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USERS' MANUAL

SINGLE CHANNEL VW DATALOGGER OPERATION

MODEL ESCL-12VT

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Contents

Battery charging and care of battery

Data logger's Battery

The ESCL-12VT Single Channel VW data logger with internal battery uses two primary D-cell non-rechargeable batteries as a power source.

If the ESCL-12VT data logger is not going to be used for more than 30 days, remove the batteries from battery compartment.

When battery voltage is showing 10 percent of battery capacity left in system information screen (at Readout unit), replace the battery at the first opportunity to avoid data loss.

WARNING: Always SHUTDOWN Data logger before removing battery from the Data logger. Data may be lost otherwise.

Readout unit's (Mobile Phone's) Battery

The ESCL-12VT relies on an Android Mobile Phone as a readout unit. The mobile phone generally has an internal sealed rechargeable Li-ion battery as a power source. A separate battery charger/adaptor unit operating from universal AC mains supply is optionally (available separately) supplied with ESCL-12VT Readout unit. This battery charger operates from 90 to 260 V AC, 50 or 60 Hz which makes it suitable for operation from AC mains available throughout the world.

On receiving the mobile phone for the first time discharge the battery fully and then recharge the battery for 2 hours using the supplied mains powered battery charger.

If the mobile phone is not going to be used for more than 10 days, fully charge the battery and switch OFF the phone before storing the mobile phone. Also fully charge the battery before use if the mobile phone has not been used for more than 10 days.

The user is strongly advised to read the instructions and user's manual supplied with the mobile phone on how to take care of its battery.

1 INTRODUCTION

1.1 Overview

The ESCL-12VT Single Channel VW Datalogger is designed to be very simple to use, be deployable in harsh environments and to be as compact as possible. The user-friendly software and standard D-cell batteries allow easy downloading of the data and maintenance in the field. Even users with very little experience with Geotechnical Instruments will be able to connect, download data and change settings with a matter of a few inputs.

1.2 System Components

The ESCL-12VT Single Channel VW Datalogger consists of the following system components and accessories:

1 ESCL-12VT Datalogger

2 Windows / Android Configuration software

3 USB to serial cable

2 OPERATING PRINCIPLE

The ESCL-12VT Single Channel VW Datalogger is designed to monitor measured parameter of both the vibrating wire element and the integral thermistor of any vibrating wire sensor. The Datalogger offers an on board 5-pin connector for rapid sensor connection. The datalogger are housed inside a IP-65 enclosure which is very robust and well-suited to operation in harsh environments.

Datalogger can store calibration coefficients, x-parameter, units of measurement etc. Data can be stored in engineering units. Each reading is stamped with date and time at which the measurement was taken. It has non-volatile flash memory to store up to 599K records.

These data files can be downloaded to PC using Configuration Manager by connecting logger with data cable or Bluetooth. The downloaded readings get stored in the PC's Home Directory in CSV format. The files can be transferred to FTP server using internet connection. It can be processed on any common available spreadsheet like Microsoft-Excel.

ESCL-12VT with built in 3G/4G modem has capability to upload data records directly to remote FTP server. Upload schedule can be set in Datalogger using this software for automatic data upload to FTP server. Schedule can be set as fast as 5 minutes. Datalogger with 2-way telemetry option can be configured remotely using internet connection.

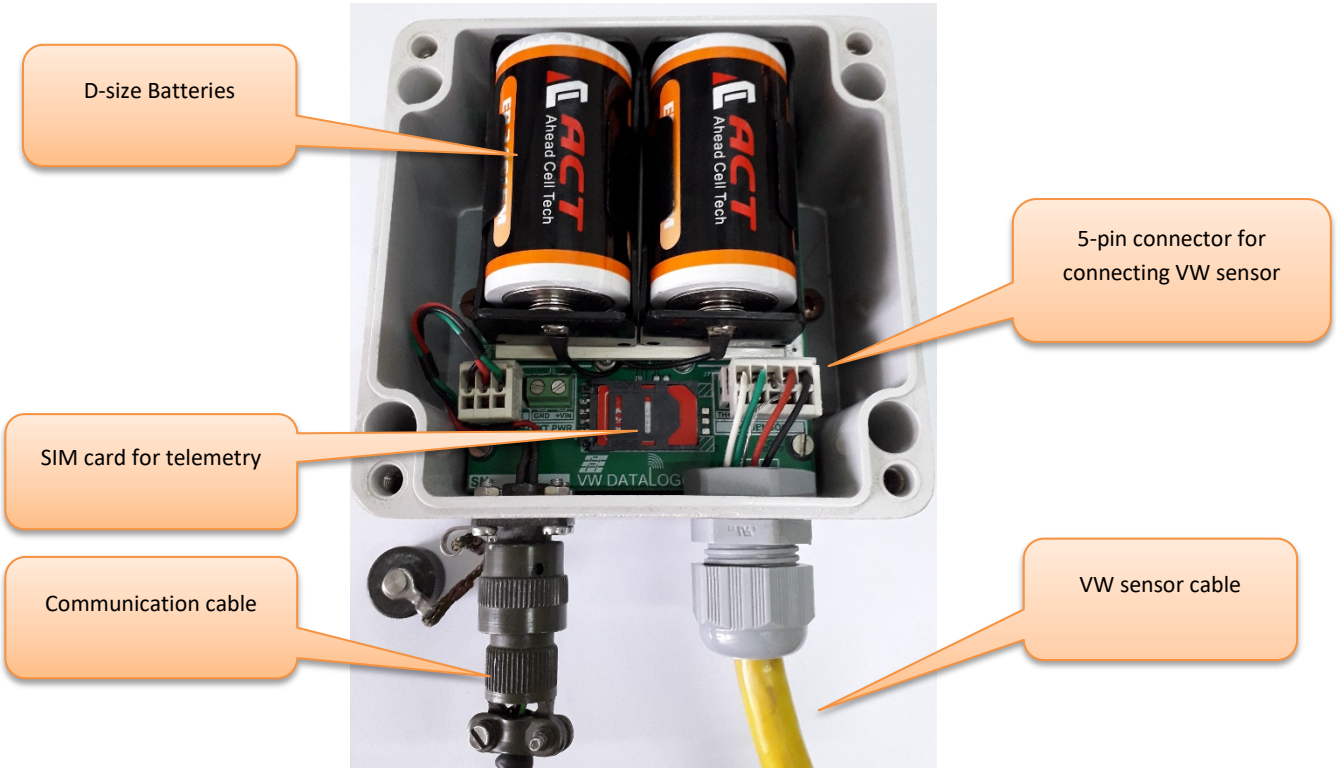

Figure 2-1: Datalogger with sensor cable

3 DATALOGGER SETUP

Refer following steps to setup datalogger for first time.

Figure 3-1: D logger

3.1 Connecting Sensor Cable

Refer following steps to connect VW sensor with Datalogger:

1. Open the datalogger by unscrewing the 4 screws provided at top cover.
2. Unscrew the cable gland (CG-1) of datalogger cable gland holder and pass sensor cable end through cable gland assembly as in Figure 3-3.
3. Take the sensor end connector and push tool provided for connecting the sensor end cable.
4. Check step 2 in Figure 3-4, hold and press down push tool to connect cable.
5. Connect Black (B) in the first slot, Red (R) in the second slot, Shield (S) in the third slot, White (W) in fourth slot and Green(G) in fifth slot. See Figure 3-5.

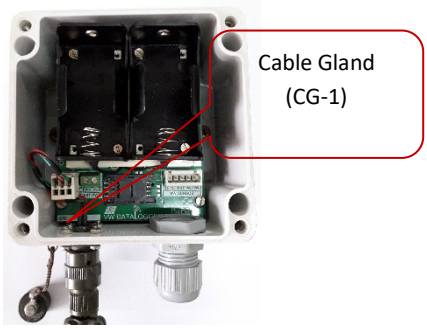

Figure 3-2: Pull out – top cover

Terminal	Wire Color
T+	Green
T-	White
GND	Shield
S+	Red
S-	Black

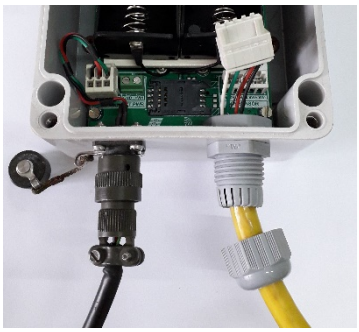

Figure 3-3: Sliding cable gland assembly

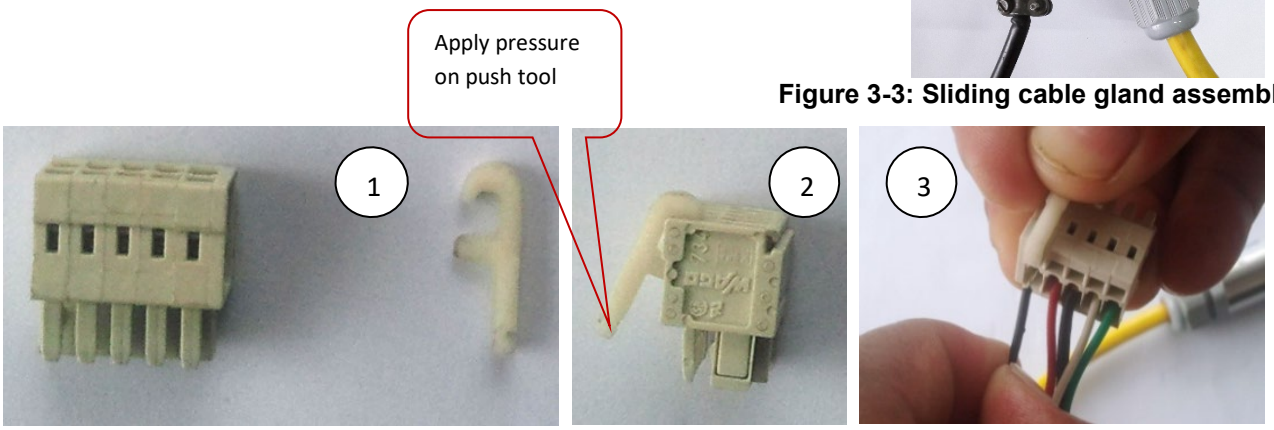

Figure 3-4: Connecting the sensor cable to sensor end connector

1. Wrap the strengthening thread around the screw and tight the screw on stud.
2. Pull the cable out to transfer cable load on the strengthening thread.
3. Plug the connector into socket provided on board as shown in Figure 3-7.
4. Push the cable gland holder in place by applying sideways pressure.
5. Screw back the cable gland.

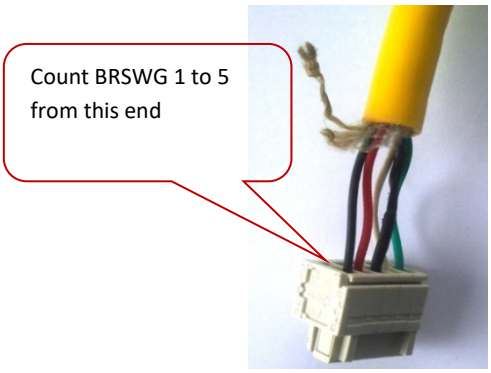

Figure 3-5: Connector wiring

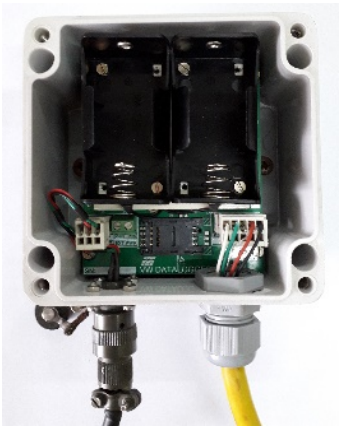

Figure 3-6: Connecting the sensor cable

3.2 Inserting SIM Card

A 3G/4G enabled SIM card is required for Dataloggers those are having telemetry option to upload logged data to remote FTP server. Refer following steps to insert SIM card into Datalogger.

1. Remove the top cover of datalogger by un-screwing the four screws on the top cap of the datalogger.
2. Unlock the SIM card holder by applying the force from side way and pull to flip–up the SIM card holder as explaned in Figure 3-9.
3. Insert the SIM card into slot of SIM card holder as direction shown in Figure 3-10.
4. Close the SIM holder by pushing from the opposite side keeping the SIM pushed down as shown in Figure 3-11. Slide the holder to Lock.

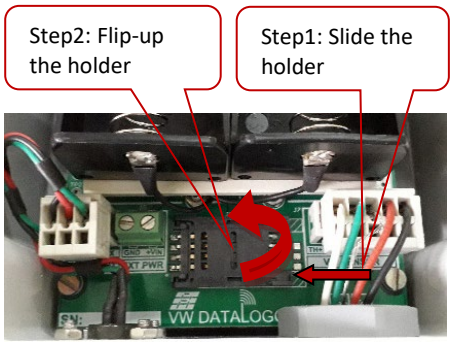

Figure 3-9

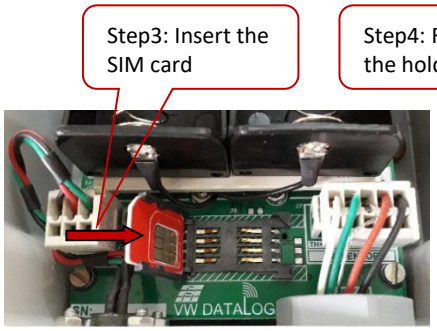

Figure 3-10

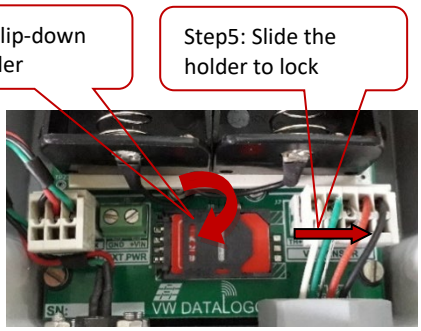

Figure 3-11

4 POWER SUPPLY

ESCL-12VT Datalogger can be powered by either of 3 options.

- Using 1.5 V Alkaline Batteries
- Using 3.6 V Lithium Batteries
- 12 V external powered.

4.1 2 X 1.5 V Alkaline battery option

Datalogger with this option uses 3 V powered power supply module. In this option, two D-size 1.5V standard Alkaline Primary Batteries can be used to power-up the Datalogger.

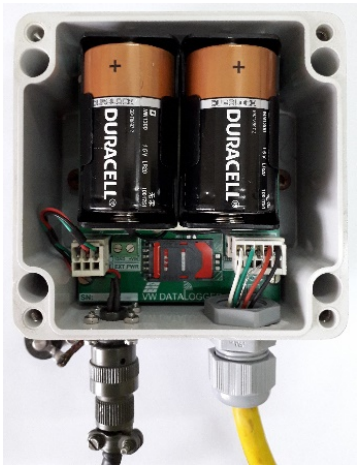

Figure 4-1 Datalogger powered with 2 x 1.5 V Alkaline Batteries

4.2 2 X 3.6 V Li battery option

Datalogger with this option uses 7.2 V powered power supply module. In this option, two D-size 3.6 V standard Lithium Primary Batteries can be used to power-up the Datalogger.

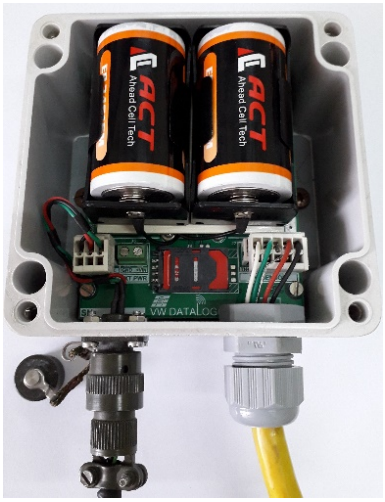

Figure 4-2 Datalogger powered with 2 x 3.6 V Lithium Batteries

4.3 12 V External Powered (Mains/Solar)

Datalogger with this option uses 12 V powered power supply module. This 12 V supply can be fed through either of various options like.

- 12 V from Mains Adaptor
- 12 V from solar panel
- 12 V from Battery backed power supply etc

Following figure 4-3 shows an example of external power supply option.

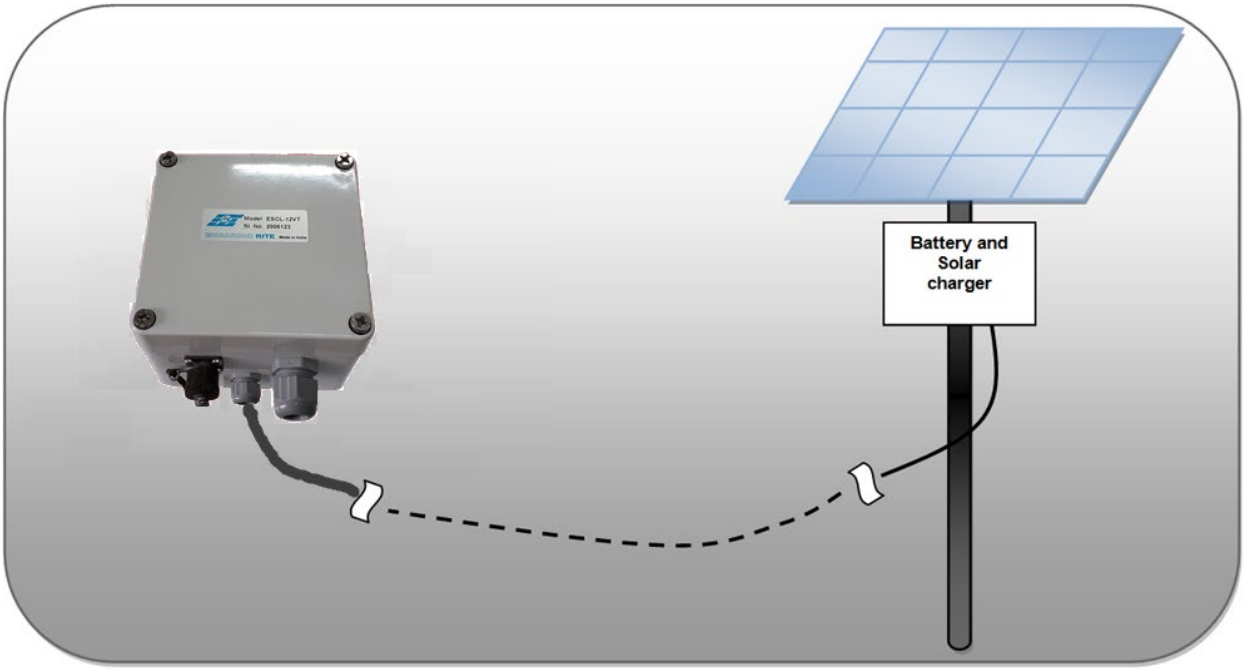

Figure 4-3 Datalogger powered with 12 V Solar powered

5 COMMUNICATION INTERFACE

Datalogger can be configured by application software using communication cable or via Bluetooth. These methods are explained in following sections.

5.1 Communication Cables

Communication cable has 4 pins USB connector at one end and 9 pins D-sub connector at another end. Connect 9 pins D-sub connector of the Interface Cable to the Datalogger and other end with USB socket at PC/Laptop. If communication cable is unavailable, standard USB to RS-232 Converter can be used. Cable wire details are given in following table.

Figure 5-1: Communication Cable

9-Pin D-Sub Female	FTDI cable wires
2	Orange
3	Yellow
5	Black
7	Brown
8	Green

RS-232 Interface Cable has 3 pins circular connector at one end and 9 pins D-sub connector at another end. Connect 3 pins circular connector of the Interface Cable to Datalogger and other end with 9-pin D-sub socket to communication cable. Cable wire details are given in following table.

Figure 5-2: RS-232 Interface Cable

9-Pin D-Sub Male	3-Pin Circular

	Connector
2	Orange
3	Yellow
5	Black

5.1.1 Connecting Datalogger with Laptop/PC using communication cable

Connect the Datalogger with Laptop/PC using communication cable as shown in Figure 5-3. Run the application on Laptop/PC to interface the Datalogger.

Figure 5-3: Datalogger connection using communication cable

5.2 Bluetooth™ Modem

The Datalogger can also be connected using Bluetooth™ modem for communicating with PC/Laptop/Mobile. Take one Bluetooth™ modem supplied by Encardio-rite. Remove the battery cover. Insert two standard 'AA' 1.5V Alkaline batteries into the holder as shown in Figure 5-5.

Figure 5-4: Bluetooth Modem

Figure 5-5: Inserting Batteries into Battery holder

Make sure that modem must be configured for 115200 baud rate and hardware flow must be OFF. Verify DIP switch settings with following Figure 5-6.

Figure 5-6: Bluetooth modem DIP switch settings

5.2.1 Connecting Datalogger with Laptop/PC using Bluetooth™ Modem

Take a Bluetooth modem and plug it at 9-pin D-sub connector of RS-232 Interface cable as shown in Figure 5-7.

Turn ON the Bluetooth modem by pressing ON/OFF switch provided near modem's battery compartment. The power indicator of Bluetooth modem will glow in GREEN colour to ensure that Bluetooth modem is ON. Turn ON the Bluetooth of the PC/laptop and search Bluetooth devices in the network. Once searching gets completed, a list of Bluetooth devices found is displayed. Find the Bluetooth modem's serial number in the list of devices found and click for pairing the PC/Laptop with the Bluetooth modem.

Once pairing button is pressed it will ask to enter passkey for authentication. Enter pairing code "**69836776**" and then press OK. On successful authentication it will show that device is paired. Now the PC/Laptop is paired with Bluetooth modem. This activity is required for first time connection with the Bluetooth modem.

Run the application software at PC/Laptop. Go to home screen and select the assigned virtual COM port and press connect Datalogger button to connect the Datalogger.

Figure 5-7: Connecting Datalogger with Laptop using Bluetooth Modem

5.2.2 Connecting Datalogger with Mobile Phone using Bluetooth™ Modem

Take a Bluetooth modem and plug it at 9-pin D-sub connector on RS-232 comms card of Datalogger as shown in Figure 5-8.

