



# PORTABLE ANALYZER KIT

## User Guide

Rev. 1



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## Patents

The product(s) described in this manual are covered under existing and pending patents.

## Important Safety Notices

When used in accordance with the instructions in this manual and the associated control drawings, the components in the Lenz and Pulse systems are approved for use in Class 1 Division 2 Groups A-D T4A and unclassified areas. Failure to follow this manual may result in an explosion hazard when used in hazardous locations or improper operation. Lenz and Pulse systems contain no user serviceable parts. Return defective equipment to Resonance Systems for repair. For any questions, problems, or service for any Resonance Systems products, visit the Resonance Systems website at <https://resonance.systems>

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## 1. Portable Kit Overview

Our Smart Portable Analyzer for Reciprocating Machinery offers a perfect blend of portability, efficiency, and smart technology, making it an indispensable tool for maintenance professionals. Whether you're managing engines, compressors, or other reciprocating machinery, our analyzer is designed to simplify your monitoring and analysis processes, ensuring optimal performance and longevity of your equipment.

Gather data swiftly and effortlessly from rotating equipment in industrial plants and perform on-site machine analysis or instantly upload it to the cloud for an expert to analyze. Access from any web browser to collect, analyze, or share it with professionals in your field.

### 1.2. User Guide Overview

The Resonance Systems User Guide provides clear instructions on setting up your analyzer, connecting it to your smart device, and initiating data collection, written for Reciprocating Machinery Analysts, Reliability Data Collection Technicians, and Reliability Engineers who monitor rotating machines in a process plant environment.

This User Guide is written for the full version of the Portable Analyzer Kit of Resonance Systems. Any differences are noted.

### 1.3. Precautions and general maintenance

Maintenance, repair, or replacement of components not specified in this guide should only be conducted by trained specialists at Resonance Systems offices or authorized service centers. Damage resulting from misuse, abuse, neglect, carelessness, or unauthorized modifications may void the warranty. By adhering to the precautions provided below, you can safely perform routine maintenance procedures on the Portable Analyzer Kit and its accessories.



**Warning:**

- *If a unit shows any sign of damage, please return for repair.*

#### 1.3.1. General Maintenance

After each route or day using the Kit, proceed to clean the equipment and its accessories.

When cleaning the equipment and its accessories, do not use any abrasive or corrosive chemicals. Do not use petroleum distillates and ketone solvents, for example, acetone, gasoline, and kerosene. Use a dry, lint-free towel or cloth dampened with a mild soap and water solution. Clean the analyzer only in a non-hazardous area.

Resonance Systems Inc., recommend performing a calibration service once per year, based on a frequently use of the Portable Analyzer Kit. This must be conducted by trained specialists at Resonance Systems offices or authorized service centers.

### 1.3.2. Precautions

When charging the Lenz or Pulse, ensure the ambient temperature where charging is occurring is 32° F to 95° F (0° C to 35° C).

Whether you are using or charging the Lenz or Pulse, be aware that it has battery temperature protection. When the temperature sensor reaches 110 ° F (35° C) the Lenz or Pulse will start blinking both lights (green and red) located next to the micro-USB charging port. Wait for it to cool down to continue.

Ensure you exclusively use power supplies and chargers that are approved by Resonance Systems. Using unauthorized power sources or chargers could void the warranty and risk damaging the Lenz or Pulse battery pack.


Do not use any other accessories or products other than their corresponding Resonance Systems products.

Do not connect a signal larger than 0 to 24 volts into any channel of Lenz. While the channels assignments are by default, be aware that you can choose or change the channel of each signal input. By doing this you are responsible for ensuring you have appropriate connectors and sensor types.


### 1.3.3. Contact us

When reaching out to Resonance Systems Technical Support please be ready to provide information about when or how the error occurred.

Please be at your computer when you call. Assisting you is more effective when we can troubleshoot the issue together.

Find the serial number of the Lenz, look at the stamp on the back of the Lenz. If you cannot find it, you should connect to Lenz > then go to the left sidebar of Rmonix and click on the Lenz icon  > it will pop up a window.

**Lenz**

Address	local.lenz.rmonix.net
Serial number	00 
Current time	4/25/2024, 2:56:07 PM






**Pulse**

Speed	593.0 RPM
Pulses per rev.	256
Signal strength	24%

**Battery**

Charge	88%
Voltage	3.9 V at 81.8°F
Time remaining	10 hr 7 min
Current	-645 mA (not charging)


**Sensors**


 X	0.00 V
 Y	0.00 V
 Z	0.00 V
 A	1.64 V
 B	1.63 V


[RESTORE FROM SAFESYNC](#)

[CONNECT TO LENZ VIA BROWSER](#)

Figure 1. Lenz serial number.


To find the version of Rmonix software > go to the left sidebar of Rmonix software and click on the Help icon  and the click *About Rmonix*.



 Version 1.90.1  
4/18/2024

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Figure 2. Rmonix version.

To find the firmware version of Lenz > go to the left sidebar of Rmonix and click on the Lenz icon  > it will pop up a window > then at the bottom of the “pop window” click on “Connect to Lenz via browser” > it will open a new window on your browser.

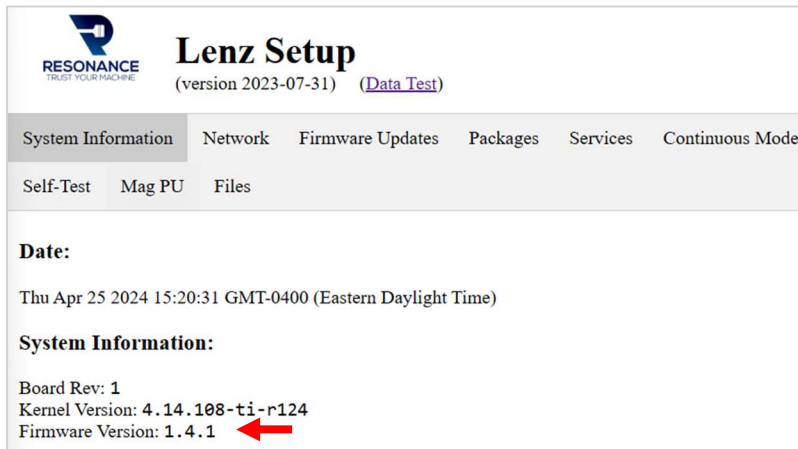


Figure 3. Interface when Lenz is connected via web browser.

### 1.3.3.1. Contact information

North America: +1 865-248-2453 (Ext. 2)  
[support@resonance.systems](mailto:support@resonance.systems)  
<https://resonance.systems/technical-support>

8609 Kingston Pike, Ste 201  
 Knoxville, TN 37923 USA  
 +1-865-248-2453



## 2. The Portable kit Analyzer

Please note that the most comprehensive list of accessories will be detailed below. Please note that the contents may vary depending on the purchase options you have chosen. Should you detect any discrepancies, please promptly reach out to your local sales representative for further assistance.

- Lenz
- Pulse
- Strobe Light
- Encoder
- Magnetic Pickup
- Magnetic Pickup Adapter
- Optical Sensor Pickup
- Accelerometer
- Velocity Probe
- Displacement Sensor Kit
- Rod Drop Kit
- Turbo Kit
- 5 Channel Vibration Kit
- Wireless Accelerometer
- Wireless Ultrasonic
- Ultronix
- Primary Ignition Cable
- Secondary Ignition Cable
- Compressor Pressure Sensor
- Engine Pressure Sensor
- Bluetooth Button
- USB Charger
- 5/16 Socket Wrench
- 1 ¼" Wrench
- Hex Allen Kit
- Ariel Kit Mounting
- Pouch
- Tripod
- Heavy Duty Case
- Smart Device Tablet (User Preference)
- Rmonix Software.

## 2.2. Lenz

The Lenz is built to be versatile. This allows for a simple three connector portable route, or our channel adapters can be used to allow for 6 sensors of data to be collected in either portable routes or in continuous mode.

### 2.2.1. Multiple Inputs

Lenz supports up to 6 channels to simultaneously collect data, but it has some restrictions for each channel, as it is mentioned in the section [2.2.1](#) of this document. To use this functionality, you need to set up a sensor for each input in the software. Please refer to the Rmonix section of this document.

*Table 1. Multiple connector options on Lenz*

Connector	Standard Option (by default)	Advanced Option (by request)
A	The default configuration for this connector is a pressure sensor, both hardware (cable) and software (Rmonix) configuration.	By request, if want to reassign to any sensor mentioned below, can obtain the appropriate cables and sensors. See Rmonix section on this document to reassign channels. <ul style="list-style-type: none"> <li>▪ Vibration (Accel, Vel, Disp)</li> <li>▪ Ultrasonic and / or Temperature</li> <li>▪ Spark</li> <li>▪ 4-20 mA signal</li> </ul>
B	The default configuration for this connector is the Ultronix sensor (2 in 1), both hardware (cable) and software (Rmonix) configuration.	By request, if want to reassign to any sensor mentioned below, can obtain the appropriate cables and sensors. See Rmonix section on this document to reassign channels. <ul style="list-style-type: none"> <li>▪ Vibration (Accel, Vel, Disp)</li> <li>▪ Pressure</li> <li>▪ Spark</li> <li>▪ 4-20 mA signal</li> </ul>
T	The default configuration for this connector is either for spark or vibration (Accel or Vel), both hardware (cable) and software (Rmonix) configuration.	By request, if want to reassign to any sensor mentioned below, can obtain the appropriate cables and sensors. See Rmonix section on this document to reassign channels. <ul style="list-style-type: none"> <li>▪ Ultrasonic</li> <li>▪ Spark</li> <li>▪ 4-20 mA signal</li> </ul>
Sync	Either a once per turn signal or 1024 pulses (Encoder) per turn may be connected to this connector	-

## 2.2.2. Front View

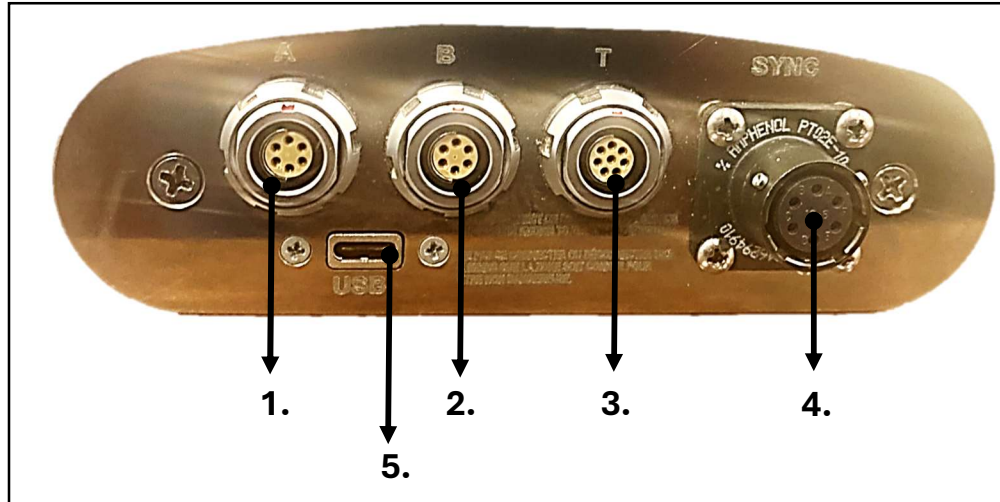


Figure 4. Front view of the Lenz.

1. A - Connector
2. B - Connector
3. T - Connector
4. Speed Synchronization Connector
5. Micro USB Communication Port (Technical Service Only)



### **To prevent damage:**

- Do not plug-in the lighting cable in the Micro USB Communication Port.
- Do not connect a signal outside the range of 0 to 24 volts into any channel input of Lenz.
- Do not connect a signal outside the range of 4-20 mA into any channel input of Lenz.
- Do not connect or use any other cable than the ones provided by Resonance Systems.

### 2.2.2.1. “A” - Connector

A - Connector has the possibility to acquire two signals simultaneously; it has 2 channels built in.

By default, the Resonance System portable kit comes with the Pressure cable connector for A connector.

Users can request the appropriate cable connector for others than pressure. By doing this, the user is responsible for ensuring having appropriate connectors, sensor types and Rmonix software configurations on this connector - channel.

### 2.2.2.2. “B” - Connector

B - Connector has the possibility to acquire two signals simultaneously; it has 2 channels built in.

By default, the Resonance System portable kit comes with the Ultronix (2 in 1 sensor) cable connector for B-connector.

Users can request the appropriate cable connector for others than Ultronix. By doing this, the user is responsible for ensuring having appropriate connectors, sensor types and Rmonix software configurations on this connector - channel.

### 2.2.2.3. “T” - Connector

T – Connector has the possibility to acquire three signals simultaneously; it has 3 channels built in. ‘T’ stands for tri.

By default, the Resonance System portable kit comes with either the one-axis or triaxial vibration sensor.

Users can request the appropriate cable connector for others than vibration. By doing this, the user is responsible for ensuring having appropriate connectors, sensor types and Rmonix software configurations on this connector - channel.

### 2.2.2.4. Speed Synchronization Connector

Speed Synchronization Connector is dedicated to acquiring the speed RPM signal input only. Three sensor types can be used on this channel – connector.

- Encoder
- Magnetic Pickup (Adapter)
- Optical Sensor Pickup.

These 3 sensors can be used either with the Lenz or Pulse.

