PDX Deploy User Manual

Version 3.3.0

Predictronics Corporation

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PDX Deploy Overview

PDX Deploy is an intuitive data visualization application that manages and monitors critical assets, issues detailed reports, maps degradation trends and predicts potential failures to achieve worry-free uptime.

> **Note:** It is highly recommended to use the PDX Deploy in Google Chrome browser. Some of the functions may not be displayed properly in other web browsers.

Key Features

- Actionable data visualization
- Real-time alarms and scheduled reporting
- On-premise/cloud hosting for data security
- Cross-platform and mobile device support

Login Page

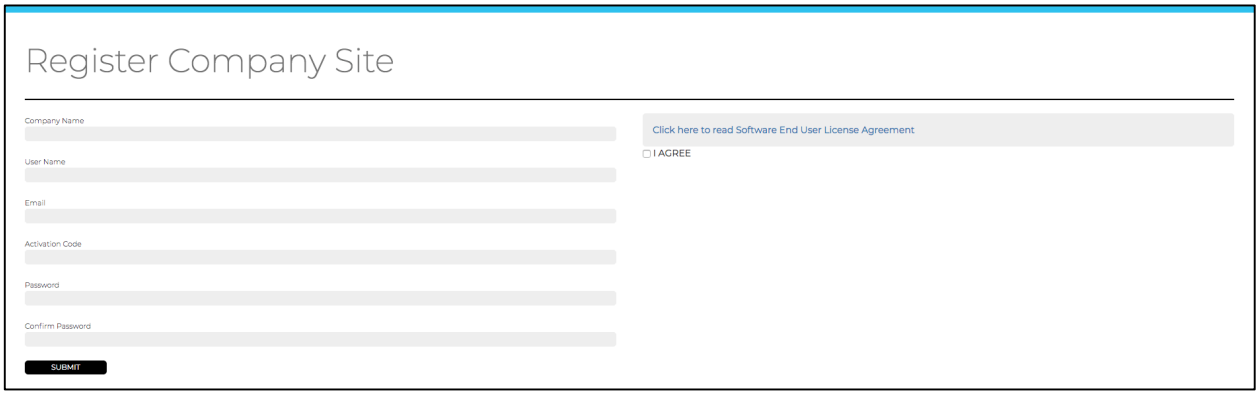
On the login page you can login with your account credentials, and the role of your account will determine which functions are available to you inside the interface. More information about user roles can be found in the Users section.

For registering the first user, you will need to register the company site, to do so click Register Company Site.

Register Company Site

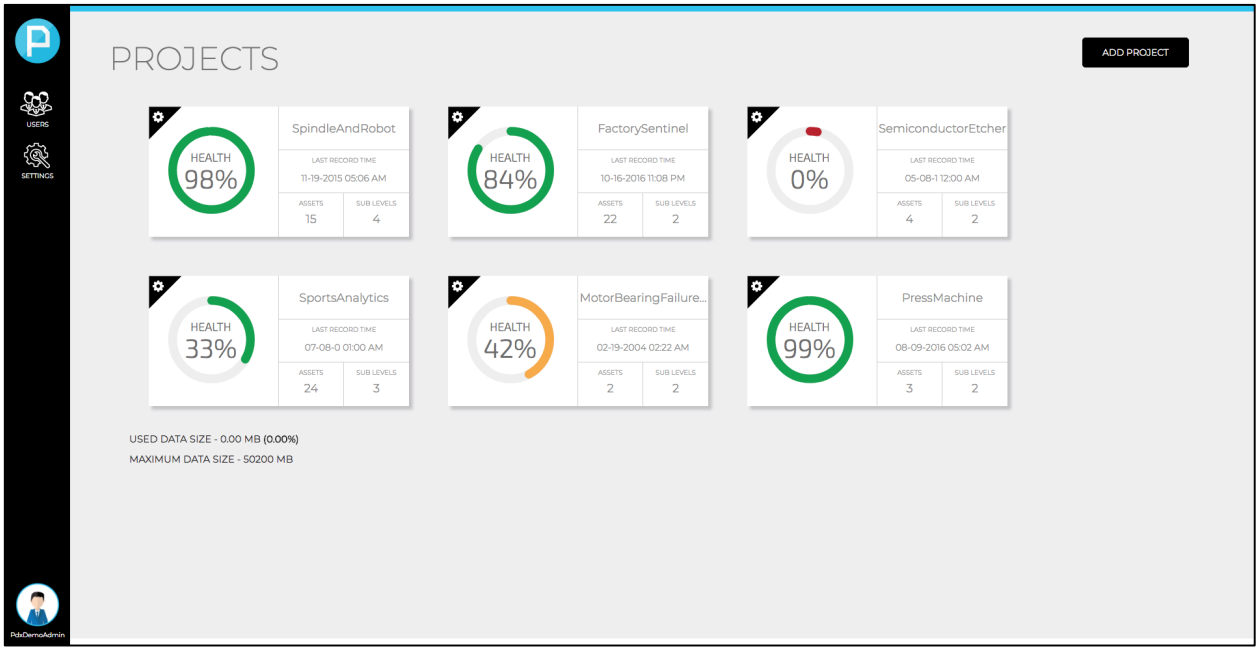
When registering the first user account and the company site:

1. Type the Company Name (also referred to as Company Site)
2. Type the username, email, and password for the first account
3. Type in the Activation Code (provided by Predictronics when PDX Deploy is purchased)
4. Read the EULA on the right, and mark the check box
5. Click Submit and a registration link will be sent to the provided email



Projects Page

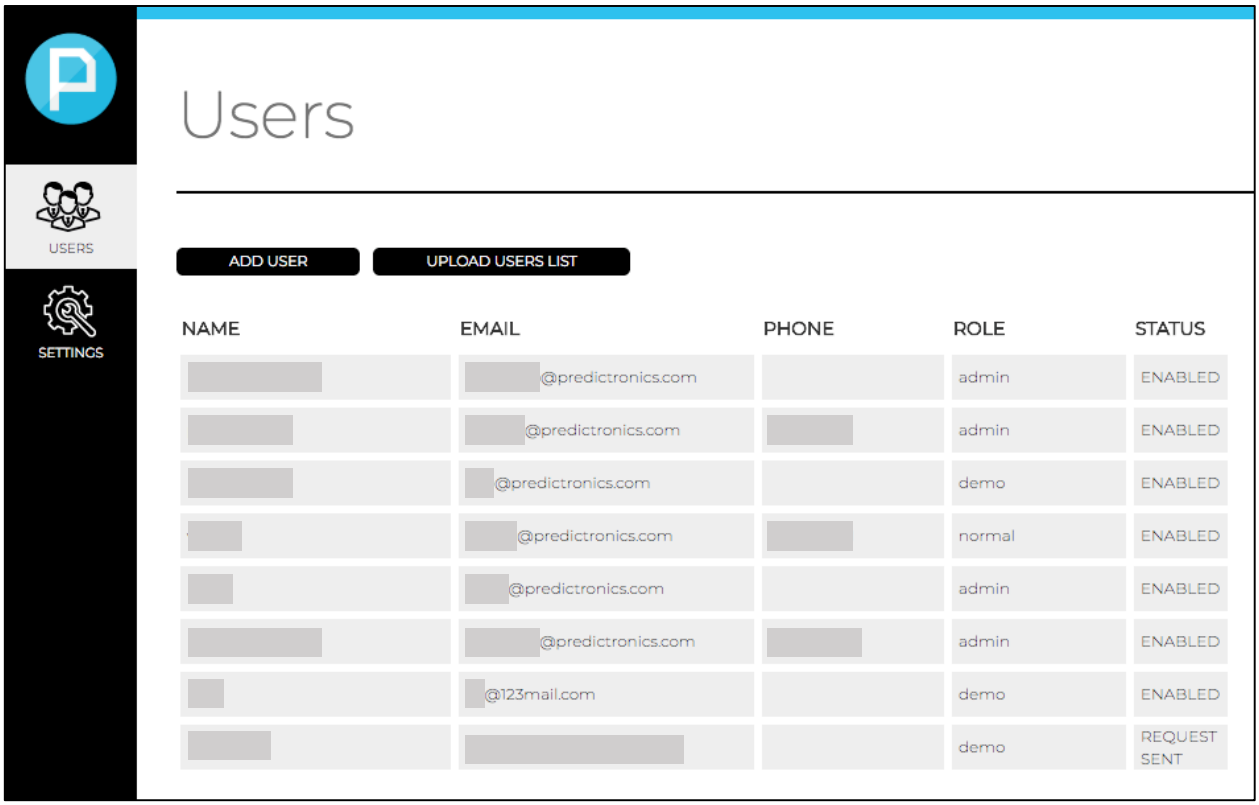
After you login, the projects page will appear, as shown below. For each project deployed there will be a tile with the health, number of assets, and the date of the latest data file for that project. To edit a projects name, click the gear icon in the top left of the project tile.



Note: The health of the project is based on the Group Health Calculation Logic setting for the project (shown in Dashboard Settings). It can either be the minimum, maximum, or average health of the assets.

Users

Only Admin users can access the Users page, which is used to add other users.



To add a single new user to PDX Deploy:

1. Click the Add User button
2. Enter the users name at the top of the Add User window
3. Enter the users email (used for notifications)
4. Optional – Enter the users phone number (only US numbers are currently supported for notifications)
5. Select the role of the user
    a. Admin User: Has access to all the functions, and can add and edit new users with the Users page
    b. Normal User: Will have login credentials which can be modified by them. They can only view the interface, they cannot make any changes to it.

c. Demo User: Will have login credentials, that cannot be changed. They can only view the interface, they cannot make any changes to it.
d. Recipient: They will not have login credentials, and cannot log into the interface. They can only receive notifications.

6. Set the desired expiry date for that user account
7. Click the Add User button

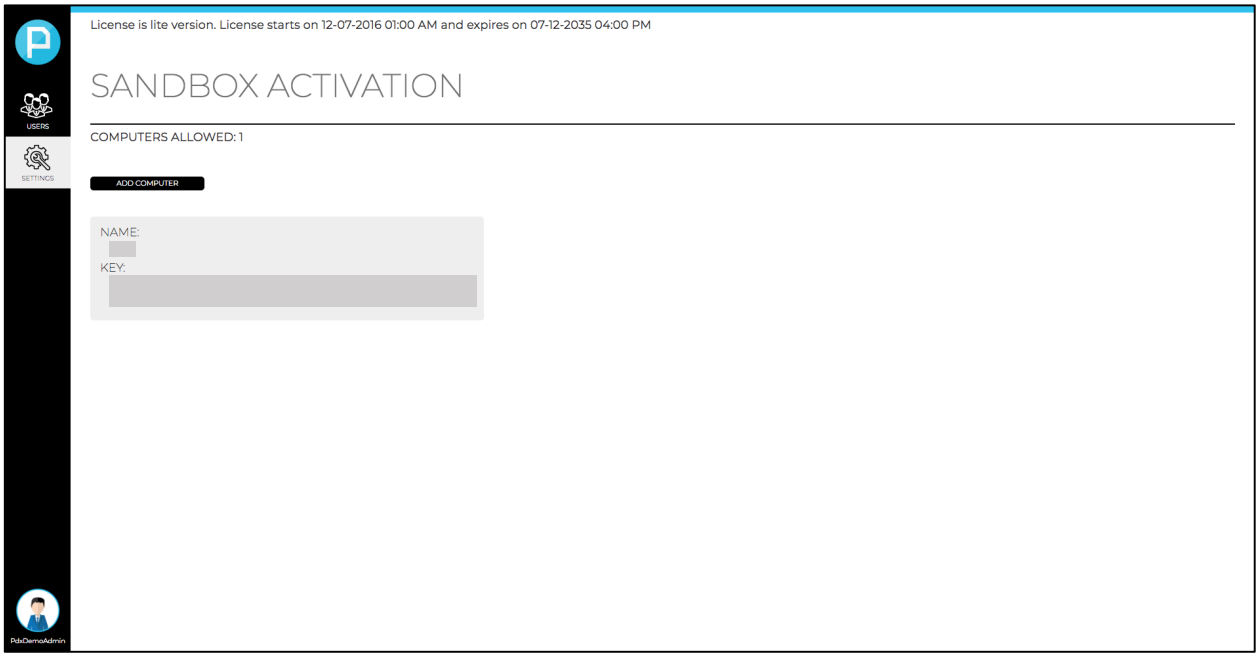
To add multiple users at once, click the Upload Users List button, and upload a .csv file in the specified format.