Turn ON the Bluetooth modem by pressing ON/OFF switch provided near modem's battery compartment. The power indicator of Bluetooth modem will glow in GREEN colour to ensure that Bluetooth modem is ON. Turn ON the Bluetooth of the Mobile Phone and search Bluetooth devices in the network. Once searching gets completed, a list of Bluetooth devices found is displayed. Find the Bluetooth modem's serial number in the list of devices found and click for pairing the Mobile Phone with the Bluetooth modem.

Once pairing button is pressed it will ask to enter passkey for authentication. Enter pairing code "**69836776**" and then press OK. On successful authentication it will show that device is paired. Now the Mobile Phone is paired with Bluetooth modem. This activity is required for first time connection with the Bluetooth modem.

Figure 5-8: Connecting Datalogger with Mobile Phone using Bluetooth Modem

Run the application software at Mobile Phone. Go to main menu screen and select the Bluetooth modem's serial number from device list. Device list can be viewed by pressing connection button from main menu screen. On selection, Datalogger will get connected to mobile phone automatically.

6 SYSTEM SPECIFICATIONS

6.1 Single Channel VW Datalogger

Sensor type : Any VW sensor with integral Thermistor

Sensors : Vibrating Wire – 1 No.
Thermistor – 1 No.

Measurement Range : VW frequency range 400 to 6000 Hz
Thermistor type Dale 1C3001-B3, temperature range -40 to +100 Celsius.

Accuracy : Frequency ± 0.01 % of reading
Temp ± 0.1˚C (excluding sensor inaccuracy)
Real time clock ± 1 minute/month

Resolution : Frequency 0.001 Hz
Temp 0.01˚C
Real time clock 1 second

Power Supply : 2 x 3.6V D-size Lithium cells (19AH)
2 x 1.5V D-size Alkaline cells (15AH)
12V External Powered (Mains / Solar)

Battery backup (@ 1 Hour scan interval) : **Without 3G/4G Modem**-
10 Years with Lithium Cell
6 Years with Alkaline Cell

With 3G/4G Modem- @upload Interval 24hrs
6 Years with Lithium Cell
2 Years with Alkaline Cell

Scan Schedule : Configurable (5 seconds – 7 days)

Data upload Schedule : Configurable (5 minutes – 7 days)

Memory : FRAM (2-Mbit) & Flash Memory (64-Mbit)

Data Storage Capacity : 3 Million data points

Wireless Modem : **3G** EHS6
4G ELS61-AUS, ELS61-EU, ELS61-US

Antenna : Built-in Stub Antenna
(Optional) External Whip Antenna

Communication Ports : RS-232 (Standard) 115 kbps

Data Transfer : Via RS232
Via 3G/4G cellular network

Configuration & Data Retrieval : **Laptop running Windows OS**-

using RS-232 or Bluetooth (see Note)

Mobile Phone running Android OS-
via Bluetooth (see Note)

FTP **:** using 3G/4G cellular network

Note: Data transfer via Bluetooth requires add-on Bluetooth dongle for Datalogger

Remote Configuration & Data Retrieval **:** Datalogger can be configured remotely by 2-way telemetry using 3G/4G cellular network

Dimensions (mm)* : L= 140mm, W= 122mm, H= 90mm

Weight* : Approx 1.4 kg (with Battery)
Approx 1.1kg (without Battery)

***Environmental*:**

Operating Temperature Range : -30°C to 70 °C

Humidity : 100 % Max

Environmental Protection : IP-65

7 DATALOGGER INTERFACE SOFTWARE

7.1 ESCL-12VT Configuration Manager for Mobile Phone

The ESCL-12VT Single Channel VW datalogger system is using Mobile Phone as a Readout unit. Phone is running on Android operating system for providing powerful platform to manage applications efficiently. Readout has so many features like phone calls, SMS, MMS, GPRS/3G/4G, Wi-Fi, Bluetooth ™, USB and high resolution Camera. User can use Readout as mobile phone for making calls. Readout has GPRS/3G/4G which enables user to access internet from site to upload/download files and checking E-mails. Wireless Bluetooth can be used to send files to PC or any other Bluetooth device. High resolution camera can be helpful to take site conditions' photographs and send them to the back office by sending MMS. It has higher capacity external memory card of 8GB which can store lots of data. Data backup can be taken on regular basis by connecting phone with PC through USB cable.

Figure 7-1 ESCL-12VT Configuration Manager Application running on Phone

The ESCL-12VT software running on phone can take sensor readings and store them into memory. The datalogger can be configured through this software. ESCL-12VT software has ability to show sensor reading logs in tabular/graphical format instantly after download reading is complete. CSV files are created automatically while saving downloaded data. These CSV files can be uploaded to remote server through GPRS/3G/4G/Wi-Fi.

Running ESCL-12VT application is very simple. It is as simple as playing games in mobile phone. The graphic user interface makes it users friendly and thus easy to operate.

7.2 ESCL-12VT Configuration Manager for PC/Laptop

The application is configuration manager software for ESCL-12VT Single Channel VW Datalogger. The datalogger can be configured through this software. It analyses the data files produced by the ESCL-12VT Single Channel VW Datalogger. The application displays raw data and parameter live. By setting the log interval for scanning, the readings can be scanned which gets saved in the logger's non-volatile memory. After download, the application allows the user to analyse the readings obtained from the datalogger in tabular and graphical form.

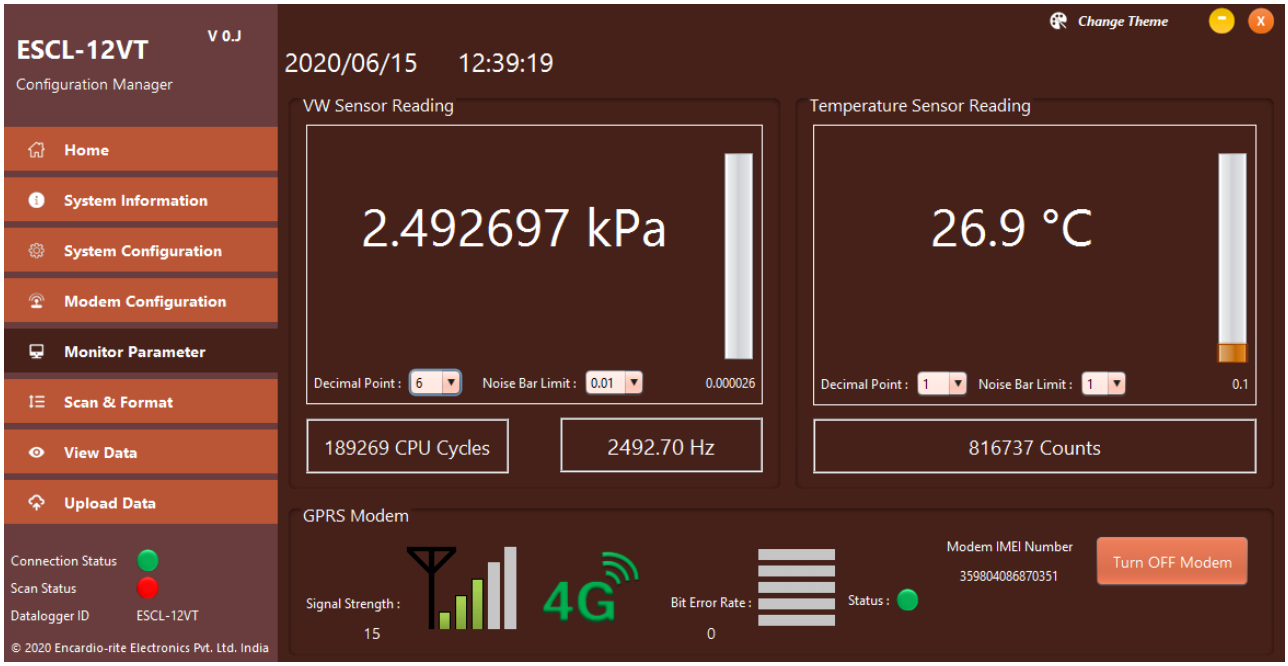

Figure 7-2 ESCL-12VT Configuration Manager Application running on PC

The software is designed in a very user friendly manner which can be operated very easily for downloading of the data and analysing the readings. Even users with little experience with Geotechnical Instruments can connect, download data and change settings as and when required.

8 WEB BASED DATA MONITORING SERVICE (WDMS)

The data on variation of water level collected from a large number of boreholes need to be presented as time Vs different parameters graphs or as tables for visualization or further analysis. Also the data may be required by a number of people sitting at different geographical locations simultaneously.

Web Data Monitoring software provided by Encardio-rite aids in the above process. It looks at the collected data and makes them immediately available in the form of time vs level plots or in tabular form.

The user will have to maintain a desktop PC with an internet connection with static IP and running windows operating system and Microsoft IIS (*Internet Information Service*) server to run this software.

Authorized users from anywhere in the world can then login the website using the supplied user name and password and access the graphs and tables using any internet connected computer and a standard web browser like Microsoft Explorer, Google Chrome, Firefox etc. Figure 8-1 showing an example of VW sensor data presented in graphical form.

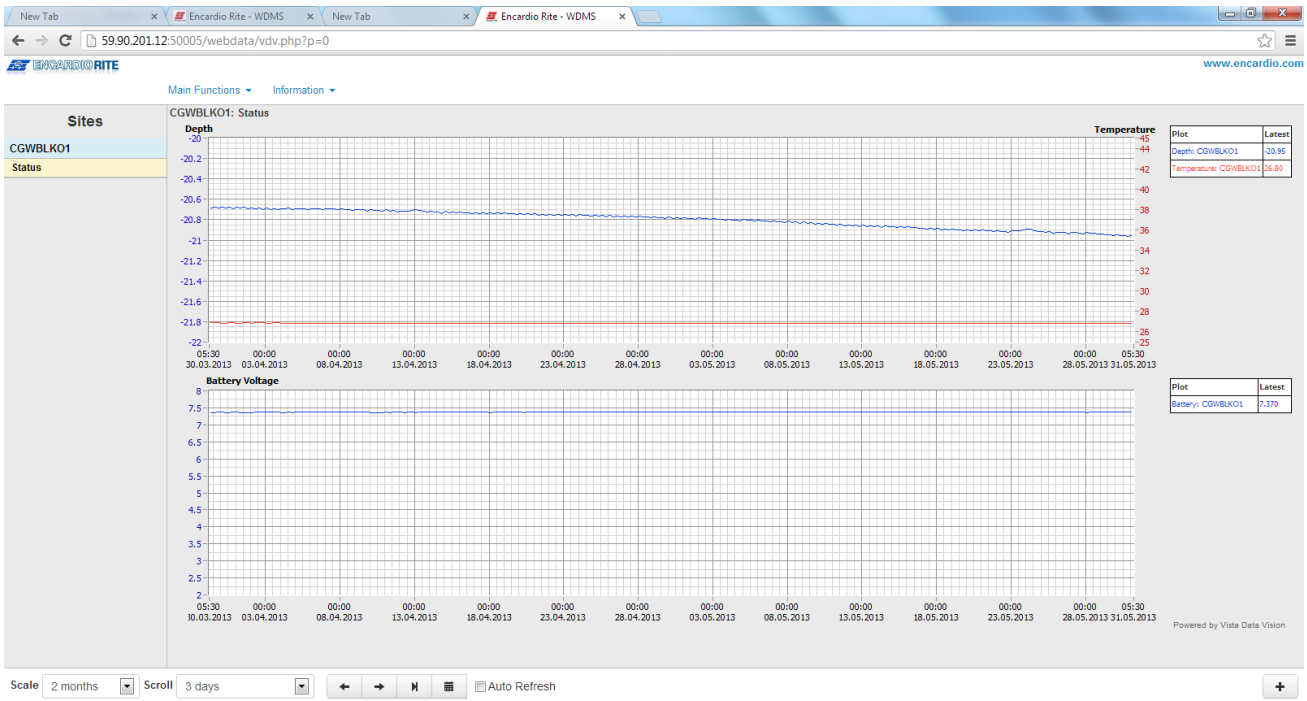

Figure 9-1: Data display on remote PC

In case a user does not want to host his own server, Encardio-rite can provide this as a service at a low cost. This service is known as Web based Data Monitoring Service (WDMS) and is available to users throughout the world.

9 SETTING SENSOR'S GAUGE FACTOR

ESCL-12VT Single Channel VW datalogger has capability to calculate parameter values using a second order polynomial equation.

$Y = A_2X^2 + A_1X + A_0$

Where, Y is the parameter value in engineering units and X is some function of the sensor frequency output.

Different manufacturers specify the value of X in different units in their test/calibration certificates supplied along with the sensor.

Case 1 : 'X' specified in terms of frequency

If the manufacturer specifies X in terms of frequency, then choose the value of "X-parameter" in SETUP screen as "FREQUENCY" from the drop down box.

Enter the value of A_0, A_1 and A_2 as mentioned in the manufacturer's calibration certificate without any modification.

Case 2 : 'X' specified in terms of frequency^2 (i.e. frequency squared)

If the manufacturer specifies X in terms of frequency^2 (frequency squared), then choose the value of "X-parameter" in SETUP screen as "FREQUENCY SQUARED" from the drop down box.

Enter the value of A_0, A_1 and A_2 as mentioned in the manufacturer's calibration certificate without any modification.

Case 3 : 'X' specified in terms of digits

This is a legacy case. Many manufacturers specify the value of X in terms of "digits" as defined below

$\text{Digits} = (\text{frequency})^2 / 1000$

In this case replace A_1 with the value A_1/ 1000 and A_2 with the value A_2/10,00,000 when entering these coefficients in the datalogger. A_0 will remain the same.

Value of A_0

The value of A_0 is generally known as offset. It may be specified in the sensor's calibration/test certificate in which case it can be entered directly in the datalogger without any modification.

However, it is more common to determine the value of A_0 at site just before or just after installation.

Enter the value of A_1 (and A_2 if required) and check the parameter value just before or after installation of the sensor (as the case may be) with zero input or reference input that should be considered as zero. Now reverse the sign of the observed parameter value and enter it in place of A_0.

Recheck the parameter value to ensure that it is now showing zero. If however, a non-zero value is required then add that non-zero value to the value of A_0 and check whether you can see that particular non-zero value with zero or reference input.

10 OPERATION AND MAINTENANCE

Although the ESCL-12VT Single Channel VW Datalogger is almost maintenance free system for long time monitoring, however it may require battery replacement.

10.1 Battery Replacement

1 Launch the configuration manager and connect the datalogger.

2 Shut down the datalogger from applications home screen and remove the USB to RS232 cable.

3 Hold datalogger in the position as shown in Figure 10-1(left). Open the top cover.

4 Replace batteries (Alkaline/Lithium) with the new one as shown in Figure 10-1(right) and close the top cover.

5 Connect the datalogger with PC/Laptop/Mobile.

6 Update the *battery installation date* using configuration manager software.

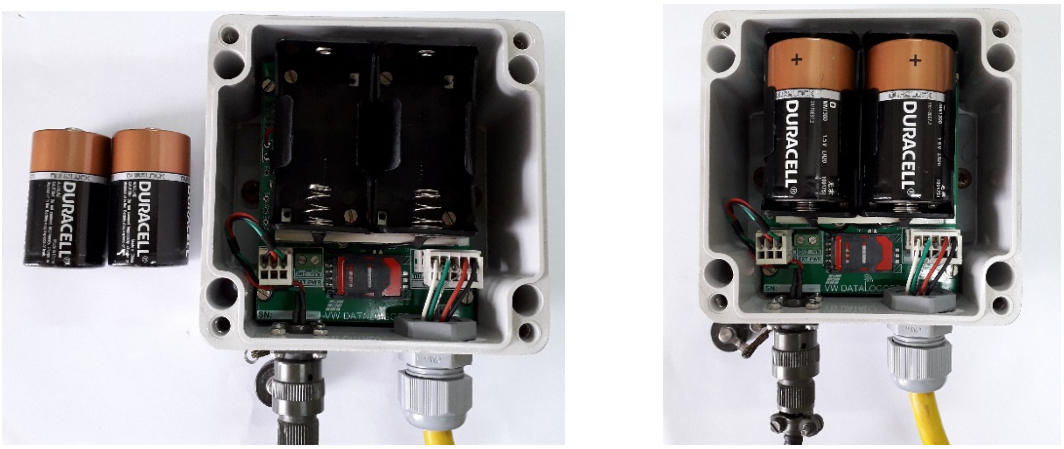

Figure 10-1: Battery replacement for Alkaline battery option

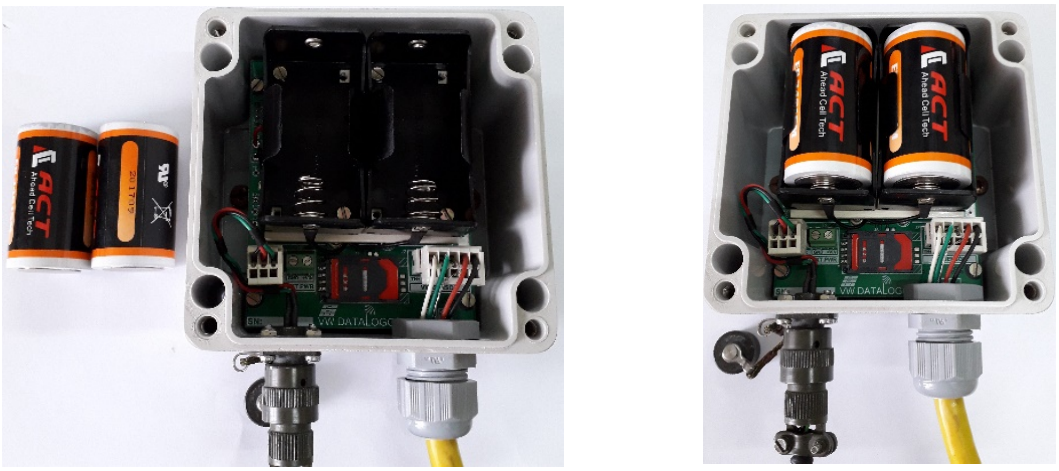

Figure 10-2: Battery replacement for Li battery option

11 TROUBLESHOOTING

- Unable to connect datalogger over Bluetooth

a) PC's Bluetooth may not be enabled.

b) Bluetooth modem may not be turned ON.

c) Bluetooth modem may be out of Bluetooth range from PC.

d) Bluetooth modem may not be paired with PC.

e) Bluetooth modem's battery may be discharged.

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

g) Turn OFF the Bluetooth modem and then turn ON.

h) Reset datalogger by shorting RST jumper once using tweezers near datalogger's serial port connector.

- Unable to connect Datalogger with RS-232 Cable

a) USB to RS-232 cable driver may not be installed properly.

b) RS232 interface connector may be loose.

c) Check the RS232 interface cable's connector for damage.

d) RS232 interface cable may be broken.

e) Datalogger's battery may be discharged.

f) Reset datalogger by shorting RST jumper once using tweezers near datalogger's serial port connector.

- Files not uploading on FTP server

a) Internet connection may not be available.

b) URL or port setting may be incorrect.

c) Check 3G/4G signal strength at *monitor parameter* screen.

d) Check Battery voltage and health at *system info* screen.

e) GPRS service may be deactivated from SIM card service provider.

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ONE STOP MONITORING SOLUTIONS | HYDROLOGY | GEOTECHNICAL | STRUCTURAL | GEODETIC

Over 50 years of excellence through ingenuity

USERS' MANUAL

SINGLE CHANNEL VW DATALOGGER CONFIGURATION MANAGER (For Android)

MODEL ESCL-12VT

Doc. # WI6002.136.2 R0 | Jun 20

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India: Lucknow | Delhi | Kolkata | Mumbai | Chennai | Bangalore | Hyderabad | J&K

Contents

1 INTRODUCTION

The application is a configuration manager for ESCL-12VT Single Channel Vibrating Wire Datalogger. The datalogger can be configured through this software. It analyzes the data files produced by the ESCL-12VT. The application displays raw data and parameter as per set monitor interval. By setting the log interval for scanning, the readings can be scanned which gets saved in the logger's non-volatile memory. After download, the application allows the user to analyze the readings obtained from the datalogger in tabular and graphical form.

1.1 Introduction about the Manual

1.1.1 Purpose of this document

The purpose of this document is to show the entire functionality of the application for the device ESCL-12VT. Please refer to *Introduction* section to know about the application.

This document serves as a help guide by showing the workflow of the entire processes. The document guides its user by providing a clear idea about how things have to be done in the application. All efforts have been made to clarify each and every step.

1.1.2 What the manual contains

The document is designed to provide step-by-step guidance using actual screenshots from the application.

1.1.3 How to use the manual

The document is intended to guide the user in a step-by-step manner starting from installing the application, accessing the application, analyzing the readings, viewing and manipulating the plots. The screenshot guides to complete the task.

NOTE: Although the best effort has been made to ensure the completeness and accuracy of the information provided in this document, Encardio Rite instruments reserves right to change the information at any time and has no liability for accuracy.

1.1.4 List of abbreviations

APN	Access Point Name
CSV	Comma Separated Values
ESCL-12VT	Single Channel Vibrating Wire Datalogger
FTP	File Transfer Protocol
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
IIS	Internet Information Service
PC	Personal Computer
SIM	Subscriber Identity Module
URL	Uniform Resource Locator
USB	Universal Serial Bus
UTC	Coordinated Universal Time
VW	Vibrating Wire
WDMS	Web based Data Monitoring Service

1.2 Overview

The software is designed in a very user friendly manner which can be operated very easily for downloading of the data and analyzing the readings. Even users with little experience with Geotechnical Instruments can connect, download data and change settings as and when required.

1.3 Operating Principle

ESCL-12VT, Single Channel VW Datalogger is designed to monitor measured parameter using a single vibrating wire sensor. Datalogger can store calibration coefficients, x-parameter, units of measurement etc. Data can be stored in engineering units. Each reading is stamped with date and time at which the measurement was taken. It has non-volatile flash memory to store up to 599K records.

These data files can be downloaded to Android phone using Configuration Manager by connecting logger with Bluetooth. The downloaded readings get stored in the phone's Home Directory in CSV format. The files can be transferred to FTP server using internet connection. It can be processed on any common available spreadsheet like Microsoft-Excel.

