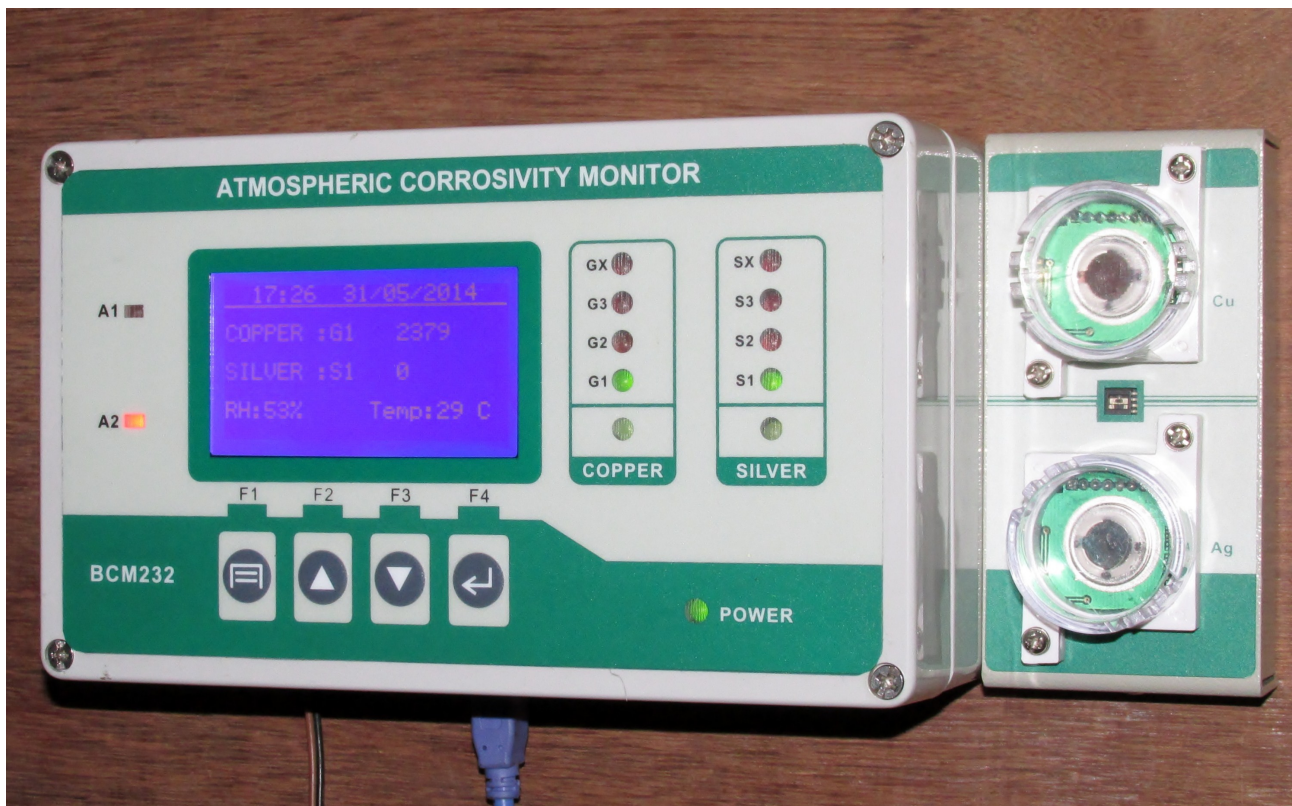


OPERATING INSTRUCTIONS



ATMOSPHERIC CORROSIVITY MONITOR

Model BCM 232

VER-2.60

As per ISA 71.04-2013 Standard

INTRODUCTION:

To protect modern electronic equipment in control rooms, data centers and precious items in museums and archives, the indoor atmosphere needs to be controlled from fluctuations in relative humidity and temperature and also presence of airborne gaseous contaminants.

The ISA 71.04-2013 standard classifies by reactivity monitoring the levels of airborne gaseous contaminants that may affect electronic hardware, control instruments, IT, telecom and data center equipment from corrosion damage.

Close monitoring of the above parameters to ensure that they are within acceptable levels can ensure the reliability of electronic equipment and the preservation of museum and archive items.

The BCM 232 Atmospheric Corrosivity Monitor is designed to fulfill this critical role. It monitors in real time the airborne gaseous contaminants as per the latest ISA 71.04-2013 standards and also relative humidity, temperature and optional room pressure.

