

Intellix™ BMT 330

USER MANUAL



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For the latest revision of this manual, visit:
<http://www.gegridsolutions.com/md/catalog/BMT330.htm>

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Related Documents

| # | Document Title |
|---|---|
| 1 | Intellix™ BMT 330 Pre-Installation Information |
| 2 | Intellix™ BMT 330 Installation Manual |
| 3 | Intellix™ BMT 330 Service Manual |
| 4 | Intellix™ BMT 330 commissioning instructions |
| 5 | Intellix™ BMT 330 Modbus registers list |
| 6 | BMT 330 DNP3 Objects & I/O Points Index Customer Guide (GEDE-GA_M-DLIS-TE.CG-049) |
| 7 | BMT 330 IEC61850 Dataset & I/O Points Index Customer Guide (GEDE-GA_M-DLIS-TE.CG-050) |

INTRODUCTION

Product Overview

The Intellix™ BMT 330 is a monitoring system that continuously:

- Measures the condition of transformer bushings (through changes in Capacitance and Power Factor)
- Detects any Partial Discharges (PD) activity in the transformer main tank; (measured as high frequency pulses).

All measurements and alarms can be reported to a remote monitoring centre via either the standard RS485 connection, one of the other communications options, or manually downloaded *in situ*. The Intellix™ BMT 330 is supplied with BMT Setup Software, which is the subject of this user manual.

WARNING

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

WARNING

The Intellix BMT 330 does not require periodic maintenance. However, if the transformer bushings are replaced by a similar bushing then the Bushing Adaptor circuit integrity checks shall be implemented and the bushing nominal parameters updated before the transformer is returned to service. Refer to the Installation manual. If the bushing is replaced by a mechanically and/or electrically different bushing a new Bushing Adaptor will be required.

WARNING

If the transformer bushings are subjected to routine maintenance, then the Bushing Adaptor circuit integrity checks should be implemented before the transformer is returned to service. Refer to the Installation manual.

Scope

This user manual covers the companion BMT Setup Software:

- Its installation on a PC.
- The configuration operations after installation of the Intellix™ BMT 330.

Monitoring of the data is carried out using GE's PERCEPTION software (v1.18.2 or above). Please refer to its own user manual.

Abbreviations & Definitions

| Abbreviation | Meaning |
|-------------------|---------------------------------------|
| CT | Current Transformer |
| Intellix™ BMT 330 | Partial Discharge and Bushing Monitor |
| LOTO | Lock Out, Tag Out procedure |
| PD | Partial Discharge |
| PDI | Partial Discharge Intensity |

Warnings & Cautions

The meaning of symbols used on the Intellix™ BMT 330 device:



Refer to the Instruction Manual to prevent injury or damage to equipment



Hazardous voltages may be present



Primary Protective earth connection



This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, third edition, or a later version of the same standard incorporating the same level of testing requirements.

The meaning of safety messages used in this Instruction Manual:

CAUTION

A procedure, practice, or condition could cause equipment damage or permanent loss of data

WARNING

A procedure, practice, or condition could cause bodily injury or death

Before performing any manipulation with the Intellix BMT 330, ensure you reviewed all the risk associated with the product listed in this manual and the installation manual.

Conventions

Menu items or options displayed on the display screen are represented in the text in bold, for example **Alarm Setup**.

Hierarchy is represented by using ">" between the nodes as *parent > child*, for example **General Information > Transformer > Power System Frequency**.



Technical Specifications

Measurements

| Feature | Value |
|---------------------------------------|---|
| Maximum Bushing Temperature at sensor | 90 deg C (194 deg F) |
| Relative Phase Angle accuracy | 0.01 deg of angle |
| Maximum number of PD measured | 200 PD per cycle (50 to 60Hz) |
| Maximum PD measurable | CAT III. 5Vac rms, 200mA; on each phase |

Environmental

| Feature | Value |
|---|---|
| Cabinet Operating Temperature Range | -40 to +55 deg C (-22 to +131 deg F) |
| When equipped with multi-master comms option | -40 to +55 deg C (-22 to +131 deg F) |
| Operating Humidity Range | 5 to 95% RH, non-condensing |
| Maximum Operating Altitude | 2000m (6500 ft) above sea level |
| Storage Temperature Range | -40 to +85 deg C (-40 to +185 deg F) |
| Minimum Ambient Temperature for Installation and Service Activities | -20 deg C (-4 deg F) |
| Cabinet Protection Level | IP55 |
| Bushing Sensor Protection Level | IP66 |
| Intellix™ BMT 330 Weight | 20 kg (44lb) |
| Bushing Sensor Weight | 350 gm (0.8 lb), typical |
| Bushing Sensor Operating Temperature | -40 to +90 deg C (-40 to +194 deg F) at Bushing Tapping Point |


Power

| Feature | Value |
|---------------------------------|---|
| AC power supply requirement | 100 to 240Vac, 50 to 60Hz, 1.24 to 0.41A |
| Output Relays (quantity 3) | Single Phase Change Over (SPCO), Maximum RATED: 2A @240VAC resistive load, 2A @ 30VDC |
| Fuse (1 each on Live & Neutral) | 10 x 38 mm time delay 500V, 3A |

Type Tests

| Category | Standard | Class/Level | Test |
|----------------------|----------------|-------------|-----------------------------------|
| EMC Emissions | CISPR 11 | A | Radiated & Conducted Emissions |
| | FCC part 15 | A | Radiated & Conducted Emissions |
| | IEC 61000-3-2 | A | Harmonic Current Emissions Limits |
| EMC Immunity | IEC 61000-4-2 | IV | Electrostatic Discharge |
| | IEC 61000-4-3 | III | Electro Magnetic Field Immunity |
| | IEC 61000-4-4 | III | Electrical Fast Transients |
| | IEC 61000-4-5 | III | Surge Immunity |
| | IEC 61000-4-6 | III | Conducted RF Immunity |
| | IEC 61000-4-8 | IV & V | Magnetic Field Immunity |
| | IEC 61000-4-11 | III | Voltage Dips & Interruptions |



| Category | Standard | Class/Level | Test |
|----------------------|----------------------|---|--|
| | IEC 61000-4-12 | X 2.5kV & 1kV | Oscillatory Wave |
| | IEC 61000-3-3 | Pst 10min, Plt 120min | Voltage fluctuations & flicker |
| | IEC 60255-5 | 5kV, 2kV & 500Vdc | Impulse, Dielectric & Insulation resistance testing |
| Environmental | IEC 60068-2-1 | -40 °C | Cold |
| | IEC 60068-2-2 | 55 °C | Dry Heat |
| | IEC 60068-2-6 | 10-500Hz, 1g operation 10-500Hz, 1g endurance | Vibration |
| | IEC 60068-2-30 | 55 °C, 95%RH | Damp Heat |
| | EN 60529 | Enclosure – IP55, Adaptor – IP66 | Degree of Protection |
| Safety | IEC 61010-1 | | 2010 + Corr1 |
| | EN 61010-1 | | 2010 |
| | UL 61010-1 | | 3 rd Edition |
| | CSA C22.2 No 61010-1 |  | This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, third edition, or a later version of the same standard incorporating the same level of testing requirements |

SOFTWARE INSTALLATION

The BMT Setup Software is supplied on a CD. To install the software, load the CD into your PC's DVD/CD drive, and the installer package should run automatically. If the installer does not run automatically, then use Windows Explorer to view the CD's directory structure. Select and double click on "setup.exe" in the root directory of the CD to start the BMT 330 Setup Software installer.

Note: the installation of a third-party run-time library requires the existence of a "My Documents" folder. If this folder does not exist the installation will fail. This error can also happen if your "My Documents" folder is on a network location which is not accessible at installer runtime. This issue can be fixed by assigning the "My Documents" folder. This can be done by either:

- a) Right-click on "My Documents" from the Start Menu or Desktop, select "Properties", and edit the "Target folder location" field; or
- b) Edit the "My Documents" registry location directly. The key value can be found at
HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Explorer\Shell Folders.

If a manual assignment of the "My Documents" folder doesn't solve the issue, then create a temporary user account in Windows and run the installer from that location.

Editing the registry carries inherent risks. Make sure you are familiar with the registry before editing the registry, manually or programmatically. It is highly recommended to create a backup of the registry before modifying it.

CONFIGURATION OF Intellix™ BMT 330

Once the Intellix™ BMT 330 cabinet has been installed and all the sensors connected, the Intellix™ BMT 330 should be configured. Service-level access to the BMT Setup Software is required; please refer to the companion Intellix™ BMT 330 Service Manual and Installation manual for instructions.



ROUTINE USER-LEVEL OPERATIONS WITH Intellix™ BMT 330

Figure 1 shows a general *Single Transformer* installation layout with the sensor connections required for the Intellix™ BMT 330. Figure 2 shows a general *Bank of 3 Single Phase Transformers* general installation layout.

- | | |
|----------------|--|
| CAUTION | <i>The external LED provide information about the Intellix™ BMT 330 status, please refer to APPENDIX 2 – FRONT PANEL LIGHTS</i> |
| WARNING | <i>The transformer will be live during this process. Ensure that you are aware of the safe working area and that the Bushing Adaptor cables are undamaged as far as can be observed before approaching the Intellix™ BMT 330 cabinet</i> |
| WARNING | <i>If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.</i> |
| CAUTION | <i>Before starting the configuration, confirm that all of the Intellix™ BMT 330 sensors have been connected.</i> |
| CAUTION | <i>All user-access activity should take place in ambient temperatures greater than -20 deg C (-4 deg F) to prevent damage to connectors and cabling as they may become brittle at extreme low temperatures.</i> |
| WARNING | <i>Prior any test that requires the removal of the transformer neutral ground, the CT MUST be removed if installed. If so, replace the Neutral CT after the transformer ground has been reconnected.</i> |
| WARNING | <i>During user access: Note that this unit may have more than one source of supply, eg the alarm relays may be from an independent AC supply. Disconnect all supplies at their source before servicing. Apply LOTO protocols.</i> |
| WARNING | <i><u>Do not</u> open the BMT 330 cabinet during rain or snow storms.</i> |

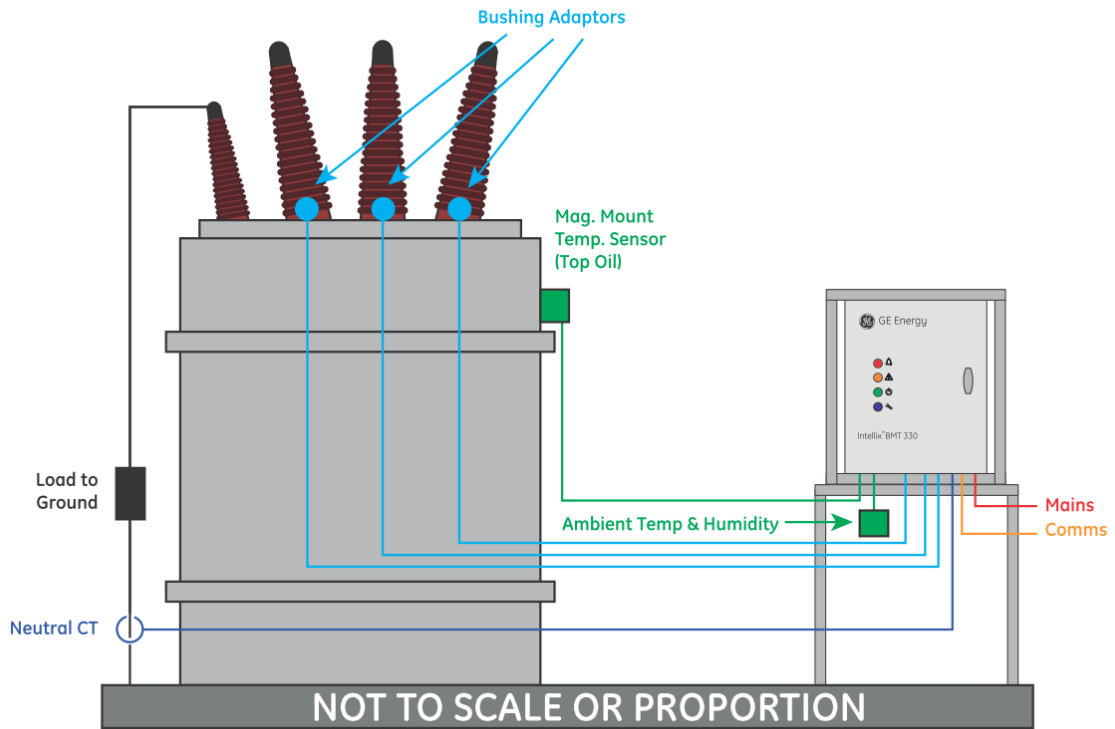


Figure 1: Single Transformer general installation layout

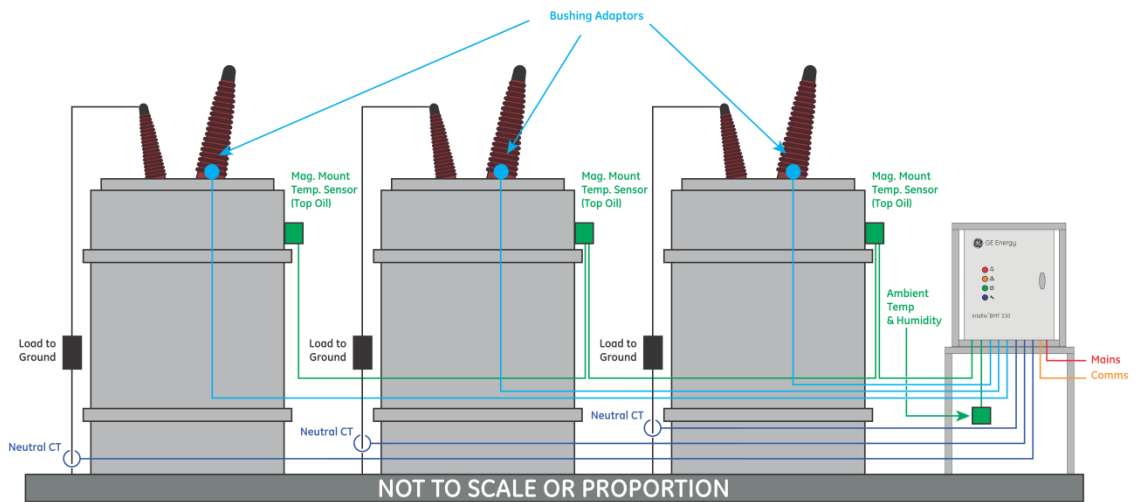


Figure 2: Bank of 3 Single Phase Transformers general installation layout

Connection of PC to Intellix™ BMT 330

The first configuration must be carried out by a direct connection of BMT Setup Software to the Intellix™ BMT 330.

To connect a laptop with the BMT Setup Software directly to the Intellix™ BMT 330 use the provided USB to mini-USB cable to connect your laptop to the mini-USB connector on the Intellix™ BMT 330 motherboard.

