

USERS MANUAL

WIRELESS VIBRATING WIRE NODE

Model EWN-01/05/10V



Doc. # WI 6002.118 Rev. 03 | July 2023



TUNNELS



HYDROELECTRIC



CONSTRUCTION



STRUCTURAL



METRO & RAIL



BRIDGES



MINING

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

CONTENT

1	INTRODUCTION	1
1.1	Vibrating wire node overview	1
1.2	Wireless network	1
1.3	Conventions used in this manual	1
1.4	How to use this manual	1
2	GENERAL DESCRIPTION	3
2.1	Model EWN-01/05/10V Vibrating wire node	3
2.2	Model EWG-01 gateway	3
2.3	System components	3
3	TECHNICAL SPECIFICATION	5
4	PRE-INSTALLATION PREPARATIONS	6
4.1	Pre-installation checks	6
4.2	Setting up the Gateway and vibrating wire nodes location	6
4.3	Setting up the Gateway & Tilt meter	6
4.4	Sampling Interval for Vibrating wire node	6
5	QUICK START GUIDE	7
5.1	Gateway Setup	7
5.2	VW Node Setup	8
6	CONFIGURING VW NODE	10
6.1	Setting up VW node	10
6.2	Connection VW Node to phone	11
6.2.1	Connection through Bluetooth	11
6.2.2	Connection through OTG	12
6.3	Config Node	13
6.4	System Setup	14
6.5	Sensor Reading	16
6.6	Download Data	17
6.7	File format	17
6.8	View Data	18
6.9	Upload File	19
6.10	Node Diagnostic	19
6.11	Factory Default	20
6.12	System Information	21
7	RE-CONFIGURING GATEWAY & NODES AFTER INSTALLATION	22
7.1	Re-configuring gateway via node	22
7.2	Re-configuring nodes via gateway	23
7.3	Re-configuration other nodes in same network via node	24
8	REGISTER NODE AT GATEWAY	27

CONTENT

9	INSTALLATION PROCEDURE FOR NODE	28
9.1	Wall mounting	28
9.2	Mast mounting	28
10	TROUBLESHOOTING	30
10.1	Unable to connect Node over Bluetooth	30
10.2	Unable to connect Node with FTDI-OTG Cable	30
10.3	Unable to communicate with Gateway	30
11	SAFETY AND WARNINGS	31
11.1	Operation Safety	31
11.2	Battery caution & warning	31

1 INTRODUCTION

1.1 Vibrating wire node overview

Model EWN-01/05/10V series of wireless vibrating wire nodes are designed to expand the data collection possibilities from vibrating wire geotechnical sensors via wireless network, eliminating the need for running lengthy cables. It is a reliable integrated system, which is capable of exciting and sampling vibrating wire sensors and reporting measurements through wireless communications network to the Gateway.

One of the significant advantages of vibrating wire wireless nodes is their ability to provide accurate and reliable measurements in remote or inaccessible locations. By eliminating the need for physical wiring connections, these nodes can be deployed in challenging environments where traditional wired sensors would be impractical or impossible to install. With their wireless connectivity, these nodes offer convenience, scalability, and cost-effectiveness, empowering industries to gather critical data in real-time and make informed decisions based on accurate measurements.

1.2 Wireless network

Wireless sensors are vital in monitoring construction sites, large structures and landslide areas. They are extensively used in applications where geotechnical and other sensors are used for data collection and transfer it to a central server for access by multiple users. Encardio-rite offers an innovative network solution that allows real-time monitoring of not only wireless vibrating wire sensor but also other geotechnical and structural sensors in challenging conditions with reliable data transfer without any delay.

In an end-to-end wireless monitoring system from Encardio-rite, the vibrating wire nodes are interfaced with the long range, low power radio frequency network to gateway. The vibrating wire nodes send recorded data to the gateway through the RF network with utmost reliability. The gateway then uploads the collected data from nodes to the central/cloud server.

The system operates on ISM sub 1 GHz operating frequency bands adjustable to requirement of each territory. The system can be adjusted to different frequency bands; for example:

India	865 – 867 MHz
Europe	868 MHz
USA/Canada/Singapore/Australia	915 MHz

A detailed reference for frequency bands allowed in different Countries is available at:

<https://www.thethingsnetwork.org/docs/lorawan/frequencies-by-country.html>

The gateway also has provision to set the frequency band, depending upon the Country.

1.3 Conventions used in this manual

WARNING! Warning messages calls attention to a procedure or practice that if not properly followed could possibly cause personal injury.

CAUTION: Caution messages calls attention to a procedure or practice, that if not properly followed may result in loss of data or damage to equipment.

NOTE: Note contains important information and is set off from the regular text to draw the users' attention.

1.4 How to use this manual

This users' manual is intended to provide you with sufficient information for making optimum use of vibrating wire nodes in your applications.

To make the manual more useful we invite valuable comments and suggestions regarding any additions or enhancements. We also request to 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 apparently minor requirement is ignored or overlooked, the most reliable of instruments will be rendered useless.

A lot of effort has been made in preparing this instruction manual. However best of instruction manuals cannot provide for each and every condition in field that may affect performance of the sensor. 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 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 inbuilt thermistor. The complete range of vibrating wire sensors can be connected to wireless node including:

- Piezometers and water level sensors
- Strain gages
- Pressure cells
- Temperature meters
- Displacement sensors, extensometers, crack meters, joint meters
- Settlement monitoring sensors

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

2.2 Model EWG-01 gateway

Encardio-rite model EWG-01 wireless gateway is used as a 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 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 prior to being routed to a 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 Smartphone
- Application software for Windows

To be arranged by 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 easily 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	1		
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 tilt meter and gateway for any physical damage.
- Open the tilt meter and gateway box to check if the internal wirings are intact.

4.2 Setting up the Gateway and vibrating wire nodes location

Selecting correct locations for Gateway and tilt meter is important, especially in case more than one tilt meter are being installed at site and connected to single gateway.

The first step is to install the Gateway at a location that is in line of sight with all the installed tilt meters or in line of sight with most tilt meters. The best location will have to be determined at the site itself. For best results, the link between the gateway and the tilt meter should be strong, preferably better than -100 dBm. Please note, the stronger the link better will be the results.

4.3 Setting up the Gateway & Tilt meter

It is recommended that the setting up and configuration of nodes and gateway is done before mounting the them at respective installation location.