ESCL-12VT with built in 3G/4G modem has capability to upload data records directly to remote FTP server. Upload schedule can be set in Datalogger using this software for automatic data upload to FTP server. Schedule can be set as fast as 5 minutes.

2 GETTING STARTED

2.1 System Configuration

The application runs on Android Smartphone. The mobile specifications are:

- Mobile OS - Android version 2.2 or above
- RAM - 512 MB (Recommended 1 GB).
- External memory - 2 GB or above
- Display size - 480 x 800 pixels or higher
- Display Type - Touch screen
- CPU - 1 GHz.
- Blue tooth - Version 3.0 with A2DP

2.2 Application Installation

It is strongly recommended to exit all programs before installation. Follow the steps below for installing the application for the first time.

Note Please make sure that option for *Unknown sources* (*allow installation of non-Market apps)* in Setting-> Security must be checked.

- Copy the "ESCL-12VT.apk" into the mobile via Bluetooth or USB cable.
- Go to copied location in tap on ESCL-12VT.apk. Then tap on install refer Fig 2.1 and 2.2.

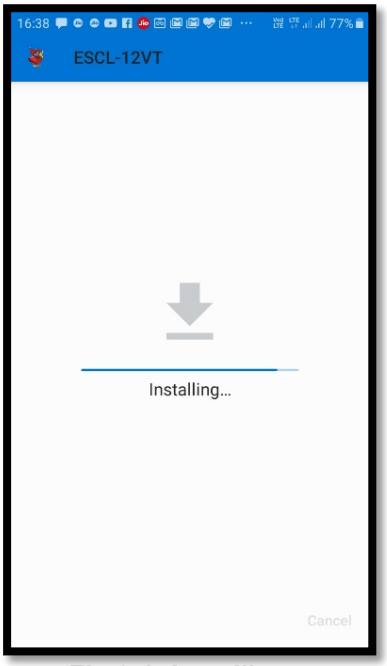


Fig 2-1: Installing

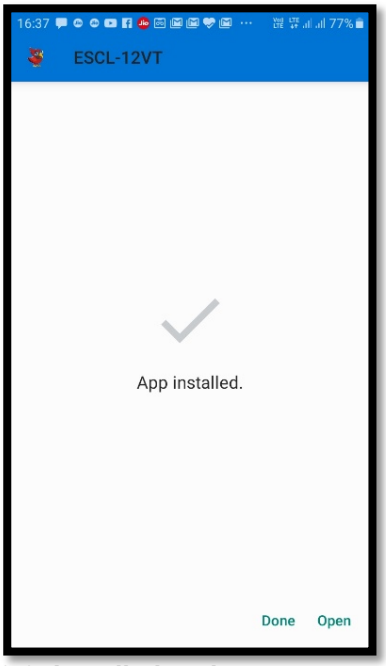


Fig 2-2: Installation done

- After installing press *DONE* or application can be opened directly by pressing *OPEN.* User can open the application through application launcher also. *See Fig 2-3*.

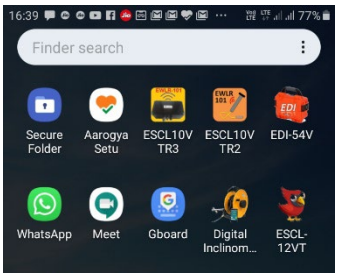


Fig 2-3 Application launcher

2.3 Connecting Datalogger with Android mobile

It has already been briefed that the datalogger's reading can be monitored using the application. To do so, the datalogger should be connected with the mobile and the application should be installed. The datalogger can be connected with mobile by using Bluetooth. Plug Bluetooth modem at 9 pins D-sub connector of the Datalogger. Make sure that modem must be configured for 115200 baud rate and hardware flow must be OFF. Verify DIP switch settings with following *Fig 2-4*.

Figure 2-4: 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 the Bluetooth of the mobile and search Bluetooth devices in the network. Once searching gets completed, a list of Bluetooth devices found is displayed. Find the Bluetooth modem's serial number in the list of devices found and click for pairing the mobile with the Bluetooth modem.

Once pairing button is pressed it will ask to enter passkey for authentication. Enter pairing code "***69836776***" and then press OK. On successful authentication it will show that device is paired. Now the Android mobile is paired with Bluetooth modem. This activity is required for first time connection with the Bluetooth modem.

Figure 2-5: Connecting datalogger using Bluetooth

2.4 Running the Application

Start the Application by a single tap on the icon ESCL-12VT from mobile screen to run the application as shown in *Fig 2-3*.

2.5 Viewing the Main Screen

Entering the application, the main screen of the application appears as displayed in *Fig 2-6*.

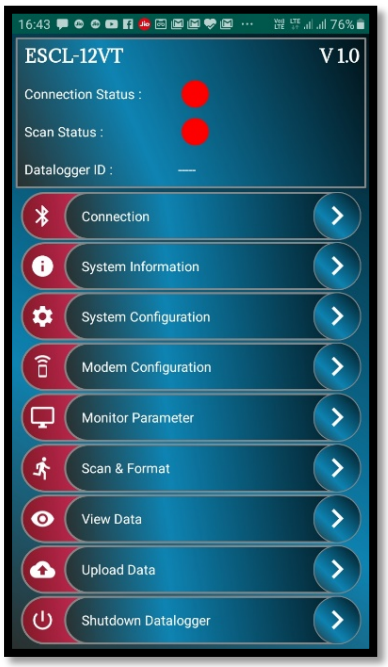


Fig 2-6: Home Screen

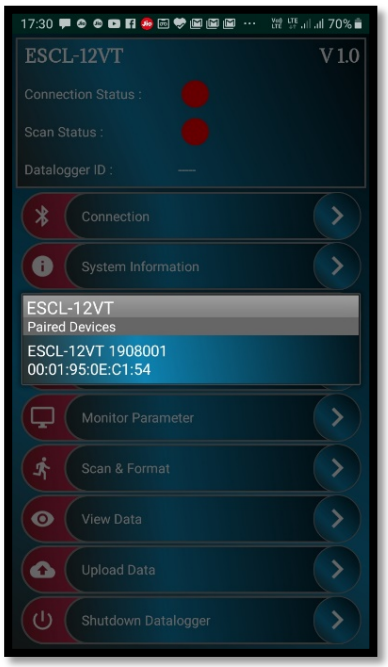


Fig 2-7: Device list

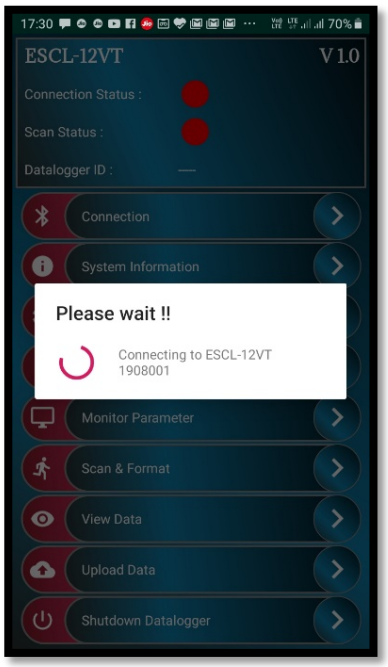


Fig 2-8 Device connectivity

2.6 Connecting with Datalogger

Application will start establishing connection if only one Bluetooth Module is paired, otherwise it shows list of paired connection. *See Fig 2-7.* Datalogger can be connected using *Connection* button from *Home screen.* Tap on Bluetooth Module name to connect datalogger. The progress bar appears on the screen as the application takes few seconds to get connected. *See Fig 2-8.* After successful connection, application checks datalogger's battery health. Application displays alert message if battery voltage found low. *See Fig 2-9.*

Application asks to enter Battery installation date if battery found replaced/re-installed. Choose battery installation date from calendar and then press OK. Press Cancel button if you are not sure about battery installation date. In this case application will ask for battery installation date next time when connecting to datalogger. *See Fig 2-10.*

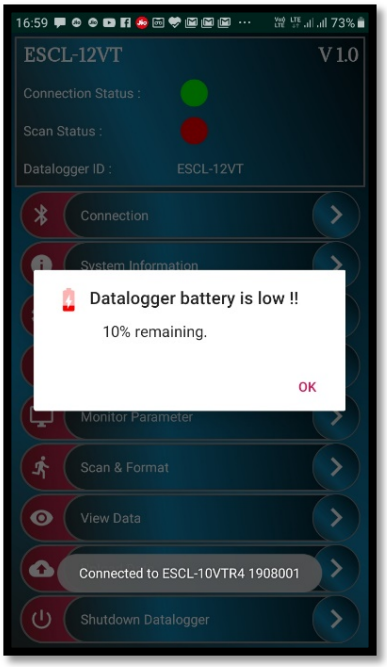


Fig 2-9: Battery Low

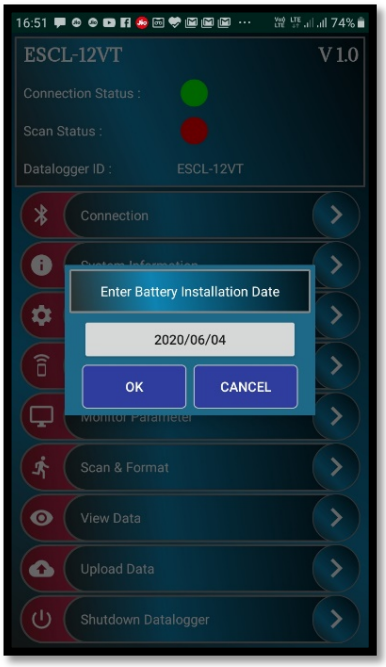


Fig 2-10: Set Date

3 HOME

Fig 3-1 shows an example of Home screen after successful connection with datalogger. Datalogger connection status indicator becomes GREEN from RED. Connected Datalogger ID can be seen on home screen. Various functions can be performed through home screen. System information can be seen by pressing System Information button. Datalogger settings can be configured using System configuration button. GPRS modem can be configured using Modem configuration button. Sensor live readings and GPRS modem signal strength can be monitored using Monitor Parameter button. Logger scanning and data download activities can be performed using Scan & Format button. Downloaded files can be viewed in tabular or graphical form by pressing view data button. Downloaded files can be uploaded to remote FTP server using Upload Data button. Connected datalogger can be shut down by pressing shut down Datalogger button. Datalogger preserves the records and configurations into its non-volatile memory while shutting down. Datalogger goes into deep sleep mode and becomes idle after shut down.

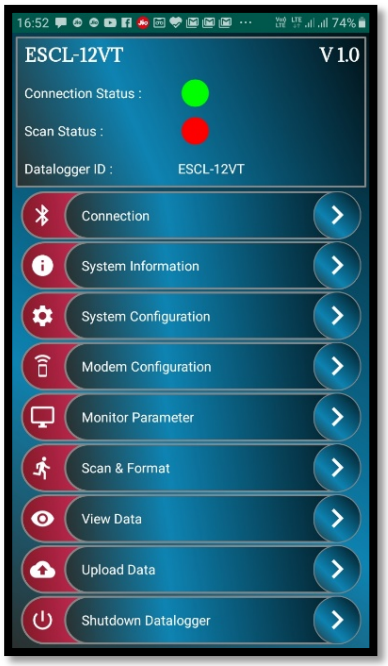


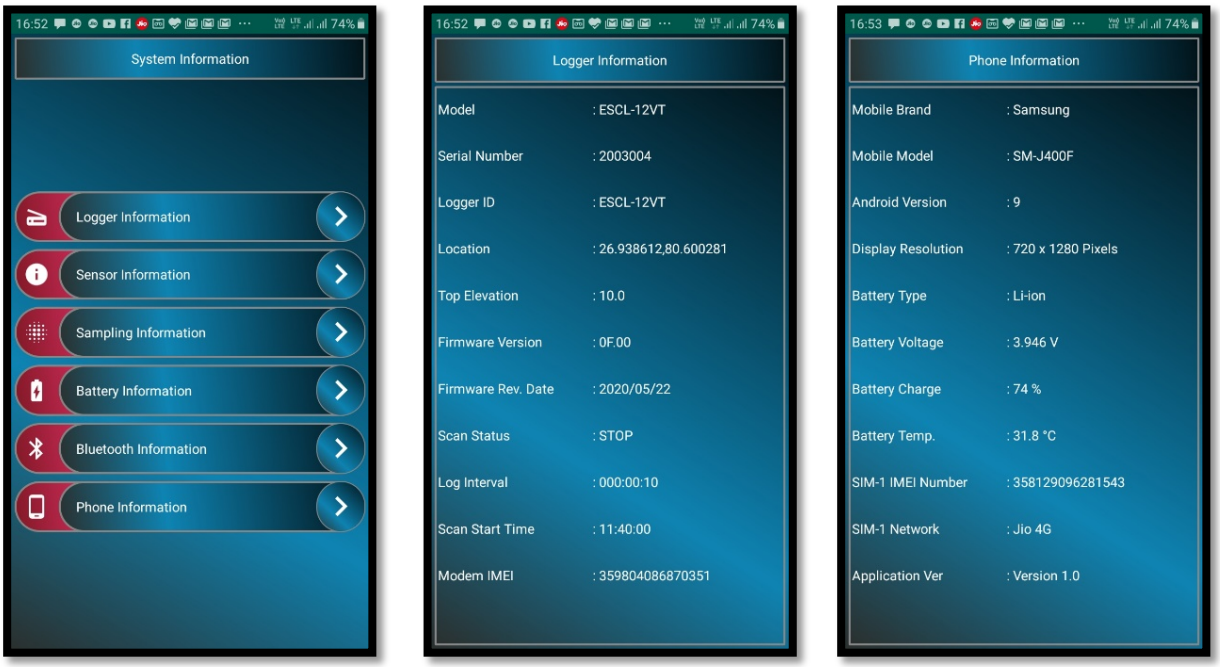
Fig 3-1: Home screen

WARNING: Always SHUTDOWN Datalogger before removing battery from the Datalogger. Data may be lost otherwise.

4 SYSTEM INFORMATION

After pressing s*ystem information* button from Home screen, application displays system info screen. Application fetches information from Datalogger to display on the screen.

Datalogger related information can be viewed using *Logger Information* button. Sensor related information can be viewed using *Sensor Information* button. Logger scanning related information can be viewed using *Sampling Information* button. Datalogger battery related information can be viewed using *Battery Information* button. Bluetooth related information can be viewed using *Bluetooth Information* button. Phone related information can be viewed using *Phone Information* button.



(a) **(b)** **(c)**

Fig 4-1: System information screens.

5 SYSTEM CONFIGURATION

Datalogger settings can be configured using *System Configuration* screen which can be opened on pressing *System Configuration* button from Home screen.

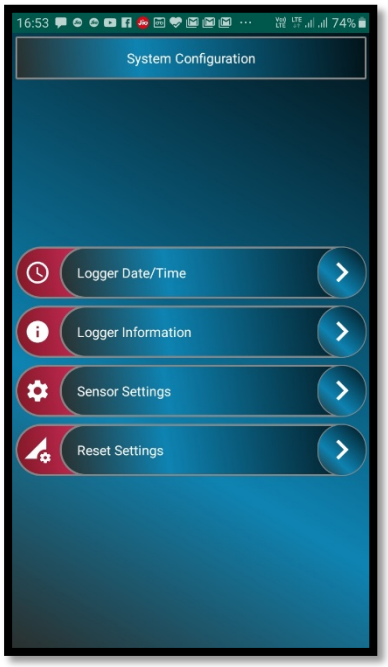


Fig 5-1: Set Up.

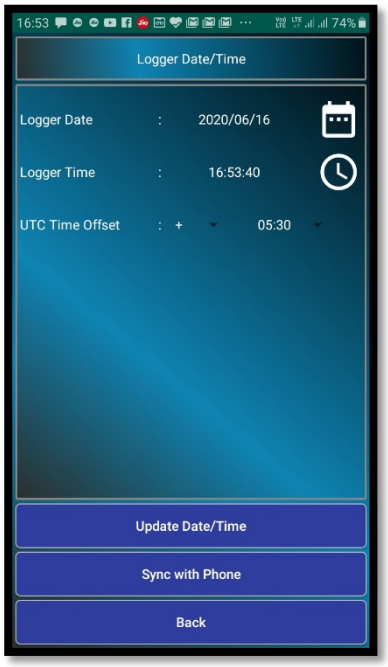


Fig 5-2: Logger Date/Time.

5.1 Logger Date/Time

Datalogger's date/time can be set using *Logger date/time* screen. Choose the date, set the time and UTC offset and then press *Update date/time* button to update logger's clock manually. User can opt for second option that is press *Sync with mobile* button. Datalogger's calendar and clock will set to Mobile's date/time. *See Fig 5-2*.

5.2 Logger Information

Datalogger's ID or station ID can be entered under *datalogger's ID*. Datalogger's installation location coordinates (latitude and longitude) can be entered under *location* fields. Datalogger's installation location above MSL (mean sea level) can be entered under *Top elevation*. Datalogger has capability to store readings by averaging of reading samples. User can set samples for averaging ranging from 2 to 250. Keep samples for averaging to 1 if averaging not needed. *See Fig 5-3*.

5.3 Sensor Setting

Sensor related settings can be set through *Sensor* screen. *See Fig 5-4.* Enter sensor *serial number*, *model* and *measuring range* of VW sensor. Keep *x-parameter* to *frequency squared* for Piezometer. Enter Piezometer sensor coefficients A0, A1 and A2. Refer section 12 to know more about sensor coefficients.

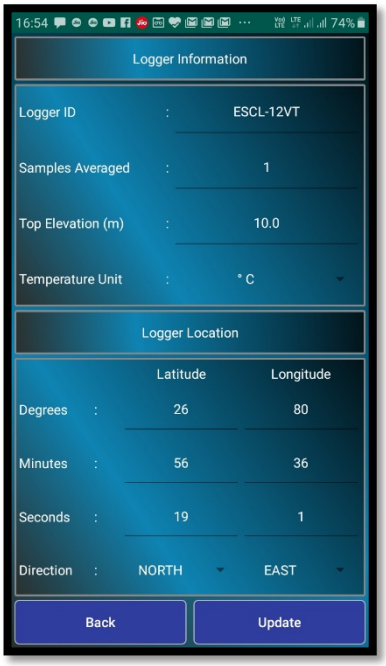


Fig 5-3: Logger info

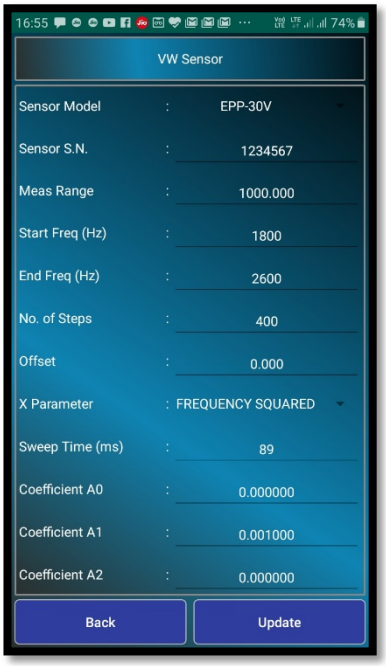


Fig 5-4: Sensor setting

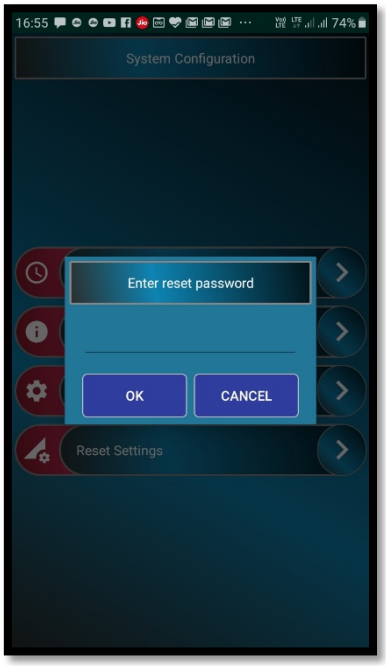


Fig 5-6: Reset Datalogger

5.4 Reset Datalogger

Datalogger can be reset to Factory defaults using '*Reset Settings'* button. Pressing on Reset settings button will show a warning message. Press NO option to abort the reset or press YES to continue.

Pressing '*Yes'*, the application will prompt for a password. Type password "**4TfZ9q7X**" and press *OK* to reset datalogger settings. Kindly remember that on pressing *'Yes*', all previous values will be erased and factory settings will be restored. *See Fig 5-6.*

WARNING: Reset settings will erase all custom settings and datalogger will be set to factory defaults.

6 MODEM SETTINGS

Dataloggers with built-in 3G/4G modem have capability to upload logger records to remote FTP server through mobile network. For using this feature, a GPRS enabled SIM card must be inserted into SIM card socket of datalogger.

Pressing on Modem Settings button from the menu will open Modem settings screen. Fig 6-1 is showing an example of modem settings screen. Modem settings screen is disabled for dataloggers which don't have built-in 3G/4G modem.

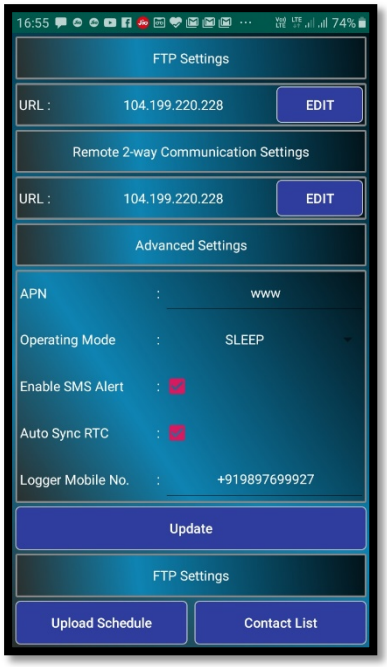


Fig 6-1: Modem Setting

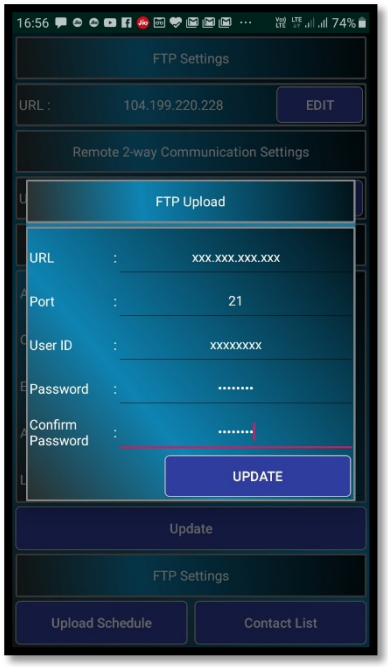


Fig 6-2: Configure FTP

Enter Network service providers *APN* for GPRS enabled SIM. GPRS modem operating mode can be configured in either of two modes OFF or sleep. Modem operating mode can be set to *OFF* where mobile network is not available or automatic upload is not required. In this mode, modem always remains OFF. This option is opt to extend battery backup.