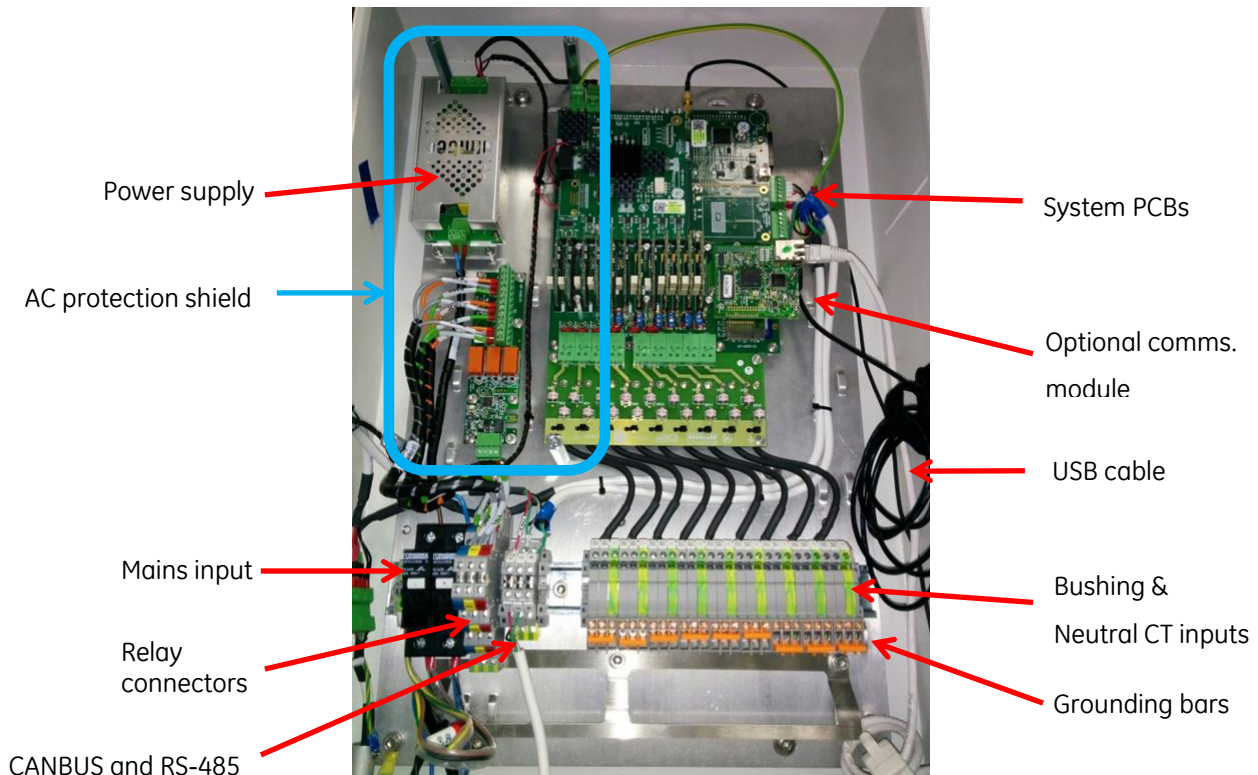


Figure 3 Intellix™ BMT 330 Cabinet Internal Layout

WARNING

The Intellix™ BMT 330 is required to be live during the set up process. Ensure that the following steps are followed precisely to avoid the risk of electric shock.

- Prior to accessing the Intellix™ BMT 330 cabinet, de-energise any AC supplies to the Intellix™ BMT 330 Alarm Relay PCB, and apply LOTO procedures.
- Open the Intellix™ BMT 330 cabinet. Ground the coaxial inputs by operating the bank of grounding bars available at the DIN rail connectors.
- The mini USB socket on the motherboard has an extension cable that is led to the bottom right hand corner of the cabinet (see Figure 3). Connect your laptop to this USB extension cable.

CAUTION

After completion of the software setup of the Intellix™ BMT 330, remove the PC connection by following the above steps in reverse, eg:

- *Remove the PC connection,*
- *Reinstate the Alarm PCB (if applicable),*
- *Unground the coaxial inputs (if applicable),*
- *Close the Intellix™ BMT 330 cabinet,*
- *Re-energise the AC supplies to the Alarm Relay PCB.*

Opening the Setup software

Launch the BMT Setup Software. At the **Communication** page ensure the BMT Setup Software can establish communication with the Intellix™ BMT 330: setup the correct connection and settings and confirm them by pressing the “**Ping**” button. A “Success” message must be returned. Otherwise go to Communication, page 20.

Select the **Access** page; and select the required access level from the drop down as appropriate (**Customer** is the default selection):

- **Customer** requires no password; you can navigate around the side tabs immediately, though you are offered a restricted selection.
- **Service** requires you to sign in using the Service Password Of The Month (Service POTM). Ensure POTM is active. Refer to the Intellix™ BMT 330 Service Manual for the service options available.
- **Factory** requires you to sign in using the Factory POTM. For internal use only.

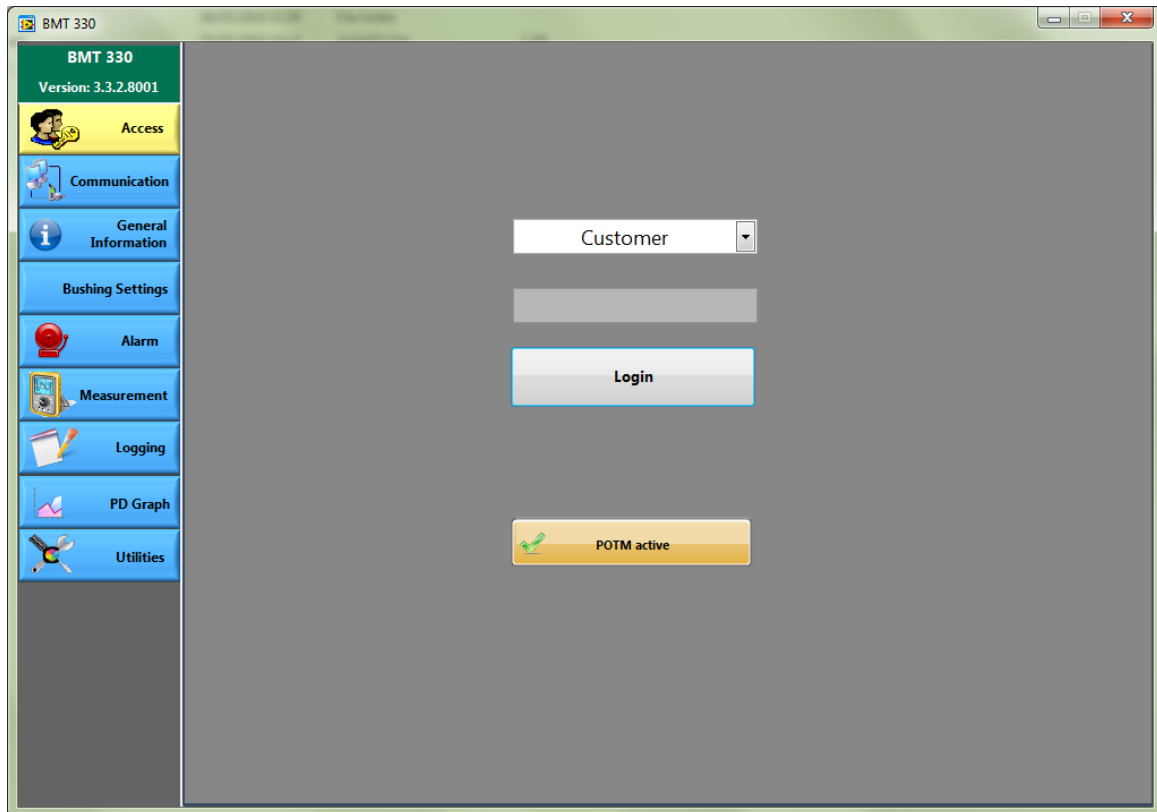


Figure 4: BMT Setup Software Sign On Screen

The available **Customer** pages are:

- [Communication](#) (page 20). This allows alteration of the Intellix™ BMT 330 setup software basic communication settings to communicate with the Intellix™ BMT 330.
- [General Information](#) (page 25). This displays the key serial number for the Intellix™ BMT 330 and the ratings of the monitored transformer.
- [Bushing Settings](#) (page 28). This allows the entry of the basic modelling parameters.
- [Alarm](#) (page 29). This gives allows entry of the alarm thresholds and gives access to and reset of the current alarm status.
- [Measurement](#) (page 47). This displays the current values of the monitored parameters.
- [Logging](#) (page 49). This configures the rate at which data is logged to SD card, and allows manual download of the available data.
- [PD Graph](#) (page 52). This provides a basic graphic interface to the Partial Discharge Phase Resolved (PRPD) data stored in the Intellix™ BMT 330.
- [Utilities](#) (page 55). This configures the communication parameters of the device.

Changing between Intellix™ BMT 330 and Intellix™ BMT 300 units

When the BMT Setup Software opens, it is designed to try to connect to the last Intellix™ BMT unit used. If this connection is no longer available or the user wishes to connect to different unit, then the communication settings for the applicable unit will need to be entered.

If the BMT Setup Software is unable to establish an automatic connection on opening, it will default to the Intellix™ BMT 330 interface.

To subsequently connect to an Intellix™ BMT 300 unit, the communications settings need to be setup and a “**Ping**” (**Communication** page) will return a message stating that the firmware does not match the 3.3 version of the BMT Setup Software. This message indicates that a successful firmware read has occurred and that a restart of the BMT Setup Software should now auto-connect to the Intellix™ BMT 300 unit.

Figure 5 shows the logic steps when changing between Intellix™ BMT330 and Intellix™ BMT 300 units.

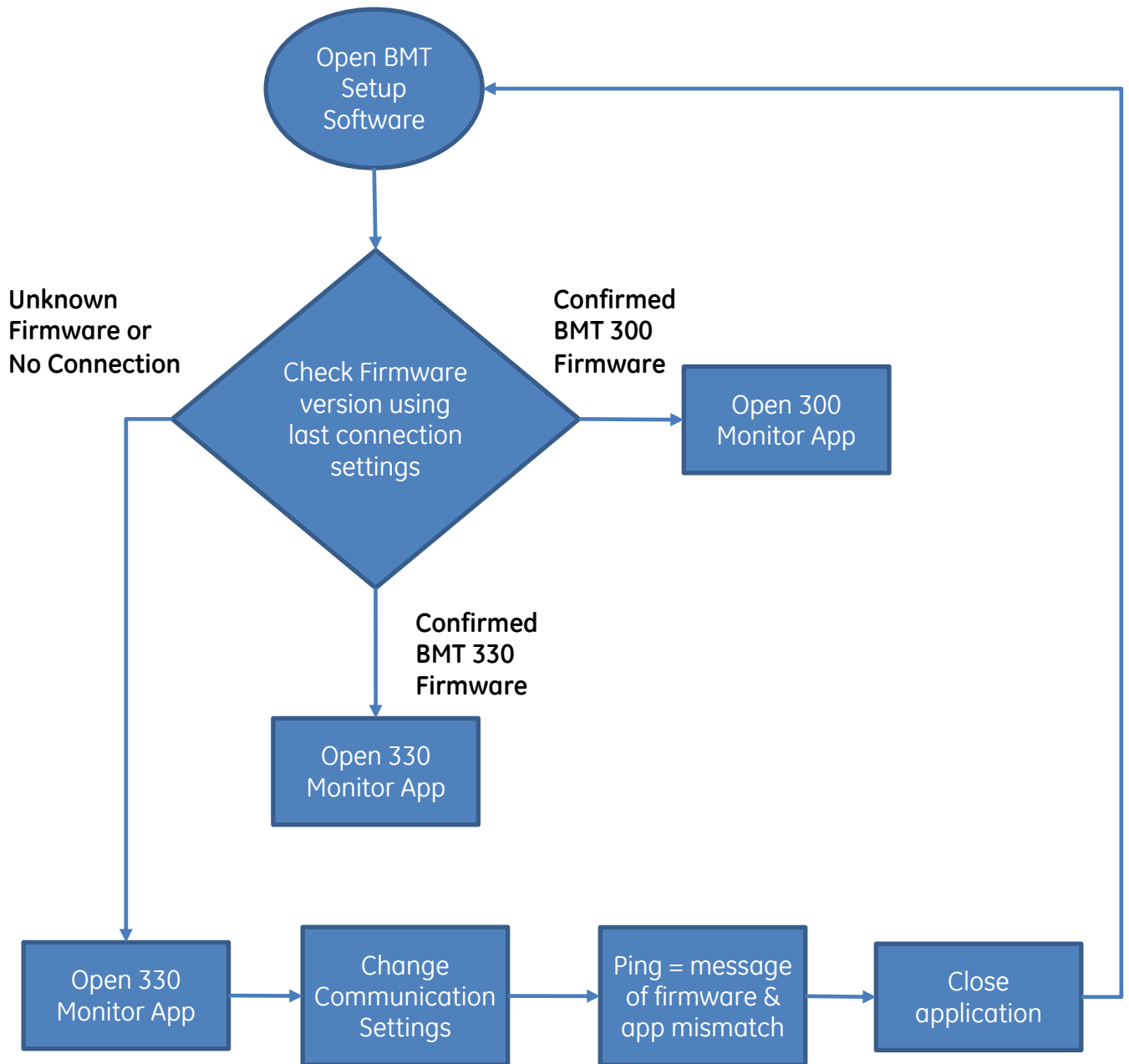


Figure 5: Changing between BMT 330 and BMT 300

Routine Operations with the Intellix™ BMT 330

Most monitoring of the Intellix™ BMT 330 parameters would be carried out by use of the Perception suite software. BMT 330 Setup Software enables you to:

- Update the [bushing settings](#) if one (or more) of the monitored bushings is replaced, go to page 28 for the Bushing Settings.
- [Acknowledge alarms](#), go to page 37 for the Alarm Statuses.
- Change [alarm thresholds](#), go to page 29 for the Alarm Settings.
- View the [instantaneous readings of Intellix™ BMT 330](#) parameters; go to page 47.
- Clear or download the [logged data](#); go to page 50

Maintenance Operations with the Intellix™ BMT 330

Whenever the bushings are serviced, the Bushing Adaptor connections must be checked for continuity and proper connection. Refer to the Installation manual for the full procedure.

The changing of a bushing must be reflected on the bushing configuration as shown in [Bushing Settings](#).

MENU OPERATIONS

Communication

Click on the “**Communication**” page, as shown below.

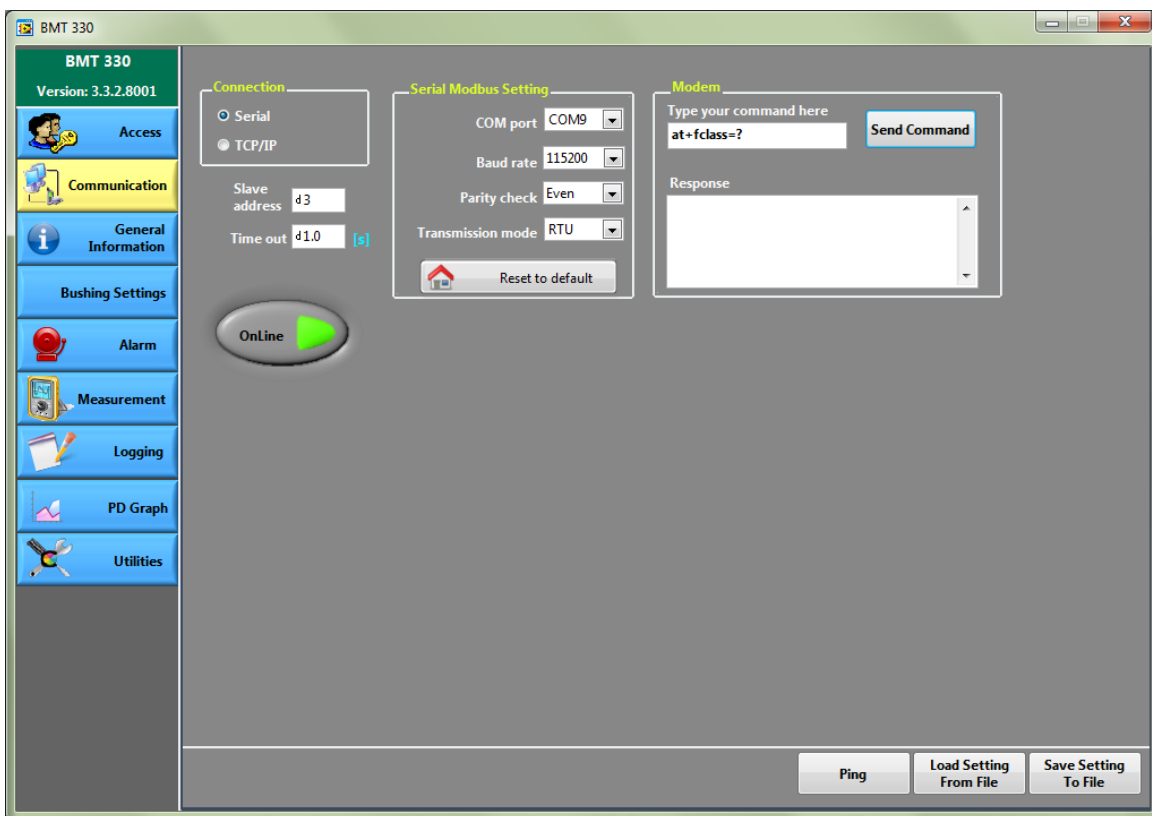


Figure 6: Communication page

Select the suitable settings to establish communication with Intellix™ BMT 330.