Admins can always edit users in the list on the Users page.

Settings

Sandbox Licenses

On the Sandbox Licenses page, the license expiry date of the current installation of PDX Deploy/Sandbox is displayed. Contact Predictronics Corp for extending the license period. One PDX Sandbox activation license is provided for every Company site.



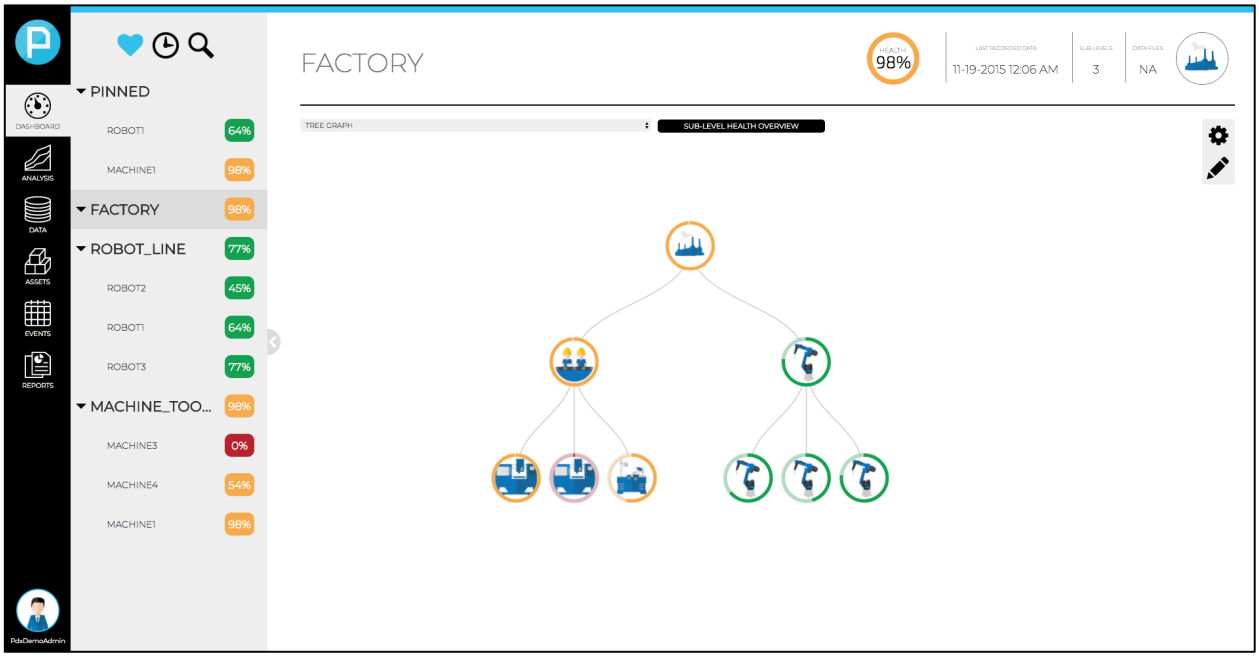
For activating the PDX Sandbox license:

1. Click the Add Computer button
2. Enter the name of the computer (this name is just to identify the system)
3. Enter the key obtained while installing PDX Sandbox.
4. Click Add Computer button to save the key.

For obtaining more sandbox licenses contact Predictronics Corp.

Main Interface Navigation

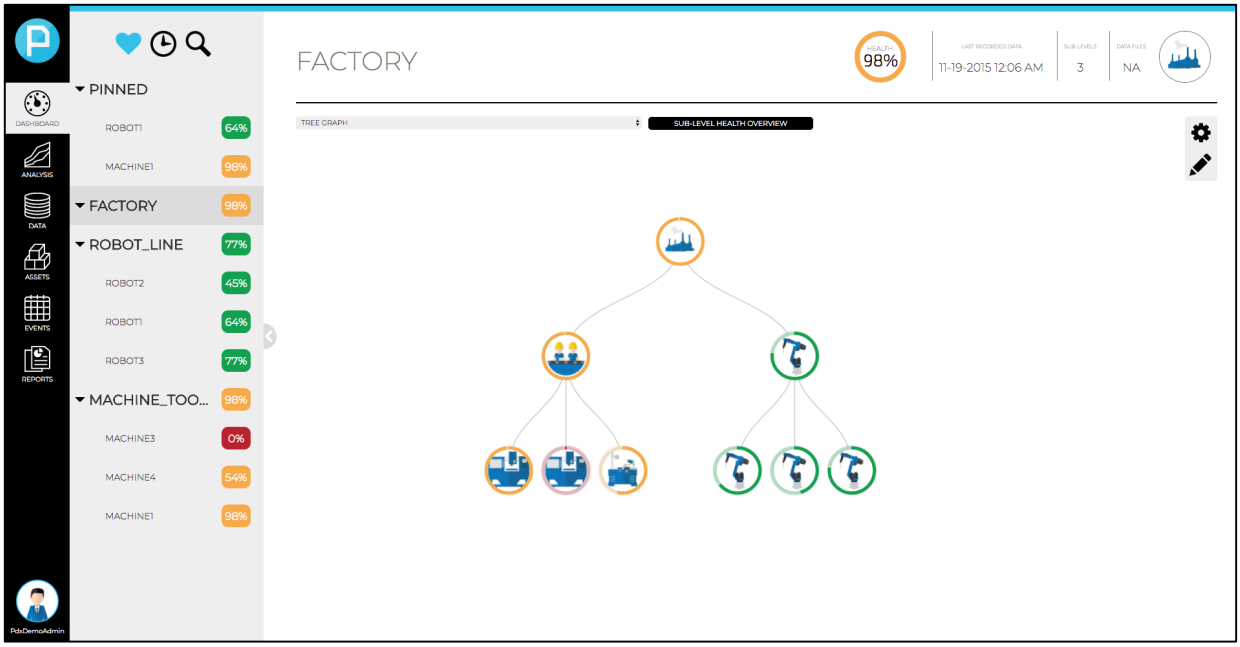
After you enter a project, you will see the main interface, as shown below.



The black navigation bar on the far-left side of the interface is always visible and contains all the main tabs. Everything to the right of the navigation bar will be populated with functions pertaining to the selected tab in the navigation bar.

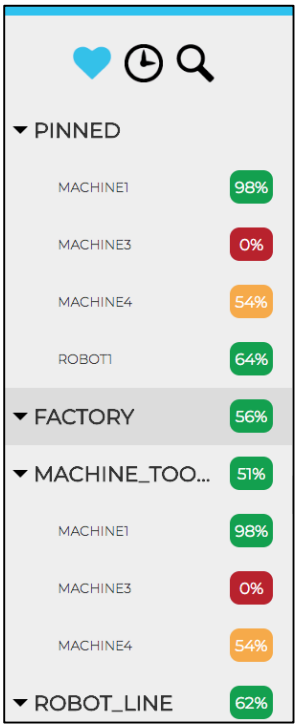
Dashboard

The Dashboard tab is always the first tab selected after you login to a project. It contains two different types of dashboards, the parent asset dashboards and the asset dashboard. A parent asset has assets that belong to it, such as a factory or a manufacturing line, while a normal asset does not have any assets that belong to it.



Asset Tree

On the left of the dashboard is the asset tree, which is where you can see all your assets, health percentages, and a color which describes the asset's health condition. The color pertains to the assets health compared to the thresholds for that asset (i.e. green means the health indicator is below the lowest threshold, which generally means the asset is normal or healthy).



By default, the assets are sorted by health, so the assets with the worse health will show up at the top and are easy to find. You can also sort by time, so the assets with the most recent data will show up at the top, and you can search by name. In addition, you can pin certain assets that you are particularly interested in, and the pinned assets will always show up at the top. To pin an asset, hover over the asset in the tree and click the pin icon.

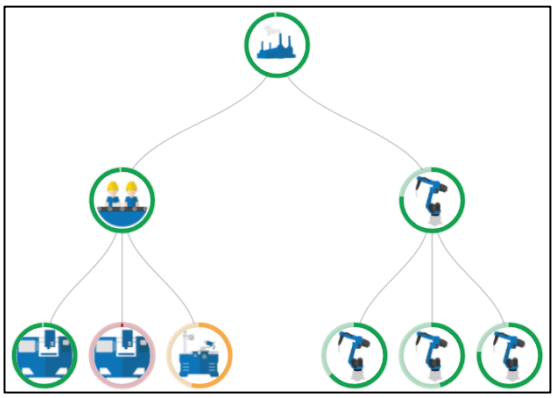
Asset Information

At the top of the dashboard, you will see the following information about the asset that is selected in the asset tree:

1. Health percentage
2. Date of last uploaded data file for that asset
3. Number of data files uploaded for that asset
4. Asset image

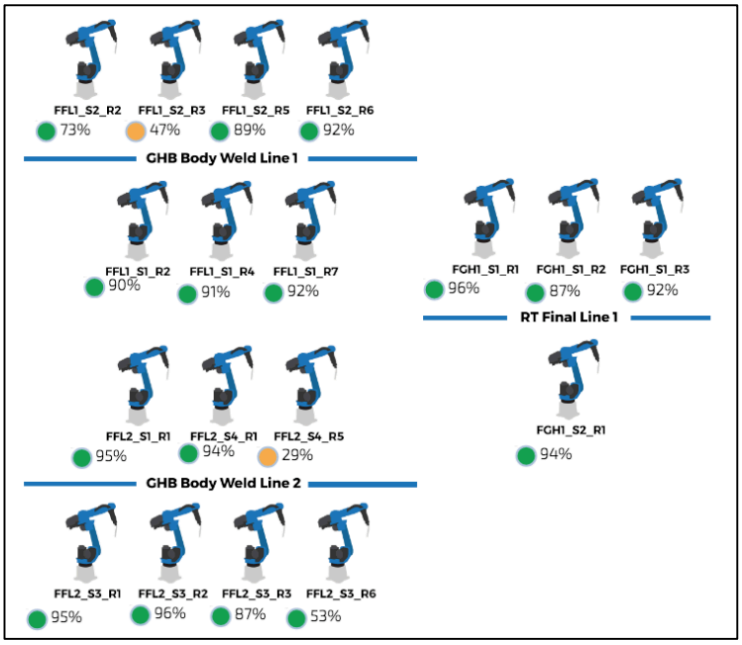
Parent Asset Dashboards

If a parent asset is selected in the asset tree, it will show the current health of that asset and all the assets that belong to it.