TECHNOLOGY:

Levels of airborne gaseous contaminants are measured by reactivity monitoring. Reactivity monitoring has normally been done by laboratory analyses of metal strips exposed to the atmospheric gases for a period of 30 to 90 days. Though this method provides a good indication of the reactivity levels it only reports total corrosion over the period and with a delay of 30 to 90 days. As such it is difficult to pinpoint corrosion events and also does not provide immediate feedback to ensure prompt corrective measures.

The BCM 232 is based on the proven quartz crystal micro balance (QCM) technology which has been in existence for quite some time. It measures the weight gain of corrosion products which build up on the surface of metal coated quartz crystals. This technology is extremely precise and can measure a film build up of less than an Angstrom (\AA 10^{-12} meters), thus providing an immediate feedback of any abnormal situation. This enables prompt identification of the corrosion event and effective corrective action to prevent damage. The BCM232 uses copper and silver coated QCMs to provide a realtime readout of corrosion levels on these two metals.

INCREMENTAL CORROSION:

The corrosion buildup over a period of 24 Hours is measured as **Incremental Corrosion** and is displayed as the ISA71.04 standard categories of G1,G2,G3 and

GX for copper and silver .

STANDARD CORROSION CLASSIFICATION COPPER:

ISA 71.04-2013 STANDARD	BCM CORRELATION	CORROSION EFFECTS
G1: < 300Å / 30 Days	G1: < 10Å / 24 Hrs	MILD : Corrosion is not an issue
G2:< 1000Å / 30 Days	G2: < 33Å / 24 Hrs	MODERATE: Measurable corrosion.
G3:< 2000Å / 30 Days	G3: < 66Å / 24 Hrs	HARSH: High probability of corrosion attack.
GX: > 2000Å / 30 Days	GX: > 66Å / 24 Hrs	SEVERE: Electronic / Electrical equipment not expected to survive.

STANDARD CORROSION CLASSIFICATION SILVER:

ISA 71.04-2014 STANDARD	BCM CORRELATION	CORROSION EFFECTS
G1: < 200Å / 30 Days	G1: < 7Å / 24 Hrs	MILD : Corrosion is not an issue
G2:< 1000Å / 30 Days	G2: < 33Å / 24 Hrs	MODERATE: Measurable corrosion.
G3:< 2000Å / 30 Days	G3: < 66Å / 24 Hrs	HARSH: High probability of corrosion attack.
GX: > 2000Å / 30 Days	GX: > 66Å / 24 Hrs	SEVERE: Electronic / Electrical equipment not expected to survive.

NOTE: BCM will display readings as per BCM CORRELATION values.

CUMULATIVE CORROSION:

The total corrosion buildup since the QCM was installed is displayed as **Cumulative Corrosion** in Angstroms . The QCM sensors can accumulate a cumulative corrosion of 4000Å , at this stage the metal on the QCM surface would have completely corroded .

RELATIVE HUMIDITY:

As relative humidity is a major factor in corrosion , high or fluctuating relative humidity levels can lead to water condensation on metal surfaces. If corrosive gases are present , these would dissolve and form acidic solutions , resulting in accelerated corrosion .It is thus required to ensure that RH levels are moderate and kept constant. RH levels beyond 50% leads to increase of corrosivity catagory to higher levels . The BCM232 measures the relative humidity (RH) level and also the rate of change of RH . Alarms are generated if RH levels go above or below set levels or exceed the preset rate of change .The RH values are logged so that

it can be related to corrosion events .

TEMPERATURE EFFECTS:

Temperature is directly related to the rate of corrosion , higher temperatures would lead to higher rates of corrosion . Also temperature fluctuations lead to water condensation resulting in accelerated corrosion . It is thus required to keep temperature at a reasonable low level and ensure that there are no temperature fluctuations .The BCM232 measures the temperature and also the rate of change of temperature . Alarms are generated if temperature goes above or below set levels or exceed the preset rate of change . The temperature is logged so that it can be related to corrosion events .

As an option the BCM232 can also measure room pressure either through a built-in pressure sensor or an external transmitter . All parameters are displayed on an built in LCD graphical display and logged to internal memory for download to SD Card or a PC using the USB port and supplied software.