Note: Communication over modem requires ASCII transmission mode due to the low speed of the connection.

Note 2: The settings in the “**Communication**” page are used to ensure that the BMT 330 Setup Software is attempting the communication with the correct protocol settings. If it is required that the Modbus protocol settings on the Intellix™ BMT 330 are to be changed, then refer to the Utilities section on page 55. If you change the [Utilities > Modbus Slave Settings](#), then you will have to come back to this “**Communication**” page to enter the new protocol setting for the BMT Setup Software to use.

| Default Serial Settings for Port 1 (RS-485/USB) | |
|---|-------|
| Slave Address | 3 |
| Baud Rate | 9600 |
| Parity Check | Even |
| Transmission Mode | RTU |
| Default Serial Settings for Port 0 (optional Ethernet/Fibre Optic) | |
| Slave Address | 3 |
| Baud Rate | 38400 |
| Parity Check | Even |
| Transmission Mode | RTU |

Table 1: Communication serial default settings

If a serial connection is selected the flow control on the PC side must be off. Please refer to the serial hardware documentation. For a modem this may be done either via AT commands (see below) of the modem driver’s interface.

- To validate the “**Communication**” settings, click the “**Ping**” button.
- Once the settings are confirmed, it is suggested that they are saved for future reference, by pressing the “**Save Setting to File**” button. A Windows File Dialogue will open, to allow you to name the settings file (in configuration, cfg, format) and set the save location, as shown in Figure 7 below.

Note: Most pages/ tabs have a “**Save Setting to File**” button. In each case, it will save just the configuration settings from that page/tab only. The option to save **all** configuration settings in one file requires the “**Service**” Function to obtain access to the **Utilities > Program Settings** tab; refer to the companion Intellix™ BMT 330 Service Manual.



Figure 7: Save “Communication” settings

If there is doubt about the existing “**Communication**” settings, or the “Ping” fails, then the basic Modbus settings can be found by the following method:

- Connect the laptop to the main PCB USB port.
- Use the terminal interface provided in [Utilities > Terminal](#), or alternatively use a third party terminal application, such as Hyperterminal. Note that Hyperterminal is no longer installed by default with Windows 7 or later Windows OS, but it can be freely downloaded.
- If using a third party terminal, configure it as: baud=115200, 8 data bits, No parity, 1 stop bit and Flow Control=none.
- Click on “**Get Modbus Settings**” or enter the command “**mbs**”
- You should get a report like this:

```
CLI>mbs
MODBUS SLAVE SETTINGS
Port: RS485
Address: 3
Baud: 9600
Parity: Even
Protocol: RTU
CLI>
```

Connected 0:06:40 Auto detect 115200 8-N-1

- To reset the communication port to its default click on “**Reset Modbus Settings**” or use “**mbsr**”.

NB: to send commands directly to the modem:

- Use "atd#" to dial a number, where # is the telephone number.
- Some modems require a specific command to open the data connection: "atdt#".
- Use "ath" to terminate the communication. The modem's escape sequence (by default "+++") prior "ath" is usually required whilst connected in data mode.
- The list of supported flow control modes is read by "at&k?". The current mode is read by "at&k?" and set by "at&kN" or "at&k=N", where N is
 - 0 : no flow control
 - 1 : hardware mono-directional flow control (only CTS active)
 - 2: software mono directional flow control (XON/XOFF)
 - 3: hardware bi-direction flow control
 - 4: software bi-directional with filtering
 - 5: pass through (software bi-directional without filtering)
 - 6: both hardware bi-directional and software bi-directional flow control with filtering

NOTE: The AT commands above and flow control modes are widely accepted as standard but may differ for a particular modem. Please refer to the modem documentation.

Notes on Intellix™ BMT 330 communication ports

Two ports (PORT0 and PORT1) are available in Intellix™ BMT 330; see Figure 8. Both ports can be used simultaneously and independently of each other. However some limitations apply when attempting to use more than one master/client per port.

MODBUS on RS485 allows only a single-master at any time. Thus, if more than one master is required to communicate with Intellix™ BMT 330, they must do so sequentially. In particular, the BMT Setup Software keeps the communication port open, once it has been successfully established, to maintain the given access provided by the POTM. The BMT Setup Software must be closed to release the communication port.

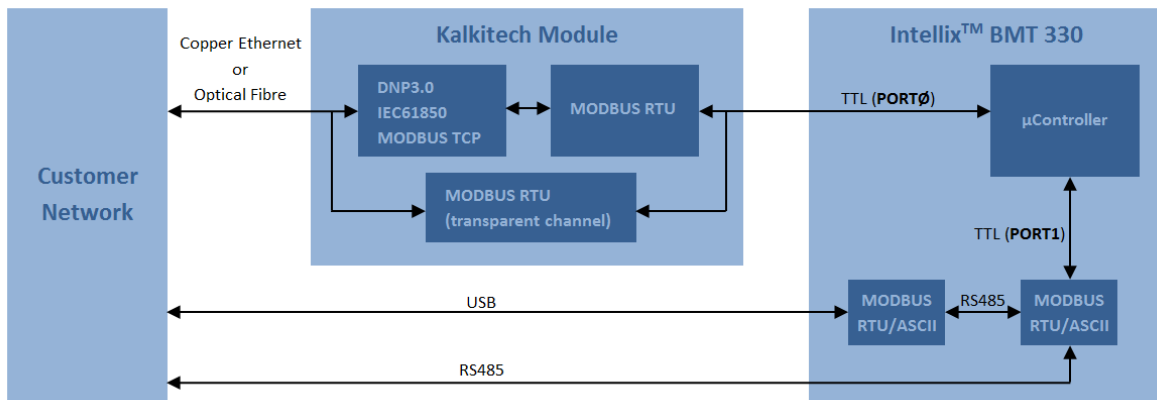


Figure 8: Available communication options between Intellix™ BMT 330 and the customer network

The optional Kalkitech module provides a MODBUS TCP, DNP3.0 or IEC61850 interface on copper or optical fibre physical layer (refer to the BMT330 Installation Manual for the module's setup instructions). These interfaces are multi-master. However the downloading of historical data from the Intellix™ BMT 330 requires a direct connection to Intellix™ BMT 330 via a transparent channel (MODBUS RTU), also provided by the optional Kalkitech module. This transparent channel is a single-master communication port. Simultaneous and independent use of 1) the multi-master MODBUS TCP, DNP3.0 or IEC61850 interface and 2) single-master direct connection via the transparent channel is permitted.

Note that a common communications error occurs when an already open single-master port is attempted to be opened by a second master.

General Information

The General Information Window has 2 tabs:

- Device Information.
- Transformer Rating.

Device Information

The Device Information tab has general identity data fields:

- **Device Serial:** it is a 32 bit unsigned integer (2 Modbus registers). This is greyed out in the “Customer” user access as it is set at the factory and is used by Perception software to identify the device.
- **Device ID:** alphanumeric string, (32 extended ASCII characters). Enter a meaningful name to identify the device.
- **Time zone:** Define the GMT time zone with this drop-down menu.

NOTE: internal time is UTC. Perception uses the Time Zone modifier to adjust for local time.

The button functions are:

- **Sync Time:** synchronises the Intellix™ BMT 330 time to the PC time.
- **Read:** read the current Intellix™ BMT 330 settings into the application.
- **Write/Program:** write the application settings to Intellix™ BMT 330.
- **Load Settings form File:** loads settings for both the “Device Information” and “Transformer Ratings” tabs from file.
- **Save Settings to File:** saves settings from both the “Device Information” and “Transformer Ratings” tabs to file.

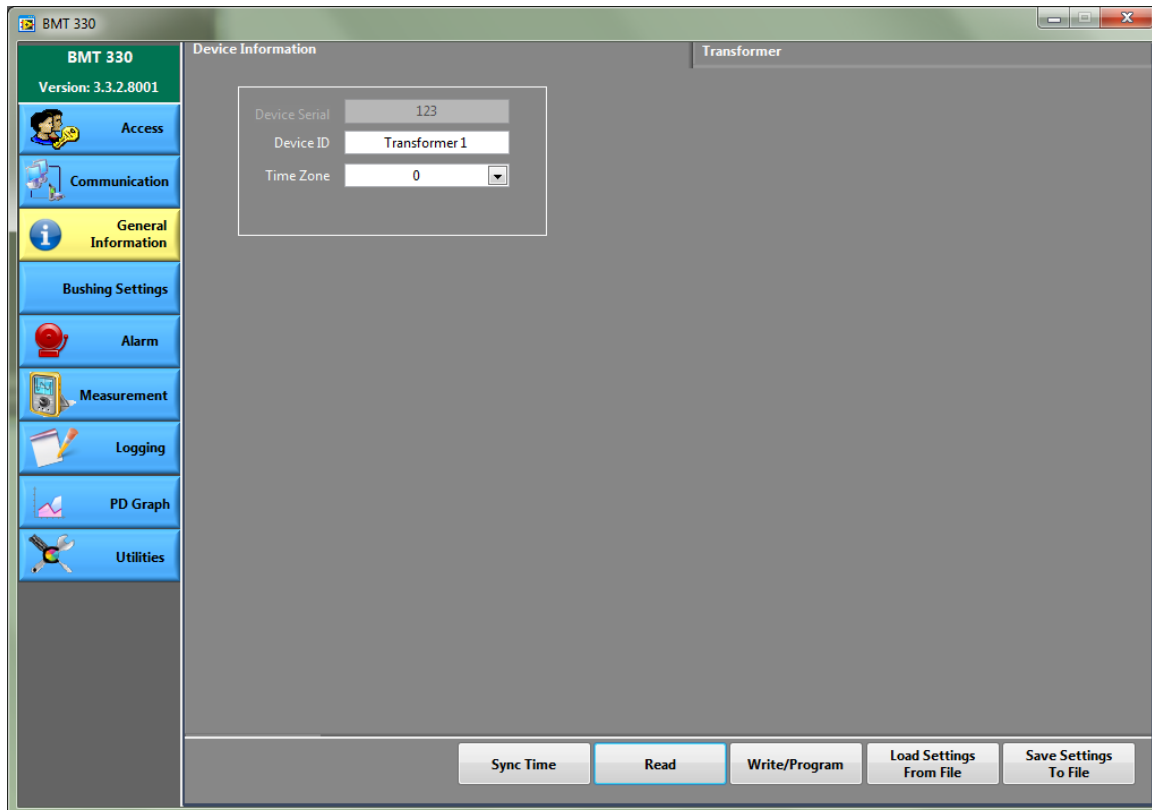


Figure 9: General Information > Device Information tab

Transformer

The Transformer Rating fields to be completed as follows:

- **Transformer Rated primary voltage:** enter the nominal line-to-line voltage (kV). Used to calculate I_{ref}^{HV} . Both primary and secondary voltages can be given as peak-to-ground (amplitude) or RMS. The right unit must be selected from the associated drop-down menu.
- **Transformer Rated secondary voltage:** enter the nominal line-to-line voltage (kV). Used to calculate I_{ref}^{LV} .
- **Neutral type:** select from drop down menu with 2 options: “available”, “not available”. If “available”, PD polarity discrimination is made available in “System Configuration”, refer to the companion Intellix™ BMT 330 Service Manual.
- **Power System frequency:** 50Hz or 60Hz. Used to calculate I_{ref}^{HV} and I_{ref}^{LV} .
- **Transformer type:** select between “single transformer” or “bank of 3 single phase transformers”. Used in the PD discrimination algorithm.

Once all the settings have been entered, press the **“Write/Program”** button to load the settings into the Intellix™ BMT 330. It is advisable to save the configuration file by pressing the **“Save Settings To File”** button.

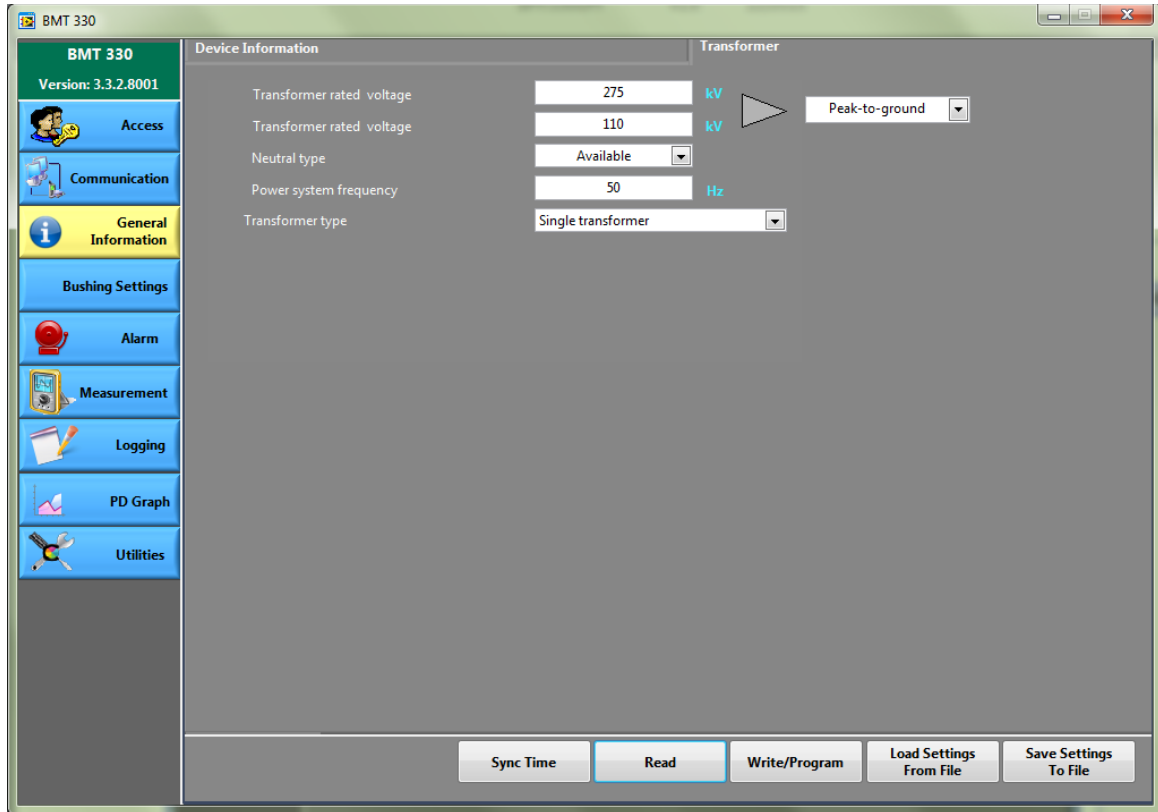


Figure 10: General Information > Transformer Rating tab

Bushing Settings

Used to assign a bushing to each of the Intellix™ BMT 330 inputs. Each bushing profile is configured in **Bushing Settings > Bushing Profiles** (Service access required).

