datasheet. Click on the "NEXT" button to input the polynomial coefficients specific to that sensor.

- Provision is provided to manage the sensor manufacturer list at the user end. To add or remove manufacturers, tap the "MFR LIST" button, illustrated in Figure 6-11 (b). Screen as shown in figure 6-11 (c) will appear. Necessary inputs can be added and saved.

<div align="center">(a)   (b)   (c)</div>

Figure 6-11 Sensor settings

6.6 Sensor Reading

Live reading of all the parameters selected under system setup" can be seen through "Sensor Reading " Live readings will help during Node installation and verify the accuracy of the entered polynomial coefficients.

Figure 6-12 Sensor Readings (Single channel, 5-channel & 10-channel)

- Tap the "SENSOR READING" tab from the "Config Node" screen (figure 6-8 (a)) to see the real-time readings of the connected sensor, as shown in Figure 6-12. For 5 or 10-channel VW Node, the user can select to monitor a single sensor or monitor all sensors button under "Monitor Screen Layout." as shown in Figure 6-13.
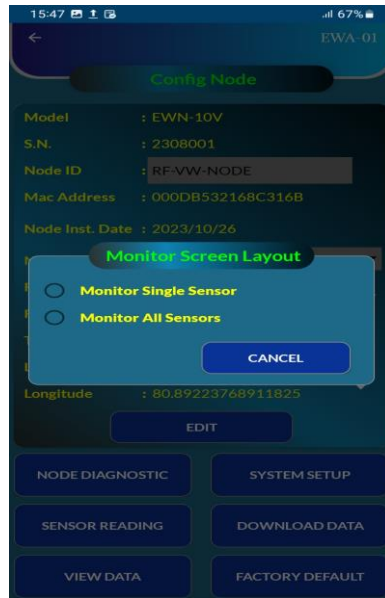
Figure 6-13 Sensor Readings

- Select the Noise bar range, parameter, and temperature decimal places. Apply inputs by clicking on the "Apply" button.

6.7   Download Data

- Press the "Download Data" button from the "Config Node" screen (figure 6-8 (a)). A window, as shown in Figure 6-13 will appear. Two options are provided to download the data:

1. Since Beginning
2. Since Last Download

Select the first option if data is downloaded for the first time; otherwise, select the second option.

- Click the "DOWNLOAD & SAVE FILE" tab to download the data. A progress bar will appear to display the download progress. Data download time depends on the record's size. After successful download, an information window pops up, indicating the successful download.

Figure 6-14 Download data

6.8   File format

The downloaded data format from the Node is as shown below:

"NODE ID","DATE/TIME","BATTV(INT)","BATTV(EXT)","FREQ(Hz)","TEMP(deg C)"
"RF-VW-NODE-14","2023/07/19 16:05:01",2926.56,211.90,2683.37,25.95
"RF-VW-NODE-14","2023/07/19 16:15:01",2926.16,211.65,2683.26,25.90
"RF-VW-NODE-14","2023/07/19 16:25:01",2926.38,210.74,2683.19,25.87
"RF-VW-NODE-14","2023/07/19 16:35:01",2929.14,210.76,2683.25,25.92
"RF-VW-NODE-14","2023/07/19 16:45:01",2929.18,207.32,2680.95,25.20
"RF-VW-NODE-14","2023/07/19 16:55:01",2928.14,202.76,2680.12,24.86
"RF-VW-NODE-14","2023/07/19 17:05:01",2927.03,202.26,2680.19,24.90
"RF-VW-NODE-14","2023/07/19 17:15:01",2926.83,204.00,2680.49,25.06
"RF-VW-NODE-14","2023/07/19 17:25:01",2926.25,208.86,2681.19,25.47
"RF-VW-NODE-14","2023/07/19 17:35:01",2926.48,218.26,2683.16,26.02
"RF-VW-NODE-14","2023/07/19 17:45:01",2927.27,228.33,2684.11,26.56
"RF-VW-NODE-14","2023/07/19 17:55:01",2926.76,237.55,2684.90,27.06

6.9   View Data

The downloaded records can be viewed using the" View Data" option.

- Press the "VIEW DATA" tab from the "Download" screen (figure 6-13). As shown in figure 6-14 (a), a window will appear.

- Select the desired Node from the drop-down.

- Select different parameters from the drop-down to view corresponding data for those parameters.

