OMNIR

BY FINNA SENSORS

SOFTWARE MANUAL

Finna Sensors

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This guide applies to the following versions:

Software: v1.0.22.0

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OVERVIEW

OMNIR software is a Windows based application that allows users to connect to the OMNIR system via a local Ethernet connection. The minimum suggested hardware to run the application is:

- Win 7 (32 or 64 bit) or greater
- .NET Framework v4.8
- 8G RAM
- 10 GB of hard-drive space
- Intel i3 3.6 GHz or faster
- Internet access to update the application

The software is designed to provide users with easy to understand screens displaying real-time information to users. In addition, more advanced users can make and apply configuration changes to the system.

Main Screen

The primary screen (Figure 1 - Main screen) displayed shows the five areas a user may view, they are:

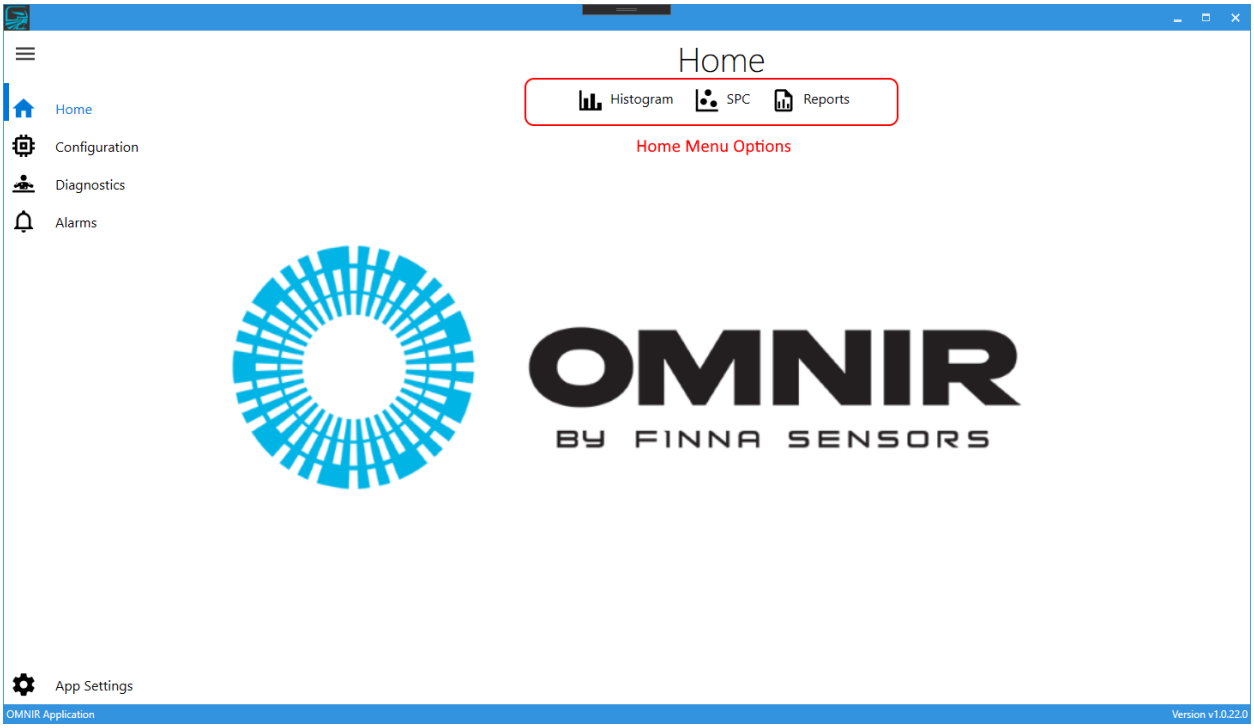
1. **Home**. These are the primary screens users can view and monitor the process information from the sensors. This includes both current values and historical information. No configuration of the system is accessible from these screens.
2. **Configuration**. All options related to configuration of the system is performed in this area. Changes made are written to the system's firmware which are retained upon a system reboot.
3. **Diagnostics**. Detailed information about sensor health and system checks.
4. **Alarms**. Active and previous alarms are viewed here.
5. **App Settings**. Settings related to the Windows application. Changes made here only apply to the local PC and are NOT saved to the system firmware.

Figure 1 - Main screen

Home Screen

The home screen (see Figure 2 - Home Screen) allows users to monitor live data as a **Histogram** or **Statistical Process Control (SPC)**. Historical information can be viewed in **Reports**.

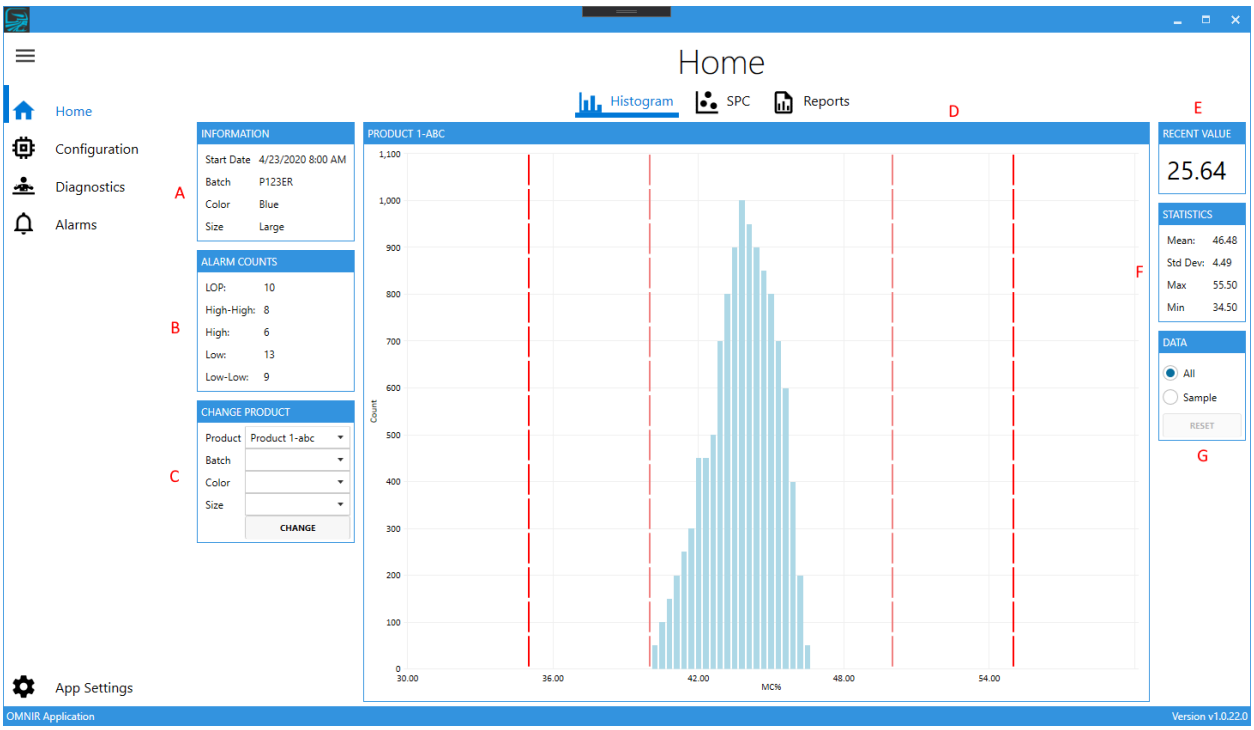
Figure 2 - Home Screen



Histogram

The histogram screen displays a summary of all data collected by OMNIR over a user specified time range. The screen is divided into seven areas labeled A through G (see Figure 3 - Histogram Data).

Figure 3 - Histogram Data



Section A – Information

This window displays general information on what is currently being measured by the OMNIR system. It includes the following:

- Start Date: starting date and time when the histogram data began collecting information.
- Batch, Color, Size: there are three optional fields entered by a user when the system is collecting data. For illustration purposes only, the figure shows Batch, Color, and Size, however the labels and allowed entries are fully configurable by the user (see Section B – Optional Categories for information on how to configure these fields).

Section B – Alarm Counts

Alarm counts display the number of times the recorded process values have exceeded the limits for the current time period. These limits are defined by the product rules in the Configuration section (see Section C – Alarms).

Section C – Change Product

If the type of product being measured changes, the user manually selects the new product (and any optional data entries) and clicks **Change** to inform the OMNIR system. OMNIR will reset the Histogram data and apply the newly selected product parameters.

Section D – Chart

This is a histogram chart of the data measured by the OMNIR system. A histogram chart displays data grouped into bins, which are displayed as columns. When a value falls

within the bin range, the column height is increased by one. The result is a chart that shows the distribution of all data collected since the *Start Time*.

If product's minimum and/or maximum process limits are configured, red dashed lines are displayed where an out of process condition occurs. The process limit lines are only displayed if limits are configured.

Section E – Recent Value

The most recent value measured by the OMNIR

Section F – Statistics

Basic statistical values for the histogram chart data. The average, standard deviation, minimum value, and maximum value are displayed.

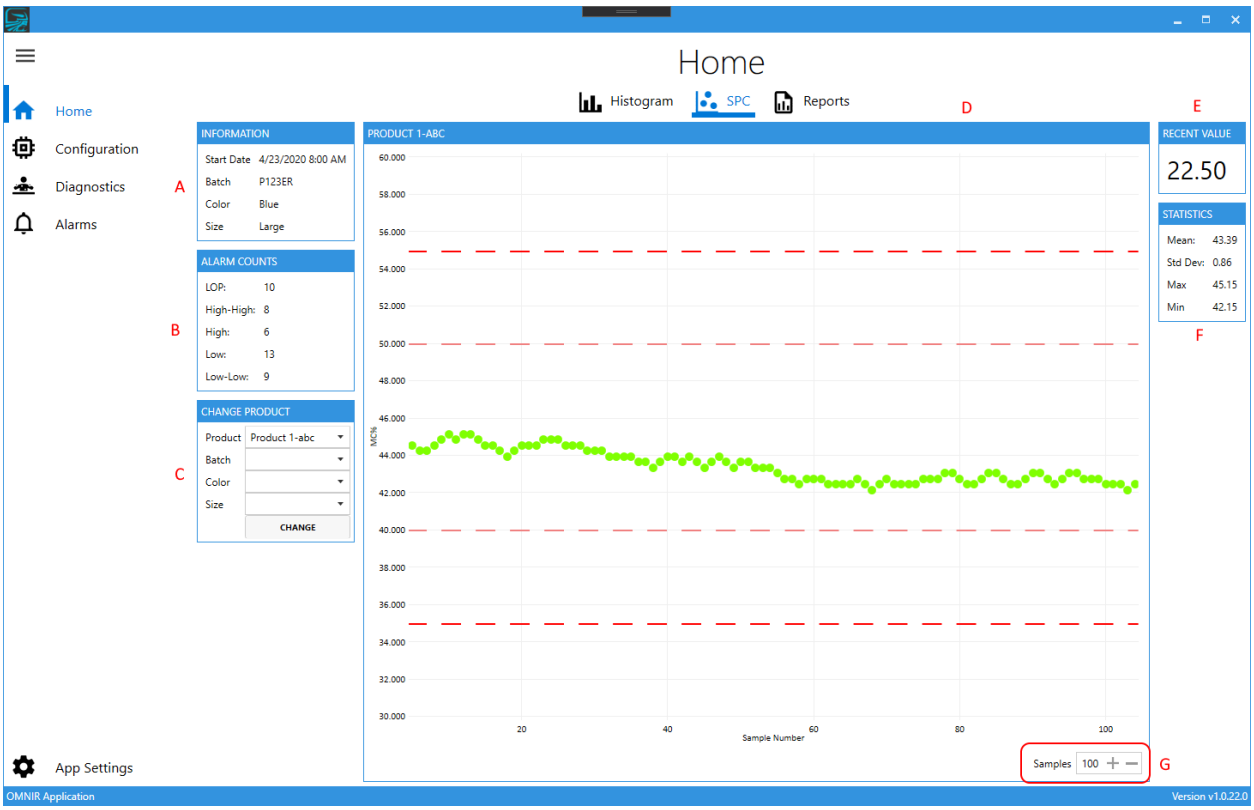
Section G – Data

The user can choose to reset the histogram chart and view the resulting data which is useful if the process has changed and the user wants to see the impact of the change. Click the **Sample** button and then **Reset** to clear the data. Note, resetting the sample data does NOT change the histogram data collected for automatic shift reporting (see SETUP SHIFTS for how to setup automatic reports). Click the **All** button to view data collected for the shift.

