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TRAINING MANUAL

AUTOMATIC WATER LEVEL MONITORING SYSTEM

MODEL EWLR-101

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Contents

1 STATEMENT OF PURPOSE

The purpose of the manual is to provide training on how to install and use the model EWLR-101 automatic water level recording/monitoring system. This document describes the system and serves as a guide to its working.

Step wise information is provided on the automatic water level recording/monitoring system, configuration manager software, installation of the system and trouble shooting. After carefully going through the training manual, it would be possible to install the system by following steps as laid down in the method statement (section 8).

2 INTRODUCTION

The Encardio-rite model EWLR-101 water level recording/monitoring system consists of an absolute pressure sensor, a barometric pressure sensor, a temperature sensor, a datalogger and configuration software for long-term monitoring & recording of water table in a borewell or water level in a lake, river or a reservoir through a gage well.

The pressure sensor is installed at a point below the minimum expected water level variation. Output of pressure sensor is proportional to the head of water above the pressure sensor (also known as piezometric head).

The datalogger is contained in a 50 mm diameter casing, around 500 mm long made of stainless steel and nylon materials. It is powered by an internal Lithium battery pack (2 x D size 3.6 V/19 Ah) that in the telemetry mode has a life of more than five years for upto four measurements/day and one transmission/day. Option of data retreival by laptop or mobile phone is also available.

Alternatively, the datalogger is also available in a polyester box 220 mm L x 120 mm W x 91 mm H. Power options available in box version are Lithium battery pack, Alkaline battery pack, mains power or solar power. Option of data retreival by telemetry, laptop or mobile phone is also available.

Measuring water level with a pressure sensor is affected by the specific gravity of water at the location. With the configuration software, the water level reading from pressure sensor can be corrected for specific gravity of water at that location, making the system suitable for use in areas with high salt content or dissolved solids.

3 APPLICATION AREAS

Encardio-rite model EWLR-101 automatic water level recording and monitoring system is suitable for number of applications. Some of them are:

- Monitoring of water level
- To monitor water table in a borehole - acquifer mapping
- Unattended maintenance free monitoring of water table in several boreholes from a central location
- Automated river, lake or reservoir water level monitoring
- Open channel water level monitoring
- Tank level measurement

The water table can be referenced to mean sea level in case installation depth above the mean sea level is known.

4 SYSTEM COMPONENTS

The automatic water level monitoring system model EWLR-101 consists of the following system components and accessories:

- Pressure sensor with attached cable with end connector to connect to datalogger
- Temperature sensor inside pressure sensor
- Barometric pressure sensor inside datalogger body

Datalogger with internal battery back-up and communication option:

Dataloggers are available in two variants:

Option 1: To be installed inside borehole

Option 2: Box type

Configuration software CD

USB to serial interface cable

USB to serial interface cable (only for box type datalogger)

Installation accessory (Mounting plate)

(variants available for borehole type datalogger and box type datalogger)

Installation accessory (Safety wire rope with holder)

Data SIM (Customer scope - in case of telemetry option)

5 SYSTEM OVERVIEW

5.1 Pressure sensor with interconnecting cable

EWLR-101 automatic water table/level monitoring system incorporates a high accuracy absolute fluid pressure sensor to monitor water level. It is installed at a depth below the minimum expected water level. A thermistor is also incorporated in the sensor for measurement of water temperature. The outer body of the sensor is of stainless steel construction - resistant to rusting or corrosion against several kinds of dissolved impurities found in water under field conditions. For saline water applications sensors with additional protection are available.

Output of the pressure sensor is proportional to the head of water (piezometric head) above the pressure sensor. The output of the pressure sensor is affected by any variation in atmospheric (also known as barometric) pressure. To get the correct water table/level, it is therefore necessary to nullify the effect of atmospheric pressure variation on the output of the pressure sensor.

The absolute pressure sensor with an integral water proof four conductor Kevlar reinforced signal cable is supplied with an individual barometric pressure sensor (fitted inside the datalogger) which allows the water level to be corrected for barometric pressure variation. The use of barometric pressure sensor eliminates the apparent variation in water level due to variation in atmospheric pressure. The system provides the correct value of water level along with barometric pressure and temperature to the user.

5.2 Automatic datalogging system

Model ESCL-10VT datalogger is available in two types of enclosures as described under Section 2**:** *INTRODUCTION,* on page 1. Repeating, these options are:

- 50 mm diameter casing, around 500 mm long; made of stainless steel and nylon material. It is powered by an internal Lithium battery pack (2 x D size 3.6 V/19 Ah). This enclosure is generally used for monitoring ground water table in a borehole.
- Polyester box 220 mm L x 120 mm W x 91 mm H. Power options available are Lithium battery pack, Alkaline battery pack, or 12 vdc external source. This enclosure is generally used for monitoring water level in lakes, reservoirs or rivers or locations where the datalogger needs to be kept in an adjoining room for satety purposes. The “box” enclosure option also has provision to connect a rain gauge to it for monitoring the rainfall in addition to water level/table, temperature and barometric pressure.

Option of data retreival by telemetry, laptop or mobile phone is available. The barometric pressure sensor, batteries and GSM/GPRS modem for telemetry system are mounted inside the enclosure. In case telemetry is not required, the GSM/GPRS modem is not provided. The datalogger can be programmed to take a measurement from every 5 seconds to every 168 hours in linear or event sampling mode. However, number of measurements taken per day should be kept to a minimum as higher frequency of measurement drains the power supply battery at a faster rate. In event based recording, frequency of recording data can be increased in case set threshold value is exceeded.

Water level reading from a pressure sensor is dependent on specific gravity of water at that location. For example if specific gravity is 1.08, the pressure sensor will give an 8 % higher output as compared to normal water which has a specific gravity 1.0. In coastal areas or in water with high dissolved solid content, the specific gravity of water will have a value greater than 1.0. The measured value of specific gravity must be entered in the datalogger so that it can provide the corrected value of the level of water.

The datalogger measures the output from the absolute and barometric pressure sensors (as well as temperature in units of degrees Celsius) and calculates the pressure in terms of water column after correcting for the measured barometric pressure and water density. The data is stored, together with the

current date, time & battery voltage, as a data record in internal 8 MB non-volatile memory of the datalogger. The datalogger has a capacity of storing around three million data points.

The parameters recorded by the datalogger are:

- Water pressure
- Barometric pressure
- Temperature
- Battery voltage
- Rainfall (only with polyester box version of datalogger)

5.3 Data retrieval and transmission

Following options are available:

5.3.1 Readout/data retrieval using laptop

The logged data from the datalogger in the field can be directly downloaded to a laptop. Data can then be transferred to the server or central PC from the laptop using either a USB pen drive or through Internet.

5.3.2 Mobile phone readout/data retrieval

The datalogger can also communicate with an Android mobile phone readout running the supplied datalogger configuration/application software through a detachable Bluetooth dongle. Data can then be transferred to the server or central PC from the mobile phone either by USB cable/Bluetooth interface or through Internet.

5.3.3 Telemetry through GSM/GPRS modem

For a location covered by any GSM/GPRS service provider's network, the data from ESCL-10VT datalogger can be transmitted remotely to a PC at a central location. The user will need to get a data SIM for each GSM/GPRS modem under a suitable data plan from the local mobile phone service provider depending on the volume of data transfer expected.

The user will have to maintain a central PC configured to work as an ftp server. Data is transferred to the user's server or a central PC for display as a table or chart for further analysis.

The PC will need an internet connection with a static IP. All the dataloggers in the network will be configured to send the data to this server PC at predetermined intervals. The system is supplied with Windows based datalogger application software with many convenient features which allows the user to set the sensor calibration coefficients, recording interval, datalogger or borehole code (identification tag numbers), sensor serial number, real time clock time etc. of the datalogger.

Users can monitor readings and GPRS signal strength for diagnostic purpose. User can start or stop scan or can manage data files, download data from the datalogger, perform data correction and save and export the data files.

Data remains stored in memory unless it is not uploaded.

5.4 Web based data monitoring service by Encardio-rite

The telemetry option described in the above three paragraphs is offered as a Web Based Data Monitoring Service (WDMS) by Encardio-rite at a low cost. This saves the users from maintaining their own server. The data on variation of water table/level collected from a large number of locations is presented as time vs. water table/level graphs or as tables for visualization or further analysis. Data is also available on time vs. barometric pressure, temperature or/and rainfall. Password protected data is available to a number of people sitting at different geographical locations simultaneously.

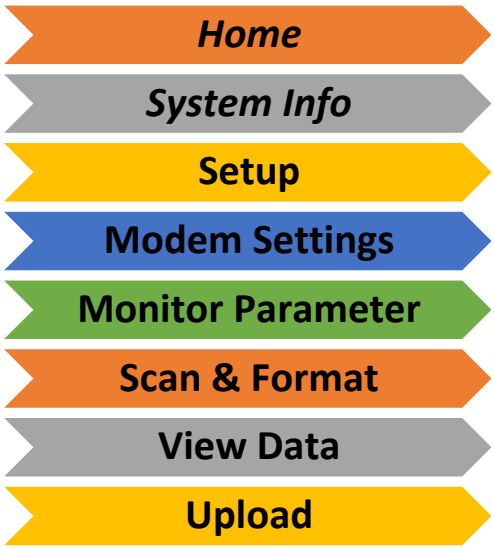
6 OVERVIEW- CONFIGURATION MANAGER SOFTWARE (FOR WINDOWS)

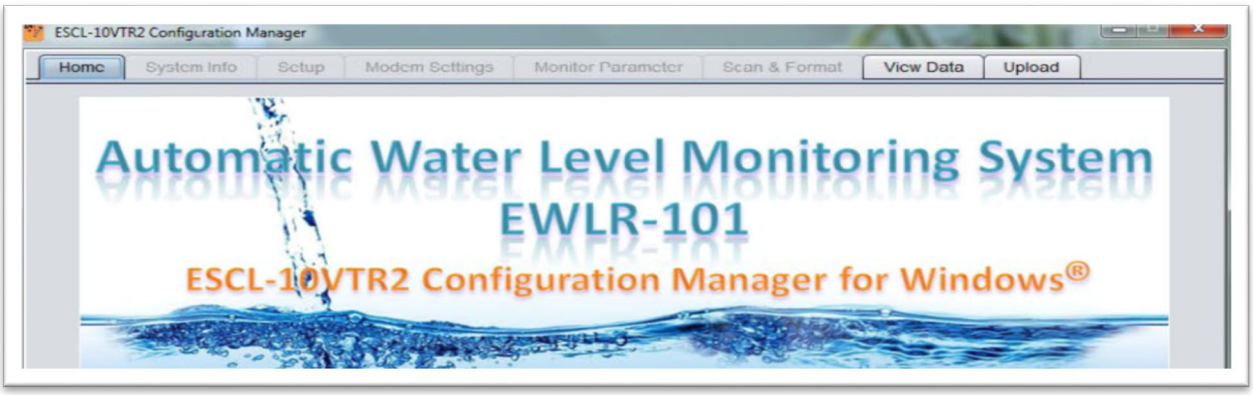
Configuration Manager is an application software that requires to be installed on the datalogger.

The Windows based data logger Configuration Manager Software comes with many convenient features making it is easy to configure the datalogger locally. User can configure the datalogger through a laptop that can be connected to the datalogger using a standard USB to serial cable.

The Configuration Manager has eight application windows, the first two being basic and the next six used for configuration and monitoring.

NOTE: A separate users' manual is available for Android version of Configuration Manager Application (suitable for Android based smart phones).





6.1 Monitoring and recording

- ✓ Date/time setting
- ✓ Datalogger ID (borehole code)
- ✓ Top elevation (mean sea level)
- ✓ Latitude and longitude of location
- ✓ Sensor serial number, sensor range and model no.
- ✓ Sensor calibration coefficients with installation depth
- ✓ Specific gravity
- ✓ Barometric pressure correction option
- ✓ Logging interval
- ✓ Monitor parameter (current values)
- ✓ Start/Stop scan
- ✓ Alarm and event log

A. Data Management

a. Manual data management

- ✓ Download data from datalogger
- ✓ Manage data file (file path)
- ✓ Data analysis (view of pre-downloaded/historical data)
- ✓ Upload data file to user's FTP server (internet connection to be active on laptop)
- ✓ Erase datalogger memory and event log

b. On Line data management (telemetry option)

- ✓ FTP server setting
- ✓ Data upload at pre-determined time
- ✓ Setting of GPRS modem
- ✓ Change of APN of SIM (as per service provider)
- ✓ Monitor parameter/readings
- ✓ Monitor GPRS signal strength for diagnostic purpose
- ✓ Alarm SMS update

7 CONFIGURATION MANAGER FOR WINDOWS - SOFTWARE MANUAL FOR AUTOMATIC WATER LEVEL MONITORING SYSTEM (EWLR-101)

List of Abbreviations

APN	Access Point Name
CSV	Comma Separated Values
EWLR-101	Automatic Water Level Monitoring System
FTP	File Transfer Protocol
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
IIS	Internet Information Service
MSL	Mean Sea Level
PC	Personal Computer
SIM	Subscriber Identity Module
URL	Uniform Resource Locator
USB	Universal Serial Bus
UTC	Coordinated Universal Time
WDMS	Web based Data Monitoring Service

7.1 Introduction

The software is used as a Configuration Manager to configure the datalogger of ESCL-10VT automatic water level recorder. It analyses the data files produced by the ESCL-10VT. The application displays raw data and parameters as per the set monitoring interval. By setting the log interval for scanning, the readings can be scanned and saved in the non-volatile memory of the logger. After download, the application allows the user to analyse the readings obtained from the datalogger in tabular and graphical form.

Users with little experience of geotechnical or geophysical instrumentation can connect, download data and change settings as and when required.

7.1.1 Operating Principle

ESCL-10VT automatic water level recorder is designed to monitor water level using a pressure sensor. The datalogger can store calibration coefficients, x-parameter, units of measurement, specific gravity, sensor installation depth etc. Data can be stored in engineering units. Each reading is stamped with date and time at which the measurement is taken. It has non-volatile flash memory to store more than three million data points.

The data files can be downloaded to a PC using the Configuration Manager by connecting the logger with a data cable or through Bluetooth. The downloaded readings get stored in the Home Directory of the PC in CSV format. The files can be transferred to a FTP server using an internet connection. It can be processed on any commonly available spread sheet like Microsoft-Excel.

ESCL-10VT with a built-in GSM/GPRS modem has capability to upload data records directly to a remote FTP server. Upload schedule can be set in the datalogger using this software for automatic data upload to FTP server. The schedule can be reset as fast as 6 times a day.

7.2 Getting Started

7.2.1 System Configuration

The application runs on Windows XP and Windows 7. The minimum system configuration is:

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

7.2.2 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.
- Clicking the Setup file, the application prepares to install.
- Click “Next” on the Introduction window to choose destination of installation folder.”
- 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.

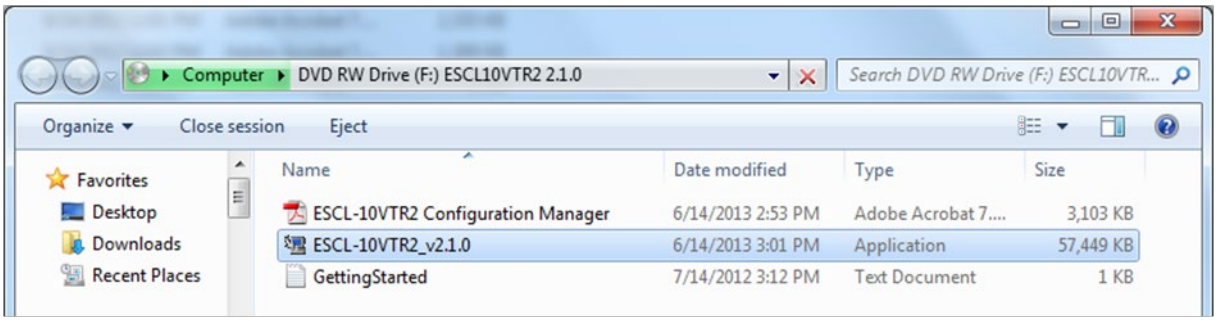


Figure 7-1: Running the Setup file

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

7.2.3 Connecting datalogger to PC

As already stated, the datalogger reading can be monitored using the application. To do so, the datalogger should be connected to the PC and the application installed. The datalogger can be connected to the PC by using the interface cable or by Bluetooth. Both the methods are explained in the section below:

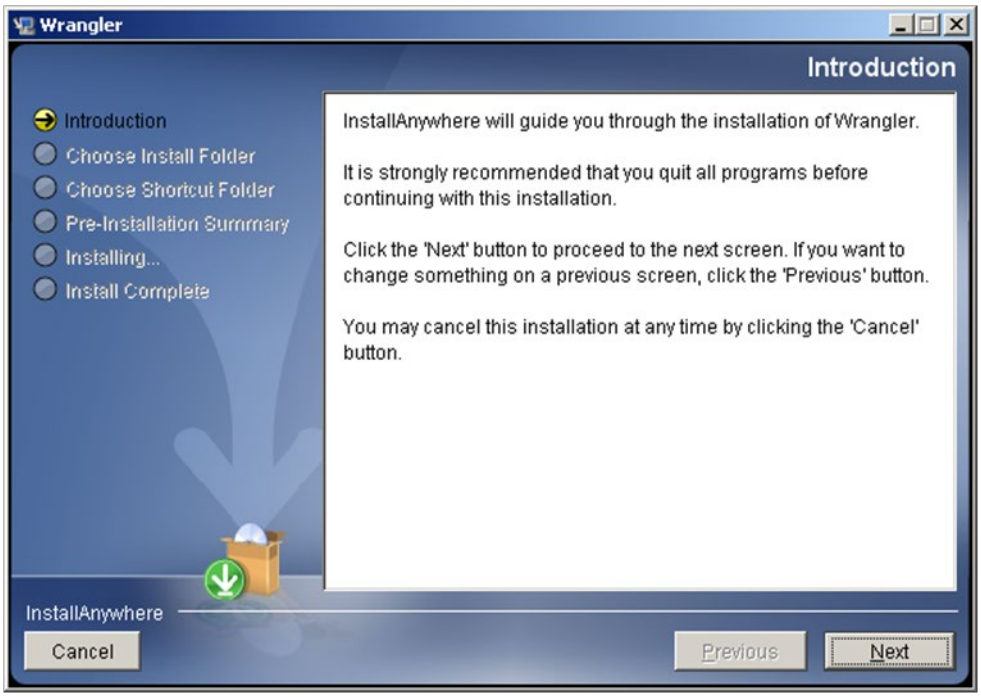


Figure 7-2: Introduction

7.2.3.1 Using interface cable

The interface cable has a 4 pins USB connector at one end and a 9 pins D-sub connector at the other end. Connect the 9 pins D-sub connector of the interface cable to the datalogger and the other end to the USB socket to the PC. In case the interface cable is not available, a standard USB to RS-232 converter can be used.

Figure 7-3: Connecting datalogger using interface cable

Figure 7-4: Connecting datalogger using interface cable

7.2.3.2 Using Bluetooth connection

The sensor readings taken can also be shared using a Bluetooth connection for communication between the PC and the datalogger. Connect the Bluetooth modem to the 9 pins D-sub connector of the datalogger making sure that the modem is configured for a baud rate of 115,200 and the hardware flow is OFF. Verify that DIP switch setting is as per figure 7-5 below:

Figure 7-5: Bluetooth modem DIP switch setting

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

Turn ON the Bluetooth of the PC/laptop and search Bluetooth devices in the network. A list of Bluetooth devices found will be 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 7-6: Connecting datalogger using Bluetooth

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

7.2.4 Running the application

Start the Application from the "Programs" menu or Double click on the icon ESCL-10VT from desktop to run the application.

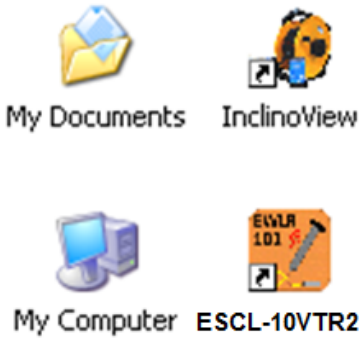


Figure 7-7: Application software shortcut

7.2.5 Viewing the main screen

Entering the application, the main screen of the application appears as displayed in figure 7-8. The menus **Home**, **View Data** and **Upload** are enabled while the rest are disabled.

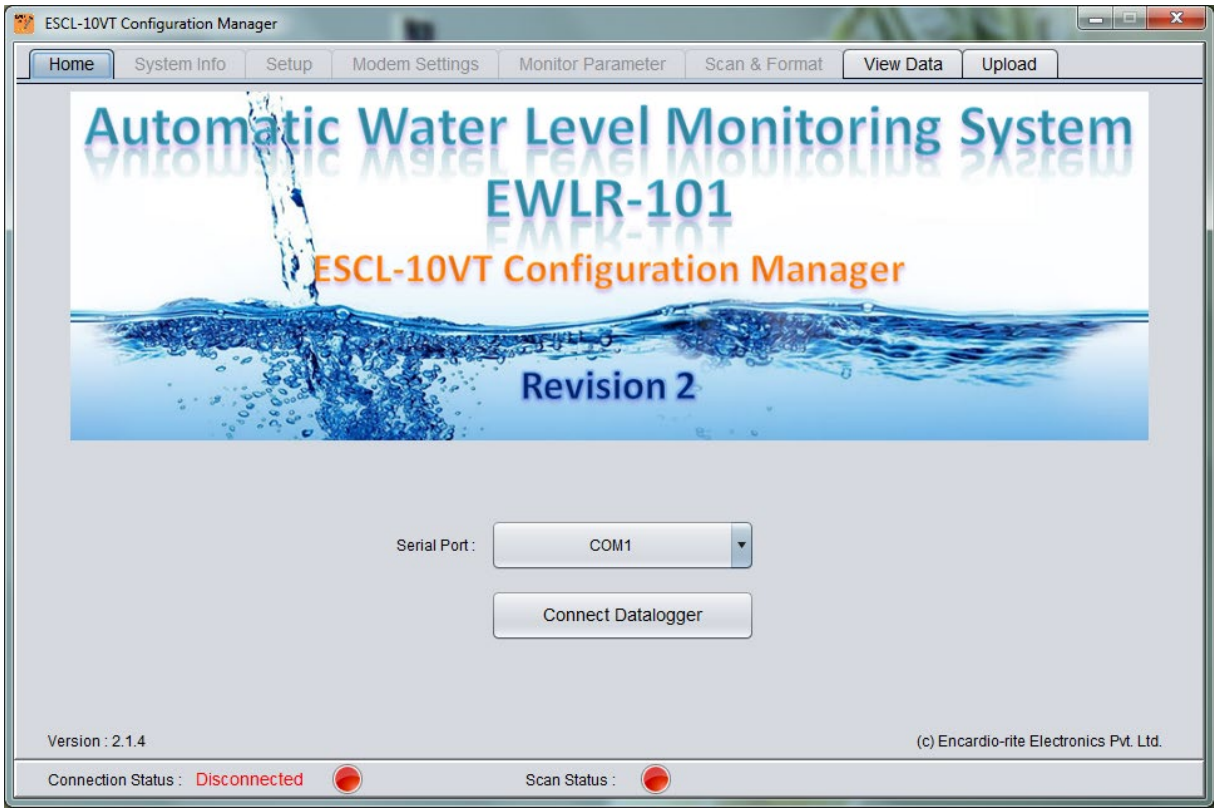


Figure 7-8: Main screen

7.2.5.1 Selecting serial port

The Serial Port can be selected using the drop down menu which displays list of available serial ports. Criteria for selecting port are as follows:

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

Case II: In case 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 →

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:

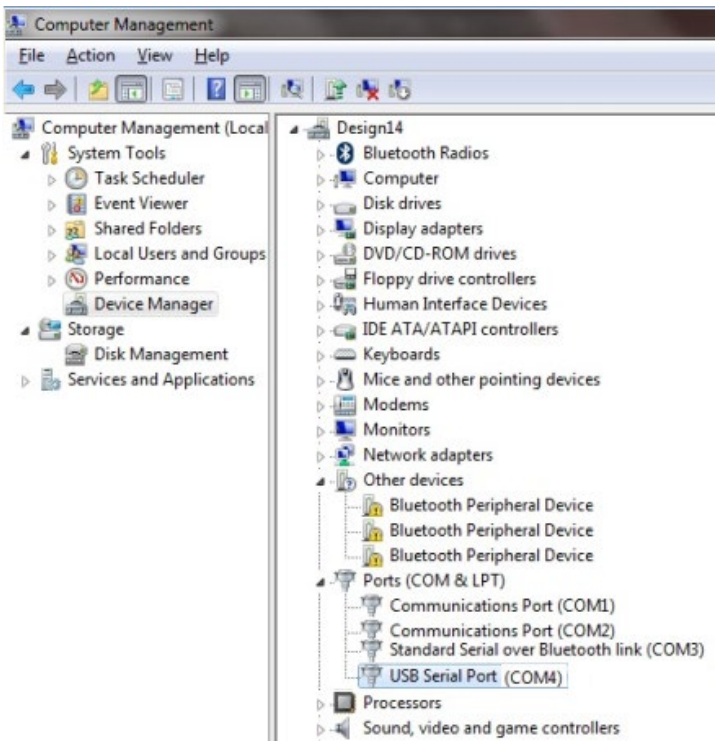


Figure 7-9: Device Manager (computer management)

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

Select the appropriate standard serial port over the Bluetooth link.