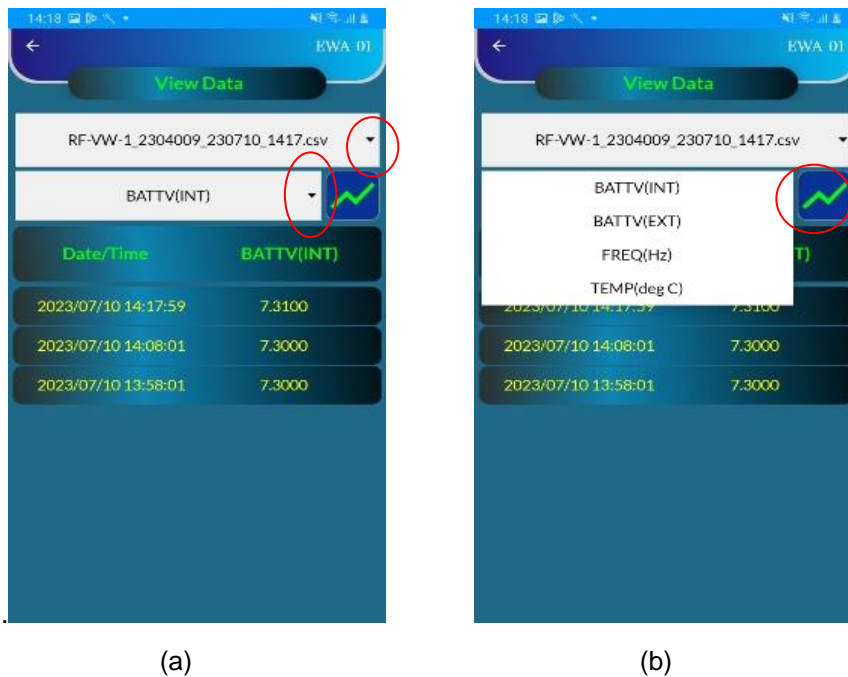(a)   (b)

Figure 6-15 View data

- A graph view of selected parameters is also available. Tap the graph button as shown in Figure 6-14 (b). As shown in the figure 6-15 (a), a window appears. To view the graph, select Graph Layout, Data Range, X-axis, and Y-axis range, and click the "OK" button.

<table>
<tr><td>(a)</td><td>(b)</td></tr>
</table>

Figure 6-16 View data in graphical format

6.10   Upload File

Once downloaded on the phone, data can be sent directly to a remote FTP server using the upload file option.

- Press the "UPLOAD FILE" tab from the "Download" screen (figure 6-13). Screen as shown in figure 6-16 (a) will appear.

- Tap the "Reset Setting" button. Screen as shown in figure 6-16 (b) will appear.

- Enter the FTP credentials correctly and save it.

- Select the file for upload (from the screen in Figure 6-16 (a)) and click on the "Upload" button to push the file to the FTP server. Internet connectivity in the Android phone is a must to perform this activity.
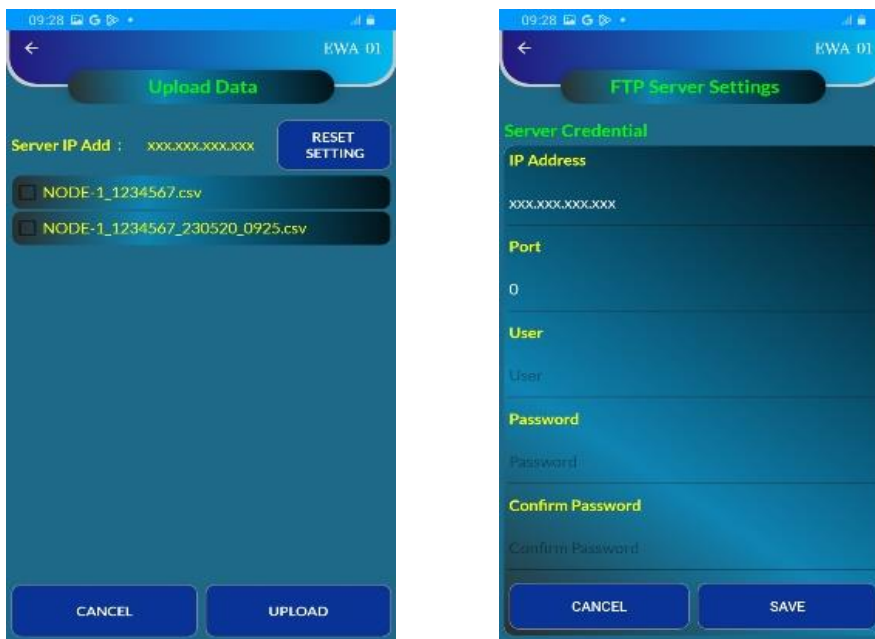
<table>
<tr><td>(a)</td><td>(b)</td></tr>
</table>

Figure 6-17 Upload data

6.11   Node Diagnostic

Node diagnostic feature is provided to test the RF communication between Node and Gateway. This feature is quite helpful during the installation of Node.

- Click the "NODE DIAGNOSTIC" tab from the "Config Node" screen (figure 6-7 (a)). A window as shown in Figure 6-14, will appear.

- Check the communication by clicking on the "START TEST" tab.