SPC

The SPC chart (Figure 4 - SPC Chart) shows the most recent data collected. The chart displays a dot each time the sensor measures the material; the most recent data is added on the right and the oldest dot is on the left side. This view is particularly useful when analyzing quickly changing process conditions. However, there is a limit to the number of points visible on the screen. If more data is desired, the histogram is a better tool. The screen is divided into seven areas labeled A through G.

Figure 4 - SPC Chart



Section A – Information

This displays general information on what is currently being measured by the OMNIR system. It includes the following:

- Start Date: starting date and time when the histogram data begin collecting information.
- Batch, Color, Size: there are three optional fields entered by a user when the system is collecting data. For illustration purposes only, the figure shows Batch, Color, and Size, however the labels and allowed entries are fully configurable by the user (see Section B – Optional Categories for information on how to configure these fields).

Section B – Alarm Counts

Alarm counts displays the number of times the recorded process values has exceeded the user defined limits for the current time period. These limits are defined by the product rules in the Configuration section (see Section C – Alarms).

Section C – Change Product

If the type of product being measured changes, the user manually selects the new product (and any optional data entries) and clicks **Change** to inform the OMNIR system. OMNIR will reset the Histogram data and apply the product parameters.

Section D – Chart

This is a point chart representation of the data measured by the OMNIR system. Each value is added as a dot to the chart, with the most recent added on the right side.

If product's minimum and/or maximum process limits are configured, red dashed lines can be used to determine when an out of process condition occurs. The process limit lines are only displayed for configured limits.

Section E – Recent Value

The most recent value measured by the OMNIR

Section F – Statistics

Basic statistical values for the histogram chart data. The average, standard deviation, minimum value, and maximum value are displayed.

Section G – Samples

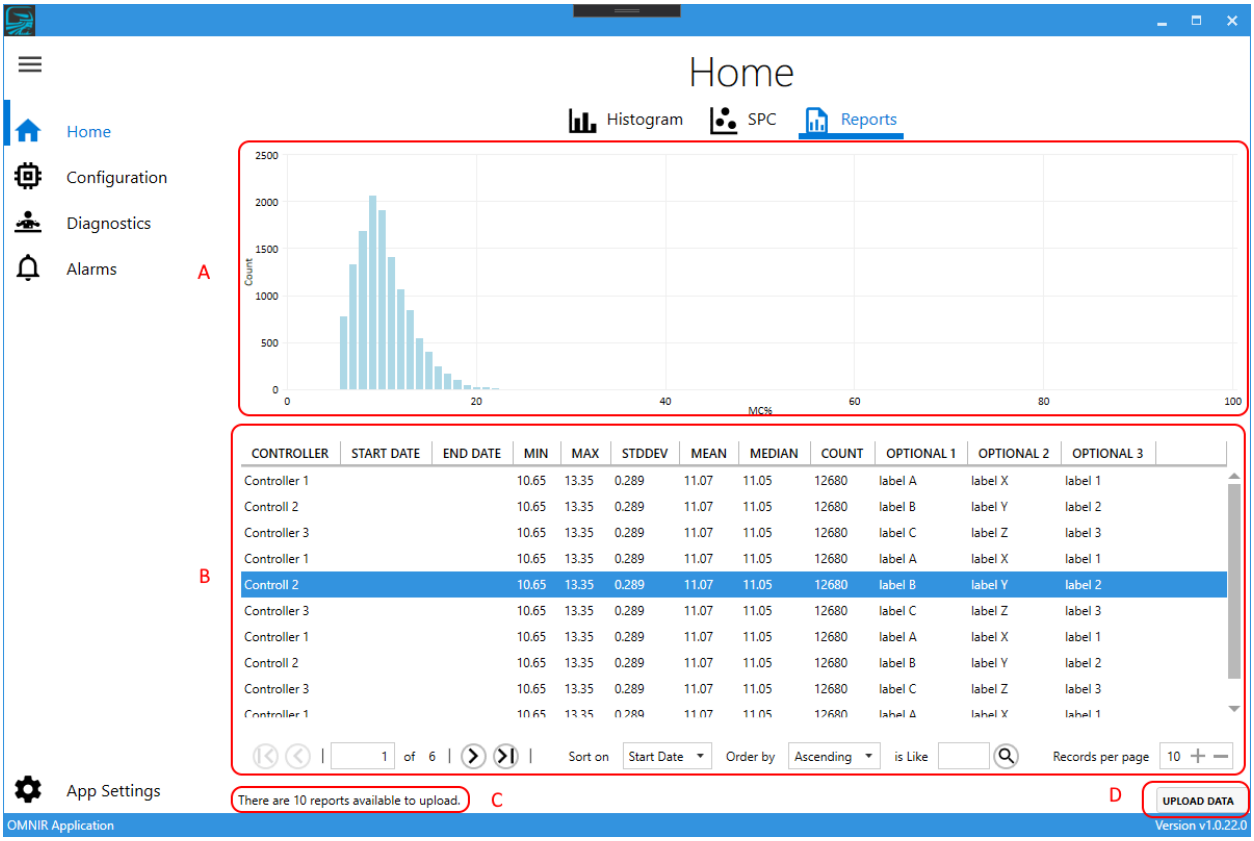
User selects the number of samples to display on the chart. Maximum value is 1000 points.

Reports

The Reports chart (Figure 5 - Reports) shows historical data collected and saved to a database.

The Reports function requires the database setup first (see Section C – Database)

Figure 5 - Reports



Section A – Histogram Chart

The histogram of historical data selected in Section B is displayed.

Section B – Table Data

Data stored in the database is shown in the table. The bottom of the table allows the user to page forward and backward to locate the desired report.

Section C – Reports Available

The number of reports available in the OMNIR system is shown on this indicator.

Section D – Upload Data

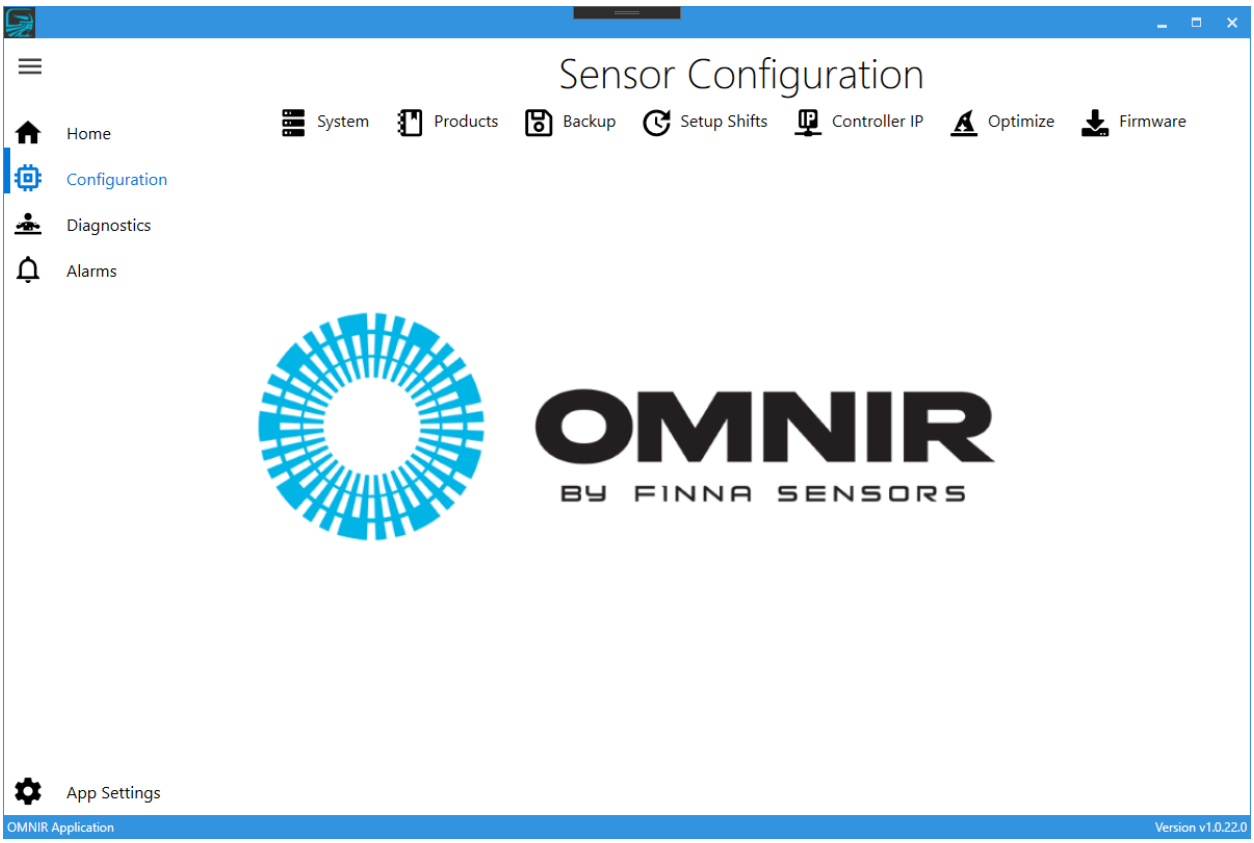
If a report is available to save to the database, the **Upload Data** button is visible. Clicking this option will read the reports from the OMNIR system and save them to the database.

Configuration Screens

The configuration tab allows the user to set and store parameters directly to the OMNIR system, care should be taken whenever making a process change (see Figure 6 - Configuration Screen). Each change to the system is logged for audit purposes (see LOGS) The primary functions available are:

- **System**: Global parameter changes to the OMNIR system are made in this tab.
- **Products**: Configuring a product's process rules and parameters are made in this tab. This includes calibration, process limits, and data smoothing.
- **Backup**: backup and restore functionality for the system can be performed via this screen. It is recommended to make periodic backups of the system configuration for disaster recovery.
- **Setup Shifts**: the system can automatically record OMNIR values and out of process conditions during a shift. This screen allows the user to configure the shift start and end times.
- **Controller IP**: the OMNIR system requires a static IP, this screen allows the user to change the system's IP. Note: after changing the IP, the application needs to be changed to communicate with this new IP (see Connection)
- **Optimize**: while the system is measuring a product, it is sometimes desirable to simulate how product rule changes impact the results. This screen provides tools to makes changes, view the simulated results, and then either accept or discard the changes.
- **Firmware**: the firmware in the OMNIR system can be upgraded via this screen.