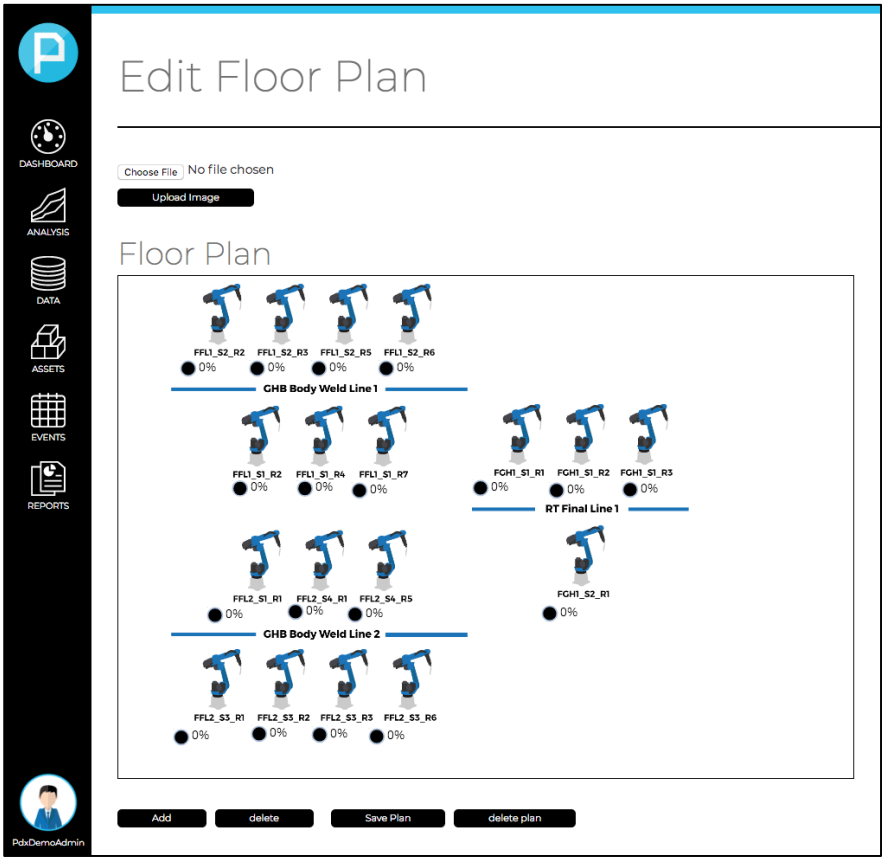
By default, a tree graph will be displayed, which will show the hierarchy of the factory, by showing which assets belong to which parent asset (i.e. manufacturing line, station, etc.).

If a floor plan is uploaded, and the highest-level parent asset is selected, it will display the location of each asset along with their health information.



Edit Floor Plan

To edit or upload the floor plan click the pencil icon in the top right of the factory dashboard, and the Edit Floor Plan page will appear.

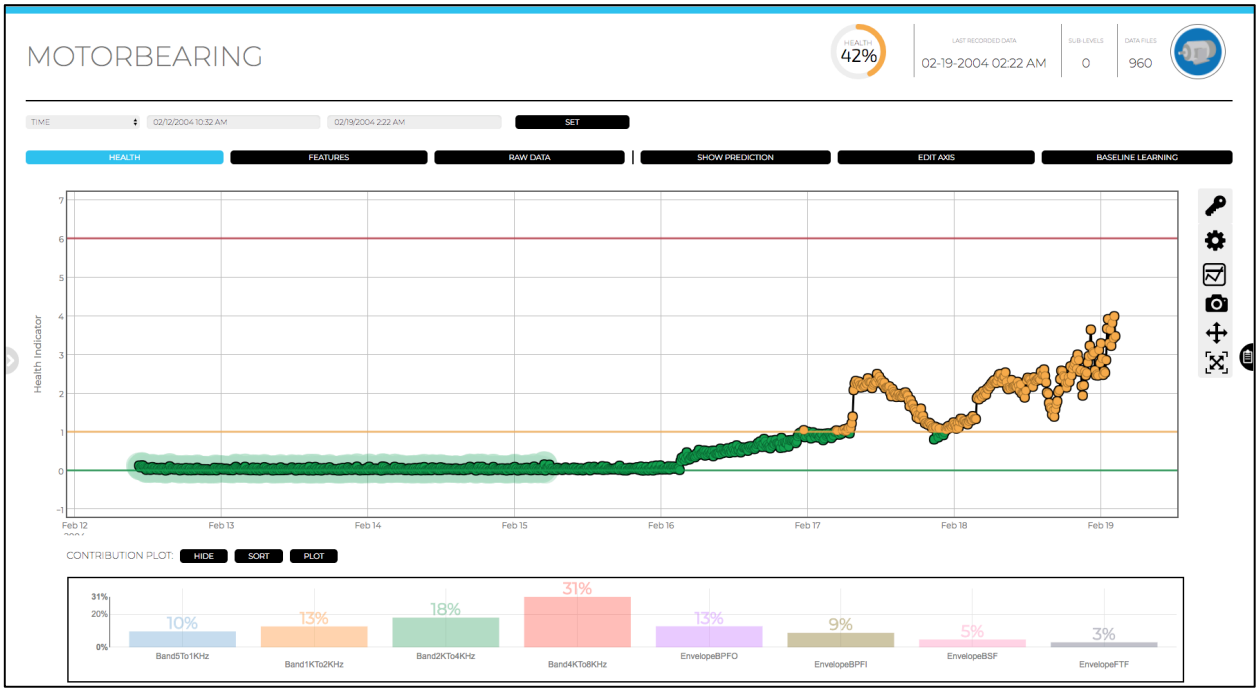


To upload a floor plan, select an image by clicking Choose File (image must be a .png file), then click Upload Image.

To add your assets to the floor plan, click the Add button at the bottom. In the Add Asset pop-up window, select the asset from the first dropdown menu, select the icon shape from the second drop down, and then click Add Asset Icon. The icon of the added asset should appear in the top left of the floor plan, drag the asset icon to the asset's location on the floor plan. You can also resize the asset icon by clicking the icon, and dragging one of the corners. When you are done adding assets, click Save Plan.

Asset Dashboard

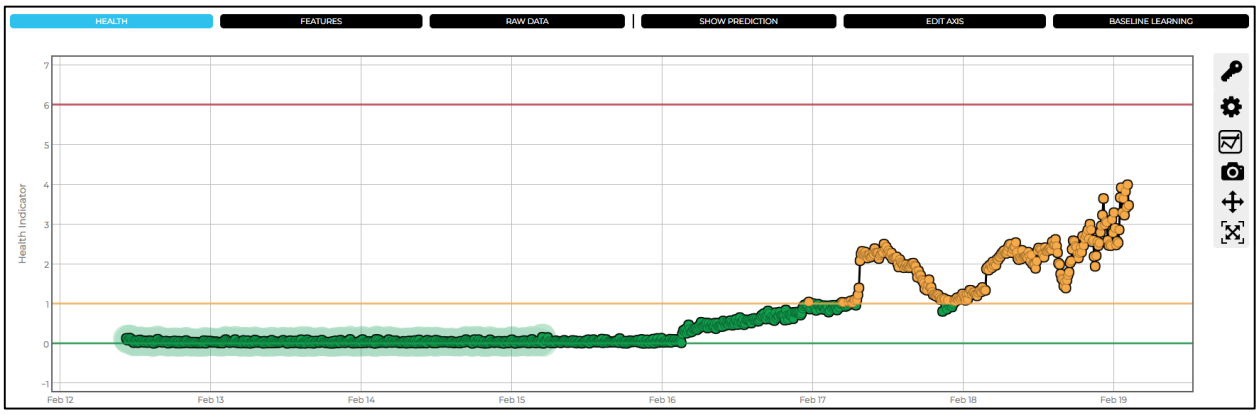
When you click on an asset from the asset tree or a parent asset dashboard you will see the individual asset's dashboard. The asset dashboard is where you will be spending the most time, as it allows you to visualize all the raw data, features and health analysis for an asset.



Note: The Baseline Learning button always exists in the top right of the asset dashboard. When clicked it will quickly redirect you to the selected asset's Baseline Learning page, in case you need to update the asset's baseline.

Health

The health plot shows the health indicator over time, which indicates how normal or abnormal the asset is compared to baseline.



The higher the health indicator, the more abnormal/degraded the asset is. The color of the health point's change based on their relationship to the thresholds (i.e. if the health point is above the second threshold the health point will turn yellow). In addition, the baseline health points are shaded green, and the data points that triggered an alarm are shaded red.

Note: The health percentage is calculated from the health indicator. 100% means the health indicator is zero (perfectly normal), 0% means the health indicator is greater than or equal to the highest or worst threshold.

Health Plot Functions

There are several functions on the right of the health plot. Below is a brief explanation of each function:

1. Graph Key (key icon) – Brings up a plot legend.
2. Dashboard Settings (gear icon)
   a. Maximum Contributions: Determines the maximum number of variables shown in the contribution chart.
   b. Maximum Sub-Level Health Bar Charts: Sets the maximum number of variables shown in the sub-level health overview chart on parent asset dashboards.
   c. Auto Refresh Dashboard: By default, the dashboard will only show new data if the page is refreshed (refreshes if you ever switch dashboards). With this option, you can set it up to automatically refresh every N seconds.
   d. Health Click Redirect: Controls which plot you are redirected to (raw data or feature plot), if you click a health point on the health plot (i.e. if you set

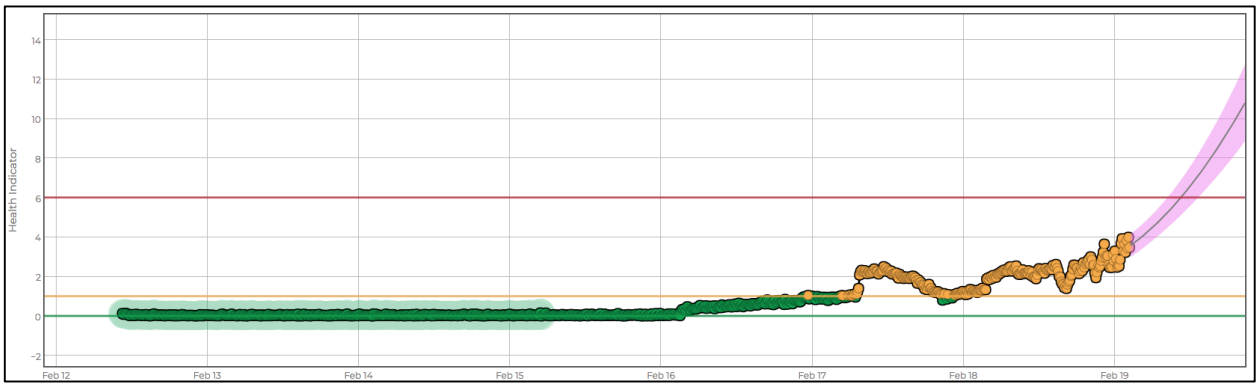
this to raw data, and you click a health point, it will show you the raw data for that date).

e. Group Health Calculation Logic: Determines how the health of a parent asset is calculated. For example, the health of a line can be calculated based on the average health of the assets that belong to that line.
f. Maximum Number of Health Points Displayed: The maximum number of health points that can be plotted in the health plot. If there are more health points than this number in the selected timespan, it will down sample the health points.
g. No Downsampling for Last N Health Points: The last N health points will not be downsampled (note: this number cannot be bigger than the max number of health points displayed).