- Node will send the test packets to the Gateway and display the acknowledgment from the Gateway.

- The status of each packet can be seen under test packet status.

- Other information like RSSI transmit power could also be seen while testing.

- After successful communication, click on the "STOP TEST" button.

(a)   (b)
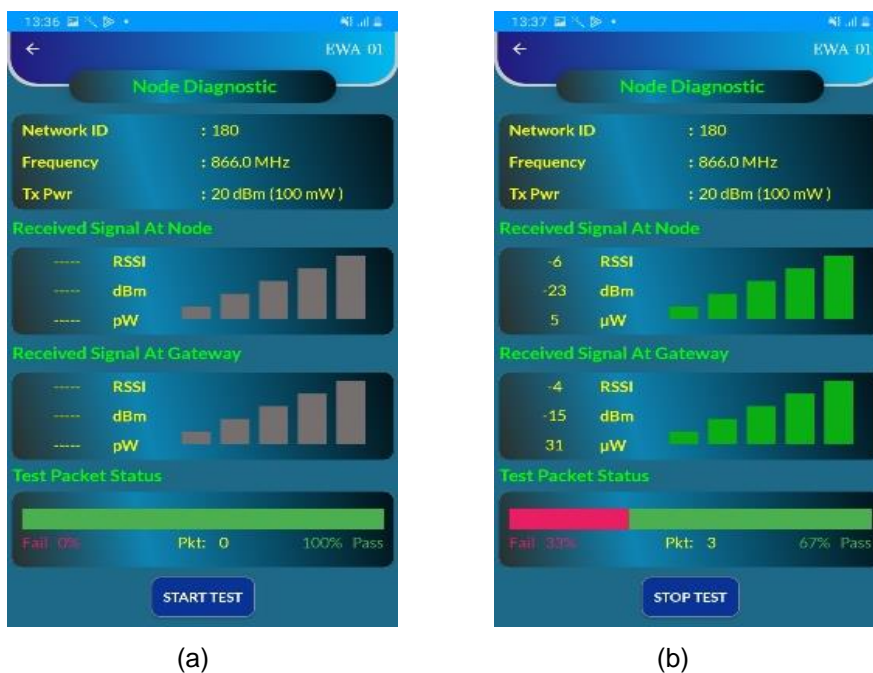
Figure 6-18 Node diagnostic

6.12   Factory Default

Factory default will erase all the user-related configuration and data except those configured from the factory. Be careful while doing a factory reset, as data can't be retrieved after this step.

- To reset the Node, click on the "FACTORY DEFAULT" tab from the "Config Node" screen (figure 6-8 (a)). A prompt window asking for a reset password will appear, as shown in Figure 6-18.

- Enter the password "4TfZ9q7X" and click on the "OK" button to reset the Node.

Figure 6-19 Reset settings to factory default

6.13   System Information

The system information option provides all the necessary information about the Node.

- Click on the "System Information" tab from the main menu. As shown in Figure 6-19, a window will be displayed. Users can click on any tab to see the related information.

Figure 6-20 System information
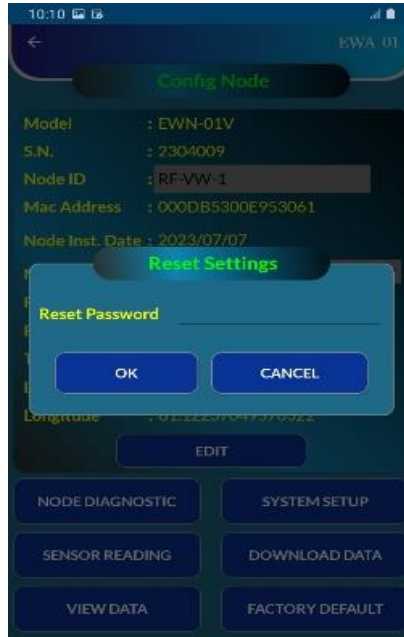
7   RE-CONFIGURING GATEWAY & NODES AFTER INSTALLATION

7.1   Re-configuring Gateway via Node

This is the advanced feature where the user can configure the Gateway in the network from any node in the same network after its installation. It allows users to modify specific gateway parameters. In a network where all nodes are connected to the Gateway, users can conveniently configure these parameters from any type of Node in the network by connecting it through an Android phone.