Figure 7-9 displays an example of available ports through the Device Manager.

7.2.5.2 Connecting datalogger

After selecting the serial port, click *Connect Datalogger button* to connect to the datalogger. A progress bar appears on the screen as the application takes a few seconds to get connected. Every time, whenever a command is given and the application takes a few seconds, the progress bar will appear on the screen.

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

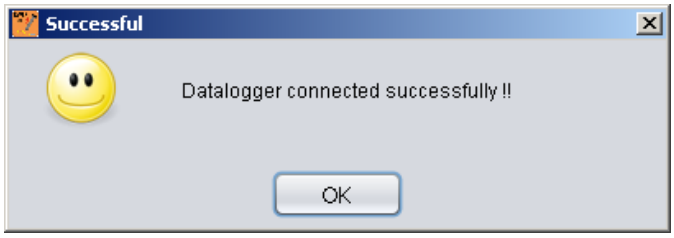


Figure 7-10: Information message

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

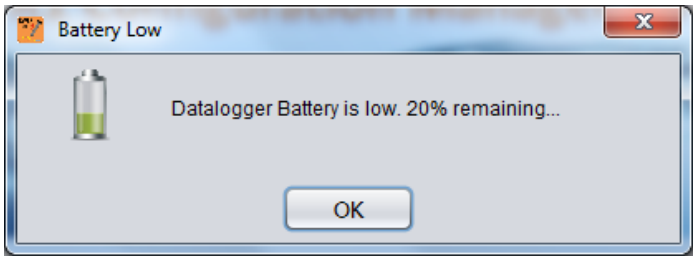


Figure 7-11: Battery low alert message

Application now checks datalogger's battery installation information. An application display information message pops up on the screen if battery is found to be 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 the application will ask for battery installation date next time when connecting to datalogger.

Figure 7-12: Battery installation date entry

7.3 Home

Connecting to the datalogger, the *Connect Datalogger* button turns to Disconnect Datalogger and an additional button *Shutdown Datalogger* appears. Click *Disconnect* Datalogger to disconnect the datalogger. Pressing the Shutdown Datalogger button, the datalogger shuts down.

System information can be viewed by clicking the ***System Info*** tab. It will show information about the datalogger. Datalogger settings can be configured using the ***Setup*** tab. GPRS modem can be configured using the ***Modem Settings*** tab. ***Monitor Parameter*** tab shows live data from the datalogger. Different sensors reading can be observed with this tab. Logger scanning and data download activities can be performed using ***Scan & Format*** tab. The data can be viewed in tabular or graphical form by pressing ***View Data*** tab. Downloaded files can be uploaded to remote server using the ***Upload*** tab.

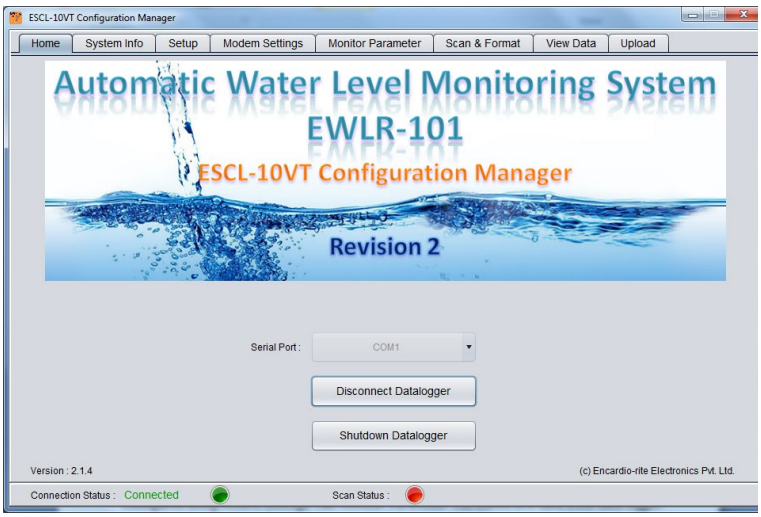


Figure 7-13: Home screen

Warning !!

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

7.4 System Information

When selecting the ***System Info*** tab, the application gets system information from the datalogger. Figure 7-14 shows an example of the ***System Info*** tab. Fields are not editable.

Datalogger serial number, model number, datalogger ID (station ID), datalogger installation location coordinates (latitude and longitude), datalogger position above MSL (mean sea level), sensor installation depth and datalogger firmware information can be seen on the *Logger Info* panel.

Sensor related information like sensor model, sensor serial number, sensor's measuring range and specific gravity of water can be seen in the *Sensor Info* panel.

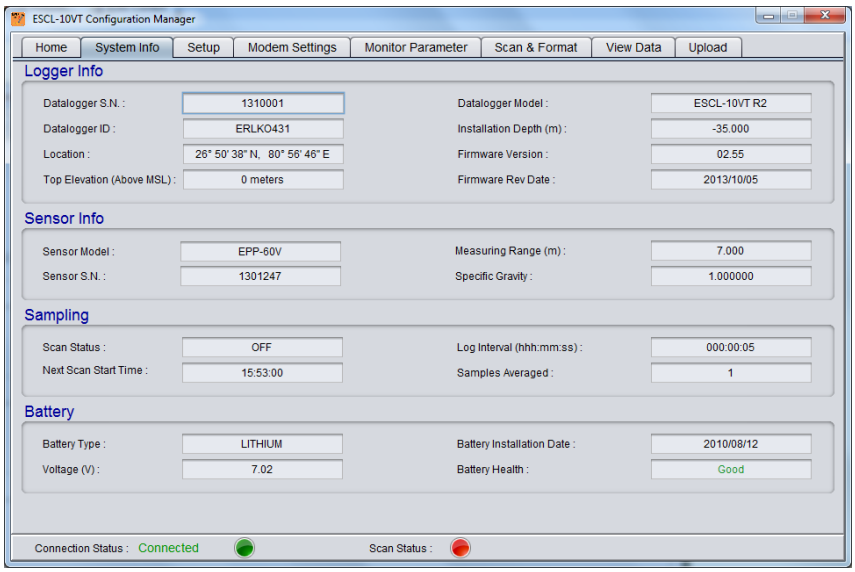


Figure 7-14: System Info screen

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

Battery related information of the datalogger like battery type, battery installation date, battery's present voltage and battery health can be viewed on the *Battery* panel.

7.5 Setup

Datalogger settings can be configured by pressing the ***Setup*** tab in the main menu. Figure 7-15 shows an example of the **Setup** screen. Fields can be edited to modify the settings.

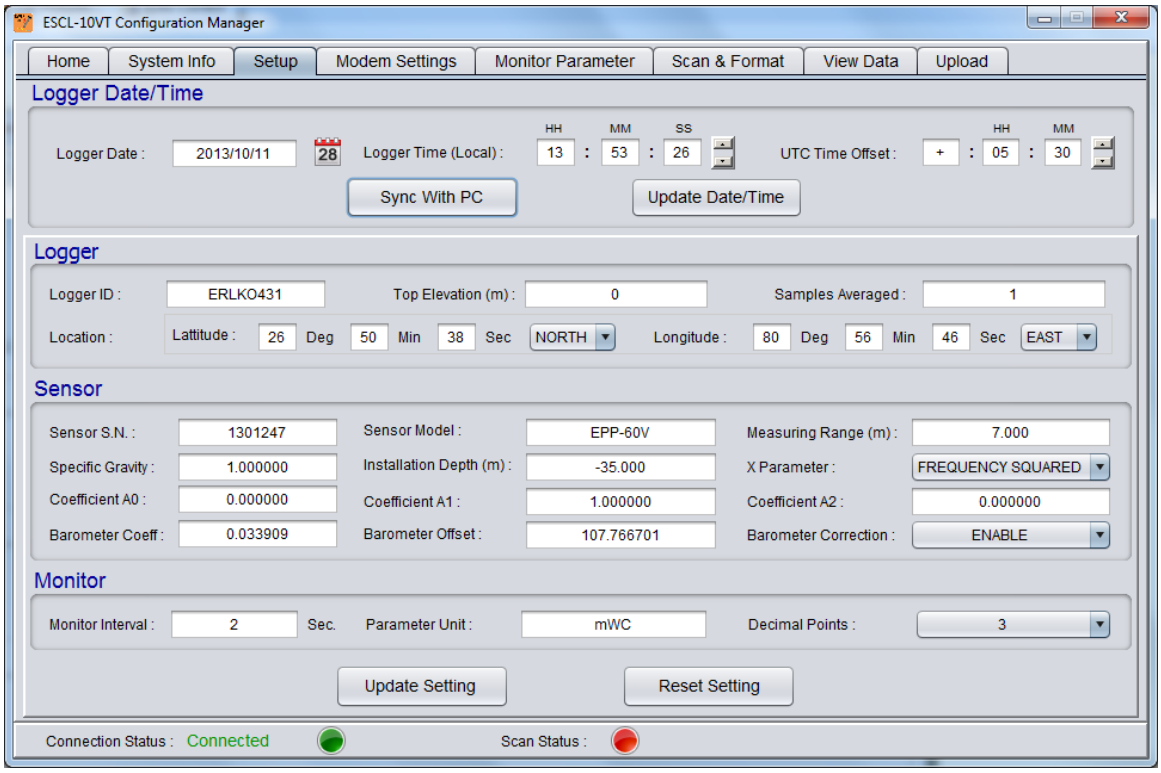


Figure 7-15: Setup screen

Datalogger's date/time can be set using the *Logger Date/Time* panel. There are two ways to set date/time - manual or sync. Select Logger Date, choose Logger Time (Local) and UTC Time Offset and then press Update Date/Time button to update the logger clock manually. For second option, press the Sync with PC button. Datalogger calendar and clock will set to PC date/time. Figure 7-16 shows an example of the acknowledgement dialog after datalogger clock synchronises with the PC.

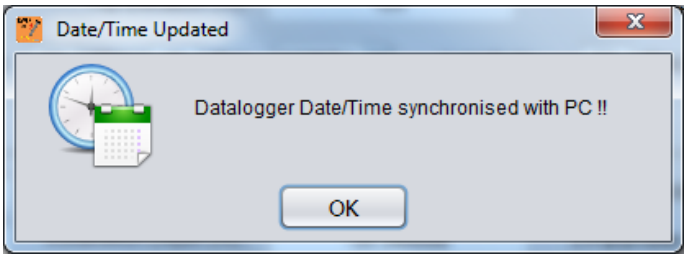


Figure 7-16: Datalogger clock sync message

Datalogger's ID or station ID can be entered in the *Logger* panel under datalogger ID. Datalogger installation location coordinates (latitude and longitude) can be entered under location fields. Datalogger 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.

Sensor related settings can be set through the *Sensor* panel. Enter sensor serial number, model and measuring range of sensor. Water specific gravity can be entered under the specific gravity field. Specific gravity of 1.0 (the specific gravity of pure water at 4°C) is adequate for many ground water applications. Sensor installation depth (from ground level) in meters must be entered under the installation depth field. Keep x-parameter to frequency squared for sensor. Enter pressure sensor coefficients A0, A1 and A2. See section 7-11 to know more about sensor coefficients.

The individual barometric pressure sensor in datalogger measures atmospheric pressure to correct for barometric pressure variations in the measured value of water level from the pressure sensor. User can choose option to enable/disable barometric correction. Barometric sensors coefficients are programmed from the factory during calibration and should not be changed unless required.

Data refresh rate for the monitor parameter screen can be set through the monitor interval field from the *Monitor* panel. Monitoring interval can be set from 2 to 255 seconds. The measurement parameter unit can be set in the parameter unit field. Decimal points for the parameter to be viewed in the monitor parameter screen and can be set from 0 to 4 decimal places in the decimal points field.

Important Pressing on UPDATE button will update datalogger with new settings.

7.5.1 Reset datalogger to factory default

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

Figure 7-17 Entering reset password

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

Warning !!
Reset settings will erase all custom settings and datalogger will be set to factory defaults.

7.6 GPRS modem settings

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

Pressing on the **Modem Settings** tab in the menu will open the modem settings screen. Modem settings tab is disabled for dataloggers which do not have a built-in GSM/GPRS modem. Figure 7-18 shows an example of the modem settings screen.

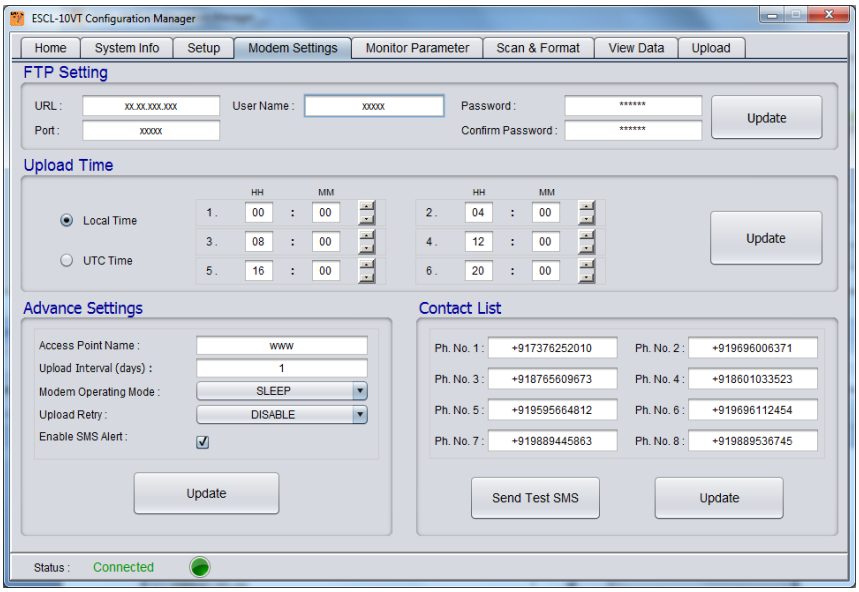


Figure 7-18 Modem settings screen

For configuring FTP server settings, the correct FTP server URL, port number, user name and password must be entered in the specified fields of the *FTP Setting* panel. Press Update FTP settings button to update FTP server settings to datalogger.

Once FTP server settings are configured, the datalogger automatically sends logger records to the remote FTP server at the upload time. Upload schedule can be set through *Upload Time* panel. User has option to set upload schedule in local time or UTC time. Upload time can be set as fast as once in an hour. Maximum 6 time slots in a day can be chosen for automatic upload. Upload interval can be set ranging from 1 to 7 days. Press Update upload time 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 three modes OFF, Sleep or ON. 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 to extend the battery backup. Modem operating mode can be set to “Sleep”. In this mode, the modem normally remains switched OFF and waken when the scheduled upload time occurs. It uploads the data to the server and then again switches OFF the modem to improve battery backup. Modem operating mode can be set to ON mode. In this mode, modem always remains ON and requires large current from battery thus reducing battery backup. This option is normally opted when datalogger is external or mains powered.

It has been observed that sometime the data does not get uploaded to the FTP server due to a problem in the mobile network. User can enable upload retry to attempt two retries at 1 hour interval each when a scheduled upload fails to upload for any reason.

SMS alerts can be set to send SMS alerts on specified mobile phones when the battery voltage goes down below a certain level or water level crosses the alert limits. To avail of this feature SMS facility in the SIM card must be enabled. Tick in check box under *Contact List* panel to enable SMS alert feature. Up to a maximum of 8 contact numbers where SMS are to be sent can be entered into the contact list. SMS alerts will be sent to all contact numbers which are entered in contact list. Send test SMS can be used to check whether SMS feature is working properly or not.

Important Pressing on UPDATE button will update datalogger with new settings.

7.7 Monitor Parameter

Pressing on **Monitor Parameter** button in the menu will open the parameter screen. **Error! Reference source not found.** shows an example of the parameter screen. This screen shows live data from the datalogger. Sensor reading, barometric pressure and temperature with datalogger's present date and time can be monitored. Data refresh rate can be set through Monitor Interval field on the **Setup** tab.

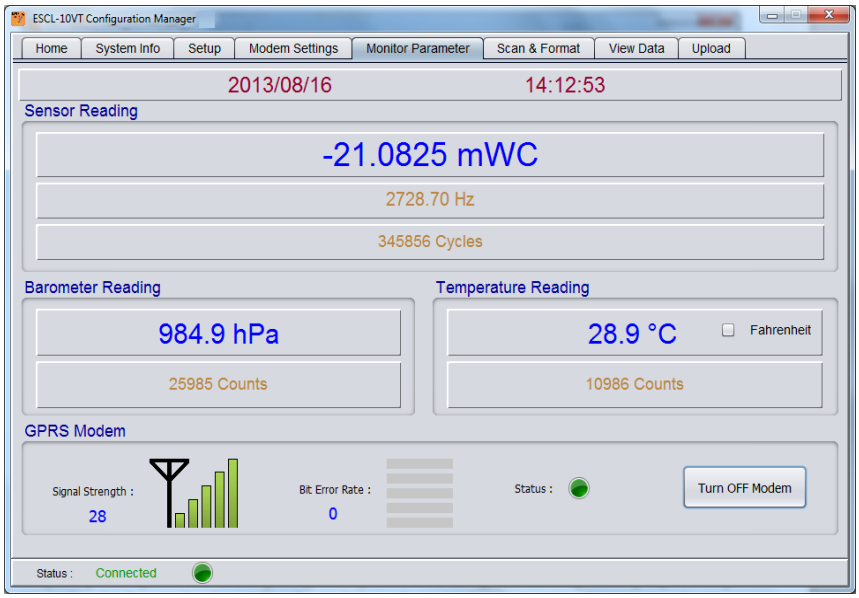


Figure 7-19 Monitor Parameter screen

The *Sensor Reading* panel shows depth of water table from the ground level or water level, pressure sensor frequency and cycle counts. Frequency and cycle counts are given for diagnostic purpose only. Water table depth or level can be decimally adjusted through decimal points setting in the **Setup** tab.

The *Barometer Reading* panel shows barometric pressure in hPa (hecto Pascal) and digital counts. Counts are given for diagnostic purpose only.

The *Temperature Reading* panel shows water temperature and digital counts. Counts are given for diagnostic purpose only. Temperature can be monitored in degrees *Celsius* or in *Fahrenheit*. Temperature reading shows -99.9 in case the sensor is not connected.

The *GPRS Modem* panel shows GPRS modem status for diagnosis. Click Turn ON Modem button to turn ON GPRS modem. After turning ON, the modem status indicator turns GREEN from RED. GSM/GPRS 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.

7.8 Scan & Format

Clicking **Scan & Format** tab in the main menu opens the scan screen. Figure 7-20 shows an example of the scan screen. Data scan and alarms settings can be done here.

Scan Option panel shows scan related information. "Log Interval" can be set in either of two modes - short or long. For fast scanning, select short option. In this option scan interval can be set from 5 to 250 seconds. For slow scanning, select long option. In this option scan interval can be set from 5 minutes to 7 days (i.e. 168 hours). 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 for a long time. What to do in case memory becomes full? There are two options. Choose from "Memory Full Action field either STOP or OVERWRITE. Scanning will stop in case datalogger memory is 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 when the memory becomes full. Readings will be recorded by overwriting on the oldest records in a cyclic manner.

It has been observed that in case of over range or a faulty sensor, many datalogger shows very large quantities or garbage values. It is very difficult for the user or the viewer software to identify these values. An error code enables to report -999.999 in data records if sensor reads values beyond its operating range for any reason. To enable Parameter Error value field, select ENABLE or DISABLE from drop down menu.

Many times an alert is required when an alarm condition occurs. Alarms limits can be set for SMS alerts in the *Alarms and Event Log* panel. Enter water table/level at which alert is required. Choose from Up, Down or None options. Up option means alarm condition occurs when water level goes up to the limit specified. Down option means alarm condition occurs when water level goes below the limit specified. None option can be selected to disable the alarm.

Sometimes fast logging is required when an alarm condition occurs. To do so, there is a provision in the software to enable event log. On enabling event log, the datalogger does fast scanning during the alarm condition and does normal scanning when the alarm condition passes away. Scan interval for alarm condition can be set through Event log interval field.

Important Press Update button to update the settings.

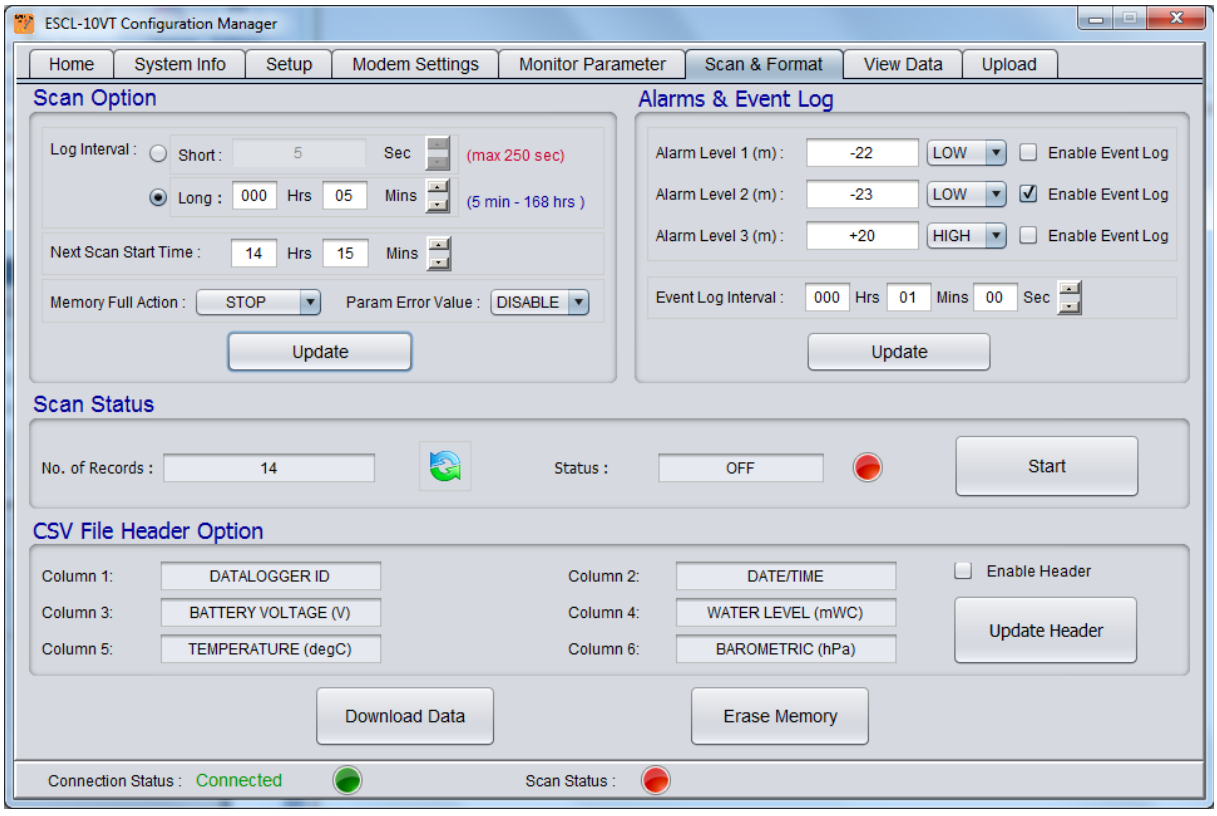


Figure 7-20: Scan & Format screen

Scan status panel shows 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 the datalogger's memory.