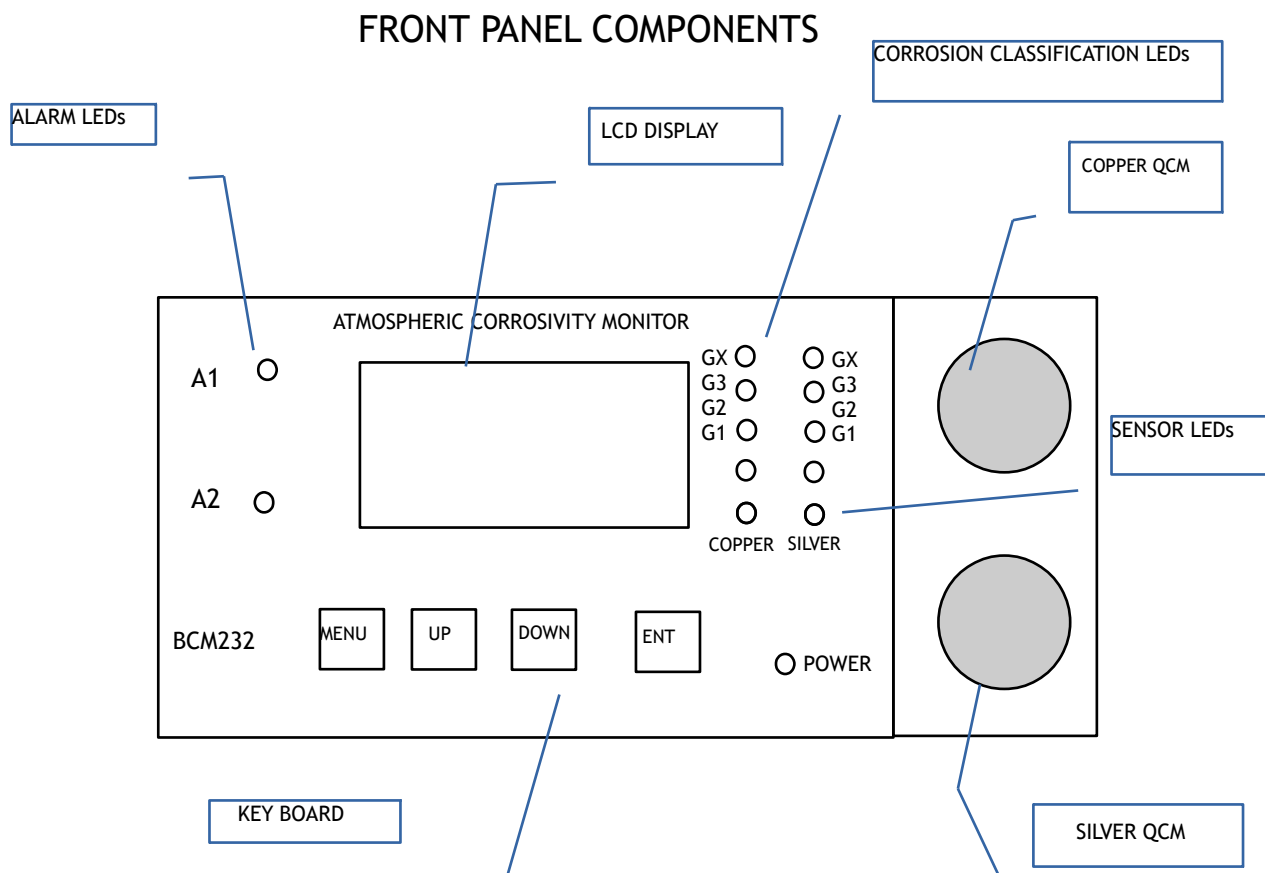
UNPACKING & INSPECTION:**NOTE:**

DO NOT REMOVE THE BCM232 FROM THE SEALED PLASTIC PACKET BEFORE IT IS READY FOR INSTALLATION IN A CONTROLLED ENVIRONMENT, AS THIS MAY DAMAGE / SHORTEN SENSOR LIFE . AFTER OPENING LEAVE THE EQUIPMENT FOR 8-10 Hrs IN THE CONTROLLED ENVIRONMENT TO NORMALISE, BEFORE SWITCHING ON.

The following items are packed along with the unit:

1. BCM232 Unit with the Copper and Silver Sensors installed .
2. 24VDC Power adapter along with AC power cord.
3. USB Cable
4. USB pen drive with BCM Connect software and operation instructions.
5. Two numbers wall mounting brackets with screws .
6. Special screw driver for use with PCB screw terminals.