Figure 6 - Configuration Screen



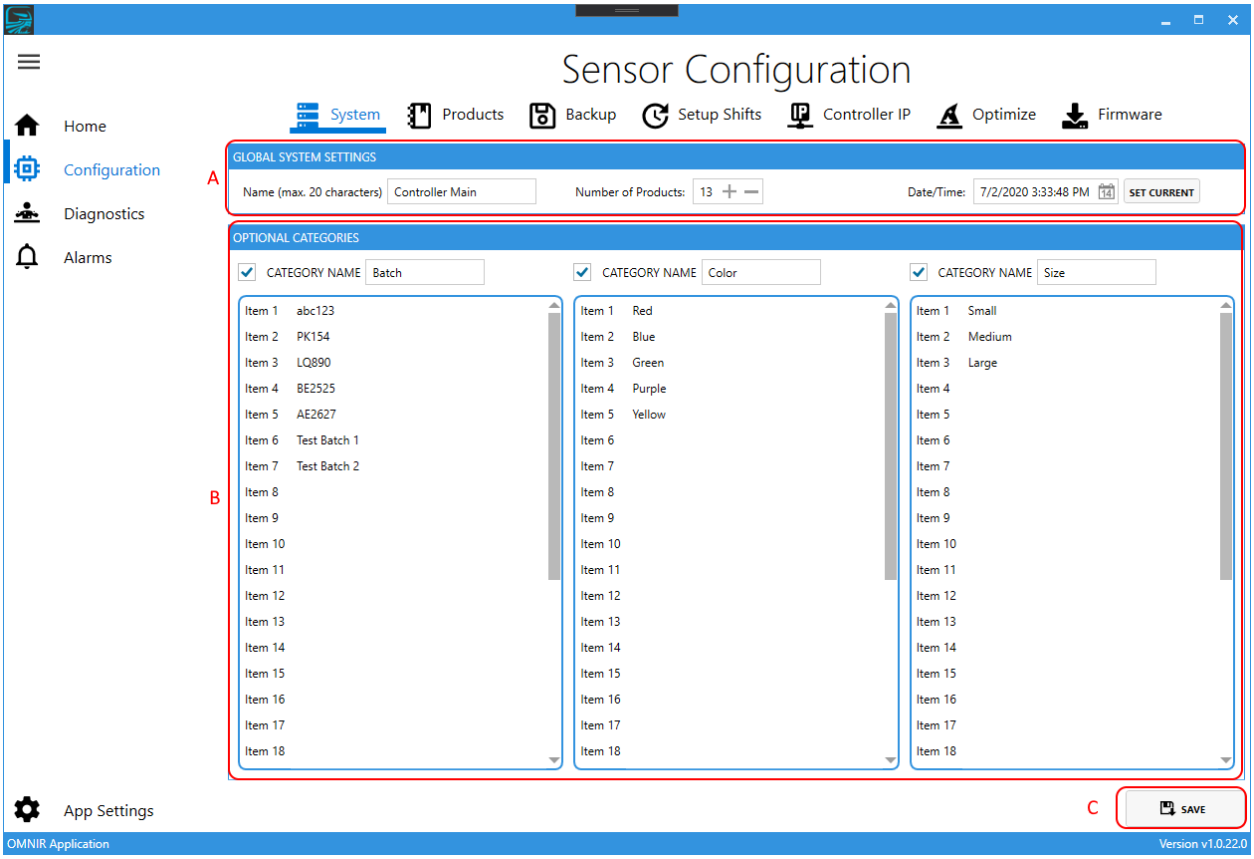
System

The system screen has three sections (see Figure 7 - System Setup):

- Section A: general settings for the controller
- Section B: user defined optional values
- Section C: save settings to the controller

After making a configuration change, a backup should be performed for disaster recovery (see BACKUP)

Figure 7 - System Setup



Section A – Global System Settings

This section has three setting values:

- Name: the user may provide a user-friendly name for the controller. This is useful when multiple controllers are on-site and it is necessary to distinguish between systems.
- Number of Products: this defines the number of products which are configured in the system. Set this number to how many products are being monitored by the system. The maximum allowed value is 120. If additional products are required in the future, increase as necessary.
- Date/Time: the controller has its own internal clock for items like automatic shift reports. Set the time to match the local PC time.

Section B – Optional Categories

Optional categories are useful to add context to the data being monitored by the system. This optional information is displayed to users on the live monitor screens and is also appended to shift reports. These categories are user-configurable to fit site specific needs. For example, users may want to record the color of the product being monitored.

Section C – Save Button

Once the changes are made, users can apply the changes to the controller by clicking the **Save** button.

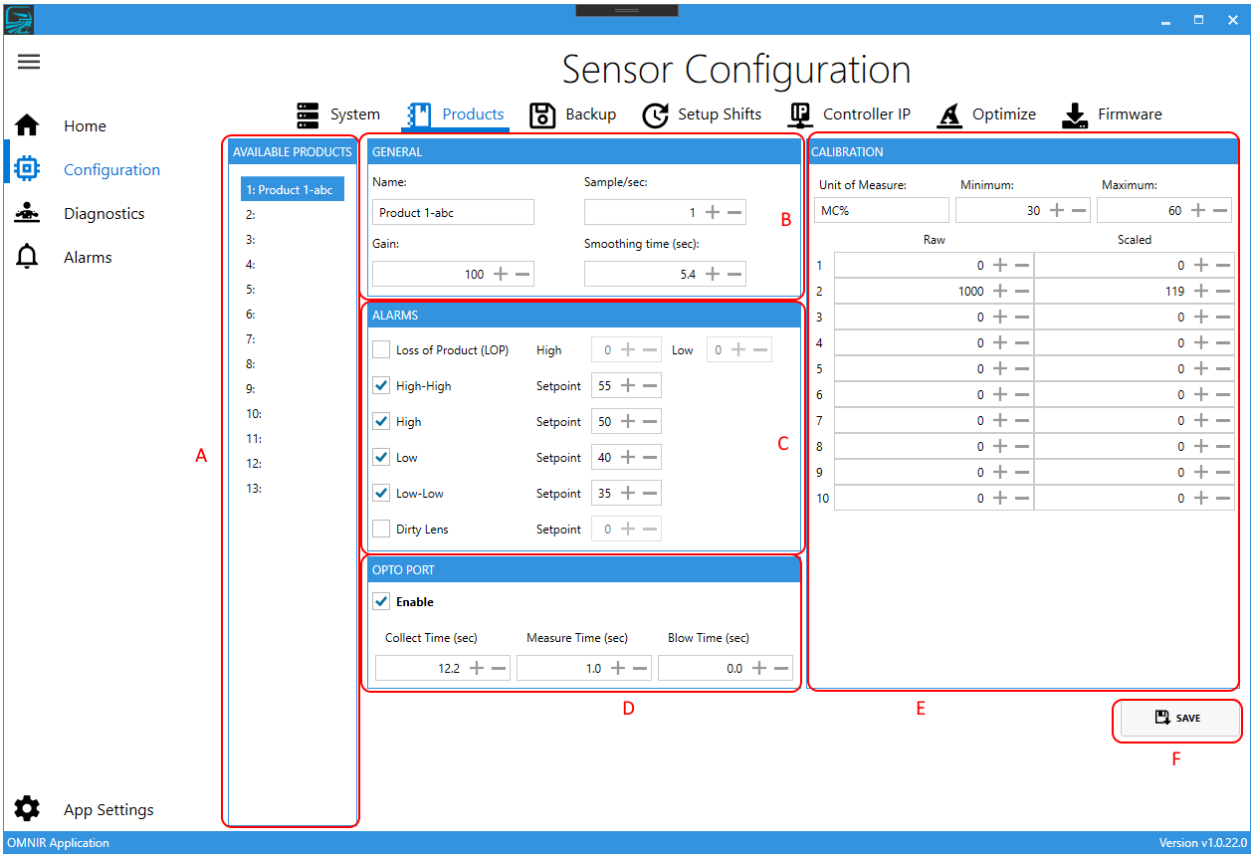
Products

The product screen allows the user sets the 'rules' for how the OMNIR responds for a product. Some information users can change include (see Figure 8 - Product Configuration):

- Section A: list of products available to configure in the system
- Section B: general parameters like name, gain, sample rate, etc.
- Section C: alarms
- Section D: Opto port configuration (an optional accessary for vertical chutes)
- Section E: calibration table

After making a configuration change, a backup should be performed for disaster recovery (see BACKUP)

Figure 8 - Product Configuration



Section A – Available Products

This is a list of products the user may configure on the system. The number of products displayed is defined on the System Configuration screen (see Section A – GLOBAL SETTINGS)

Section B – General

The items available to configure are:

- Name: name of the product
- Sample/sec: number of samples to measure per second. Maximum is 255 samples/second.
- Gain: between 0% (no gain) and 100% (maximum gain) and determines how much gain to apply on the signal. A rule of thumb is the gain should be set to 70% of maximum before clipping. For example, if the signal starts to clip at 60%, then the gain should be set to 70% of 60% = 42%. The gain can be adjusted as necessary without impacting the calibration table as long as the signal does not clip (see section Sensor Health for information about clipping)
- Smoothing time (sec): if there is noise in the measurement results, a moving average can be applied to smooth out the results. Set the value between 0.0 to 25.5 seconds.

Section C – Alarms

Process alarms can be used to determine if the process is in control. The user defines the parameters per application. The process alarms are defined as follows:

- High-High: system measures a value greater than limit
- High: system measures a value greater than limit but less than High-High (if enabled)
- Low: system measures a value lower than low but greater than Low-Low (if enabled)
- Low-Low: system measures a value lower than limit

In addition, there is a Loss of Product (LOP) alarm condition when the system is no longer measuring the product, e.g. measuring the conveyor material. When this value is set, and the system determines an LOP condition, the user is informed the system is not measuring product.

Finally, there is a Dirty Lens parameter. This can be set to detect if the lens is dirty and requires cleaning to ensure an accurate result is reported.

Section D – Opto Port

The Opto Port accessory is used to measure fine grained materials collected in a chute. If it is being used, the following timer values should be entered:

- Collect Time (sec): the amount of time to collect sample in the chute

- Measure Time (sec): the length of time to measure the sample
- Blow Time (sec): the length of time to actuate a blower to clear the sample area

Section E – Calibration

The calibration section is where a user defines the relationship between the sensor signal and moisture content. The following values can be entered:

- Unit of Measure: this is a description label of what is being measure, e.g. MC%
- Minimum: the minimum value allowed
- Maximum: the maximum value allowed
- Raw vs. Scaled: A calibration table that establishes a relationship between the sensor value and moisture content. The raw and scaled values can be between -2147483.648 and +2147483.647.