- Click on the "Config Gateway" tab from the main menu. As shown in the figure 7-1 (a), a window will appear. The screen shows the gateway information and configuration options.
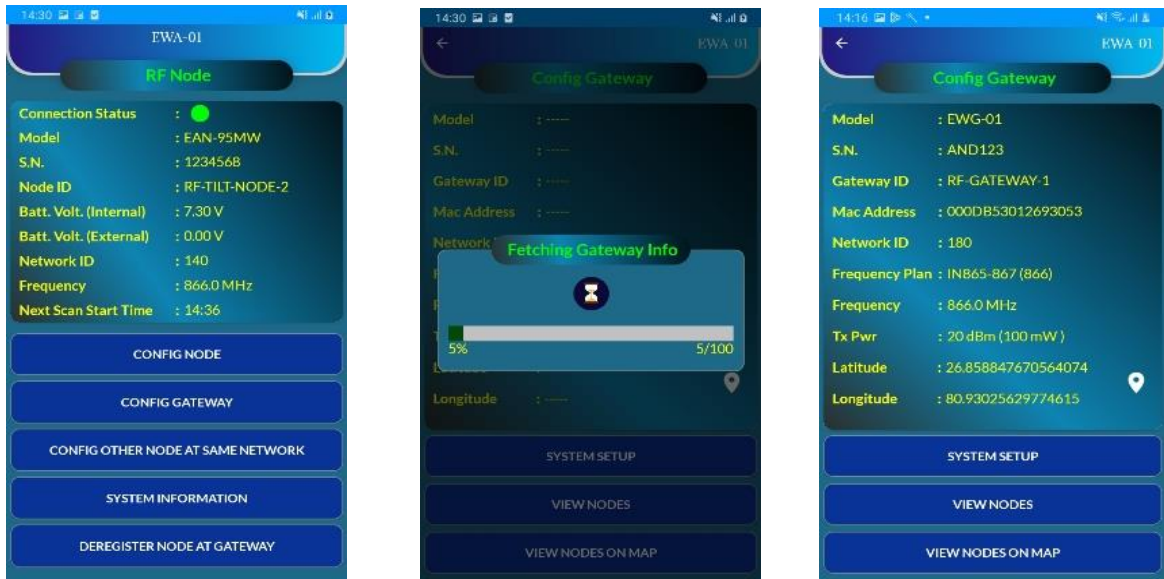
| (a) | (b) | (c) |

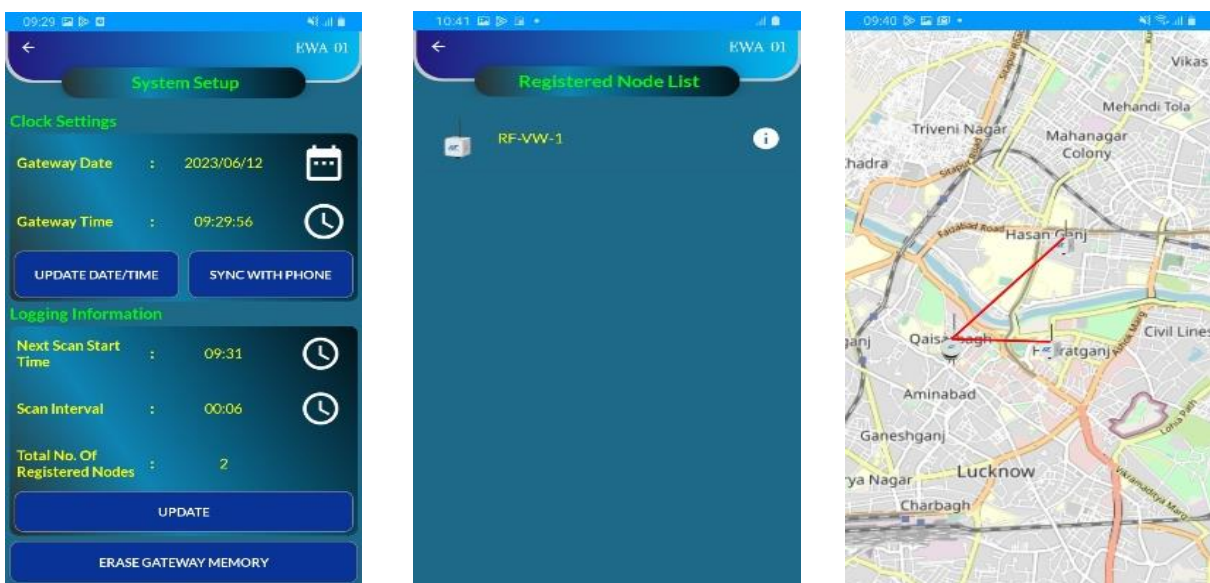**Figure 7-1 Config gateway via Node**

- Click on the "System Setup" tab to configure the Gateway. Though all the configuration can not be done from Node, a few important parameters like Gateway's Clock Settings, Scan Start Time, and Scan Interval can be modified, as shown in Figure 7-2 (a).

| (a) | (b) | (c) |

Figure 7-2 View nodes within wireless network

- Gateway's memory can also be erased from this window by selecting the "Erase Gateway Memory" tab.