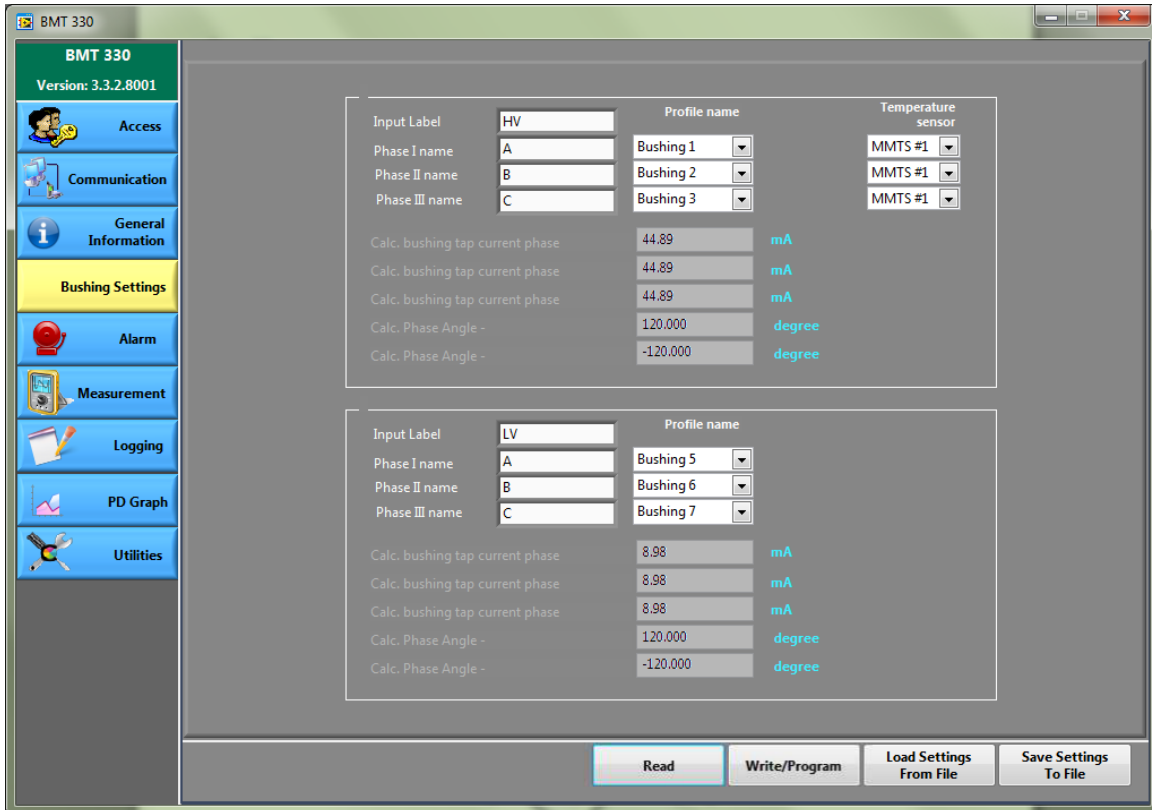


Figure 11: Bushings Settings page

Enter labels for primary and secondary (if applicable) inputs, e.g. "TR1 HV". Enter phase labels, e.g. "U", "V" and "W". Select what bushing is associated to each input. Finally select what temperature is associated to each input for the "bank of 3 single phase transformers" case. The expected currents and inter-phase angles are then displayed in this tab as per the selected bushings. Once the inputs have been configured, press the **"Write/Program"** button to load the settings into the Intellix™ BMT 330. It is advisable to save the configuration file by pressing the **"Save Settings To File"** button.

Alarm

There are 6 tabs in the Alarm page:

- [Alarm Settings](#), go to page 29.
- [System Supervision](#), go to page 31.
- [Partial Discharge](#), go to page 33.
- [Bushing Insulation](#), go to page 35.
- [Alarm Statuses](#), go to page 37. **Note:** If the Alarms are set to “manual acknowledgement” in the **Alarm Settings** tab, then alarms have to be manually acknowledged and reset in this tab.
- [Relay Control](#), go to page 46

Please note that the default alarm values for PD and bushing monitoring are conservative, and therefore may be tight for some transformers. These alarm values should be reviewed when the transformer is energised and again 1 month after Intellix™ BMT 330 has been operational.

Alarm Settings

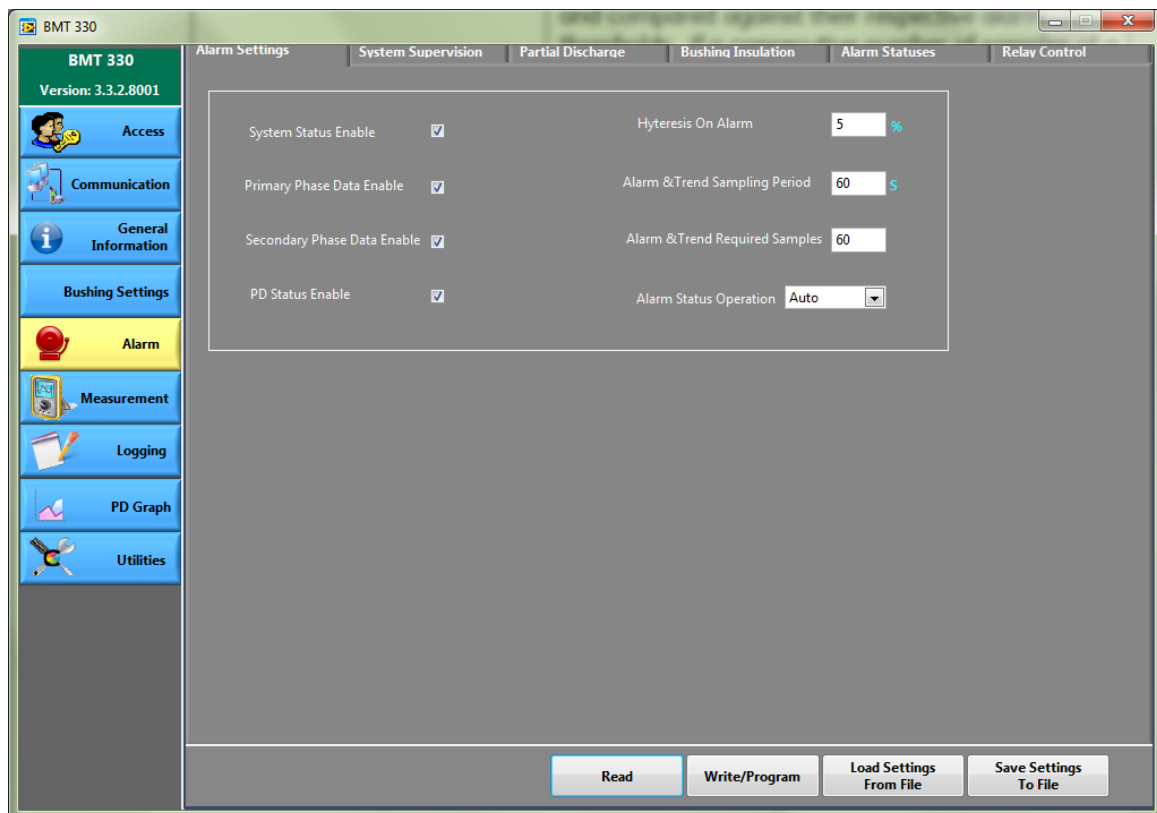


Figure 12: Alarm > Alarm Settings tab



| Parameter | Suggested Value |
|--------------------------------|--|
| System status enable | Checked |
| Primary voltage data enable | Checked |
| Secondary voltage data enable | Checked if secondary set of bushings is monitored, unchecked otherwise. Default is unchecked. |
| PD Status Enable | Checked |
| Hysteresis on alarms | Default is 5%. Alarm triggered if parameter is above threshold. Trigger armed as long as parameter >100-Hysteresis on alarms % of the threshold value. Value is advised to be 10% or less. |
| Alarm & trend sampling period | Default is 60s, allowable range is 0 to 3600s. Period at the end of which the parameters are sampled and compared against their respective alarm thresholds. If a consecutive number of samples of a particular parameter are above its alarm threshold is equal or greater than the Alarm & trend required samples then the alarm trigger is armed (see below). Once the trigger is armed it will not be disarmed until this particular parameter is below its hysteresis-corrected threshold (see above). If the Alarm Status is <i>Auto</i> the alarm will switch off if the trigger is disarmed. If it is <i>Manual</i> the alarm will be on independently of the trigger status until it is acknowledge, at which time the alarm will switch off if the trigger is unarmed. |
| Alarm & trend required samples | Default=60, allowable range is 0 to 3600. Required number of consecutive samples above the given threshold to arm the alarm trigger. See above. |
| Alarm Status operation | Choice of Auto or Manual (see above): Default is Auto. Auto – the alarms switch off once the parameter goes back into the acceptable range. Manual – the alarm is maintained until it is manually acknowledged, see the “Alarm Statuses” tab on page 37 |

Table 2: General Alarm Settings

Once all the settings have been entered, press the **“Write/Program”** button to load the settings into the Intellix™ BMT 330. It is advisable to update the configuration file by pressing the **“Save Settings To File”** button.

System Supervision

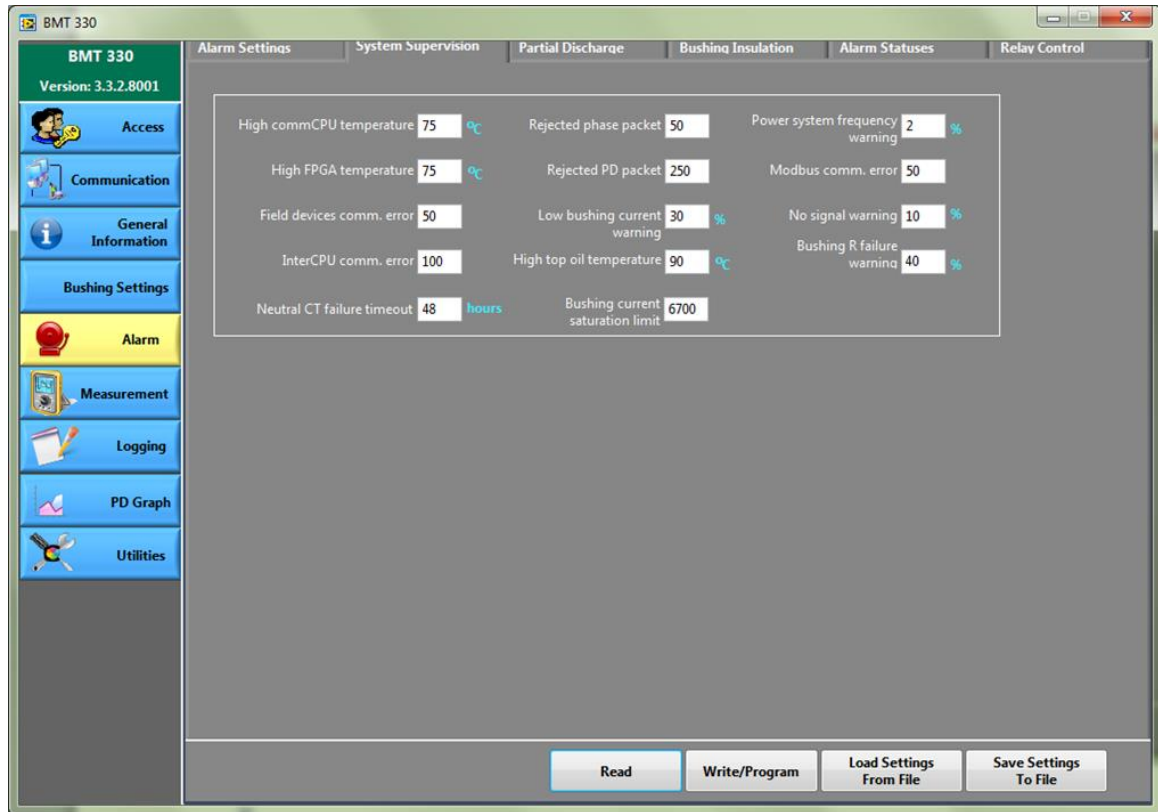


Figure 13: Alarm > System Supervision tab

| Parameter | Suggested Value or Source of Data |
|--|---|
| High Comm CPU temperature (sets the alarm trigger value) | Default= 75 deg C; (usual operating range -40 to 70 deg C) |
| High FPGA temperature (sets the alarm trigger value) | Default= 75 deg C; (usual operating range -40 to 70 deg C) |
| Field devices comm error | Number of continuous failed comms attempts before triggering alarm. Default=50 |
| Inter CPU comm error | Number of continuous failed comms attempts before attempting to recover the inter CPU communication. If unsuccessful the alarm will be triggered. Default=100 |
| Neutral CT failure timeout | Period with PD activity on any phase (A, B or C) but none on the neutral required to trigger alarm. Default=48 hours |

| Parameter | Suggested Value or Source of Data |
|----------------------------------|---|
| Rejected phase packet | Number of continuous failed comms attempts with bushing data before triggering alarm. Default=50. |
| Rejected PD packet | Number of continuous failed comms attempts with PD data before triggering alarm. Default=250 |
| Low bushing current warning | Default 30%. Current % drop from expected current before this service alarm is triggered. |
| High top oil temperature | Default value 90 deg C. Alarm threshold for top oil temperature. |
| Bushing current saturation limit | ADC raw count threshold above which the input signal is no longer linear. Default=6700 |
| Power system frequency warning | Percentage change in nominal frequency which triggers an alarm, default=2% |
| Modbus comm. error | Number of continuous errors in the internal RS485 line which triggers an alarm, default=50 |
| No Signal Warning | Default = 10%. The percentage of I_{ref} below which this alarm is triggered. |
| Bushing R Failure Warning | The percentage increase in bushing adaptor sampling current from one sampling period to the next that triggers an alarm. An increase in current is indicative of a failure in one of the resistors, either in the bushing adaptor or the Intellix™ BMT 330 motherboard input. Default = 40%, to be set according the expected current and the input's load. |

Table 3: System Supervision Alarm Settings

Once all the settings have been entered, press the "**Write/Program**" button to load the settings into the Intellix™ BMT 330. It is advisable to save the configuration file by pressing the "**Save Settings To File**" button.