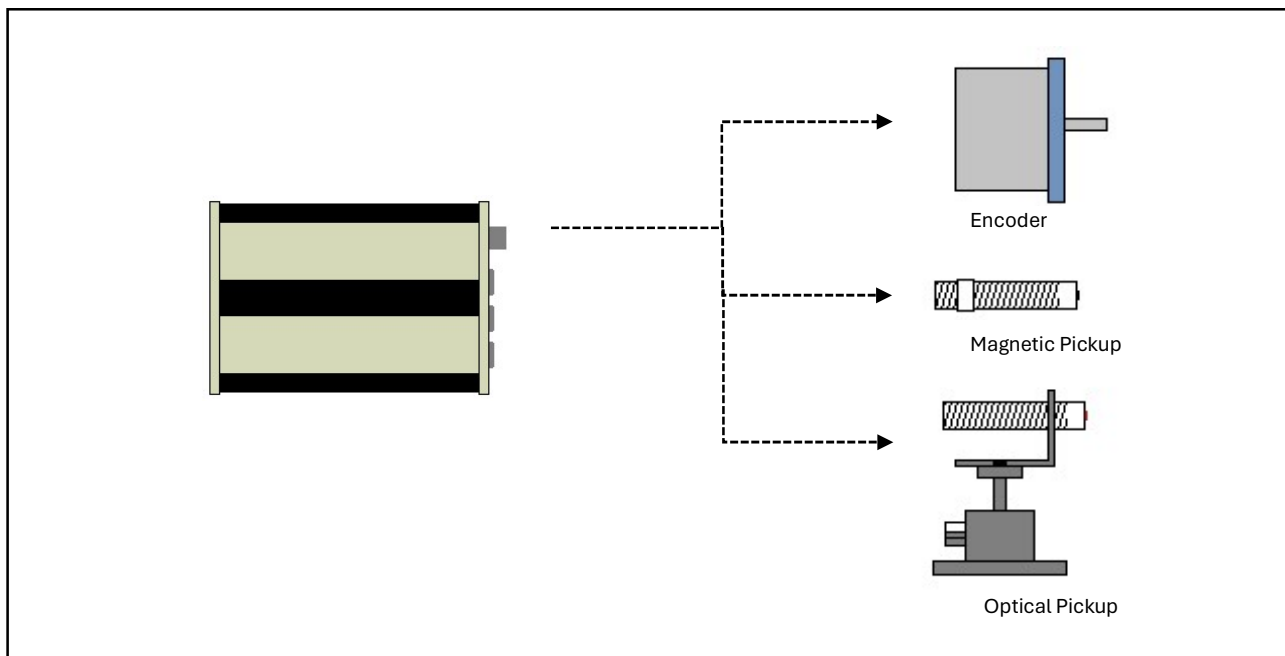


Figure 5. Wire connection options. Lenz and speed instruments.

### 2.2.2.5. USB-C Communication Port

This connector must be used only by trained specialists at Resonance Systems offices or authorized service centers.

### 2.2.3. Back View

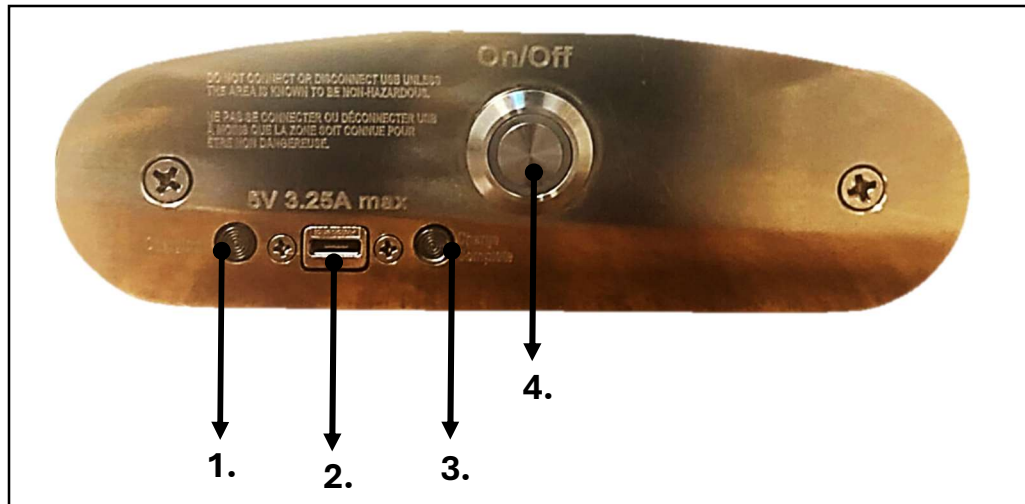


Figure 6. Rear view of the Lenz

1. Red LED Light – Charging Mode
2. Micro USB Charging Port
3. Green LED Light – Full Charge Mode
4. On / Off Button

#### 2.2.3.1. Micro USB Charging Port

To charge the Lenz follow these steps:

- Insert the power supply connector into the Lenz, can be powered on or off. The Lenz is fully operational during charging. Resonance Systems suggests charging the battery overnight prior to your intended usage.
- Connect the AC connector from the power supply to a standard AC outlet, which should range from 100 VAC to 250 VAC, with a frequency of 50-60 Hz. A complete recharge typically requires ~ 4 hours.



**Warning:**

- *Explosion hazard – Do not connect or disconnect USB unless the area is known to be non-hazardous.*

## 2.2.4. Battery Status

The back of Lenz has 2 LED lights that show the status when charging the battery.


Table 2. LED indicator mode on Lenz

Color	Mode
Red	Charging
Green	Ready – 100% Charged
Red & green blinking	High Temperature on the Battery



### **To prevent damage:**

- *Lenz has a High Temperature sensor to protect the battery pack. When the temperature sensor reaches 110 ° F (35° C), red and green LED lights will start blinking until Lenz batteries cool down. If the power supply is connected to Lenz, disconnect it.*
- *Use only power supplies and chargers that are approved by Resonance Systems. Using unauthorized power sources or chargers could void the warranty and risk damaging the Lenz or Pulse battery pack.*

While using the Lenz on the field and it is connected to Rmonix, you can see the battery percentage on the screen. Connect to Lenz > then go to the left sidebar of Rmonix and place the cursor on the battery icon  > it will show the percentage.

## 2.2.5. Turn the Lenz on or off

To activate the Lenz, press the power button located on the back of the device and the indicator light illuminates.

Once powered on, the Lenz will initiate its startup sequence – the blue light will remain steady. After ~ 3 minutes the blue light will begin blinking, signaling that the Lenz network is now prepared for connection.

If the unit refuses to turn on, then the internal batteries may be depleted, and the unit should be charged.

To power off the Lenz, press and hold the power button for 3 seconds until the indicator light turns off, indicating that the device is shutting down.

If the unit refuses to turn off, then the button may be held for 15 seconds to force the unit off.



### **Warning:**

- *Forcing the unit off is not desired as it increases the risk of corrupting internal data storage.*

## 2.2.6. Storage Capacity


Since the Lenz and Rmonix are connected through a smart device (tablet, iPhone, etc), the collection of data is handled by the web browser of the smart device. The web browser stores the data until it is transferred to the cloud.

The Lenz (Resonance Systems Portable Kit version) also has a storage capacity of 128 GB. By request, it could be expanded up to 1 TB. This must be conducted by trained specialists at Resonance Systems offices or authorized service centers.

Lenz will store this data for up to 7 days. If the data storage in the smart device is lost, Lenz has a feature called SafeSync, it can restore data.

### 2.2.6.1. SafeSync

Rmonix's SafeSync feature allows it to continuously save analysis data to the Lenz as it's collected. This ensures that your data is backed up and accessible, even if something happens to your tablet or phone.

Rmonix will automatically check SafeSync whenever it connects to the Lenz. You can also manually check by connecting to the Lenz > then go to the left sidebar of Rmonix and click on the Lenz icon  > it will pop up a window > click on “Restore from SafeSync”

**Lenz**

Address	local.lenz.rmonix.net
Serial number	00
Current time	4/25/2024, 2:56:07 PM

**Pulse**


Speed	593.0 RPM
Pulses per rev.	256
Signal strength	24%

**Battery**

Charge	88%
Voltage	3.9 V at 81.8°F
Time remaining	10 hr 7 min
Current	-645 mA (not charging)

**Sensors**

<span style="color: green;">X</span>	0.00 V
<span style="color: green;">Y</span>	0.00 V
<span style="color: green;">Z</span>	0.00 V
<span style="color: orange;">A</span>	1.64 V
<span style="color: purple;">B</span>	1.63 V

[RESTORE FROM SAFESYNC](#) 

[CONNECT TO LENZ VIA BROWSER](#)

Figure 7. Lenz icon

## 2.2.7. Mounting

The Lenz has been designed for mounting either for portable mode or continuous mode. For portable mode use the pouch that comes with the Resonance Systems Portable Kit and insert the clip into your belt.



Figure 8. Lenz Pouch mounting example.

Should users desire continuous data collection with their Resonance Systems Portable Kit, they can utilize magnets affixed to the rear of the Lenz. This facilitates secure mounting of the Lenz alongside any ferrous material, preventing accidental dislodging. Request it from your Resonance Systems sales representative.

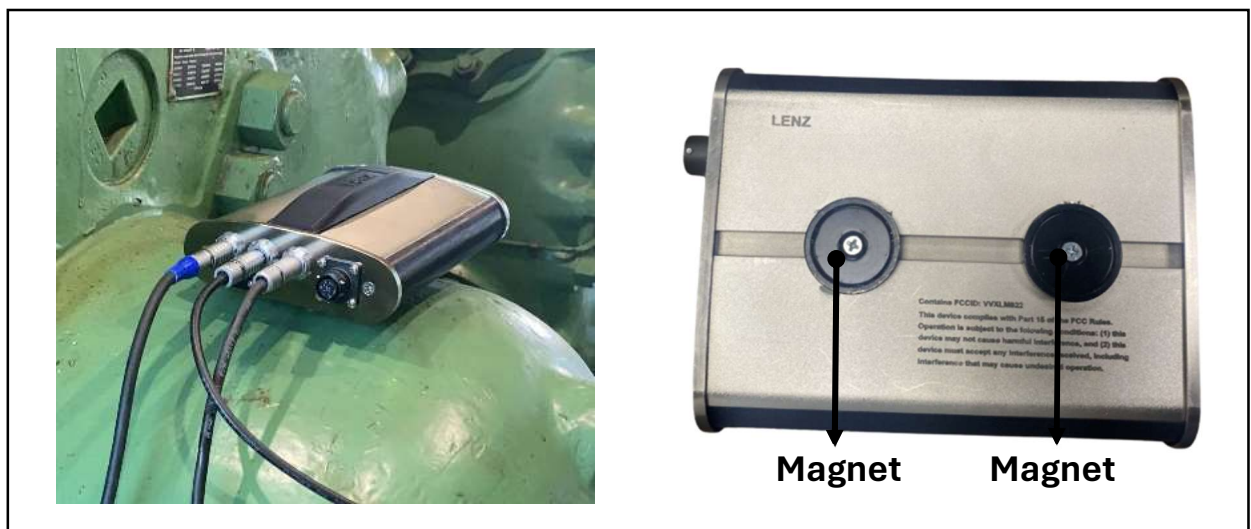


Figure 9. Lenz continuous mode mounting example.



### 3. Pulse

The purpose of the Timing Control Module, called Pulse, is to provide machine speed and / or shaft position information to the Lenz without connecting cables.

The Pulse receives the machine rotation data via the Encoder / Mag pickup/Optical pickup connected by cable, it processes the signal and transmits via radio frequency the machine shaft rotation in real time to the Lenz processing module.