The gateway configuration needs to be done before nodes are configured. For setting up and configuring the gateway, refer to User's Manual # WI6002.117 on Gateway. Configuration of vibrating wire 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 Sampling interval for vibrating wire node is:

$$\text{Sampling Interval (Seconds)} = (15 * \text{No. VW Node}) + 180$$

5 QUICK START GUIDE

A quick start guide for both setting up and configuring Gateway and VW Node is given below. 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 the antenna's into their respective connector.
- Step 2:** Insert the battery into battery holder with their correct polarity.
- Step 3:** Connect any standard DC Power (9-30 V, 1 A) into Connector named as "IN" on the PCB with 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 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 [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 Android phone using passkey = [6965785054](#)
- Step 11:** Now open EWA-01 application on Android phone
- Step 12:** Select the paired Gateway to connect the application with 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 map.
Note down the Network ID.
Click on [save](#) button.
- Step 14:** Go to [Cellular Setup>>Turn on modem](#) to check for the signal strength then >>[Turn off 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 FTP server
- Step 15:** Go back to 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. Now we will move forward to configure the node.

5.2 VW Node Setup

Use step by step procedure to configure the VW Node.

- Step 1:** Open the node box. Connect the RF antenna (Provided with supply).
- Step 2:** Connect the vibrating wire sensor into designated connector with accurately.
- Step 3:** Insert the batteries into battery holder with their correct polarity.
- Step 4:** **Optional** - Connect any standard DC Power (9V, 1A) into Connector named as "EXT" on the node PCB with correct polarity.
- Step 5:** Switch on the node and wait for 30 sec.
- Step 6:** **Connecting the node to phone:**

1. Through Bluetooth Modem

- Insert the RS-232 Bluetooth Modem (provided with supply) into DB9 connector and switch on the Bluetooth modem
- Go to android phone's [Settings>>Connections](#)
- Turn ON the Smartphone Bluetooth
- Press on [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 Android phone using passkey = [6965785054](#)
- Now open EWA-01 application on Android phone
- Select the paired Node to connect the application with 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 supply. Once connected a prompt window will appear. Tap the FTDI button, Home screen of node will appear. Refer to the section [6.2.2](#) of this users manual for more details on this.

- Step 7:** Once connected through any one methods explained in Step 5 go to [Config Node >> Edit](#)
Enter Node ID, Installation date and select Network ID (same as Gateway network Id), Frequency plan(Same as selected in Gateway).
Enter Latitude and Longitude information either manually or through map. Click on [Save](#) button.
- Step 8:** Go to [Node Diagnostic >> Start Test](#) to see the signal strength and test packet status and then [Stop test](#).
- Step 9:** Go back to previous screen and Click on [System Setup>> Update Date/Time or Sync with Phone](#) to set the clock of the node.
Click on the [Erase Node Memory](#) to erase residual data if any.
Click on the [Edit](#) under Edit Sensor Parameter to enable/disable the parameter to report along with their units of choice, click on [Save](#).
- Step 10:** Click on "VW SENSOR SETTINGS" enter the sensor ID, Sensor comments. Select the sensor manufacturer, sensor model etc. After that click on "NEXT" button and enter the sensor polynomial coefficients as per the sensor calibration certificate also select the thermistor type from the dropdown. Click on "SAVE" button
- Step 11:** Go back to 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 Home screen click on [Register Node at Gateway](#) and wait for some time. If everything has been followed as per the steps stated above the node will successfully registered to the gateway.

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

6 CONFIGURING VW NODE

6.1 Setting up VW node

- Open the top cover with screw driver. Description of each part of the node is given in the figure 6-2