Partial Discharge

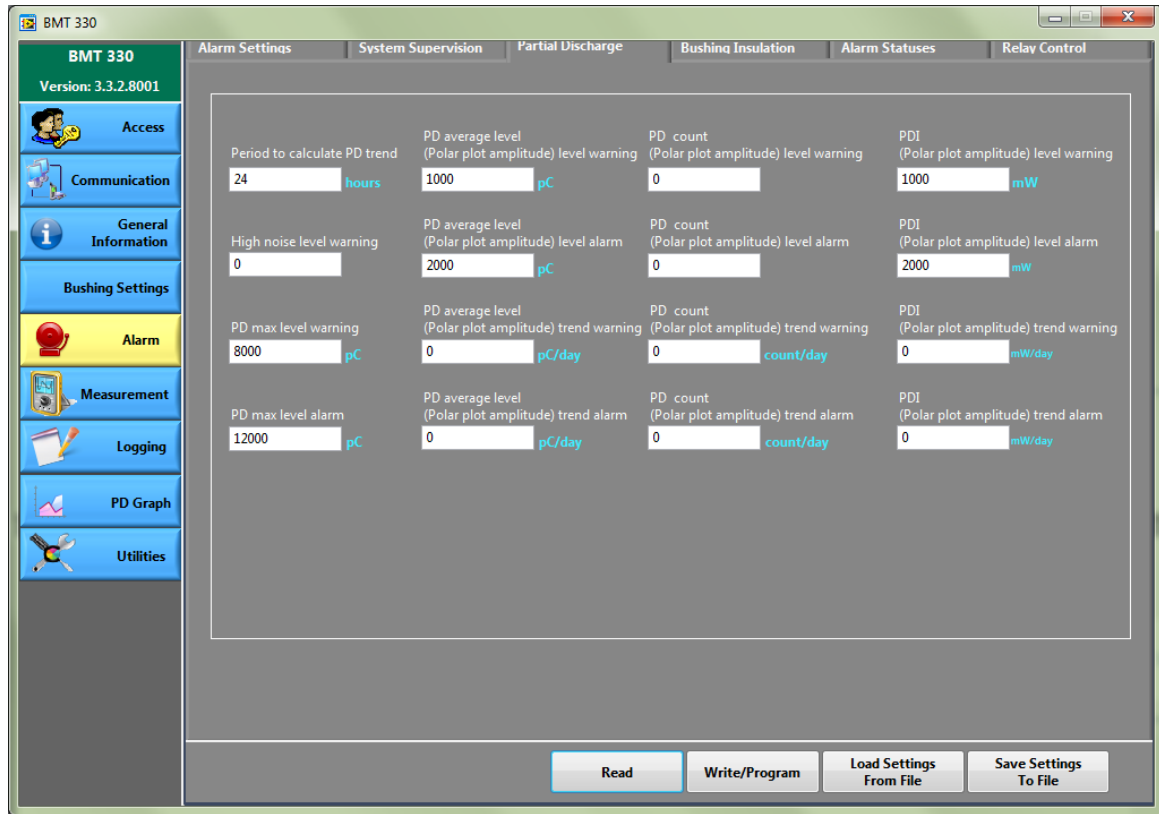


Figure 14: Alarm > Partial Discharge tab

| Parameter | Suggested Value or Source of Data ¹ | |
|--------------------------------|--|------------------------------|
| | Default | Allowable range ² |
| Period to calculate PD trend | 24 h | 0 to 720 |
| High noise level high | 0 (disabled) | 0 to 100 |
| PD max level warning | 8000 pC | 0 to 65000 |
| PD max level alarm | 12000 pC | 0 to 65000 |
| PD average level warning | 1000 pC | 0 to 65000 |
| PD average level alarm | 2000 pC | 0 to 65000 |
| PD average level trend warning | 0 (disabled) | 0 to 65000 |

¹ Alarm limits and settings must be revised a few weeks after installation by customer depending on bushing behaviour.

² Value of zero disables this particular alarm.

| Parameter | Suggested Value or Source of Data ¹ | |
|------------------------------|--|------------------------------|
| | Default | Allowable range ² |
| PD average level trend alarm | 0 (disabled) | 0 to 65000 |
| PD count level warning | 0 (disabled) | 0 to 65000 |
| PD count level alarm | 0 (disabled) | 0 to 65000 |
| PD count trend warning | 0 (disabled) | 0 to 65000 |
| PD count trend alarm | 0 (disabled) | 0 to 65000 |
| PDI level warning | 1000 mW | 0 to 65000 |
| PDI level alarm | 2000 mW | 0 to 65000 |
| PDI trend warning | 0 (disabled) | 0 to 65000 |
| PDI trend alarm | 0 (disabled) | 0 to 65000 |

Table 4: Partial Discharge Alarm Settings

Bushing Insulation

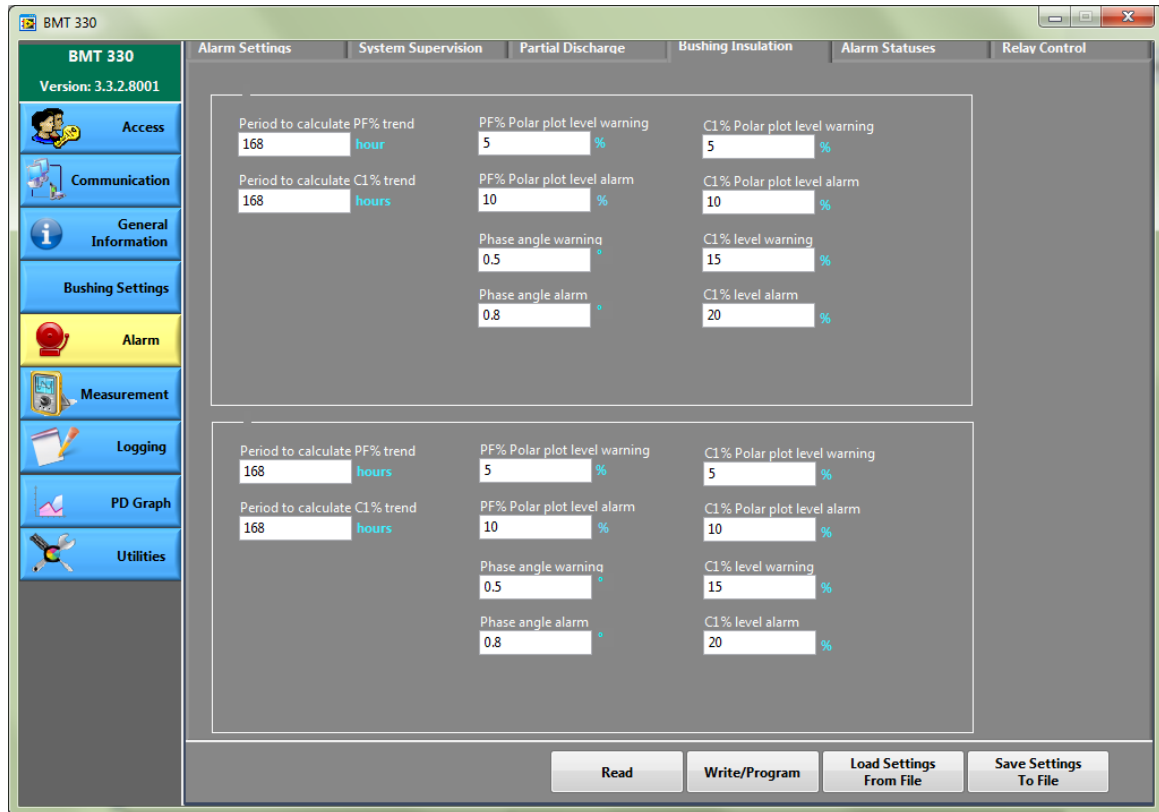


Figure 15: Alarm > Bushing Insulation tab

Enter settings for Primary bushings:

| Parameter | Suggested Value for both Primary & Secondary ³ | |
|-------------------------------|---|------------------------------|
| | Default | Allowable range ⁴ |
| Period to calculate PF% trend | 168h | 0 to 720 h |
| Period to calculate C1% trend | 168h | 0 to 720 h |
| PF% Polar plot level warning | 150% | 0 to 600% |
| PF% Polar plot level alarm | 200% | 0 to 600% |
| Phase angle warning | 0.5° | 0 to 10° |
| Phase angle alarm | 0.8° | 0 to 10° |

³ Alarm limits and settings must be revised few weeks after installation by customer depending on bushing behaviour.

⁴ Value of zero disables this particular alarm.



| Parameter | Suggested Value for both Primary & Secondary ³ | |
|------------------------------|---|------------------------------|
| | Default | Allowable range ⁴ |
| C1% Polar plot level warning | 5% | 0 to 100 % |
| C1% Polar plot level alarm | 10% | 0 to 100 % |
| C1% level warning | 15% | 0 to 100 % |
| C1% level alarm | 20% | 0 to 100 % |

Table 5: Bushing Insulation Alarm Settings

After entering settings for Primary bushings, repeat procedure and enter settings for Secondary bushings if applicable.

Write the alarm settings to the Intellix™ BMT 330 by pressing the **"Write/Program"** button. It is advisable to save the configuration file by pressing the **"Save Settings To File"** button.

Alarm Statuses

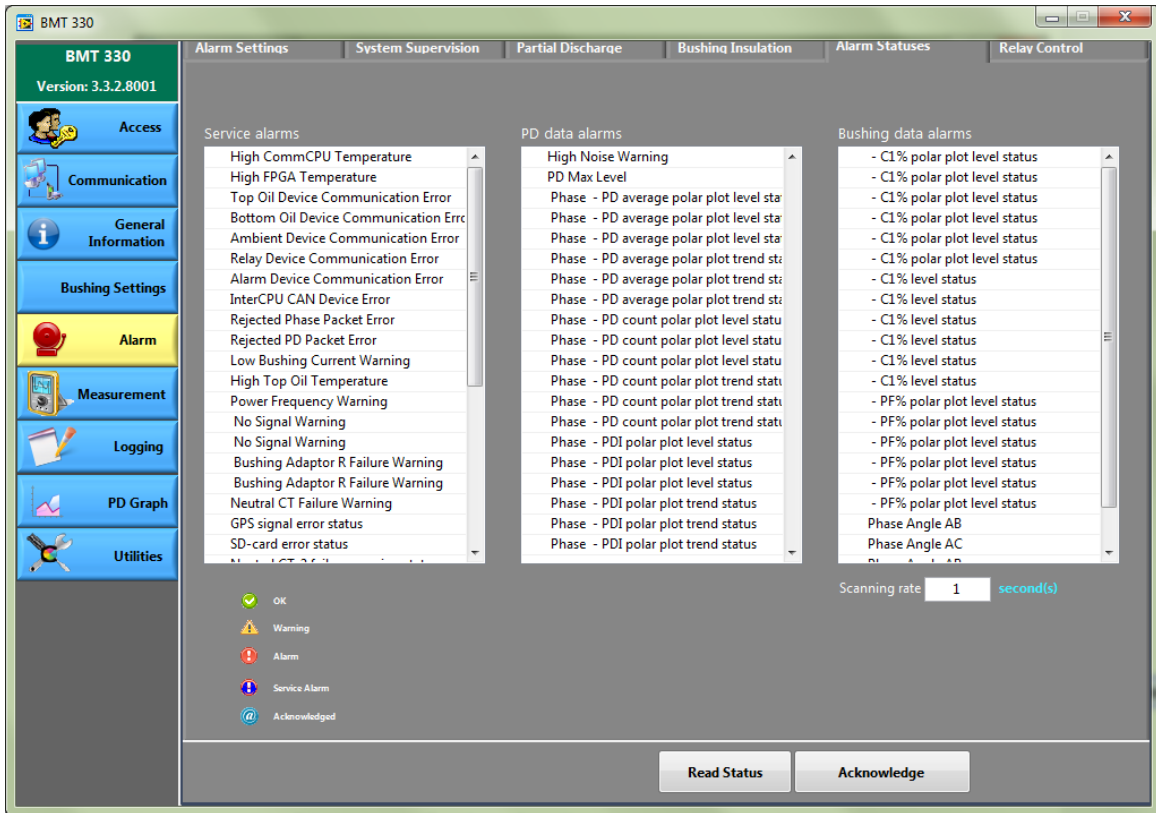


Figure 16: Alarm Statuses tab

The **Alarm Statuses** tab indicates the current status of all alarms. The individual alarms can be selected in normal Windows manner (CTRL+ click for multiple selections). The actions are:

- **Read Status** – refreshes the alarm status screen.
- **Acknowledge** – Acknowledges the selected alarms, but leaves them at their current status as given by the alarm trigger state (see Alarm Settings)

Service alarms

The following events will trigger a service alarm:

| Service Alarm | Description |
|--------------------------|--|
| High CommCPU Temperature | Comm CPU temperature is above the given threshold (see High Comm CPU temperature in Table 3) |
| High FPGA Temperature | FPGA temperature is above the given threshold (see High FPGA temperature in Table 3) |



| | |
|---------------------------------------|---|
| Top Oil Device Communication Error | Intellix™ BMT 330 cannot communicate with the Top Oil #1 magnetically mounted temperature sensor (see Field devices comm error in Table 3) |
| Bottom Oil Device Communication Error | Intellix™ BMT 330 cannot communicate with the optional Bottom Oil magnetically mounted temperature sensor (see Field devices comm error in Table 3) |
| Ambient Device Communication Error | Intellix™ BMT 330 cannot communicate with the ambient relative humidity and temperature sensor (see Field devices comm error in Table 3) |
| Relay Device Communication Error | Intellix™ BMT 330 cannot communicate with the relay board (see Field devices comm error in Table 3) |
| Alarm Device Communication Error | Intellix™ BMT 330 cannot communicate with the door mounted LED board (see Field devices comm error in Table 3) |
| InterCPU CAN Device Error | Communication between the 2 Intellix™ BMT 330 CPUs cannot be established (see Inter CPU comm error in Table 3) |
| Rejected Phase Packet Error | Bushing monitoring data could not be delivered from the FPGA to the main CPU (see Rejected phase packet in Table 3) |
| Rejected PD Packet Error | PD data could not be delivered from the FPGA to the main CPU (see Rejected PD packet in Table 3) |
| Low Bushing Current Warning | One or more of the measured input currents has dropped below a given threshold (see Low bushing current warning in Table 3) |
| High Top Oil Temperature | Top Oil #1 temperature is above a given threshold (see High top oil temperature in Table 3) |
| Power Frequency Warning | The measure power frequency has deviation beyond a given threshold (see Power system frequency warning in Table 3) |

| | |
|---|--|
| Primary No Signal Warning | One or more of the measured Primary input currents is below a given threshold (see No Signal Warning in Table 3) |
| Secondary No Signal Warning | One or more of the measured Secondary input currents is below a given threshold (see No Signal Warning in Table 3) |
| Primary Bushing Adaptor R Failure Warning | One or more of the measured Primary input currents has suddenly changed by more than a given threshold (see Bushing R Failure Warning in Table 3) |
| Secondary Bushing Adaptor R Failure Warning | One or more of the measured Secondary input currents has suddenly changed by more than a given threshold (see Bushing R Failure Warning in Table 3) |
| Neutral CT Failure Warning | Whilst PD events have been detected by the Primary input, no PD event has been picked up by the Neutral CT #A for a given period of time (see Neutral CT failure timeout in Table 3) |
| GPS Signal Error Status | No signal is being received from the GPS |
| SD-Card Error Status | Read/write operations with the internal SD card fail |
| Neutral CT-2 Failure Warning Status | Whilst PD events have been detected by the Primary input, no PD event has been picked up by the Neutral CT #B for a given period of time (see Neutral CT failure timeout in Table 3) |
| Neutral CT-3 Failure Warning Status | Whilst PD events have been detected by the Primary input, no PD event has been picked up by the Neutral CT #C for a given period of time (see Neutral CT failure timeout in Table 3) |
| High Top Oil Temperature-2 Warning Status | Top Oil #2 temperature is above a given threshold (see High top oil temperature in Table 3) |



| | |
|---|--|
| High Top Oil Temperature-3 Warning Status | Top Oil #3 temperature is above a given threshold (see High top oil temperature in Table 3) |
| High Top Oil Temperature-4 Warning Status | Top Oil #4 temperature is above a given threshold (see High top oil temperature in Table 3) |
| Top Oil Device-2 Communication Error Status | Intellix™ BMT 330 cannot communicate with the Top Oil #2 magnetically mounted temperature sensor (see Field devices comm error in Table 3) |
| Top Oil Device-3 Communication Error Status | Intellix™ BMT 330 cannot communicate with the Top Oil #3 magnetically mounted temperature sensor (see Field devices comm error in Table 3) |
| Top Oil Device-4 Communication Error Status | Intellix™ BMT 330 cannot communicate with the Top Oil #4 magnetically mounted temperature sensor (see Field devices comm error in Table 3) |
| Primary A – Current Saturation | Primary A input is saturated (see Bushing current saturation limit in Table 3) |
| Primary B – Current Saturation | Primary B input is saturated (see Bushing current saturation limit in Table 3) |
| Primary C – Current Saturation | Primary C input is saturated (see Bushing current saturation limit in Table 3) |
| Secondary A – Current Saturation | Secondary A input is saturated (see Bushing current saturation limit in Table 3) |
| Secondary B – Current Saturation | Secondary B input is saturated (see Bushing current saturation limit in Table 3) |
| Secondary C – Current Saturation | Secondary C input is saturated (see Bushing current saturation limit in Table 3) |