Visually check for damage and any missing items and immediately report to manufacturer . In case of damage to shipping container inform the carrier immediately .



INSTALLATION:**WARNING:**

The unit contains sensitive electronics components and must not be dropped or mishandled during installation . Please ensure that dust or other particles do not enter the sensor housing during installation .

Mounting:

1. The unit should be wall mounted in a vertical position within the controlled area . Select a suitable position free of vibration and without obstructions which ensures adequate air flow round the unit .
2. Carefully open the unit by unscrewing the four front captive screws , (screws may need to be pulled out fully to open the cover) pull the front cover up slightly and then opening the hinged cover .
3. Fix the two/four wall mounting brackets on the back by inserting the M4 screws from the front slots (after opening the box) and tightening the screws from the front side.
4. Close the front and mark the 4 mounting hole position on the wall , remove the box and keep in a safe place so that dust or other particles does not enter the sensor . Drill the holes , clean the area of dust or metal particles and install the unit .

Power connection:

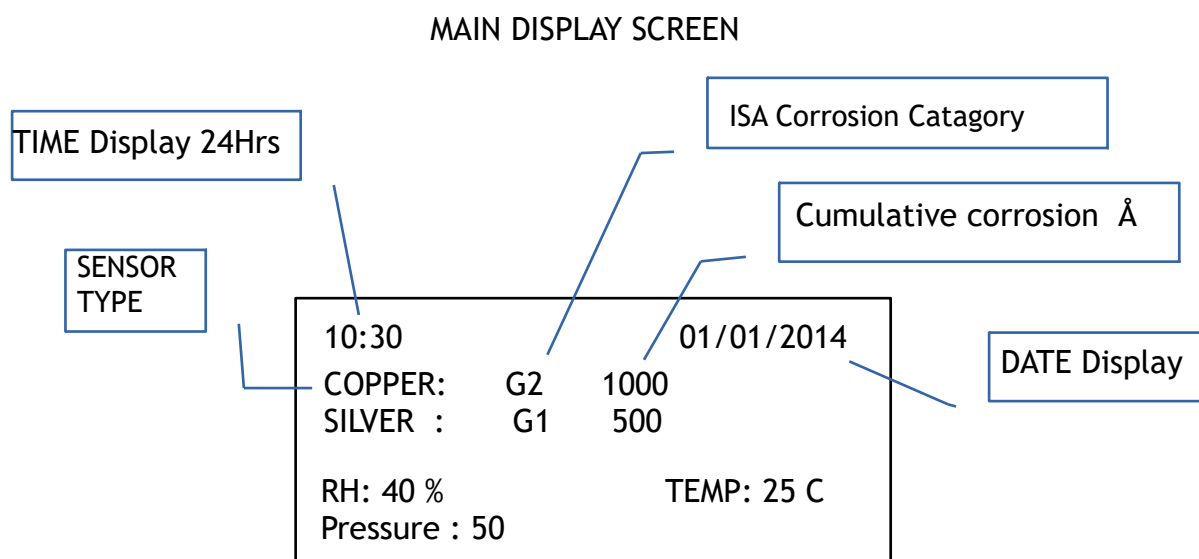
1. The unit can be powered from any DC power supply of 18 to 36 Volts DC / 500 mA .
2. If 24VDC is available at site it can be directly connected to terminal 1 & 2 marked (+) and (-) PWR .
3. An 18V DC / 1A mains adapter is also provided, which can be directly plugged in to the DC power adapters socket on the unit. Plug in the adapter output plug into the socket and connect the AC cord to a 230V AC supply .The power adapter can get quite warm during operation so keep it in an open space.

OPERATION:

Before power ON install the unit at the location where it will be used .On initial power ON the unit checks the sensors and initialises the new sensors , this process takes two hours . The unit should not be powered off or disturbed during this phase in any way . The display indicates 'NEW SENSOR' and 'Initialising/Wait ...' and the sensor LEDs should be flashing amber after some time during this mode . In case a problem is detected with the sensors, the sensor LEDs stay RED and display indicates 'OPEN/FAIL!' Or 'BAD SENSOR' .