Modem operating mode can be set to '*Sleep'* mode. In this mode, modem normally remains in OFF state and wake when scheduled upload time occurs. It will upload the data to remote FTP server and then goes into OFF state. This option is opt to improve battery backup.

Datalogger files can be uploaded to FTP server automatically by providing FTP server authentication and upload time schedule.

6.1 Configure FTP

Press *update* button from *FTP settings* panel to set FTP server credentials. A pop up dialog will open as shown in Fig 6-2. For configuring FTP server settings correct FTP server URL, port number, user and password must be entered into specified fields. Enter the remote server FTP credentials for data transfer and 2-way telemetry support. Press Update button to update FTP server settings to datalogger.

Press Update button to update FTP server settings to datalogger. Once FTP server settings are configured, datalogger automatically sends logger records to remote FTP server when upload time occurs.

6.2 Upload Schedule

Press upload schedule button from schedule & contacts panel to set the upload schedule. Upload schedule can be set through Upload Time panel.

Fig 6-3 Upload schedule

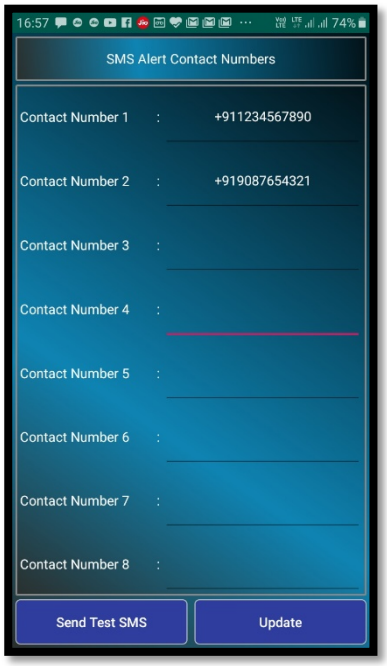


Fig 6-3: Contact List

Once FTP server settings configured datalogger automatically sends logger records to remote FTP server when upload time occurs. Upload schedule can be set through Upload Time panel. Upload time can be set as fast as 5 minutes. Upload interval can be set ranging from 5 minutes to 7 days. Press *Update* button to update schedule.

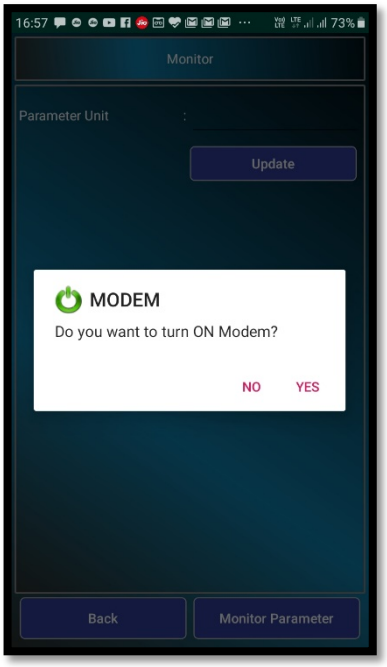
6.3 Contact List

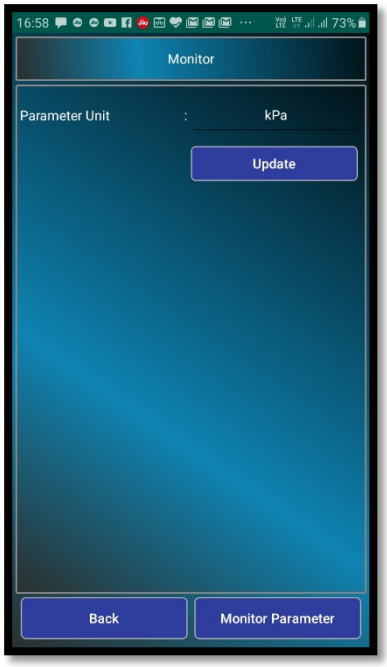
Datalogger can send SMS alerts to some contact numbers if battery voltage goes low or sensor parameter level crossed alarm limit. These contact numbers can be entered into contact list. Maximum 8 contact numbers can be stored in Datalogger's memory. SMS facility must be available in SIM card to avail this feature. Tick in check box under *GPRS settings* panel to enable SMS alert feature.

7 MONITOR PARAMETER

User can monitor sensor's live data through *Monitor parameter* screen. Tap on *Monitor* button from *Home* screen will open *Monitor* screen. A dialog will ask to *Turn On modem* if the modem is turned off. This dialog will not appear if GPRS modem is already turned ON or GPRS modem not available in the datalogger. Press *Yes* to turn ON the modem. See Fig 7-1

Parameter unit can be set under *parameter unit* field. Press *Update* button to update the fields. See Fig 7-2





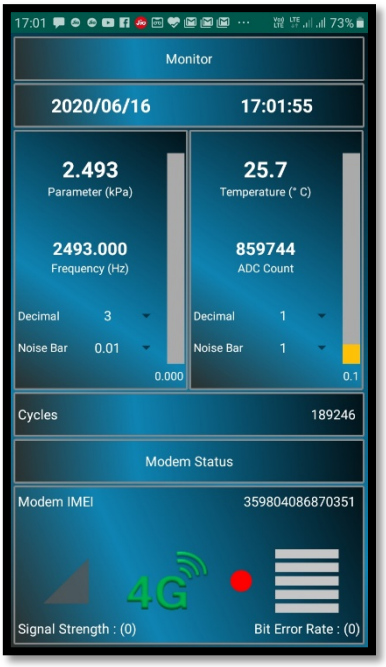


Fig 7-1 Modem Turn ON **Fig 7-2 Monitor Set up** **Fig 7-3 Monitor Parameter screen**

Press *Monitor Parameter* button to open the monitor parameter screen. Fig 7-3 is showing an example of *monitor parameter* screen. Datalogger current date/time is showing under *Monitor* panel. Reading under parameter is showing current level of VW sensor. The corresponding Piezometer sensor frequency and CPU cycle counts are also displaying for diagnostic purpose.

The *Temperature Reading* panel shows water temperature and digital counts. ADC Counts are given for diagnostic purpose only. Temperature reading shows -99.9 in error conditions like sensor reading out of range or sensor not connected.

Reading decimal digits can be set using drop down option. Similarly, noise bar range can be set to view deviation between two consecutive readings in noise bar.

The *GPRS Modem* panel shows GPRS modem status for diagnostic. GSM signal strength and bit error rate can be monitored. Signal strength should be greater than 11 (out of 31) to ensure successful FTP upload. External antenna is recommended where signal strength is below 12. Bit error rate less than 2 is good for error free communication.

8 SCAN

Data logging schedule and alarms can be set through scan screen. Datalogger records can also be downloaded or erased through this screen. Tap on *Scan & Format* button from Home screen opens *Scan* screen. See Fig 8-1.

Scan option panel showing scan related information. Log interval can be set from 5 seconds to 7 days (i.e. 168 hrs). Once log interval is set, datalogger scanning can be started. Datalogger will start scanning from *next scan start time*.

Though datalogger memory is very large with respect to record size, memory can get full if scan interval is very fast and memory not erased since a long time. What to do if memory gets full? There are two options. Choose memory full action either stop or overwrite. Scanning will get stopped in case of datalogger memory full if STOP option is selected. In this case the readings will not be recorded further once the memory is full. The other option is to overwrite if the memory becomes full, the readings will be recorded but it will overwrite from oldest record in a cyclic manner.

Fig 8-1 Scan Screen

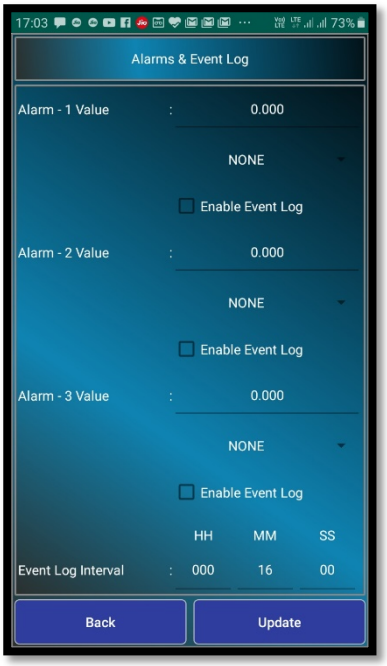


Fig 8-2 Alarms & event

It has been observed that in case of over range or faulty sensor many datalogger shows very large quantities or garbage values. It is very difficult for user or viewer software to identify those values. An error code of "NaN" for VW parameter and "NaN" for temperature will be reported in data records if sensor reads values beyond its operating range for any reason. To enable user defined *Error code* enter the error code value for *parameter* and *temperature* and then select *Parameter Error* option *Enable* from drop down menu.

Scan status panel showing total number of records stored in datalogger's memory. Datalogger scanning can be started by pressing START button once. Pressing the start button starts the scanning and scan status becomes ON. Status indicator becomes GREEN. While scanning, the Start button becomes Stop. During scanning, the datalogger scans sensor at specified log interval and the sensor readings gets stored in datalogger's memory.

Datalogger scanning can be stopped by pressing Stop button once. Pressing on *stop* button stops the scanning and scan status becomes OFF. Status indicator becomes RED. *Stop* button becomes *start* again.

8.1 Alarm & Event log

Many times we require an alert when an alarm condition occurs. We can set alarms limits for SMS alerts. Tap on *Alarm & Event Log* button. Enter parameter levels at which alerts are required. Choose Up, Down or None option. *Up* option means alarm condition occurs when measured parameter level goes up with the limit specified. *Down* option means alarm condition occurs when parameter level goes below the limit specified. *None* option can be selected to disable the alarm. *See Fig 8-2.*

Sometimes we need to do fast logging when an alarm condition occurs. To do so there is a provision in software to *enable event log*. On enabling event log datalogger do fast scanning while an alarm condition remains and does normal scanning if alarm condition passed.

8.2 Download Data

Readings (data) can be downloaded from datalogger's memory using *Logger Memory* button. On tap on this button, application opens *Logger memory* screen that contains information about headers of Download data. Downloaded data are stored in CSV (comma separated values) file. Data may contain header information if CSV header is enabled from *CSV header option* panel. Some Header fields are locked for editing rest is editable. User can modify editable fields. Press *Update* button to update header information. *See Fig 8-3.*

Fig 8-3 CSV File headers

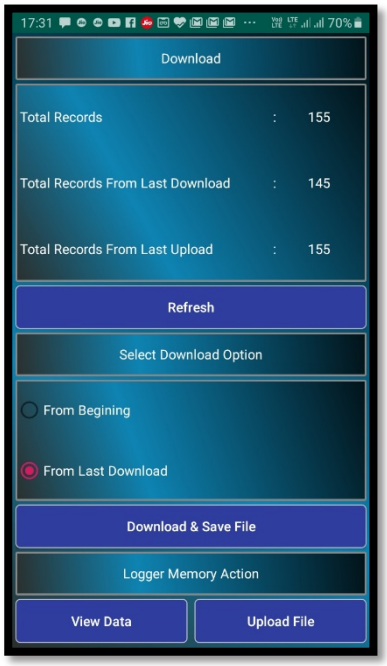


Fig 8-4 Download File

To continue for download data tap on *Download Data* button. A screen opens which contains information about number of records and file name which is going to download. Tap on *Download & Save File* button to download the CSV file. Data download time depends on records size of datalogger's memory. See Fig 8-4. A progress bar appears to display the download progress. See Fig 8-5. Data gets successfully downloaded on completion of this progress bar.

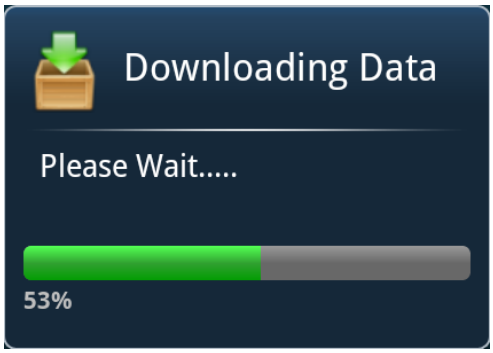


Fig 8-5 Download progress

Another dialog asks to erase datalogger memory after download. Press NO option to abort the deletion or press yes to confirm deletion.

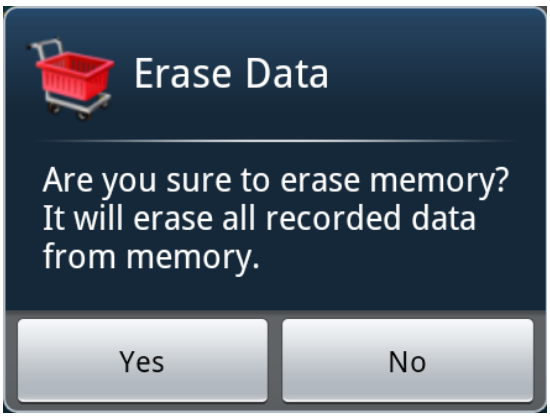


Figure 8-6: Erasing datalogger memory

8.3 Erase Memory

Erase the datalogger's records by pressing *Erase Memory* button in Logger memory screen. It will erase all previous readings and the *No. of Records* would become zero (Kindly note that this activity is exactly same to what has been explained in the context of Figure 8-6). Pressing '*Yes*'; datalogger's memory will be erased which will not affect other settings.

9 VIEW DATA

This screen allows the user to view datalogger's reading and interpret the data in tabular and graphical form. Select the file through the drop down menu. On selecting file, readings automatically get updated in table.

9.1 View Table

In the given example, the file ESCL-12VT_2003004.csv is selected for interpretation. The readings are displayed in the Fig 9-1. Data in table represents date/time stamp of reading, VW sensor frequency, Parameter value, Sensor Temperature and Datalogger's Battery Voltage. Parameter decimal digits can be set from drop down option.

Fig 9-1(a)

Fig 9-1(b)

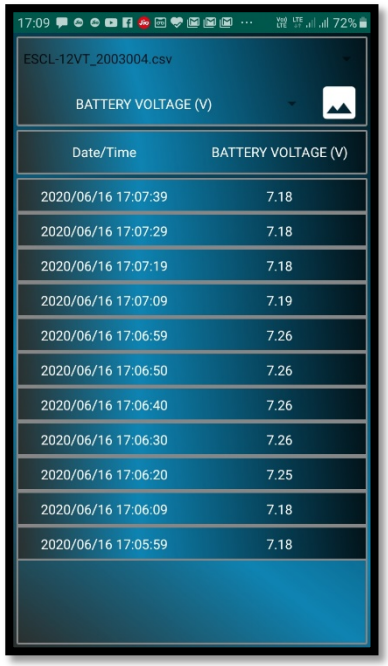


Fig 9-1(c)

9.2 View Graph

Press on graph icon from table view to see the selected file data in graphical form. Pressing on Graph icon from table view, opens data range selection screen. See Fig 9-2.

Data range shows the records date/time range of selected file. Select X-axis range using calendar and time icon for which you want to view on graph.

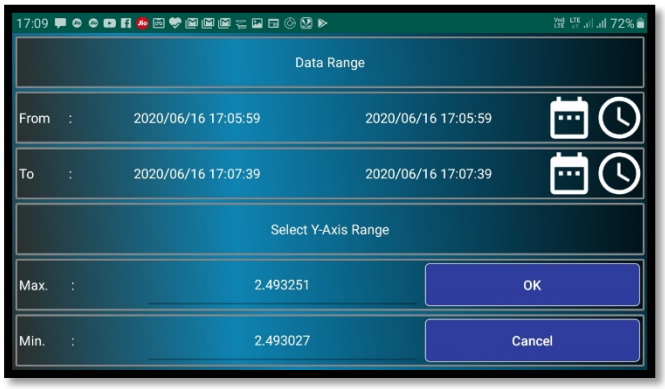


Fig 9-2 Data Range Selection screen

Select Y-axis range and then press OK button to open the graph screen. Fig 9-3 is showing an example of graph screen. Graph customization can be done like zoom-in, zoom-out or pan through icons on right bottom corner of the screen.

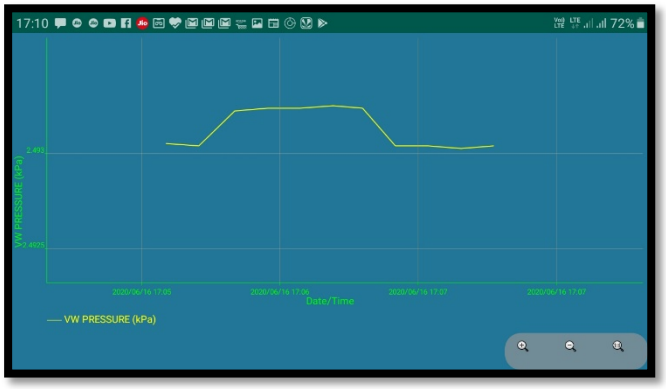


Fig 9-3 VW Parameter Vs Time

10 UPLOAD

The upload feature allows the user to upload the *downloaded data* to the FTP server from anywhere using the internet connection. Phone must have internet connectivity for using this feature. Pressing the *Upload Data* button in the Home screen, the upload screen appears with the list of datalogger files which are downloaded from dataloggers.

Figure 10-1: Upload files

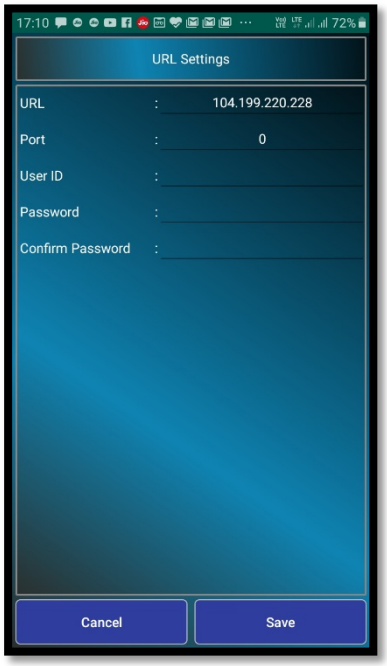


Fig 10-2 URL setting

Press on *Reset URL* button to enter the FTP credentials like URL, port, user and password. See Fig 10-2. Type FTP server URL address. Provide port number of the FTP server. Enter user name and password for authentication. After providing all credentials press on *save* button to update URL settings. Make sure that the mobile has internet access. Once *update* button is pressed, application will try to connect to the server. URL setting will be updated on successful connection to the server. URL settings will be restored to old one in case of connection failure.

Select the datalogger file which are to be uploaded. Files can be selected by ticking on check boxes. In the given example, two files are selected to be uploaded. Pressing on *upload* button will start uploading selected files to the FTP server. After successful upload, an information message pops up on the screen confirming successful file upload.

11 TROUBLESHOOTING

- Unable to connect datalogger over Bluetooth

a) PC's Bluetooth may not be enabled.

b) Bluetooth modem may not be turned ON.

c) Bluetooth modem may be out of Bluetooth range from PC.

d) Bluetooth modem may not be paired with PC.

e) Bluetooth modem's battery may be discharged.

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

g) Turn OFF the Bluetooth modem and then turn ON.

h) Reset datalogger by shorting RST jumper once using tweezers near datalogger's serial port connector.

- Unable to connect Datalogger with RS-232 Cable

a) USB to RS-232 cable driver may not be installed properly.

b) RS232 interface connector may be loose.

c) Check the RS232 interface cable's connector for damage.

d) RS232 interface cable may be broken.

e) Datalogger's battery may be discharged.

- Files not uploading on FTP server

a) Internet connection may not be available.

b) URL or port setting may be incorrect.

c) Check 3G/4G signal strength at *monitor parameter* screen.

d) Check Battery voltage and health at *system information* screen.

e) GPRS service may be deactivated from SIM card service provider.

12 SETTING SENSOR'S GAUGE FACTOR

ESCL-12VT single channel datalogger has capability to calculate parameter values using a second order polynomial equation.

$Y = A_2X^2 + A_1X + A_0$

Where, Y is the parameter value in engineering units and X is some function of the sensor frequency output.

Different manufacturers specify the value of X in different units in their test/calibration certificates supplied along with the sensor.

Case 1 : 'X' specified in terms of frequency

If the manufacturer specifies X in terms of frequency, then choose the value of "X-parameter" in SETUP screen as "FREQUENCY" from the drop down box.

Enter the value of A_0, A_1 and A_2 as mentioned in the manufacturer's calibration certificate without any modification.

Case 2 : 'X' specified in terms of frequency^2 (i.e. frequency squared)

If the manufacturer specifies X in terms of frequency^2 (frequency squared), then choose the value of "X-parameter" in SETUP screen as "FREQUENCY SQUARED" from the drop down box.

Enter the value of A_0, A_1 and A_2 as mentioned in the manufacturer's calibration certificate without any modification.

Case 3 : 'X' specified in terms of digits

This is a legacy case. Many manufacturers specify the value of X in terms of "digits" as defined below

Digits = (frequency)^2 / 1000

In this case replace A_1 with the value A_1 / 1000 and A_2 with the value A_2/10,00,000 when entering these coefficients in the datalogger. A_0 will remain the same.

12.1 Value of A0

The value of A_0 is generally known as offset. It may be specified in the sensor's calibration/test certificate in which case it can be entered directly in the datalogger without any modification.

However, it is more common to determine the value of A_0 at site just before or just after installation.

Enter the value of A_1 (and A_2 if required) and check the parameter value just before or after installation of the sensor (as the case may be) with zero input or reference input that should be considered as zero. Now reverse the sign of the observed parameter value and enter it in place of A_0.