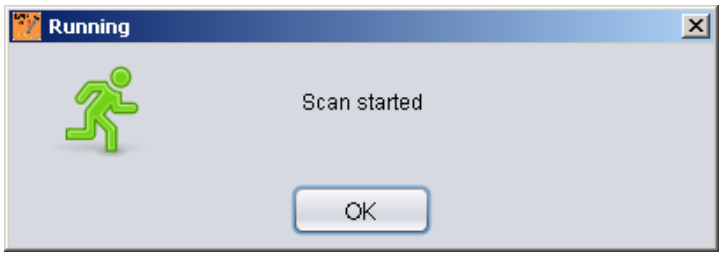


Figure 7-21: Scanning started information message

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.

Readings (data) can be downloaded from datalogger's memory by pressing Download Data button. Data download time depends on records size of datalogger's memory. Progress bar dialog displays download progress. It can take several minutes in case of large number of records. After successful download, an information window pops-up mentioning the location of downloaded files.

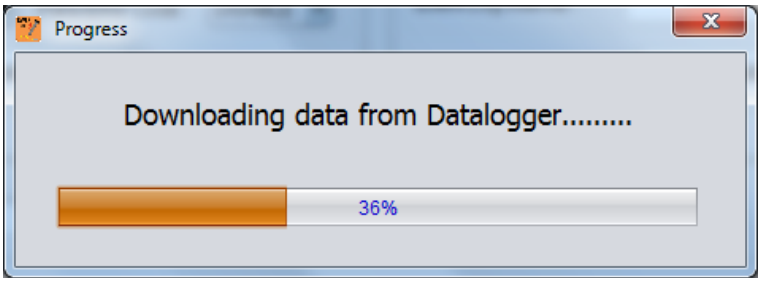


Figure 7-22: Download progress

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

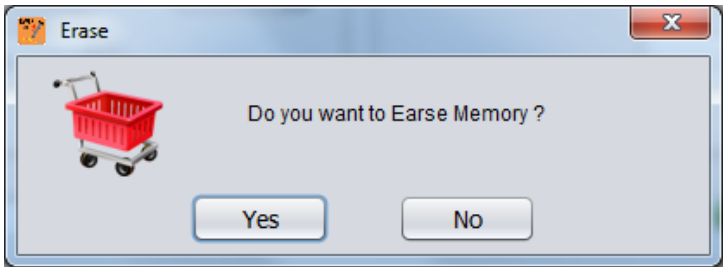


Figure 7-23: Erasing datalogger memory

Erase datalogger memory by pressing Erase Memory button. It would erase all previous readings and the No. of Records would become zero (Please note that this activity is exactly the same as has been explained in the context of figure 7-23). The application seeks permission to erase logger memory. Click Yes to proceed or No to abort. On clicking Yes, the datalogger's memory will be erased without affecting the other settings.

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

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

7.9 Upload

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

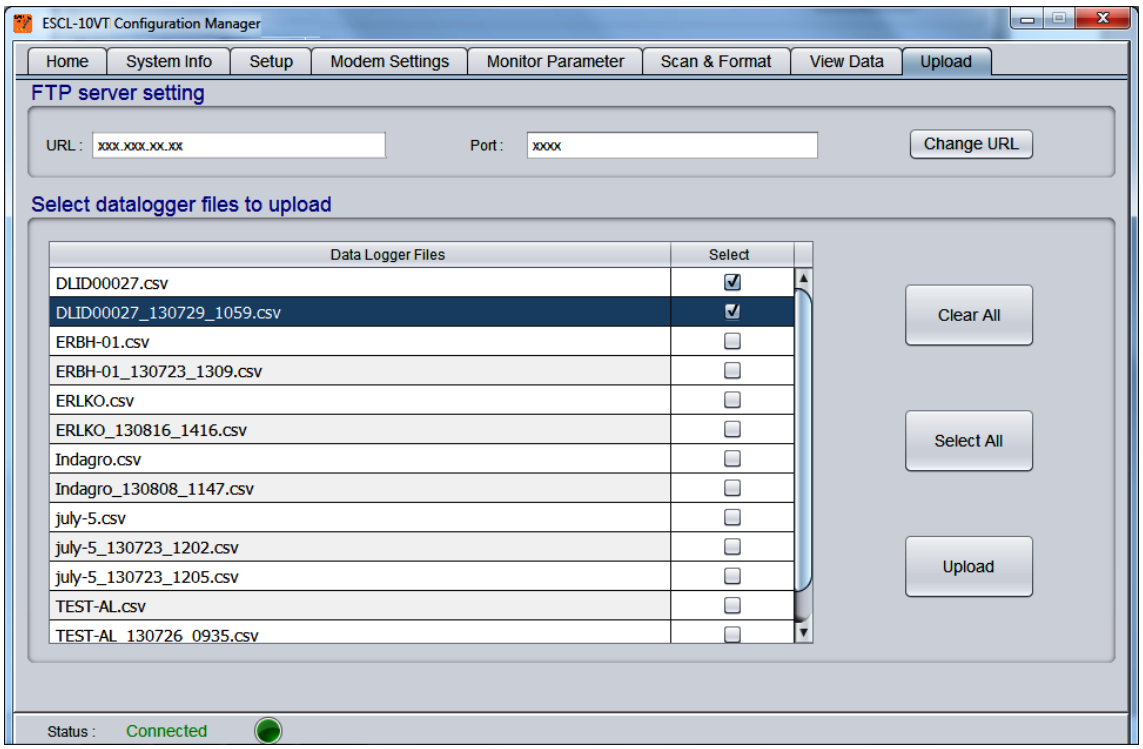


Figure 7-24: Files Upload Menu

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.

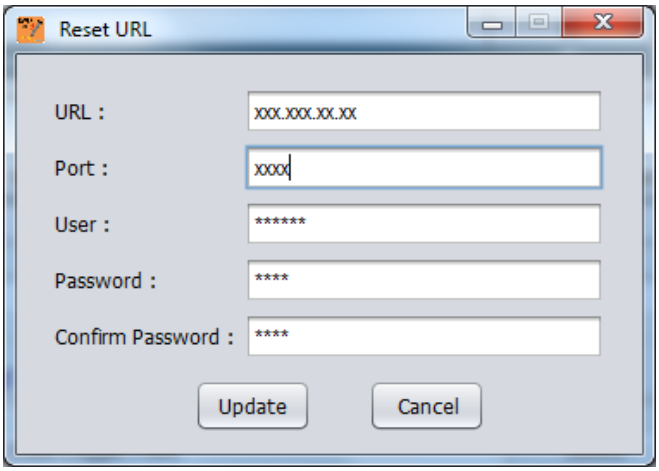


Figure 7-25: Reset URL screen

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.

7.10 View Data

The **View Data** tab allows the user to view datalogger readings and interpret the data in tabular and graphical form. Select the file through the drop down menu. On selecting the file, the readings get updated automatically in the table.

7.10.1 View Table

In the given example, the file DEMO1-A00035_130822_1358.csv is selected for interpretation. Folder can be selected from the Browse button. The readings are displayed in figure 7-26. Data in table represents Date/Time stamp of reading, Parameter value, Barometric Pressure, Sensor Temperature and Datalogger Battery Voltage.

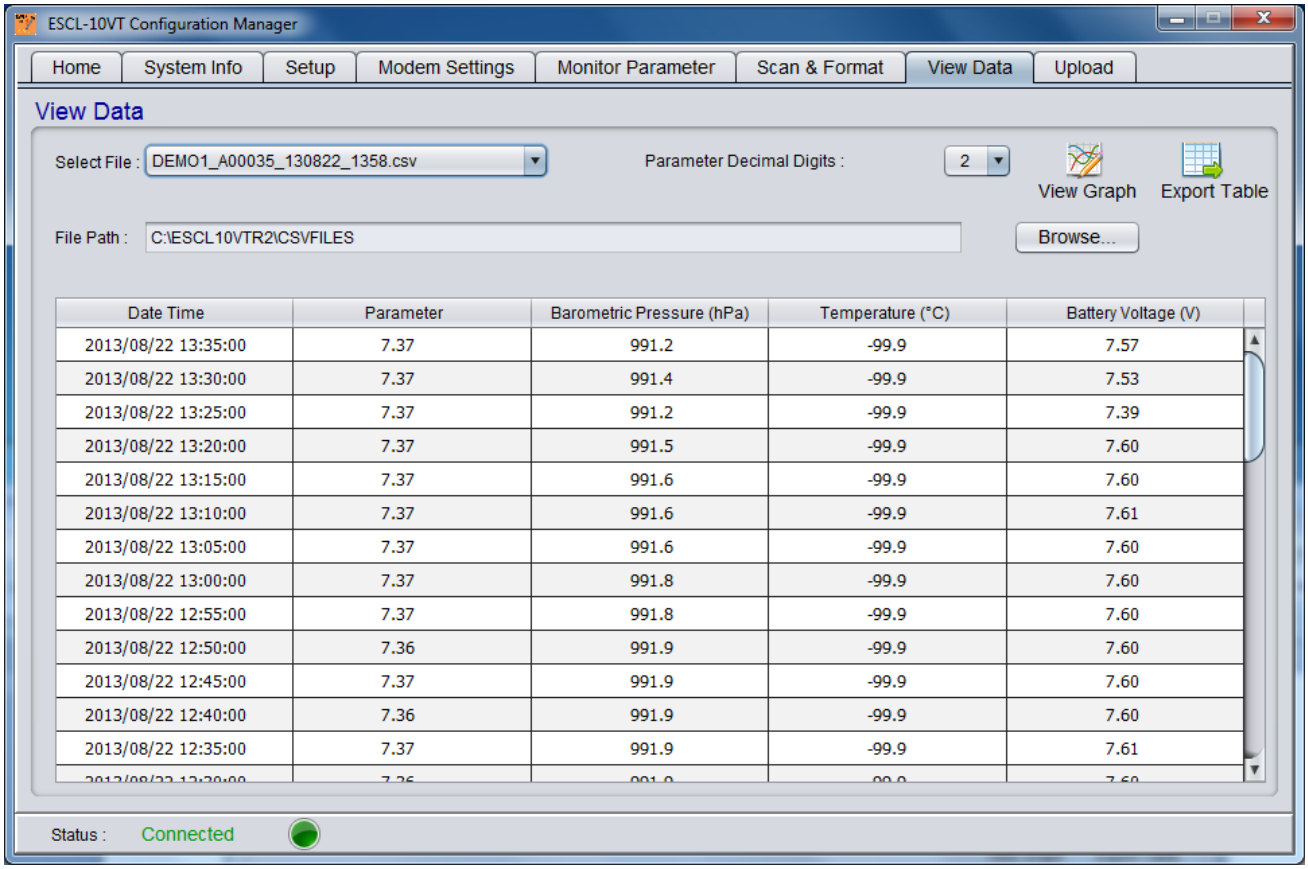


Figure 7-26: Viewing readings

7.10.2 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. A dialog box will open asking for file format. Figure 7-27 shows an example of the file format dialog. The table can be exported in either of two file formats- Standard or Extended. The Standard format may have data header information while the Extended format contains file header information. Refer

to section 13 to know more about file formats. Choose appropriate file format and output file path where data file is to be exported and then press the OK button to generate the CSV file.

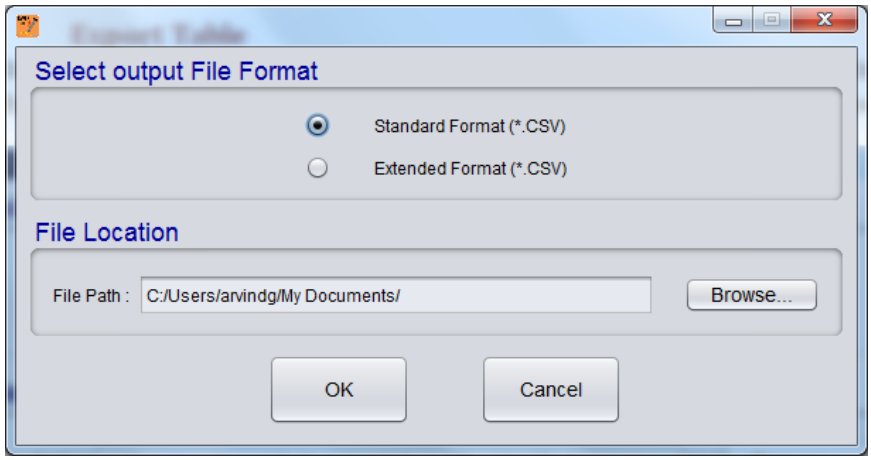


Figure 7-27: Selecting File Format

7.10.3 View Graph

To see the graph, click on the View Graph button on the *View Data* panel. On clicking View Graph, application shows a dialog box to select the data range. Figure 7-28 is an example of the data range selection menu. Choose X-axis and Y-axis range and then click OK to view the graph.

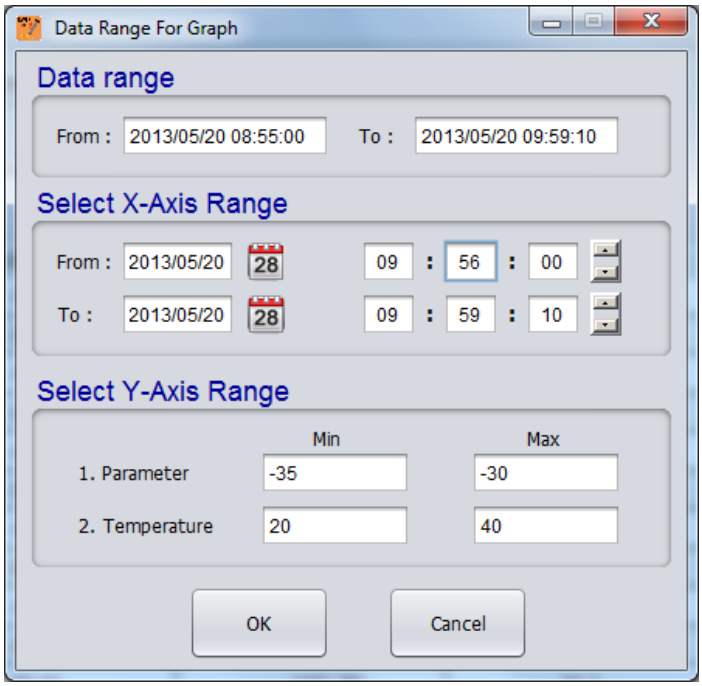


Figure 7-28: Data range selection for graph

Figure 7-29 is an example of graph screen. The graph menu has two tabs. The first tab is showing the graph of water level (parameter) and the second tab is showing the logger's battery voltage.

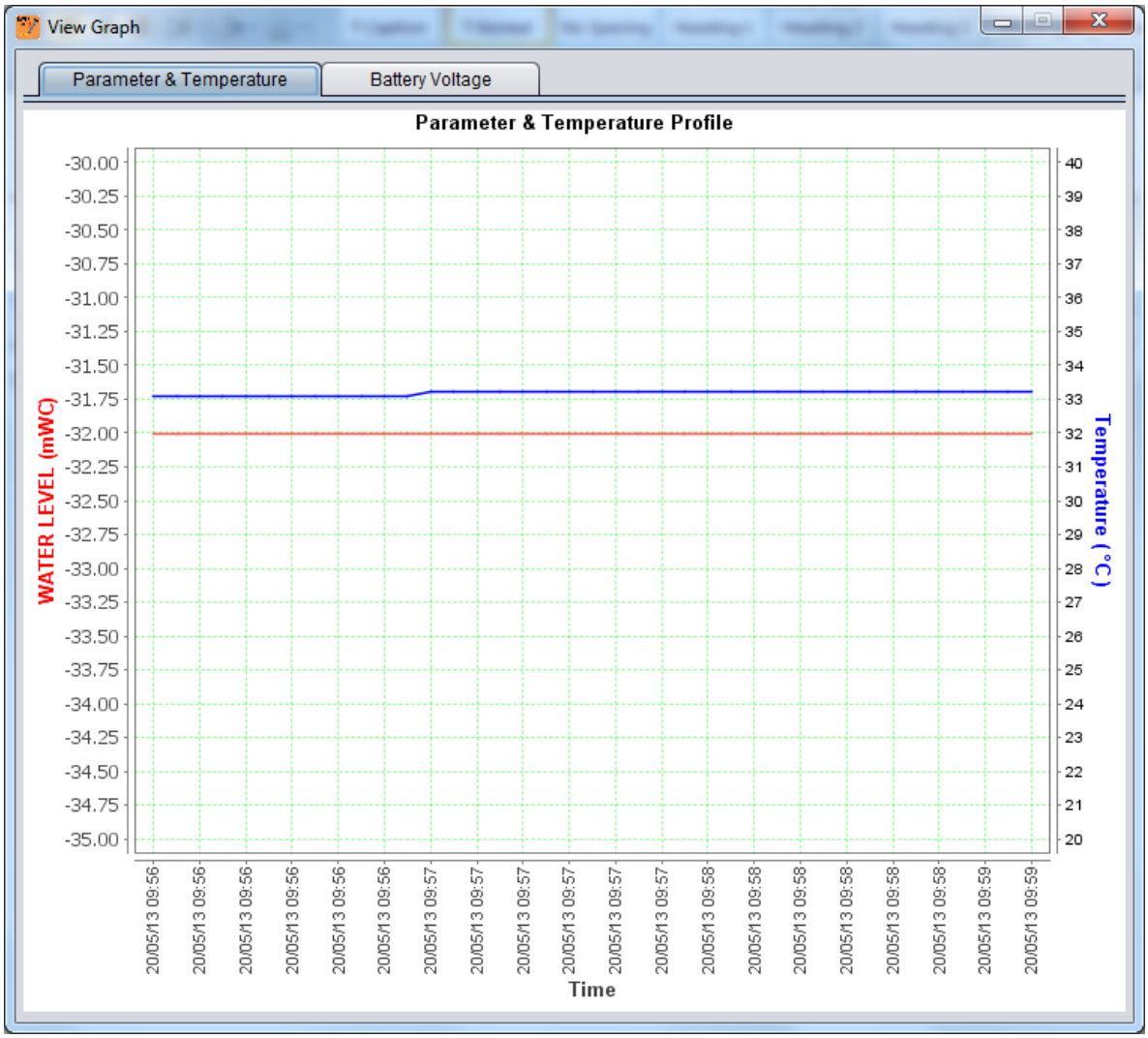


Figure 7-29: Parameter and Temperature vs Time plot

7.10.4 Graph Customization

This section allows the user how 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.

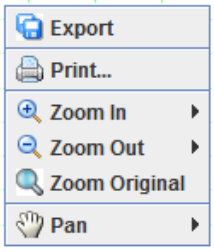


Figure 7-30: Graph customization

7.10.4.1 Export Graph

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

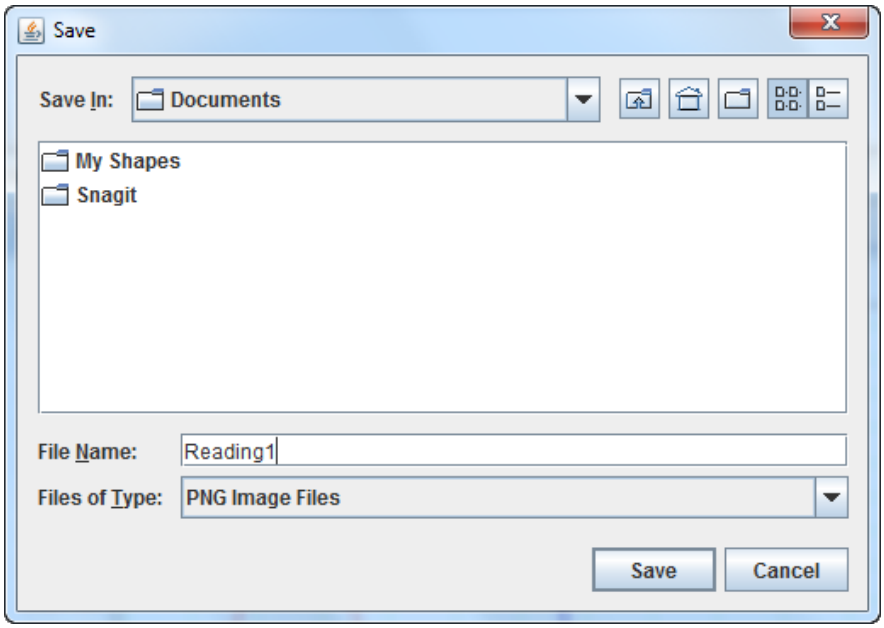


Figure 7-31: Saving the exported file

7.10.4.2 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.

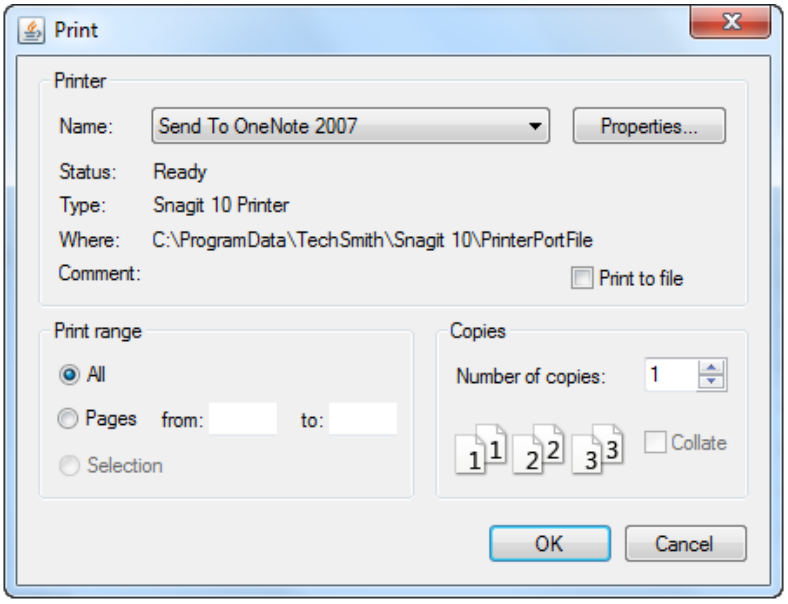


Figure 7-32: Print Settings

7.10.4.3 Zoom In

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

7.10.4.4 Zoom Out

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

7.10.4.5 Zoom Original

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

7.10.4.6 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.

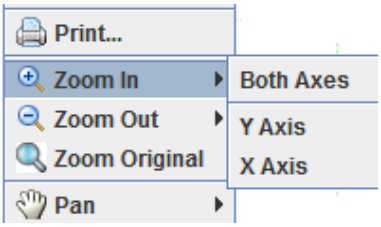


Figure 7-33: Zoom In Option

7.11 Setting Sensor Gage Factor

EWLR-101 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 A0, A1 and A2 as mentioned in the manufacturer’s calibration certificate without any modification.

Case 2: 'X' specified in terms of frequency2 (i.e. frequency squared)

If the manufacturer specifies X in terms of frequency2 (frequency squared), then choose the value of "X-parameter" in **SETUP** screen as "FREQUENCY SQUARED" from the drop down box. Enter the value of A0, A1 and A2 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 A1 with the value A1/1000 and A2 with the value A2/1000,000 when entering these coefficients in the datalogger. A0 will remain the same.