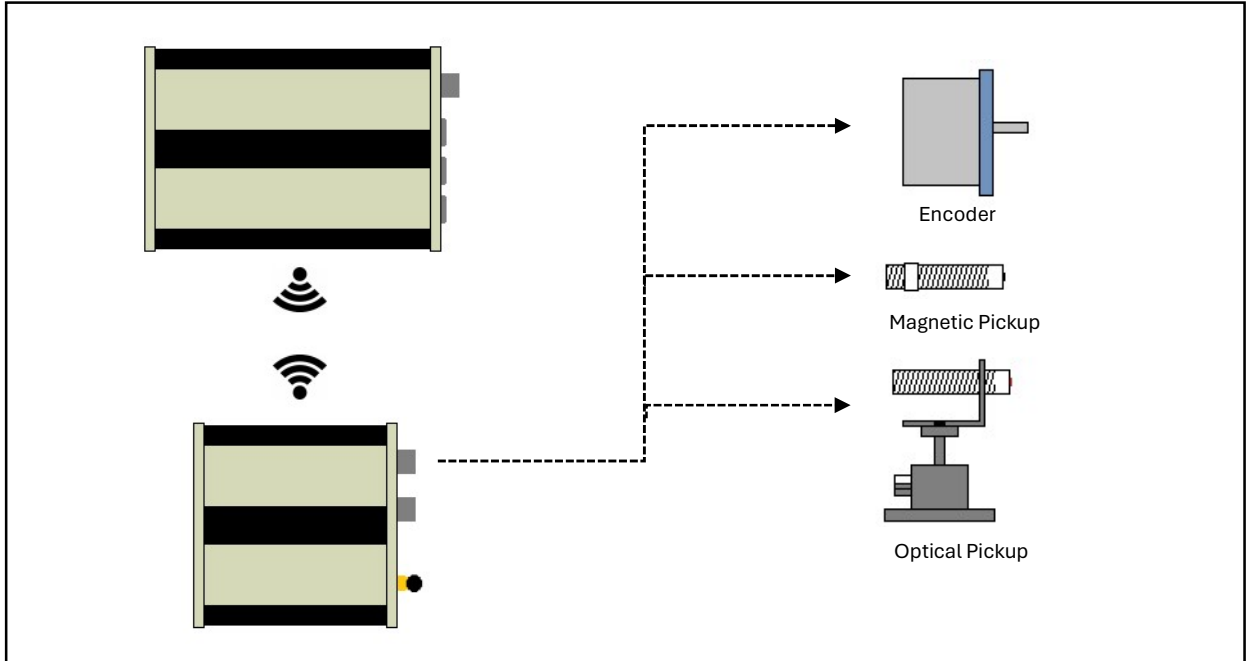


Figure 10. Wireless connection options. Lenz, Pulse, and speed instruments

## 3.2. Front View

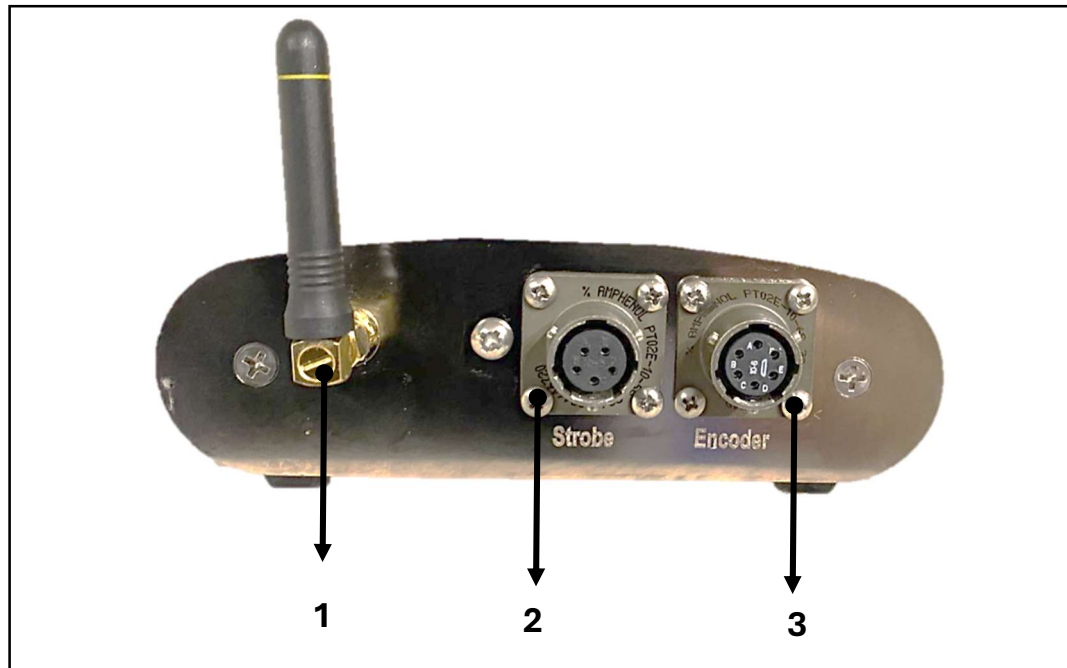


Figure 11. Front view Pulse.

1. Antenna
2. Strobe Connector
3. Speed Synchronization Connector



**To prevent damage:**

- Do not connect or use any other cable than the ones provided by Resonance Systems.

### 3.2.1. Antenna

The antenna facilitates the transmission of radio frequency signal at ~ 900 MHz Proprietary transmitter. This signal carry data wirelessly between Pulse and Lenz. It converts electrical signals from the speed data into radio waves for transmission.

The antenna is omnidirectional, the range of the signal is ~ 90 ft.

If you are intending to use two or more Pulse devices closer than ~ 90 ft, the signal will be erroneous. Please contact Technical Services for this case, referring to section 1 > Contact us of this document.

### 3.2.2. Strobe Connector

The connection marked “Strobe” is for connecting the Resonance Systems timing light strobe.

The Strobe Light blinks at the same rate as the speed signal. If no speed instrument is connected to the Pulse / Strobe Light, it blinks at 594 RPM. This allows users to test the functionality of the system even without an external speed instrument connected.

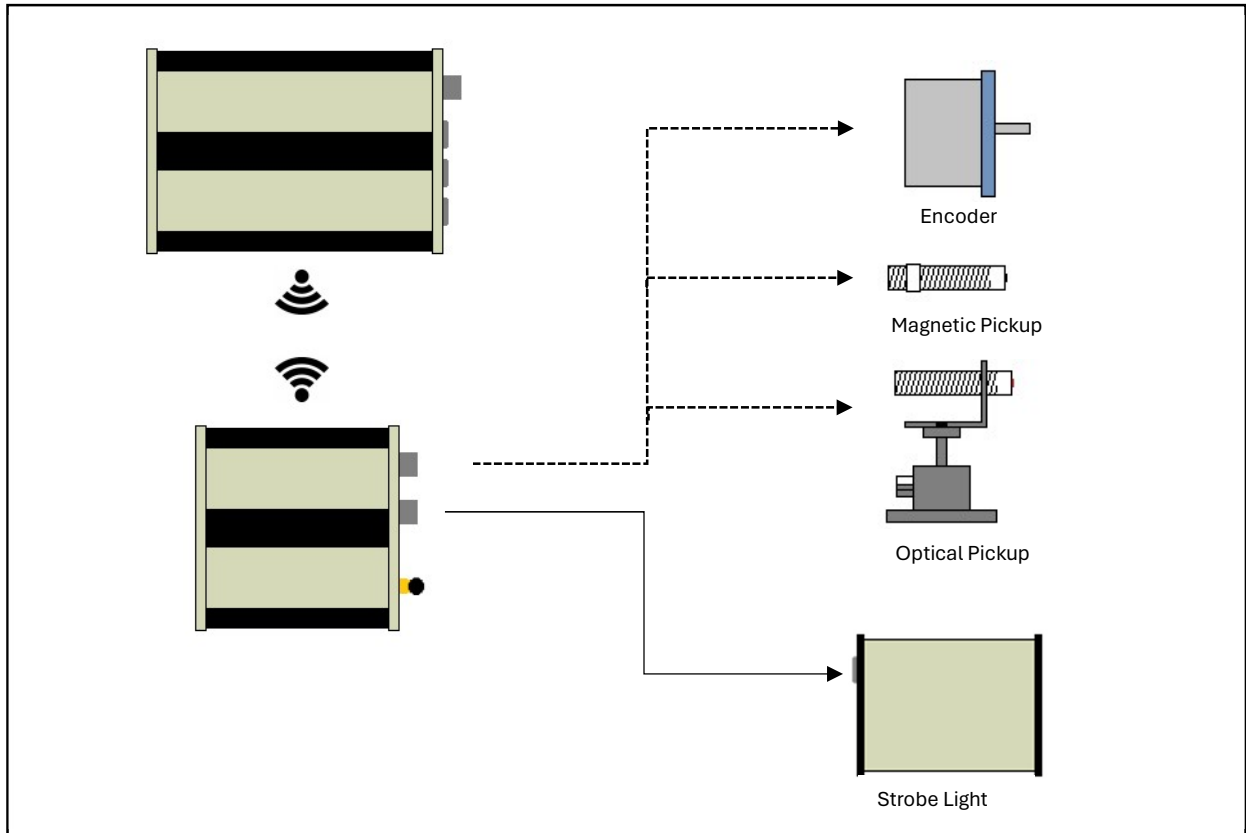


Figure 12. Pulse connection. Lenz, Pulse, speed instruments & Strobe light.

### 3.2.3. Speed Synchronization Connector

Speed Synchronization Connector is dedicated to acquiring the speed RPM signal input only. Three sensor types can be used on this channel – connector.

- Encoder
- Magnetic Pickup (Adapter)
- Optical Sensor Pickup.

These 3 sensors can be used either with the Lenz or Pulse.



- To prevent damage:**
- If the Pulse, Timing Control Module is used, the Sync connector in Lenz should remain unconnected.

### 3.3. Back View

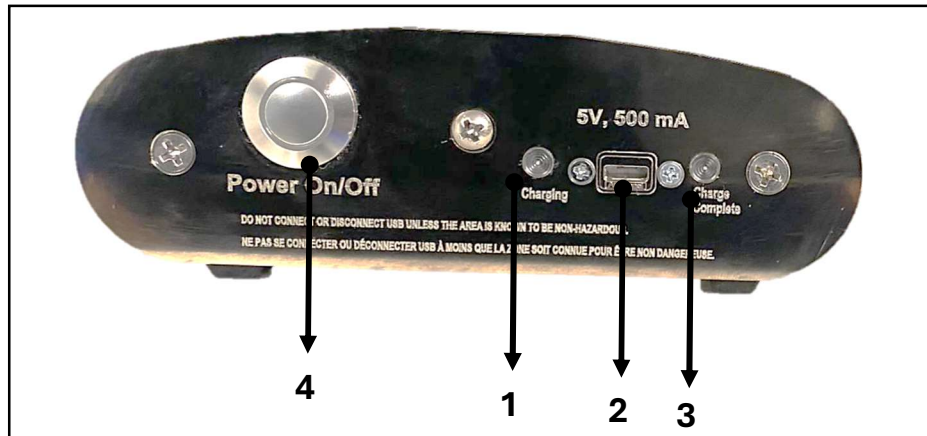


Figure 13. Pulse back view.

1. Red LED Light – Charging Mode
2. Micro USB Charging Port
3. Green LED Light – Full Charge Mode
4. On / Off Button

#### 3.3.1. Micro USB Charging Port

To charge the Pulse follow these steps:

- Insert the power supply connector into the Pulse, it can be powered on or off. The Pulse is fully operational during charging. Resonance Systems suggests charging the battery overnight prior to your intended usage.
- Connect the AC connector from the power supply to a standard AC outlet, which should range from 100 VAC to 250 VAC, with a frequency of 50-60 Hz. A complete recharge typically requires ~ 4 hours.



**Warning:**

- *Explosion hazard – Do not connect or disconnect USB unless the area is known to be non-hazardous.*

### 3.3.2. Battery Status

The back of the Lenz has 2 LED lights that show the status when charging the battery.

Table 3. LED indicator mode on Pulse

Color	Mode
Red	Charging
Green	Ready – 100% Charged
Red & green blinking	High Temperature on the Battery



**To prevent damage:**

- *The Pulse has a High Temperature sensor to protect the battery pack. When the temperature sensor reaches 110 ° F (35° C), red and blue LED lights will start blinking until Lenz batteries cool down. If the power supply is connected to Lenz, disconnect it.*
- *Use power supplies and chargers that are approved by Resonance Systems. Using unauthorized power sources or chargers could void the warranty and risk damaging the Lenz or Pulse battery pack.*

### 3.3.3. Turn the Pulse on or off

To activate the Pulse, press once the power button located on the back of the device, and the indicator light illuminates. The blue light will begin blinking at the test speed rate of 594 RPM.

When connecting the rotational speed device, the blinking rate will be the same as the rotational speed of the machine (RPM).

To power off the Pulse, press the power button once.

### 3.3.4. Mounting

The Pulse has been designed for mounting either for portable mode or continuous mode. Either portable or continuous mode leave the Pulse on a flat surface, or you can use the magnets. This facilitates secure mounting of the Pulse alongside any ferrous material, preventing accidental dislodging. Request it from your Resonance Systems sales representative.



**To prevent damage:**

- *The operating temperature for the Pulse should not exceed 120°F (48°C).*

If possible, it should be placed at the midpoint around the area you will be moving through. The antenna is omnidirectional, meaning the signal strength is the same in all directions.

## 4. Rmonix Software

Accessing Rmonix software requires a PC, laptop, tablet, or any smart device connected to the internet. Rmonix operates as cloud-based software.

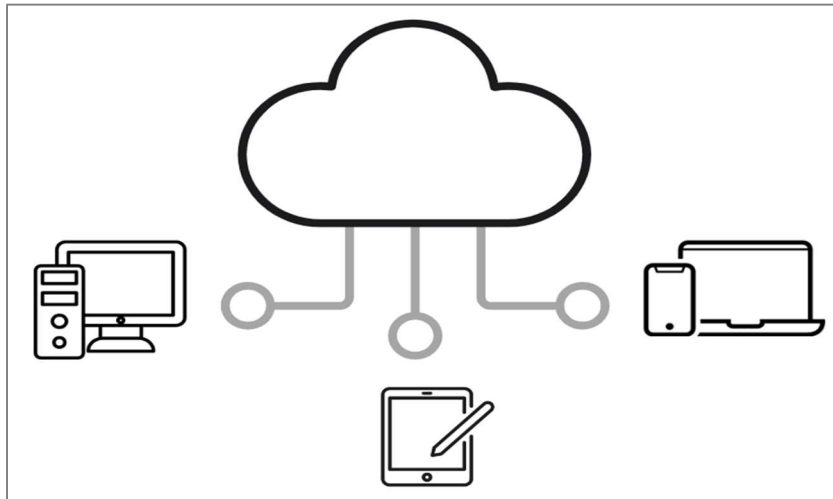


Figure 14. *Cloud Architecture Computing. Rmonix Network*

### 4.2. Operating Requirements

The user's device must meet at least the following specifications:

- **Browser Compatibility:** While there's no strict browser preference, the system performs optimally on Google Chrome and Safari. It's recommended to keep these browsers updated to their latest two versions for the best experience.
- **Internet Connection:** A minimum download speed of 1.5 Mbps and an upload speed of 1.0 Mbps are required.
- **Bluetooth / Wi-Fi:** The device should have Bluetooth 2.0 or later capability and support Wi-Fi 802.11 (or later) on both 2.4 GHz and 5.2 GHz frequencies.
- **Other requirements:** We do not have a minimum requirement. However, for better experience, we highly recommend: For smart devices, a minimum screen resolution of 360×800 is needed, while for PCs or laptops, it should be 1280×800.