- To view all the nodes connected within the wireless network, click on the "View Nodes" tab from the Figure 7-1 (c) screen. Screen as shown in figure 7-2 (b) will appear.

- To view the location of the connected Node on the map, tap on the "View Nodes on Map" tab. Screen as shown in Figure 7-2 (c) will appear, with a map showing the location of nodes.

7.2   Re-configuring nodes via Gateway

With this feature, the user can perform node-to-node communication and configure any other node in the same network from the current Node.

- Click on the tab "CONFIG NODE" from the main menu. As shown in Figure 7-3 (b), a screen will appear.
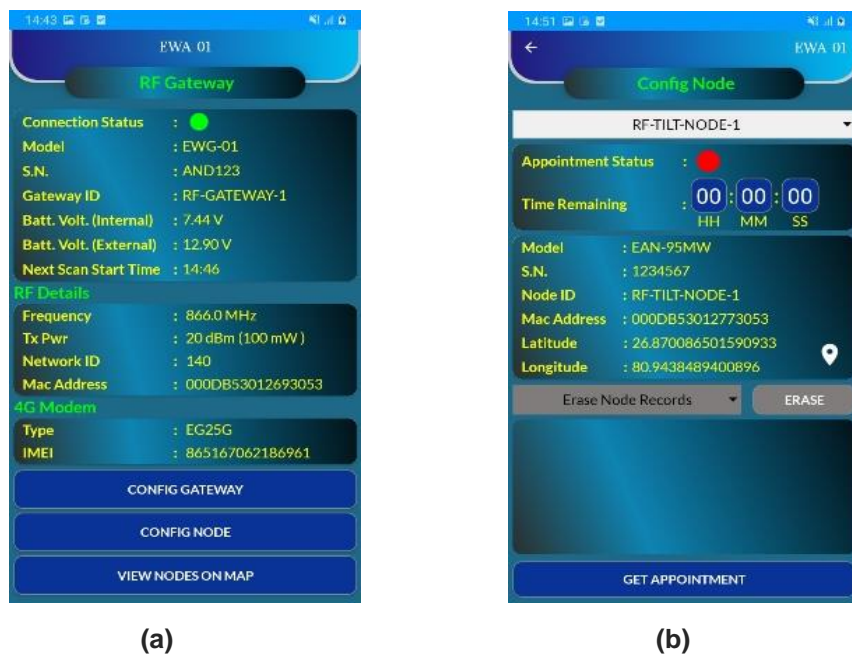

(a)   (b)

Figure 7-3

(a)   (b)   (c)

Figure 7-4

- To configure a specific node, choose the desired Node from the drop-down menu,

- Click on the "GET APPOINTMENT" tab to establish a live connection with the chosen Node. Please refer to the images in Figure 7-4 for detailed instructions on obtaining an appointment from the Node.

- Upon successfully raising the appointment request, the screen as shown in Figure 7-5 (a) will appear. It will indicate the remaining time until the Node becomes live.

- As the appointed time approaches, the appointment status will turn green, as shown in Figure 7-5 (b).

- A countdown timer will initiate based on the selected chat duration from the previous step.

- Once the Node becomes live, it will be able to respond to the requested commands, as shown in Figure 7-5 (c).

| (a) | (b) | (c) |

Figure 7-5

- Users can cancel the appointment anytime by clicking the Cancel Appointment button.

7.3   Re-configuration other nodes in the same network via Node

Encardio-rite's RF wireless system allows even Node to configure another node. Below are the steps outlining how to configure the Node using Gateway:

- Click on the "CONFIG OTHER NODE AT SAME NETWORK" tab on the home screen, as illustrated in Figure 7-6 (a).