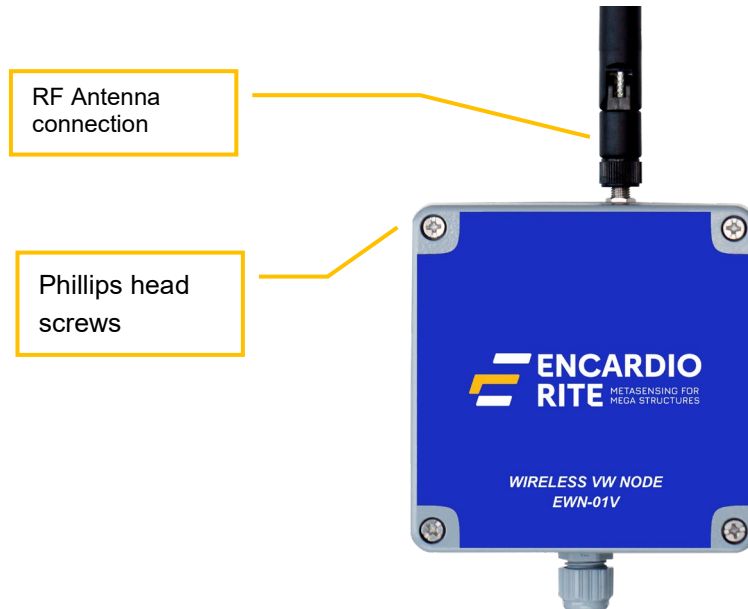


Figure 6-1 EWN-01V Single channel vw node

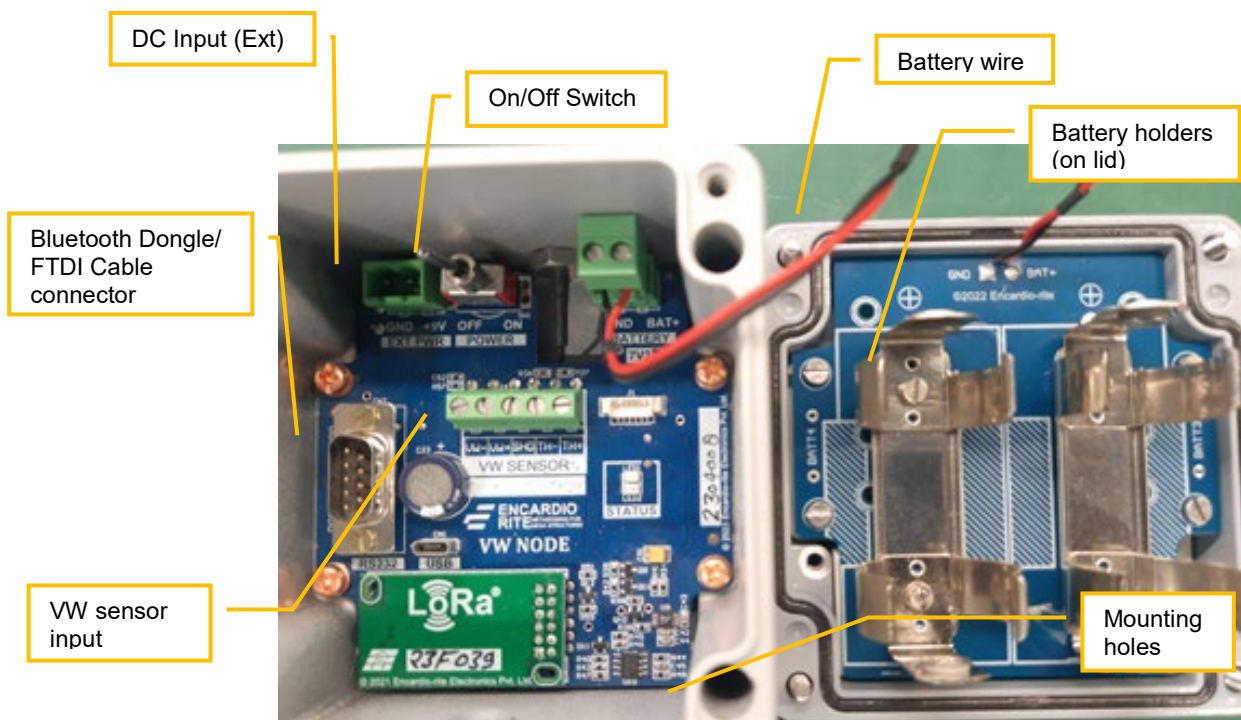


Figure 6-2 EWN-01V Single channel node details

- Connect the RF antenna (provided with supply) to the node properly.
- Connect the vibrating wire sensor cable to designated connector in node (VW+,VW-, SHD, T+,T-) as shown in figure 6-3.

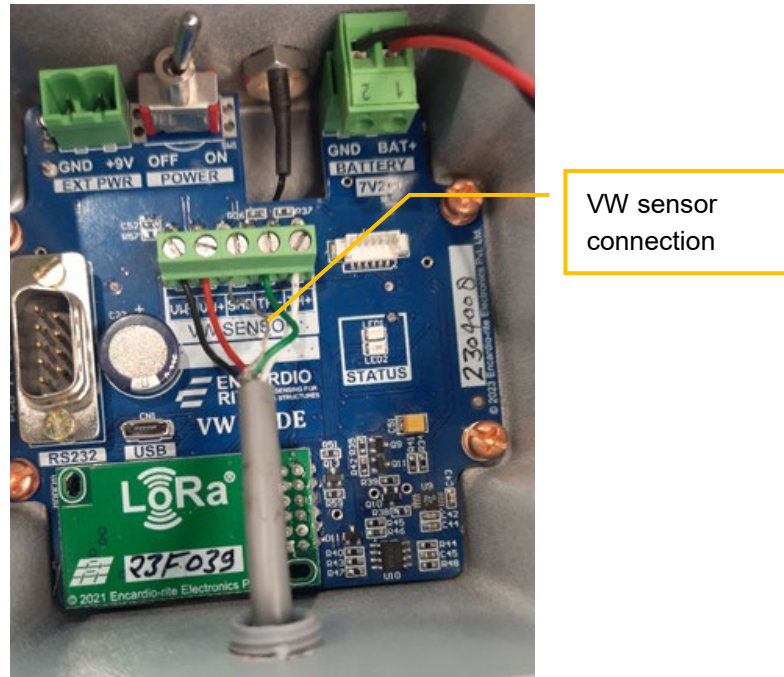


Figure 6-3 VW sensor connection to EWN-01V single channel vw node

- Insert the batteries carefully into Battery holder with their correct polarity. Ensure that the positive “+” and negative “-” are correctly connected, then switch on the node.
 - 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 node performs its internal operations.

6.2 Connection VW Node to phone

Install the apk file (provided with the supply) for “EWA-01” app on the phone. App shortcut 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.

6.2.1 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. Make sure that modem must be configured for 115200 baud rate and hardware flow must be OFF. Verify DIP switch settings with following figure 6-4.

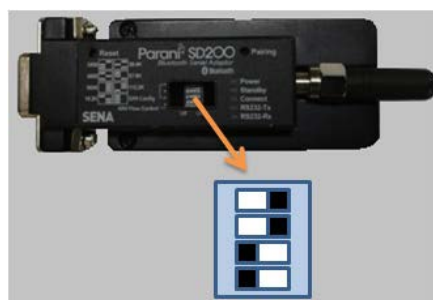


Figure 6-4 Bluetooth modem DIP switch settings

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

- Turn on Bluetooth of the android phone and go to Bluetooth settings. Click on “scan” button. Phone will show the list of Bluetooth devices found. Find the Node Name and serial number on phone screen and click for pairing the phone with Node. Once pairing button is pressed it will ask to enter passkey for authentication.
- Enter pairing code “6965785054” and then press OK. On successful authentication, it will show that device is paired. Now phone is paired with Node.
- Open the "EWA-01" apk installed on 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).

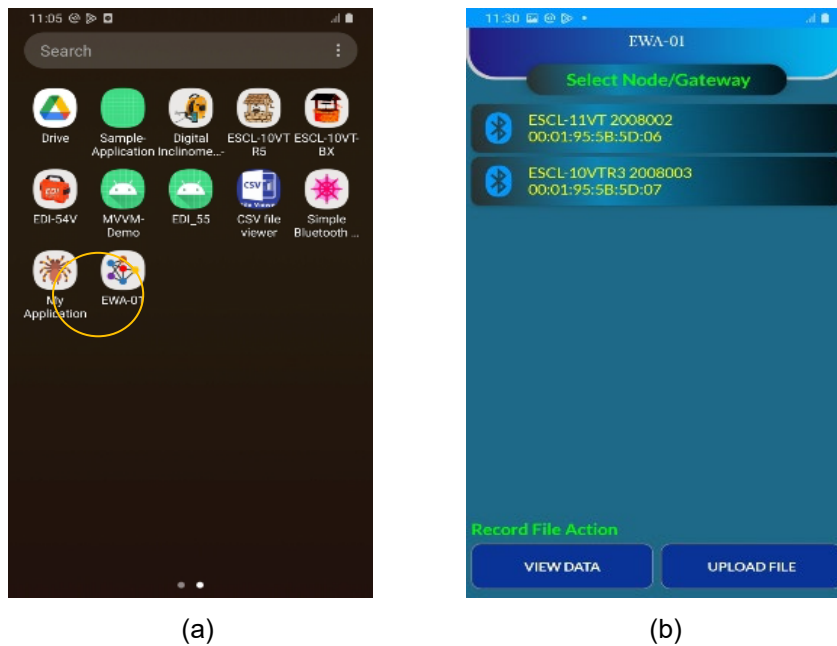


Figure 6-5

6.2.2 Connection through OTG

- Switch on the node and connect it to the Smartphone using the FTDI to OTG adaptor provided with 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 the figure 6-7 (a). Click on the FTDI button, home screen of “RF Node” will appear, as shown in figure 6-7 (b).