3. Threshold Settings (thresholds icon)
   a. Adjust threshold values: You can increase or decrease the threshold values.
   b. Add thresholds: You can also add more thresholds.
   c. Adjust alarm settings: Which threshold triggers an alarm, and how many health points have to be above the threshold before an alarm is triggered. For example, an alarm could be setup to be triggered if 4 of the last 5 health points are above the threshold. Alarms trigger events, which can trigger notifications.
4. Download plot as a .png file (camera icon) – saves the health plot as a png file.
5. Pan – Allows you to pan in the plot.
6. Autoscale – Resets the plot axes.

Health Prediction

Click Show Prediction above the health plot, to predict future health and see when the asset will cross a threshold based on recent trends.

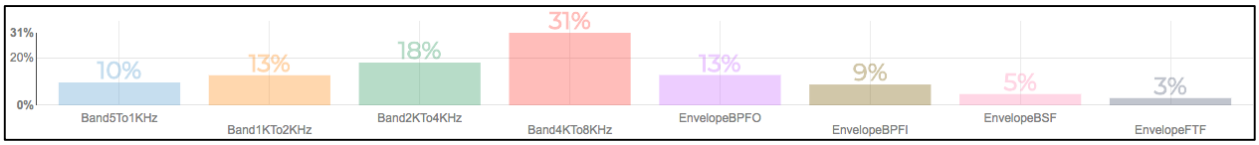


The prediction will show the trend line, as well as confidence bounds.

Note: If the health points have a more consistent trend, with less fluctuations, the confidence bounds will be tighter.

Health Contributions

Below the Health plot, you can see the contribution of each variable to the health indicator. This is used to indicate which variable is the most abnormal, to help diagnose the failure mode.



The variables that are displayed in the contribution plot depend on which method in the configured PDX Sandbox project was selected to be the final output for PDX Deploy. For example, if the selected health method is an aggregate of multiple health methods, the contribution variables will be the output of all the health methods. If the selected health method is based on features, then the contribution variables will be the features used for that health method.

Note: If a variable has a higher percentage, it means that it is more abnormal compared to other variables. However, if the health indicator is low, none of the variables are significantly abnormal.

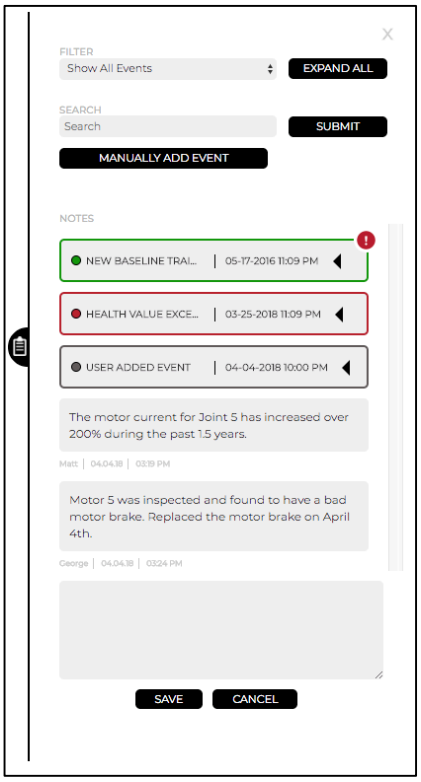
To plot contributions over time, click Plot next to Contribution Plot at the bottom of the dashboard.

Notes

On the right of the asset dashboard is the notes tab. To open the notes tab click the clipboard icon on the right. This contains all the automatically and manually generated events for the selected asset, as well as general comments left by any user.

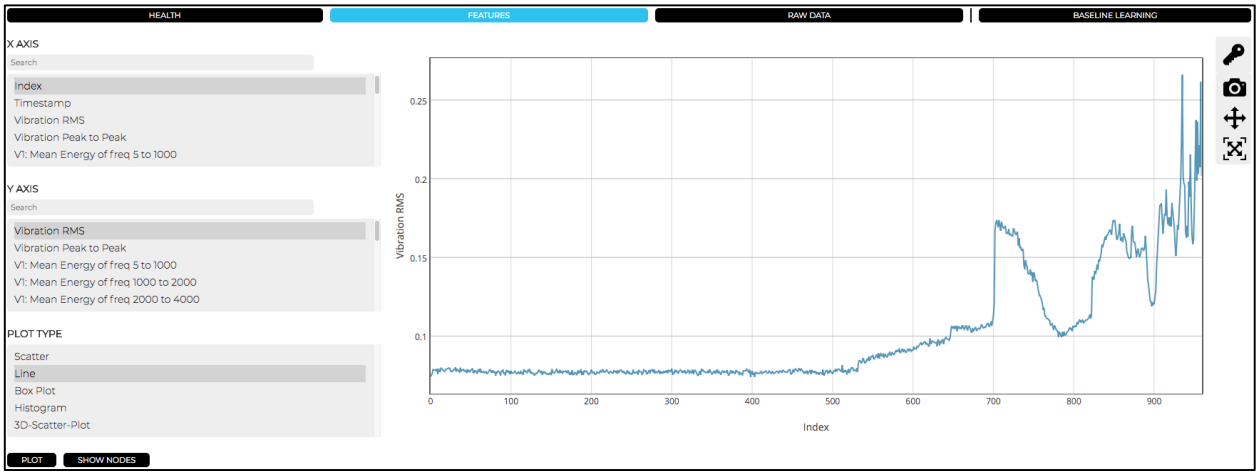
To add a comment to the notes section, enter your comment in the box at the bottom and click Save.

At the top of the notes section you can also filter the events shown, and manually add events (i.e. you could create an event for a maintenance action, the event will be indicated on the health indicator plot).



Features

The Features plot allows you to dive deeper to better understand the characteristics of the asset over time. To access the Features plot, click the Features button at the top of the asset dashboard. On the Features plot, you can see all the statistical features that were extracted in the configured PDX Sandbox project.

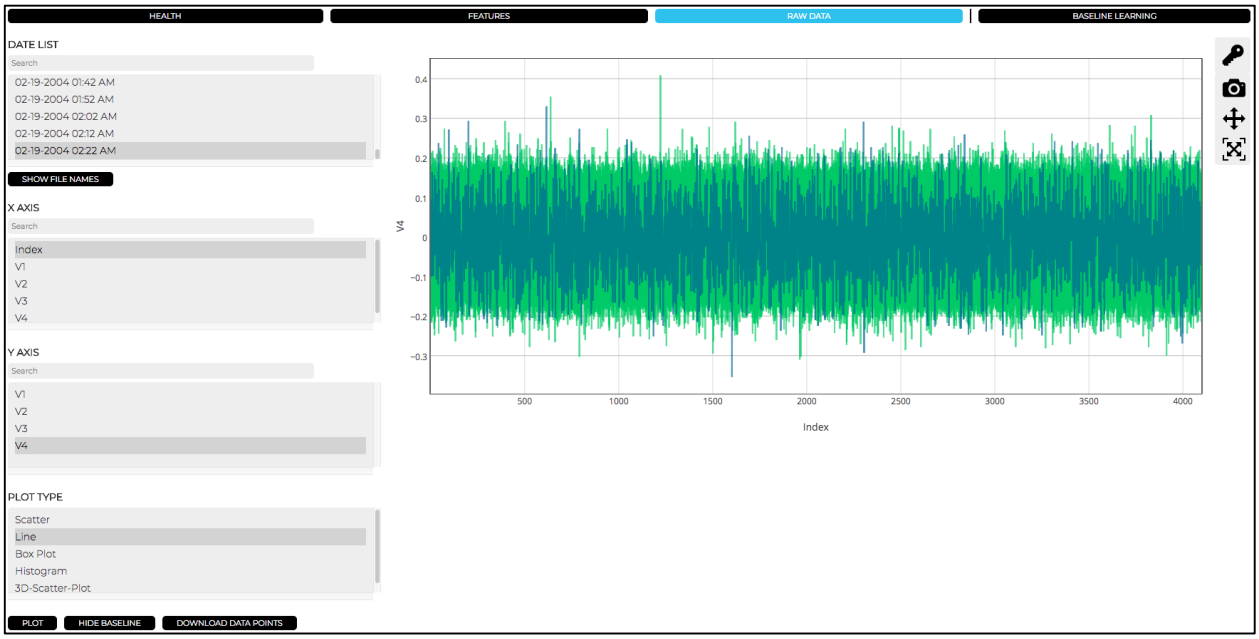


There are several different types of plots available, and you can also plot features on both the x and y axis to view the relationships between features.

To plot the feature(s) for multiple assets, click the Show Nodes button next to Plot and select the assets that you want to plot.

Raw Data

To dive even deeper into how the asset is behaving, you can also plot the raw data. To access the Raw Data plots, click the Raw Data button at the top of the asset dashboard.