Value of A0

The value of A0 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 A0 at site just before or just after installation. Enter the value of A1 (and A2 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 A0.

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 A0 and check whether you can see that particular non-zero value with zero or reference input.

7.12 Installation Depth

Sensor installation depth is the location of sensor diaphragm from ground level.

Installation depth = - sensor location from ground level

Example: Installation depth = -10.5 for water level sensor mounted 10.5 meter below ground level.

7.13 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.

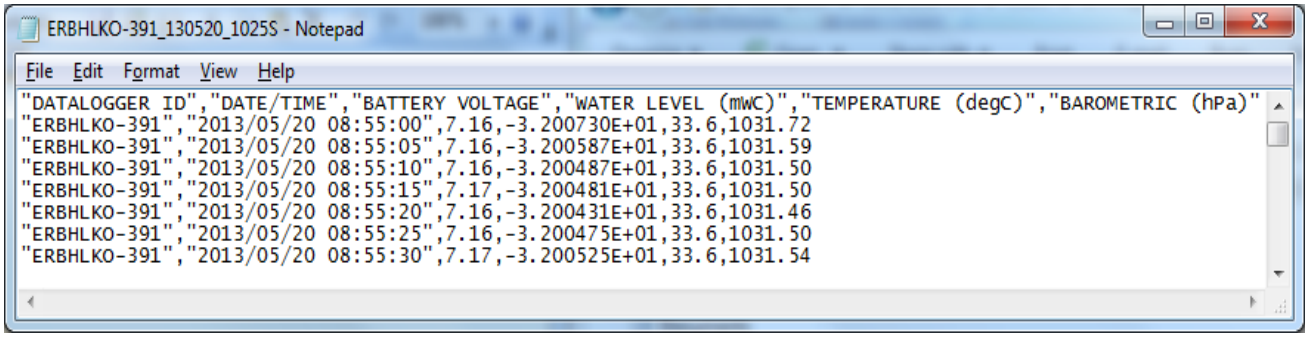


Figure 7-34: Standard File Format

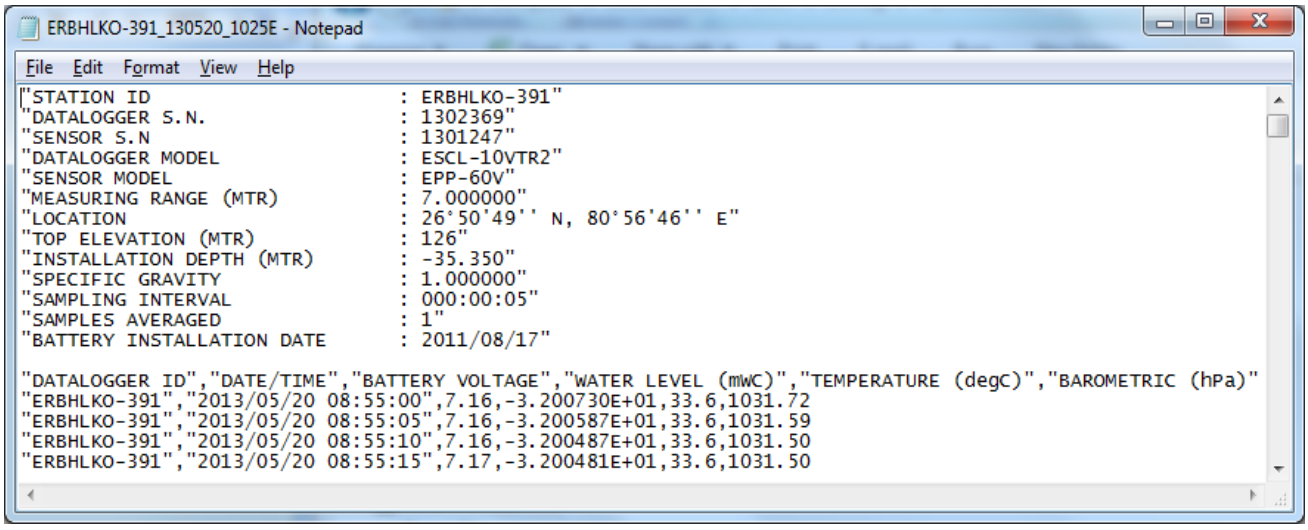


Figure 7-35: Extended File Format

NOTE: Users' manual on Configuration Manager application for ANDROID (for smart phones) is available separately.

7.14 Web based Data Monitoring Service (WDMS)

The data on variation of water table or level collected from a large number of locations needs to be presented as time vs. water 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 it immediately available in the form of a time vs. table/level plot 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 7-36 showing an example of borehole depth, temperature and battery voltage data presented in graphical form.

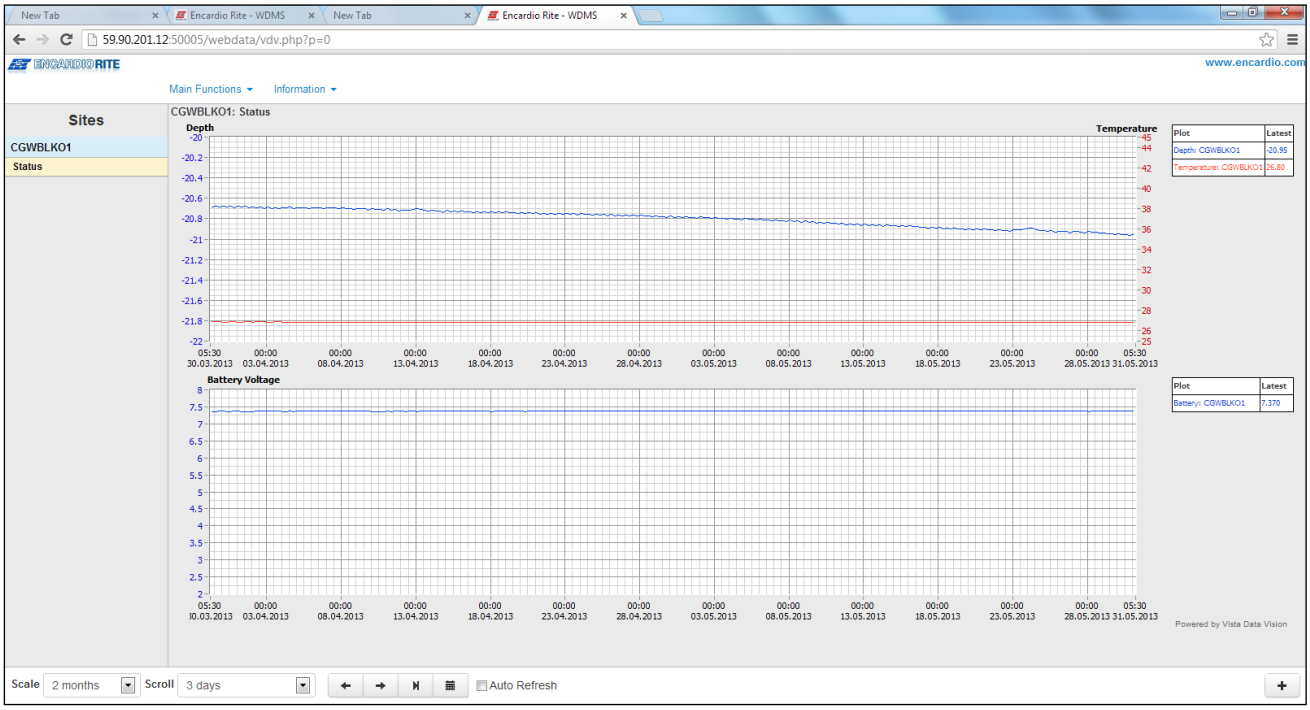


Figure 7-36: Data display on remote PC

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

8 METHOD STATEMENT - EWLR-101BH

Installation of model EWLR-101BH automatic water level recording system for monitoring ground water level

This method statement defines the procedure for long term monitoring of ground water table/level from a 52, 76 or 100 mm diameter borehole. An automatic water level recording system including datalogger and sensor is installed in a borehole for ground water monitoring. The data can be obtained locally by using a laptop computer/mobile phone or remotely through telemetry.

Note: For installation at other places like in a river, reservoir or lake or for using the box version of the datalogger, the procedure will need to be somewhat modified.

8.1 General description

Encardio-rite model EWLR-101 system is designed for long term monitoring of ground water table/level, temperature and barometric pressure. The ground water level is measured by a pressure sensor connected through a 4-core Kevlar reinforced cable to the ESCL-10VT datalogger.

EWLT-101 system is available in two options:

- Model **EWLR-101BH** system with ESCL-10VT datalogger housed in a cylindrical body and powered by lithium cells.
- Model **EWLR-101BX** system with the ESCL-10VT datalogger in a polyester box 220 mm L x 120 mm W x 91 mm H.

The EWLR-101 system enables observing water table/level, temperature and barometric pressure data at programmable time interval and storing date and time stamped data readings in the non-volatile memory of the datalogger. Data can be retrieved from the datalogger through any of the following options:

- Telemetry through GSM/GPRS modem (FTP data transfer)
- Readout/data retrieval using laptop or mobile phone

8.2 Specifications

Refer to data sheet provided on model EWLR-101 Automatic Water Level Monitoring System for detailed specifications of the system.

8.3 Site preparation before Installation (scope of client)

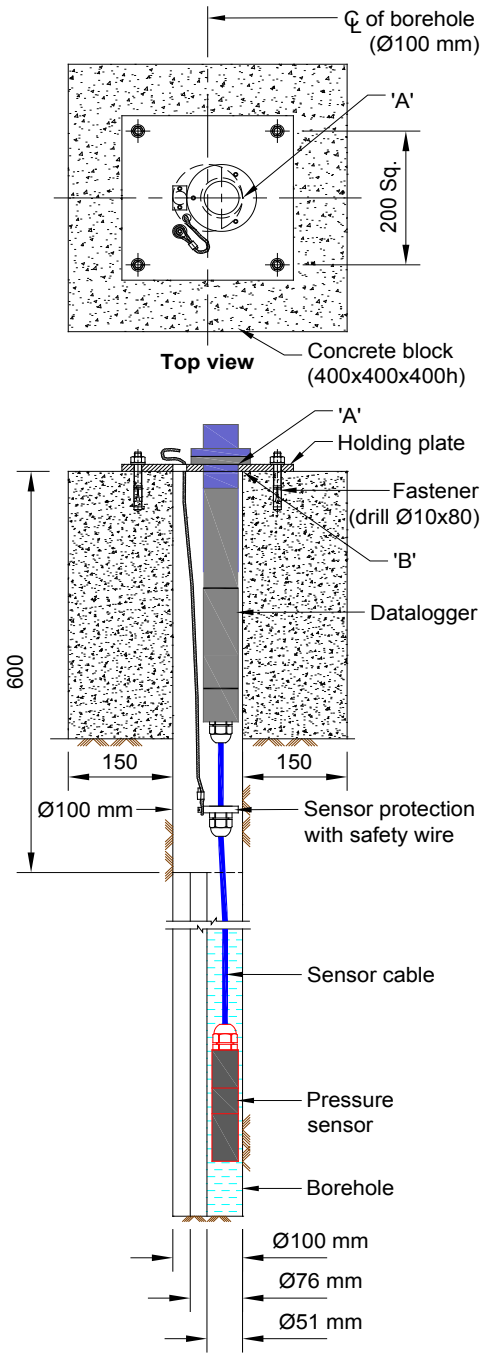


Figure 8-1: Installation

The client should ensure completion of following works before proceeding to site for installing EWLR-101BH automatic water level monitoring system.

8.3.1 If an existing borehole is not available, drill a borehole around 0.5 m deeper than depth at which sensor is to be lowered. For borehole less than 100 mm in diameter, increase diameter in top 600 mm depth to 100 mm, eccentric with the drilled borehole as shown in figure 8.1.

Note: Smaller diameter borehole (50 mm or 76 mm) may not allow verifying reading manually with a water level sounder.

8.3.2 At mouth of borehole, make a concrete platform (around 400 mm x 400 mm x 400 mm) concentric with the 100 mm diameter at the top of the borehole as shown in figure 8.1. Make sure that the top edge of the plastic pipe coming out of the borehole is flush with the raised platform by cutting any extra length from the top.

8.3.3 Client should make suitable provision if installation needs protection from vandalism.

8.3.4 In case data is to be transmitted by telemetry, a pre-activated data SIM card should be available with the client before the installation is scheduled.

8.4 Preparation for mounting holding plate on concrete block

8.4.1 Remove stainless steel holding plate from the packing case. The holding plate has a 60 mm diameter hole which is to be mounted 20 mm eccentric by aligning its edge with the edge of the 100 mm diameter borehole. Refer to figures 8.1 and 8.2. Provision of eccentric mounting is made for convenience in taking water table reading manually using a water level sounder.

8.4.2 Place holding plate on concrete block. Align edge of 60 mm hole in holding plate (marked A) with edge of 100 mm hole in concrete block (marked B) as shown in figure 8.1.

8.4.3 Drill four 10 mm diameter x 80 mm deep holes for HLC M10 x 80 Hilti or equivalent fasteners, using the holding plate as a template.

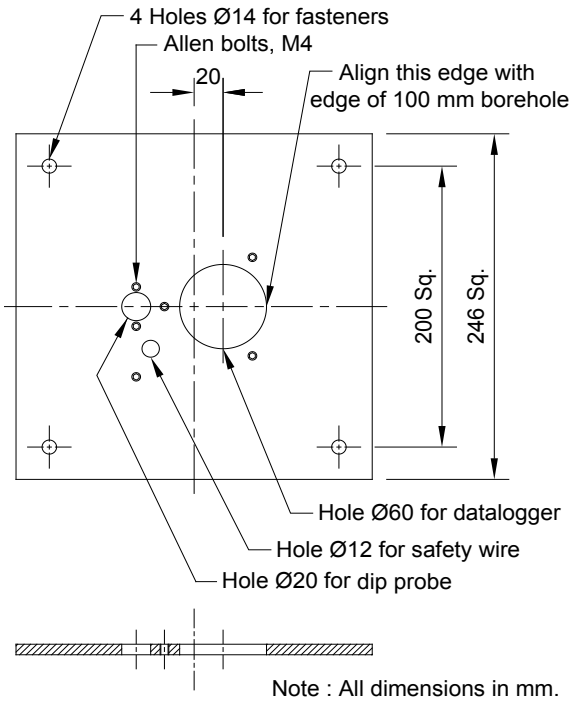


Figure 8-2: Stainless steel holding plate

8.5 Tools and accessories for EWLR-101BH

Open packing case and physically verify the instruments and installation accessories/tools available in the packed box as per the packing slip

8.5.1 Check availability of following tools and accessories in the packing box:

- Allen key 3 and 4 mm
- Screw driver (cheese head 4 mm and Philips head 4 mm)
- Support CM software CD
- FTDI USB To RS232 cable
- USB drive CD
- Adhesive tube
- 5 pin sensor cable end connector with push tool (only with units not completely assembled)

8.5.2 Client to check availability of following tools and accessories with him before proceeding to install the EWLR-101 system (**clients' scope**):

- Drill machine with 10 mm diameter drill bit to make holes for fasteners in concrete block.
- Spanner 12/13 mm and 18/19 mm. In case vented tube cable is used 24/27 mm instead of 18/19 mm.
- Hammer
- Dip measuring tape (water level sounder)
- Laptop with CD drive enabled and Administrator type user account access.
- Soft cloth

Note: Cutter/paper knife (arranged by client) to be used to open the packing case.

8.6 Installation of datalogger software "Configuration Manager" for Windows (first time installation)

8.6.1 Software installation:

- Switch-on laptop and check battery is 100 % charged.
- Check the user account type: user should be the Administrator.
- Check laptop (system) configuration. Encardio-rite datalogger software 'Configuration Manager' runs on Window XP/window 7 with minimum system configurations of at least 512 MB RAM (Recommended 1 GB) and minimum free space of 60 MB.
- Insert the datalogger software (Configuration Manager) disk into the CD-ROM drive.
- Click on the Set-up file: the application prepares to install (figure 8-3).
- Click "Next" on "Introduction" window to choose destination of installation folder (figure 8-4).
- Follow the on-screen instructions to install the software.

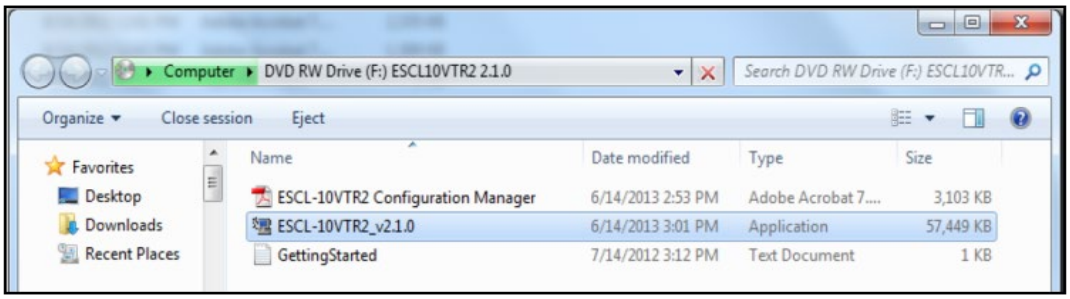


Figure 8-3: Running the set-up file

- After installation, remove configuration manager CD.

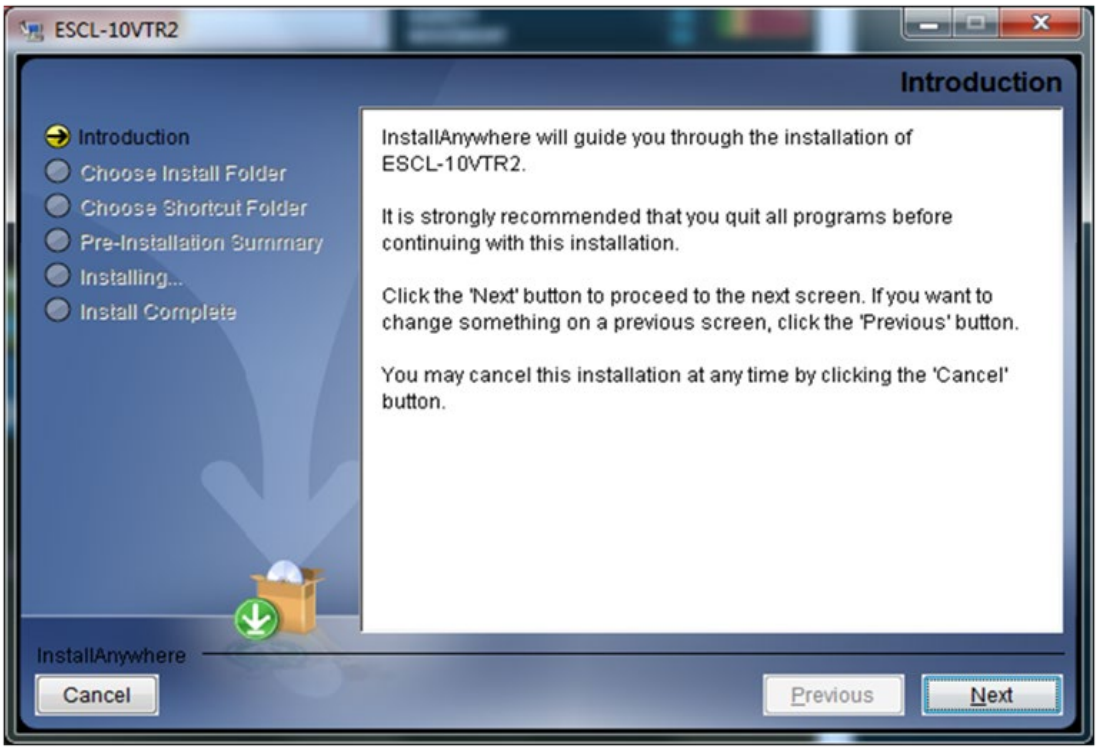


Figure 8-4: Installation introduction

8.6.2 Connecting Datalogger to PC/laptop

- Connect the “USB to serial interface cable” to one of the USB drives of PC/laptop. Check the system for USB to serial COM port driver. Normally USB to serial driver are installed on the computer. In case the USB to serial driver is not installed on the PC/laptop, insert the ESCL-10VT Configuration Manager CD again.
- Click on the Set-up file (in the driver folder). The application prepares to install the USB to serial driver.
- Once the driver is installed, check the USB to Serial Port by following the path:

Go to Computer →→ Right Click → Manage → Device Manager →Ports (COM & LPT).

You will find *USB Serial Port (COM …..)* under Ports section

- Remove the CD.
- Launch the Configuration Manager software by choosing it from the program list in the Start Menu. The software window as per figure 8-5 will get launched; the PC is ready for connecting to datalogger

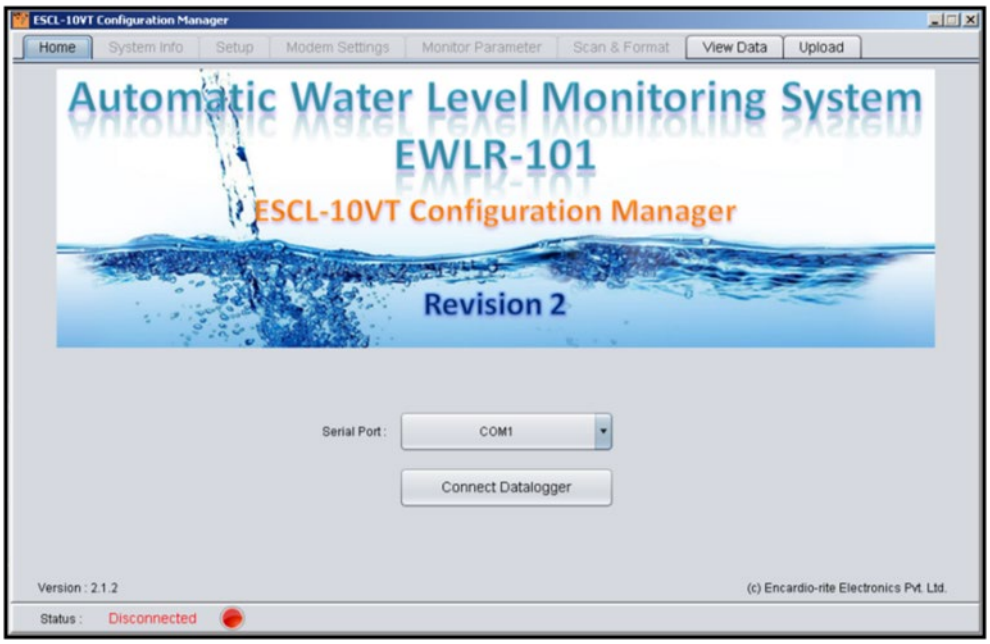


Figure 8-5: EWLR-101 Configuration Manager - Home

Note: For details on installation Configuration Manager application for ANDROID on smart phones, please refer to the users manual available separately Android version..

8.7 Assembly of model EWLR-101BH system

AWLR-101BH Automatic water level monitoring systems are supplied from the factory in two options:

- **Option I:** Fully assembled system where client has specified depth at which the pressure sensor is to be installed
- **Option II:** Partially assembled system where client has not specified depth at which the pressure sensor is to be installed. The system is supplied with a longer length cable which has to be cut to correct length at site and assembled to the datalogger

Warning: Do not apply manual (hand/finger) pressure on the pressure sensor diaphragm.

8.7.1 Record required details in the installation information sheet.

- Refer to Apendix-1 - *The installation information sheet*. Complete and fill in the available details on the sheet.
- Check the depth of water level/water table from ground level in borehole with a dipmeter probe (reduce the height of platform i.e. 400 mm from the reading to get correct water level depth from ground level). Record the absolute reading on the information sheet.
- Confirm the required depth of sensor below water level. Record it in the information sheet.

Note: The installation depth is the depth of sensor diaphragm (bottom) from ground level; (or depth of water table from ground level + depth of sensor below water level).