Section F – Save Button

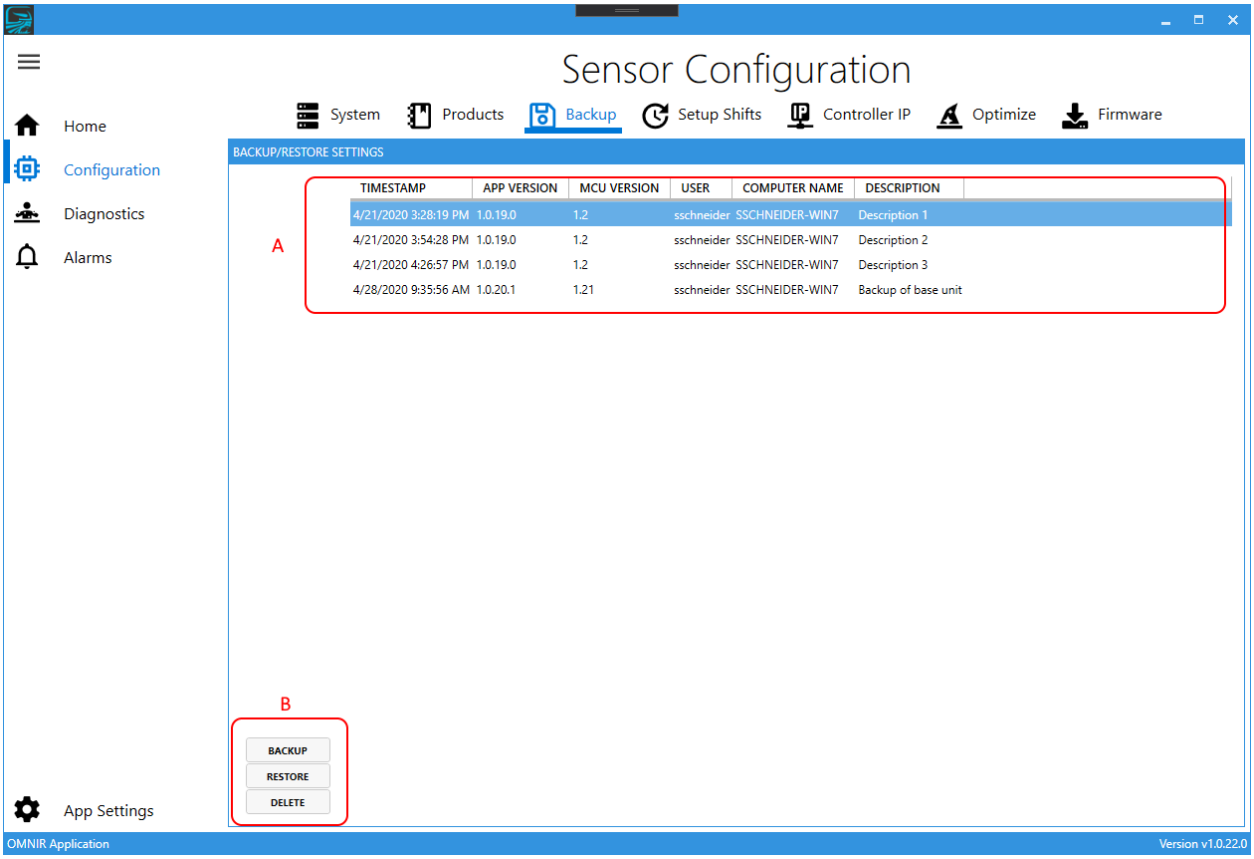
The **Save** button downloads the information to the controller. The changes are applied immediately.

Backup

The OMNIR system has full backup and restoration functionality for disaster recovery. The screen has two sections: (a) record of all backups, and (b) functions to backup/restore. All backups are saved to the SQL server database.

The backup/restore function requires the database to setup first (see Section C – Database)

Figure 9 - Backup Screen



Section A – Log

The log section shows all system backups along with the following information:

- Timestamp: this is the date and time when the backup was performed
- App Version: the version of the application when the backup was performed
- MCU version: the firmware version of the controller
- User: the person logged into Windows who performed the backup
- Computer Name: which computer initiated the backup
- Description: optional descriptive information the user entered regarding the backup

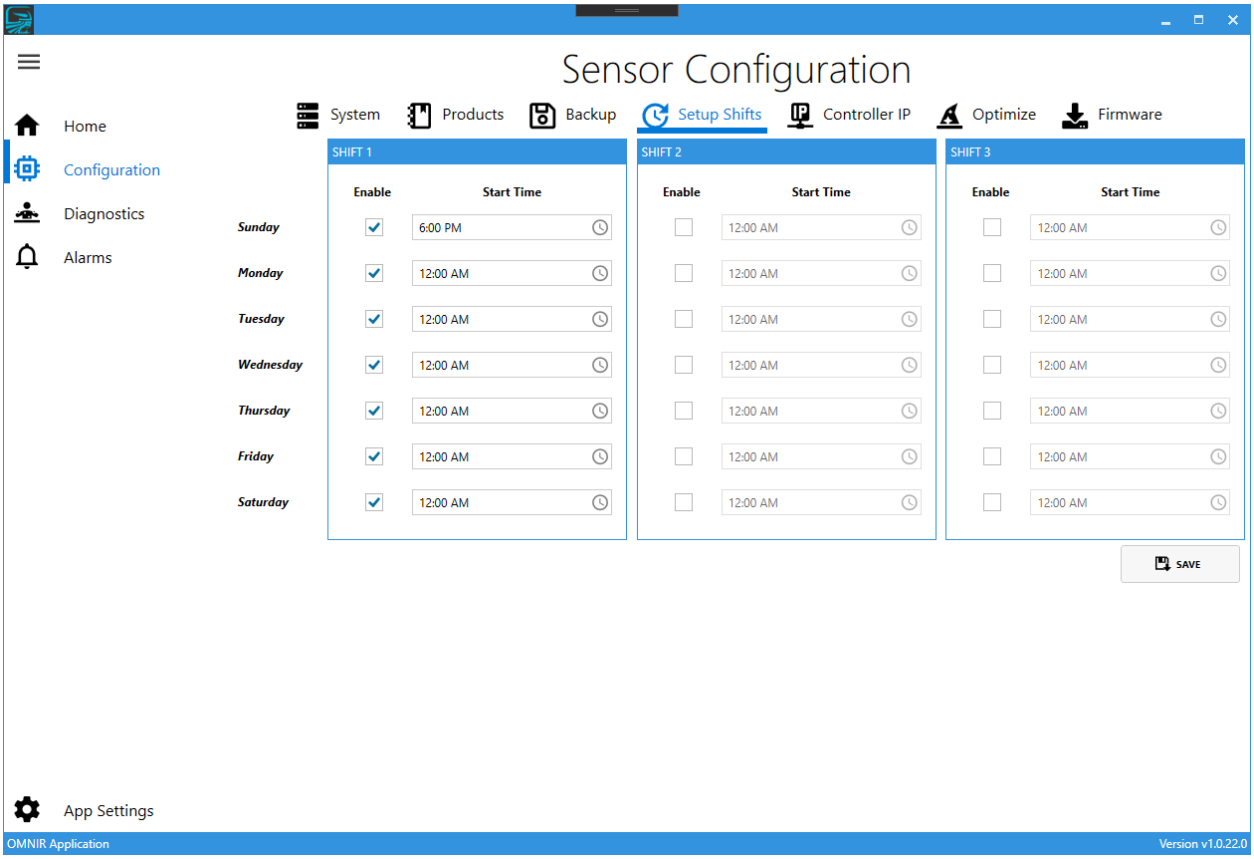
Section B – Actions

- Click the **Backup** button to save all the settings. User will be prompted for an optional description of the backup, then confirm.
- To restore, select a backup from the log in Section A then click the **Restore** button. User will be prompted to confirm restoring before overwriting the system settings.
- Clicking the **Delete** button will permanently remove the backup from the database. The user will be prompted to confirm *permanently* deleting this action.

Setup Shifts

If shifts are setup in the OMNIR system, it will automatically summarize and record the OMNIR results per shift. There are up to three shifts available per day, up to 7 days per week (see Figure 10 - Shift Setup).

Figure 10 - Shift Setup



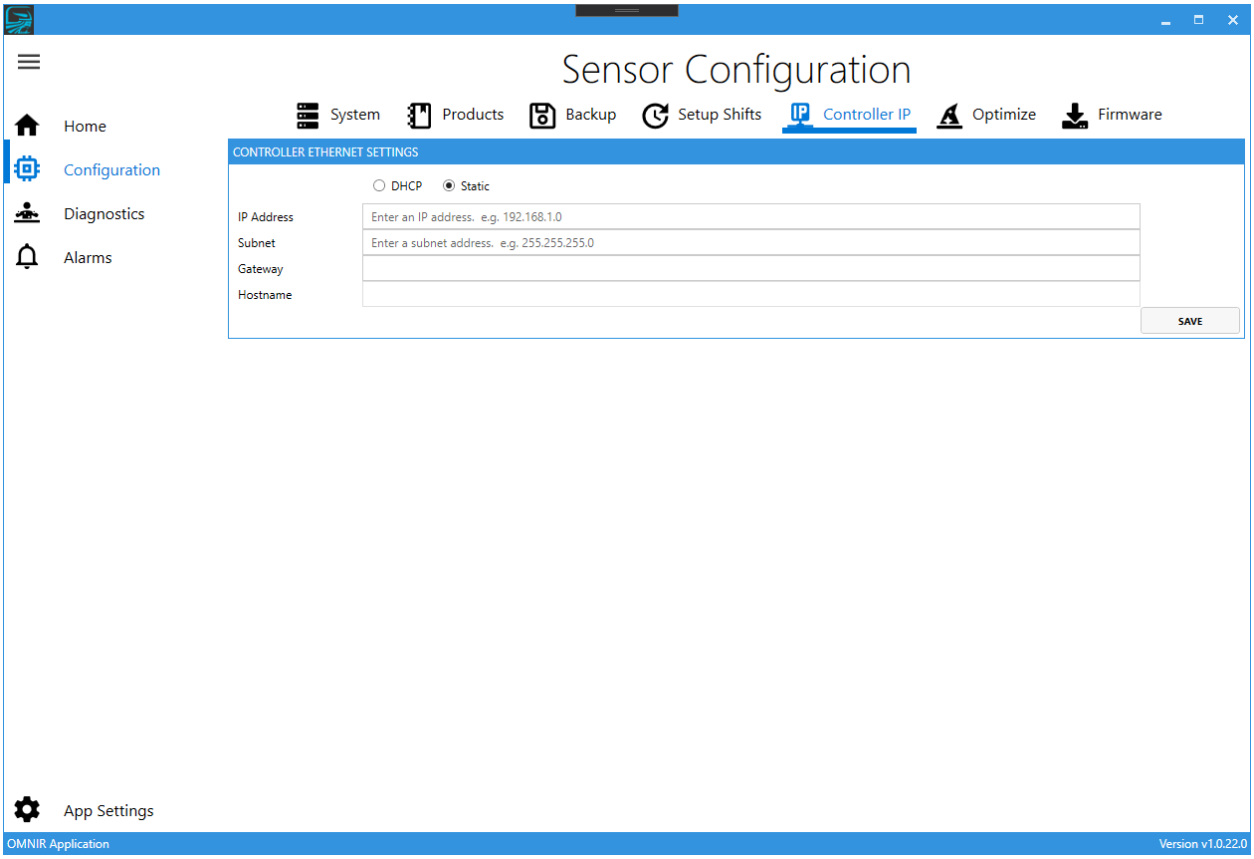
The user checks the box for the shift they would like enabled and enters the starting time for the shift. When the next shift starts, the data that was collected is archived and the data is cleared. Any new data is saved to the current shift.