### 4.3. Language Considerations

Rmonix software is in English. Please make sure your web browser language setting is also set to English. If you need a different language, adjust your web browser's language settings accordingly. However, we strongly recommend using English. Please note that we do not provide support for web browser settings.

## 4.4. Getting Started

Software installation is no longer needed since it is cloud-based, the latest versions are updated regularly. Likewise, to gain access to Rmonix it is mandatory to create a user account:


1. Open your web browser of preference.
2. Create a user account visiting <https://rmonix.net>
3. Your user account must be verified and approved by the Resonance System Team. If there is a delay of more than 24 hours in the approval process, please contact Technical Services, referring to Section 1 > Contact Us in this document.
4. Once your user account has been approved, log in.

### 4.4.1. User levels

- **Regular user account:** The default setting creates the user account as a regular user account. The user can see and modify all the data under their domain. Two or more users under the same domain can see, edit, and share the data among them. Everybody gets equal permission.
- **Manager user account:** A manager – level user can assign permissions to other users under the same domain:
  - Read-only > view assets and data.
  - Write > edit setups, take data, and adjust historical data.
  - Create > create, rename, move, and delete assets, stations, and groupings.
  - Manage > everything above and the ability to change permissions for other users.

To obtain a Manager User Account, please contact Technical Services. For further assistance, refer to Section 1 > Contact Us in this document.

### 4.4.2. Password & Phone Number

On the left panel click on Profile icon  > then click on Preferences icon.

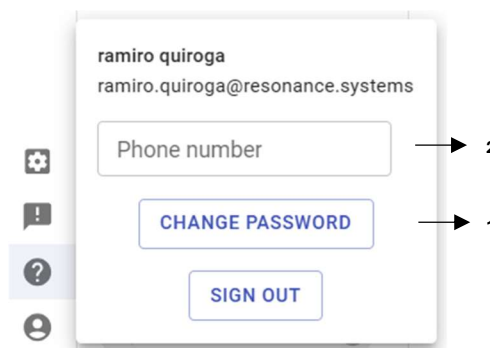


Figure 15. User profile

1. Click on the "Change Password" button to modify your password. An email will be sent to your user email with the instructions.
2. Add or modify your phone number in the "Phone number" box. Phone number is only used as an optional field on the report builder.

## 4.5. Preferences & Settings

### 4.5.1. Preferences

On the left panel click on Preferences & Settings icon  > then click on Preferences icon .

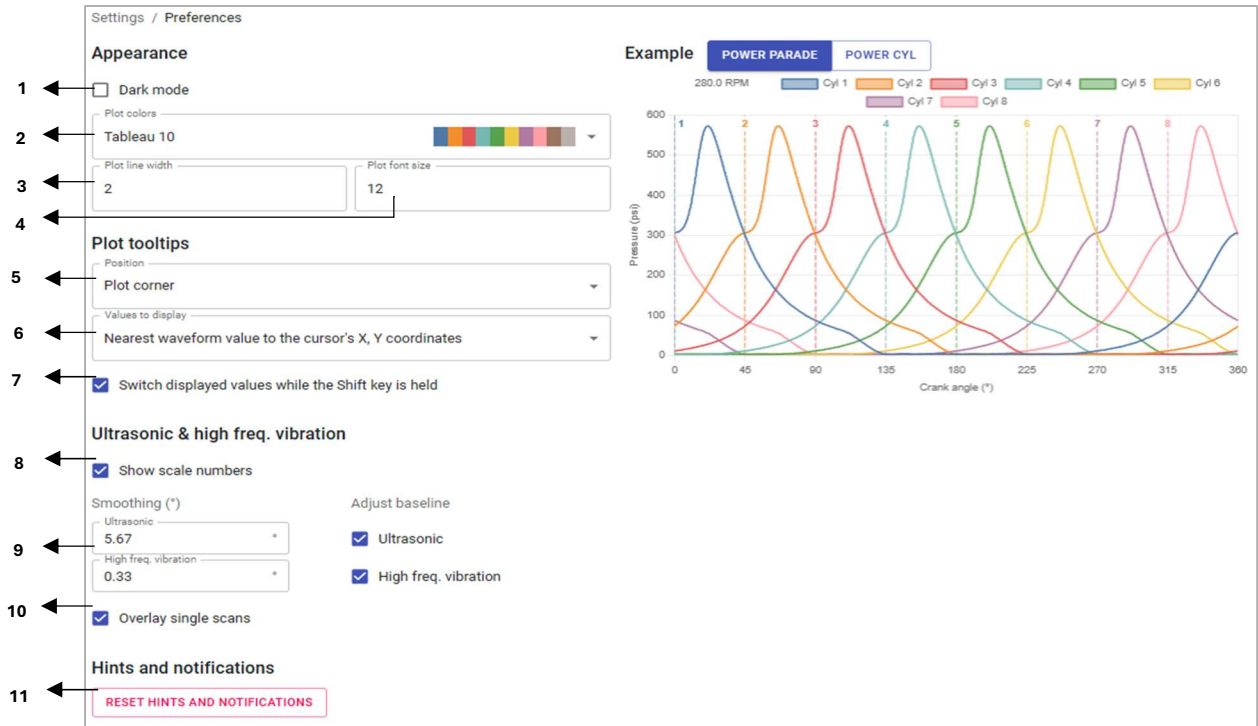


Figure 16. Preferences setup.

#### Appearance

1. Dark mode. – Check or uncheck. Dark and Light mode changes the look of the Rmonix background.
2. Plot colors. – Choose the plot line colors between more than 100 options.
3. Plot line width. – Enter a value between **1 to 100** to change the width of the lines in the plot.
4. Plot font size. – Enter a value between **6 to 24** to change the font size in the plots.

#### Plot tooltips

5. Values position. – Display the value(s) where the cursor is at, either fixed at the corner of the plot or dynamically at the current position of the cursor.
6. Values to display. – Display a single value at the cursor's X, Y coordinates in the plot, or show multiple values at the nearest X coordinates to the cursor.
7. Switch displayed values while the Shift key is held. – Display all the values at the cursor's X coordinates when the Shift key is held.

#### Ultrasonic & high frequency vibration

8. Show scale numbers. – Show ultrasonic & high frequency vibration scale numbers at the right side of the plot.





9. Smoothing. – Assing a value to smooth either the ultrasonic or high frequency vibration plot.
10. Overlay single scans. – Display additional lines (if any), placed on top of graphs to highlight vibration and ultrasonic lines.

### Hints and Notifications

11. Reset Hint and Notifications. - Some notifications have a "do not show this again" box. Pressing this button resets those. So, you can see all/any hints and notifications.

## 4.5.2. Plot Definitions

On the left panel click on Preferences & Settings icon  > then click on Plot definitions icon 

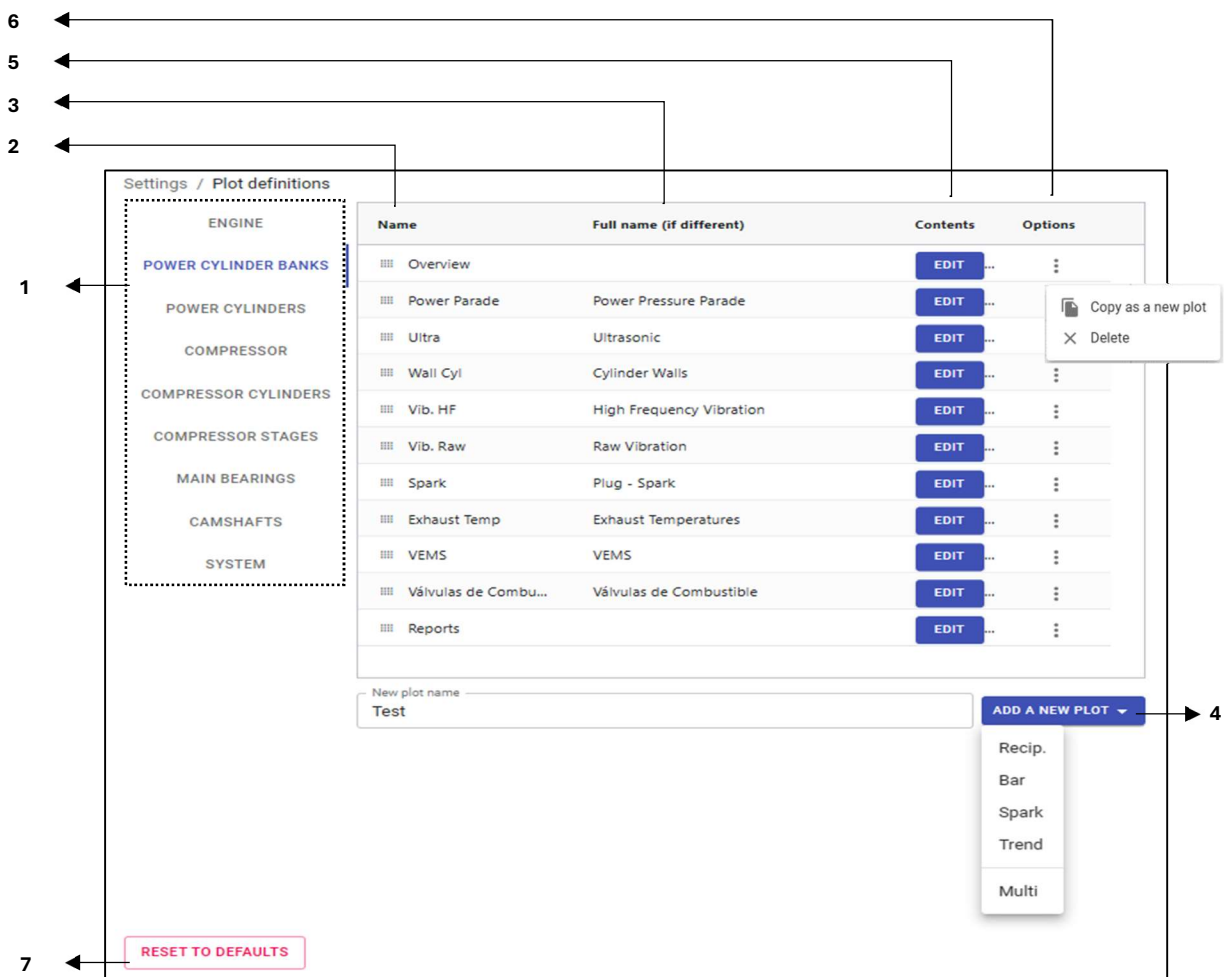



Figure 17. Plot definitions

Rmonix is a smart software that puts together all information that is related to each other. It classifies the plots according to the assets, components and points that has been setup in the route. This customization is available bar charts (temperatures & panel readings), spark detail plots, and crank-angle plots.

By default, Rmonix comes with certain plots pre-defined. Otherwise, it allows to the user to customize according to their preferences.

1. **Left panel.** - Select the asset or specific component within the asset from the left panel to configure the plots.
2. **Name.** – This represents the "Short Name" shown on the tabs of the plots. Adjacent to the name, there's an icon  that enables the dragging and dropping of plots to adjust their display order of the Tabs plots.
3. **Full Name.** – This is the "Full Name" that appears when you hover the mouse cursor over the tabs while viewing plots.
4. **Add new plot.** – A plot name must be typed before adding a new plot. You can choose from five types of plots to add:
  - Recip.: This plot utilizes crank-angle data to show dynamic data.
  - Bar: It displays non-dynamic values or panel data in a bar chart format.
  - Spark: Specifically for secondary ignition data.
  - Trend: Shows the historical trend of non-dynamic values or panel data.
  - Multi: A multiplot that combines any of the plots mentioned above.
5. **Contents.** – After clicking the Edit button, a popup window will arise:

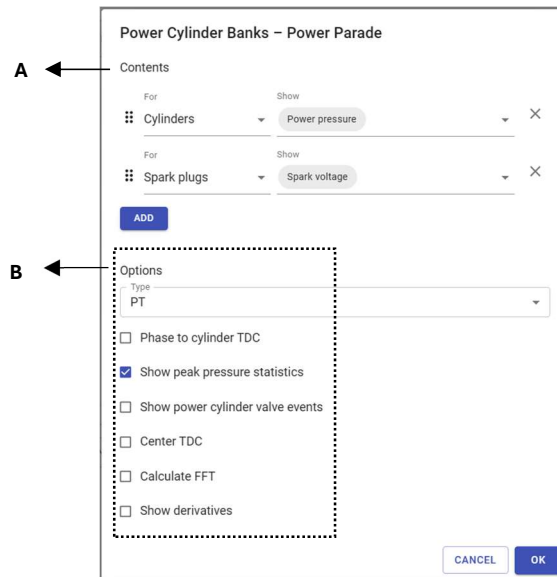



Figure 18. Power setup.

- A. Contents. – The available content options vary based on either the selected asset or component and the type of plot that was previously chosen.
  - I. In the "For" column, select a component or asset with preconfigured data. Utilize the icon  to drag and drop, adjusting their display order in the plots.
  - II. In the "Show" column, you can check one or more parameters, which represent sensor data.

III. Click on the “Add” button to add a new component or asset data.

B. Options. – Select how you would like your data to be displayed and/or specify the type of analysis you want to view

6. **Options.** – Click on the 3 dots icon  $\dots$  and a popup window appears. Select the option, either delete or Copy as a new plot.
7. **Reset to defaults.** – Click on the “Reset to default” button to restore or revert all plots to their original settings and layout.