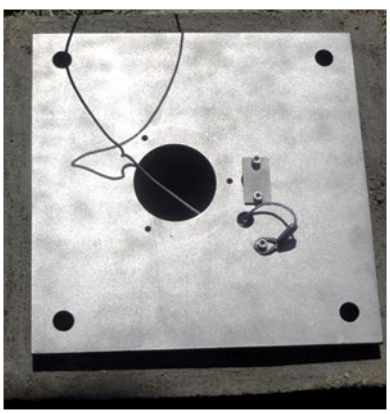


Figure 8-6: Holding plate fixed with sensor safety wire

Note: Sensor should be installed below the lowest expected water level (for better measurement accuracy, it is advisable to use the lowest possible range of pressure sensor)

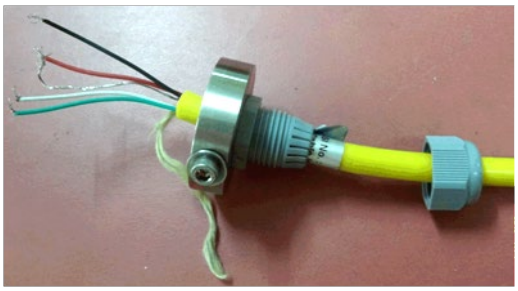


Figure 8-7: Fixing sensor protector

8.7.2 An M4 Allen bolt and washer is provided to fix the safety wire to holding plate. Remove these with the 3 mm Allen key.

8.7.3 Pass safety wire from he bottom through the 12 mm diameter hole provided in the holding plate.

8.7.4 Fix end loop of safety wire to the holding plate with the washer and Allen screw as per figure 8-6.

Figure 8-8: Knurled cap at datalogger lower end

8.7.5 Check datalogger and sensor for any damage to cable/connector.

8.7.6 In case of pre assembled system as per option 1 of § 8.7, go to § 8.7.27

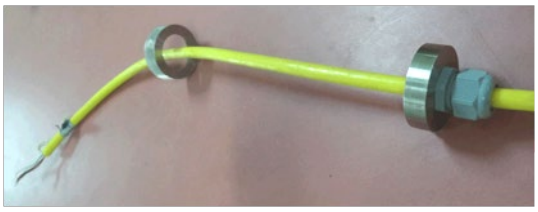


Figure 8-9: Sliding sensor cable through knurled end cap

8.7.7 In case of option 2, where sensor is supplied with an attached length of extra cable specified in order, cut the cable to get the precise length required as per depth of installation. Refer to the meter marking provided on the cable for reference.

Figure 8-11: Pulling out cable gland holder assembly

8.7.8 Pass cable free end through sensor protector (figure 8-7). Clamp sensor protector to cable around 0.5 m from the free end.

8.7.9 Unscrew and remove knurled end cap at bottom of datalogger (figure 8-8).

8.7.10 Pass sensor cable end through this knurled end cap (figure 8-9).

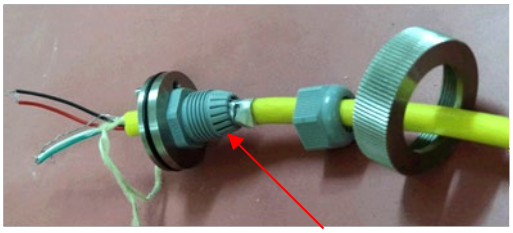


Figure 8-10: Sliding sensor cable through cable gland holder assembly

8.7.11 At bottom of datalogger assembly, you will see a cable gland holder assembly. Pull it out by applying side ways pressure. Refer to figure 8-10.

8.7.12 Unscrew nut of cable gland and pass sensor cable end through as shown in figure 8-11.

8.7.13 Slide the cable gland over the sensor cable.

8.7.14 Connect sensor cable end to the 5 pin connector pressing the lever of push tool down as shown in step 2 of figure 8.12. (5 pin connector and push tool are part of supply).

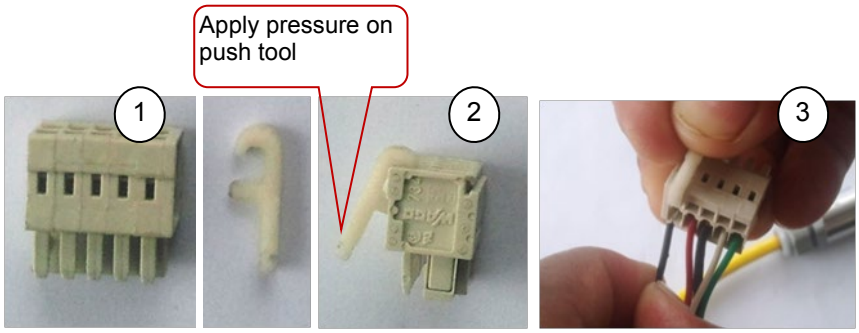


Figure 8-12: Sensor end connector and push tool

8.7.15 Connect cable as follows:

- Black (B) in the first slot.
- Red (R) in the second slot.
- Shield (S) in the third slot.
- White (W) in fourth slot.
- Green(G) in fifth slot.

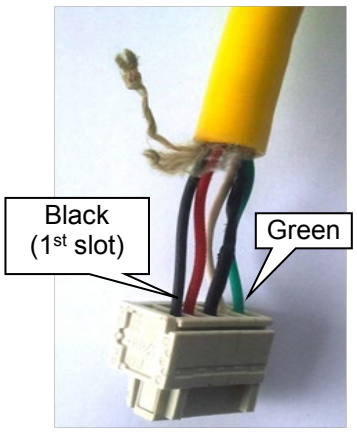


Figure 8-13: Connecting the sensor cable to sensor end connector

8.7.16 Verify wiring of sensor cable to 5 pin connector as per figure 8-13.

8.7.17 Next step is to securely fasten the kevlar reinforcement (looks like a bunch of fine yellow threads) to the cable gland assembly. Remove screw and bobbin from the cable gland assembly. Refer to figure 8-14.

8.7.18 Wrap the kevlar reinforcement around the bobbin by tying a knot and a drop of adhesive over it (Fevi Kwik or any other).

8.7.19 Secure the screw as shown in the figure 8-14.

8.7.20 Pull cable out to transfer cable load on the kevlar reinforcement.

8.7.21 Re-check the complete assembly. The sensor side assembly will look like figure 8-15 and wiring as shown in figure 8-16.

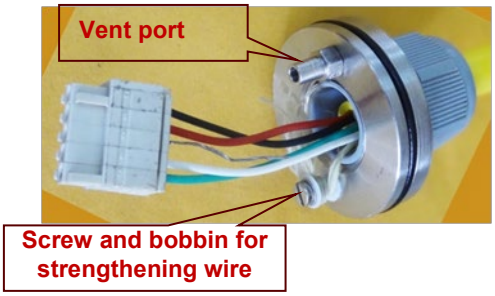


Figure 8-14: Connecting the sensor

8.7.22 Connect datalogger connector end to the sensor end connector as in figure 8-17.

8.7.23 Connect the vent port to hydrophobic filter end as in figure 8-18.

8.7.24 Pull the cable out to transfer cable load on the kevlar reinforcement.

Figure 8-15: Sensor side cable assembly

8.7.25 Push the cable gland holder in place by applying sideways pressure as shown in figure 8-19.

8.7.26 Screw back the knurled datalogger end cap (datalogger housing nut).

8.7.27 Insert SIM card (only in case of telemetry option):

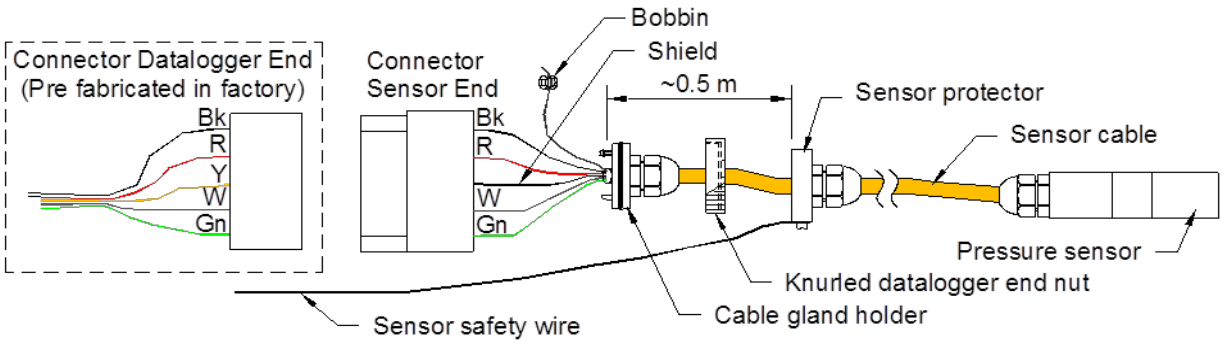


Figure 8-17: Datalogger to sensor cable wire assembly

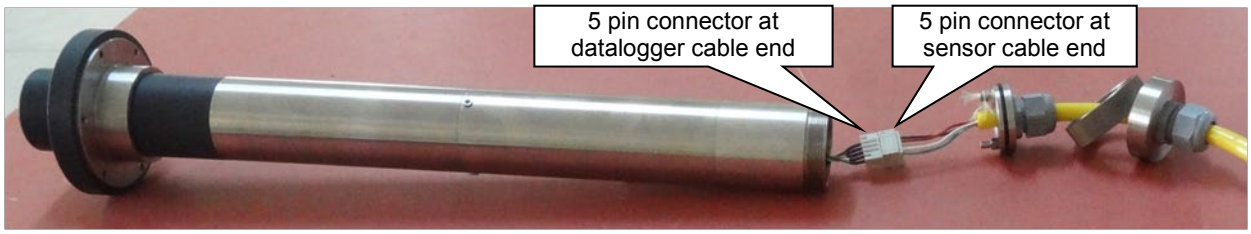


Figure 8-16: Datalogger to sensor cable assembly

- Remove the top cap of datalogger by un-screwing the three screws on the top cap of the datalogger using the 4 mm Allen key.
- To install SIM, unlock the slot by pushing the upper edge of SIM slot as per figure 8-20.
- Place data SIM in slot as per figure 8-21.
- Lock SIM slot by pushing from the opposite side keeping the SIM pushed down in position, refer to figure 8-22.
- Datalogger and sensor are now ready for connecting to PC.

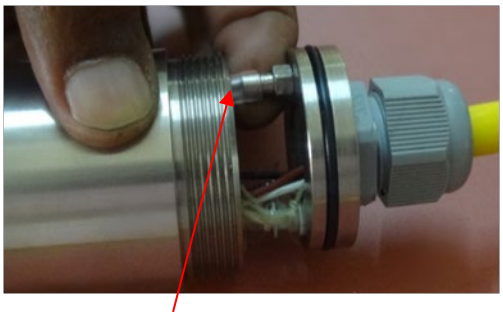


Figure 8-18: Connecting vent port

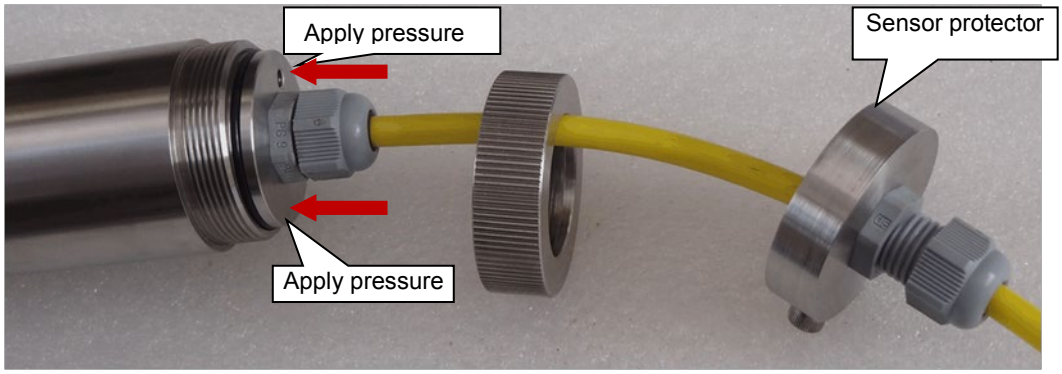


Figure 8-19: Connecting sensor end assembly to datalogger

8.8 Pre-installation checks and system configuration

8.8.1 Connect the laptop and EWLR-101 datalogger through the USB to RS232 cable provided with the system figure 8-23.

8.8.2 Launch the Configuration Manager software in the laptop. Select the correct communication port and connect the datalogger.

Note: Please refer to Section 7 of this manual for complete details on Configuration Manager software.

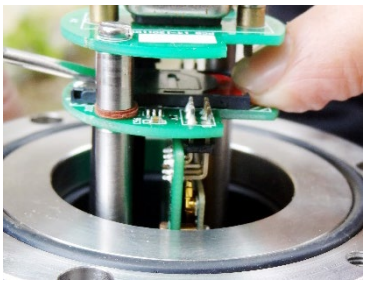


Figure 8-20: SIM slot locking

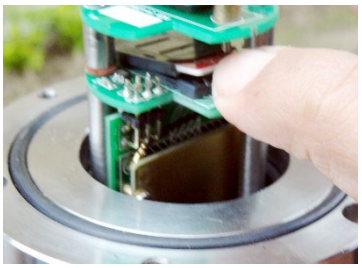


Figure 8-21: SIM installation

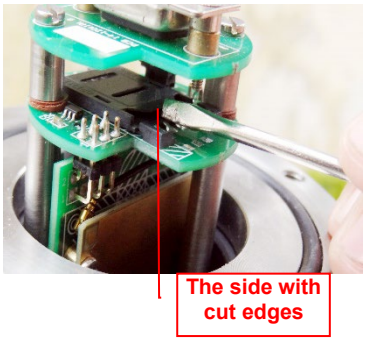


Figure 8-22: SIM slot opening

8.8.3 Check the display message for successful connection of datalogger.

8.8.4 **System Info'** tab: Check system information by clicking on System Info (this information is automatically taken by application from datalogger. The fields are non-editable).

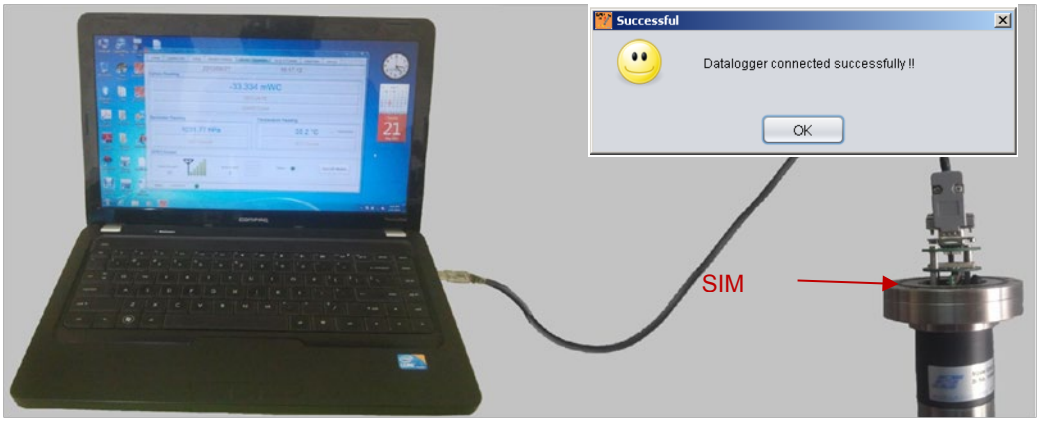


Figure 8-23: EWLR-101 Datalogger connecting to PC

8.8.5 **Setup**" tab: To update and configure the datalogger system information, click on the 'Setup' tab. Setup fields can be edited to modify settings.

a. Logger Date/Time section: Update data/time and UTC offset otherwise click Sync with PC

b. Logger section:

- Logger ID: Configuration manager automatically detects the factory set datalogger ID
- Top elevation: Enter the borehole top position above MSL (Mean Sea Level)

NOTE: The borehole top position should also be checked frequently and corrected for any settlement. A settlement target can be installed near borehole for this purpose.

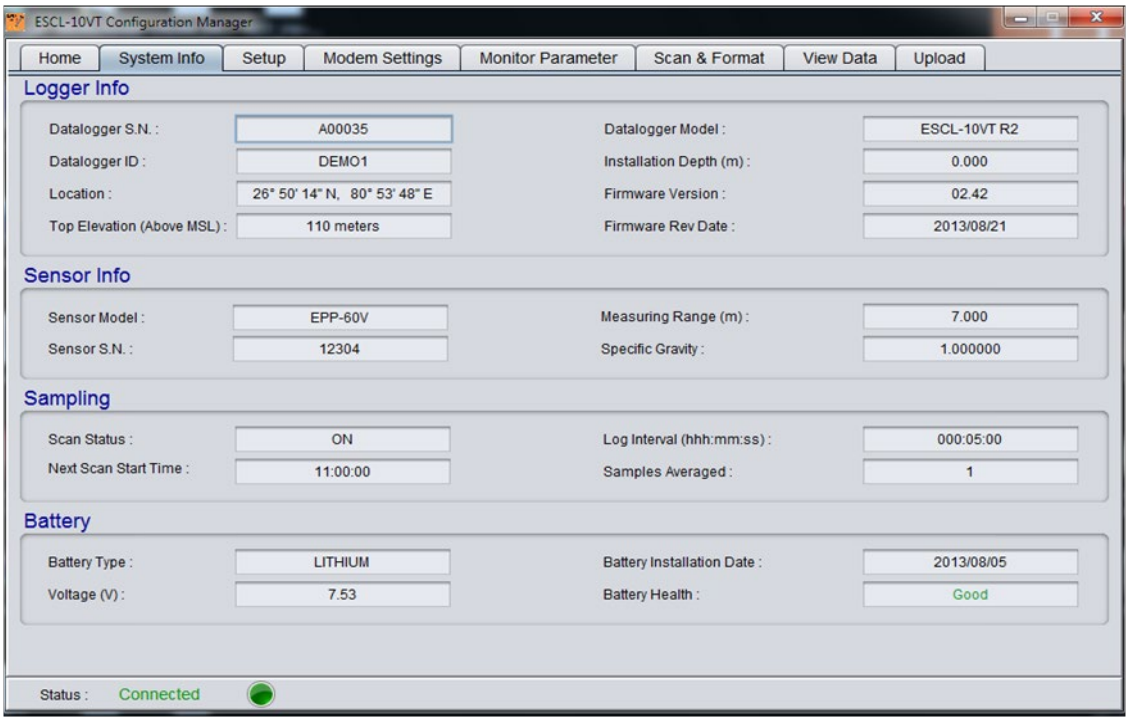


Figure 8-24: EWLR-101 Configuration manager - System Info

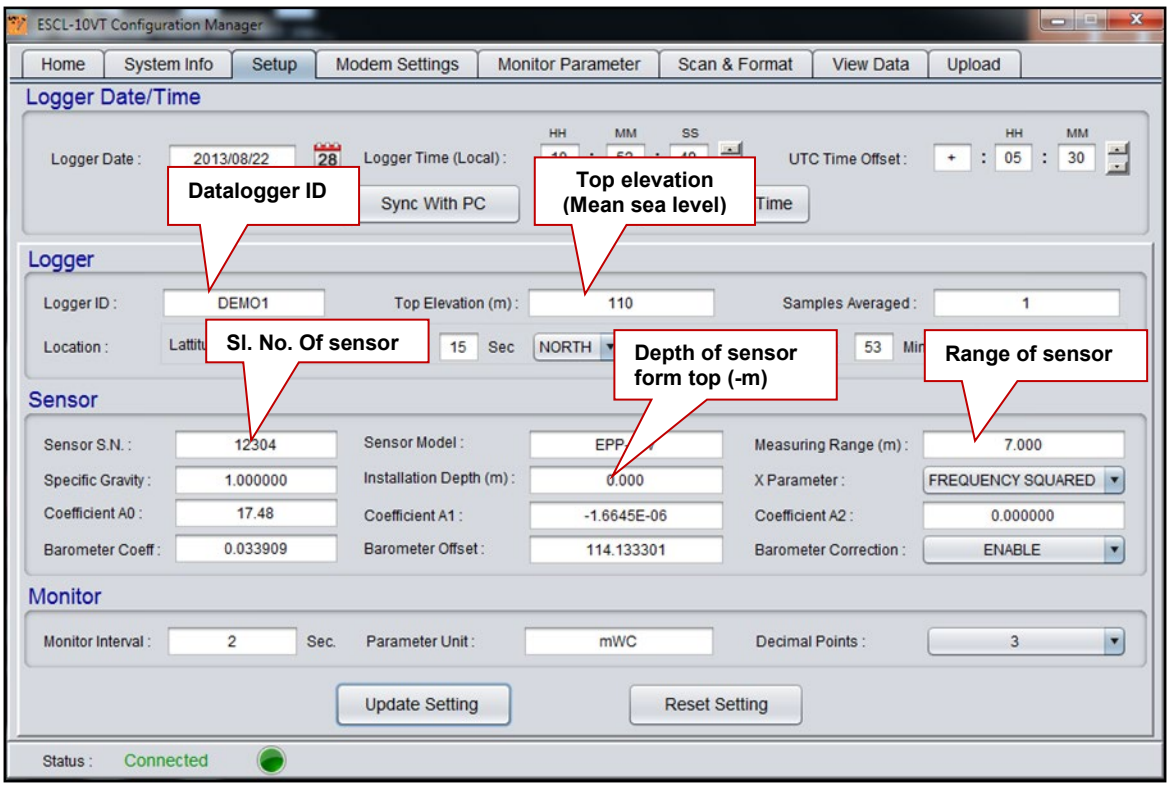


Figure 8-25: EWLR-101Configuration manager – Setup

- Samples Averaged: Datalogger can store readings by averaging the samples from 2 to 250. Keep samples for averaging to 1 in case averaging is not required
- Location: Enter the datalogger installation location coordinates (latitude and longitude)

c. Sensor section:

- Serial number: Enter the sensor serial number, model and measuring range.

- Update the Specific Gravity (standard 1.0) in the specified field.
- Enter Installation Depth as “0”.
- Set X Parameter to “frequency squared”.
- Enter Coefficient A0 as “0”.
- From the sensor test report provided with the system enter the pressure sensor coefficients A1 and A2. In case polynomial correction is not applicable put value of coefficient A2 as “0”.
- The Barometric coefficient and barometric offset are factory set. “Enable” the barometric correction and click on Update setting.

d. Monitor section: All the parameters in this section are factory set.

8.8.6 ‘**Monitor Parameter**’ tab: Place sensor vertically at the ground level and click on ’Monitor Parameter’ tab.

a) Wait for the parameter value to stabilize and note this value in the information sheet. This is the value of coefficient A0.

b) Click on the ‘Setup’ tab and enter coefficient A0 (with sign reversed) using sensor panel. Press ‘Update Setting’ to update coefficient.