After making a configuration change, a backup should be performed for disaster recovery (see BACKUP)

Controller IP

The controller IP address can be changed from the application. However, after changing the IP the application connection IP will need to be changed too. Enter the desired IP using the parameters provided by the IT department (see Figure 11 - Controller IP)

Figure 11 - Controller IP



Optimize

This screen provides functionality to make parameter changes to the currently running, view the simulated results, and then either accept or discard the changes. The primary sections are:

- Section A: calibration table for the product
- Section B: product settings related to data smoothing and process limits
- Section C: SPC chart of product values
- Section D: histogram chart of product values
- Section E: the most recent product value
- Section F: statistics on the SPC chart
- Section G: number of out process alarms
- Section H: raw data obtained from the senor
- Section I: commands to clear the histogram chart and save any changes made

Any change made on this screen are simulated and shown, however this is a *simulated* result only. The change is not applied until the **Save** button is pressed. Any change is highlighted to

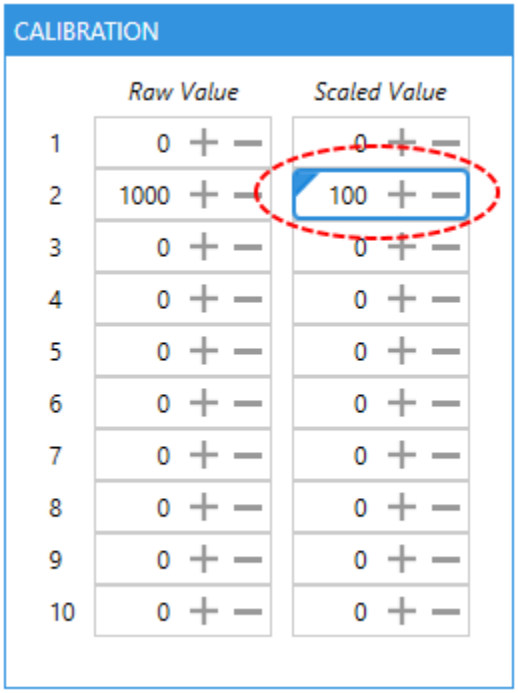
indicate it varies from the controller value; hovering over the change triangle in the upper left corner shows the user the original value stored in the controller. This allows the user to freely make changes without impacting production until the desire result is achieved.

After making a configuration change, a backup should be performed for disaster recovery (see BACKUP)

Section A – Calibration Table

The calibration section is where a user defines the relationship between the sensor signal and moisture content. See Section E – CALIBRATION for detailed information about setting the values. Figure 12 - Change highlighted on calibration table shows how a change to the table is displayed to the user.

Figure 12 - Change highlighted on calibration table



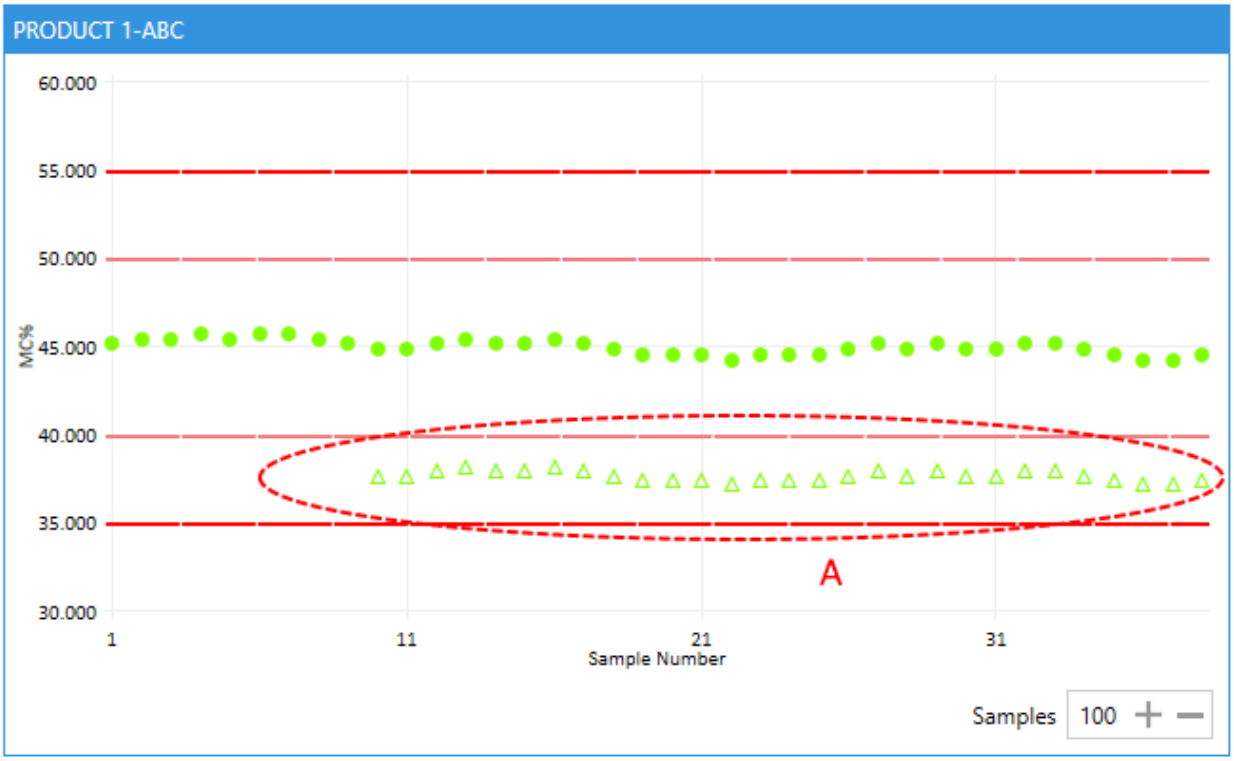
Section B – Product Settings

Process alarms can be used to determine if the process is in control. The user defines the parameters per application. See Products section for detailed information.

Section C – SPC Chart

This chart displays the most recent values measured by the system. If a change to the Calibration Table is made, a second series of triangles is shown to indicate the impact of this change (See Figure 13 - Change to calibration shown on SPC).

Figure 13 - Change to calibration shown on SPC



Section D – Histogram Chart

The histogram chart shows the distribution of values captured for a large amount of data. Any change made to the calibration table is reflected in the distribution, however if the dataset is already large it may be difficult to discern the impact of the change. To better see the impact, click **Reset Histogram** to clear the graph and show new data points. Note: this does not impact the histogram being recorded in the controller.

Section E – Recent Value

This is the most recent value measured by the system.

Section F – Statistics

Basic statistics for the data in the SPC chart. For more detail information see Section F – STATISTICS

Section G – Alarm Counts

These are out of process alarms that have occurred. See Section B – ALARM COUNTS for more information.

Section H – Raw Data

Raw data can be useful to determine what values to set the LOP alarms and calibration table entries. The data displayed is the most recent value measured.

Section I – Save

To apply the changes to the product, click the **Save** button.

Firmware

The system firmware is upgraded from this screen in a two-step process (see Figure 14 - Upgrade Firmware).

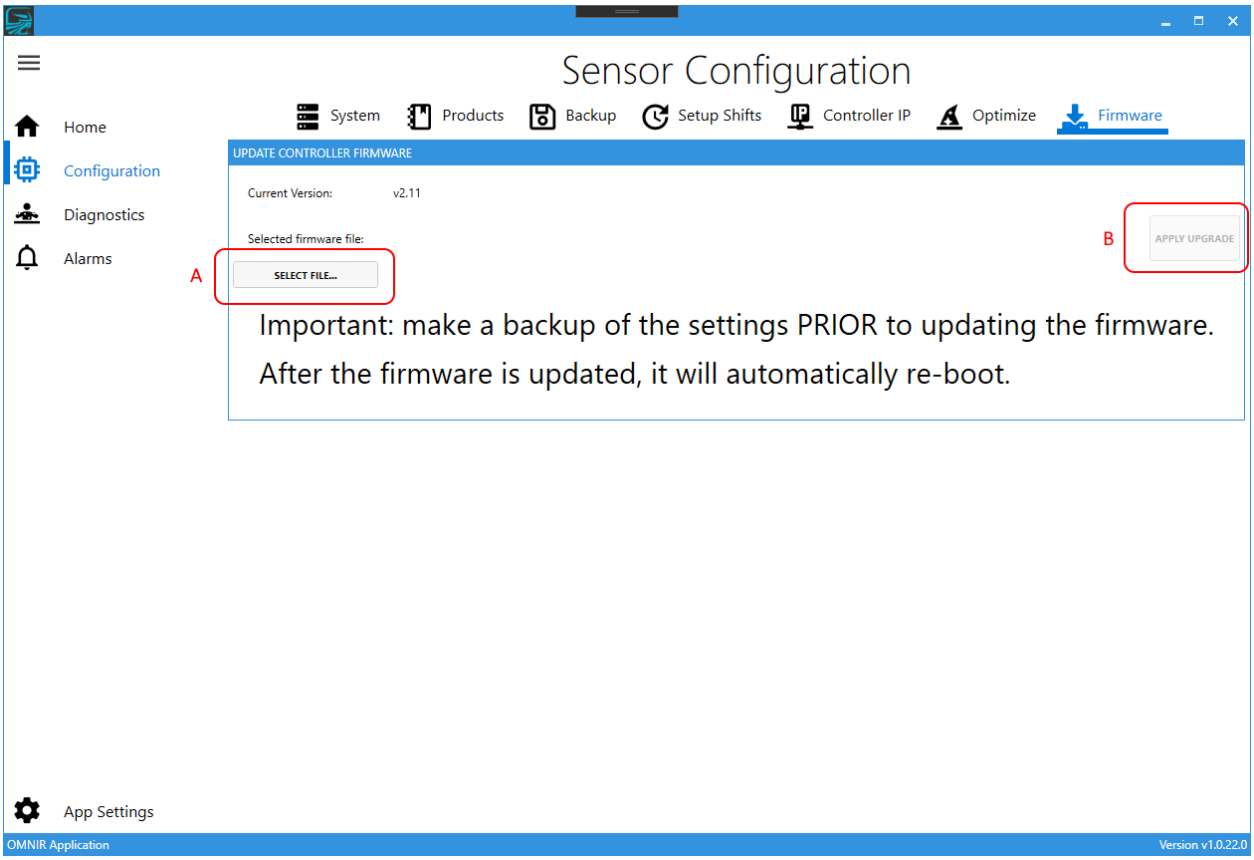
Step A: click the **Select File** button and select the desired firmware file to install

Step B: click the **Apply Upgrade** button to initiate the firmware upgrade

After the system has updated, wait 30 seconds then try to re-connect to the sensor in the App Settings – Connection screen (see Connection).