### 4.5.3. Units of measurement

On the left panel click on Preferences & Settings icon  $\text{⚙}$  > then click on Unit of measurement icon  $\text{📏}$ .

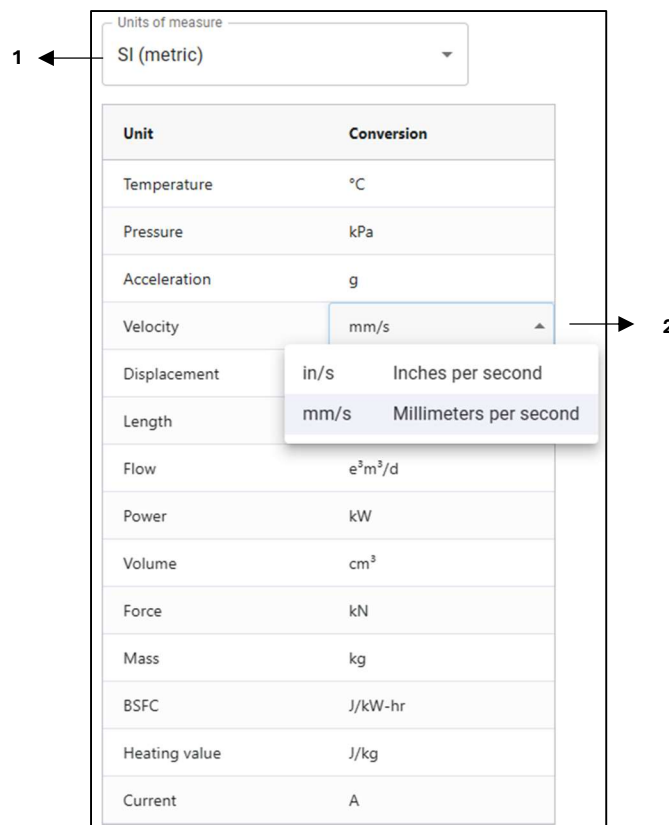





Figure 19. Units setup.

1. **Units of Measure Selection.** - Click on the dropdown box to select from Metric, English, Canadian, or Customize units.
2. **Unit Conversion.** - Click on the unit you wish to change, then choose from the available options in the dropdown box. Any changes made are automatically saved and are accessible next time under "Custom units" in the dropdown box.

## 4.5.4. Report Templates







To access the report builder, please note that it is available as an add-on. This feature is not included in the standard package and requires a separate purchase or subscription. Please request it from your Resonance Systems sales representative.

On the left panel click on Preferences & Settings icon  > then click on Report Templates icon .




**Report templates**

You can use Word documents (.docx) as report templates. Upload your templates here, then choose a template to use within the Report Builder sidebar.

File	Actions
Resonance Template Rev 12.docx	 
31e.docx	 
2.docx	 
...	 

4 ←

3 ←  Drag and drop files or click here

**How to use report templates**

In your template document, include a placeholder for any item you wish to place on the report. Placeholders are always enclosed in double braces: for example, `{{placeholder}}`. Make sure to include `{{report_pages}}` (or one of the "Additional placeholders" below) for the main report contents.

- General
- Analyst
- Asset
- Compressor
- Engine
- Run

2 ←

1 ← [Download sample template](#)

**Additional placeholders**

Instead of using `{{report_pages}}`, you can use placeholders for individual plots or report items. For example, the compressor performance report is listed as "Compressor performance" in the report builder. The placeholder for that item would be `{{compressor_performance}}`. If you've added a "Cyl 1 PV" plot to your report, you can refer to it as `{{cyl_1_pv}}`. Additionally, if your compressor has multiple stages (so that stage flow values appear on the compressor report), you can use refer to those as `{{compressor_stage_1_flow}}`, `{{compressor_stage_2_flow}}`, etc.

**Formatting**



Reports are designed for 8.5x11" paper with 0.75" left and right margins. (Microsoft Word calls these "Moderate" margins.) You can adjust report styles by changing the Microsoft Word's Heading styles (Normal, Heading 1, Heading 2...)


Figure 20. Report templates files.

To generate a Report Analysis in Rmonix software, you have the option to integrate with third-party software to extract information from Rmonix into a Microsoft Word document. This is achieved by utilizing placeholders within a predefined MS Word template.

1. **Template.** - Accessing a sample template for download is available. You'll require Microsoft Word or equivalent to open or create a template. Please note that this is a third-party program, and we do not provide support for it.
2. **Placeholders.** - This section provides a comprehensive list of all available placeholders.
3. **Upload Document.** - Upload or drag and drop the previously created template document. Ensure that the document file is saved with the .docx extension.
4. **Document Folder.** - This section displays all documents uploaded or saved within the Rmonix software. In the "Action" column, you can delete or download previously uploaded documents.

### 4.5.5. Station & Asset upload history

On the left panel click on Preferences & Settings icon  > then click on upload history icon .





Status	File	Uploaded ↓	Warnings	Reprocess
	S030 - M-U 01.wrpm	9/8/2021, 9:38 PM	16	
	S045 - MU 03.wrpm	9/8/2021, 4:30 PM		
	S045 - MU 03.wrpm	9/8/2021, 4:06 PM		
	S045 - MU 03.wrpm	9/8/2021, 4:05 PM		
	Sta 130 - U17SI.wrpm	9/8/2021, 3:16 PM	1	

↓
↓
↓
↓
↓

1
2
3
4
5

Figure 21. Upload history.

Check the status of the file when it has been uploaded to the cloud.

1. **Status.** – The status column shows 3 different icons/statuses:
  - a. The icon  indicates an error. Please get in touch with Technical Services for this case, refer to section 1 > Contact us in this document.
  - b. The icon  indicates a warning, suggesting that not all data points could be processed. Clicking on the Warnings column shows more information. Or assigning them to the asset component may resolve this issue.
  - c. The icon  represent that the data has been uploaded successfully.
2. **File.** – Represent the name of the file, click on it to download it.
3. **Upload data & Time.** – Display the stamp of the date and time the data has been uploaded.
4. **Warnings.** – Show the count of errors in the file whenever either an error or warning popup appears.
5. **Reprocess.** – Clicking this icon  initiates the reprocessing of the upload of data.

### 4.5.6. Lenz Settings

On the left panel, click Preferences & Settings icon > then click on the Lenz settings icon .

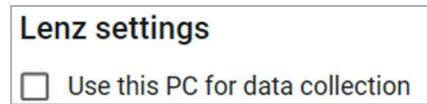


Figure 22. Enable device for data collection.

Selecting the box activates data collection for the device, whether it's a PC, laptop, tablet, or smartphone.

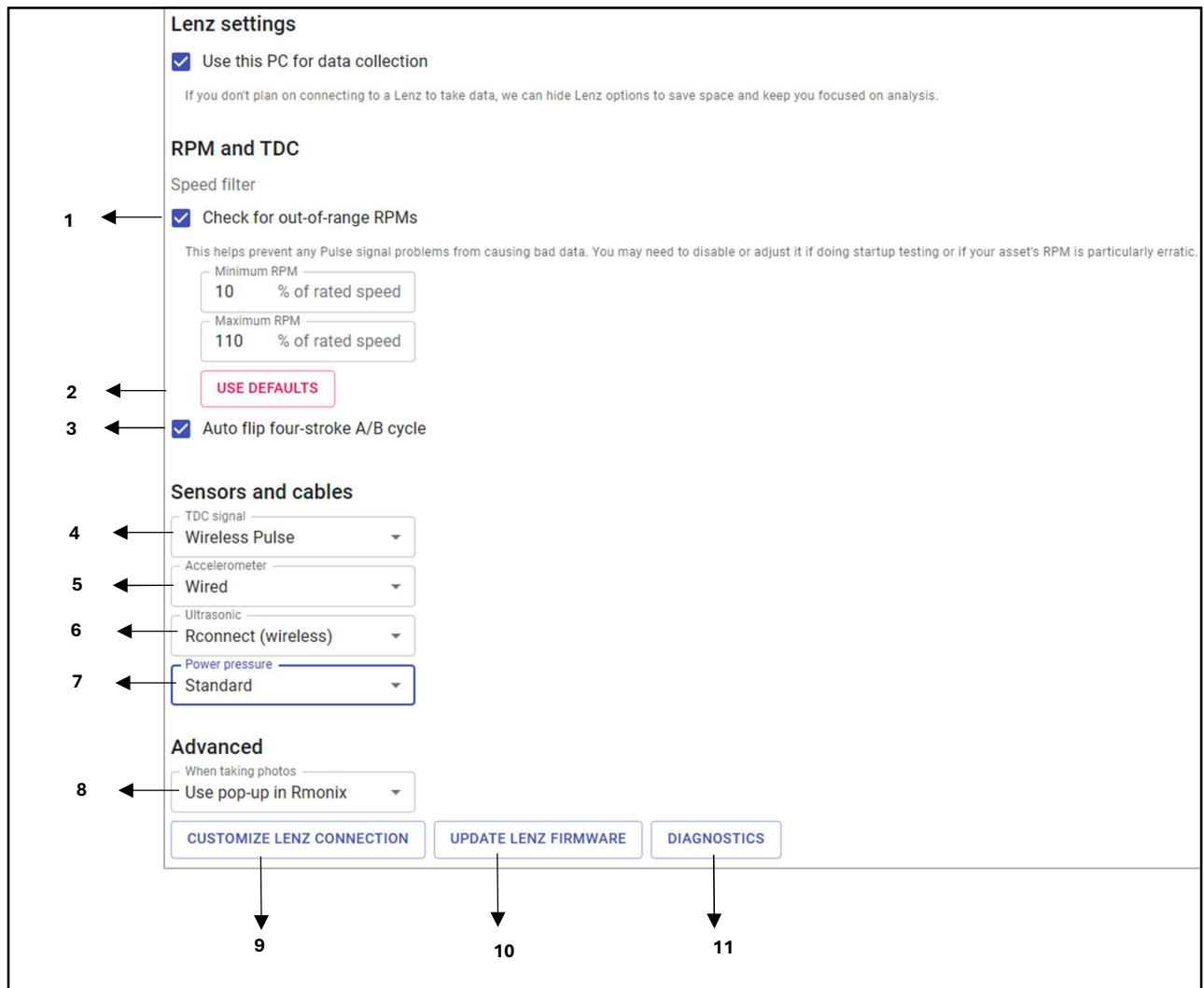




Figure 23. Lenz settings.

## RPM and TDC

1. **Out of Range RPMs.** – By checking this box, Rmonix will show a message while taking data if the RPM reading falls outside the pre-configured speed.  
 To configure the rated speed, go to the left panel, navigate to Asset Setup  > Select Asset > Other Settings  > modify the value in the Rated Speed box.  
 Note that the Pulse test speed is 594 RPM; for further information, refer to the Pulse section of this document.
2. **Use defaults.** - Hit the button “Use defaults”, to reset the range values of rated speed.
3. **Auto flip.** – When taking data on a 4-stroke engine, it can automatically detect which revolution the engine is on, without making you manually select “Flip A/B cycle”. Rmonix is smart enough to detect if the engine is on Power or Intake stroke (If the checked box is on).

## Sensor and cables

4. **TDC Signal.** – Select either wireless or wired speed (RPM signal) from the dropdown menu. Opt for wireless if you're using Pulse (*See Figure 10*) or choose wired (cable connection) if you're directly inputting the speed (RPM signal) to the Lenz (*See Figure 5*).
5. **Accelerometer.** - Choose between a wired or wireless accelerometer sensor according to your specific sensor requirements.
6. **Ultrasonic.** - Choose between a wired or wireless ultrasonic sensor according to your specific sensor requirements.
7. **Power pressure.** – Choose Standard unless directed otherwise by Resonance Customer Support.
8. **When taking photos.** – Users can capture photos while collecting data. These photos are automatically linked to the corresponding data points along your route. You have the option to use the built-in camera feature within Rmonix (640x480 px) or your device's standard camera app, providing higher resolution (whatever the resolution may be) and additional photography features.

## Advanced

9. **Customize Lenz Connection.** – This setting lets you override the URL that connects to the Lenz Wi-Fi.



### **Warning:**

- *Only change these settings if directed by Resonance Customer Support*

10. **Update Lenz Firmware.** – Updating the Firmware of Lenz is rarely done. It happens when Resonance Systems releases a new version of it, due to bug fixes, security patches, enhanced features or optimized performance, and others. This can be done remotely by the instruction and supervision of the Resonance Systems team or authorized service centers. Damage resulting from unauthorized modifications may void the warranty.

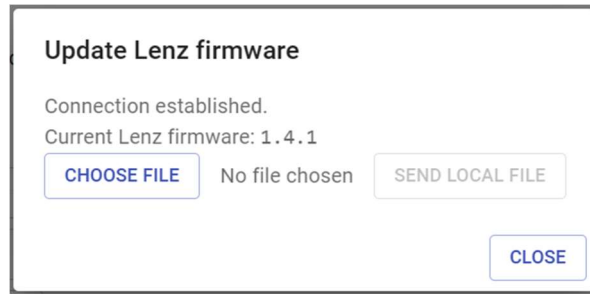


Figure 24. Lenz Firmware.