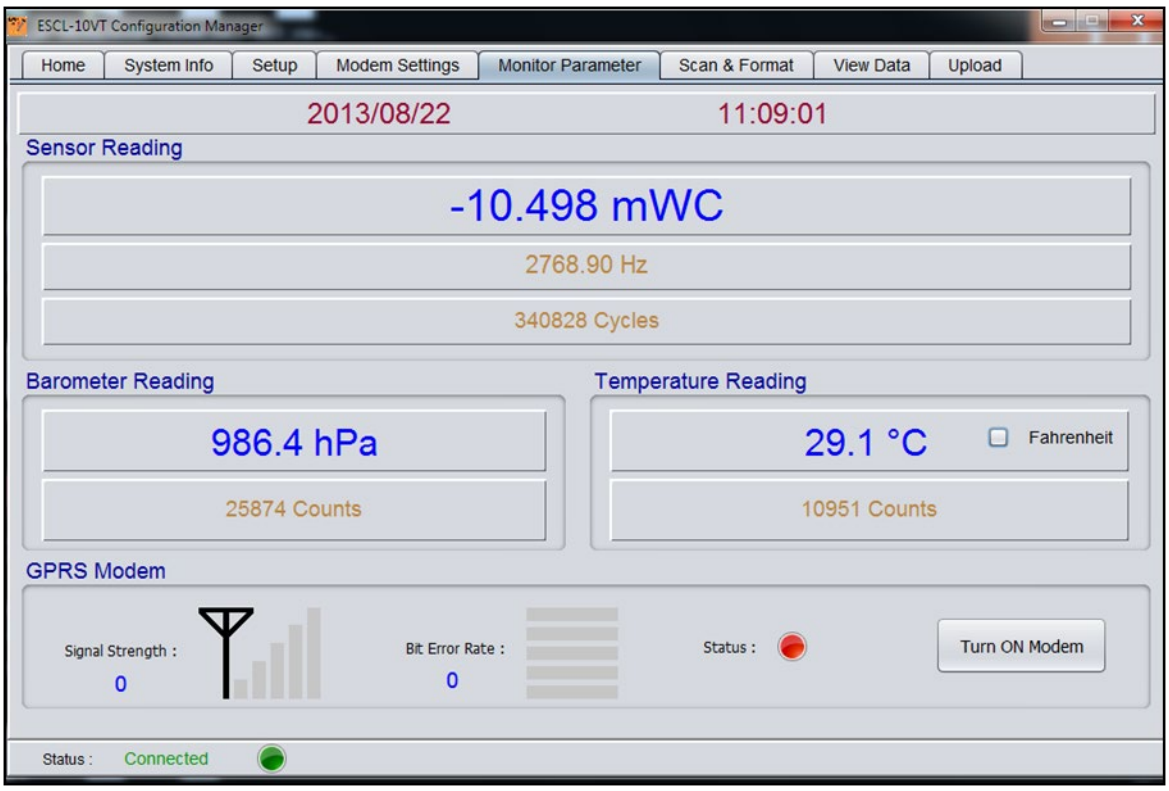


Figure 8-26: EWLR-101 Configuration manager – Monitor Parameter

8.8.7 ‘**Modem Settings**’ tab: In case FTP data upload is required click on ’Modem Settings’. Refer to figure 8-27.

a) FTP settings section: Enter and update the FTP server setting i.e. URL, port, user name and password. These are predefined values in case Encardio-rite FTP server services are being hired. In such case, these parameters are factory set.

b) Upload Time section: Update the upload time schedule for local time or UTC time. Maximum 6 time slots can be set for data upload. The data upload interval can be set from 1 hour to 7 days. Datalogger will automatically upload the data as per the scheduled time in case internet access is available on the laptop. Prefer upload of once a day for longer battery life.

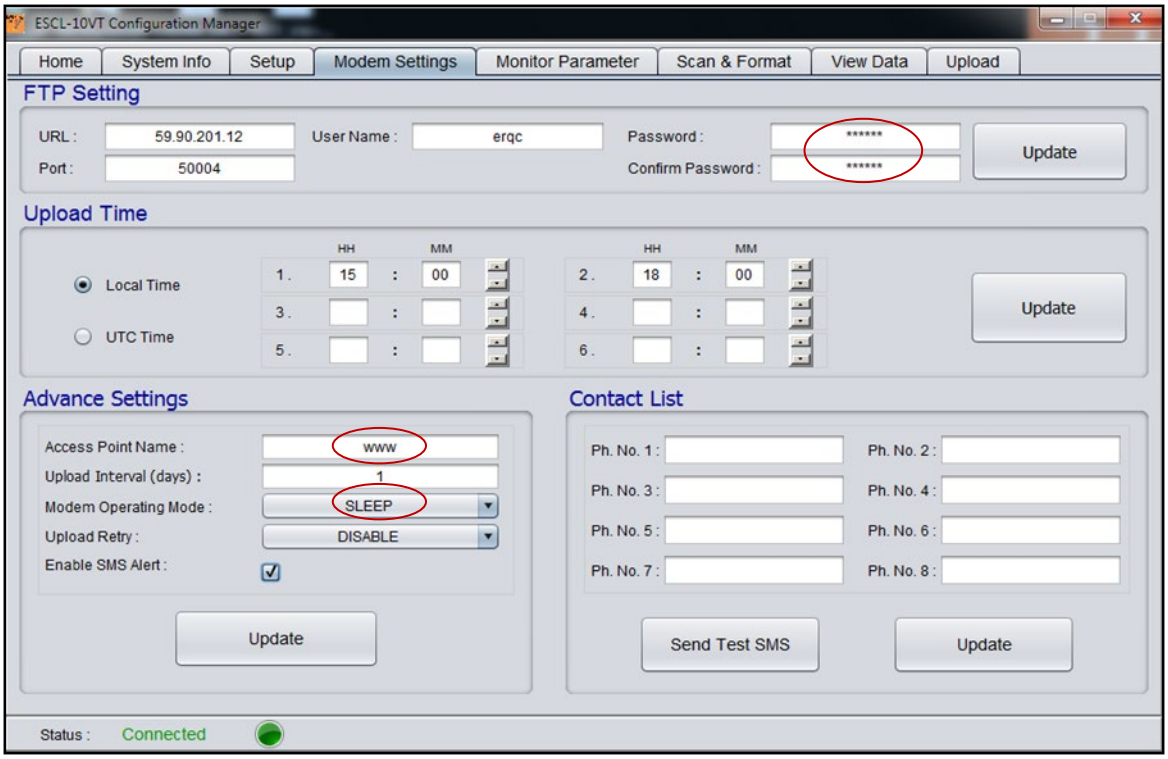


Figure 8-27: EWLR-10 Configuration manager – Modem setting

c) Advance Setting section: In case of telemetry option, update details in 'Advance settings' fields;

- Network service provider's APN no. for data enabled internet SIM,
- Data upload interval as required
- Modem operating mode - OFF, Sleep or ON. The preferred option is "Sleep" mode.
- Enable the SMS alert.
- Press 'Update' to update settings

d) Contact List section:. Update the Contact list. (Ensure that SIM is a data SIM and it is activated for SMS also).

8.8.8 '**Scan & Format'** tab: Click on 'Scan and Format' tab.

a) Scan Option section: Set the desired time interval of data scanning either for Short (5 to 250 sec) or Long interval (5 min to 168 hrs).

b) Alarms & Event Log section: In case required, update alarm levels as required.

8.8.9 Click on '**Home**' tab. A window will appear asking to set the scan off to be "yes" or "no". Select no. 'Home' tab will apear now. Click on "Disconnect Datalogger" and close the application.

8.8.10 Remove the USB to RS232 cable from the datalogger.

8.8.11 Replace the datalogger top cap and tighten the three screws by the 4 mm Allen key.

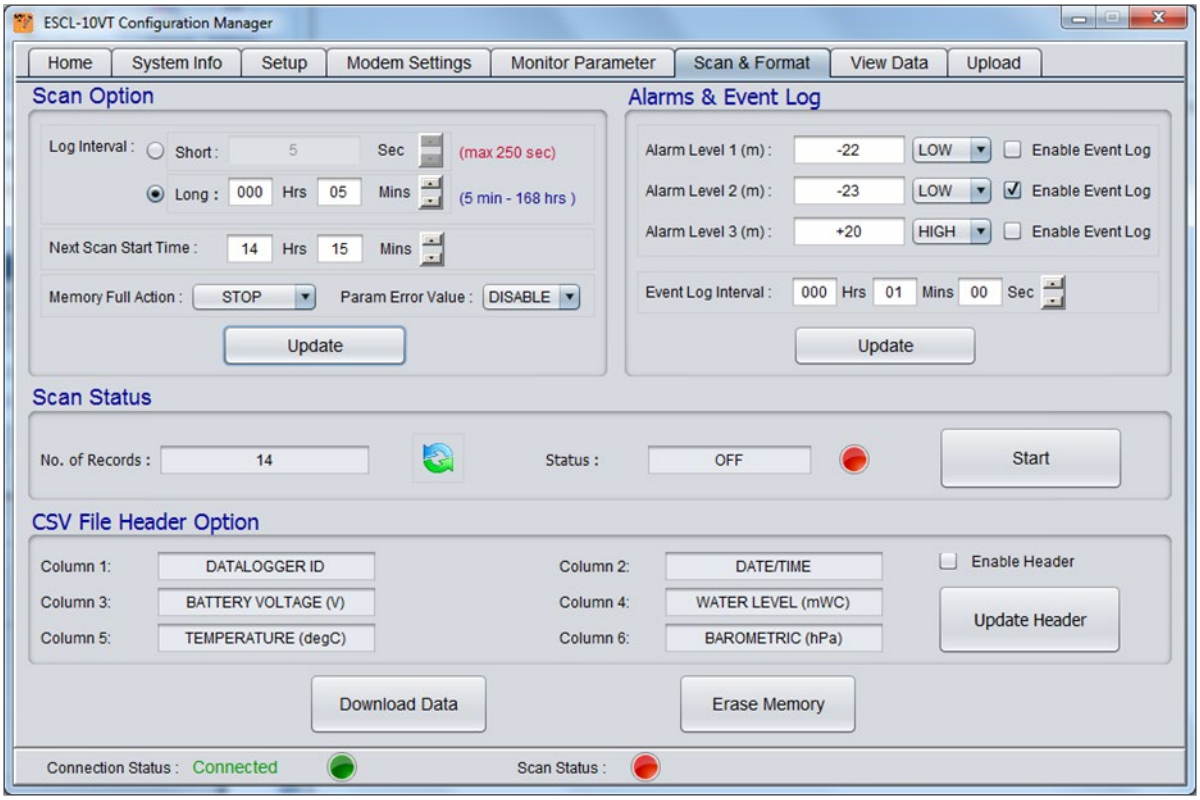


Figure 8-28: EWLR-101 Configuration manager – Scan & Format

8.9 Installation in borehole

Note: Before lowering sensor ensure that end loop of safety wire that holds cable is tightened with the M4 Allen screw on the holding plate.

Note: Arrange a small stool/chair at the borehole location. Alternatively spread out a plastic sheet for placing laptop and sensor during the installation procedure.

The installation procedure is described here in brief.

8.9.1 Place the four M10 x 80 fasteners in the drilled hole on the 400 mm x 400 mm concrete block. Place the holding plate over the block, aligning the corner holes over the fasteners. Loosely fasten the four screws on the fastners.

8.9.2 Remove top cap of datalogger by un-screwing the three screws on the top cap of the datalogger by the 4 mm Allen key.

8.9.3 Connect datalogger to PC with USB to RS232 (serial) interface cable and launch the Configuration Manager.

8.9.4 Click on the “Monitor Parameter” check and note the value while sensor is at ground level.

Figure 8-29: Cable safety wire

8.9.5 Remove Allen screw and washer from the sensor protector and secure free end loop of security wire to sensor protector. Tighten the screw by Allen key carefully. Refer to figure 8-29.

Note: The other end of the safety wire loop is fixed to the holding plate to prevent the sensor assembly from dropping down accidentally into the borehole.

8.9.6 Start lowering the sensor into borewell gently up to the installation depth. Ensure that the sensor does not experience a “free fall”.

8.9.7 Allow the sensor to stabilize to water condition. Switch to “Monitor Parameter” window. Check the parameter value for desired depth below water level. Record this value.

8.9.8 Switch to “Setup” window. Enter the sensor installation depth {from ground level with (-) sign} in meters under ‘Installation Depth’ field and update setting (as noted earlier in the Information Sheet).

8.9.9 Switch to “Scan and Format” and verify the desired scan time interval. Select the Scan status as “ON” (initially the Scan time interval can be set short).

8.9.10 Click on ‘Data Download’ sometime after switching “Scan” to “On” condition. After downloading, data can be viewed in View Data. Switch to “View Data” to check the downloaded data.

8.9.11 In case ftp upload is required for the downloaded data, switch to “Upload” option to upload this data at ftp server/site (Internet access required).

Figure 8-30: Datalogger top view

8.9.12 In case data retrieval is by telemetry, do following:

a) insert the data SIM card in the slot given at top of datalogger (in case not done earlier as per **§** 8.7.27). Re-check the modem setting in the Configuration Manager application. Using Encardio-rite WDMS services (Web data monitoring services) data can be viewed online now.

b) Click on “Scan and Format” page of Configuration Manager application. Switch off scanning and set time interval of data scanning for Short period 5 sec. Also set the “Next Scan Start Time” to 5 min from current laptop time.

c) Switch on scanning. Notice “No. of records” will increase as the datalogger scans records. Keep refreshing the window. The records will start decreasing at the set upload time.

d) Now set the scanning and upload time details to desired value.

8.9.13 Secure the datalogger to holding plate with the three Allen screws provided. Fix the top cap of datalogger using the screws. Tighten all the four screws of the holding plate and lock the protection box.

8.10 Operation and maintenance

Although the EWLR-101BH automatic water level monitoring system is almost maintenance free for long periods of time, it may require some maintenance including battery replacement.

8.11 Battery Replacement

8.11.1 Remove the three M5 x 8 Allen head screws from the black topcap of the datalogger using the 4 mm Allen key. Remove black topcap.

Figure 8-31: Battery replacement

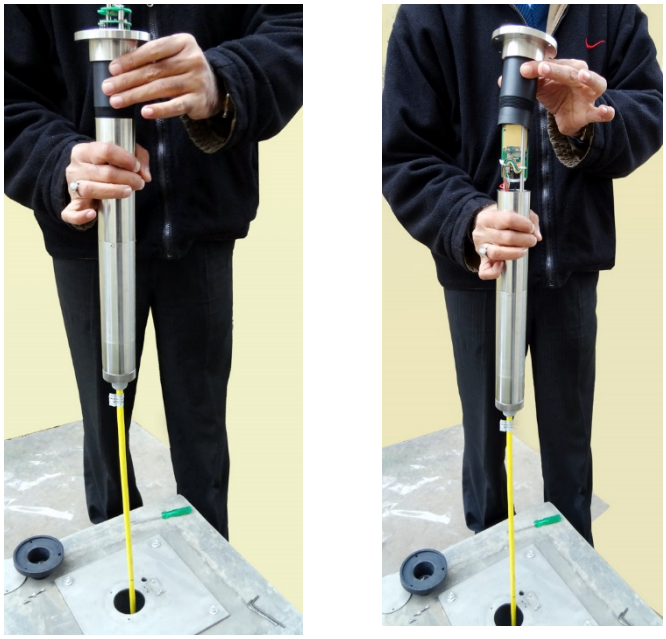


Figure 8-32: Opening the Nylon housing

8.11.2 Launch Configuration Manager software on laptop and connect datalogger to laptop with the USB to RS232 cable.

8.11.3 Shut down datalogger and remove the USB to RS232 cable.

8.11.4 Remove datalogger from borehole by unscrewing the three M4 x 10 Allen head screws using the 3 mm Allen key. Refer to figure 8-31.

8.11.5 Hold datalogger in upright position. Refer to figure 8-32. Rotate the black nylon housing in anti-clock wise direction to open the datalogger top.

Caution: Please make sure that the datalogger body is held tightly and only the black nylon housing is rotated to prevent damage to the system.

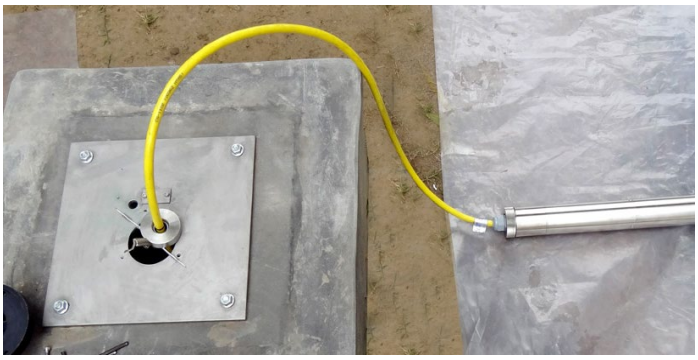


Figure 8-33: Taking out datalogger from borehole

Figure 8-34: Taking out GSM card assembly

8.11.6 Carefully remove the housing, keeping nylon housing straight. Refer figure 8-32.

8.11.7 Take out the datalogger and keep it on a clean surface over plastic sheet/packing material. Hold the cable protector of cable over the holding plate, as shown in figure 8-33.

8.11.8 Now gently pull GSM card assembly up. Apply small sideways momentum to pull out assembly very slowly. Care should be taken as excessive force might pull the cable and damage card. Refer to figure 8-34.

Figure 8-35: Taking out battery

8.11.9 Now slightly tilt the datalogger with top downwards. The assembly of battery with black cap will come out of housing with its positive terminal upside; refer to figure 8-35.

8.11.10 Replace the old assembly of batteries with the new one. Keep positive terminal of batteries upside, covered with cap. Slide back the battery in its place. Refer figure 8-36. Ensure that the batteries are properly set. The top cap will come below the internal threads of the steel housing.

Figure 8-36: Replacing battery

8.11.11 Before placing the GSM card assembly back, gently pull up the bunched wire as shown in figure 8-37 around 1~2 cm to avoid cable coming in between the battery cap and holding spring

8.11.12 Gently press and hold GSM card assembly in place and align both the compartments of datalogger as per figure 8-38 and screw back the nylon housing.

8.11.13 Check the datalogger after connecting again with the laptop.

8.11.14 Update the battery installation date in the configuration manager.

Figure 8-37: Pulling of wire bunch while pushing back GSM assembly

Figure 8-38: Fixing back the nylon housing

9 METHOD STATEMENT - EWLR-101BX

Installation of model EWLR-101BX automatic water level recording system for monitoring ground water level

This method statement defines the procedure for long term monitoring of ground water table/level from a 52, 76 or 100 mm diameter borehole. An automatic water level recording system including datalogger (box type) and sensor is installed in a borehole for ground water monitoring. The data can be obtained locally by using a laptop computer/mobile phone or remotely through telemetry.

9.1 General description

Encardio-rite model EWLR-101 system is designed for long term monitoring of ground water table/level, temperature and barometric pressure. The ground water level is measured by a pressure sensor connected through a 4-core Kevlar reinforced cable to the ESCL-10VT datalogger.

The EWLR-101 system enables observing water table/level, temperature and barometric pressure data at programmable time interval and storing date and time stamped data readings in the non-volatile memory of the datalogger. Data can be retrieved from the datalogger through any of the following options:

- Telemetry through GSM/GPRS modem (FTP data transfer)
- Readout/data retrieval using laptop or mobile phone

EWLR-101 system is available in two options:

- Model **EWLR-101BH** system with ESCL-10VT-BH datalogger housed in a cylindrical body and powered by lithium cells.
- Model **EWLR-101BX** system with the ESCL-10VT-BX datalogger in a polyester box 220 mm L x 120 mm W x 91 mm H.

This method statement describes the procedure for installing model EWLR-101BX automatic water level recording system, with model ESCL-10VT-BX box type datalogger.

9.2 Specifications

Refer to data sheet 1216-13 on model EWLR-101BH/BX Automatic Water Level Monitoring System for detailed specifications of the system.

9.3 Site preparation before Installation (scope of client)

The client should ensure completion of following works before proceeding to site for installing EWLR-101BX automatic water level monitoring system.

9.3.1 Installation in borehole:

a) If an existing borehole is not available, drill a borehole of 100 mm diameter, around 0.5 m deeper than depth at which sensor is to be lowered..

Note: Smaller diameter borehole of 50 mm or 76 mm can also be used. However, this will not allow verifying reading manually with a water level sounder.

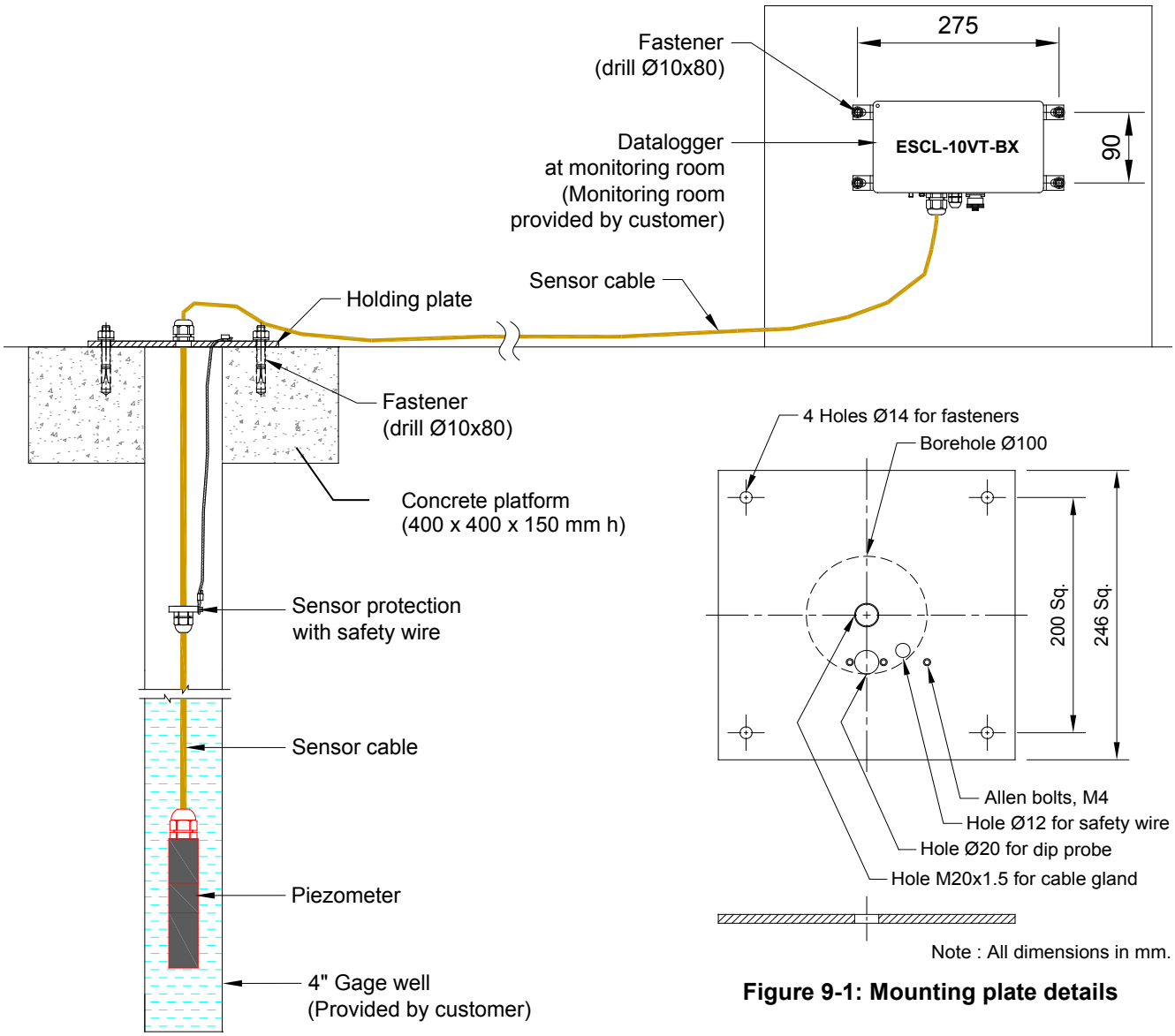


Figure 9-1: Mounting plate details

Figure 9-2 Typical installation scheme for EWLR-101BX system

a) At mouth of borehole, make a concrete platform (around 400 mm x 400 mm x 150 mm height) concentric with the 100 mm diameter at the top of the borehole as shown in figure 9-1. Make sure that the top edge of the plastic pipe coming out of the borehole is flush with the raised platform by cutting any extra length from the top.

b) Client should make suitable provision if installation needs protection from vandalism.

c) In case data is to be transmitted by telemetry, a pre-activated data SIM card should be available with the client before the installation is scheduled.

9.3.2 Preparation for mounting holding plate on concrete block

b) Remove stainless steel holding plate from the packing case. Refer to figure 9-2 for details of mounting plate.

c) Place holding plate on concrete block. Align the plate over borehole such that the edge of 20 mm dia hole (provided for manual reading with dip meter) comes within the edge of 100 mm bore hole in concrete block as shown in figure 9.2.

d) Drill four 10 mm diameter x 80 mm deep holes for HLC M10 x 80 Hilti or equivalent fasteners, using the holding plate as a template.