- Allow some time for the Node to retrieve information about all the connected nodes in the network. Once this process is complete, a screen, as shown in 7-6 (b), will appear, presenting the gathered information about the network's connected nodes.
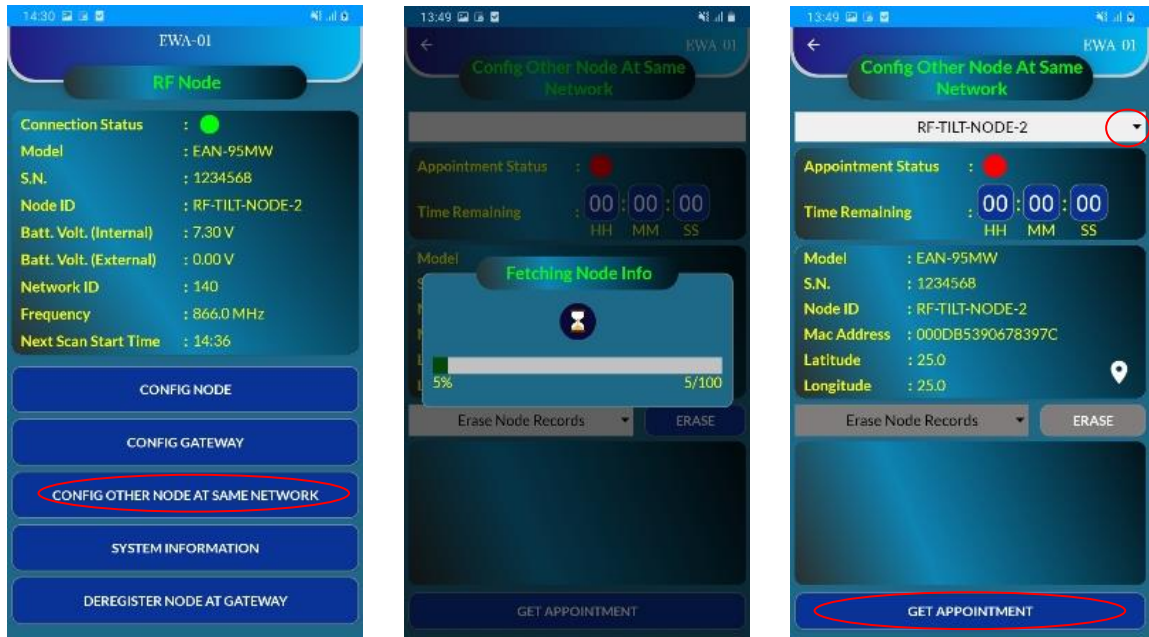
(a)   **(b)**   **(c)**

Figure 7-6

- Choose the desired Node from the drop-down menu to configure a specific node, as Figure 7-6 (c) shows.

- Click on the "GET APPOINTMENT" tab to establish a live connection with the chosen Node. Please refer to the images in Figure 7-7 for detailed instructions on obtaining an appointment from the Node.
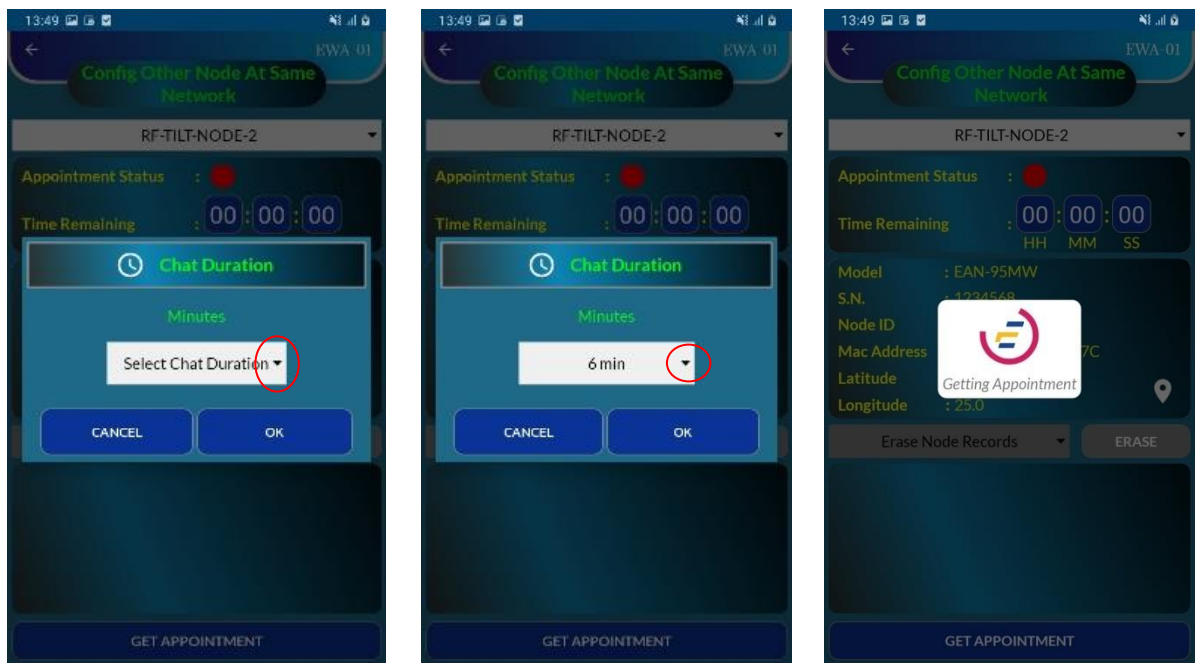
(a)   **(b)**   **(c)**

Figure 7-7

- Upon successfully raising the appointment request, screen as shown in Figure 7-8 (a) will appear. It will indicate the remaining time until the Node becomes live.

- As the appointed time approaches, the appointment status will turn green, as shown in figure 7-8 (b.