To plot raw data:

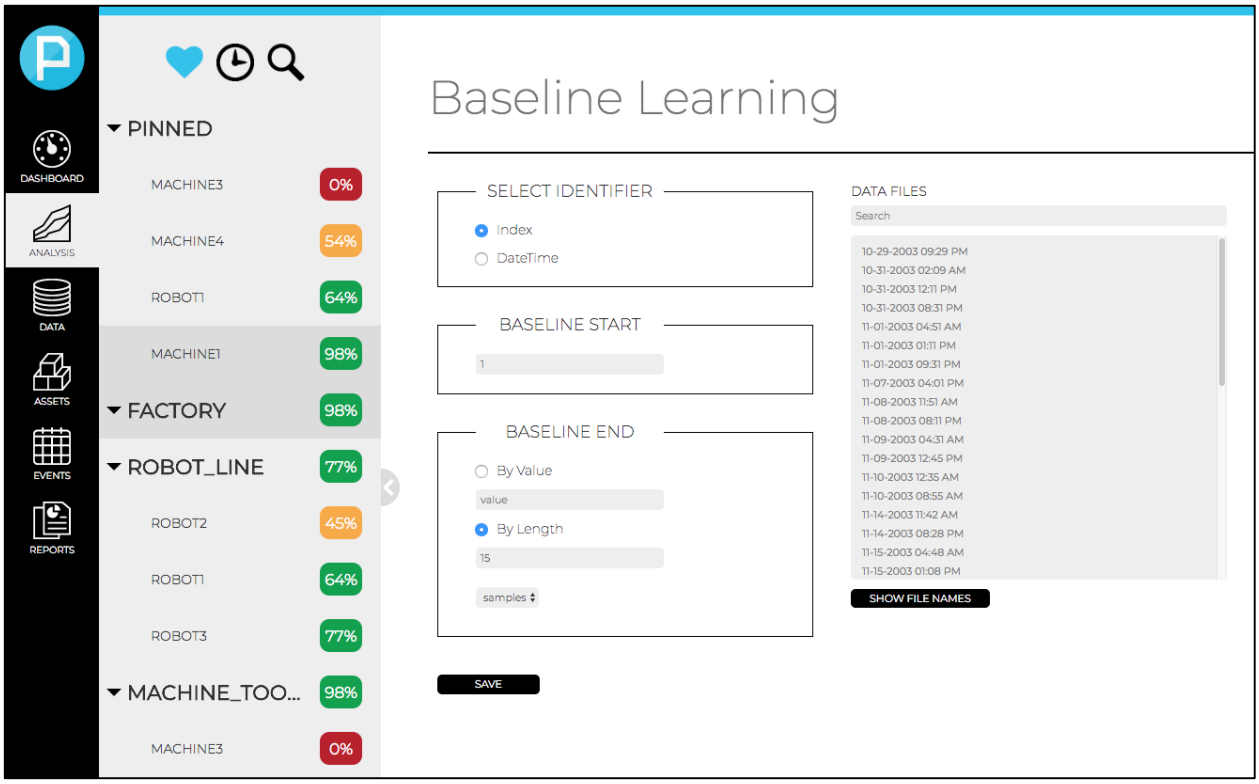
1. Select which data file(s) you want to plot from the first list.
2. Select which signal to plot on the x and y axis.
3. Select the plot type.
4. Click Plot.
5. Optional – Click Show Baseline to compare the data to the baseline data. Baseline data will appear on the plot in green.

Analysis

The Analysis tab contains the Baseline Learning, Algorithm, and Execute pages, which control how and when the analysis algorithm calculates health information from new data.

Baseline Learning

The Baseline Learning page is used to change an asset's baseline, in order for the asset's model to be retrained. The baseline data is used to teach the asset's model what the normal behavior is for that asset.



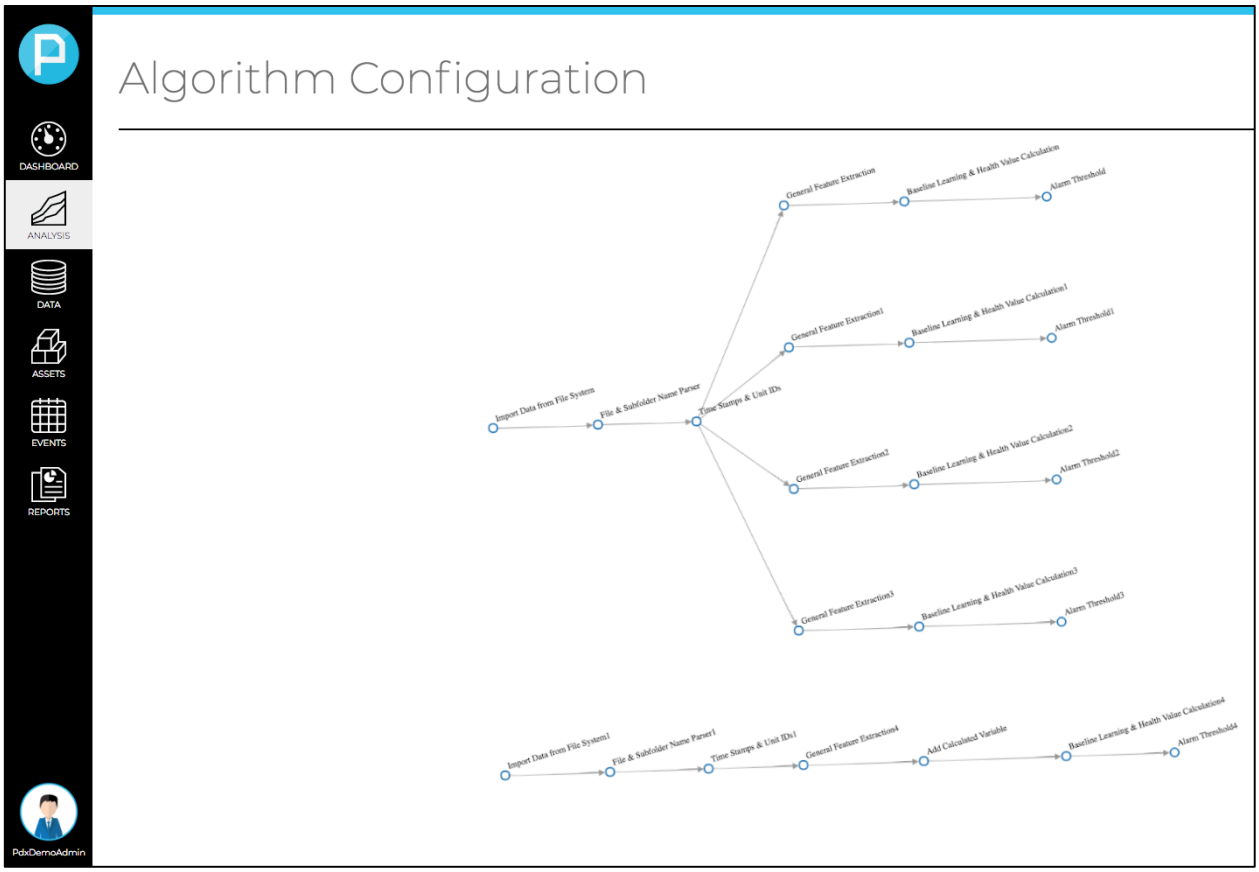
To change an asset's baseline:

1. Select the asset from the asset tree.
2. Choose an identifier from the Select Identifier panel, this determines how the Baseline Start is set. For example, index refers to file index, if index is set to 1 the baseline will start from the first file.
3. Set the Baseline Start.
4. Set the Baseline End. You can choose either how many files or days after you want to include for the baseline.
5. Click Save.
6. The asset's model will be retrained, and health will be calculated with the new baseline the next time the analysis execution is triggered.

The files listed on the right are just for reference, and do not control anything.

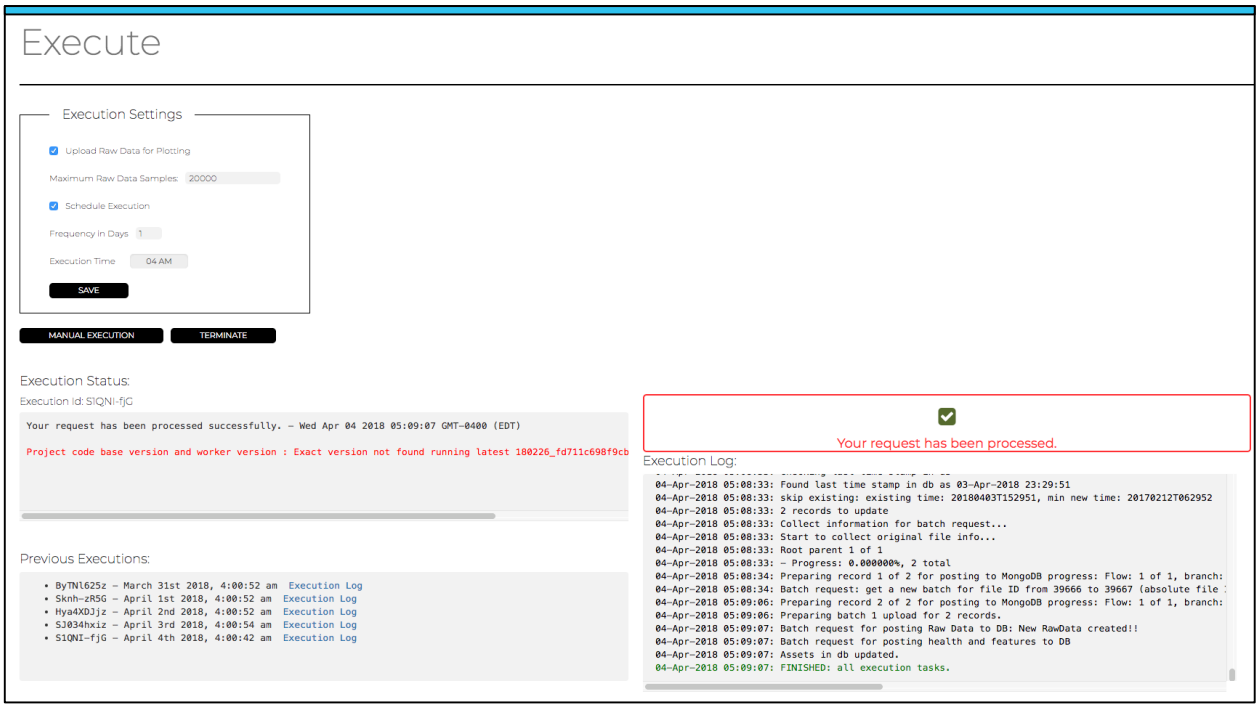
Algorithm

The algorithm page depicts the flow of the configured PDX Sandbox project/algorithm used for the current PDX Deploy project. It allows you to see what modules are being used, and how they are arranged in the project.



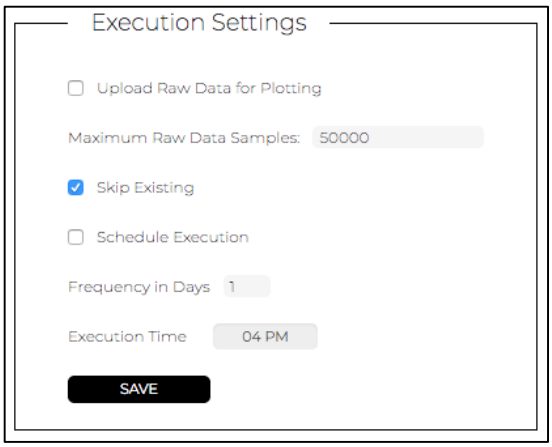
Execute

The execute page is used to control when the analysis is executed, so that health information can be calculated from new data files. The analysis can be executed automatically and manually.