Recheck the parameter value to ensure that it is now showing zero. If however, a non-zero value is required then add that non-zero value to the value of A_0 and check whether you can see that particular non-zero value with zero or reference input.

13 FILE FORMATS

The data files used for transferring datalogger data to other software have the following formats. All data is in standard ASCII text format (7 bit). Variables are separated with commas (,).This format is suitable for direct import in Microsoft Excel (All versions) or other commercially available spread sheet programs for formatted printing and graphical plotting. Numeric values may or may not have a leading plus (+) sign but a minus (-) sign is always explicitly included. The contents of the data file are printed in Courier mono space font below.

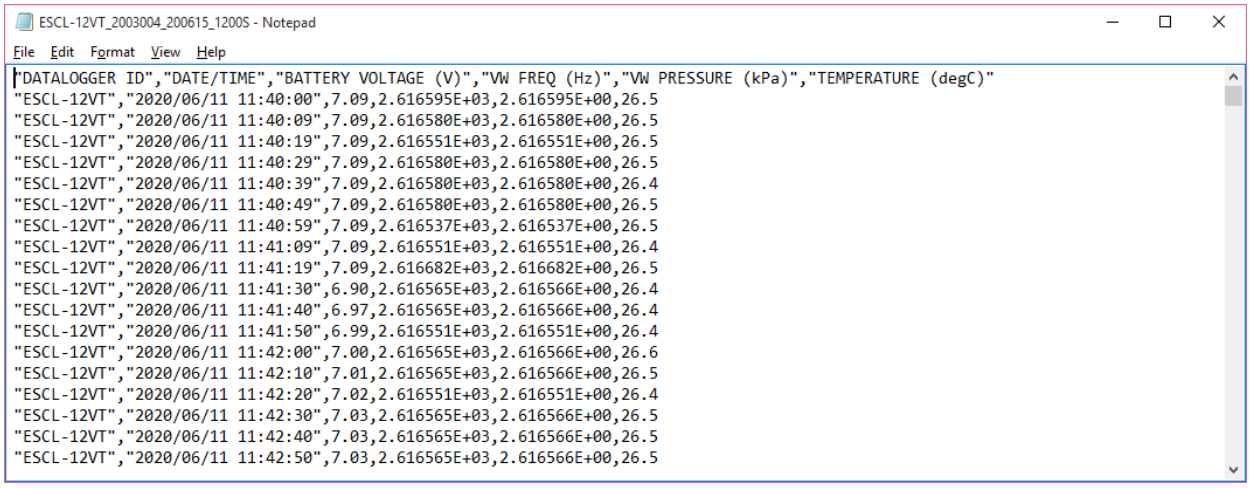


Figure 13-1: Standard File Format

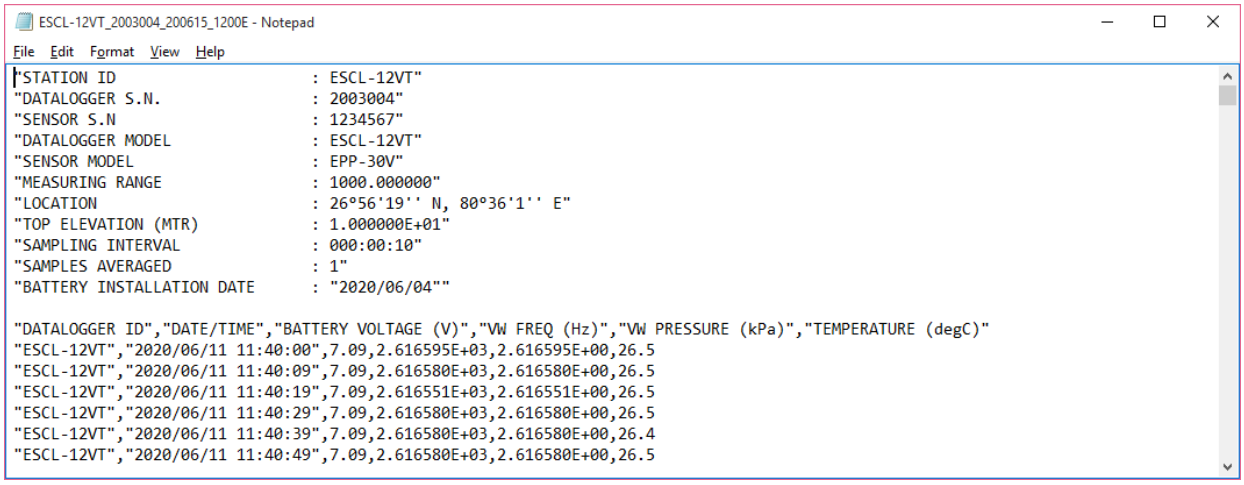


Figure 13-2: Extended File Format

14 REMOTE 2-WAY CONFIGURATION SOFTWARE

Datalogger with built-in 3G/4G modem can be remotely configured using *Remote 2-way configuration* software. Figure 14-1 showing home screen of remote configuration software. User can install this application to any server machine to control all dataloggers centrally.

Datalogger information like serial number, firmware version, battery voltage, battery installation date etc. can be get from the Datalogger.

Sensor related information, coefficients, offset and alarm levels can be edited. Scan schedule and upload schedule can be programmed remotely.

Logged data can be downloaded on demand using this application.

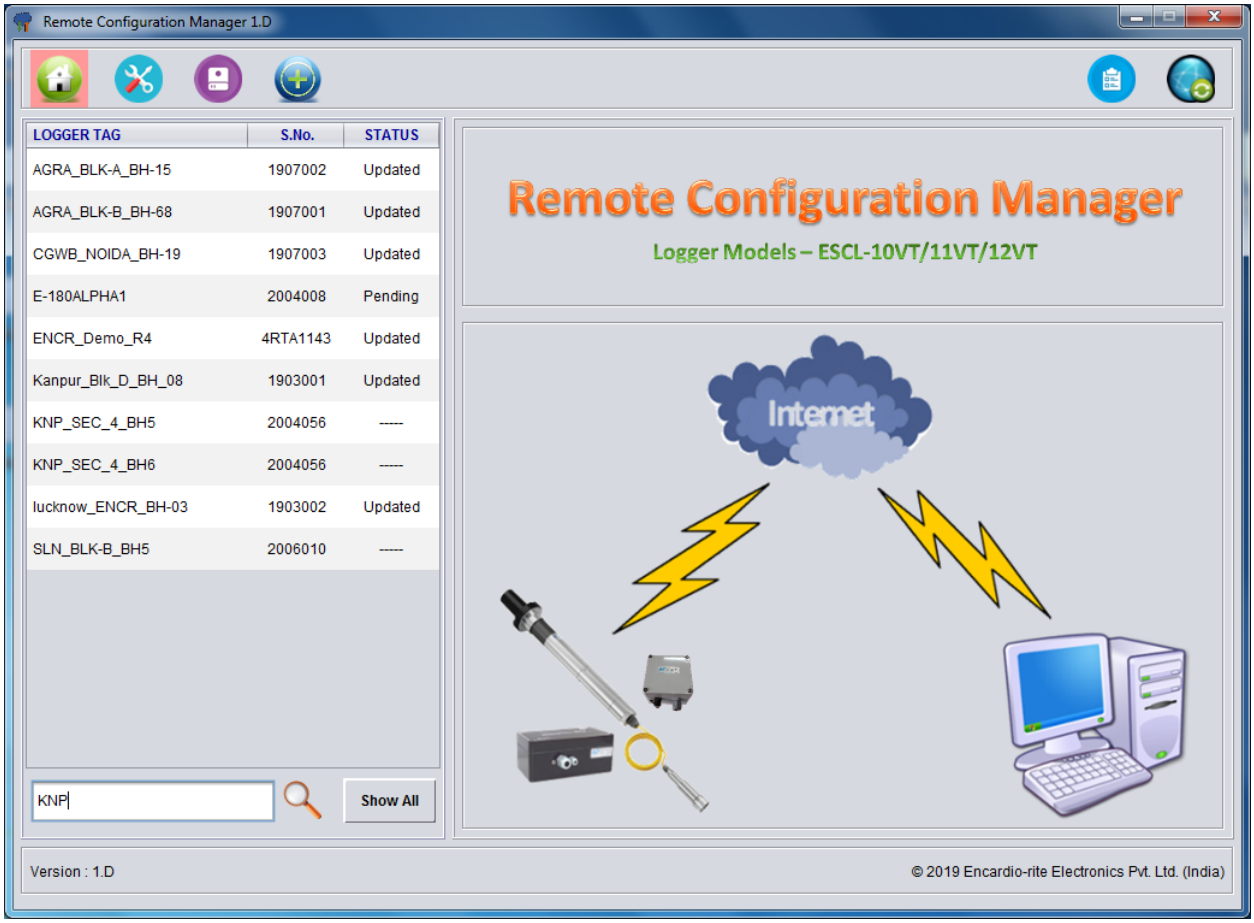


Figure 14-1: Remote 2-way configuration software

15 WEB BASED DATA MONITORING SERVICE (WDMS)

The data on variation of measured sensor data collected from a large number of dataloggers need to be presented as time Vs level graphs or as tables for visualization or further analysis. Also the data may be required by a number of people sitting at different geographical locations simultaneously.

Web Data Monitoring software provided by Encardio-rite aids in the above process. It looks at the collected data and makes them immediately available in the form of time Vs level plots or in tabular form.

The user will have to maintain a desktop PC with an internet connection with static IP and running windows operating system and Microsoft IIS (*Internet Information Service*) server to run this software.

Authorized users from anywhere in the world can then login the website using the supplied user name and password and access the graphs and tables using any internet connected computer and a standard web browser like Microsoft Explorer, Google chrome Firefox etc. Figure 15-1 showing an example of Borehole data presented in graphical form.

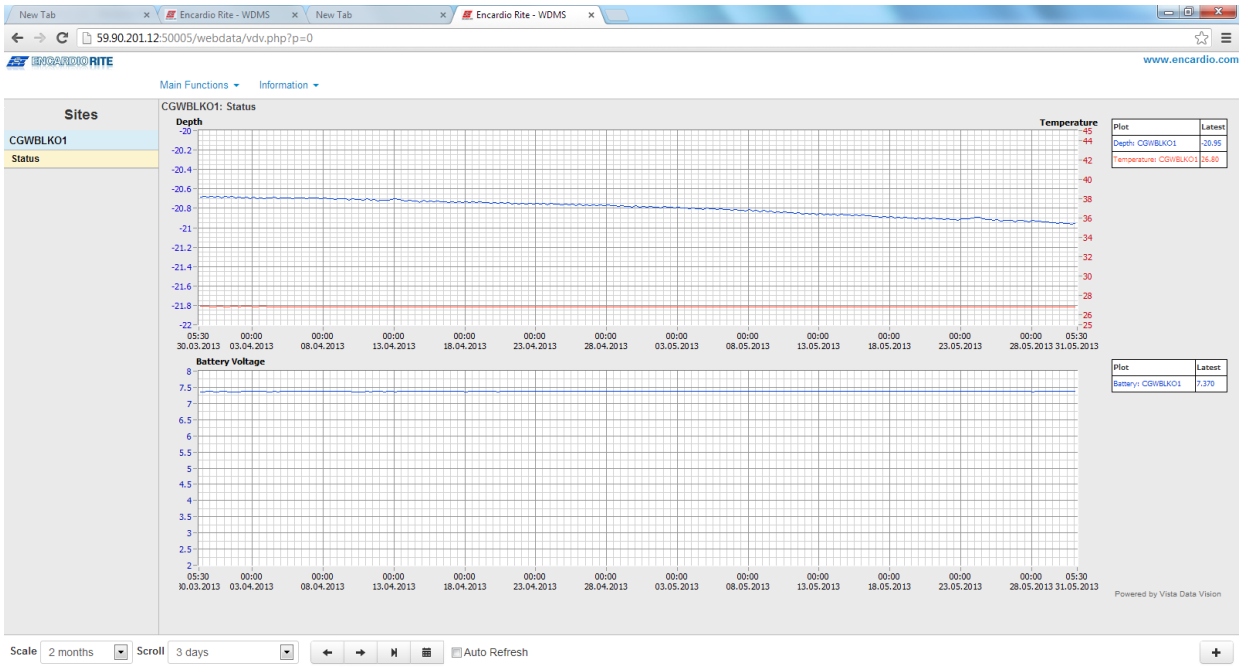


Figure 15-1: Data display on remote PC

In case a user does not want to host his own server, Encardio-rite can provide this as a service at a low cost. This service is known as *Web based Data Monitoring Service* (WDMS) and is available to users throughout the world.

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USERS' MANUAL

SINGLE CHANNEL VW DATALOGGER CONFIGURATION MANAGER (For Windows)

MODEL ESCL-12VT

Doc. # WI WI6002.136.3 R0 | Jun 20

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India: Lucknow | Delhi | Kolkata | Mumbai | Chennai | Bangalore | Hyderabad | J&K

Contents

1 INTRODUCTION

The application is a configuration manager for ESCL-12VT Single Channel Vibrating Wire Datalogger. The datalogger can be configured through this software. It analyzes the data files produced by the ESCL-12VT. The application displays raw data and parameter as per set monitor interval. By setting the log interval for scanning, the readings can be scanned which gets saved in the logger's non-volatile memory. After download, the application allows the user to analyze the readings obtained from the datalogger in tabular and graphical form.

1.1 Introduction about the Manual

1.1.1 Purpose of this document

The purpose of this document is to show the entire functionality of the application for the device ESCL-12VT. Please refer to *Introduction* section to know about the application.

This document serves as a help guide by showing the workflow of the entire processes. The document guides its user by providing a clear idea about how things have to be done in the application. All efforts have been made to clarify each and every step.

1.1.2 What the manual contains

The document is designed to provide step-by-step guidance using actual screenshots from the application.

1.1.3 How to use the manual

The document is intended to guide the user in a step-by-step manner starting from installing the application, accessing the application, analyzing the readings, viewing and manipulating the plots. The screenshot guides to complete the task.

NOTE: Although the best effort has been made to ensure the completeness and accuracy of the information provided in this document, Encardio Rite instruments reserves right to change the information at any time and has no liability for accuracy.

1.1.4 List of abbreviations

APN	Access Point Name
CSV	Comma Separated Values
ESCL-12VT	Single Channel Vibrating Wire Datalogger
FTP	File Transfer Protocol
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
IIS	Internet Information Service
PC	Personal Computer
SIM	Subscriber Identity Module
URL	Uniform Resource Locator
USB	Universal Serial Bus
UTC	Coordinated Universal Time
VW	Vibrating Wire
WDMS	Web based Data Monitoring Service

1.2 Overview

The software is designed in a very user friendly manner which can be operated very easily for downloading of the data and analyzing the readings. Even users with little experience with Geotechnical Instruments can connect, download data and change settings as and when required.

1.3 Operating Principle

ESCL-12VT, Single Channel VW Datalogger is designed to monitor measured parameter using a single vibrating wire sensor. Datalogger can store calibration coefficients, x-parameter, units of measurement etc. Data can be stored in engineering units. Each reading is stamped with date and time at which the measurement was taken. It has non-volatile flash memory to store up to 599K records.

These data files can be downloaded to PC using Configuration Manager by connecting logger with data cable or Bluetooth. The downloaded readings get stored in the PC's Home Directory in CSV format. The files can be transferred to FTP server using internet connection. It can be processed on any common available spreadsheet like Microsoft-Excel.

ESCL-12VT with built in 3G/4G modem has capability to upload data records directly to remote FTP server. Upload schedule can be set in Datalogger using this software for automatic data upload to FTP server. Schedule can be set as fast as 5 minutes.

2 GETTING STARTED

2.1 System Configuration

The application runs on Windows XP, Windows-7, Windows-8 and Windows-10. The minimum system configurations are:

- The RAM of the computer should at least be 512MB (Recommended 1GB).
- The hard disk should have minimum free space of 60 MB.

2.2 Application Installation

It is strongly recommended to exit all programs before installation. Follow the steps below for installing the application for the first time.

Note The *user account type* should be the Administrator.

- Insert the disk into the CD-ROM drive.

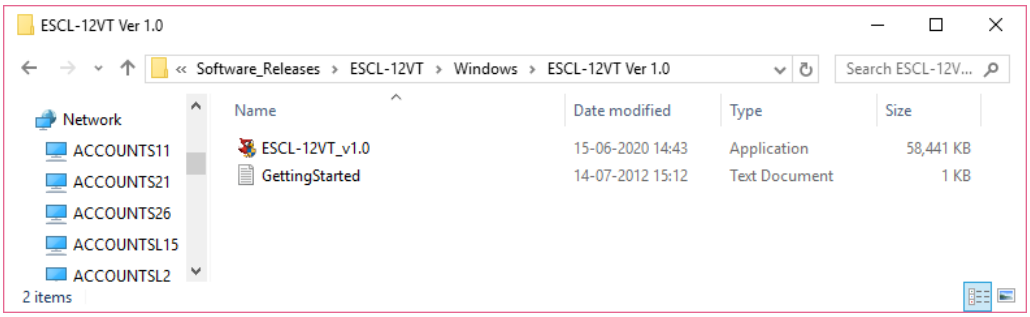

Figure 2-1: Example of Running the Setup file

- Clicking the Setup file, the application prepares to install.
- Click *Next* on the *Introduction* window to choose destination of installation folder.

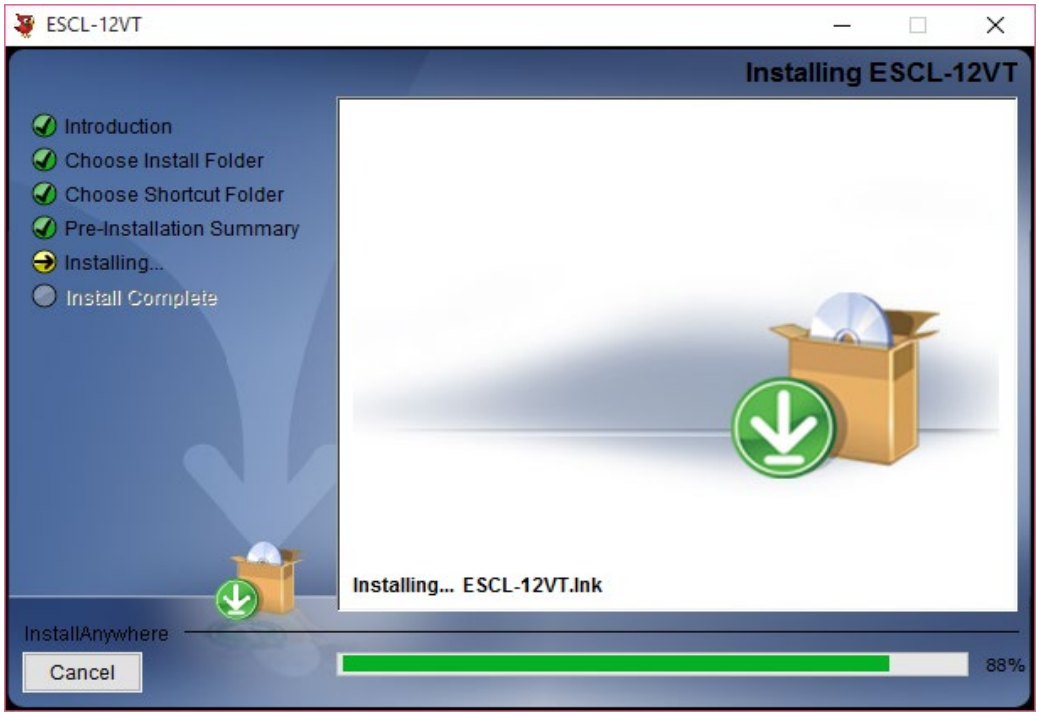

Figure 2-2: Installation Introduction

- By default the destination of installation is Program Files in C Drive. Select the destination folder for the installation and click on next.
- Click in front of the radio button where the product icon has to be created. Click *next.*
- Next window displays the pre-installation summary. Click *Install* to continue.
- Press *Done* to finish the installation.

Now, the application can be launched by choosing it from the program list in the Start Menu. For convenience purpose, a desktop shortcut can be created.

2.3 Connecting Datalogger with PC

It has already been briefed that the datalogger's reading can be monitored using the application. To do so, the datalogger should be connected with the PC and the application should be installed. The datalogger can be connected with PC by two methods, firstly by using interface cable and secondly by using Bluetooth. Each of these is explained in separate section below.

2.3.1 Using Interface Cable

Interface cable has 4 pins USB connector at one end and 9 pins D-sub connector at another end. Connect 9 pins D-sub connector of the Interface Cable to the Datalogger and other end with USB socket at PC. Secondly if Interface cable is unavailable, standard USB to RS-232 Converter can be used.

Figure 2-3 : Connecting datalogger using interface cable

2.3.2 *Using Bluetooth Connection*

The sensor readings taken can also be shared using Bluetooth connection for communicating PC with Datalogger unit. Plug Bluetooth modem at 9 pins D-sub connector of the Datalogger. Make sure that modem must be configured for 115200 baud rate and hardware flow must be OFF. Verify DIP switch settings with following Figure 2-4.

Figure 2-4: Bluetooth modem DIP switch settings

Turn ON the Bluetooth modem by pressing ON/OFF switch provided near modem's battery compartment. The power indicator of Bluetooth modem will glow in GREEN colour to ensure that Bluetooth modem is ON.

Turn ON the Bluetooth of the PC/laptop and search Bluetooth devices in the network. Once searching gets completed, a list of Bluetooth devices found is displayed. Find the Bluetooth modem's serial number in the list of devices found and click for pairing the PC/Laptop with the Bluetooth modem.

Figure 2-5: Connecting datalogger using Bluetooth

Once pairing button is pressed it will ask to enter passkey for authentication. Enter pairing code "**69836776**" and then press OK. On successful authentication it will show that device is paired. Now the PC/Laptop is paired with Bluetooth modem. This activity is required for first time connection with the Bluetooth modem.

2.4 Running the Application

Start the Application from the "Programs" menu or Double click on the icon ESCL-12VT from desktop to run the application.