After the initialising period of two hours the sensor LEDs should turn GREEN and

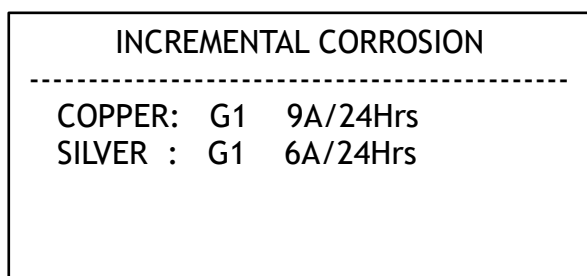
flash every second indicating normal operation. It takes a further 2-3 hours for the first corrosion readings to be calculated and displayed, As the readings indicate incremental corrosion value during the last 24 Hours period, the initial readings may not be accurate and actual reading should only be taken after 24 Hours.



Note: If Pressure option is not selected through the BCM Connect software Pressure will not be displayed.

INCREMENTAL CORROSION DISPLAY:

Incremental corrosion values are displayed on the INCREMENTAL SCREEN in Angstrom / 24 Hours, to view the screen press the [MENU] key.



ALARM DISPLAY:

Alarms are displayed on the ALARM SCREEN and also the A1 & A2 LEDs ,to view the alarm screen press the [MENU] key again .

ALARM SCREEN

RH: HIGH/LOW/RATE
TEMP: HIGH / LOW / RATE
PRES: HIGH / LOW
SENSORS: OKAY / CU-FAIL / AG-FAIL

Press the [MENU] key again to come out of ALARM SCREEN.

The alarm are configuration through the BCMConnect software , the following can be configured:

1. Alarm setpoints.
2. Alarm LED A1 & A2 operation.
3. RELAY operation
4. BUZZER operation .

The buzzer can be acknowledged using the [ENTER] key .

SD CARD COPY SCREEN:

Pressing the [MENU] key again the 'SD CARD COPY MENU' is displayed .

SD CARD COPY MENU

LOG RECORDS: xx

1. All Records [*]

2. Last 10 Days []

3. Last 40 Days []

Insert SD Card -->

[MENU]Exit Copy[ENT]

The 'Log Records' shows the number of log records available.

Three copy options are provided , 1. Copy All log records , 2. Copy last 10 Days log (960 records), 3. Copy last 40 days log (3840 records). The copy options can be selected by using the [UP] or [DOWN] keys.

After selecting the required log copy option . Insert the SD card and press the [ENT] key , the log data would now be copied to the SD Card as a file 'BCMLOG.csv' , if a previous copy of BCMLOG.csv file exists on the SD Card it will be renamed as BACKUP1 or BACKUP2 or BACKUP3 up to three levels. Any error message would also be displayed on the screen if unable to copy .

Note: The SD Card needs to be fully inserted in the slot provided on top , till it locks with a click sound . The card can be removed by pressing in the card again.

PRESSURE INPUT:

A 4-20mA input is also provided to wire an external 4-20mA pressure transmitter. If a two wire transmitter is used a 18V/30mA field supply is also provided to power the transmitter.

For 3 or 4 wire transmitters connect output to terminals marked (+) & (-) .

For 2 wire transmitters connect to terminal (V)supply & (+).

The pressure transmitter options can be configured through the BCM connect software.

ANALOG OUTPUTS:

Four 4-20mA analog outputs are provided, each output can be configured to transmit the following parameters:

RH, Temperature, Pressure, Copper-Incremental/Cum/Catagory , Silver-Incremental/Cum/Catagory.

The outputs can be configured through the BCM connect software.

Engineering units scaling for different parameters:

Sl	Parameter	4 mA	20 mA	Remarks
1	RH	0 %	100 %	Range: 0 to 100% RH
2	Temperature	-10 Deg C	+100 Deg C	Range: -10C to +100C
3	Pressure	0	As set in BCM(1000 max)	Range: 0 to Scale set in BCM
4	Incremental Value	0 Ang/24Hrs	67 Ang/24Hrs	Range: 0Ang/24Hrs to 67 Ang/24 Hrs
5	Cumulative Value	0 Ang	4000 Ang	Range: 0 to 4000 Ang
6	Corrosion Catagory	0 = Not Ready	4= GX	0 = Not ready 1 = G1 2 = G2 3 = G3 4 = GX

Note: DAC1 corresponds to OUTPUT-4 , DAC2 to OUTPUT-3 ,DAC3 to OUTPUT-2 & DAC4 to OUTPUT-1. PLC/DSC should have Isolated analog input card if more than one output is required to be connected.