Execution Settings

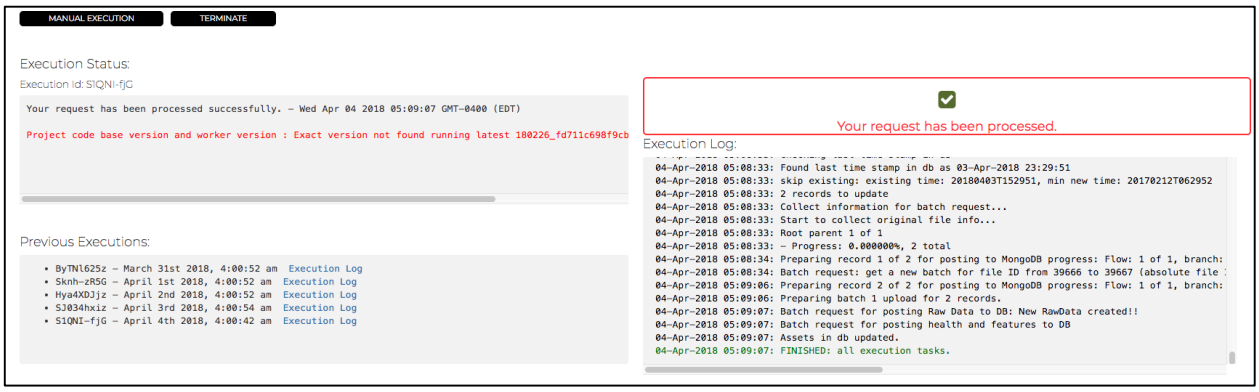
Typically, the first two settings will rarely need changed, the default settings are usually sufficient.



Descriptions of each control:

1. Select if you want raw data uploaded for the raw data plots
2. Set the maximum total number of raw data samples (all variables combined) uploaded. If the total number of raw data samples exceeds this value, data will be down sampled.
3. Check skip Existing if you do not want it to re-upload previously uploaded data files (recommended)
4. Check schedule execution, if you want automatic executions
5. Select how often the automatic executions should occur
6. Select what time of day the automatic executions occur
7. Click Save to save the settings

Execution Status



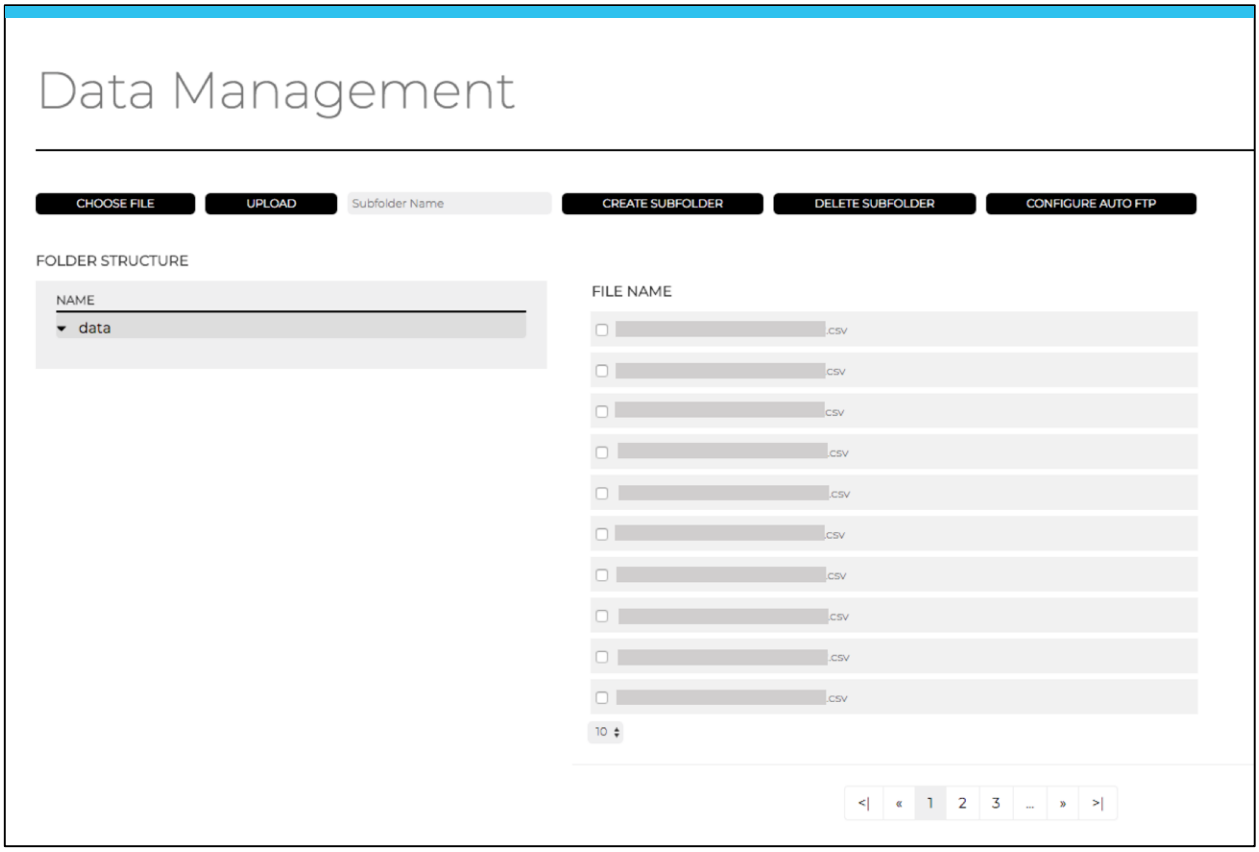
Execution Status: The details of the current execution such as start time/End Time, project code base version and execution status can be viewed here.

Execution Log: The detailed logs of the ongoing execution can be viewed here. These logs are updated as the execution is going on.

Previous Executions: The ID's and execution completed times of previous five executions are displayed here. The complete log of each execution can be viewed by clicking the Execution Log link beside each.

Data

In the Data tab, you can manually upload data to the server for analysis, or setup an automatic data fetch.

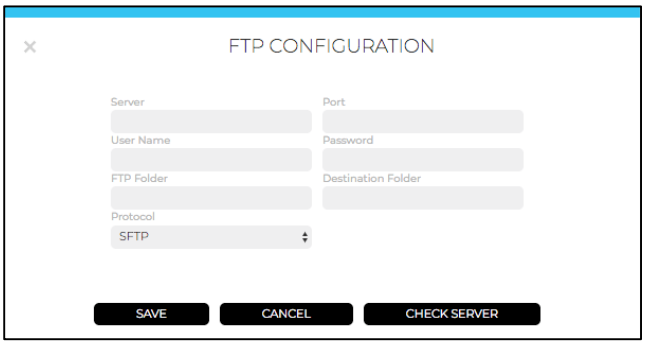


To upload data manually:

1. Click Choose File
2. Select data file(s) to upload (1,000 data file limit per upload)
3. Click upload

Configure Auto-FTP

The Configure Auto-FTP function can be used to automatically upload data files every hour from an FTP Server.



To setup the automatic data fetch:

1. Enter the FTP/SFTP server address.
2. Enter the port on which the FTP/SFTP server is running.
3. Enter the User Name and Password to Access the Server.
4. Enter the FTP Folder path from which the files are to be fetched from. If the files are stored in the root folder of the FTP/SFTP server leave it blank, otherwise enter the path to folder in the configured server.
5. Enter the Destination Folder path to which the files are to be transferred to. If the files are to be transferred to root folder, i.e. the main folder in the Data tab, leave it blank (most common). If you want to transfer the data to a sub folder of the root folder, enter the path to the folder from root directory.
6. Select the protocol of Configured server, either SFTP or FTP.
7. The Status of the configured Server settings can be verified by clicking Check Server.
8. Click Save to save the settings.

Assets

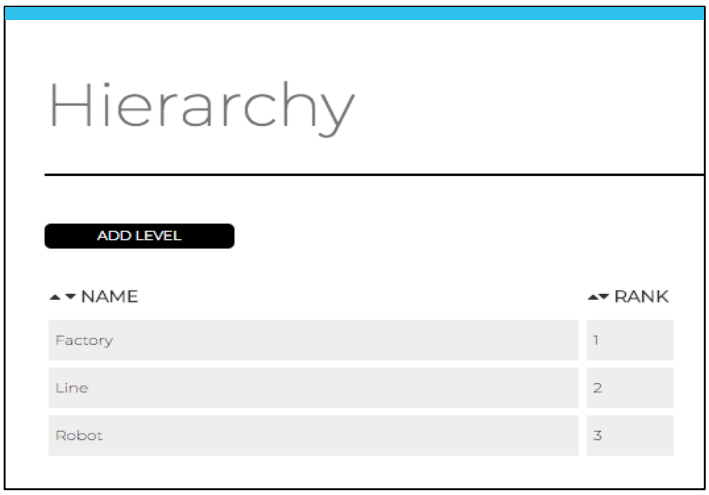
An asset can be considered as a machine or component or a type of parent asset (i.e. factory, manufacturing line, etc.). The Assets tab allows you to add assets, and define their relationships with other assets, so that the overall hierarchy of your factory or system can be represented in the parent asset dashboards. In addition, you can also add descriptions and edit the names of each asset.

Hierarchy

The Hierarchy page is used to define the hierarchy of your factory or system, which must be defined before you can correctly define the hierarchy of an asset.

To add levels:

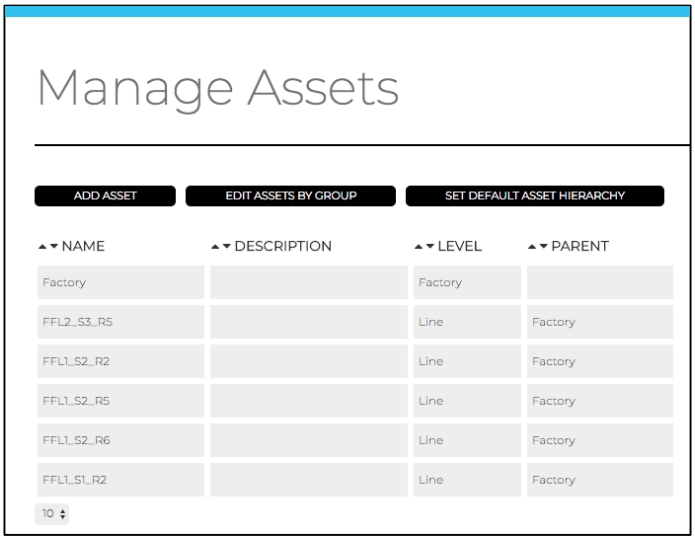
1. Click the Add Level button
2. Enter the level name
3. Enter the level rank



Manage Assets

On the Manage Assets page, you can see a list of all the assets, along with their hierarchy level, and parent asset (if applicable).

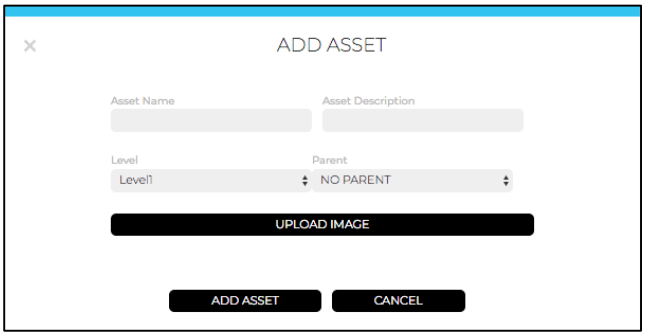
When data from new assets are uploaded, new assets will be added to the list automatically.



Note: Existing assets can be edited by hovering over the asset in the asset table and clicking the pencil icon on the right.