PD data alarms

PD events are monitored from the Primary input only. The following warnings/alarms may be triggered.

| PD data alarm | Description |
|--|---|
| High Noise Warning | Calculated PD noise is above a given threshold (see High noise level high in Table 4) |
| PD Max Level | PD Max is above a given threshold (see PD max level warning and PD max level alarm in Table 4) |
| Primary Phase A – PD Average Polar Plot Level Status | The PD apparent charge for Primary A in the polar plot is above a given threshold (see PD average level warning and PD average level alarm in Table 4) |
| Primary Phase B – PD Average Polar Plot Level Status | The PD apparent charge for Primary B in the polar plot is above a given threshold (see PD average level warning and PD average level alarm in Table 4) |
| Primary Phase C – PD Average Polar Plot Level Status | The PD apparent charge for Primary C in the polar plot is above a given threshold (see PD average level warning and PD average level alarm in Table 4) |
| Primary Phase A – PD Average Polar Plot Trend Status | The PD apparent charge change for Primary A in the polar plot is above a given threshold (see Period to calculate PD trend, PD average level trend warning and PD average level trend alarm in Table 4) |
| Primary Phase B – PD Average Polar Plot Trend Status | The PD apparent charge change for Primary B in the polar plot is above a given threshold (see Period to calculate PD trend, PD average level trend warning and PD average level trend alarm in Table 4) |
| Primary Phase C – PD Average Polar Plot Trend Status | The PD apparent charge change for Primary C in the polar plot is above a given threshold (see Period to calculate PD trend, PD average level trend warning and PD average level trend alarm in Table 4) |



| PD data alarm | Description |
|--|---|
| Primary Phase A – PD Count Polar Plot Level Status | The PD count for Primary A in the polar plot is above a given threshold (see PD count level warning and PD max level alarm in Table 4) |
| Primary Phase B – PD Count Polar Plot Level Status | The PD count for Primary B in the polar plot is above a given threshold (see PD count level warning and PD max level alarm in Table 4) |
| Primary Phase C – PD Count Polar Plot Level Status | The PD count for Primary C in the polar plot is above a given threshold (see PD count level warning and PD max level alarm in Table 4) |
| Primary Phase A – PD Count Polar Plot Trend Status | The PD count change for Primary A in the polar plot is above a given threshold (see Period to calculate PD trend, PD count trend warning and PD count trend alarm in Table 4) |
| Primary Phase B – PD Count Polar Plot Trend Status | The PD count change for Primary B in the polar plot is above a given threshold (see Period to calculate PD trend, PD count trend warning and PD count trend alarm in Table 4) |
| Primary Phase C – PD Count Polar Plot Trend Status | The PD count change for Primary C in the polar plot is above a given threshold (see Period to calculate PD trend, PD count trend warning and PD count trend alarm in Table 4) |
| Primary Phase A – PDI PolarPlot Level Status | The PDI for Primary A in the polar plot is above a given threshold (see PDI level warning and PDI level alarm in Table 4) |
| Primary Phase B – PDI Polar Plot Level Status | The PDI for Primary B in the polar plot is above a given threshold (see PDI level warning and PDI level alarm in Table 4) |
| Primary Phase C – PDI Polar Plot Level Status | The PDI for Primary C in the polar plot is above a given threshold (see PDI level warning and PDI level alarm in Table 4) |
| Primary Phase A – PDI Polar Plot Trend Status | The PDI change for Primary A in the polar plot is above a given threshold (see Period to calculate PD trend, PDI trend warning and PDI trend alarm in Table 4) |

| PD data alarm | Description |
|---|--|
| Primary Phase B – PDI Polar Plot Trend Status | The PDI change for Primary B in the polar plot is above a given threshold (see Period to calculate PD trend, PDI trend warning and PDI trend alarm in Table 4) |
| Primary Phase C – PDI Polar Plot Trend Status | The PDI change for Primary C in the polar plot is above a given threshold (see Period to calculate PD trend, PDI trend warning and PDI trend alarm in Table 4) |

Bushing data alarms

The following warnings/alarms may be triggered by bushing monitoring events.

| Bushing data alarm | Description |
|---|--|
| Primary Phase A – C1% Polar Plot Level Status | The C1% polar plot amplitude is above a given threshold on an area defined by Primary A (see C1% Polar plot level warning and C1% Polar plot level alarm in Table 5) |
| Primary Phase B – C1% Polar Plot Level Status | The C1% polar plot amplitude is above a given threshold on an area defined by Primary B (see C1% Polar plot level warning and C1% Polar plot level alarm in Table 5) |
| Primary Phase C – C1% Polar Plot Level Status | The C1% polar plot amplitude is above a given threshold on an area defined by Primary C (see C1% Polar plot level warning and C1% Polar plot level alarm in Table 5) |
| Secondary Phase A – C1% Polar Plot Level Status | The C1% polar plot amplitude is above a given threshold on an area defined by Secondary A (see C1% Polar plot level warning and C1% Polar plot level alarm in Table 5) |
| Secondary Phase B – C1% Polar Plot Level Status | The C1% polar plot amplitude is above a given threshold on an area defined by Secondary B (see C1% Polar plot level warning and C1% Polar plot level alarm in Table 5) |



| Bushing data alarm | Description |
|---|--|
| Secondary Phase C – C1% Polar Plot Level Status | The C1% polar plot amplitude is above a given threshold on an area defined by Secondary C (see C1% Polar plot level warning and C1% Polar plot level alarm in Table 5) |
| Primary Phase A – C1% Level Status | The Primary A measured input current has changed beyond a given threshold (see C1% level warning and C1% level alarm in Table 5) |
| Primary Phase B – C1% Level Status | The Primary B measured input current has changed beyond a given threshold (see C1% level warning and C1% level alarm in Table 5) |
| Primary Phase C – C1% Level Status | The Primary B measured input current has changed beyond a given threshold (see C1% level warning and C1% level alarm in Table 5) |
| Secondary Phase A – C1% Level Status | The Secondary A measured input current has changed beyond a given threshold (see C1% level warning and C1% level alarm in Table 5) |
| Secondary Phase B – C1% Level Status | The Secondary B measured input current has changed beyond a given threshold (see C1% level warning and C1% level alarm in Table 5) |
| Secondary Phase C – C1% Level Status | The Secondary B measured input current has changed beyond a given threshold (see C1% level warning and C1% level alarm in Table 5) |
| Primary Phase A – PF% Polar Plot Level Status | The PF% polar plot amplitude is above a given threshold on an area defined by Primary A (see PF% Polar plot level warning and PF% Polar plot level alarm in Table 5) |
| Primary Phase B – PF % Polar Plot Level Status | The PF% polar plot amplitude is above a given threshold on an area defined by Primary B (see PF% Polar plot level warning and PF% Polar plot level alarm in Table 5) |
| Primary Phase C – PF % Polar Plot Level Status | The PF% polar plot amplitude is above a given threshold on an area defined by Primary C (see PF% Polar plot level warning and PF% Polar plot level alarm in Table 5) |

| Bushing data alarm | Description |
|--|--|
| Secondary Phase A – PF % Polar Plot Level Status | The PF% polar plot amplitude is above a given threshold on an area defined by Secondary A (see PF% Polar plot level warning and PF% Polar plot level alarm in Table 5) |
| Secondary Phase B – PF % Polar Plot Level Status | The PF% polar plot amplitude is above a given threshold on an area defined by Secondary B (see PF% Polar plot level warning and PF% Polar plot level alarm in Table 5) |
| Secondary Phase C – PF % Polar Plot Level Status | The PF% polar plot amplitude is above a given threshold on an area defined by Secondary C (see PF% Polar plot level warning and PF% Polar plot level alarm in Table 5) |
| Primary Angle AB | The measured inter-phase angle between Primary A and B is beyond a given threshold respect the expected angle (see Phase angle warning and Phase angle alarm in Table 5) |
| Primary Angle AC | The measured inter-phase angle between Primary A and C is beyond a given threshold respect the expected angle (see Phase angle warning and Phase angle alarm in Table 5) |
| Secondary Angle AB | The measured inter-phase angle between Secondary A and B is beyond a given threshold respect the expected angle (see Phase angle warning and Phase angle alarm in Table 5) |
| Secondary Angle AC | The measured inter-phase angle between Secondary A and C is beyond a given threshold respect the expected angle (see Phase angle warning and Phase angle alarm in Table 5) |

Relay Control

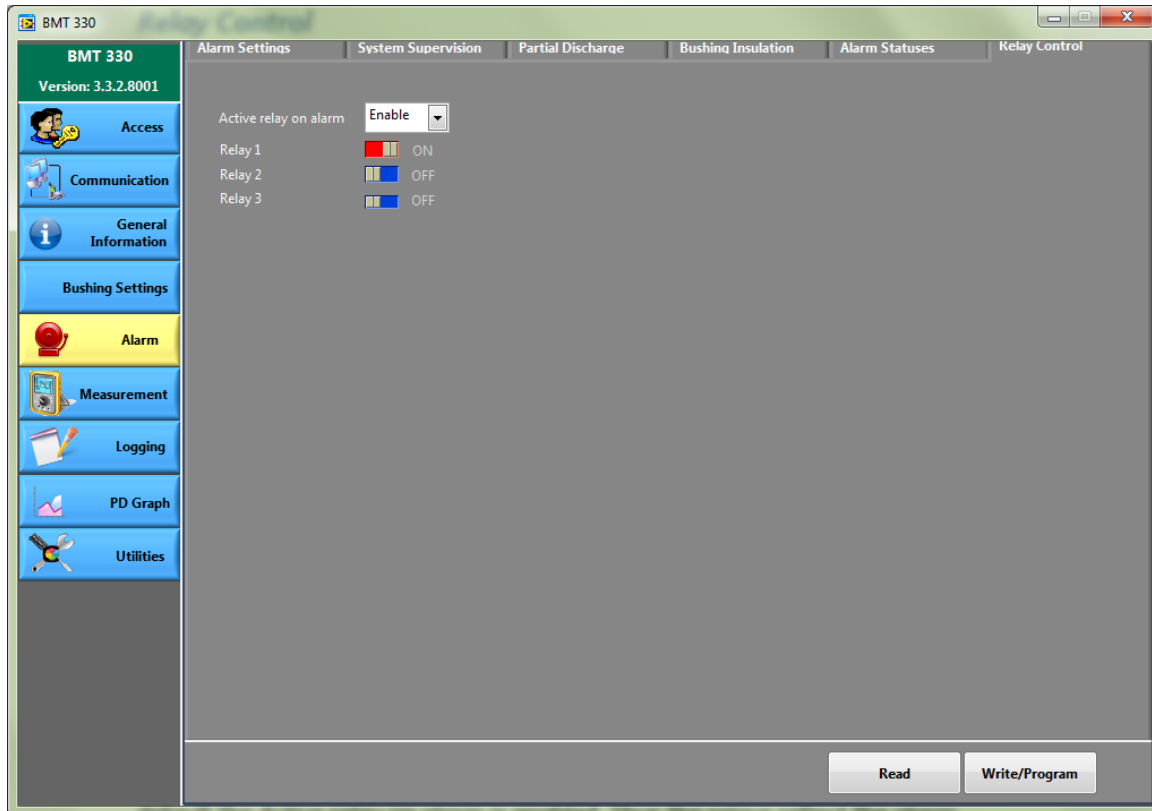


Figure 17: Alarm Statuses tab

The **Relay Control** tab provides the means to control the Intellix™ BMT 330 relays. By default the *Active relay on alarm* is enabled. Thus the relays reflect the alarm statuses:

- Relay 1 (Service) is energized by default. If a service alarm is on or Intellix™ BMT 330 loses power it will switch to OFF.
- Relay 2 (Warning) and Relay 3 (Alarm) are de-energized by default. If either of their respective alarms is on, the corresponding relay will switch to ON.

Relays can be manually controlled by disabling the *Active relay on alarm*. Then the relays are not synchronized with the alarm statuses; and the user can manually switch the relays (by clicking on the relay switch icon and then click on **Write/Program**).

NOTE: disabling the *Active relay on alarm* is used to install/test the relays wiring. During operation Intellix™ BMT 330 requires it to be enabled; otherwise any service, warning and/or alarm event will not reflect on the relays.

Measurement

The Measurement page displays the instantaneous measurements taken by the Intellix™ BMT 330, plus CANBUS and GPS values.

The “**Start**” button starts polling the instantaneous results. The label of the button then changes to “**Stop**”. Pressing the “**Stop**” button will cease polling.

The “**Clear Error**” button resets the “*Last detected error*” and the **Measurement > Sensors > Field Sensors Error** counters.

The Measurement page holds 2 tabs: [Measurements](#) (p. 47), that displays the bushing monitor and PD values; and [Sensors](#) (p. 48), that displays the CANBUS sensors and GPS.

Measurements

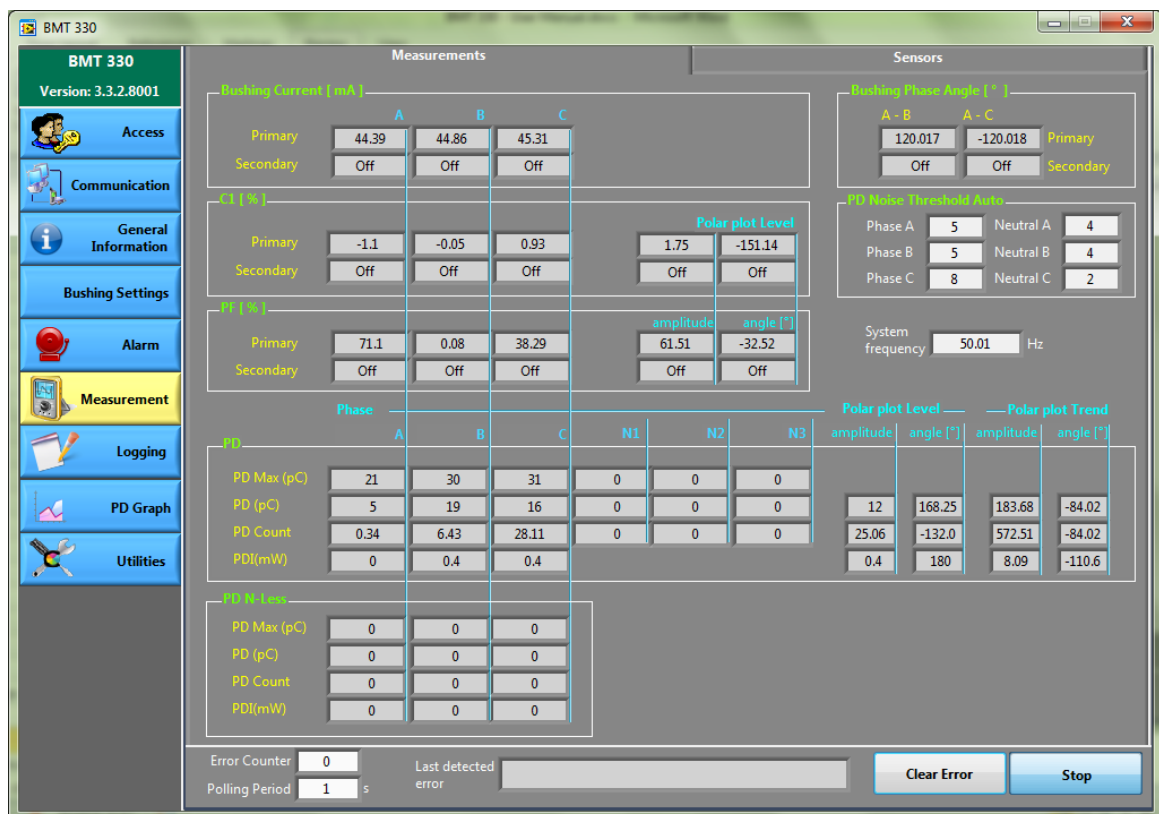


Figure 18: Measurements tab

Note:

- The C1% measurements are calculated based on the bushing current measurements and the expected currents presented in the Bushing Settings.