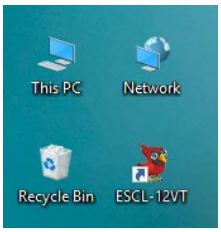

Figure 2-6: Application software shortcut

2.5 Viewing the Main Screen

Entering the application, the main screen of the application appears as displayed in Figure 2-7. The menus *Home, Upload Data* and *View Data* are enabled while the rest are disabled.

Figure 2-7: Main Screen

2.5.1 Selecting Serial Port

The serial port can be selected using drop down menu which displays the list of available serial ports. Select port as per the cases discussed below:

Case I: If the physical comport is inserted, select COM1 or COM2 wherever 9 pins D-sub Connector of Interface cable is inserted.

Case II: In case if the Datalogger is connected through USB Serial Port, the port can be known by following the path mentioned below:

Go to Computer → Right Click → Manage → Device Manager → Ports

Select the appropriate USB Serial Port.

Case III: If the Datalogger is connected through Bluetooth, the port can be known by following the path mentioned below:

Go to Computer → Right Click → Manage → Device Manager → Ports

Select the appropriate standard serial over Bluetooth link.

Figure 2-8 displays an example of available ports through device manager.

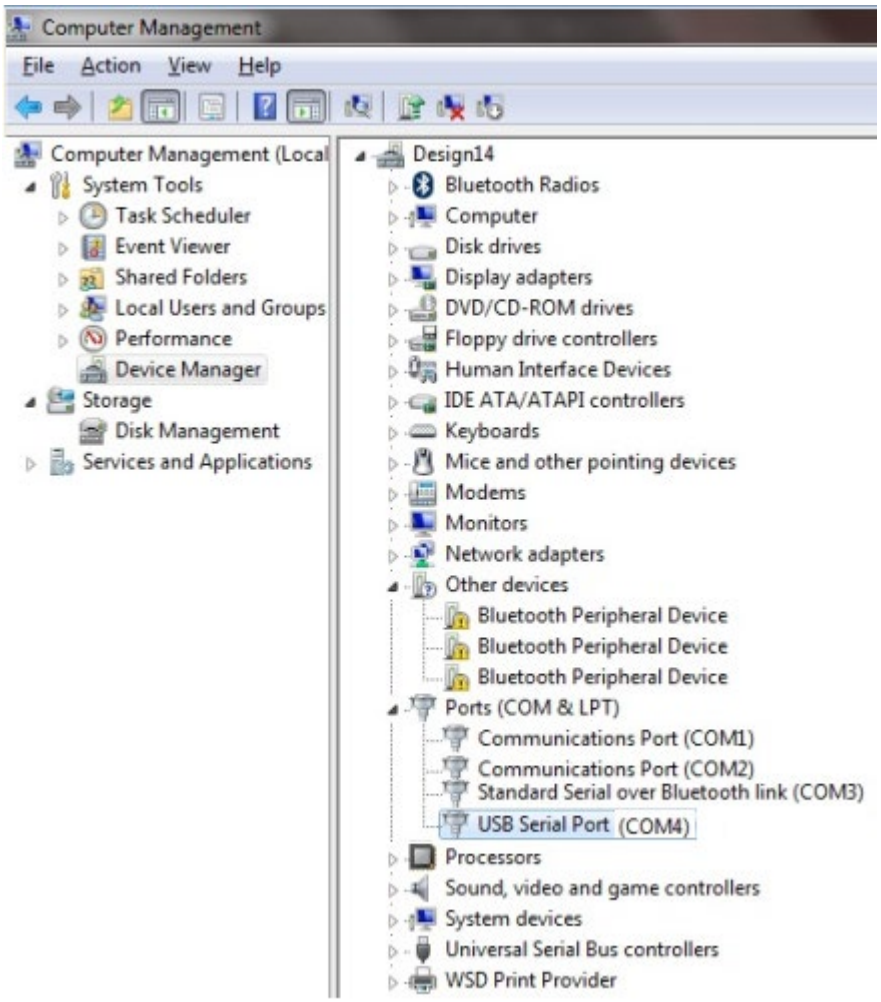

Figure 2-8: Device Manager (Computer Management)

2.5.2 Connecting Datalogger

After selecting the Serial Port, click *Connect Datalogger* to connect to the datalogger. The progress bar appears on the screen as the application takes few seconds to get connected. Every time whenever a command is given and the application takes few seconds, the progress bar appears on the screen.

After successful connection, an information message pops up on the screen confirming successful connection. Press OK to proceed.

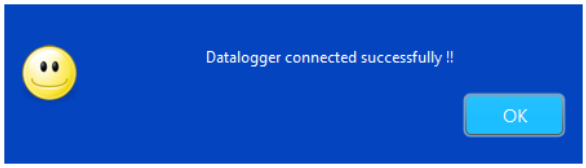

Figure 2-9: Information message

Application checks datalogger's battery health. Application displays information message pops up on the screen if battery voltage found low.

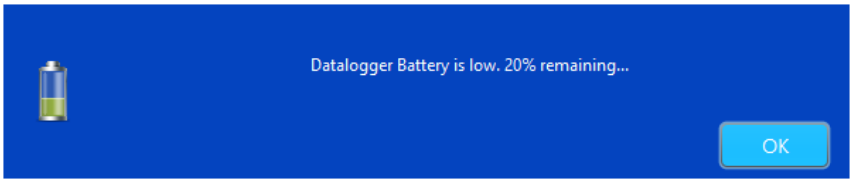

Figure 2-10: Battery low alert message

Now application checks datalogger's battery installation information. Application displays information message pops up on the screen if battery found replaced / re-installed. Choose battery installation date from calendar and then press OK. You can press Cancel button if you are not sure about battery installation date. In this case application will ask for battery installation date next time when connecting to datalogger.

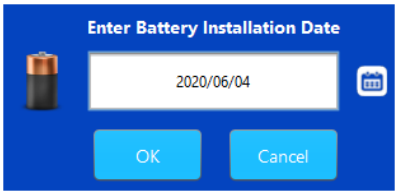

Figure 2-11: Battery installation date entry

3 HOME

Connecting to Datalogger, the *Connect Datalogger* button turns to *Disconnect* and an additional button *Shutdown Datalogger* appears. Click *Disconnect* to disconnect the datalogger. Pressing on 'shutdown datalogger' button, the datalogger gets shutdown.

Figure 3-1: Home Screen

System information can be seen by clicking *System Info* Tab. It will show the information about Datalogger. Datalogger settings can be configured using *System Configuration* Tab. 3G/4G modem can be configured using *Modem Configuration* Tab. *Monitor Parameter* Tab shows live sensor data from data logger. Different Sensors reading can be observed with this tab. Logger scanning and data download activities can be performed using *Scan & Format* Tab. Downloaded files can be uploaded to remote server using *Upload Data* Tab. The data can be viewed in tabular or graphical form by pressing *View Data* Tab. *Connection* and *scan* status indicator shows current status.

WARNING: Always SHUTDOWN Datalogger before removing battery from the Datalogger. Data may be lost otherwise.

4 SYSTEM INFORMATION

When selecting *system information* tab, application gets system information from datalogger. Figure 4-1 shows an example of *system information* tab. All fields are not editable.

Datalogger serial number, Model number, Datalogger ID (station ID), Datalogger installation location coordinates (latitude and longitude), Datalogger's position above MSL (mean sea level), Modem's IMEI number and Datalogger's Firmware information can be seen in *Logger info* panel.

Sensor related information like Sensor model, Sensor serial number, sensor's measuring range and temperature measurement unit can be seen in *Sensor info* panel.

Data log related information like Scan status, data logging interval, next scan start time and number of samples averaged can be seen in *sampling* panel.

Datalogger's battery related information like Battery type, Battery installation date, battery's present voltage and battery health can be viewed in *Battery* panel.

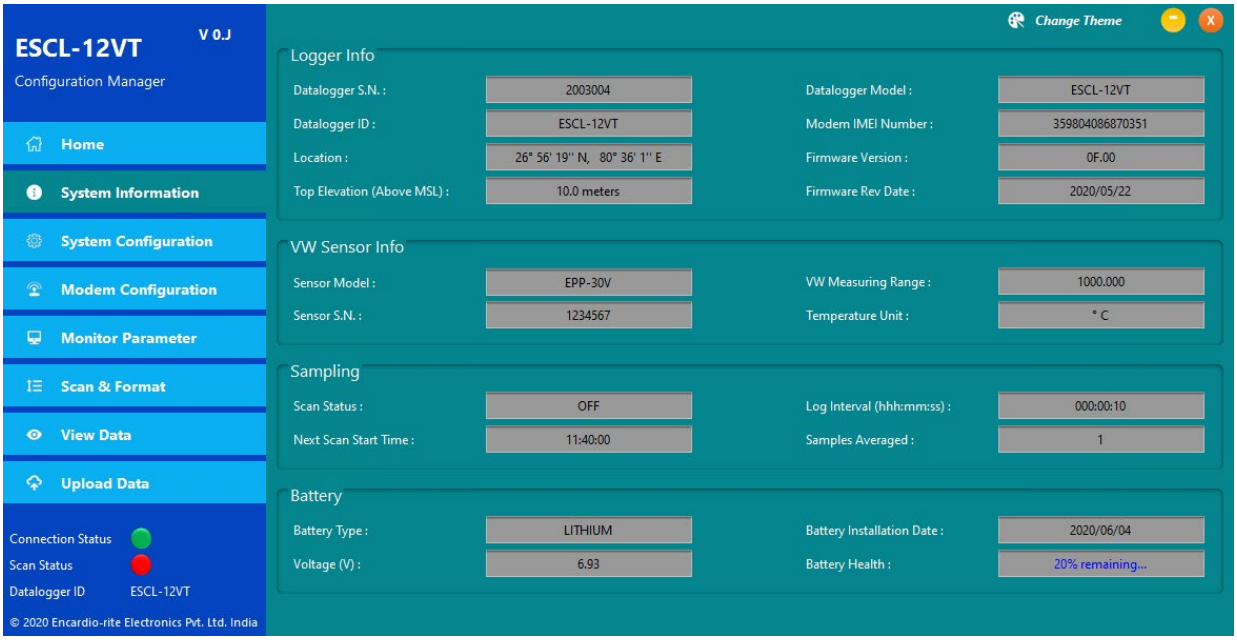

Figure 4-1: System Info screenSystem Configuration

Datalogger settings can be configured using *System Configuration* tab which can be opened on pressing *System Configuration* button in the main menu. Figure 5-1 shows an example of setup screen. Fields can be edited to modify the settings.

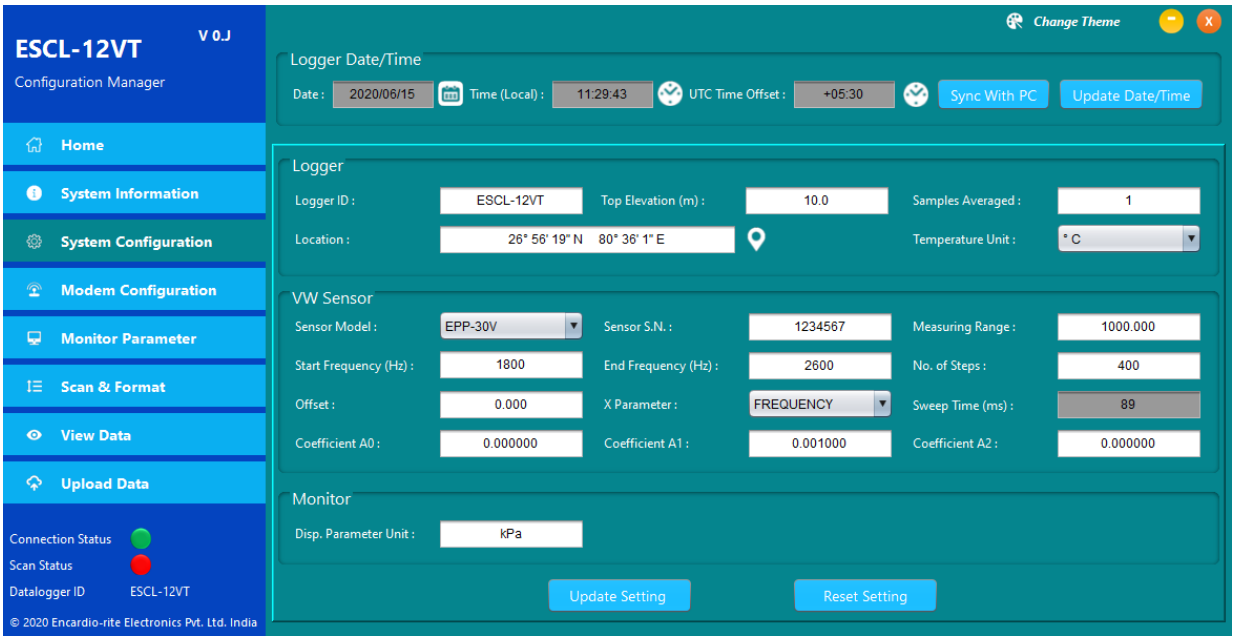

Figure 5-2: Setup Screen

Datalogger's date/time can be set using *Logger date/time panel.* There are two ways to set date/time manual or sync. You can select logger date, choose local time and UTC offset and then press Update date/time button to update logger's clock manually. You can opt for second option that is press *Sync with PC* button. Datalogger's calendar and clock will set to PC's date/time. Figure 5-1 shows an example of acknowledge dialog after datalogger clock synced with PC.

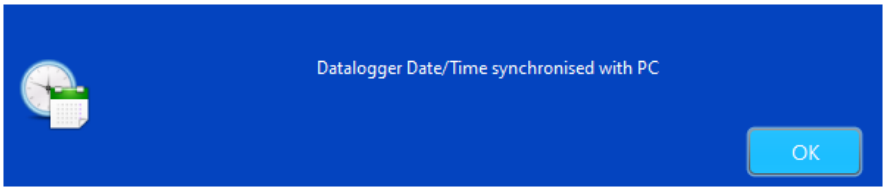

Figure 5-3: Datalogger clock sync message

Datalogger's ID or station ID can be entered under *datalogger's ID*. Datalogger's installation location coordinates (latitude and longitude) can be entered under *location* fields. Datalogger's installation location above MSL (mean sea level) can be entered under *Top elevation*. Datalogger has capability to store readings by averaging of reading samples. User can set samples for averaging ranging from 2 to 250. Keep samples for averaging to 1 if averaging not needed. Select the temperature measurement to change the unit.

Sensor related settings can be set through *Sensor* panel. Select the VW sensor model, enter sensor *serial number* and *measuring range* of vibrating wire sensor. Sensor excitation sweep frequency range automatically get modified on selection of VW sensor model. However, start frequency, stop frequency and number of steps for sweep can be edited. Keep *x-parameter* to *frequency squared* for vibrating wire sensor. Enter vibrating wire sensor coefficients A0, A1 and A2. See section 13 to know more about sensor coefficients.

Measurement parameter unit can be set under *parameter unit* field.

NOTE: Pressing on UPDATE button will update datalogger with new settings.

4.1 Reset Datalogger to Factory Default

Datalogger can be reset to Factory defaults using '*Reset Settings'* button. Pressing on Reset settings button will show a warning message. Press NO option to abort the reset or press YES to continue.

Clicking *Yes*, the application will prompt for a password. Type password "**4TfZ9q7X**" and press *OK* to reset datalogger settings. Kindly remember that clicking *Yes*, all previous values will be erased and factory settings will be restored.

Figure 5-4: Entering reset password

WARNING: Reset settings will erase all custom settings and datalogger will be set to factory defaults.

5 MODEM SETTINGS

Dataloggers with built-in 3G/4G modem have capability to upload logger records to remote FTP server through mobile network. For using this feature, an internet enabled SIM card must be inserted into SIM card socket into datalogger.

Pressing on *Modem Configuration* tab in the menu will open *Modem configuration screen*. This tab is disabled for dataloggers which don't have built-in 3G/4G modem. Figure 6-1 shows an example of *Modem configuration screen*.

Figure 6-1: Modem settings screen

For configuring FTP server settings correct FTP server URL, port number, user and password must be entered into specified fields. Enter the remote server FTP credentials for data transfer and 2-way telemetry support. Press *Update* button to update FTP server settings to datalogger.

Once FTP server settings configured datalogger automatically sends logger records to remote FTP server when upload time occurs. Upload schedule can be set through Upload Time panel. Upload time can be set as fast as 5 minutes. Upload interval can be set ranging from 5 minutes to 7 days. Press Update button to update schedule.

Network service providers *APN* for GPRS enabled SIM card must be entered under APN field in *advance settings* panel. GPRS modem operating mode can be configured in either of two modes OFF or Sleep. Modem operating mode can be set to *OFF* where mobile network is not available or automatic upload is not required. In this mode, modem always remains OFF. This option is opt to extend battery backup. Modem operating mode can be set to *Sleep* mode. In this mode, modem normally keep switch OFF and wake when scheduled upload time occurs. It will upload the data to server and then switch OFF the modem to improve battery backup. Datalogger mobile number can be entered in provided field for information purpose.

Records are uploaded to FTP server in CSV (comma separated values) file format. Data may contain header information if CSV header is enabled for uploaded file from advanced settings panel.

Auto sync RTC feature is given to sync Datalogger clock with network provided time every time while uploading data to server.

SMS alerts can be set to receive SMS alerts on your phone when battery goes low or water level crossed alert limits. To avail this feature SMS facility in SIM card must be enabled. Tick in check box under *advance settings* panel to enable SMS alert feature. Contact numbers where SMS to be sent can be entered into contact list. SMS alerts will be sending to all contact numbers which are entered in contact list. Maximum 8 contact numbers can be entered. Send test SMS can be used to check whether SMS feature is working properly or not.

It is recommended that do not communicate with the Datalogger if upload process is in progress otherwise GPRS link to remote server may get broken. GPRS upload time depends upon the record size being uploaded.

NOTE: Pressing on UPDATE button will update datalogger with new settings.

6 MONITOR PARAMETER

Pressing on *Monitor Parameter* tab will open Parameters screen. Figure 7-1 shows an example of parameter screen. This screen shows live data from datalogger. One can monitor sensor reading and temperature with datalogger's present date and time. Parameter *unit* can be set through *parameter unit* field from *system configuration* tab.

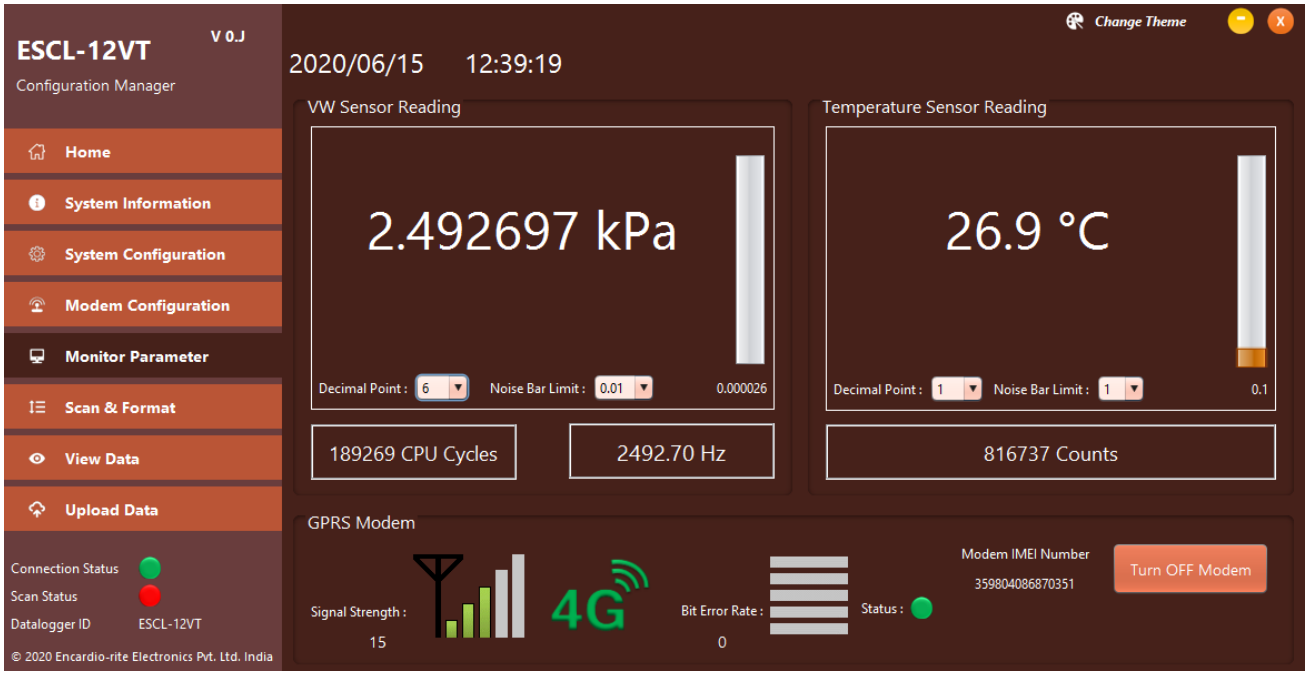

Figure 7-1: Monitor Parameter screen

The VW *Sensor Reading* panel shows VW sensor parameter, sensor frequency and cycle counts. Frequency and cycle counts are given for diagnostic purpose only. Parameter value can be decimally adjusted through *decimal points* setting.

The *Temperature Sensor Reading* panel shows sensor temperature and digital counts. Counts are given for diagnostic purpose only. Temperature can be monitored in *Degrees* or in *Fahrenheit*. Temperature reading shows error code -99.9 if sensor not connected. Temperature value can be decimally adjusted through *decimal points* setting.

The *GPRS Modem* panel shows GPRS modem status for diagnostic. Click on turn ON modem button to turn ON GPRS modem. After turning ON, the modem status indicator becomes GREEN from RED. 3G/4G signal strength and bit error rate can be monitored. Signal strength should be greater than 11 (out of 31) to ensure successful FTP upload. External antenna is recommended where signal strength is below 12. Bit error rate less than 2 is good for error free communication.

7 SCAN

Clicking *Scan & Format* tab opens Scan screen. Figure 8-1 shows an example of scan screen. Data scan and alarms settings can be done here.