**Warning:**

- Only change these settings if directed by Resonance Customer Support

**11. Diagnostics. –**

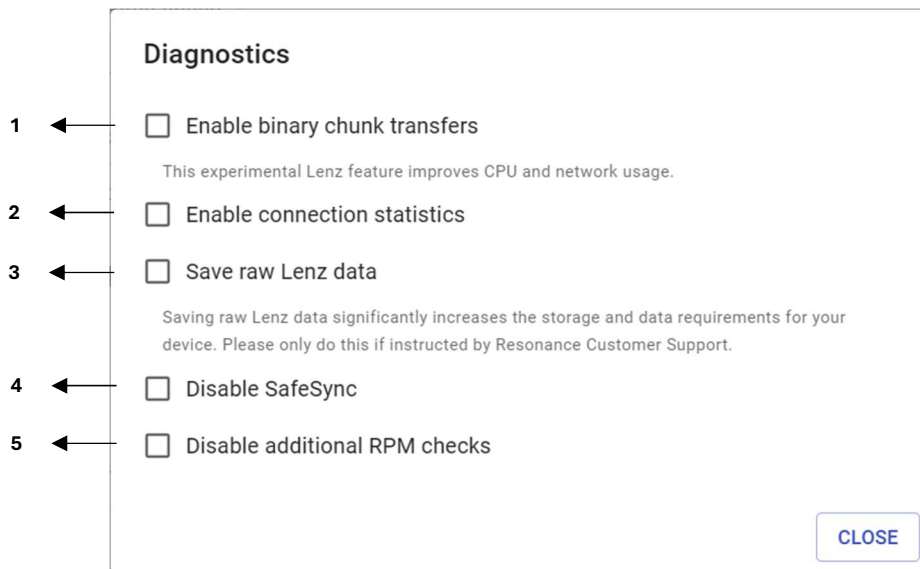


Figure 25. Diagnostics options.

1. Binary chunk transfer involves sending data in binary format in discrete segments rather than a continuous stream, aiming for more efficient, reliable, and faster transmission. Still in Beta development.
2. Enabling connection statistics collects and provides data on network performance, usage, and related metrics for Resonance Systems. This fosters collaboration to improve network performance and reliability.
3. Checking this option enables the saving of raw Lenz network traffic. Resonance Systems can utilize this data for troubleshooting purposes if needed.
4. Disabling this feature could potentially lead to the loss of access to the collected data. SafeSync feature allows it to continuously save analysis data to the Lenz as it's collected. This ensures that your data is backed up and accessible, even if something happens to your tablet or phone.
5. Disabling this feature may result in inaccurate data referencing. Rmonix verifies the RPM speed against the previous reading.



### 4.5.6.1. Analysis runs on this device

On the left panel, click Preferences & Settings icon > then click on the Lenz settings icon > Check the box use this PC / Phone for data collection > Go back to Preferences & Settings icon > a new option is enabled, click on the Analysis Runs on this device icon .

The data collected is stored in both the Lenz and the web browser. This window refers to the data in the web browser. Data that has been upload to the cloud is automatically deleted from the web browser after 7 days.

This lists data that you've recently taken on this PC. Older data is automatically removed to save space once it's uploaded to the cloud. You're all set! All of your data is safely on the cloud.

Asset	Date ↓	Run # ↓	Uploaded	Points	Options
<a href="#">Without Lenz - Photos</a>	5/17/2024	1	✓	1	⋮

- Re-upload
- Delete
- Export >

↓  
1

↓  
2

↓  
3

↓  
4

↓  
5

↓  
6

Figure 26. Analysis runs on device.

1. **Asset.** - Represent the name of the file, click on it and re direct to the data / analysis.
2. **Date.** – Display the stamp of the date the data has been taken.
3. **Run #.** – It shows the number of Runs the user made.
4. **Uploaded.** – An icon ✓ appears when the data has been uploaded to the cloud.
5. **Points.** – It shows how many data points have been collected.
6. **Options.** – Click on the 3 dots icon ⋮ and a popup window appears. Select the option, either delete, Export or Re-upload.



**Alert:**

- An alert message will pop up if the device is not connected to the internet, while uploading data. Connect to the internet to upload the data.

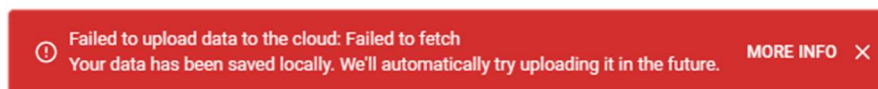




Figure 27. Failed to upload the data message.

### 4.5.7. Continuous mode connections

On the left panel, click Preferences & Settings icon  > then click on the Continuous mode connections .

This window displays the status of all your connected devices under your domain, if any.

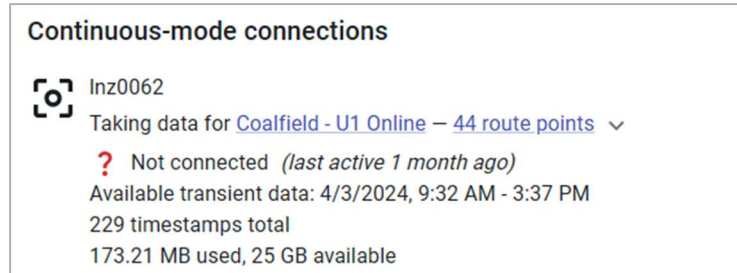




Figure 28. Continuous mode connections.

## 4.6. Create a New route

### 4.6.1. Stations & assets

At the bottom of the Rmonix window, click on Add a station or asset icon  > then click on Create a station or grouping icon .

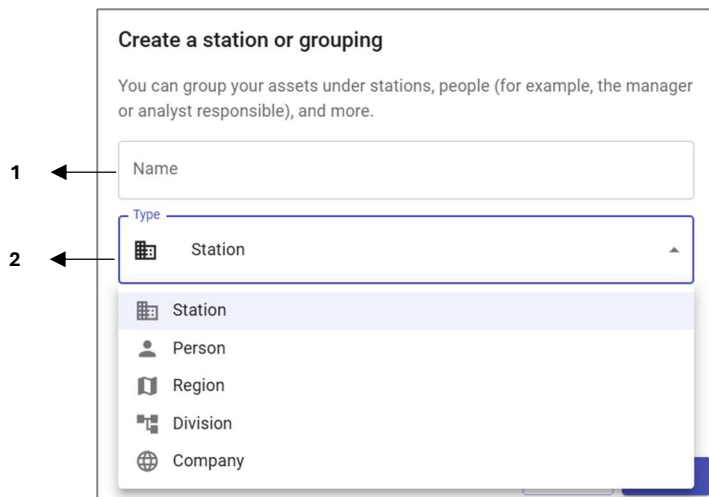




Figure 29. Create a station or grouping.

1. **Name.** - Type a name for your Grouping.
2. **Type.** – Choose between Station, Person, Region, Division or Company.

Next, at the bottom of the Rmonix window, click on Add a station or asset icon  > then click on Create an asset icon .

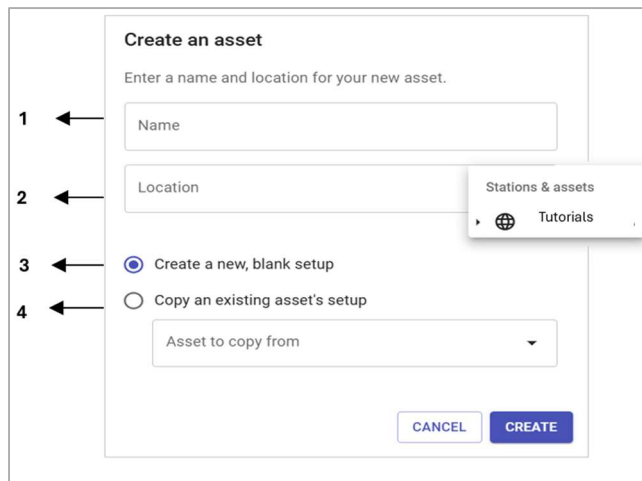


Figure 30. Create a new asset.

1. **Name.** - Type a name or Tag for your Asset.
2. **Location.** – Choose the grouping your assets is under. Refer to the type of grouping (Station, Person, etc.)
3. **Create a new.** – Choose this if you are creating from scratch.
4. **Copy an existing asset's setup.** – Choose this if you want to copy the setup from an existing asset.

#### 4.6.2. Upload a file



On the left panel, click Stations & Assets icon  > then drag and drop the file you want to import. Drop it into the "Stations & Assets" column. Rmonix allows to import either an asset or a station file.



Figure 31. Importing a file, drag and drop the file.

### 4.6.3. Arrange assets & groupings

On the left panel, click Stations & Assets icon  > then click and hold on the asset you want to move, then drag and drop it under the desired grouping.

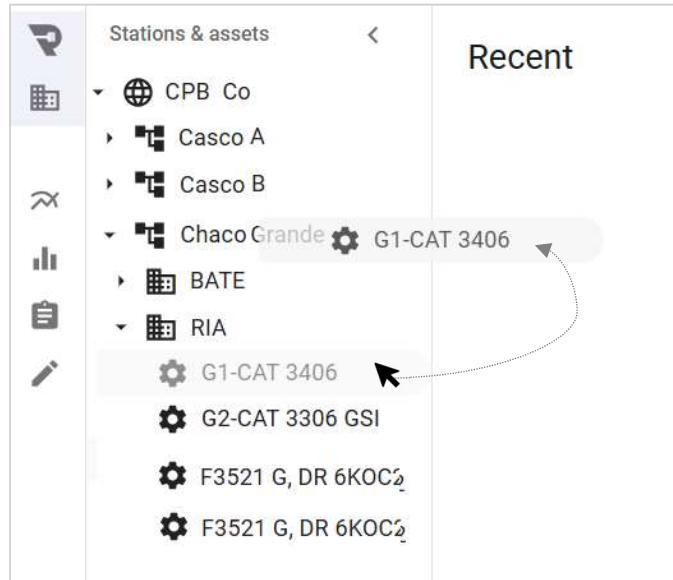


Figure 32. Arrange assets or groups.

### 4.6.4. Rename, Move & Delete Assets

Right click on the asset name to Rename, Move or Delete it.

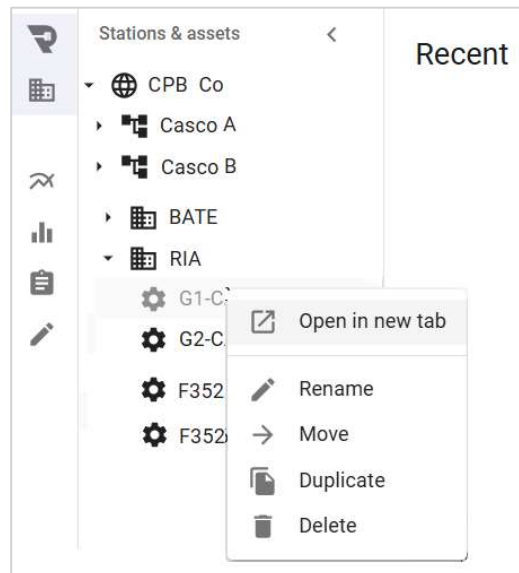


Figure 33. Rename, Move, Duplicate & Delete Assets

### 4.6.5. Rename, Edit Permissions, Move & Delete a Grouping

Right click on the grouping name to Rename, Move, Delete or Edit permissions.

Refer to section 4.4.1. User levels of this document for Edit permissions.

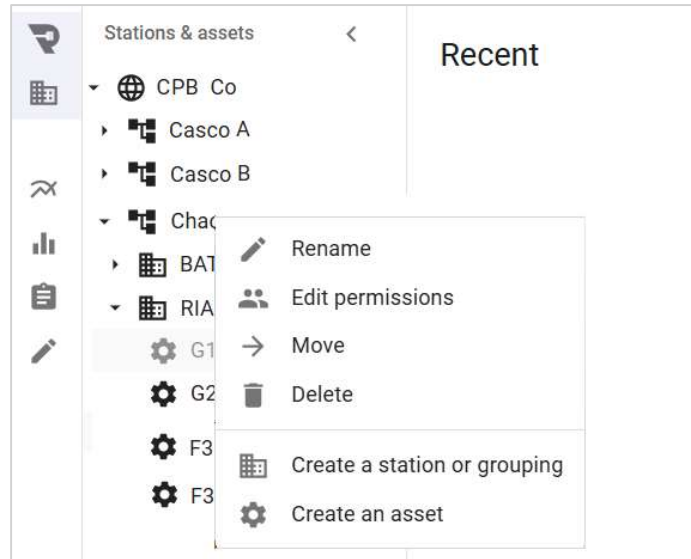


Figure 34. Rename, Edit Permissions, Move & Delete Grouping

### 4.7. Asset setup

On the left panel, click the Stations & Assets icon > then click on Asset setup > the click on the asset created.