- At the home screen various information about the node can be seen. Detailed description of each segments required for configuration is given in the subsequent sections.

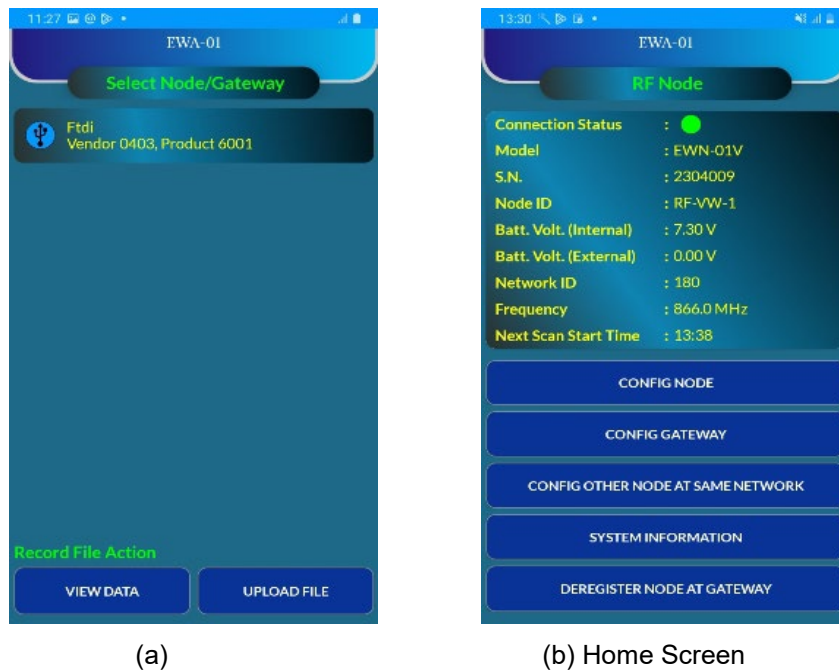


Figure 6-7 Home screen

6.3 Config Node

Click on the “CONFIG NODE” tab from Home screen, a window as shown in the 6-8 (a) will appear. Click on ‘Edit’ button to input the information as per the requirement.

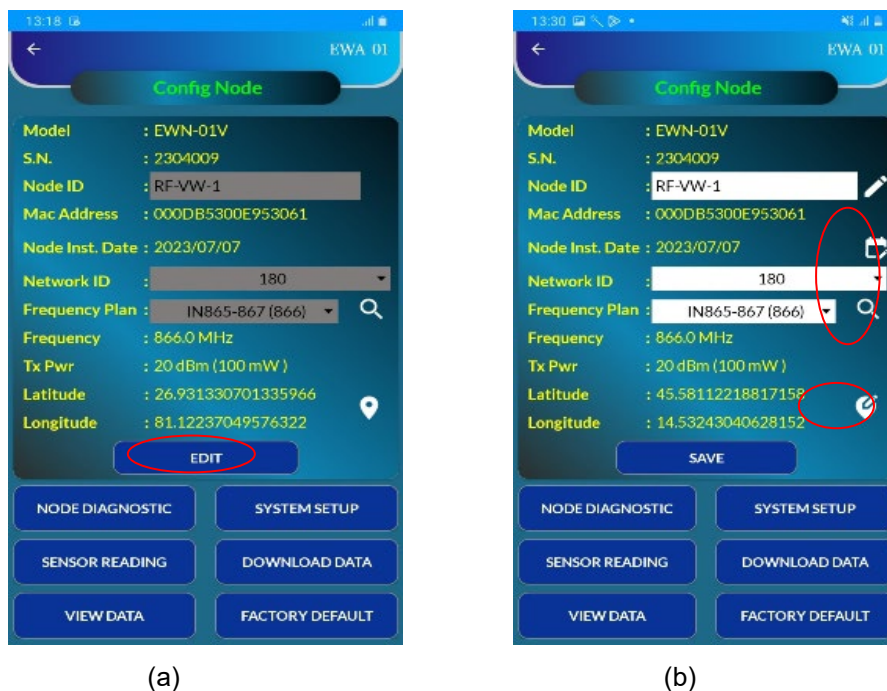


Figure 6-8 Config node

- User can input the “Node ID” of their choice. Try to input some meaningful ID so that it becomes convenient for other users also.

- Click on the Calendar Icon as shown in figure 6-8 (b) to enter the "Node Inst. date".
- User can select the "Network ID" from the drop down menu. Select the same Network ID what 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. User can select the region and associated frequency by tapping on the search icon.
- For setting Latitude and Longitude of respective installation location, click on the location icon as shown in figure 6-8 (b). A prompt window will appear as shown in figure 6-9 (a)
 - If 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 user does not know the installation location coordinates, select the button "Set location from map" 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 location is selected, click on 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 location is selected, click on the "SAVE" button to store all the information inside the node.



Figure 6-9 Location Coordinates

6.4 System Setup

Clock and parameter related information can be edited and modified under system setup.

- Tap the "SYSTEM SETUP" button as shown in the figure 6-8 (b). A new window will appear as shown in figure 6-10 (a).



Figure 6-10 System setup & Sensor settings

- Set the “Clock Settings” or RTC (Real-Time Clock) either manually or through auto sync option. Remember that during auto synchronization, the smart phone must have the updated RTC clock settings. Once done, apply the changes by clicking on the "UPDATE DATE/TIME" button.
- Any previous log can be erased by clicking on “ERASE NODE MEMORY”. Be cautious while doing so as erased data cannot be recovered later.
- User can also control and configure the parameter along with their units of choice. Click the “EDIT” button. Enter the parameter name and specify the unit of measurement, select the desired temperature unit. Save the changes through the “SAVE” button.
- Click the "VW SENSOR SETTINGS" tab (figure 6-10 (a)). Screen as shown in Figure 6-10 (b) 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 sensor under “Sensor Comments”.
 - Select the manufacturer of sensor using dropdown list. Encardio rite's sensors are automatically included, and user can choose the appropriate model from the dropdown 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 dropdown. If unsure, please get in touch with Encardio rite for information on the pulse for averaging settings.
 - Click on the "NEXT" tab, window as shown in figure 6-11 (a) will appear. 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 dropdown menu. Save inputs by clicking on "SAVE" button.
 - If sensors from other manufacturers need to be connected to Encardio-rite vw node, select "Any Mfr" from the dropdown 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 user end. To add or remove manufacturers, tap on 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.