MODBUS / RS485 Port:

An isolated Rs485 port has been provided to connect to BMS / DCS / PLC or other controller or PC through MODBUS RTU slave protocol .

The modbus register address for the parameters are given below:

Note: Registers values are signed 16 bit integers

4001: Version Number

4002: RH

4003: Temperature

4004: Pressure

4005: Copper Incremental.

4006: Copper Cum

4007: Copper ISA Category.

4008: Silver Incremental.

4009: Silver Cum

4010: Silver ISA Category.

The device slave address and the serial port configuration can be set through the BCMConnect software.

Warning & Error Indications:

The unit provides the following warning / error indications :

1. Date Time not set - A warning indication [!] is displayed before the Date / Time display.

Action reqd: Set the Date/Time through the BCMConnect software .

2. No Battery / Battery fail - A flashing battery symbol would be displayed on the bottom right hand corner of the main screen .

Action reqd: Open the instrument and replace with a new battery type CR2032 .

BCMCONNECT Software:

All functions of the BCM232 can be configured through the BCMConnect windows software .

INSTALLING the USB Driver :

Before installing the BCMConnect software the BCM USB driver needs to be installed on the PC .

Power up the BCM the red LED beside BCM USB connector should be glowing. Connect the BCM and the PC using the USB cable provided , after some time the PC should start installing new hardware device . Provide the USB driver 'mcb2300-vcom' on the USB driver folder of the pendrive when requested by the PC. If required the driver can be manually installed by 'install new driver' option from the device manager.

The unconfigured BCM USB device should be showing as 'Unknown USB device !' right click and select 'Update driver software' and provide the given driver.

Once properly installed a new COM port should have been created in the 'Ports (COM & LPT)' tab of device manager .

The green LED beside the BCM USB connector should now be glowing .

INSTALLING the BCMConnect software:

Open the folder containing the BCMConnect software and double click on the 'Setup' application . The software should now be automatically installed and create a desktop shortcut.

RUNNING the BCMConnect application:

Before running the BCMConnect application always check that the USB cable is connected between the BCM and the PC and the green LED beside the BCM USB connector is ON .

It may take some time for the green LED to light up , please wait till it is ON.

BCMCONNECT software:

On startup the BCMConnect software searches the new BCM COM port created , if port is not found , a warning message is displayed . Shut down the application check USB cable , check that the green LED besides the BCM USB connector is glowing and retry again.

If port is found the COM port number should be displayed on the 'Ports' display. Click the red 'CONNECT' button connection should be established and message 'Wait downloading configuration' should be displayed . The button should now turn green and show 'DISCONNECT'.

The BCMConnect software contains multiple TABs for various functions , each TAB function is explained below:

GENERAL TAB:

This displays the realtime values of the different parameters , and also the A1 & A2 Alarm Status.

RH ALM:

This tab is used to set the RH alarms .

TEMP ALM:

This tab is used to set the Temperature alarms .

PRES ALM:

This tab is used to set the Pressure alarms .

CONFIG TAB:

This tab is used to configure the BCM hardware .

- DAC setup
- Pressure Transmitter setup
- Serial Port Setup
- System Time & Date setup - If time/date is to be updated from PC time /date keep the Update Time check box ticked .

After all the settings have been done press the 'SAVE SETTINGS' button . The new configuration will be uploaded to the BCM and message 'Wait uploading configuration' will be displayed . Wait till uploading is complete .

DATALOG TAB:

The datalog tab is provided to set the log interval and download the logged data to a file and also to plot the data on a chart .

To change the log interval select the Log interval from the dropdown box and press 'SAVE SETTINGS' (Save setting can be done as a final step after doing all the changes in the other tabs).

To clear the stored datalogs 'CLEAR LOG' button can be pressed , a confirmation screen will be displayed and all datalog stored in memory will be deleted.

To download datalog press the 'DOWNLOAD' button , the number of records to download can be entered in the 'Records to Download' box or can be left blank to download all the available records.

A file dialog box would open and request a file name to save the data , enter the file name and folder to save the data . Download files are saved in '.csv ' format and can be opened in excel .

When the data is downloaded the chart is also populated to view the data in a graphical formal .

CLOSE BCMCONNECT:

To close the application click the 'DISCONNECT' button and then the CLOSE [X] button .