Prior to upgrading the firmware, a backup should be performed (see BACKUP)

Figure 14 - Upgrade Firmware

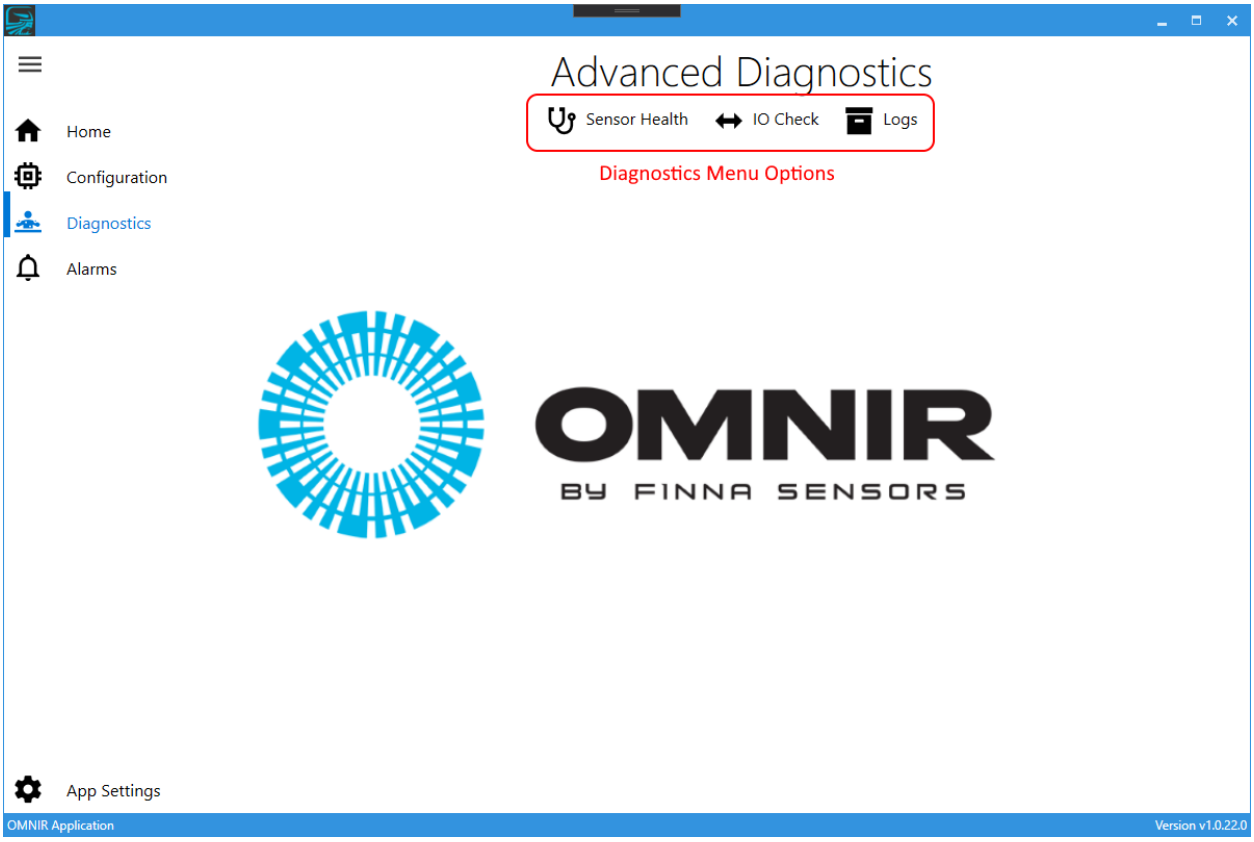


Diagnostics Screens

The Diagnostic screen (Figure 15 - Diagnostic Menu) has three options:

- **Sensor Health**: user may monitor detailed information about a sensor's health. This includes all health sensors, general status information, and NIR results.
- **IO Check**: this screen provides functionality to check hardware discrete IO and analog outputs
- **Logs**: a record of all configuration changes and general status information.

Figure 15 - Diagnostic Menu

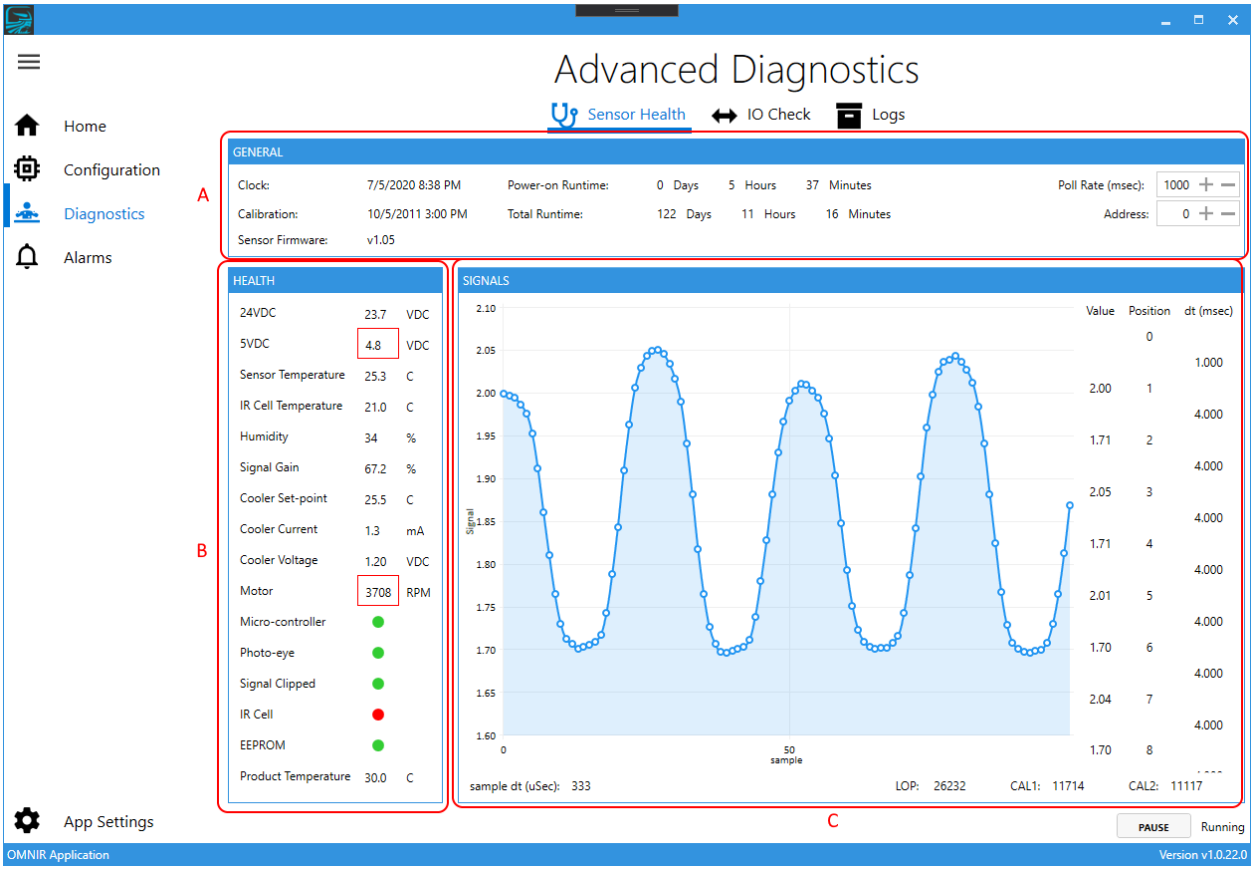


Sensor Health

This screen is an advanced diagnostics screen showing detailed information about a sensor. It is designed to diagnose a problem with the sensor, and identify the issue. Typically a technician with knowledge of how the sensor functions would view this data on this screen in a remote troubleshooting session. The following lists the primary sections in Figure 16 - Sensor Health:

- Section A: general information about the sensor
- Section B: detailed on-board diagnostic information in the sensor
- Section C: raw IR data captured by the sensor

Figure 16 - Sensor Health



Section A – General

The area shows information such as when the sensor was last calibrated, how long the unit has been in service, and the firmware version.

There are two controls that allow a user to select which sensor to view data (i.e. Address) and how quickly to read the information from the sensor (i.e. Poll Rate).

Section B – Health

Detailed results from the sensor's onboard sensors. This includes information like voltages, temperatures, and alarm conditions. The *Signal Clipped* indicator is an important item to watch when setting up a product; if this is illuminated the gain on the sensor is too high and needs to adjusted.

Section C – Signals

Raw data measured by the sensor. This can be used to determine how well the sensor is measuring the material.

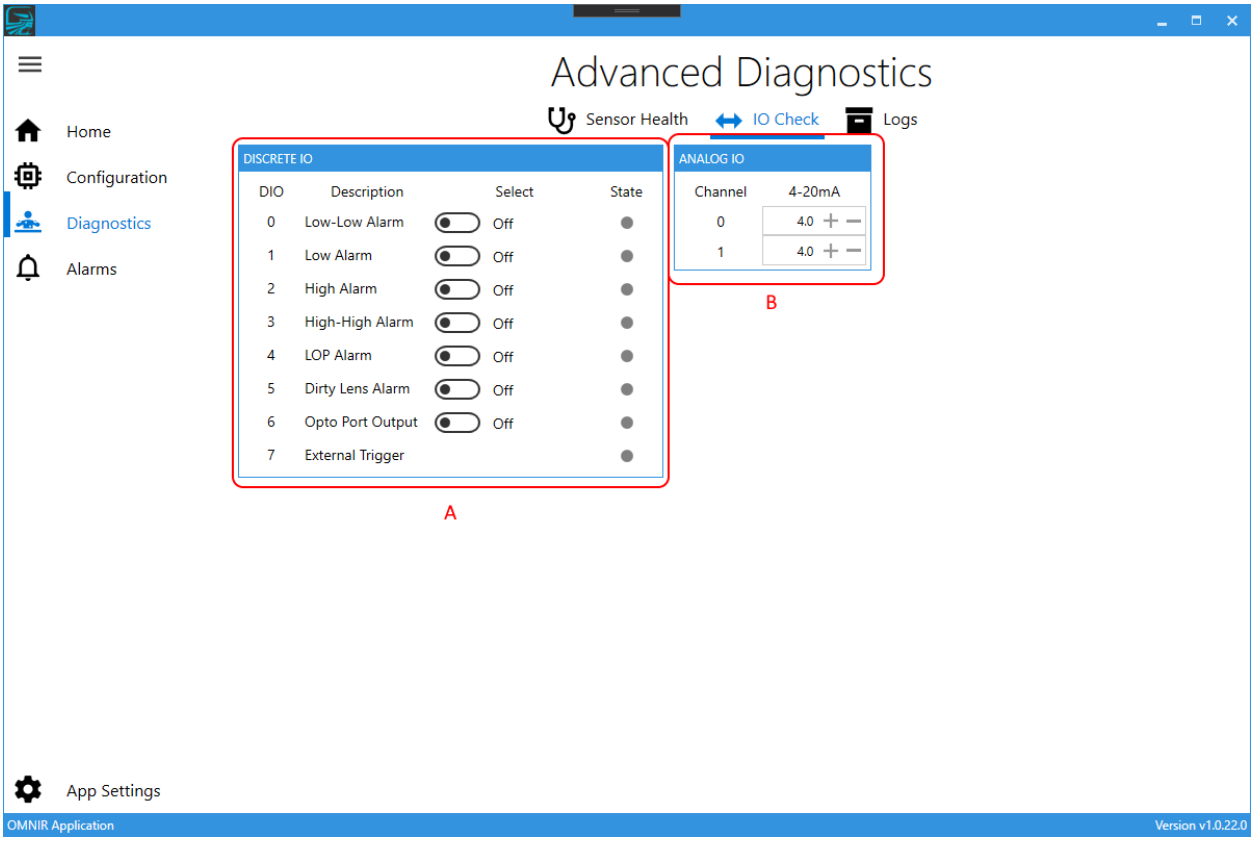
IO Check

The IO Check screen (see Figure 17 - IO Check) allows users to test the discrete IO points and analog outputs in order to confirm the IO is correctly terminated to the field IO points. This

screen will automatically refresh the data once per second, so ensure any IO check waits at least that long.