(a)

(b)

(c)

Figure 6-11 Sensor settings

6.5 Sensor Reading

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

Figure 6-12 Sensor Reading

- Tap the "SENSOR READING" tab from "Config Node" screen (figure 6-8 (a)) to see the real-time readings of connected sensor as shown in figure 6-12.
- Select the Noise bar range, parameter and temperature decimal places. Apply inputs by clicking on "Apply" button.

6.6 Download Data

- Press "Download Data" button from "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:

- Since Beginning
- Since Last Download

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

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



Figure 6-13 Download data

6.7 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
```

6.8 View Data

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

- Press the "VIEW DATA" tab from "Download" screen (figure 6-13). A window as shown in figure 6-14 (a) will appear.
- Select the desired node from the dropdown.
- Select different parameters from the dropdown to view corresponding data for those parameters.

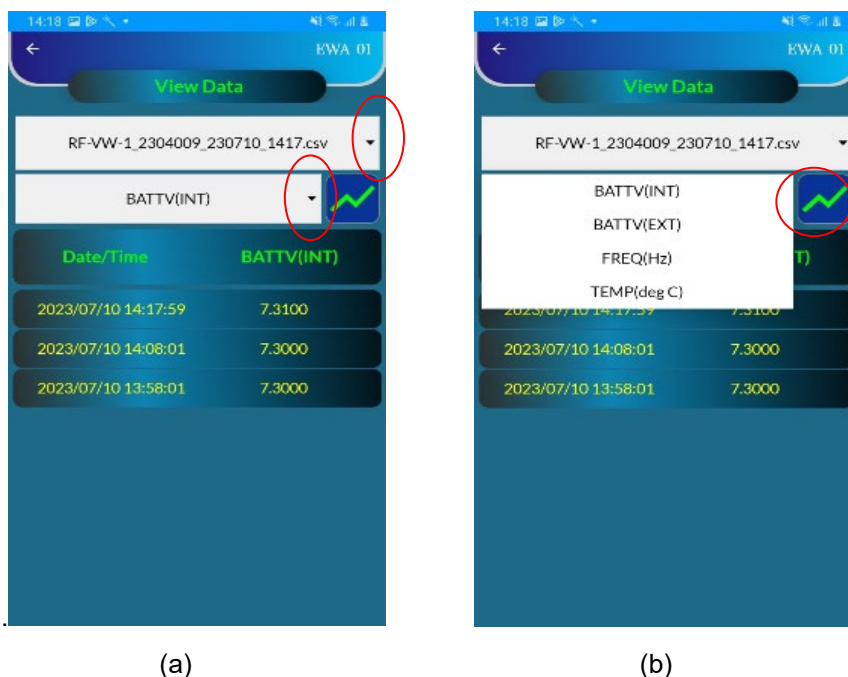


Figure 6-14 View data

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

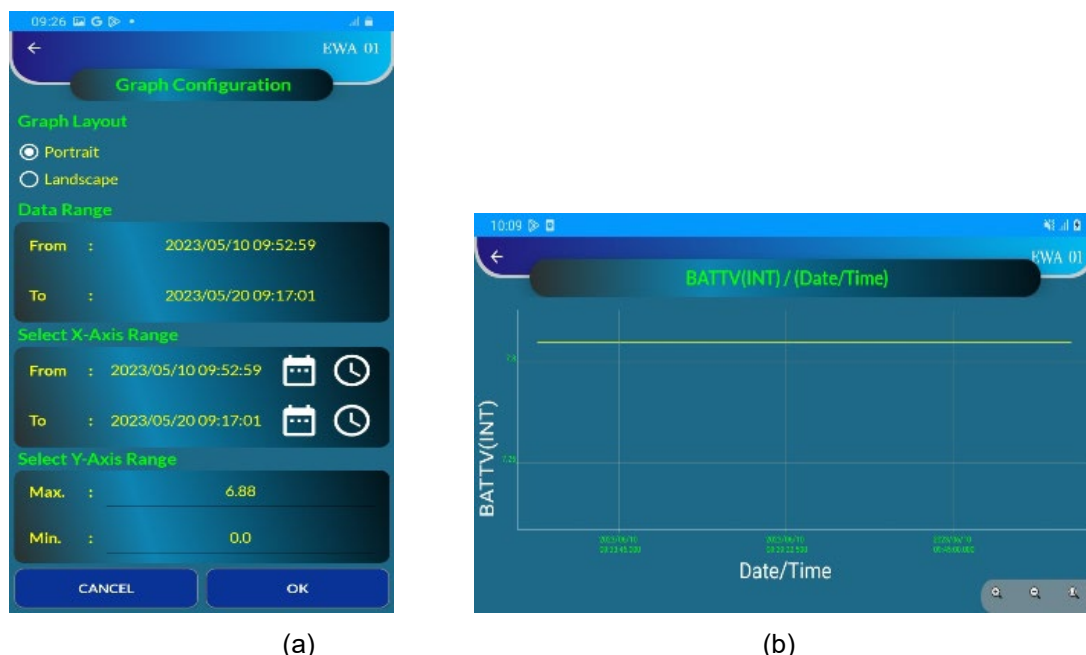


Figure 6-15 View data in graphical format

6.9 Upload File

Data once downloaded on phone can be sent directly to remote FTP server using upload file option.