▪ A countdown timer will initiate based on the selected chat duration from the previous step. Once the Node becomes live, it will be able to respond to the requested commands, as shown in Figure 7-8 (c).
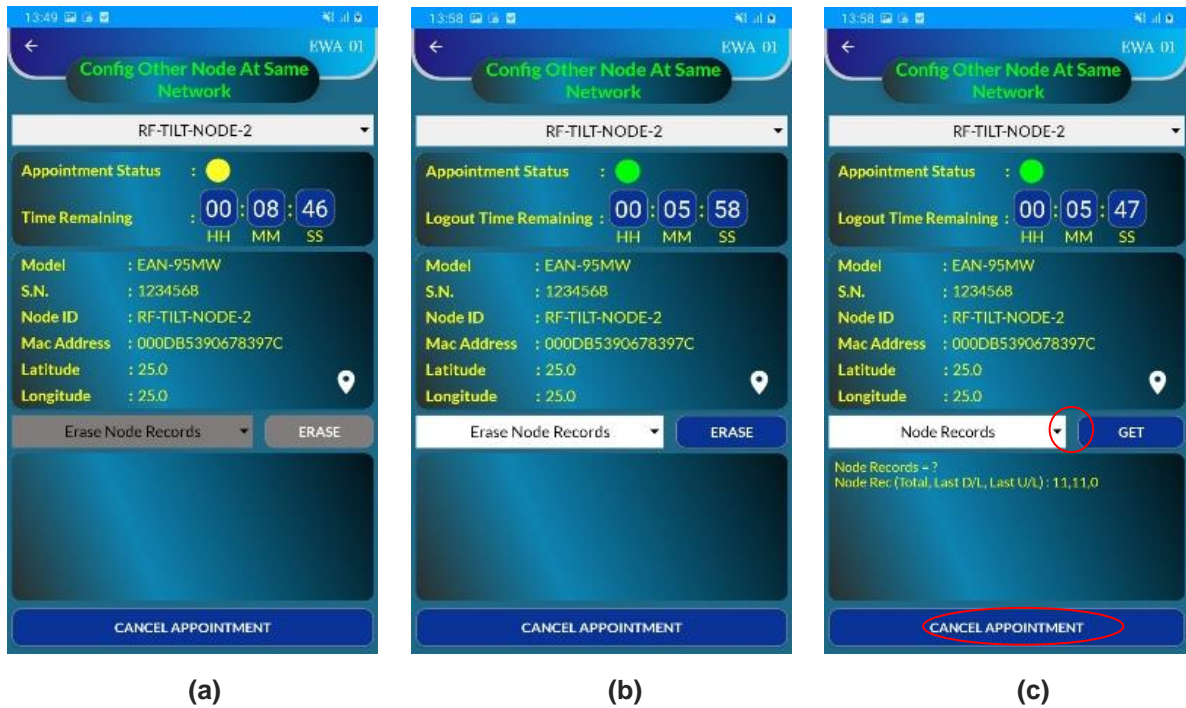

| (a) | (b) | (c) |

Figure 7-8

▪ Users can cancel the appointment anytime by clicking the Cancel Appointment button.

8   REGISTER NODE AT GATEWAY

After configuring the Node by following all the above steps, it is time to register the Node to Gateway.

NOTE: While the setting up of nodes and Gateway can be done before installation, registering of the nodes to Gateway must be done after installation of all nodes and Gateway (of same network)

- Click on the "Register Node At Gateway "tab from the main menu. While registering, a progress bar will popped up as shown in the figure 8-1 (a) to confirm the process.

- Once the Node is registered with the Gateway, a prompt window for successful registration will pop-up as shown in figure 8-1 (b).

(a)   (b)

Figure 8-1

9   INSTALLATION PROCEDURE FOR NODE

Sites being different from each other must be properly surveyed to determine the best place for mounting the nodes and Gateway. Generally, the Gateway should be in line of sight of all the nodes. To achieve better coverage/transmission of data, it is recommended to mount the vibrating wire node as high as practicably possible at site. The nodes come with mounting accessories suitable for wall mounting or mast/pole mounting, depending on the type of order placed.