Add Asset

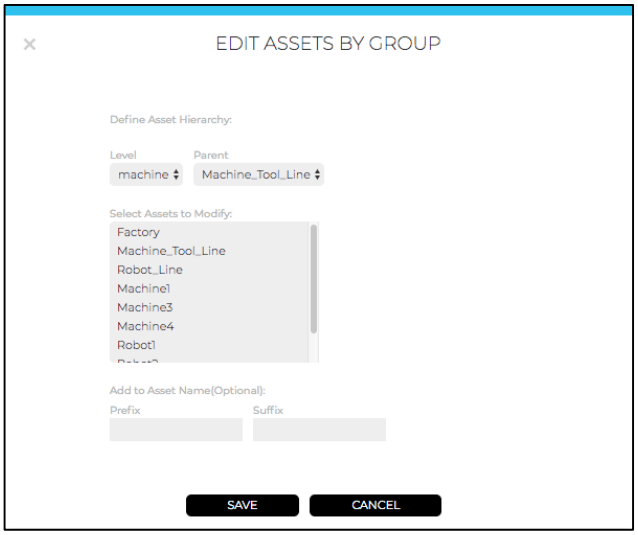
To add other assets that do not have data (i.e. factory, manufacturing line, station, etc.) you can click the Add Asset button on the Manage Assets page. In the Add Asset pop-up window, enter the assets information and click Add Asset.



Edit Assets By Group

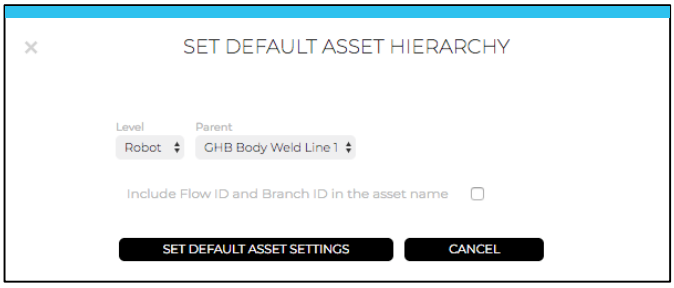
To edit multiple assets from in the Manage Assets page:

1. Click the Edit Assets By Group button.
2. Define the hierarchy of the assets.
3. From the list, select which assets you want to apply the changes to.
4. Optional – Enter the prefix and suffix you would like added to the asset(s) name(s)



Set Default Asset Hierarchy

Click Set Default Asset Hierarchy in the top right of the Manage Assets page to set the default hierarchy for assets that are generated when data from new assets are uploaded. Select the default hierarchy level and parent asset.



Events

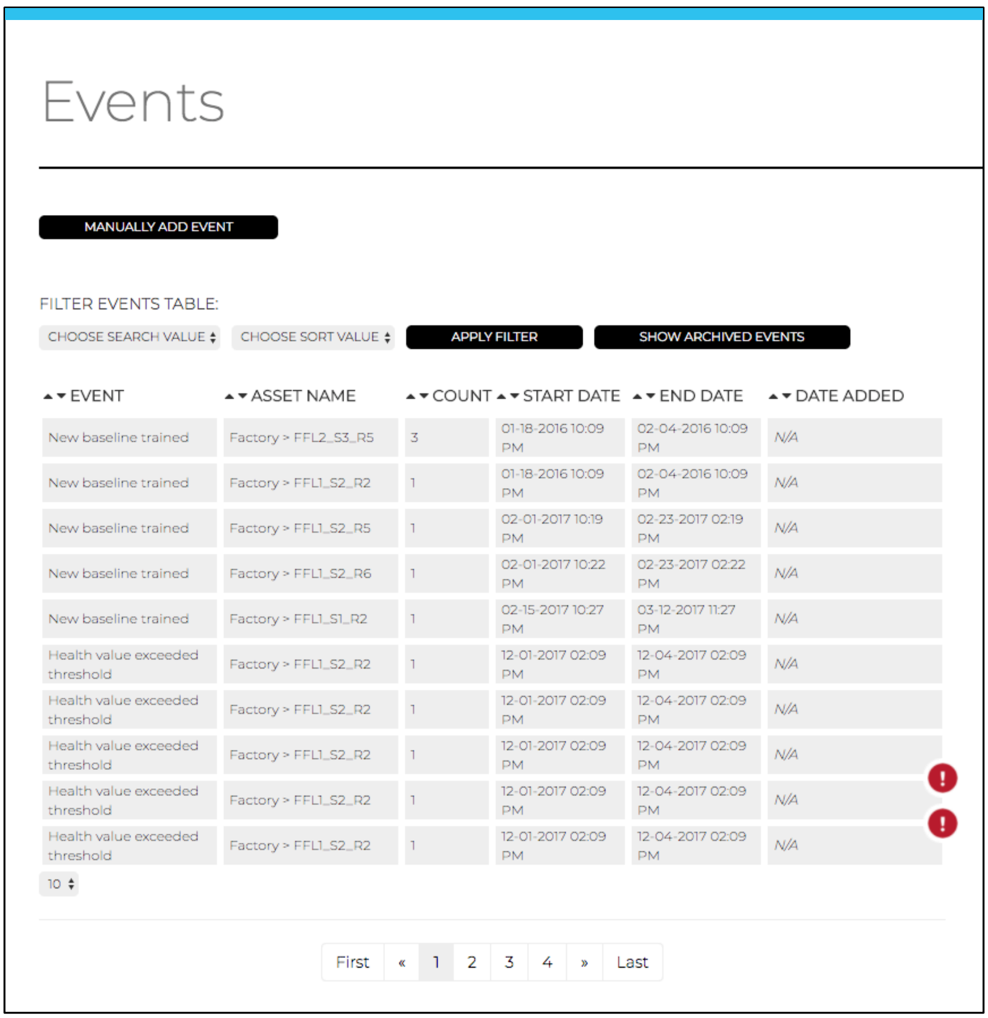
In the events tab, you can look at events that already happened, and you can setup automatic notifications so that you will be notified when new events occur.

The 3 main types of events that can occur for an asset are:

1. New baseline trained
2. Health value exceeded threshold
3. User added event

Events History

The Events History page allows you to easily look at all the events that occurred in the factory.



EVENT	ASSET NAME	COUNT	START DATE	END DATE	DATE ADDED
New baseline trained	Factory > FFL2_S3_R5	3	01-18-2016 10:09 PM	02-04-2016 10:09 PM	N/A
New baseline trained	Factory > FFL1_S2_R2	1	01-18-2016 10:09 PM	02-04-2016 10:09 PM	N/A
New baseline trained	Factory > FFL1_S2_R5	1	02-01-2017 10:19 PM	02-23-2017 02:19 PM	N/A
New baseline trained	Factory > FFL1_S2_R6	1	02-01-2017 10:22 PM	02-23-2017 02:22 PM	N/A
New baseline trained	Factory > FFL1_S1_R2	1	02-15-2017 10:27 PM	03-12-2017 11:27 PM	N/A
Health value exceeded threshold	Factory > FFL1_S2_R2	1	12-01-2017 02:09 PM	12-04-2017 02:09 PM	N/A
Health value exceeded threshold	Factory > FFL1_S2_R2	1	12-01-2017 02:09 PM	12-04-2017 02:09 PM	N/A
Health value exceeded threshold	Factory > FFL1_S2_R2	1	12-01-2017 02:09 PM	12-04-2017 02:09 PM	N/A
Health value exceeded threshold	Factory > FFL1_S2_R2	1	12-01-2017 02:09 PM	12-04-2017 02:09 PM	N/A
Health value exceeded threshold	Factory > FFL1_S2_R2	1	12-01-2017 02:09 PM	12-04-2017 02:09 PM	N/A

With the Filter Events Table controls, the events table can be filtered to show certain event types, or events for certain assets.

In the events table, there is a red exclamation point on the events that are new and have not been seen before. To mark as seen click the red exclamation point.

After an event is marked as Seen, there are several buttons that will appear when you hover over the event in the table:

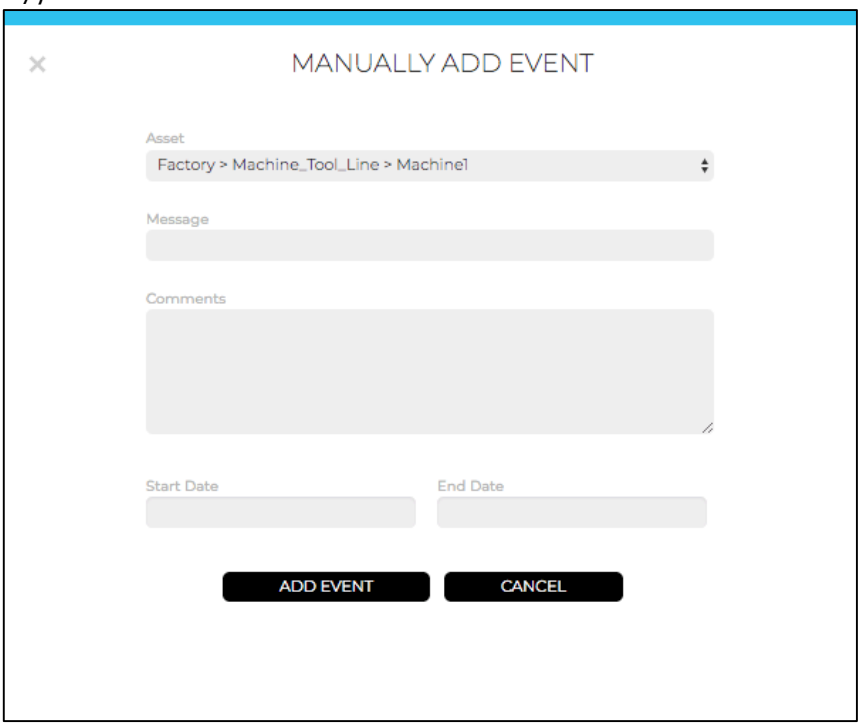
1. Delete – Permanently deletes the event from the event table
2. Details – Shows notes left by any user on the event
3. Notify – Allows you to forward a notification email or text message about the event to any User
4. Archive – Hides the event from the event table, unless Show Archived Events is selected in the Filter Events Table controls
5. Mark as Unseen – Resets the event back to unseen state

Note: Currently SMS text message notifications are only supported for U.S. providers.