Scan option panel showing scan related information. *Log interval* can be set from 5 seconds to 7 days (i.e. 168 hrs). Once log interval is set, datalogger scanning can be started. Datalogger will start scanning from *Next scan start time*.

Though datalogger memory is very large with respect to record size, memory can get full if scan interval is very fast and memory not erased since a long time. What to do if memory gets full. There are two options. Choose memory full action either *stop* or *overwrite*. Scanning will get stopped in case of datalogger memory full if STOP option is selected. In this case the readings will not be recorded further once the memory is full. The other option is to overwrite where if the memory becomes full, the readings will be recorded but it will overwrite from oldest records in a cyclic manner.

It has been observed that in case of over range or faulty sensor many datalogger shows very large quantities or garbage values. It is very difficult for user or viewer software to identify those values. An error code of "NaN" for VW parameter and "NaN" for temperature will be reported in data records if sensor reads values beyond its operating range for any reason. To enable user defined *Error code* enter the error code value for *parameter* and *temperature* and then select *Parameter Error* option *Enable* from drop down menu.

Many times we require an alert when an alarm condition occurs. We can set alarms limits for SMS alerts. Enter VW parameter at which alerts are required. Choose Up, Down or None option. *Up* option means alarm condition occurs when measured value goes up with the limit specified. *Down* option means alarm condition occurs when measured value goes below the limit specified. *None* option can be selected to disable the alarm.

Sometimes we need to do fast logging when an alarm condition occurs. To do so there is a provision in software to *enable event log*. On enabling event log datalogger do fast scanning while an alarm condition remains and does normal scanning if alarm condition passed. Scan interval for alarm condition can be set through *Event log interval* field.

Important Press *Update* button to update the settings.

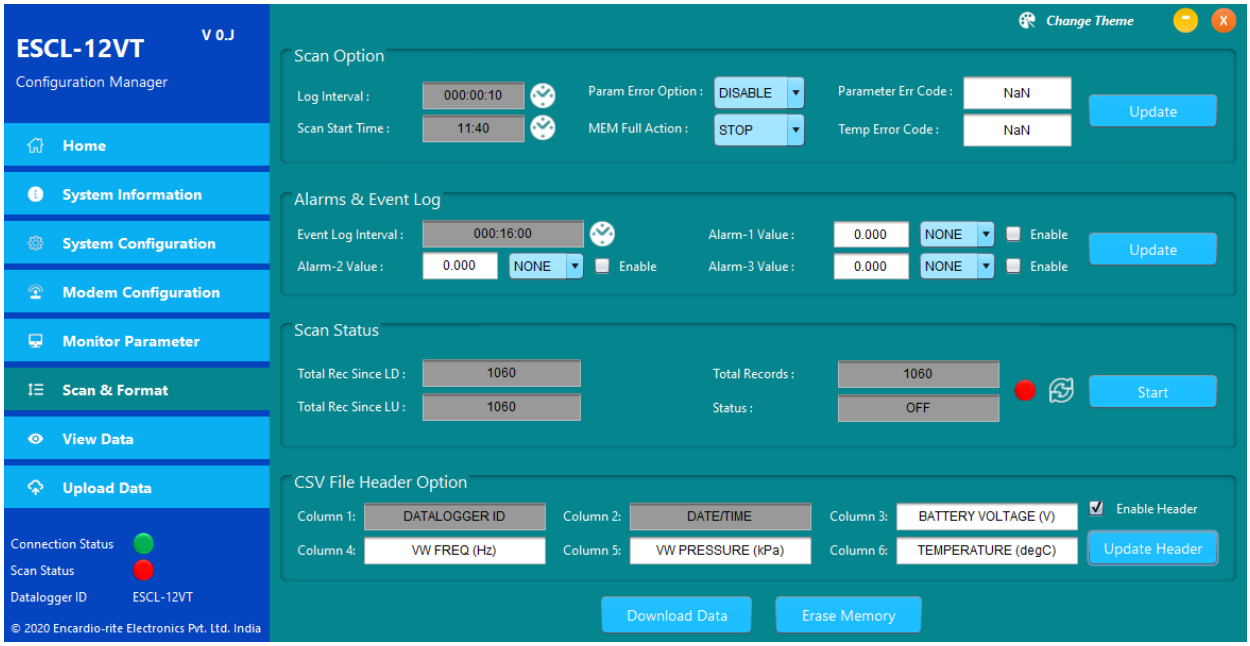

Figure 8-1: Scan & Format screen

Scan status panel showing total number of records stored in datalogger's memory. "*Total Records"* showing total number of records stored in Datalogger's memory since last erase. "*Records since last download"* showing total number of records reaming into Datalogger's memory since last download while "*Records since last upload"* showing total number of records reaming into Datalogger's memory since last upload. Datalogger scanning can be started by pressing *START* button once. Pressing the *start* button starts the scanning and scan *status* becomes ON. Status indicator becomes GREEN. While scanning, the *Start* button becomes *Stop*. During scanning, the datalogger scans sensor at specified log interval and the sensor readings gets stored into datalogger's memory.

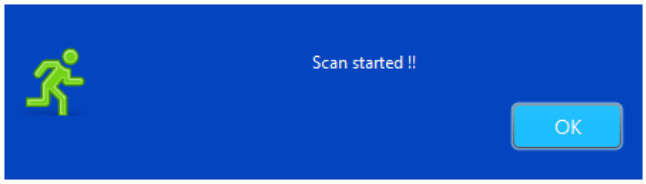

Figure 8-2: Scanning started information message

Datalogger scanning can be stopped by pressing *Stop* button once. Pressing on stop button stops the scanning and scan status becomes OFF. Status indicator becomes RED. *Stop* button becomes *start* again.

Refresh button can be pressed to refresh number of records stored in datalogger's memory.

Readings (data) can be downloaded from datalogger's memory by pressing *Download Data* button. A dialog will open for selecting download option. User can download complete records from memory since last erase by selecting download option "*Since Beginning*". If a user wants to download only recent records from last download then select "*Since Last Download"* option. Click OK to start the download.

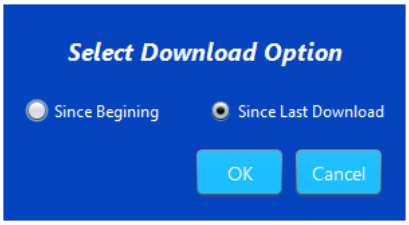

Figure 8-3: Select Download Option

Data download time depends on records size of datalogger's memory. Progresses bar dialog displays download progress. It can take several minutes also in case of large number of records. After successful download, an information window pops-up.

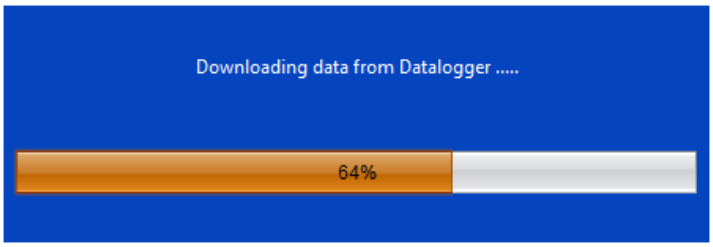

Figure 8-4: Download progress

Another window asks a confirmation to erase datalogger memory. Press NO option to abort the deletion or press yes to confirm deletion.

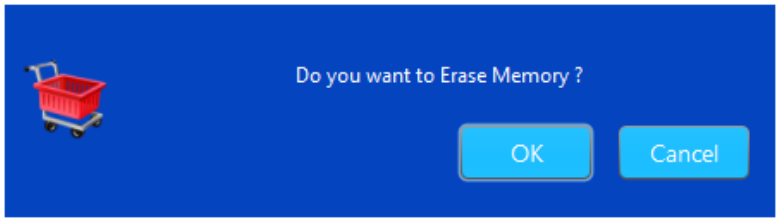

Figure 8-5: Erasing datalogger memory

Application will show memory empty dialog if number of records are zero in Datalogger's memory.

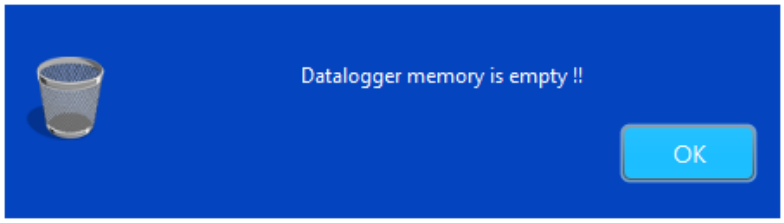

Figure 8-6: Datalogger memory empty message

Downloaded data are stored in CSV (comma separated values) file. Data may contain header information if CSV header is enabled from *CSV header option* panel. Some Header fields are locked for editing rest are editable. User can modify editable fields. Press *Update header* button to update header information.

Erase datalogger memory by pressing *Erase Memory* button. It would erase all previous readings and the *No. of Records* would become zero. The application seeks permission to erase logger memory as already shown in *Figure 8-5*. Click *Yes* to proceed or *No* to abort. Clicking *Yes*, datalogger's memory will be erased which will not affect other settings.

NOTE: It is recommended to erase memory each time after downloading records.

Downloaded data will be saved in CSV (comma separated values) format at specified file path. An example of file path is given below

File path: [root]\ESCL-12VT\CsvFiles\Site*.CSV

8 UPLOAD

The upload feature of the application allows the user to upload the *downloaded data* to the FTP server from anywhere using the internet connection. Clicking the *Upload* button in the main menu, the upload window appears with the list of datalogger files if it has been downloaded.

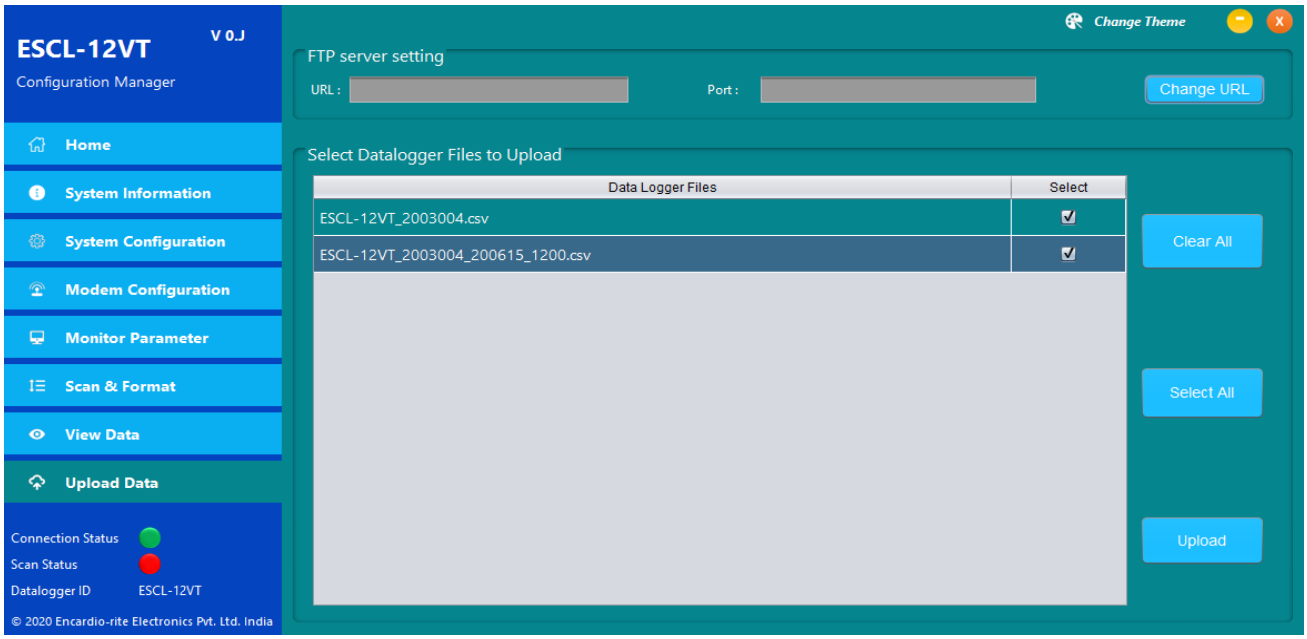

Figure 9-1: Files Upload Menu

To reset URL, click on *Change URL* button (If the user is entering the upload menu for the 1st time, the text boxes for URL and Port will be empty but if once entered, the application takes the previously entered values of its own). The application will open URL settings menu.

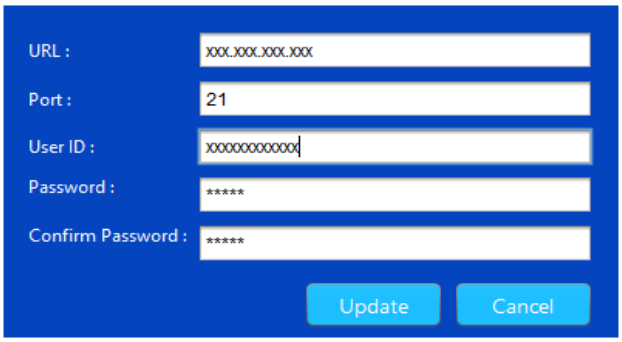

Figure 9-2: Reset URL screen

Type FTP server URL address. Provide port number of the FTP server. Enter user name and password for authentication. After providing all credentials press on *update* button to update URL settings. Make sure that the PC has internet access. Once *update* button is pressed, application will try to connect to the server. URL setting will be updated on successful connection to the server. URL settings will not be changed in case of connection failure.

For files upload, select the datalogger file which has to be uploaded. Files can be selected by ticking on check boxes. In the given example, two files are selected to be uploaded. If all the files have to be uploaded, click *Select All* button. To deselect all the files, click *Clear All* button. Click *Upload Files* button to upload the file/files. Press *Upload* button to upload the selected files. After successful upload, an information message pops up on the screen confirming successful file upload.

9 VIEW DATA

This tab allows the user to view datalogger's reading and interpret the data in tabular and graphical form. Select the file through the drop down menu. On selecting file, readings automatically get updated in table.

9.1 View Table

In the given example, the file ESCL-12VT_2003004_200615_1200.csv is selected for interpretation. Folder can be selected from *Browse* button. The readings are displayed in the Figure 10-1. Data in table represents date/time stamp of reading, VW sensor frequency, Parameter value, Sensor Temperature and Datalogger's Battery Voltage. Parameter decimal digits can be set from drop down option.

Figure 10-1: Viewing readings

1.1.1 Export Table

Table data can be exported to CSV file that can be viewed in any spreadsheet viewer. To do so click at export table icon. Clicking on export table will open a dialog asking for file format. Figure 10-2 showing an example of file format dialog. Table can be exported in either of two file formats *Standard* and *Extended*. Standard format may have data header information while extended format contains file header information. Refer section 14 to know more about file formats. Choose appropriate file format and output file path where data file to be exported and then press OK button to generate the CSV file.

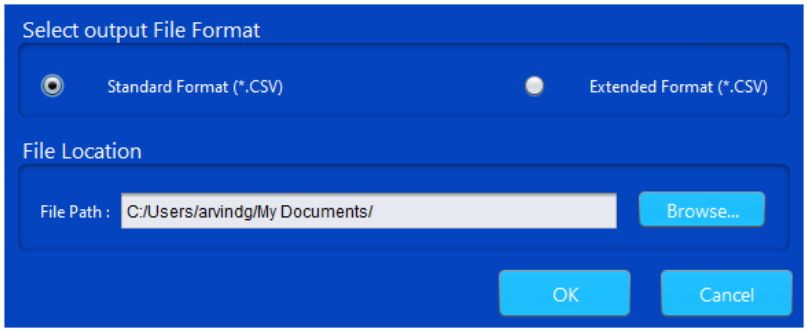

Figure 10-2: Selecting File Format

9.2 View Graph

To see the graph, click on *View Graph* button from *view data* screen. On clicking view graph, application shows a dialog to select data range. Figure 10-3 showing an example of data range selection menu. Choose X-axis and Y-axis range and then click on OK to view the graph.

Figure 10-3: Data range selection for graph

Figure 10-4 showing an example of graph screen. There are 4 tabs in graph menu. First tab is showing graph of Parameter and temperature Vs Time. Battery Voltage tab will show Datalogger's Battery status Vs Time. VW Freq tab will show sensor's frequency Vs Time. Temperature tab will show sensor temperature Vs Time.

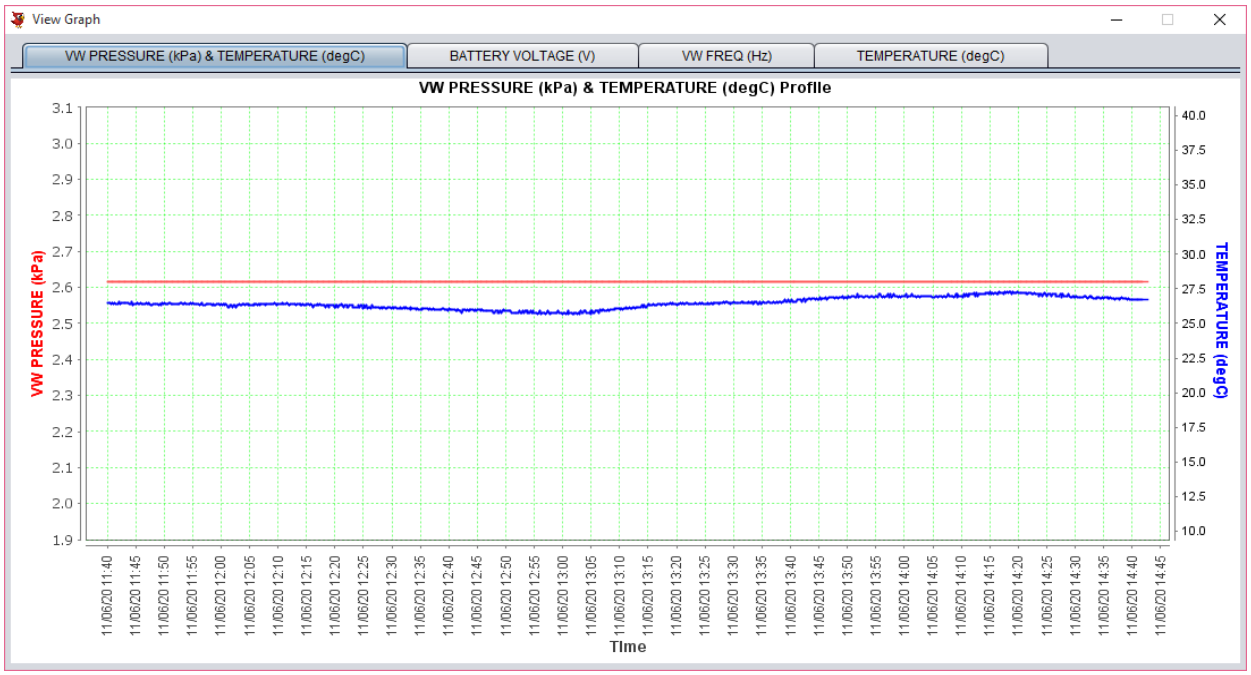

Figure 10-4: Parameter and Temperature Vs Time plot

9.3 Graph Customization

This section allows the user to customize the graph as and when required. At any time, right clicking the mouse on the plot area will bring the options discussed separately in this section.

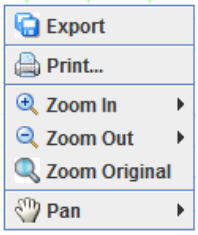

Figure 10-5: Graph customization

9.3.1 Export Graph

The application offers the facility to export a datalogger file in graphical form. The file is saved as a *png* image file.

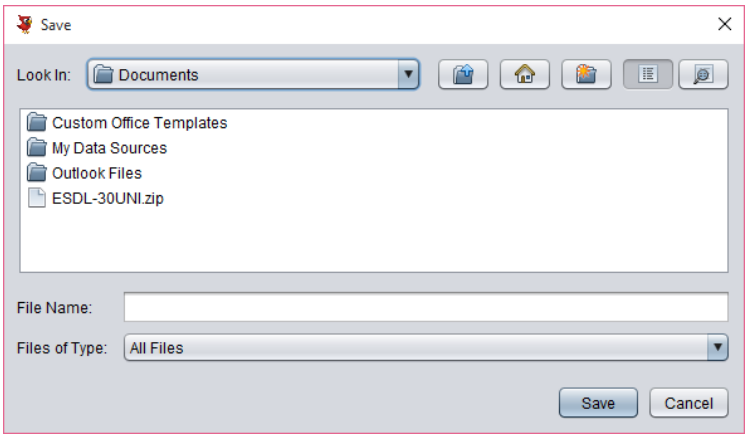

Figure 10-6: Saving the exported file

9.3.2 Print

Giving the print command would give the print of the graph. To take the print of the graph, follow the steps below:

I Right click and select Print.

II Select/enter entries as required on the *Page Set-Up* dialogue. Click Ok to go to the *Print* page.

III Select/enter entries required on the *Print* page.

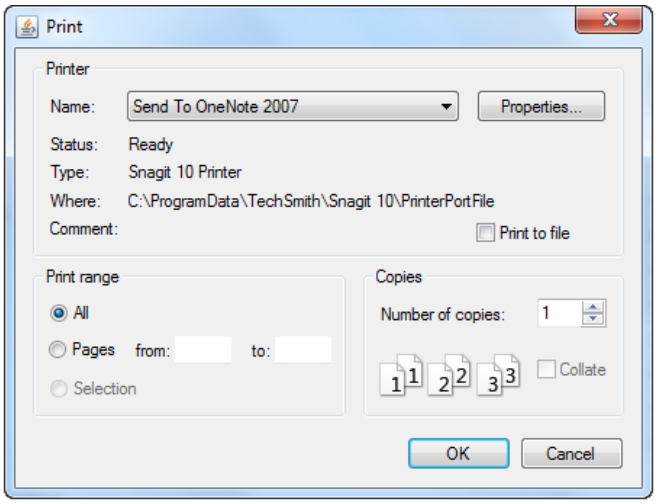

Figure 10-7: Print Settings

9.3.3 Zoom In

This feature allows the user to *Zoom* single or both axes.