- Press the “UPLOAD FILE” tab from “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 screen in figure 6-16 (a)) and click on the “Upload” button to push the file to FTP server. Internet connectivity in the android phone is must to perform this activity.



Figure 6-16 Upload data

6.10 Node Diagnostic

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

- Click “NODE DIAGNOSTIC” tab from “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 acknowledgement from 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.

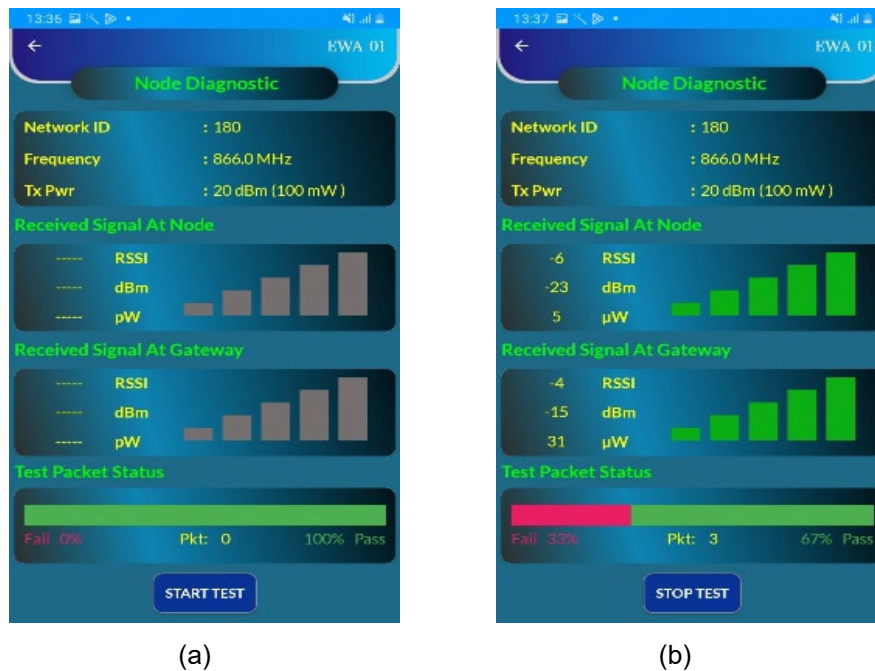


Figure 6-17 Node diagnostic

6.11 Factory Default

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

- To reset the node, click on the "FACTORY DEFAULT" tab from "Config Node" screen (figure 6-8 (a)). A prompt window asking for reset password will appear as shown in figure 6-18.
- Enter the password "4TfZ9q7X" and click on the "OK" button to reset the node.

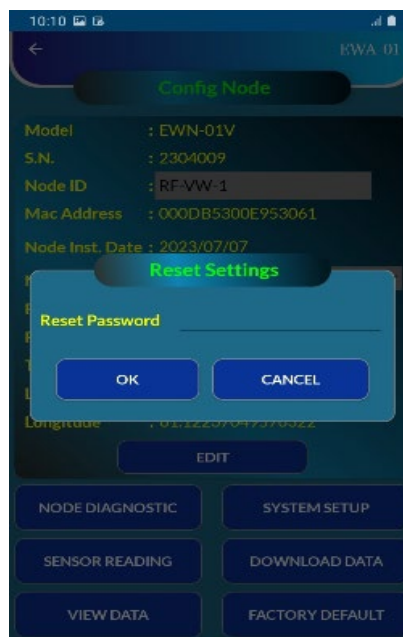


Figure 6-18 Reset settings to factory default

6.12 System Information

System information option provides all the necessary information's about the node.

- Click on the "System Information" tab from the main menu. A window as shown in the figure 6-19 will be displayed. User can click on any tab to see the related information.

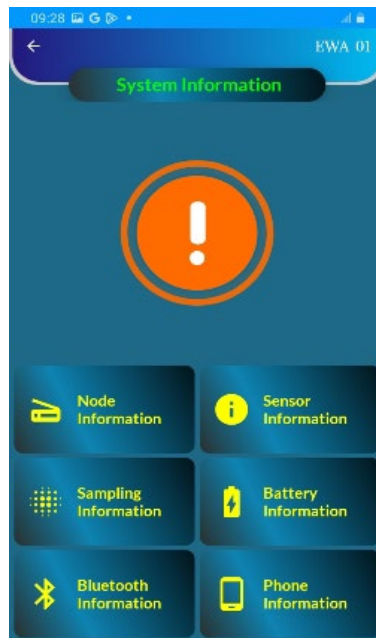


Figure 6-19 System information

7 RE-CONFIGURING GATEWAY & NODES AFTER INSTALLATION

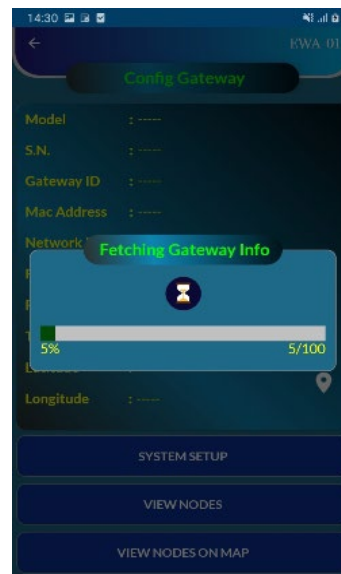
7.1 Re-configuring gateway via node

This is the advanced feature where 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 or Laptop.