The user must confirm the OMNIR system will not take any readings during IO checkout

Figure 17 - IO Check



Section A – Discrete IO

This section provides functionality to turn on the discrete outputs for DIO 0-6. The user may actuate DIO 7 (External Trigger) and confirm the State light illuminates when on.

Section B – Analog IO

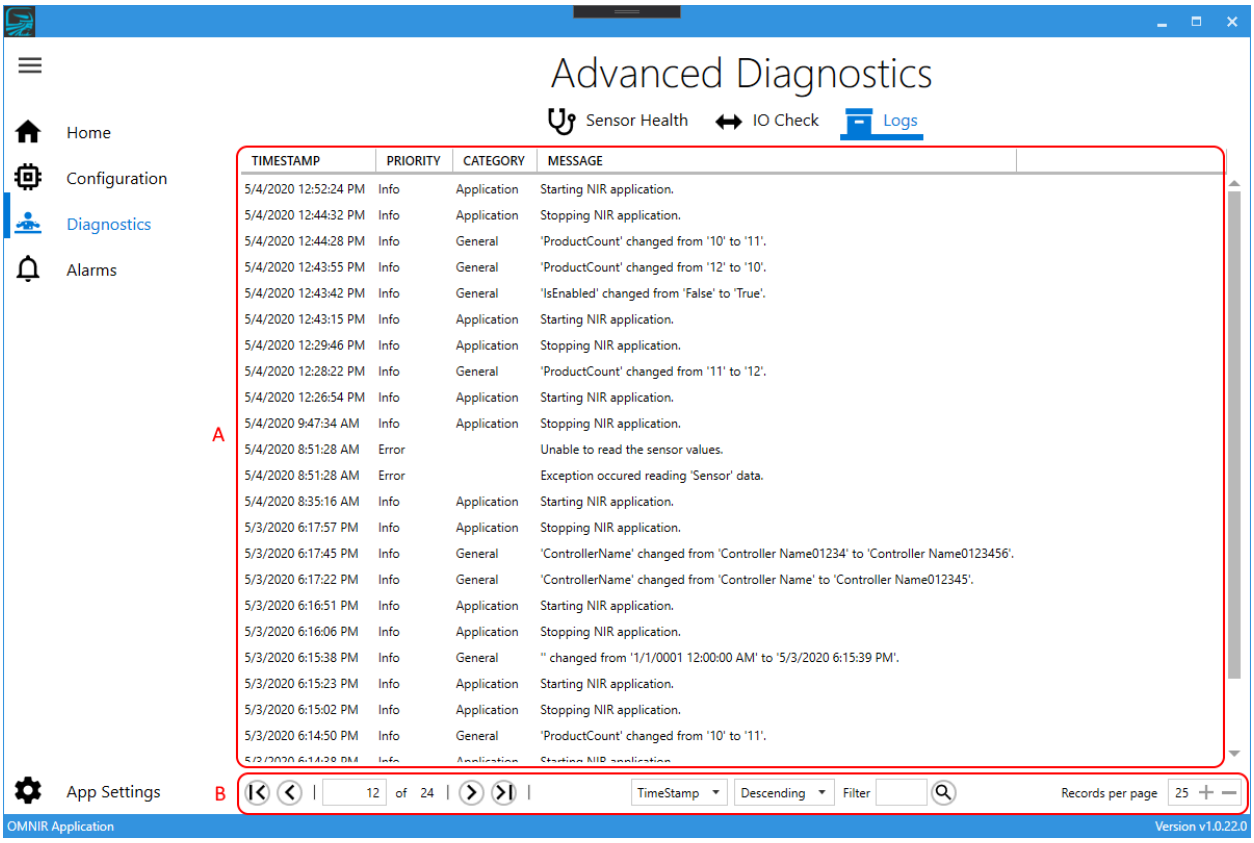
The user may set the analog output value for each channel and confirm the level is reached.

Logs

The log screen displays general information about the software and any errors that may have occurred. In addition, there is a record of any system changes performed. This audit trail can be of assistance when the system does not respond as it had previously and a user is looking to verify if a change was made in order to explain the new behavior.

The logs function requires the database to setup first (see Section C – Database)

Figure 18 - Logs



Section A – Logs

This section displays the following information:

- Timestamp: The date and time when alarm was generated.
- Priority: Unique ID number identifying the source of the alarm.
- Category: type of alarm

- Message: A description of the alarm condition.

Section B – Navigation

The user can page forward/backward in the logs, change the number of logs shown per page, or filter the logs.

Alarms

When an alarm condition is detected by the system, an alarm notification icon is shown along with the number of new alarms detected (see

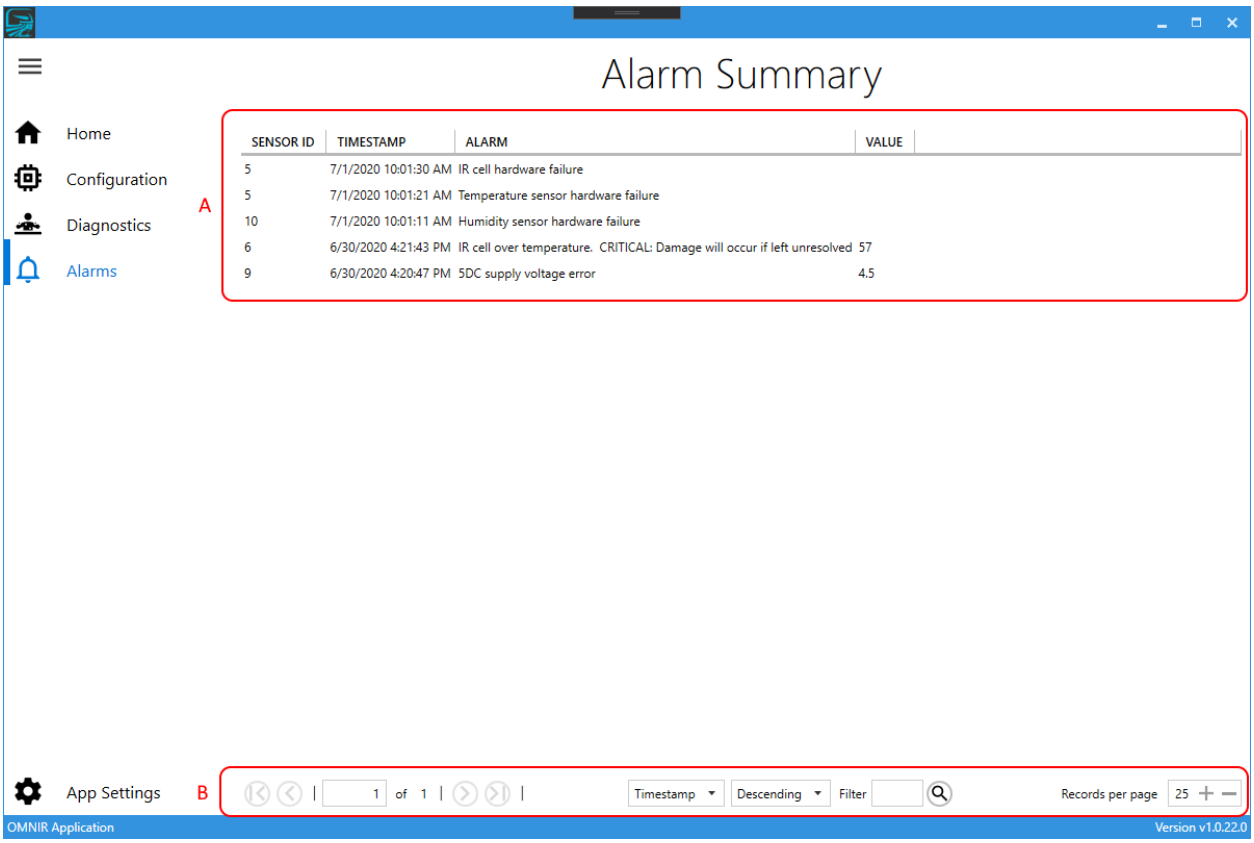
Figure 19 - Alarm *Notification*).

The alarms function requires the database to setup first (see Section C – Database)

Figure 19 - Alarm Notification

Clicking the **Alarms** button displays the screen in Figure 20 - Alarm Screen.

Figure 20 - Alarm Screen



The alarm summary includes two sections.

Section A – Alarms

Contains the following information:

- Sensor ID: Unique ID number identifying the source of the alarm.
- Timestamp: The date and time when alarm was generated.
- Alarm: A description of the alarm condition.
- Value: If the alarm condition includes information about the alarm value it is shown here.