Manually Add Event

Events can be manually added for assets, in order to log events that cannot be automatically logged, but can affect the assets health indicator, such as:

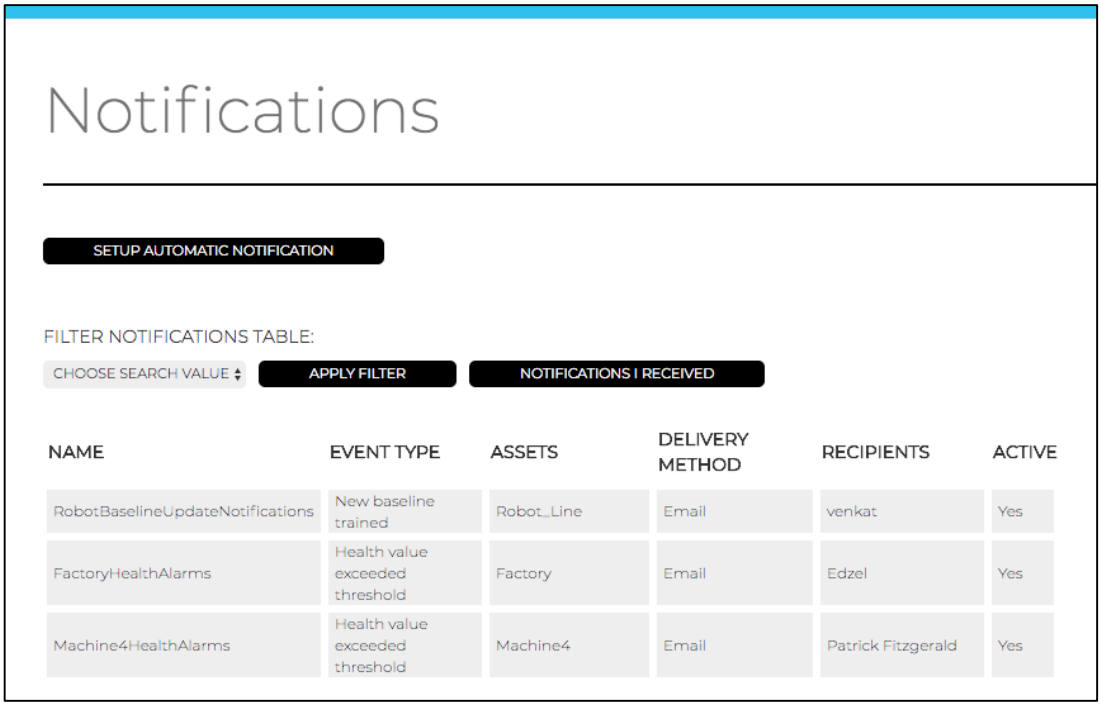
- Maintenance actions
- Abnormal operations (i.e. the machine was running an abnormal program that day)



The manually added events will also be indicated on the asset's health plot, to provide context to the health points that occur within the event's start and end date.

Notifications

On the notifications page, you can setup automatic notifications that will send notifications via email or text message when an asset's health crosses a threshold, or if other types of events occur. You can also see a list of notifications already setup by you and other users in the table shown below.

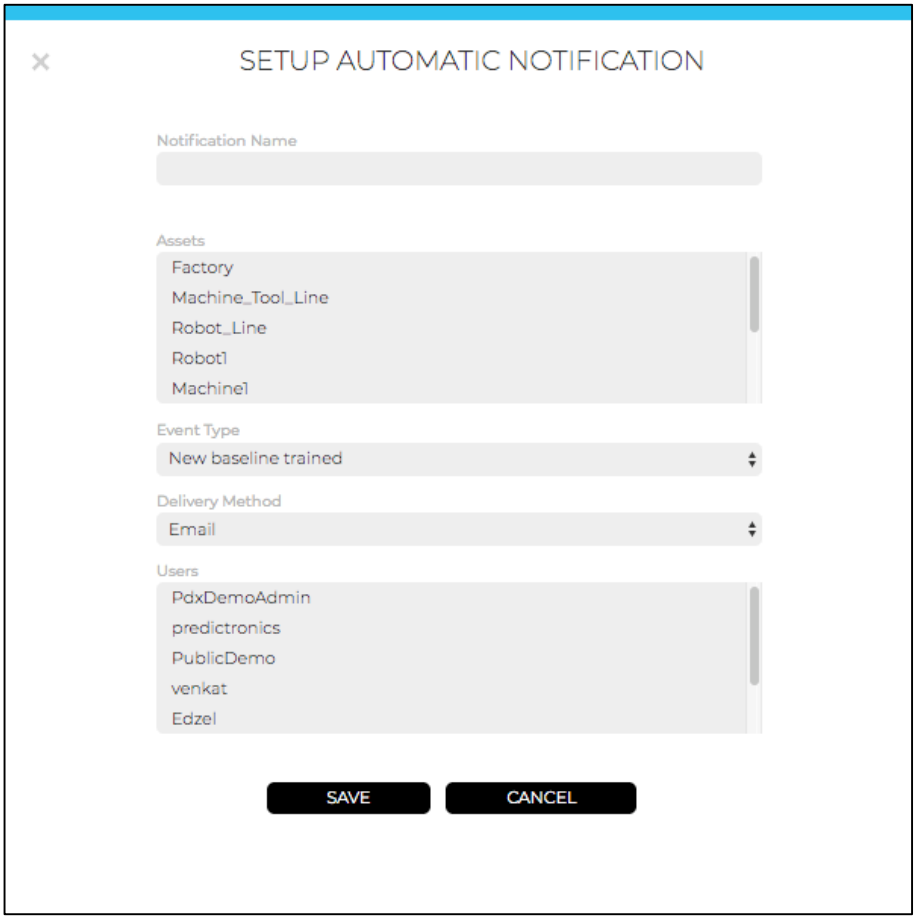


For each notification it shows the name, event types and assets that can trigger the notification, deliver method, recipients, and whether or not the notification is currently active. Previously setup notifications can be edited by hovering over the notification in the table, and clicking the pencil icon.

Setup Automatic Notification

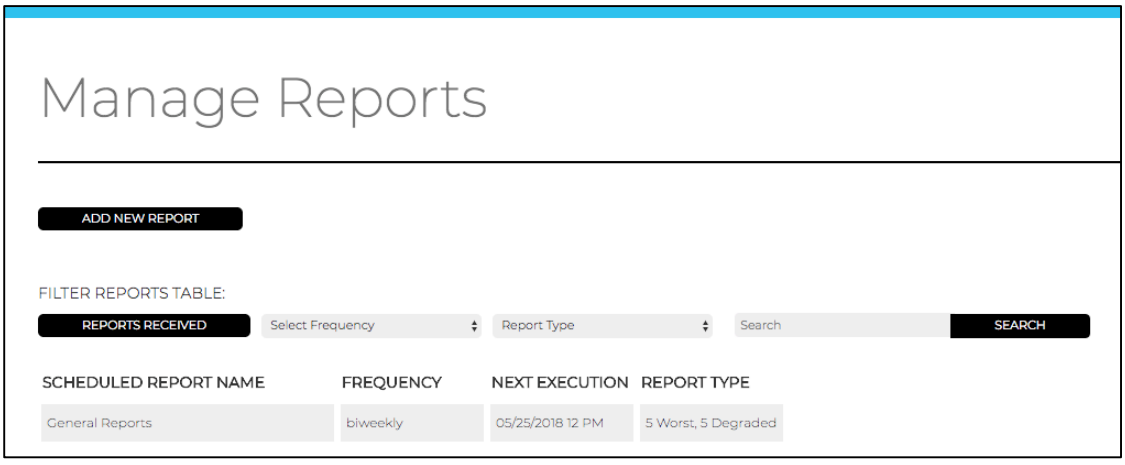
To setup new automatic notifications:

1. Click the Setup Automatic Notification button at the top of the Notifications page.
2. Name the notification by typing in the top edit box
3. Select the Asset(s) you would like to be notified about
4. Select which event type you would like to be notified about
5. Select how you would like the notification delivered (email or text message)
6. Select which users you would like notified.
7. Click Save



Reports

The reports tab allows you to setup customized reports that are emailed daily, weekly, bi-weekly, or monthly depending on your preference. You can also see a table of all the reports that are already setup by any user.

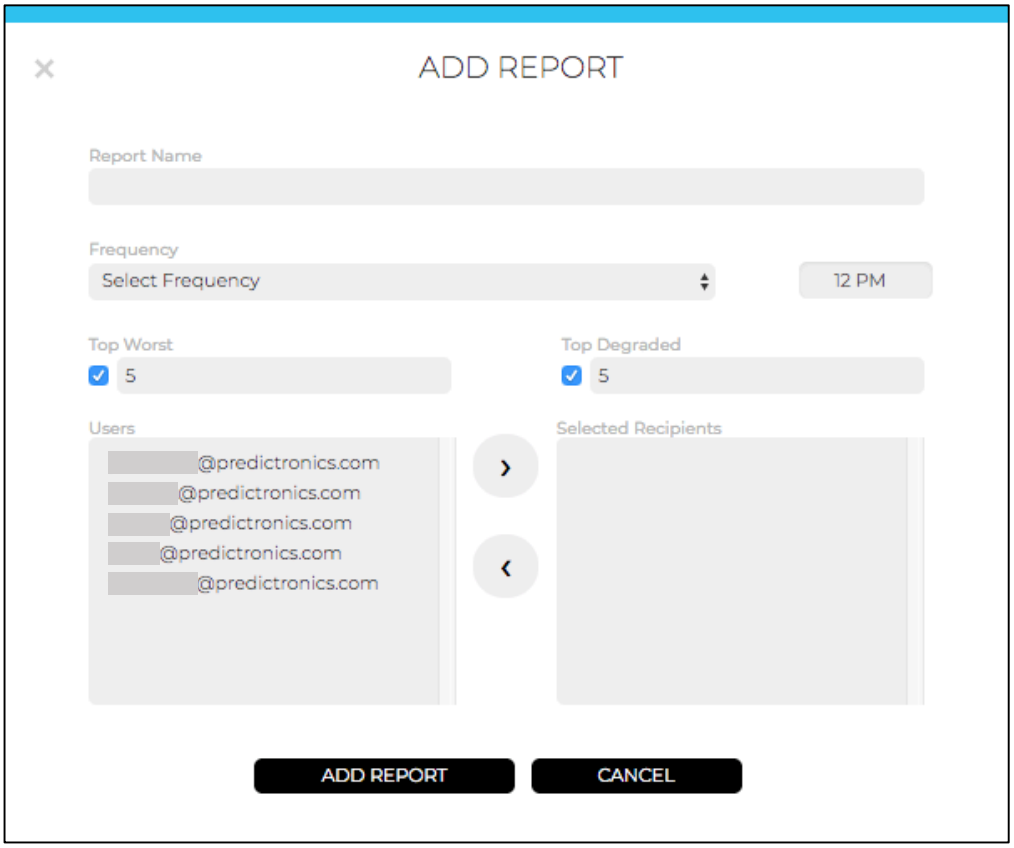


In the table you can see the name of each report, how frequently the report is sent out, the date of the next scheduled report, and the information the report contains. Reports can always be edited by hovering over the report in the table and clicking the pencil icon on the right.

Add New Report

To add new reports:

1. Click Add New Report
2. In the Add Report window, type the name of the report
3. Select how frequently the report is sent out
4. Select the time of day the report is sent
5. Configure what is included in the report. You can select to include the top N worst assets (assets with the worst health), and/or the top N most degraded assets (assets that had the biggest drop in health since the last report)
6. Select who the report is sent to by selecting the email address from the Users list and moving them to the Selected Recipients list
7. Once the report is configured, click Add Report to save it



User

In the bottom left of the main interface, there are several more functions available to the user, if you click the image above your username. Below is a brief description of each function:

1. Change Password – You can change your password.
2. Upload Image – Here you can upload your user image (the image shown above your username). And if you are an Admin user, you can also upload the company logo (displayed on login screen).
3. User Manual
4. Help – Email link to customerservice@predictronics.com
5. Logout