- Click on the “Config Gateway” tab from the main menu. A window as shown in the figure 7-1 (a) will appear. 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, but few important parameters like Gateway's Clock Settings, Scan Start Time, 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 "Erase Gateway Memory" tab.
- To view all the nodes connected within the wireless network, click on the "View Nodes" tab from screen shown in figure 7-1 (c). Screen as shown in figure 7-2 (b) will appear.
- To view the connected nodes location 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 location of nodes.

7.2 Re-configuring nodes via gateway

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

- Click on the tab "CONFIG NODE" from the main menu. A screen as shown in figure 7-3 (b) will appear.

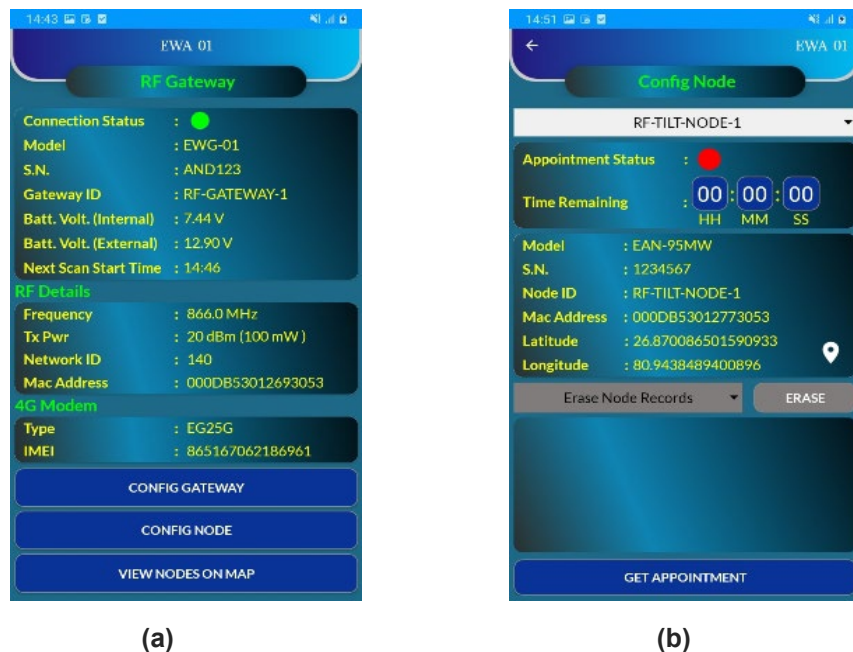


Figure 7-3

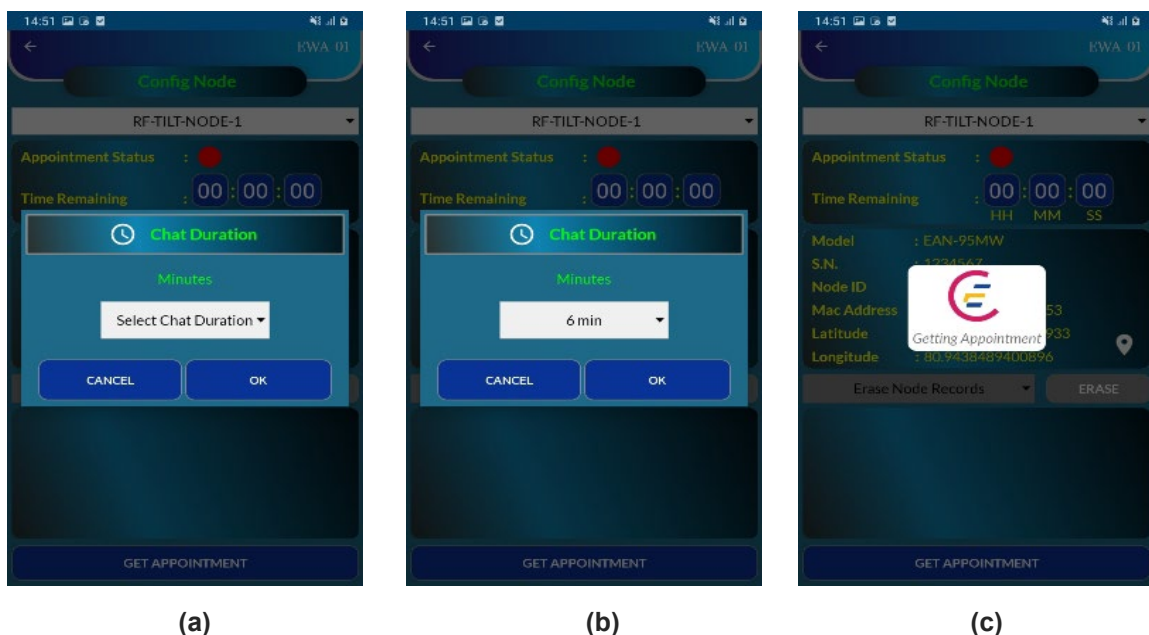


Figure 7-4

- To configure a specific node, choose the desired node from the dropdown 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).

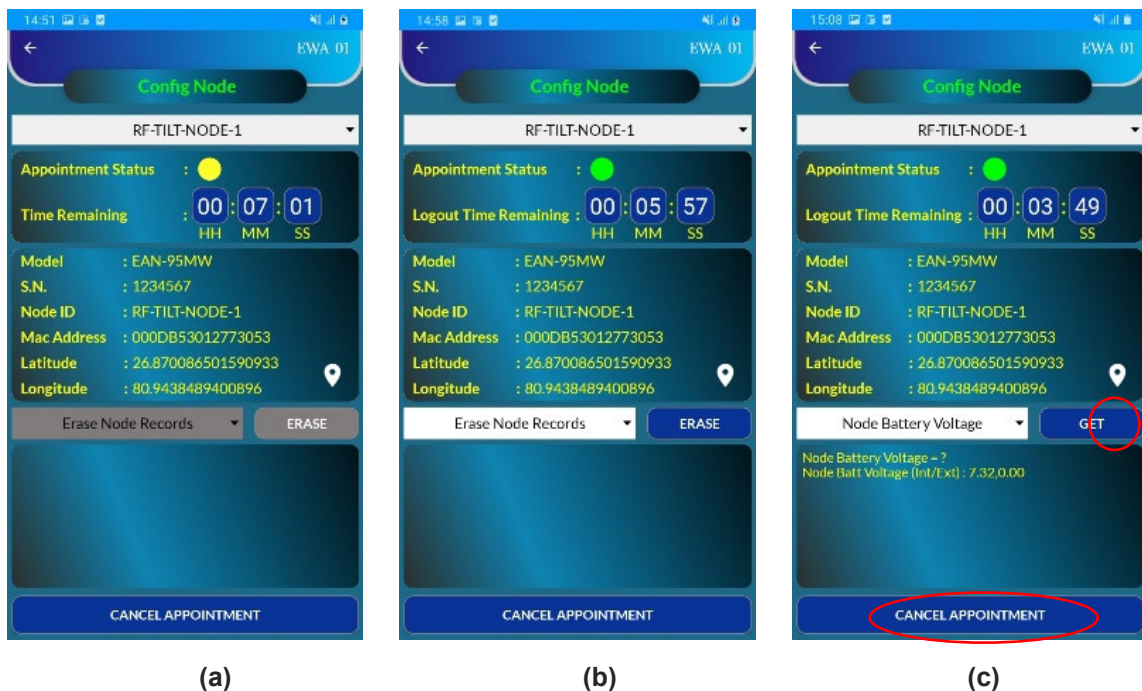


Figure 7-5

- User can cancel the appointment any time by clicking on the Cancel Appointment button.

7.3 Re-configuration other nodes in 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:

- At the home screen click on the "CONFIG OTHER NODE AT SAME NETWORK" tab, as illustrated 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, screen as shown in 7-6 (b) will appear, presenting the gathered information about the network's connected nodes.