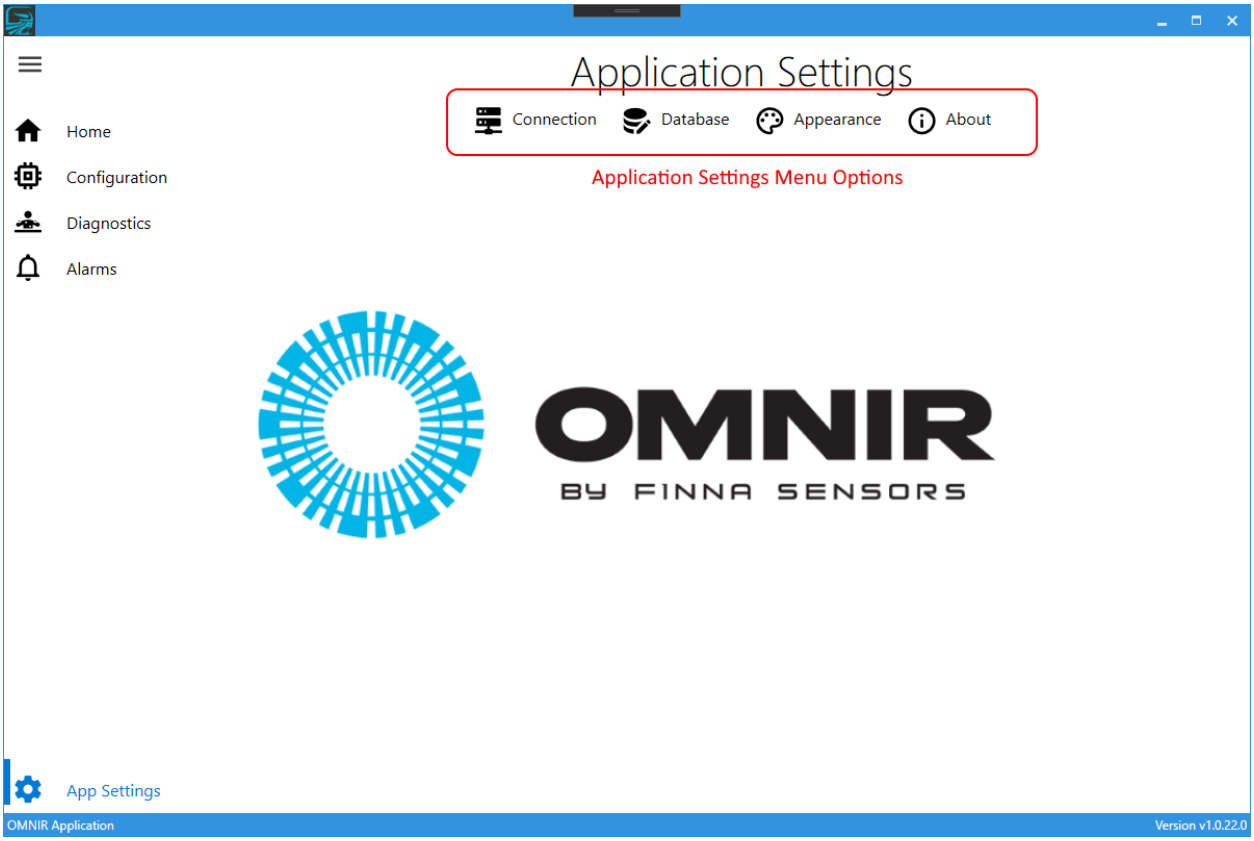
Section B – Navigation

The user can page forward/backward in the alarms, change the number of alarms shown per page, or filter the alarms.

App Settings

The Application Settings screen (Figure 21 - Application Settings) allows users to establish a **Connection** to an OMNIR system, setup the **Database** for archival purposes, customize the application's **Appearance**, and update the software in the **About** screen. All configuration changes in the Application Settings are *only* applied to the local PC. If the software is installed on another PC, these settings will need to be changed.

Figure 21 - Application Settings

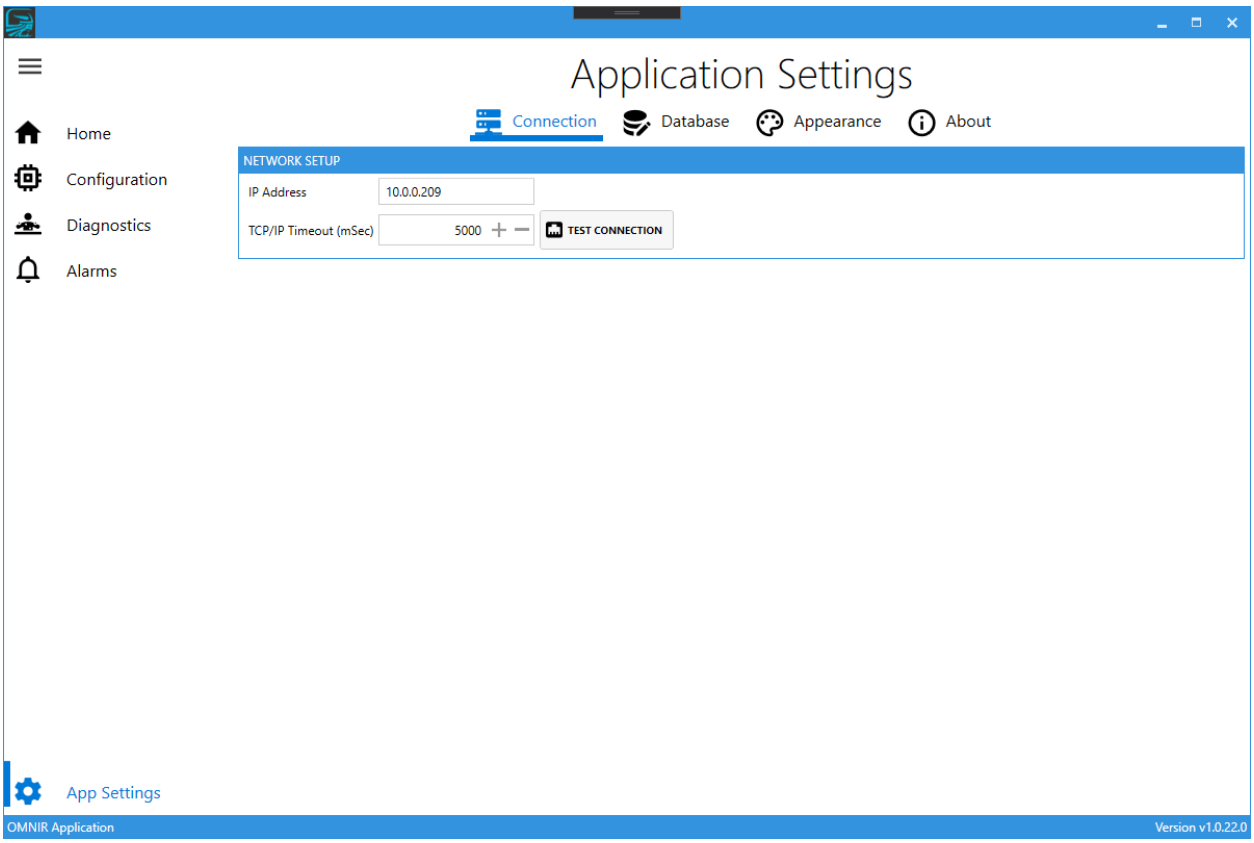


Connection

The software communicates to the OMNIR system via standard Ethernet network protocol. After determining the static IP of the OMNIR system, enter the IP address in the field (see Figure 22- Connection Screen). Test the communication is successful by clicking the **Test Connection** button.

The TCP/IP timeout value allows a user to determine the maximum time for a response before responding with an error. On slow networks, it may be necessary to increase this timeout value to reduce the number of communication errors.

Figure 22- Connection Screen



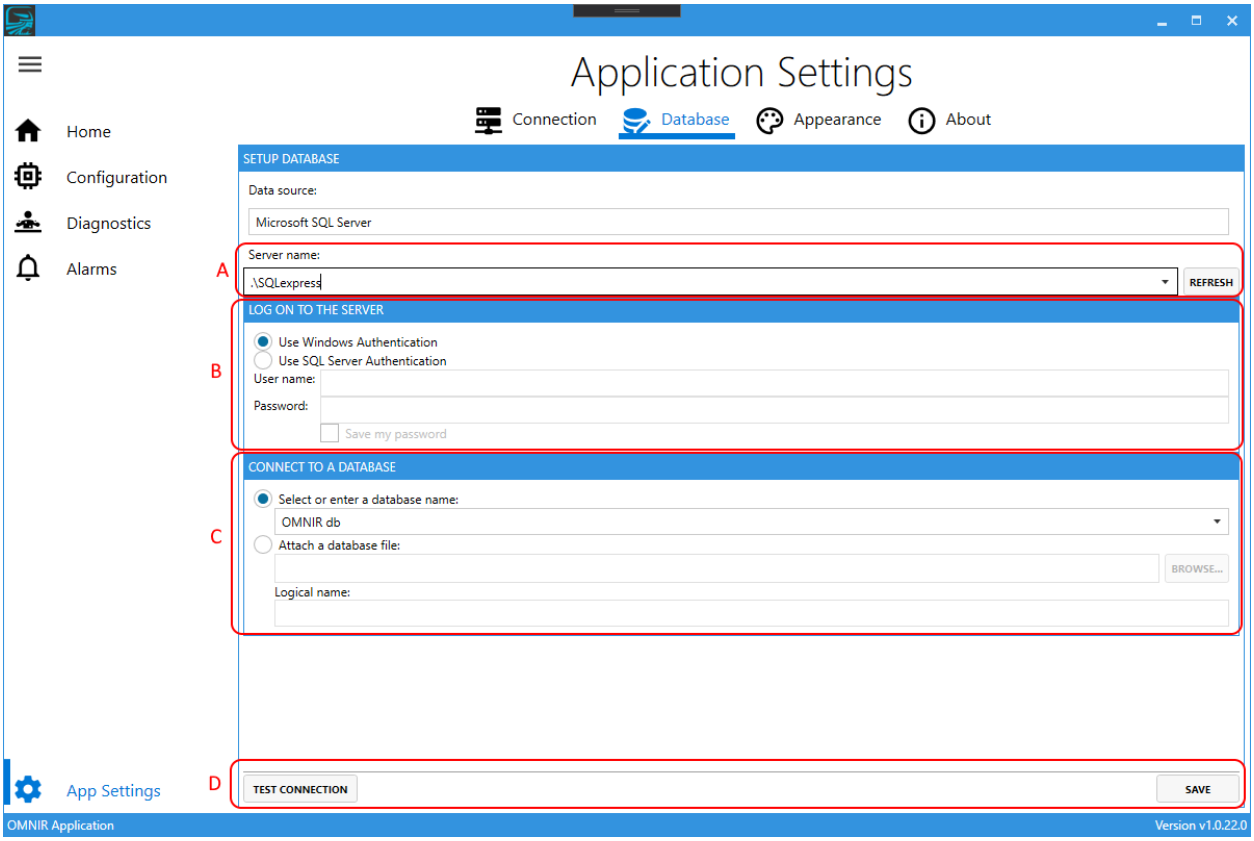
Database

The OMNIR system stores log information, backups, and other data in a SQL server. The server is typically on the same PC as the application, however it can also be located on any networked PC. When the SQL server is networked, the data can be shared on multiple PCs and IT can ensure the information is backed up for disaster planning purposes.

Prior to running the system, it is highly recommended to establish a connection to the database

There are four sections to in the database setup screen (see Figure 23 - Database Setup), they are (a) Server Name, (b) Authentication, (c) Database, and (d) Test/Save database connection.

Figure 23 - Database Setup



Section A – Server Name

Click the pull-down button to search for available SQL servers, then select the SQL Server instance (Note: if SQL server is on the PC the default setting is **.\SQLexpress**). In the event the server is not found, the user can also manually type in the address of the server. The correct format to access SQL server is the *computer name\SQL server name*.

The **Refresh** button will re-search for an available SQL server.

Section B – Authentication

The authentication section ensures the user has rights to access the data. Either use the built-in Windows authentication or SQL server's authentication. Note: setting up authentication rights is beyond the scope of this document and is typically managed by an IT department.

Section C – Database

To choose an existing database, click the pull-down to search for available databases on the selected SQL server. If a database exists on the SQL server but is not available to select, the user does not have sufficient Authentication rights.

The IT department should provide alternative Authentication credentials or ensure the existing credentials have rights.

To create a new database, enter the database name.

Section D – Test/Save Connection

After entering data into sections A, B, and C, the **Test Connection** can be used to confirm the connection is valid. Click the **Save** button to accept the changes. If this a new database, the user will need to confirm creating a database.

Appearance

Users can customize the appearance of the application to Light or Dark as well choose accent colors.

About

This screen provides detailed information about the application and identifies if a new application version is available. If the application can be updated, click the **Update** button to install the new version.

An internet connection is required to upgrade the application