- The PF% measurements are calculated based on the bushing phase angle measurements and the expected phase angles presented in the Bushing Settings tab.
- The PD Max displayed on this page is the maximum PD value for the cycle. The log file PD Max is the maximum value of the PD averaged over each cycle. This PD Max is refreshed every 2 seconds.
- PD (pC) is the amplitude (apparent charge) of the PD event.
- PD count is the number of partial discharge events per cycle
- PDI (mW) is the average power associated to a PD event (as defined in IEC 60270).

Sensors

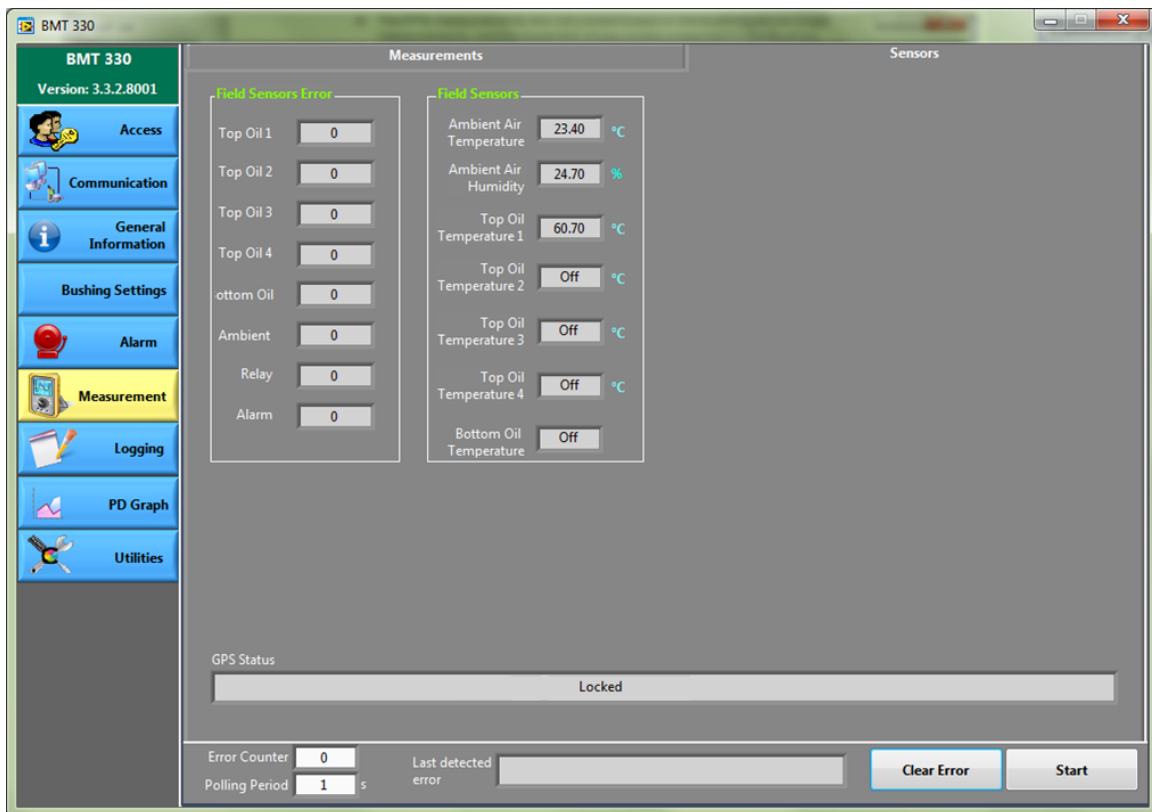


Figure 19: Sensors tab.

Logging

The Logging page has 2 tabs:

- [Log Settings](#), go to page 49.
- [Log Data](#), go to page 50.

Log Settings

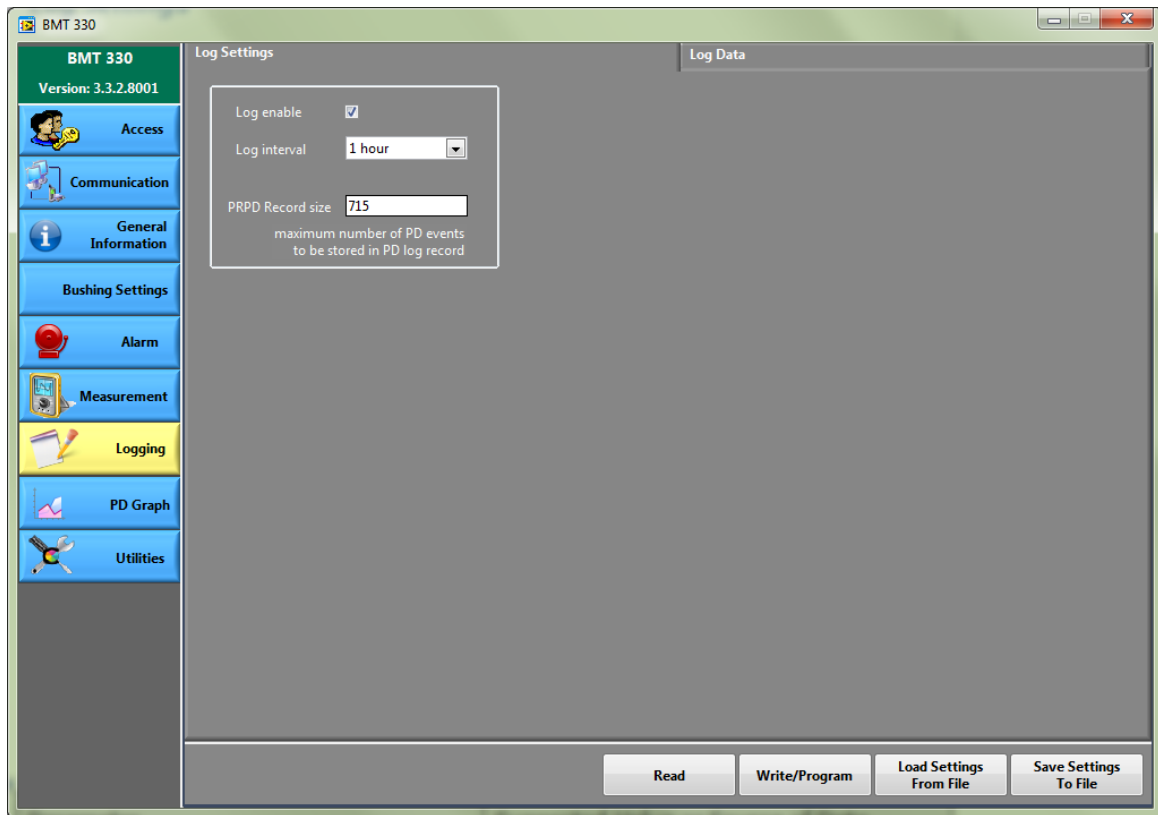


Figure 20: Logging > Log Settings tab

| Parameter | Suggested Value or Source of Data |
|--------------|---|
| Log Enable | Checked/Enabled |
| Log Interval | The period between log recordings. Default is 1 hour |

| Parameter | Suggested Value or Source of Data |
|------------------|--|
| PRPD Record size | The maximum number of PD events to store per PRPD record. Its maximum value is 1534. Default is 715 |

Table 6: Log Settings tab

Commit these entries to the Intellix™ BMT 330 by pressing the **“Write/Program”** button. It is advisable to save the configuration file by pressing the **“Save Settings To File”** button.

Log Data

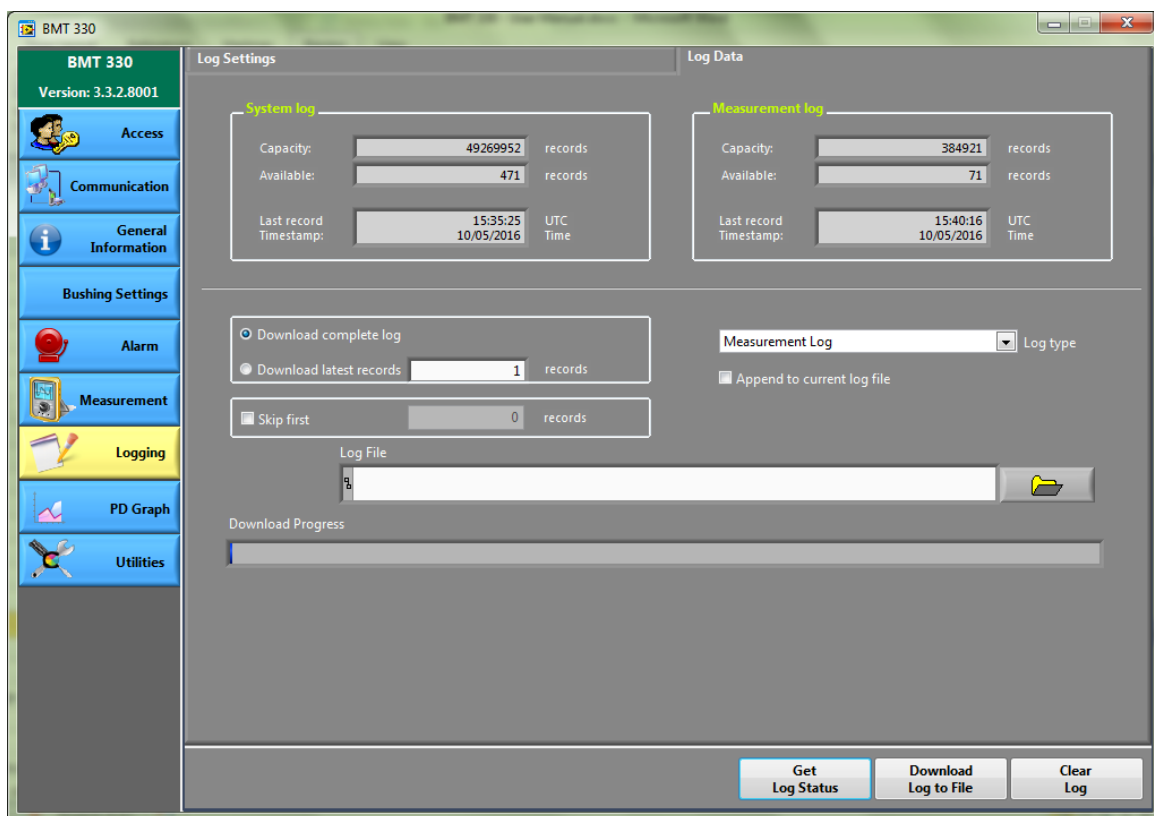


Figure 21: Logging > Log Data tab

- **Log File:** enter or browse to a location to store log files.
- **Log Type:** Select from the drop down whether you require a “measurement”, “status” or the extended PRPD “PD” log file.
- The file grid is populated with the chosen file type when the **“Get Log Status”** button is pressed.

- **“Download Log to File”** will download the selected files in the file grid. The download behaviour can be modified by the check boxes above the file grid:
 - **Append to current log file:** If “Append to current log file” is checked, then the new log file data will be appended to the log file selected by the log file browser below.
 - **Download Complete log:** If “Download complete log” is checked, then the full selected log will be downloaded, but for the registers set by the “Skip first” checkbox.
 - **Latest records:** If “Download latest records” is checked, then only the latest record will be downloaded. If 48 records is set in this field and the “Log Interval” is set to 1 hours, then the last 48 hours of data will be downloaded.
 - **Skip first:** if selected, the oldest records set by the text box are skipped when downloading.

PD Graph

The BMT 330 Setup Software provides a graphic interface to the Phase Resolved Partial Discharge (PRPD) data stored in the Intellix™ BMT 330.

Remote PRPD monitoring is also provided by Perception software suite.

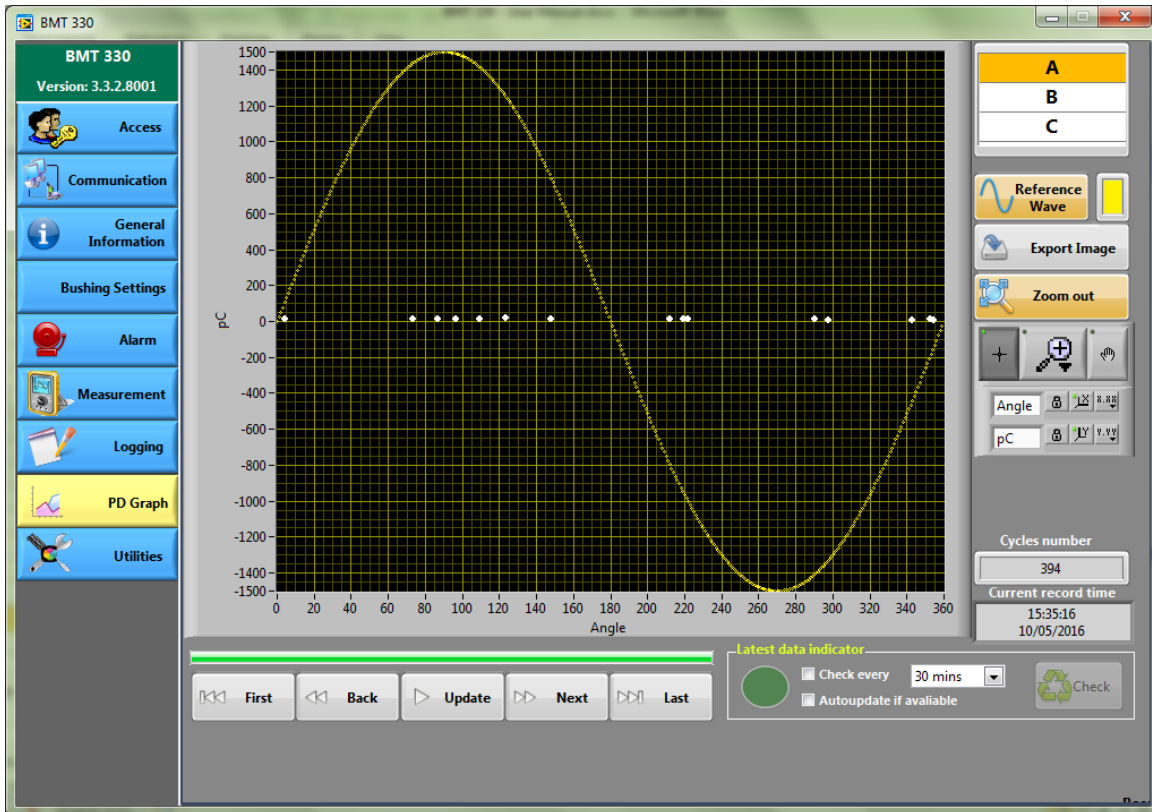




Figure 22: PD Graph page









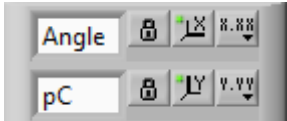
By default the last recorded PRPD for the selected input (to-right corner) is displayed.

A reference sinusoidal can be shown/hidden by pressing on the **“Reference Wave”** button, and its colour selected on the colour palette on its right.