Figure 9-2b: Mounting plate to be placed over casing

9.3.3 Installation in reservoir/lake:

e) If gage well is not available, mount a 100 mm diameter casing at the desired depth.

Note: Smaller diameter casing of 50 mm or 76 mm can also be used. However, this will not allow verifying reading manually with a water level sounder.

Note: In case, a platform can be made, same mounting plate as mentioned above can be used. Alternatively, mounting plate variant (with a ring below) is available, that can be placed on the casing. The plate will rest over the casing, holding the installed pressure sensor with attached cable in position. The ring will set inside the casing, preventing the plate from falling off. Refer to figure 9-2b.

9.4 Tools and accessories for EWLR-101BX

Open packing case and physically verify the instruments and installation accessories/tools available in the packed box as per the packing slip

f) Check availability of following tools and accessories in the packing box:

- Allen key 3 and 4 mm
- Screw driver (cheese head 4 mm and Philips head 4 mm)
- Support Configuration Manager software CD
- USB drive CD
- FTDI USB To RS232 cable
- RS232 cable with Amphenol connector (supplied only with ESCL-10VT-BX box type datalogger)
- Adhesive tube
- 5 pin sensor cable end connector with push tool (only with units not completely assembled)

g) Client to check availability of following tools and accessories with him before proceeding to install the EWLR-101BX system (**clients' scope**):

- Drill machine with 10 mm diameter drill bit to make holes for fasteners in concrete block.
- Spanner 12/13 mm and 18/19 mm.
- Hammer
- Dip measuring tape (water level sounder)
- Laptop with CD drive enabled and Administrator type user account access.
- Soft cloth

Note: Cutter/paper knife (arranged by client) to be used to open the packing case.

9.5 Installation of datalogger software 'Configuration Manager' for Windows (first time installation)

Please refer to section 8-6 under Section 8 "Method statement for installation of model EWLR-101BH system".

9.6 Installation of model EWLR-101BX system

Warning: Do not apply manual (hand/finger) pressure on the pressure sensor diaphragm.

9.6.1 Record required details in the installation information sheet.

- Refer to Apendix-1 - *The installation information sheet*. Complete and fill in the available details on the sheet.
- Check the depth of water level/water table from ground level in borehole with a dipmeter probe

Note: Where platform has been constructed, reduce the height of platform i.e. 150 mm from the reading to get correct water level depth from ground level). Record the absolute reading on the information sheet.

- Confirm the required depth of sensor below water level. Record it in the information sheet.

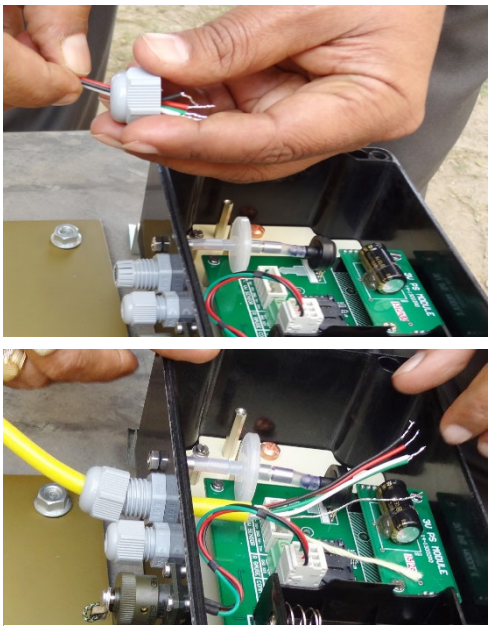


Figure 9-4: Connecting sensor cable to datalogger

Note: The installation depth is the depth of sensor diaphragm (bottom) from ground level; (or depth of water table from ground level + depth of sensor below water level).

Note: Sensor should be installed below the lowest expected water level (for better measurement accuracy, it is advisable to use the lowest possible range of pressure sensor)

9.6.2 An M4 Allen bolt and washer is provided to fix the safety wire to holding plate. Remove these with the 3 mm Allen key. Refer to figure 9-3.

9.6.3 Pass safety wire from the bottom through the 12 mm diameter hole provided in the holding plate.

9.6.4 Fix end loop of safety wire to the holding plate with the washer and Allen screw as per figure 9-3.

9.6.5 Check datalogger and sensor for any damage to cable/connector.

9.6.6 Cut the cable to get the precise length required i.e. depth of installation + length required from borehole top to datalogger location (refer to the meter marking provided on the cable for reference).

Note: Location of ESCL-10VT-BX datalogger mounting may vary depending on the application. In case control room is available near the borehole/gagewell location, datalogger can be mounted on the wall of control room. Cable length of pressure sensor should be estimated accordingly.

The datalogger can also be mounted near the borehole location, over the platform, in an enclosure provided by Encardio-rite (optional

Figure 9-3: Fixing sensor protector

supply), or inside any custom made enclosure provided by the client.

Caution: Ensure that the datalogger is always mounted in vertical position i..e the glands are at bottom side.

9.6.7 Put a clear mark on the cable for the installation depth of sensor i.e. the length required from sensor bottom to the cable gland on mounting plate at top.

9.6.8 Pass cable free end through sensor protector (figure 9-4). Clamp sensor protector to cable around 0.5 m below the marking made for installation depth of sensor.

9.6.9 Pass cable free end through the cable gland of the mounting plate upto the marking of depth of installation.

9.6.10 Tighten the cable gland to hold the pressure sensor tightly. Refer to figure 9-3.

9.6.11 Lower the sensor now upto desired depth. Place the mounting plate in position over the borehole/gagewell.

9.6.12 Fix the mounting plate with the four fastners (HLC M10 x 80 Hilti or equivalent).

9.6.13 Slide the free end of sensor cable through the cable gland of the datalogger. Refer to figure 9-5

9.6.14 Connect sensor cable end to the 5 pin connector pressing the lever of push tool down as shown in figure 9-6. (5 pin connector and push tool are part of supply)

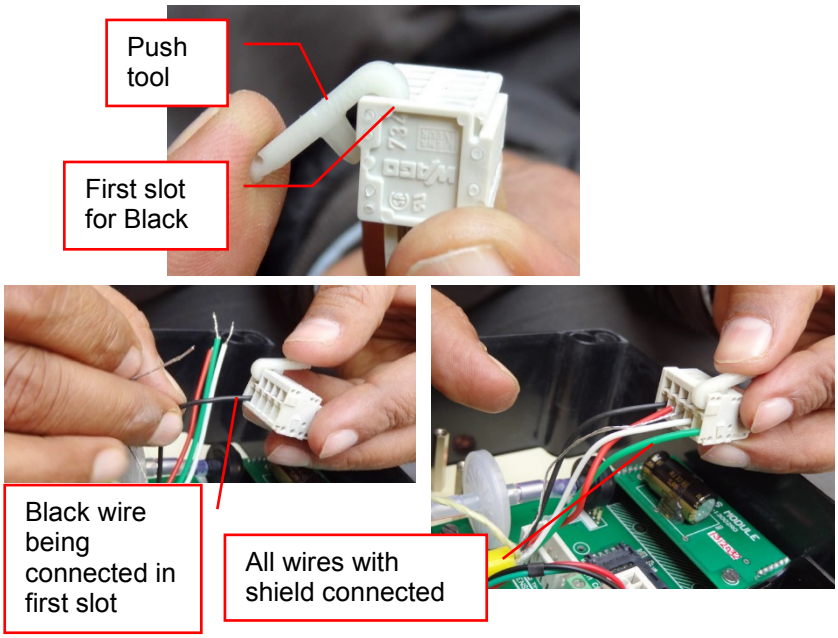


Figure 9-6: Connecting cable to 5 pin connector

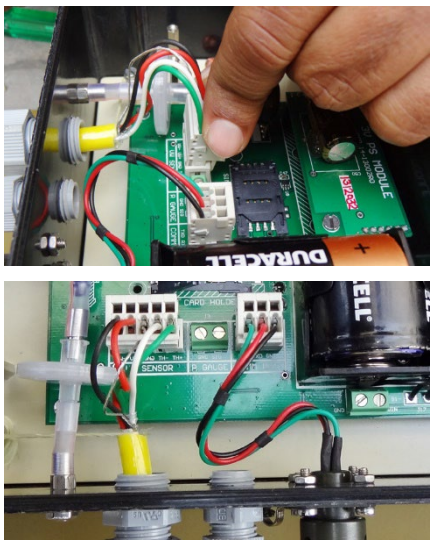
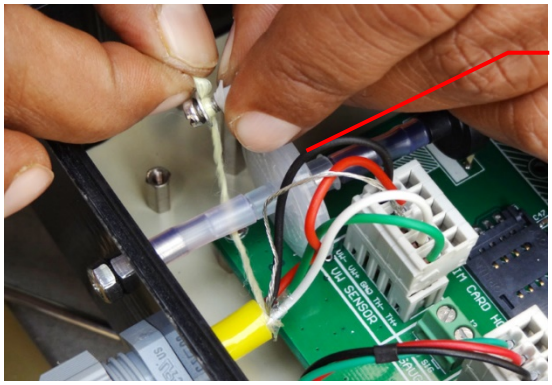


Figure 9-5: Sensor wiring to datalogger



kevlar reinforcement being fastened to the bobbin/ screw assembly

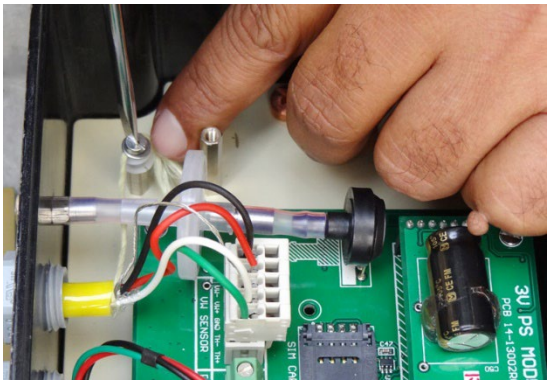


Figure 9-7: Fastening of kevlar reinforcement to datalogger

Figure 9-8: Fixing back the screw with Kevlar reinforcement

9.6.15 Connect cable as follows. Refer to figure 9-7.

- Black (B) in the first slot.
- Red (R) in the second slot.
- Shield (S) in the third slot.
- White (W) in fourth slot.
- Green(G) in fifth slot.

9.6.16 Verify wiring of sensor cable to 5 pin connector as per figure 9-8.

9.6.17 To fasten the kevlar reinforcement of cable (looks like a bunch of fine yellow threads) to the datalogger, remove screw and bobbin from the datalogger. Refer to figure 9-8.

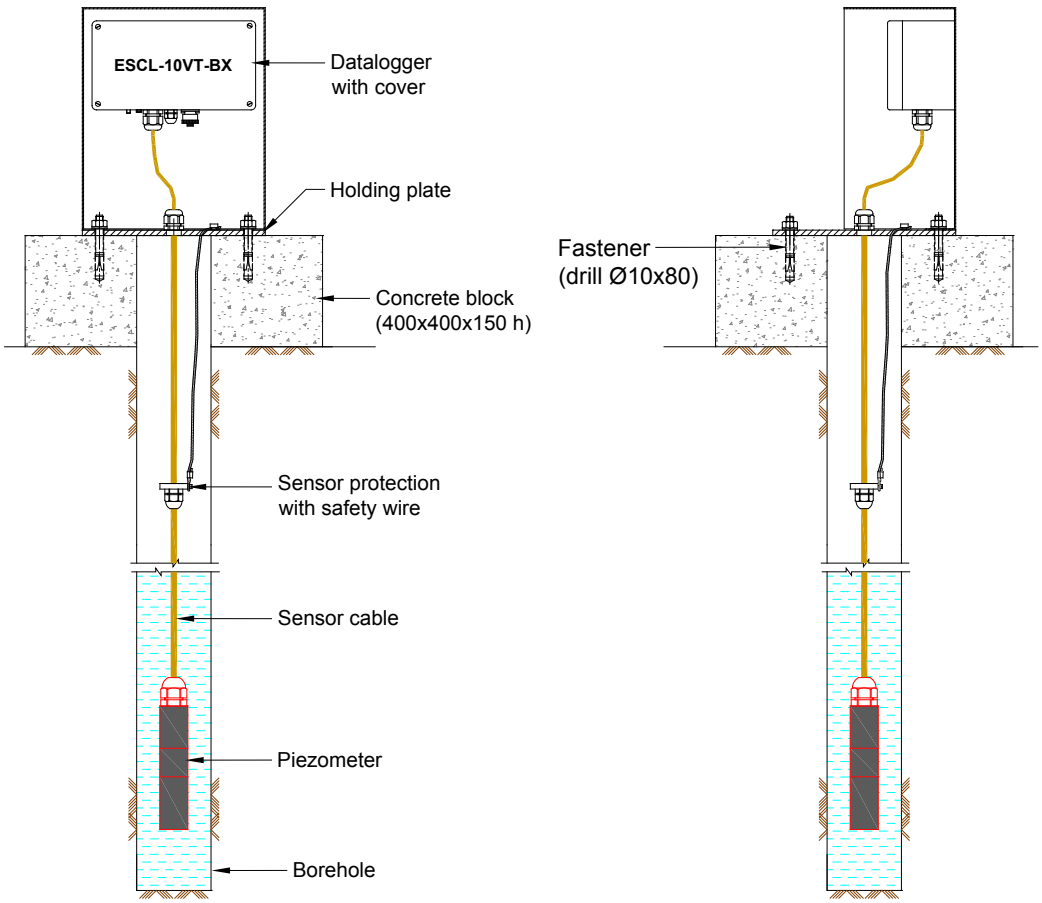


Figure 9-9: Typical installation scheme with enclosure provided by Encardio-rite (optional)

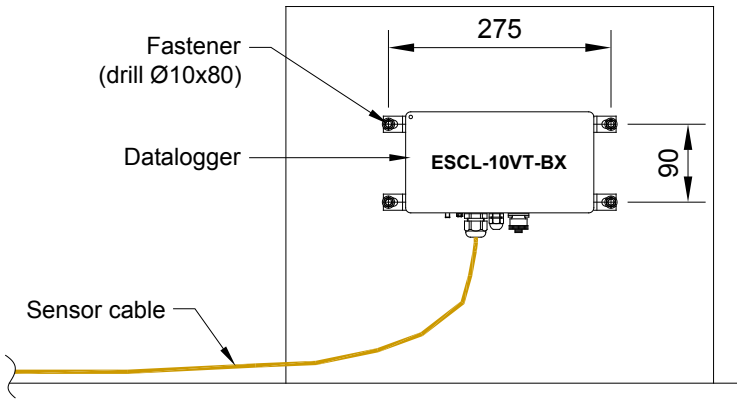


Figure 9-11: Mounting details of ESCL-10VT-BX datalogger

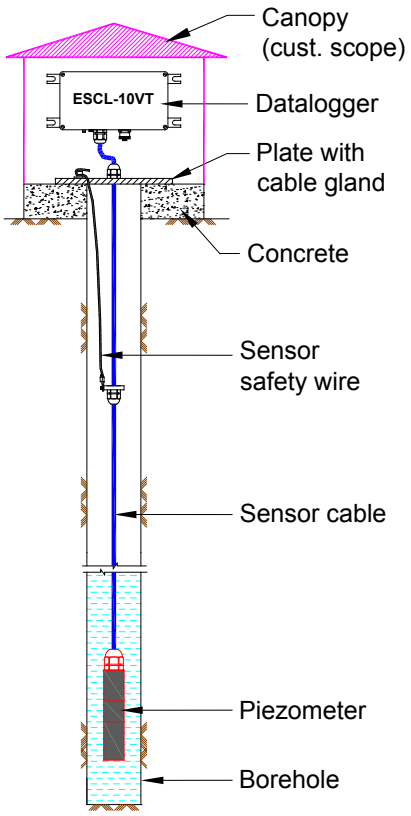


Figure 9-10: Installation of EWLR-101BX in custom made enclosure (customer scope)

9.6.18 Wrap the kevlar reinforcement over the bobbin and screw assembly by tying a knot and a drop of adhesive over it (Fevi Kwik or any other).

9.6.19 Secure the screw as shown in figure 9-8.

9.6.20 Pull cable out to transfer cable load on the kevlar reinforcement

9.6.21 Mount the datalogger.

Note: Mounting of datalogger depends on the location of the datalogger. Typical mounting arrangement inside the enclosure provided by Encardio-rite is shown in figure 9-9

9.6.22 Alternatively, the datalogger can be mounted in custom made enclosure provided by client/user. Refer to figure 9-11.

9.6.23 In case the datalogger is to be mounted in monitoring room, a typical installation scheme is given in figure 9-1.

9.6.24 For mounting the datalogger, four mounting clamps are provided on the datalogger. The center to center distance of mounting holes is 90 mm (h) and 275 mm (w). Refer to figure 9-12.

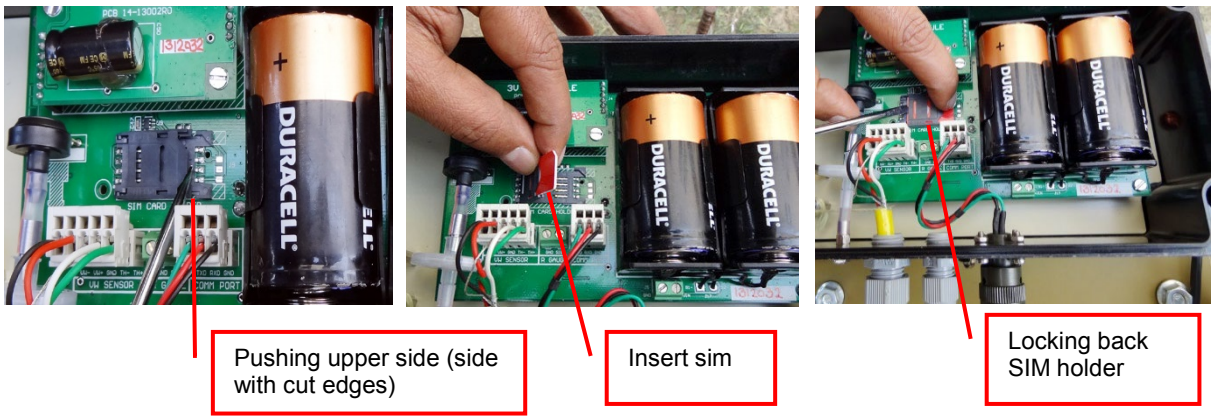


Figure 9-12: Inserting SIM

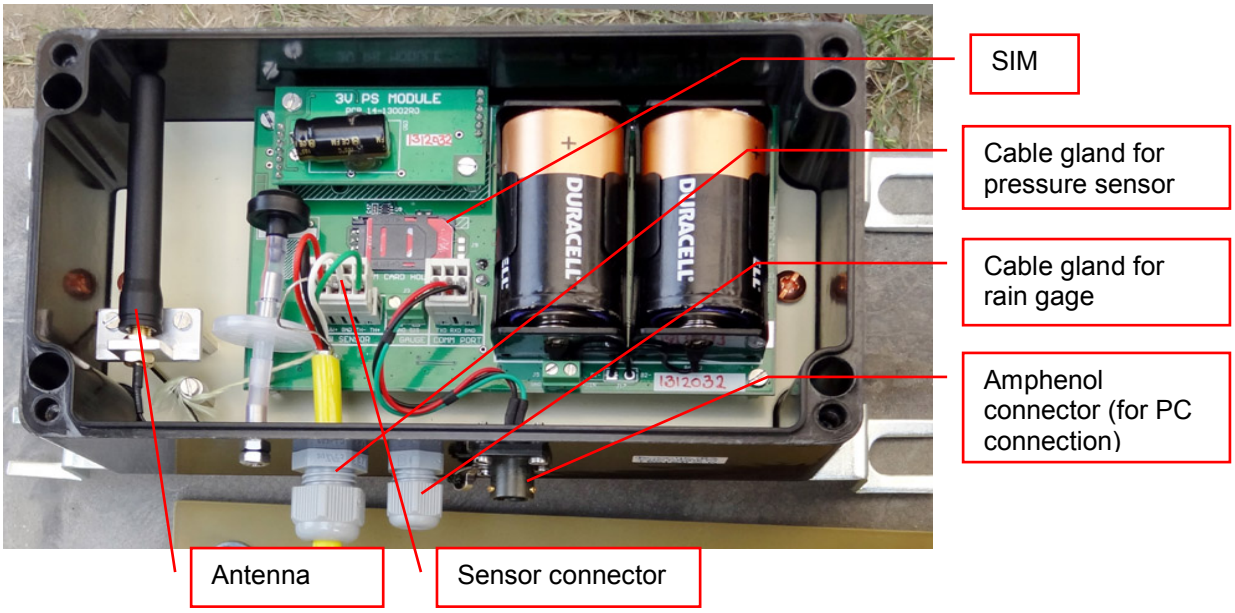


Figure 9-13: ESCL-10VT-BX Datalogger with telemetry option

9.6.25 Care should be taken that the datalogger is mounted in a vertical position as shown in the figures (glands should be at bottom).

9.6.26 Inserting SIM card (only in case of telemetry option):

- Remove the cover of datalogger by un-screwing the four star head screws.
- To install SIM, unlock the slot by pushing the upper edge of SIM slot as per first picture of figure 9-13.
- Place data SIM in slot as per second picture of figure 9-13.
- Lock SIM slot by pushing from the opposite side keeping the SIM pushed down in position, refer to

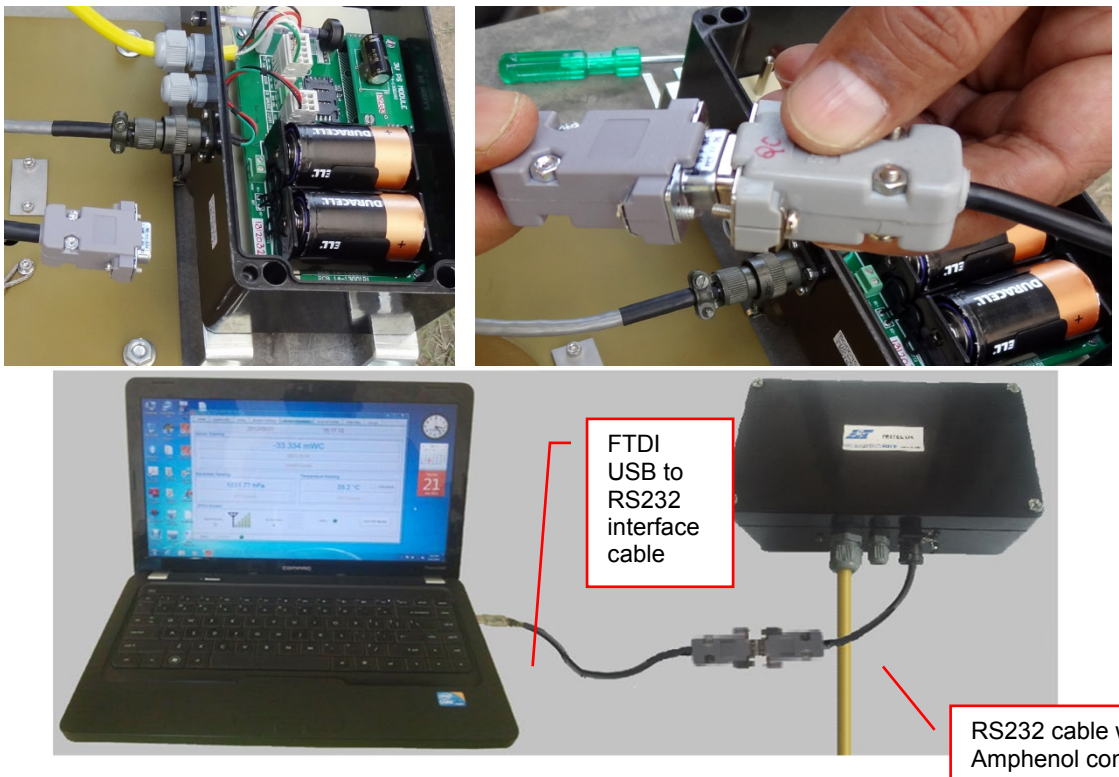


Figure 9-14: ESCL-10VT-BX Datalogger connection to Laptop/PC

third picture of figure 9-13.