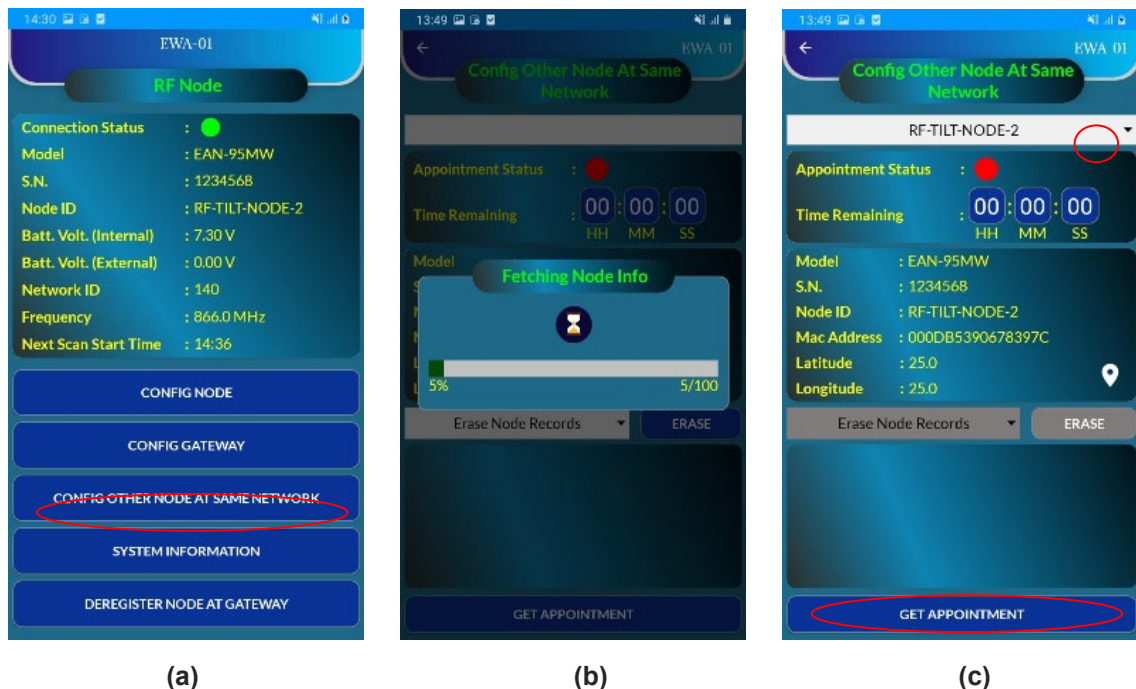


Figure 7-6

- To configure a specific node, choose the desired node from the dropdown menu, as shown in figure 7-6 (c).
- 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.

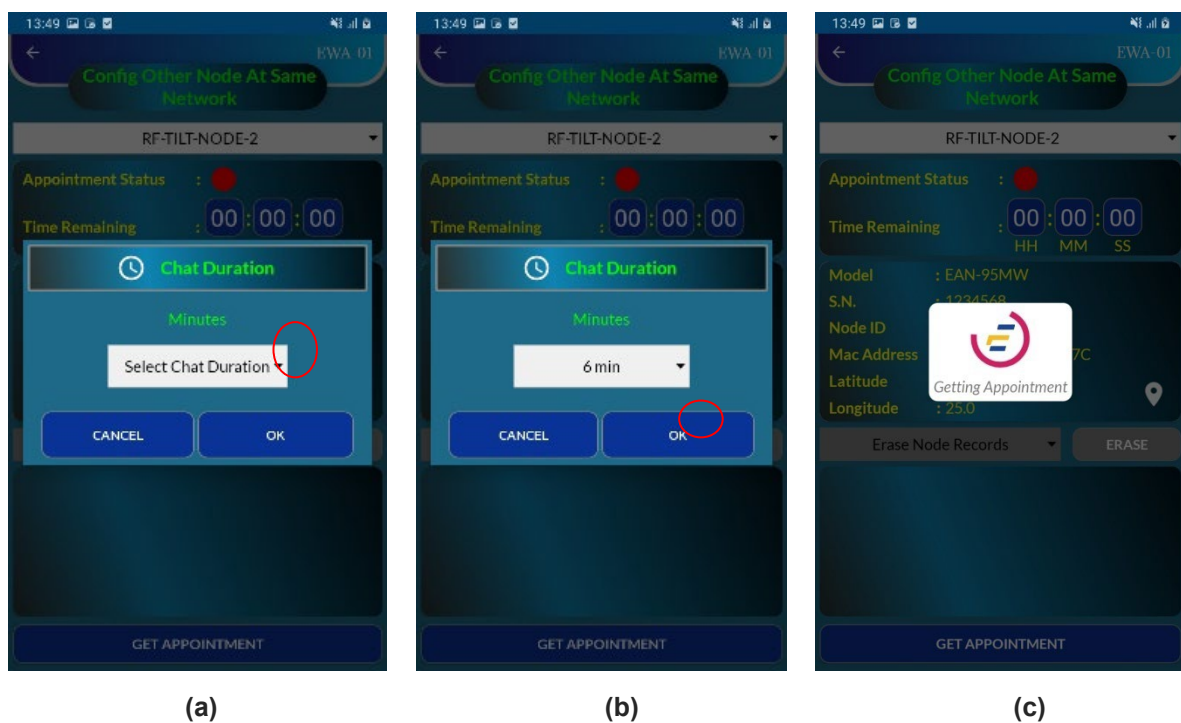


Figure 7-7

- 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).



Figure 7-8

- User can cancel the appointment any time by clicking on 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 the 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.

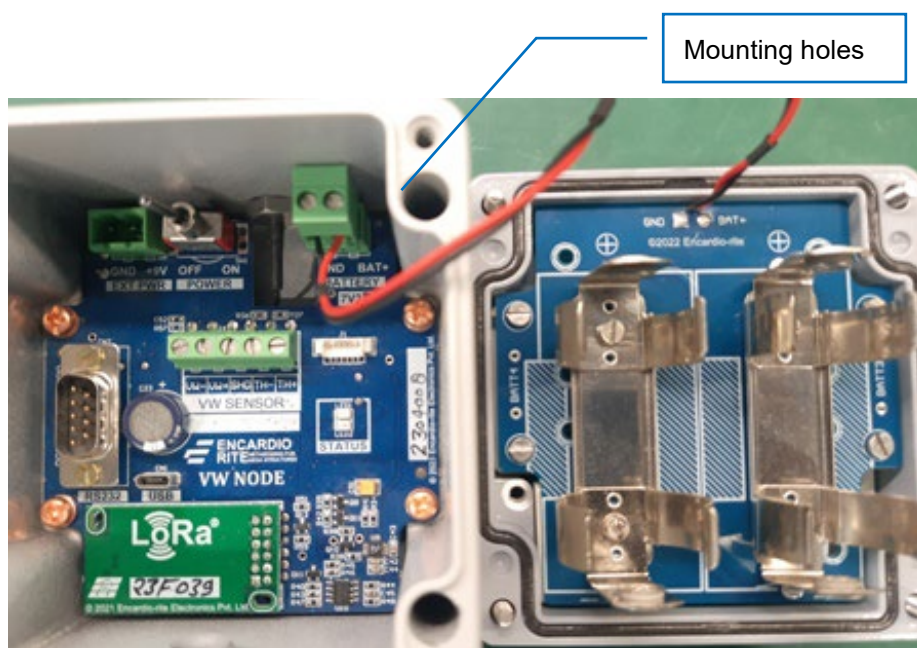


Figure 9-1

- Mark the locations of four mounting holes.
- Ensure that position of the holes are 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 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 precaution must however be taken for protection of the equipment.

Type of mast to be used for such application depends on the site location.

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

Height of Node mounting needs to be carefully planned such that it is in line of sight of Gateway, but not too high to attract lighting.

Once the mast is ready, node can be fixed on it using suitable bracket, 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 requirement.

NOTE: Mast, mounting accessories, protection cover and necessary civil works is in the scope of the client.



**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 phone.
- 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 users 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.