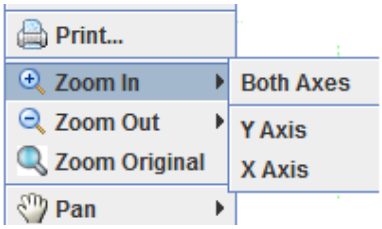

Figure 10-8: Zoom In Option

9.3.4 Zoom Out

It allows the user to *Zoom* out single or both axes.

9.3.5 Zoom Original

Any time to see the actual view of the plot if it has been zoomed in/out, click zoom original.

9.3.6 Pan

Pan option allows the user to choose between panning (press CTRL key to allow panning) in the x only, y only or both x and y direction simultaneously.

10 CHANGE THEME

Application theme is what controls the look and appearance of the software. At the top right corner of the home screen click change theme to change or create new theme for the application software.

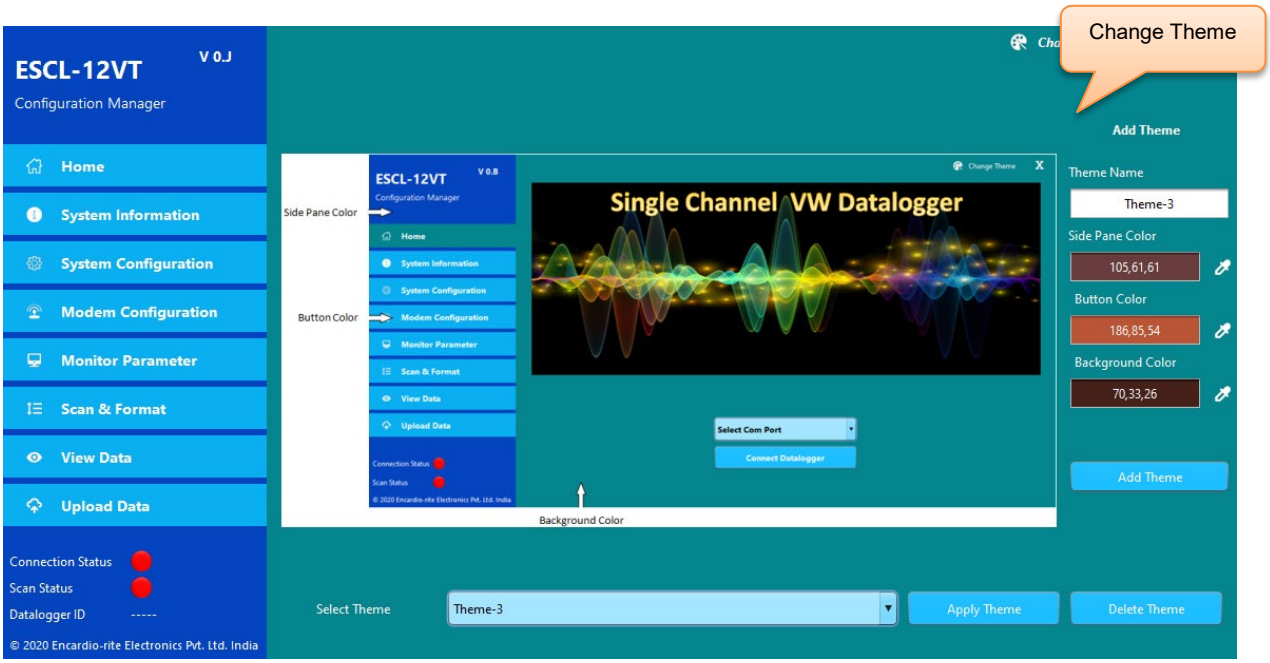

Figure 11-1: Change Theme Screen

Choose the theme from drop down option. Theme color palettes are shown in right side of the screen for the selected theme. User can edit the colors using color picker option and can add new theme by entering new theme name and then press add theme button to add new theme. Press Apply Theme button to apply new theme. Figure 11-2 is showing changed screen color after applying new theme.

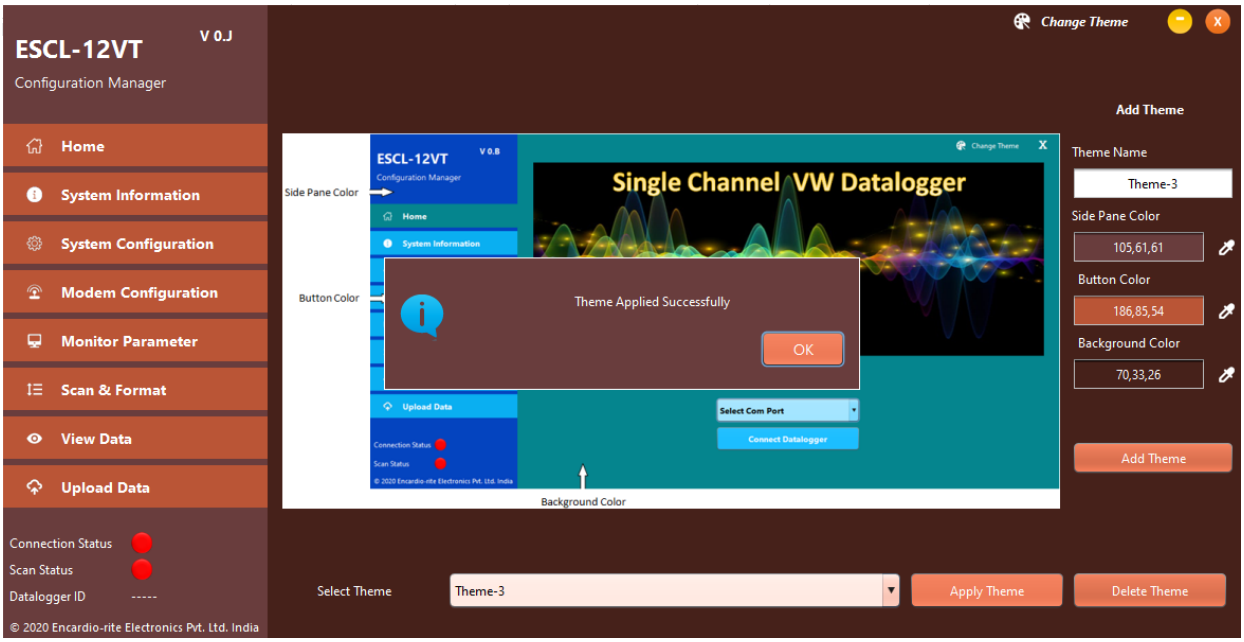

Figure 11-2: Screen after applying new theme

11 TROUBLESHOOTING

- Unable to connect datalogger over Bluetooth

a) PC's Bluetooth may not be enabled.

b) Bluetooth modem may not be turned ON.

c) Bluetooth modem may be out of Bluetooth range from PC.

d) Bluetooth modem may not be paired with PC.

e) Bluetooth modem's battery may be discharged.

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

g) Turn OFF the Bluetooth modem and then turn ON.

h) Reset datalogger by shorting RST jumper once using tweezers near datalogger's serial port connector.

- Unable to connect Datalogger with RS-232 Cable

a) USB to RS-232 cable driver may not be installed properly.

b) RS232 interface connector may be loose.

c) Check the RS232 interface cable's connector for damage.

d) RS232 interface cable may be broken.

e) Datalogger's battery may be discharged.

- Files not uploading on FTP server

a) Internet connection may not be available.

b) URL or port setting may be incorrect.

c) Check 3G/4G signal strength at *monitor parameter* screen.

d) Check Battery voltage and health at *system info* screen.

e) GPRS service may be deactivated from SIM card service provider.

12 SETTING SENSOR'S GAUGE FACTOR

ESCL-12VT single channel datalogger has capability to calculate parameter values using a second order polynomial equation.

$Y = A_2X^2 + A_1X + A_0$

Where, Y is the parameter value in engineering units and X is some function of the sensor frequency output.

Different manufacturers specify the value of X in different units in their test/calibration certificates supplied along with the sensor.

Case 1 : 'X' specified in terms of frequency

If the manufacturer specifies X in terms of frequency, then choose the value of "X-parameter" in SETUP screen as "FREQUENCY" from the drop down box.

Enter the value of A_0, A_1 and A_2 as mentioned in the manufacturer's calibration certificate without any modification.

Case 2 : 'X' specified in terms of frequency^2 (i.e. frequency squared)

If the manufacturer specifies X in terms of frequency^2 (frequency squared), then choose the value of "X-parameter" in SETUP screen as "FREQUENCY SQUARED" from the drop down box.

Enter the value of A_0, A_1 and A_2 as mentioned in the manufacturer's calibration certificate without any modification.

Case 3 : 'X' specified in terms of digits

This is a legacy case. Many manufacturers specify the value of X in terms of "digits" as defined below

$\text{Digits} = (\text{frequency})^2 / 1000$

In this case replace A_1 with the value A_1 / 1000 and A_2 with the value A_2/10,00,000 when entering these coefficients in the datalogger. A_0 will remain the same.

12.1.1.1 *Value of A0*

The value of A_0 is generally known as offset. It may be specified in the sensor's calibration/test certificate in which case it can be entered directly in the datalogger without any modification.

However, it is more common to determine the value of A_0 at site just before or just after installation.

Enter the value of A_1 (and A_2 if required) and check the parameter value just before or after installation of the sensor (as the case may be) with zero input or reference input that should be considered as zero. Now reverse the sign of the observed parameter value and enter it in place of A_0.

Recheck the parameter value to ensure that it is now showing zero. If however, a non-zero value is required then add that non-zero value to the value of A_0 and check whether you can see that particular non-zero value with zero or reference input.

13 FILE FORMATS

The data files used for transferring datalogger data to other software have the following formats. All data is in standard ASCII text format (7 bit). Variables are separated with commas (,).This format is suitable for direct import in Microsoft Excel (All versions) or other commercially available spread sheet programs for formatted printing and graphical plotting. Numeric values may or may not have a leading plus (+) sign but a minus (-) sign is always explicitly included. The contents of the data file are printed in Courier mono space font below.

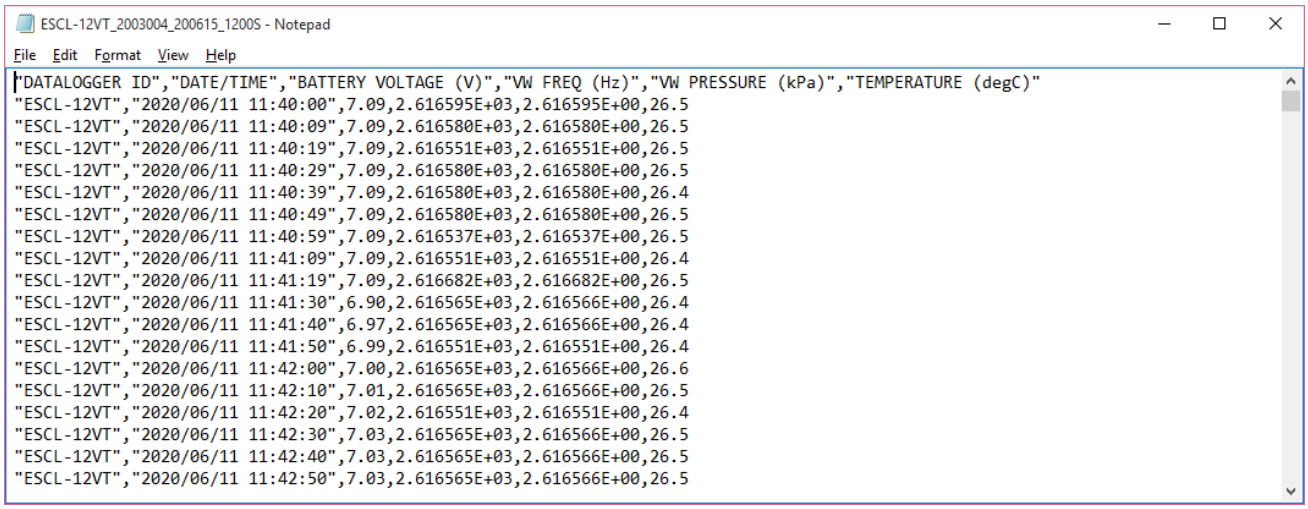

Figure 14-1: Standard File Format

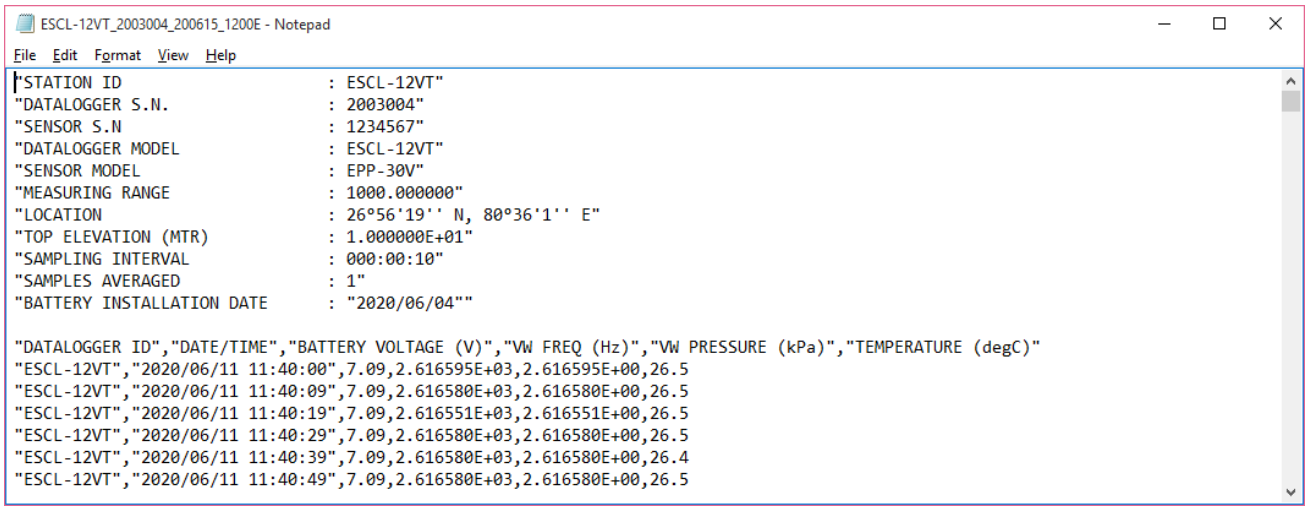

Figure 14-2: Extended File Format

14 REMOTE 2-WAY CONFIGURATION SOFTWARE

Datalogger with built-in 3G/4G modem can be remotely configured using *Remote 2-way configuration* software. Figure 15-1 showing home screen of remote configuration software. User can install this application to any server machine to control all dataloggers centrally.

Datalogger information like serial number, firmware version, battery voltage, battery installation date etc. can be get from the Datalogger.

Sensor related information, coefficients, offset and alarm levels can be edited. Scan schedule and upload schedule can be programmed remotely.

Logged data can be downloaded on demand using this application.

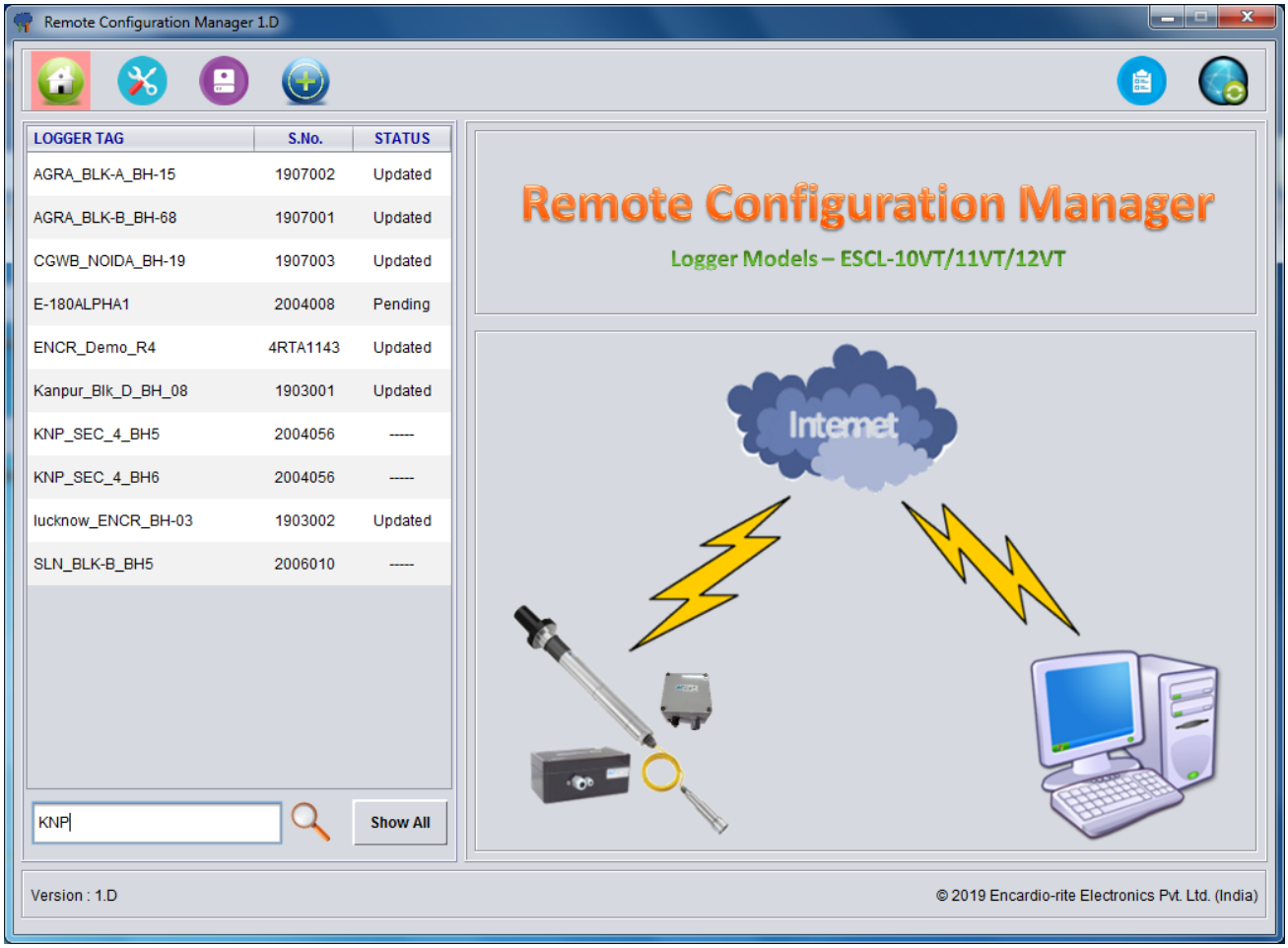

Figure 15-1: Remote 2-way configuration software

15 WEB BASED DATA MONITORING SERVICE (WDMS)

The data on variation of measured sensor data collected from a large number of dataloggers need to be presented as time Vs level graphs or as tables for visualization or further analysis. Also the data may be required by a number of people sitting at different geographical locations simultaneously.

Web Data Monitoring software provided by Encardio-rite aids in the above process. It looks at the collected data and makes them immediately available in the form of time Vs level plots or in tabular form.

The user will have to maintain a desktop PC with an internet connection with static IP and running windows operating system and Microsoft IIS (*Internet Information Service*) server to run this software.

Authorized users from anywhere in the world can then login the website using the supplied user name and password and access the graphs and tables using any internet connected computer and a standard web browser like Microsoft Explorer, Google chrome Firefox etc. Figure 16-1 showing an example of Borehole data presented in graphical form.

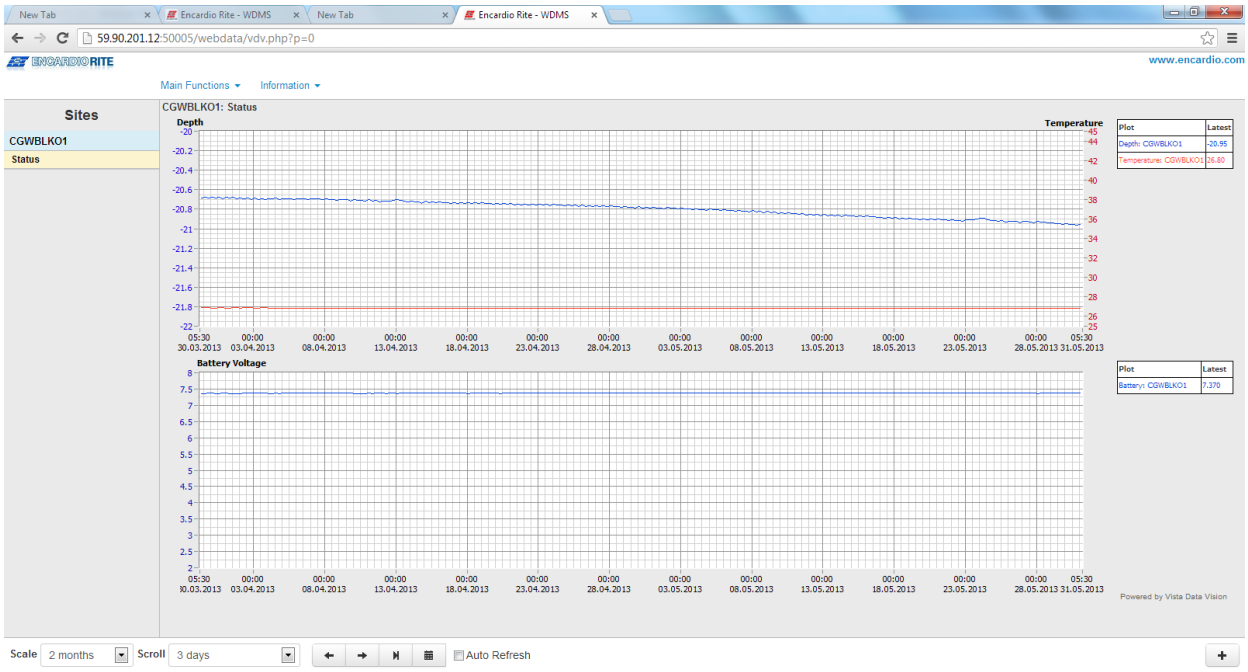

Figure 16-1: Data display on remote PC

In case a user does not want to host his own server, Encardio-rite can provide this as a service at a low cost. This service is known as Web based Data Monitoring Service (WDMS) and is available to users throughout the world.