9.1   Wall mounting

- The Nodes can be directly fixed to a flat surface using four screws. The node enclosure has mounting holes for fixing it on any place surface.
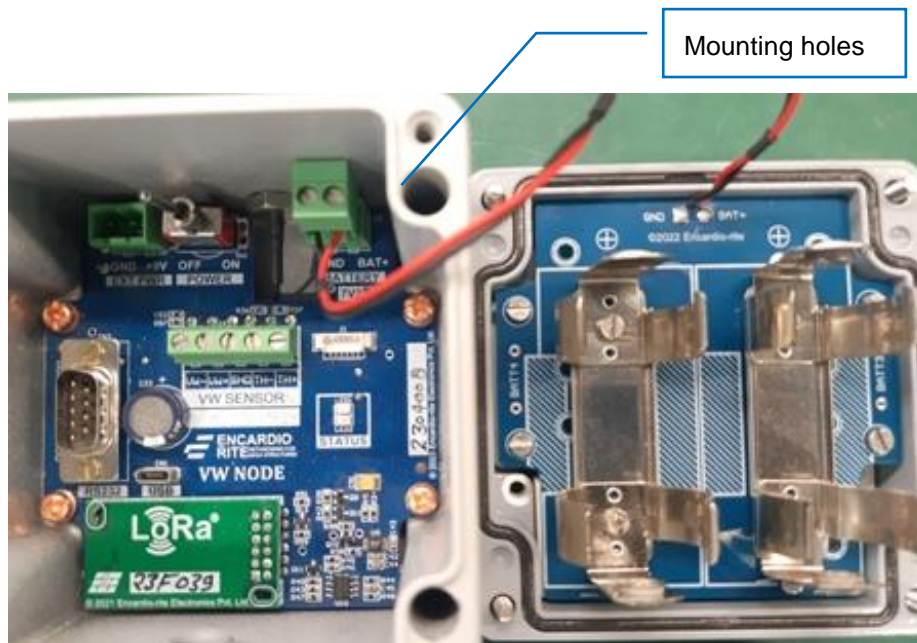

Figure 9-1

- Mark the locations of four mounting holes.
- Ensure that the position of the holes is aligned correctly, using a spirit level.
- Drill holes depending on the mounting fasteners being used for fixing the Node (supplied with the Node).
- Fix the Node on the surface using fasteners.

NOTE: Installation may have to be improvised or tailor-made depending upon site conditions, like using cable ties

9.2   Mast mounting

Mounting the Node on a tall mast is a good solution to achieve better height. Ample precautions must, however, be taken for the protection of the equipment.

The type of mast to be used for such an application depends on the site location.

- A mast can be a small pole mounted to the roof of any structure or portable cabin available at the site (with required permissions).
- In an open field or hilly region application, a mast can be a pole installed in the ground with a strong foundation. If required, it can be supported with guy wires.

The height of Node mounting needs to be carefully planned to be in line with Gateway's sight, but not too high to attract lighting.

Once the mast is ready, the Node can be fixed on it using suitable brackets, clamps, and fixing plate. If required, a suitable protection box can be provided. A typical installation photograph is shown below for reference. A protection box may be provided, depending on site requirements.

NOTE: Mast, mounting accessories, protection cover, and necessary civil works are in the Client's scope.

**Figure 9-2 EWN-01V VW node mounted on mast
with a protection box (antennae inside protective tube)**

10   TROUBLESHOOTING

10.1   Unable to connect Node over Bluetooth

- Android phone's Bluetooth may not be enabled.

- Bluetooth modem may be out of Bluetooth range from Android phones.

- Bluetooth modem may not be paired with android phone.

- Check Bluetooth modem baud rate settings. It must be configured for 115200 and hardware flow control should be OFF.

- Turn OFF the Node and then turn ON again.

- Remove the power from Node, wait for 30 seconds and then connect the power again. Now try to connect.

10.2   Unable to connect Node with FTDI-OTG Cable

- RS232 interface connector may be loose.

- Check the interface cable's connector for damage.

- RS232 interface cable may be broken.

- Node battery may be discharged.

- Remove the batteries, wait for 30 seconds and then mount the batteries. Now try to connect.

10.3   Unable to communicate with Gateway

- Check the antenna for loose connection.

- Antenna to RF modem connecting cable may be damage.

- Antenna itself may be damaged try with another antenna

- Node battery may be discharged.

11 SAFETY AND WARNINGS

11.1 Operation Safety

- Before taking any action, please read the user's manual carefully,.

- Ensure that all the procedures and installations are correctly carried out.

- The case and mountings should be grounded, where practicable.

- This product has been designed to meet a certain water-proof level. However, it becomes vulnerable to water ingress when the lid screws are not tightened properly, or if the cable gland has not been sealed properly.

- This product must not be disassembled under any circumstances. If done, it will void the warranty and may leave the product in a dangerous state.

11.2 Battery caution & warning

- To install the battery into a holder, please follow the "+" (positive) and "-" (negative) signs carefully. Wrong orientation of a battery could potential cause unit damage.

- If battery is incorrectly replaced, there may be danger of explosion.

- Use only with the type recommended by the manufacturer. Observe any warnings specified by the battery manufacturer.

- The battery has a relatively high capacity, so please take special care during storage and usage.

- When disposing of the batteries please contact your local authorities or dealer and ask for the correct method of disposal.

- When disconnecting the battery, please take special care not to apply excessive force, otherwise the battery holder and the nearby circuitry can get damaged.

If the above safety precaution and warnings are not followed, the manufacturer cannot be held responsible for any damage and injury caused to the users.