The PRPD can be exported as an image by pressing on the **“Export Image”** button.

The PRPD display can be modified by using the provided controls:

| | |
|---|---|
|  Zoom out | Removes any applied zoom and displays the default PRPD view |
|  | Moves the cursor on the display |

| | | | | |
|---|---|---------------------|--------------------------------|--------------------------------|
|  | Zooms in and out of the display. You are offered 6 varieties of zoom: | | | |
| |    | Zoom into selection | Zoom X axis between boundaries | Zoom Y axis between boundaries |
| |    | Select whole graph | Zoom out generally | Zoom in generally |
|  | Panning Tool, picks up the plot and moves it around on the display | | | |
|  | Scale legend. Use it to change the X and Y axis titles; to lock and unlock autoscale; and to format the axis labels | | | |

If you right-click whilst the cursor is within the graph area, a pop up menu appears, as shown in Figure 23.

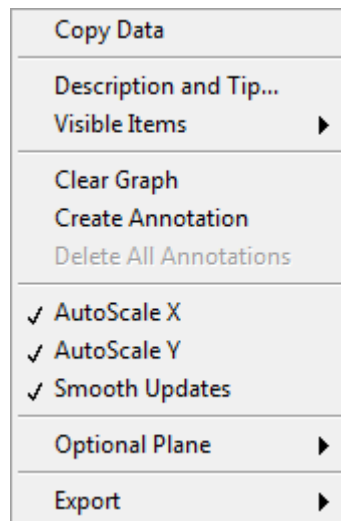


Figure 23: PRPD graph pop up menu

The options allow the following:

- **Copy Data:** stores an image copy of the PRPD into the clipboard so that it can be pasted into other applications.
- **Description and Tip:** shows the description and tip for this PRPD. Currently these values are empty.
- The **Visible Items** side menu allows you to select the graph items to be displayed (Scale Legend, Graph Palette, etc.).
- **Clear Graph:** clears the PRPD area.
- **Create Annotation:** Allows you to add some notes to the PRPD.



- **AutoScale:** Autoscales the selected axis.
- **Smooth Updates:** Makes graphic PRPD transitions visually smoother; e.g. when zooming in.
- The **Export** option allows to export the PRPD to the clipboard, an excel spreadsheet or as a simplified image.

Utilities

Modbus Slave Settings

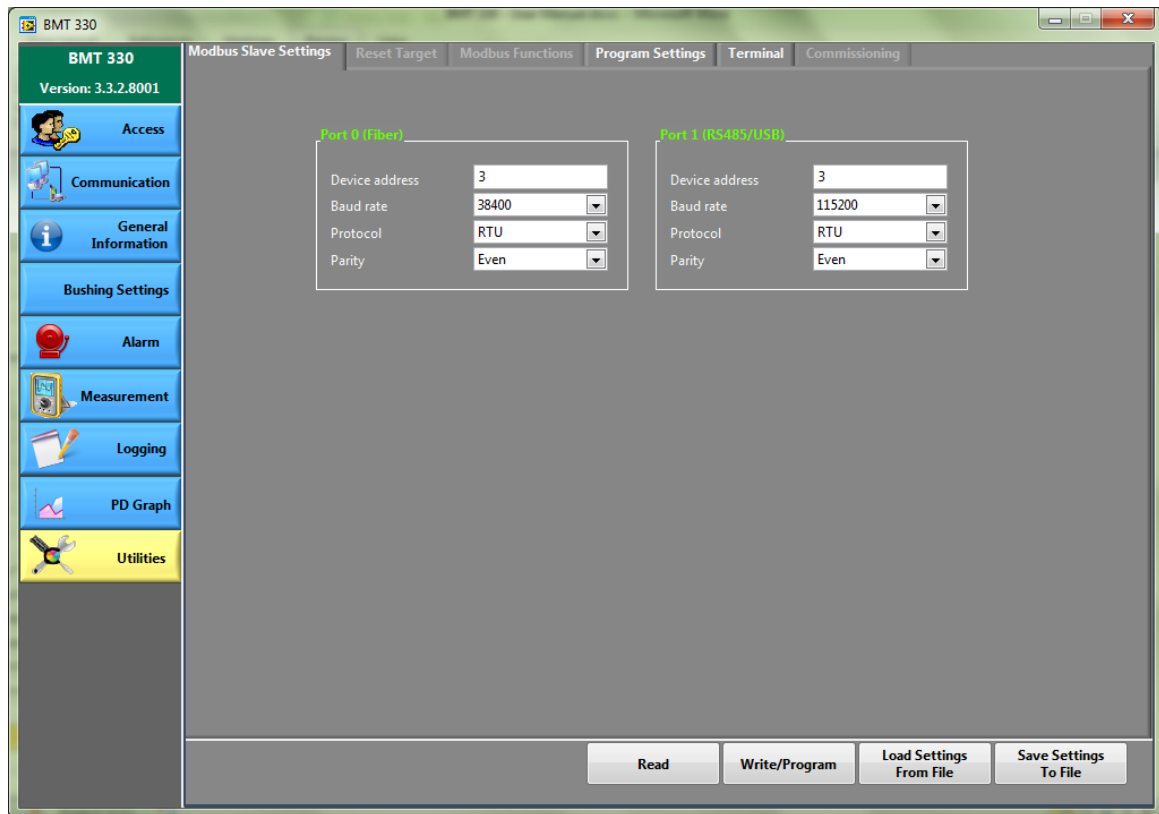


Figure 24: Utilities > Modbus Slave Settings tab

The standard parameters for Port0 (optional Ethernet/Fibre Optic) and Port1 (RS-485/USB) are:

- **Device Address:** the device ID (default 3).
- **Baud Rate:** The communication's bit rate.
- **Protocol:** Either binary (RTU) or text (ASCII).
- **Parity:** extra bit used for error checking (EVEN, ODD, NONE).

The parameters above can take any value, as long as they match the ones in the **Communication** page. Also, if there are other layers between the PC application and Intellix™ BMT 330, these layers must be able to handle the port settings, and then the matching must be:

- The **Communication Settings** must match the PC interface layer and
- The Intellix™ BMT 330 interface layer must match the **Modbus Slave Settings**.

Program Settings

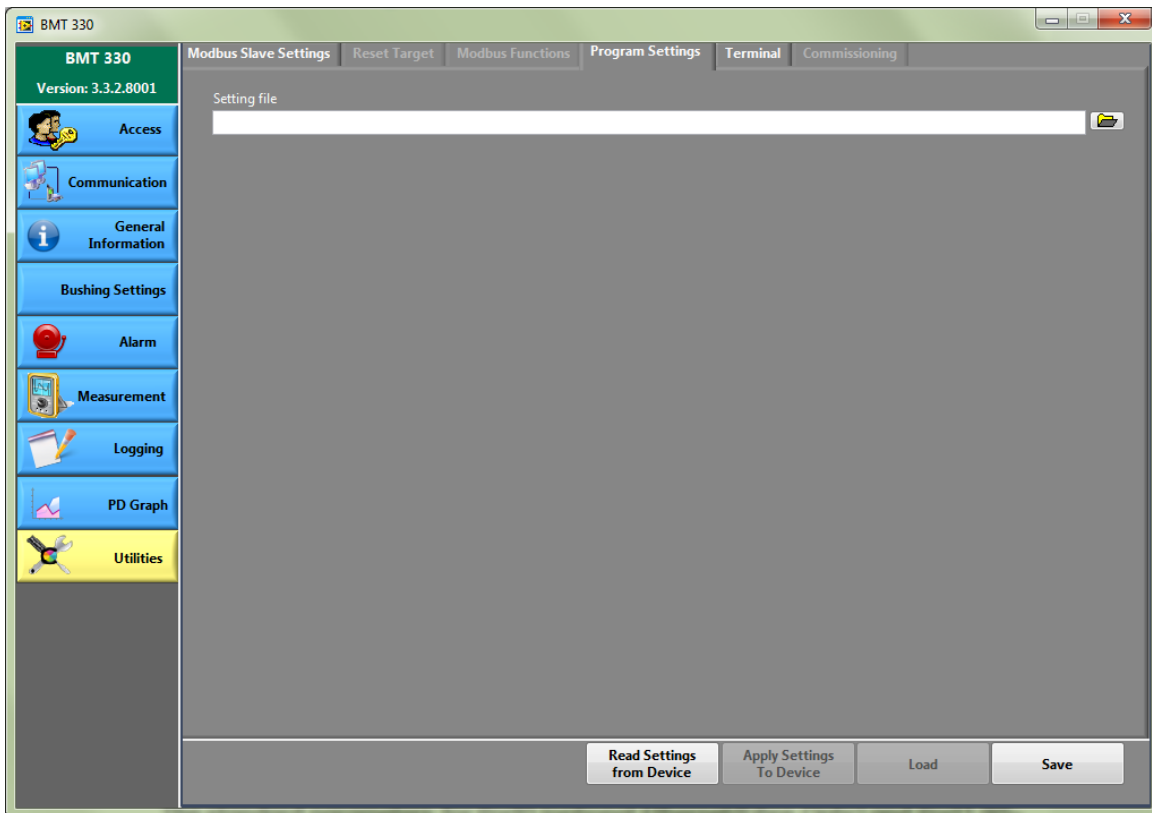


Figure 25: Utilities > Program Settings

A “Customer” user can save the Intellix™ BMT 330 settings to a file (but not load them from a file).

First ensure that the BMT 330 Setup Software is synchronised to the values in the Intellix™ BMT 330 by left-click the “**Read Settings from Device**” button.

Then enter a file name and path in the setting file box, or select a path and a file using the Save As dialog that is open by a left-click on the yellow folder; and press the “**Save**” button.

Terminal

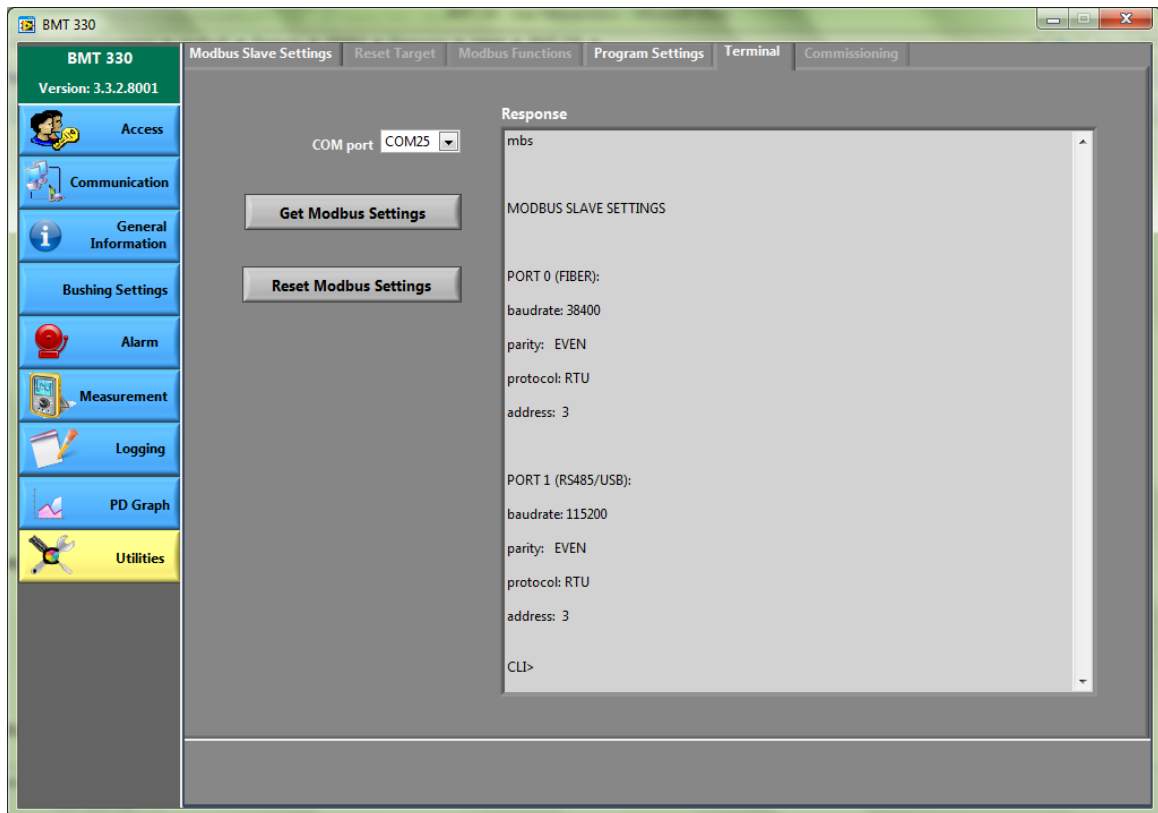


Figure 26: Utilities > Terminal tab

The current settings for Port0 (Ethernet/Fibre Optic) and Port1 (RS-485/USB) can be discovered using the secondary mini USB port available in the cabinet as shown in Figure 27. Select the COM port assigned to it by the PC and press **“Get Modbus Settings”**⁵.

Press **“Reset Modbus Settings”** to reset the ports settings to their default values, see Communication, p.20.

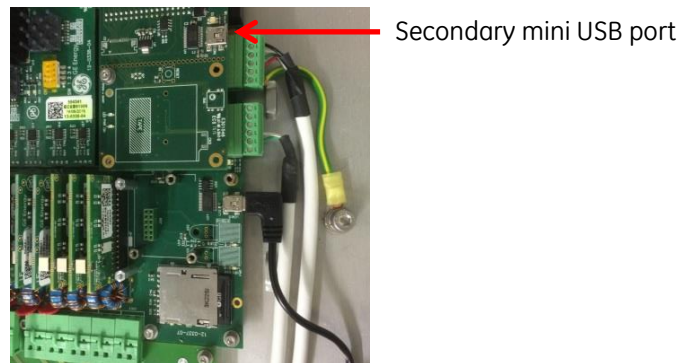


Figure 27: Location of secondary mini USB port

⁵ The assigned COM port can be found by right-clicking “Computer” and selecting “Manage”; followed by selecting “Device Manager”, under “Ports (COM & LPT)”.







APPENDIX 1: MANUAL INSTALLATION OF BMT 330 SETUP SOFTWARE

To manually install the BMT 330 Setup Software package on your laptop, carry out the following actions, in the order presented. The CD shipped with the Intellix™ BMT 330 or a copy is required:

- Install the LabViewRunEngine suite:
 - Open the Intellix™ BMT 330 Prerequisites directory,
 - Open the LabViewRunEngine directory.
 - Double click on the "setup.exe".
 - After the installation decline the PC restart, opt for restart later.
- Install the Visa suite:
 - Open the Intellix™ BMT 330 Prerequisites directory,
 - Open the Volume directory.
 - Double click on the "setup.exe".
 - After the installation decline the PC restart, opt for restart later.
- Install the USB to Serial driver:
 - Open the Intellix™ BMT 330 Prerequisites directory,
 - Open the "USB to 232" directory.
 - Double click on the "PL2303_Prolific_DriverInstaller.exe".
- After the installation: restart your PC to register all of the installed software.
- Copy the Intellix™ BMT 330 software directory to a suitable location.
 - Open the Intellix™ BMT 330 directory.
 - Select "BMT_330.exe".
 - Right click>create shortcut.
 - Move the shortcut to your desktop.

APPENDIX 2 – FRONT PANEL LIGHTS

| Light Colour | Light Symbol | Meaning |
|--------------|--|--|
| GREEN | POWER  | AC power applied |
| BLUE | SERVICE  | Service Required. Triggered by warning service event. |
| YELLOW | CAUTION  | A measured parameter has exceeded a user-programmed “warning” threshold. |
| RED | ALARM  | A measured parameter has exceeded a user-programmed “alarm” threshold. |