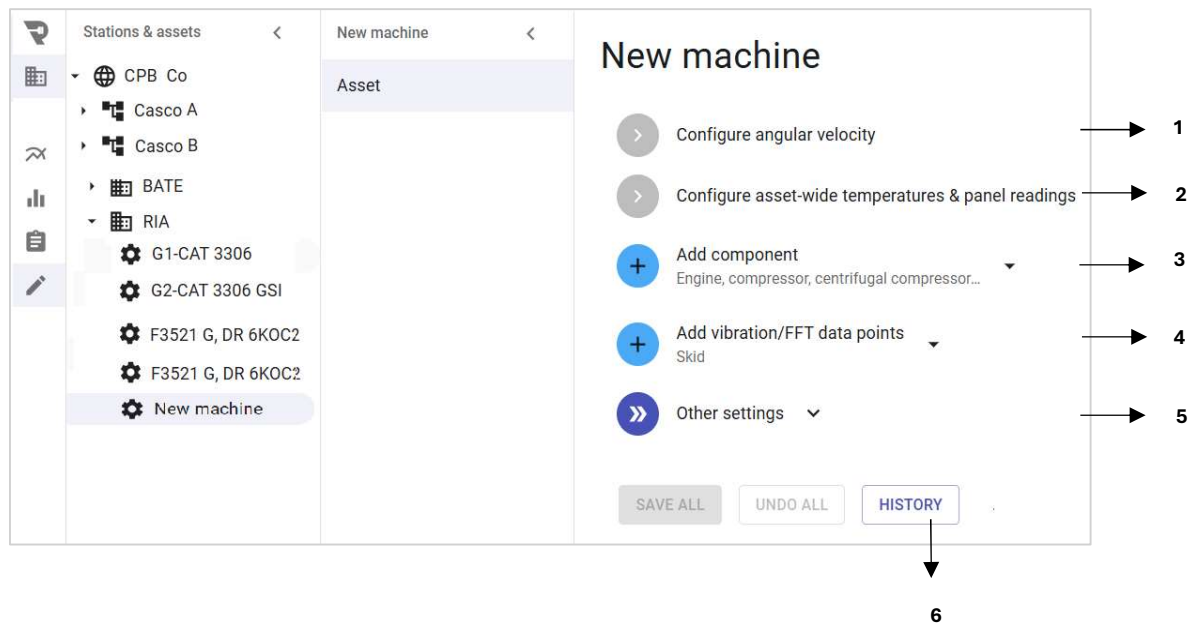





Figure 35. Asset setup.

- Angular Velocity.** – Click on the *angular velocity* icon  to collect angular velocity data > then choose the number of cycles to collect > and click the OK button. This point is at the asset level.

**Note** -----

The encoder is needed to collect this type of data.

-----

- Asset Temperatures & Panel readings.** – Click on Configure asset-wide temperatures & panel readings icon  > then, check the box for the type of information you want to collect and/or add a custom point by clicking the icon at the bottom right . These readings are at the asset level.

**Note** -----

To collect the data, use the on screen keyboard to type it in. Temperature data can be collected either by typing it manually or using the IR temperature sensor.

-----

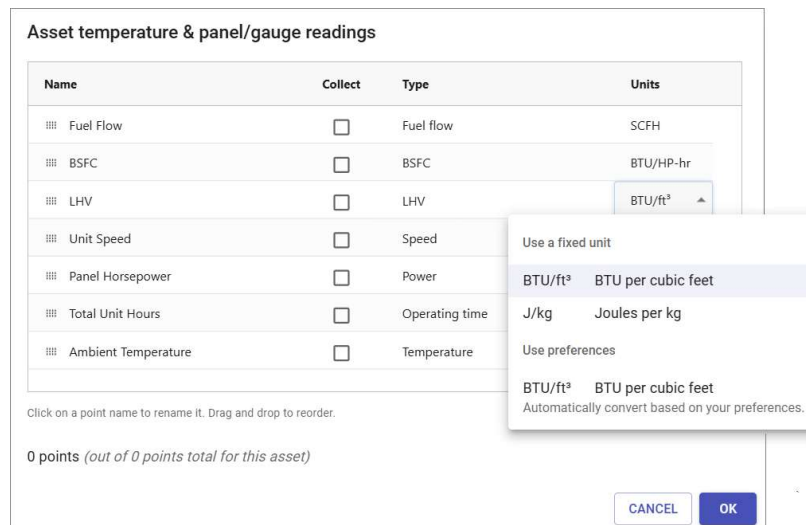



Figure 36

- Asset Components.** – Click on “Add component” icon  > then, add the machine of preference > a popup window will appear, fill in the requested information. Add a driver and a driven unit. Add more than one component if needed.

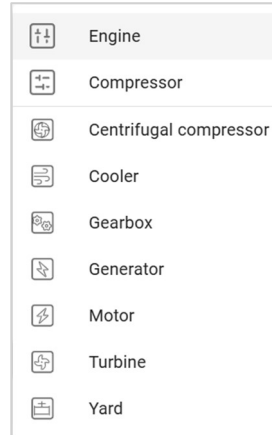


Figure 37. Components list.

4. **Asset Vibration / FFT.** – Click on “Add vibration/FFT data points” icon > then, a popup window will appear > choose the vibration points of preference at the asset level.

**Note** -----

An accelerometer or velocity probe is needed to collect this data type.

-----

5. **Other settings.** – Click on the “Other settings” icon > fill in the information requested.
6. **History.** – Clicking this button displays the history of all changes made to the asset.

## 4.7.1. Component setup

After a component is added, each one needs to be set up.

### 4.7.1.1. Engine

On the left panel, click the Stations & Assets icon > then click on Asset setup > then click on the component created.

When adding a component –Refer to the asset component section– a popup window will show up. Fill in the basic information.

**Note** -----

Type at least three letters in the Manufacturer box to autofill all the information. If the autofill option is available, the cylinder geometry will be filled in too.

-----

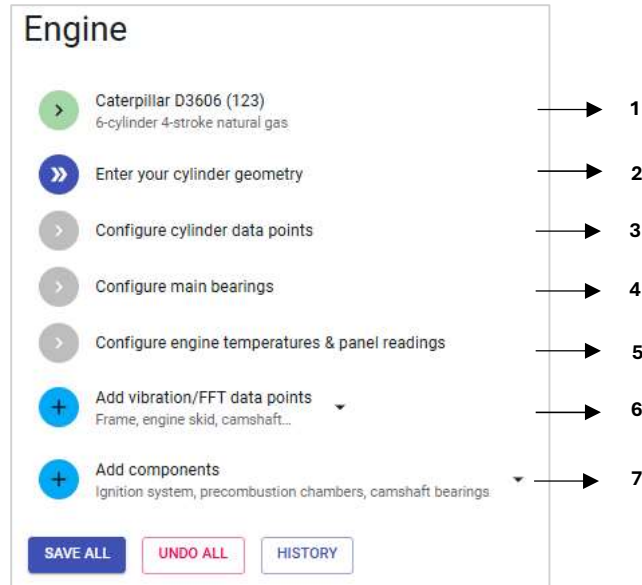







Figure 38. Engine

1. **Basic information.** - To fill in the basic information, start by typing at least three letters in each field, such as the Manufacturer box, to trigger the autofill feature and populate the remaining details automatically.
2. **Cylinder geometry.** - Click on the *Cylinder geometry* icon  to edit > then under the geometry tab, input the bore, stroke, connecting rod length, and phase position for each cylinder. In the Timing tab, enter the degree events for the opening and closing of the exhaust, intake, and fuel valves. You can include an upper and lower range ( $\pm$ ) for each event.
3. **Cylinder data points.** - Click on the Cylinder data points icon  to edit > By checking the box for the data to be collected, Rmonix will automatically generate the number of points based on the engine's number of cylinders.

**Note** -----

Select the pressure sensor range and the number of cycles to collect in the pressure data section.  
-----


4. **Main Bearings.** - Click on the Main bearings icon  to edit > then enter the number of main bearings. Rmonix will create a time domain measurement point for each main bearing by checking either the raw or high-frequency vibration box. In the FFT Vibration section, checking the velocity or acceleration box will cause Rmonix to create a frequency domain measurement point for each main bearing. Adjust the Averages, Lines, or Fmax as needed. These settings can also be modified later in the advanced section.  
  
If temperature records of main bearings are required, simply check the Main Bearing temperature box.
5. **Temperatures and Panel readings.** - Click on Configure engine temperatures & panel readings icon  > then, check the box for the type of information you want to collect and/or add a custom point by clicking the icon at the bottom right .



**Note** -----

Notice that under the Engine tab, only one point will be created. In the Cylinder tab, the number of points to be created will depend on the number of cylinders of the engine.

-----

- 6. Add vibration/FFT data points.** - Click on “Add vibration/FFT data points” icon  > then, a popup window will appear > choose the vibration points of preference at the engine level > then, by checking of vibration sensor box, Rmonix will create a frequency domain measurement point for each point. Adjust the Averages, Lines, or Fmax as needed. These settings can also be modified later in the advanced section. Choose one or all the vibration axes.

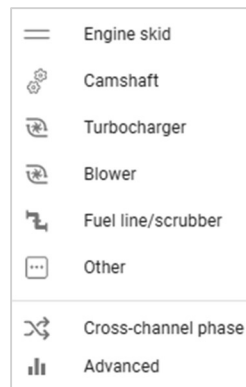



Figure 39. Engine vibration / FFT data options.

- 7. Components.** – Click on “Add components” icon  > then, a popup window will appear > choose the components of preference at the engine level

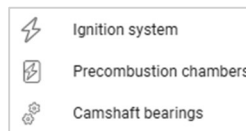




Figure 40. Other components options.

### 4.7.1.2. Compressor

On the left panel, click the Stations & Assets icon  > then click on Asset setup  > then click on the component created.

When adding a component –Refer to the asset component section– a popup window will show up. Fill in the basic information.

**Note** -----

Type at least three letters in the Manufacturer box to autofill all the information. If the autofill option is available, the bore, stroke, connecting rod, and rod diameter will be filled in.

-----

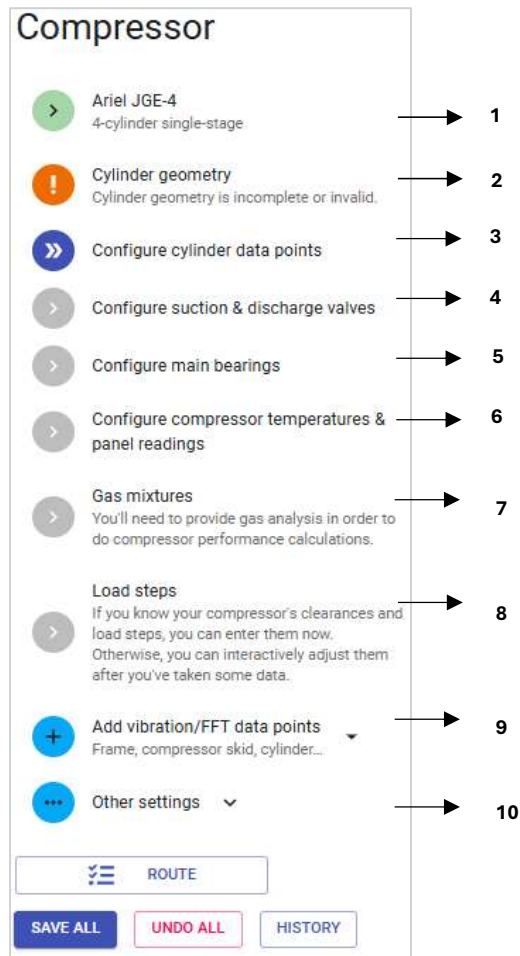


Figure 41. Compressor setup

- 1. Basic information.** - To fill in the basic information, start by typing at least three letters in the Manufacturer box to trigger the autofill feature and populate the phase, bore, stroke, connecting rod, and rod diameter.

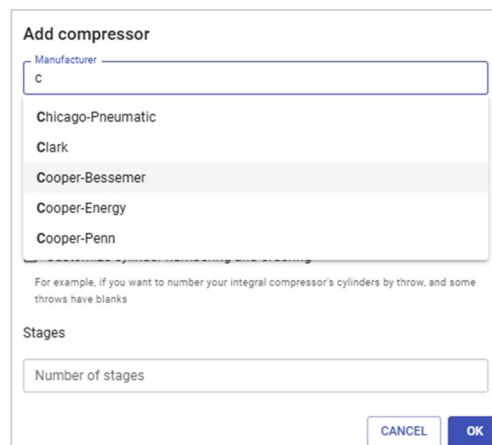


Figure 42. Autofill feature.

- 2. Cylinder geometry.** – If the autofill feature is used, the bore and mass information will remain blank and must be filled in by the user. Bore information is mandatory. If the mass information is not provided, the rod load analysis will be incomplete.

Compressor cylinder geometry

Cyl.	Phase (°)	Dimensions (in)				Max Rod Load (klbf)		Mass (lb)		✓
		Bore	Stroke	Con Rod	Rod Dia.	Compression	Tension	Piston + Rod	Crosshead	
1	108	6.00	20.00	50.00	4.00	125.00	125.00	145.000	87.000	✓
2	252	0.00	20.00	50.00	4.00	125.00	125.00	0.000	0.000	⚠
3	36	0.00	20.00	50.00	4.00	125.00	125.00	0.000	0.000	⚠


This compressor has tail rods.

UNDO REDO CANCEL OK

Figure 43. Compressor cylinder geometry.

**Note**

The last column displays either a check or warning icon, depending on whether the required information is complete.

- 3. Cylinder data points.** – Click on the Cylinder data points icon  to edit > By checking the box for the data to be collected, Rmonix will automatically generate the number of points based on the compressor’s number of cylinders.

Cylinder data points

Pressure and temperature

Pressure

Pressure sensor: 2000 psi

Number of cycles to collect: 10

Suction & discharge temperatures

Suction: Per cylinder

Discharge: Per cylinder

Nozzle pressures

Vibration & ultrasonic

Raw vibration

High freq. vibration

Ultrasonic

Crosshead raw vibration

Crosshead high freq. vibration

Other

Rod drop

0 points (out of 1 point total for this asset)

CANCEL OK

Figure 44. Compressor cylinder data points.

**Note**

Select the pressure sensor range and the number of cycles to collect in the pressure data section. Suction and discharge temperatures can be selected for the entire compressor, for each cylinder, or for each cylinder end.