Note: The dataloggers to be used with telemetry option, are supplied with an antenna.

- Fix back the cover of dataloger.
- The datalogger and sensor are now ready for connecting to PC.

9.6.27 For connection to PC/Laptop, connect the RS232 cable to the amphenol connector of the datalogger. To this connect the FTDI USB to RS232 cable. Refer to figure 9-14 for details.

9.7 Pre-installation checks and system configuration

9.7.1 Connect the laptop and ESCL-10VT-BX datalogger through the USB to RS232 cable (and RS232 cable with Amphenol connector) provided with the system. Refer to figure 9-15.

9.7.2 Launch the Configuration Manager software in the laptop. Select the correct communication port and connect the datalogger.

Note: Please refer to Section 7 of this manual for complete details on Configuration Manager software.

9.7.3 Check the display message for successful connection of datalogger.

9.7.4 '**System Info'** tab: Check system information by clicking on System Info (this information is automatically taken by application from datalogger. The fields are non-editable).

9.7.5 '**Setup**" tab: To update and configure the datalogger system information, click on the 'Setup' tab. Setup fields can be edited to modify settings.

a) Logger Date/Time section: Update data/time and UTC offset otherwise click Sync with PC.

b) Logger section:

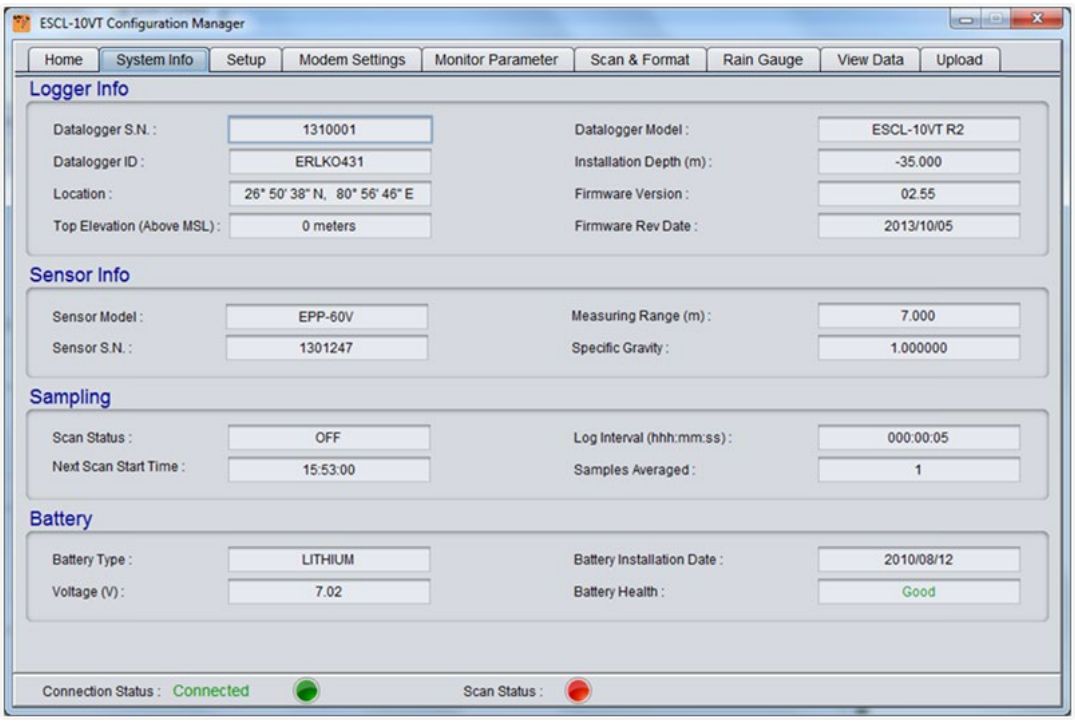


Figure 9-15: EWLR-101 Configuration manager - System Info

- Logger ID: Configuration manager automatically detects the factory set datalogger ID.
- Top elevation: Enter the borehole top position above MSL (Mean Sea Level).

NOTE: The borehole top position should also be checked frequently and corrected for any settlement. A settlement target can be installed near borehole for this purpose.

- Samples Averaged: Datalogger can store readings by averaging the samples from 2 to 250. Keep samples for averaging to 1 in case averaging is not required
- Location: Enter the datalogger installation location coordinates (latitude and longitude)

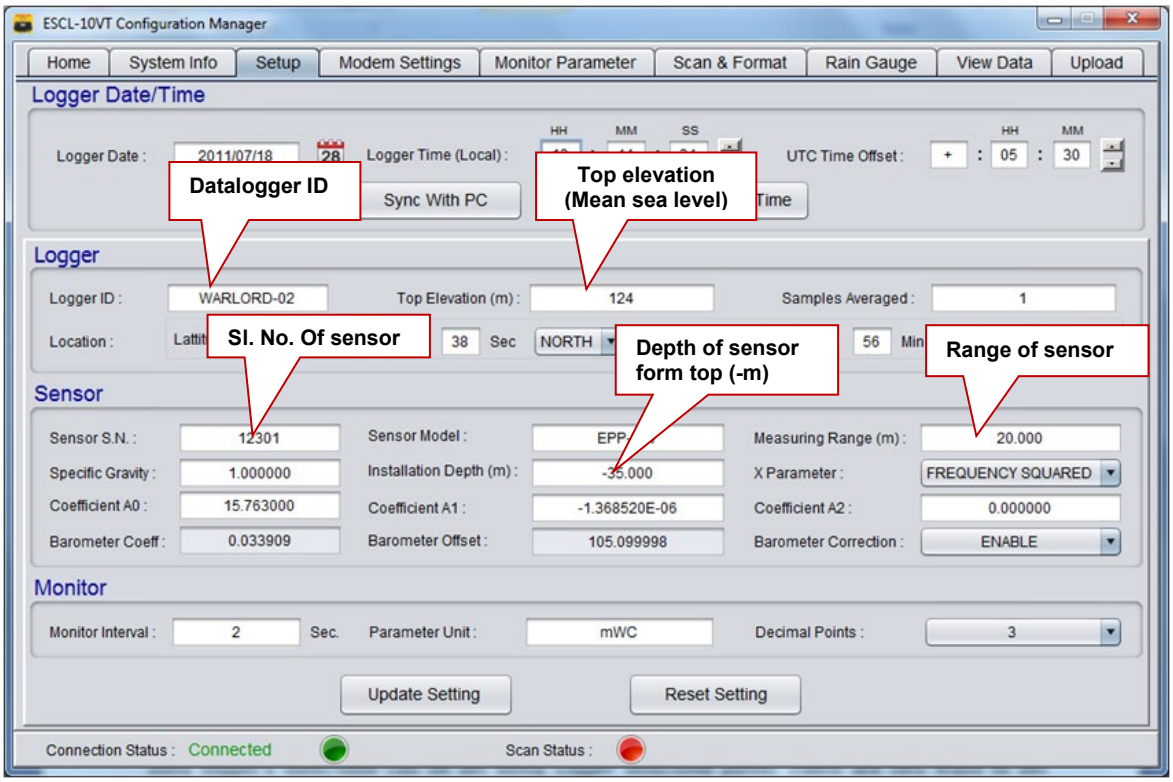


Figure 9-16: EWLR-101Configuration manager – Setup

c) Sensor section:

- Serial number: Enter the sensor serial number, model and measuring range.
- Update the Specific Gravity (standard 1.0) in the specified field.
- Enter Installation Depth as “0”.
- Set X Parameter to “frequency squared”.
- Enter Coefficient A0 as “0”.
- From the sensor test report provided with the system enter the pressure sensor coefficients A1 and A2. In case polynomial correction is not applicable put value of coefficient A2 as “0”.
- The Barometric coefficient and barometric offset are factory set. “Enable” the barometric correction and click on Update setting.

d) Monitor section: All the parameters in this section are factory as shown in figure 9-17

9.7.6 ‘**Monitor Parameter**’ tab: Place sensor vertically at the ground level and click on ’Monitor Parameter’ tab.

a) Wait for the parameter value to stabilize and note this value in the information sheet. This is the value of coefficient A0.

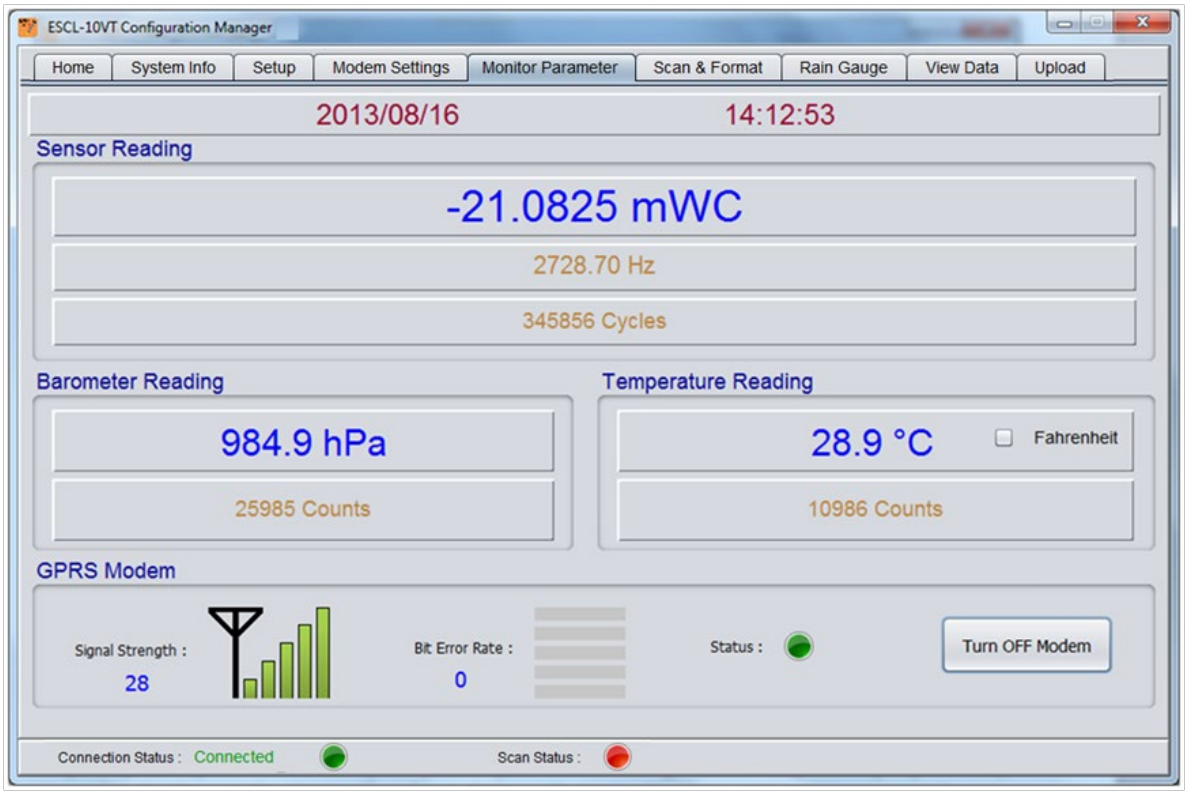


Figure 9-17: EWLR-101 Configuration manager – Monitor Parameter

b) Click on the 'Setup' tab and enter coefficient A0 (with sign reversed) using sensor panel. Press 'Update Setting' to update coefficient.

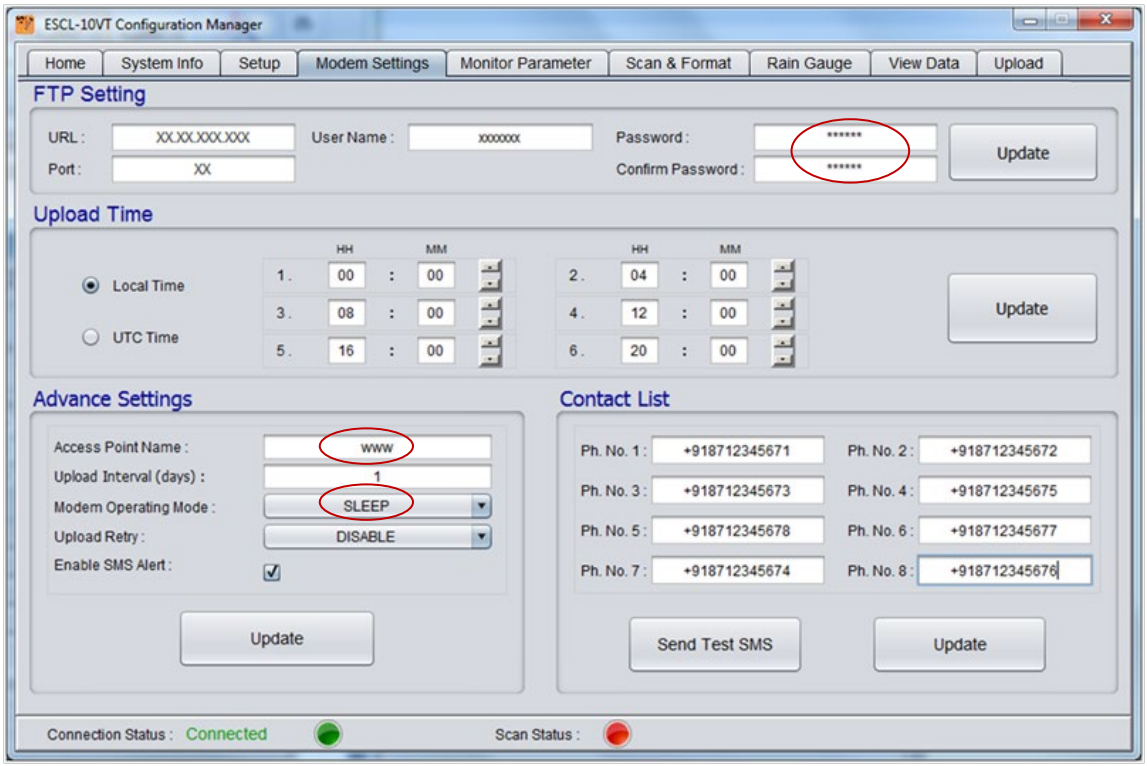


Figure 9-18: EWLR-10 Configuration manager – Modem setting

9.7.7 '**Modem Settings**' tab: In case FTP data upload is required click on 'Modem Settings'. Refer to figure 9-19.

a) FTP settings section: Enter and update the FTP server setting i.e. URL, port, user name and password. These are predefined values in case Encardio-rite FTP server services are being hired. In such case, these parameters are factory set.

b) Upload Time section: Update the upload time schedule for local time or UTC time. Maximum 6 time slots can be set for data upload. The data upload interval can be set from 1 hour to 7 days. Datalogger will automatically upload the data as per the scheduled time in case internet access is available on the laptop. Prefer upload of once a day for longer battery life.

c) Advance Setting section: In case of telemetry option, update details in 'Advance settings' fields;

- Network service provider's APN no. for data enabled internet SIM,
- Data upload interval as required
- Modem operating mode - OFF, Sleep or ON. The preferred option is "Sleep" mode.
- Enable the SMS alert.
- Press 'Update' to update settings

d) Contact List section:. Update the Contact list. (Ensure that SIM is a data SIM and it is activated for SMS also).

9.7.8 '**Scan & Format'** tab: Click on 'Scan and Format' tab.

a) Scan Option section: Set the desired time interval of data scanning either for Short (5 to 250 sec) or Long interval (5 min to 168 hrs).

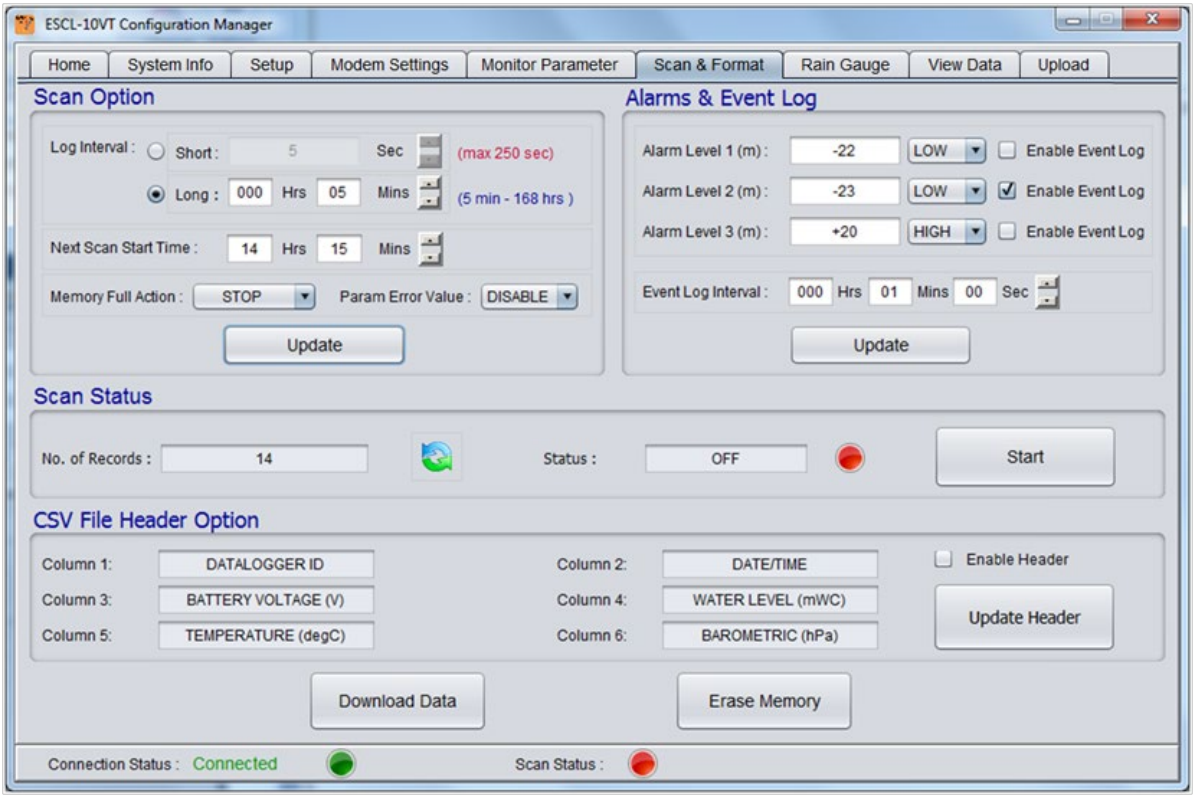


Figure 9-19: EWLR-101 Configuration manager – Scan & Format

b) Alarms & Event Log section: In case required, update alarm levels as required.

9.7.9 Click on '**Home**' tab. A window will appear asking to set the scan off to be "yes" or "no". Select no. 'Home' tab will apear now. Click on "Disconnect Datalogger" and close the application.

9.7.10 Remove the USB to RS232 cable from the datalogger.

9.7.11 Replace the datalogger top cap and tighten the three screws by the 4 mm Allen key.

NOTE: Model ESCL-10VT-BX datalogger has provision to connect a rain gage also. The next tab "**Rain Gauge**" is active in case there is prior information/order to connect raingage. Otherwise, the 'Raingage" tab is disabled.

9.8 Final testing

9.8.1 Allow the sensor to stabilize to water condition. Switch to "Monitor parameter" window. Check the parameter value for desired depth below water level. Record this value.

9.8.2 Switch to "Setup" window. Enter the sensor installation depth {from ground level with (-) sign} in meters in the "Installation depth" field and update settings (as noted earlier in the information sheet).

9.8.3 Switch to "Scan and Format" and verify the desired scan time interval. Select the Scan status to "ON" (initially the Scan time interval can be set short).

9.8.4 Check data download sometime after switching "Scan" to "On" condition. After downloading data can be view in the "View Data" tab.

9.8.5 In case ftp upload is required for the downloaded data, switch to "Upload" option to upload this data at ftp server/site (Internet access required).

9.8.6 In case data retrieval is by telemetry, do following:

a) Insert the data SIM card in the slot given at top of datalogger (in case not done earlier as per **§** 9.4.26).

b) Re-check the modem setting in the Configuration Manager application.

c) Using Encardio-rite WDMS services (Web data monitoring services) data can be viewed online now.

9.8.7 Click on "Scan and Format" page of configuration manager software. Switch off scanning and set time interval of data scanning for Short period 5 sec. Also set the "Next Scan Start Time" to 5 min from current laptop time.

9.8.8 Switch on scanning. Notice "No. of records" will increase as the datalogger scans records. Keep refreshing the window. The records will start decreasing at the set upload time.

9.8.9 Now set the scanning and upload time details to desired value.

10 ESSENTIAL REQUIREMENT FOR INSTALLATION AND MONITORING PERSONNEL

Personnel involved in installation and monitoring must have a background of good installation and monitoring practices and knowledge of water level/table monitoring systems. They must be professionally trained. Persons having no prior experience may find it difficult to carry on with this work. Intricacies involved are such that even if a single essential but apparently minor requirement is ignored or overlooked, the most reliable of instruments and data obtained from them will be rendered useless.

This method statement does not provide for each and every condition in the field that may affect the performance of the instrument. Also, blindly following the method statement will not guarantee success. Sometimes, depending upon field conditions, the personnel will have to consciously depart from the written text and use their knowledge and common sense to find the solution to a particular problem.

Users must ensure that their installation and monitoring personnel have prior training and experience in all operations laid down in this method statement before taking up this installation and monitoring work.

11 QUESTIONNAIRE

What is water table?

What is the mean sea level?

What is Coefficient A0 and how we measure it?

What is Coefficient A1 and how we determine its value?

Why we require updating the water density?

What is the purpose of barometric pressure correction?

How to measure the water level before installation of EWLR-101 system?

What precaution to be taken to safe guard sensor from slipping into borehole?

How to check the signal strength of the communicating modem in datalogger?

Advise in case we require installing the system in a saline water application?

12 TROUBLESHOOTING

System is installed on top of a borehole with pressure sensor installed to measure water table. Once installed, the system can be easily accessed and checked for working and any remedial action in case required.

Maintenance and trouble shooting is to periodically check the data retrieved. Refer to the following list of problems and possible solutions should problems arise. For any additional help, consult factory.

12.1.1 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.

12.1.2 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.

12.1.3 Files not uploading on FTP server

a) Internet connection may not be available.

b) URL or port setting may be incorrect.

c) Check GSM/GPRS 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.

12.1.4 Symptom: Datalogger reading unstable

a) Check battery voltage.

b) Does the readout work with another piezometer? If not, the readout may have a low battery or be malfunctioning. Consult the manual of the readout unit for charging or trouble shooting instructions.

c) Use another readout unit to take the reading.

d) Check if there is a source of electrical noise nearby? General sources of electrical noise are motors, generators, transformers, arc welders and antennas. If so the problem could be reduced by shielding from the electrical noise.

12.1.5 Symptom: Datalogger showing no output

a) Check the connector wiring between datalogger and pressure sensor.

b) Check the pressure sensor, the cable may be cut or crushed? Check the nominal resistance between the two gage leads using an Ohm meter. It should be within 120 - 150 Ohm. The correct value is given in the piezometer test certificate. If the resistance reads infinite or a very high value, a cut in the cable is suspected. If the resistance reads very low (<100 Ohm), a short in the cable is likely.

13 APPENDIX-1 (INFORMATION SHEET)

Date:	
Client Name:	Location:
Order No.:	Invoice No.:
Data Transfer Type:	

Sl. #	Parameter	Details	Remarks
1	Datalogger I.D.		
2	Borehole Location		
3	Location MSL (Mean Sea Level)		
4	Coefficient A1 (from test report)		
5	Coefficient A2 (from test report)		
6	Measured value of Coefficient A0		
7	Depth of Borehole		
8	Measured value of Water level		
10	Depth of sensor below water level		Will depend on the maximum variation in water level
11	Specific gravity of water		Standard is 1.0
11	URL for ftp		
12	Port		
13	APN		Depends on service provider
14	Modem (GPRS signal strength)		