- Suction & discharge valves.** - Enter the number of suction and discharge valves per cylinder end. Then, choose their layout or numbering and check the boxes for the data to be collected. Rmonix will automatically generate the number of points based on the number of valves per cylinder and the selected data types.

**Suction & discharge valves**

Valves per cylinder end

Cylinder	Suction valves	Discharge valves
1	1	1
2	1	1
3	1	1

Valve layout (numbering): D1, D2, S3, S4...

Valve data

- High freq. vibration
- Ultrasonic
- Temperature


36 points will be created. ⓘ  
36 points (out of 37 points total for this asset)

CANCEL OK

Figure 45. Suction & Discharge valves.

**Note**

-----  
 The valve layout follows a clockwise order for both the suction and discharge valves.  
 -----

- Main bearings.** – Click on the Main bearings icon  to edit > then enter the number of main bearings. Rmonix will create a time domain measurement point for each main bearing by checking either the raw or high-frequency vibration box. In the FFT Vibration section, checking the velocity or acceleration box will cause Rmonix to create a frequency domain measurement point for each main bearing. Adjust the Averages, Lines, or Fmax as needed. These settings can also be modified later in the advanced section. If temperature records of main bearings are required, simply check the Main Bearing temperature box.

**Main bearings**

Number of main bearings: 2

Crank-angle vibration

- Raw vibration
- High freq. vibration

FFT vibration

- Velocity
- Acceleration

Bearing type: SELECT BEARING

Other

- Main bearing temperature

4 points will be created. ⓘ  
4 points (out of 5 points total for this asset)

CANCEL OK

Figure 46. Compressor main bearings setup.

6. **Compressor temperatures & panel readings.** – Click on Configure compressor temperatures & panel readings icon > then, check the box for the type of information you want to collect and/or add a custom point by clicking the icon at the bottom right +.

Figure 47. Compressor temperature & panel readings setup.

**Note** -----

Notice that under the Compressor tab, only one point will be created. In the Cylinders tab, the number of points to be created will depend on the number of cylinders in the compressor.

-----


7. **Gas mixtures.** - Click on the Gas mixtures icon > then, add gas mixture(s) composition and assign at each stage.

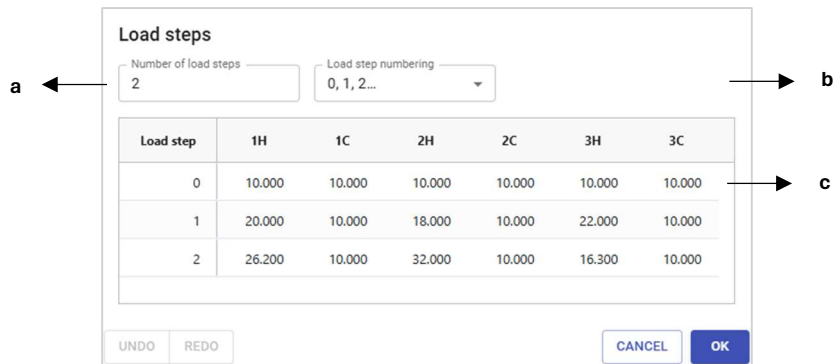
- a. Add gas by selecting the “Add” button.
- b. Add gas mixtures as required.
- c. Assign each created gas mixture to its respective stage if necessary.

**Note** -----

Use advanced thermodynamics calculations when more precision is required.


-----

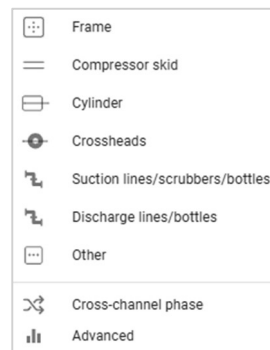
- 8. Load steps.** – Click on the “Load Steps” icon  > then, a popup window will appear > set the load steps according to preferences.



Load step	1H	1C	2H	2C	3H	3C
0	10.000	10.000	10.000	10.000	10.000	10.000
1	20.000	10.000	18.000	10.000	22.000	10.000
2	26.200	10.000	32.000	10.000	16.300	10.000


Figure 48. Load steps setup.

- Add as many load steps as required.
  - Choose the numbering.
  - Type in the % percentage of each load step.
- 9. Add vibration/FFT data points.** - Click on “Add vibration/FFT data points” icon  > then, a popup window will appear > choose the vibration points of preference at the compressor level > then, checking of vibration sensor box, will cause Rmonix to create a frequency domain measurement point for each point. Adjust the Averages, Lines, or Fmax as needed. These settings can also be modified later in the advanced section. Choose one or all the vibration axes.



- Frame
- Compressor skid
- Cylinder
- Crossheads
- Suction lines/scrubbers/bottles
- Discharge lines/bottles
- Other
- Cross-channel phase
- Advanced

Figure 49. Compressor FFT options.

- 10. Other settings.** - Click on “Other settings” icon  > then, type in the Mechanical efficiency, Auxiliary load, and the TDC offset.


Mech. efficiency %  
Leave blank to use the industry convention of 95% mechanical efficiency.

Auxiliary load 35.0 hp  
Additional load added to calculate the compressor's brake power (BHP).

TDC offset °  
Optional; for a separable unit with an encoder. You can use the timing light for the engine's TDC then express the compressor as an offset from that.

Figure 50. Compressor other settings.

## 4.8. Route






After a component is created and data points added > Click the “Route” button . Now, you can edit, re-order, add comments, and add calibration steps of the data points of the route.

There are two types of views, the “smart view” and the “expanded”

The screenshot shows the 'Route' configuration screen in 'SMART' view. At the top, there are tabs for 'SMART', 'EXPANDED', and 'OPTIONS'. Below the tabs is a list of components on the left and an 'Unused' list on the right. A component 'Comp 3 Suc Nozzle Trace' is being dragged from the 'Unused' list to the main route list. The interface includes buttons for 'SAVE ALL', 'UNDO', 'BACK', and 'RESET TO DEFAULTS'. Labels a-f indicate specific UI elements: 'a' points to the 'Unused' list, 'b' points to the 'SMART' tab, 'c' points to the 'New calibration step' button, 'd' points to the 'New comment' button, 'e' points to the 'RESET TO DEFAULTS' button, and 'f' points to the 'Route' dropdown menu.

Figure 51. Route in Smart view. Drag and drop

- a. Drag and drop route points between the "Used" and "Unused" columns as needed. Points in the "Unused" column will not appear on the route, and no data will be collected for these points.

- b. The view of listing of points is “collapsed” by default. Use the “Expand all”  or “Collapse all”  buttons to manage the view or expand individual route points by clicking the dropdown icon . To drag and drop multiple route points at once, use the “Select multiple” button .
- c. Drag and drop a calibration step into the route. To undo this, drag it to the right column.
- d. Drag and drop a comment or text into the route. To undo this, drag it to the right column.
- e. Hit the “Reset to defaults” to undo all the changes.
- f. Configure multiple routes for an asset setup. - To set up alternate routes, click on the dropdown icon  > then click “Add an alternate route” > Then, name it and choose if copying an existing route or creating a new one. Users can create many routes as is required.

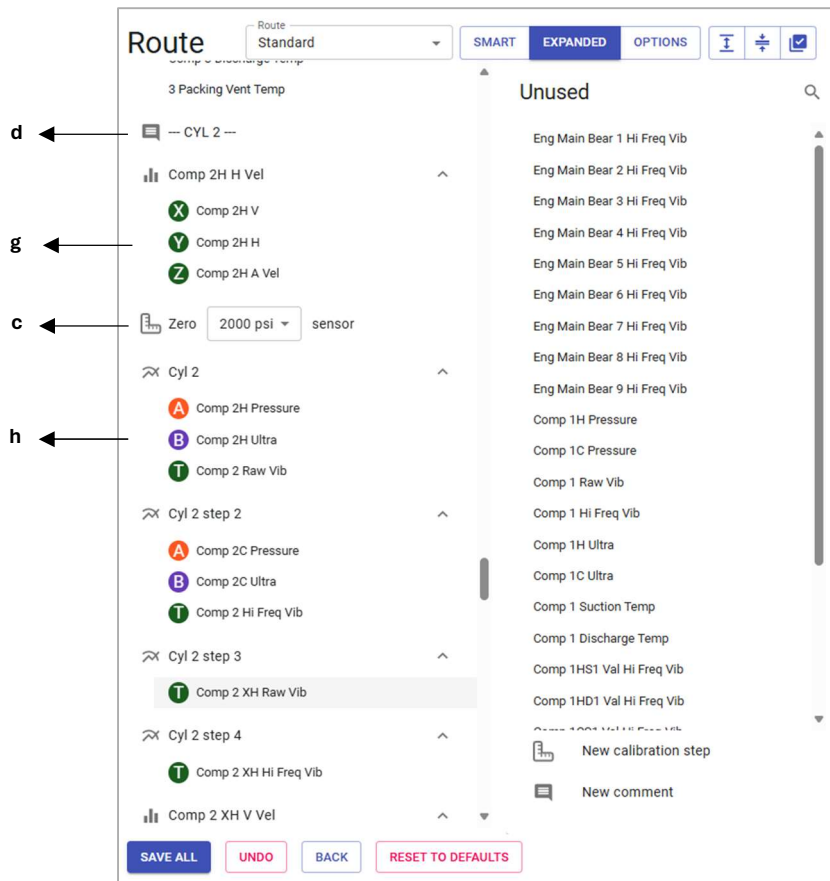


Figure 52. Route Expanded view.

- g. When using a triaxial vibration sensor or XYZ box, the vibration points must be grouped under the main point. The icons for the vibration points display X, Y, and Z when data is set to be taken with either the triaxial sensor or the XYZ box. The letter displayed on each icon indicates the channel where the sensor must be connected to the Lenz.

**Note**

Letters X, Y, or Z must be used with the triaxial sensor or XYZ box, either of which should be connected to channel T on the Lenz.



- h. The icons are arranged by default into groups, but they can be rearranged according to user preference. (see section below).

**Note** -----

*The letter displayed on each icon indicates the channel where the sensor must be connected to the Lenz. The assignment of channels or letters is made by default. (Refer to the section below if you wish to change it.)*

-----

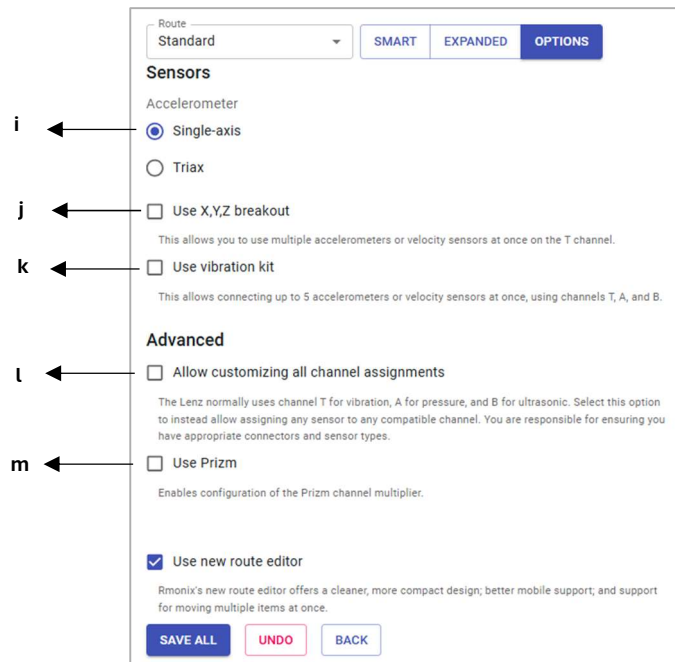


Figure 53. Options of Route setup.

- i. Single-axis vibration sensor is checked by default.
- j. Check Triax if using the triaxial sensor.
- k. Check XYZ breakout when using the XYZ box with single-axis vibration sensors.
- l. Select this option to instead allow assigning any sensor to any compatible channel. Adequate hardware must be acquired for this feature. Please request it from your Resonance Systems sales representative.
- m. Select his option when using the online system kit, “Vital Eye”

**Note** -----

*Hit the Save All button or all changes in the route editor will be lost.*

-----

## 4.9. Connecting to the Lenz

Follow these steps to connect to the Lenz:

1. Access the Rmonix software through a web browser of any PC, laptop, tablet, or any smart device connected to the internet and log in (Refer to the section Getting Started in this document). Rmonix operates as cloud-based software.

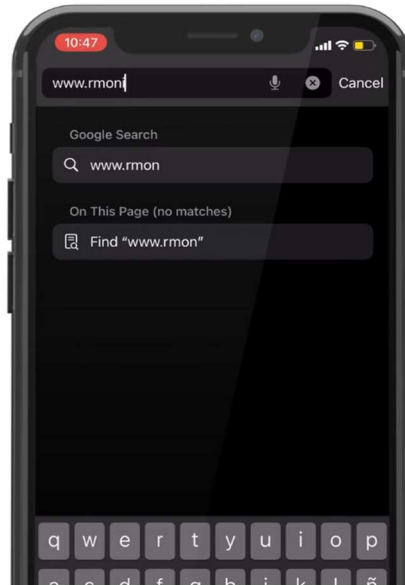


Figure 54. Accessing to Rmonix.net

2. Turn on the Lenz. Refer to the section *Turn the Lenz on or off* in this document.
3. Connect your device to the Lenz Network. The name of the network is the Lenz serial number. The default password is **Resonance**. For password issues, please contact Technical Services, referring to Section 1 > Contact Us in this document.



Figure 55. Lenz network.

- After connecting to the Lenz Network, back to Rmonix. Follow the next section Collecting the data.

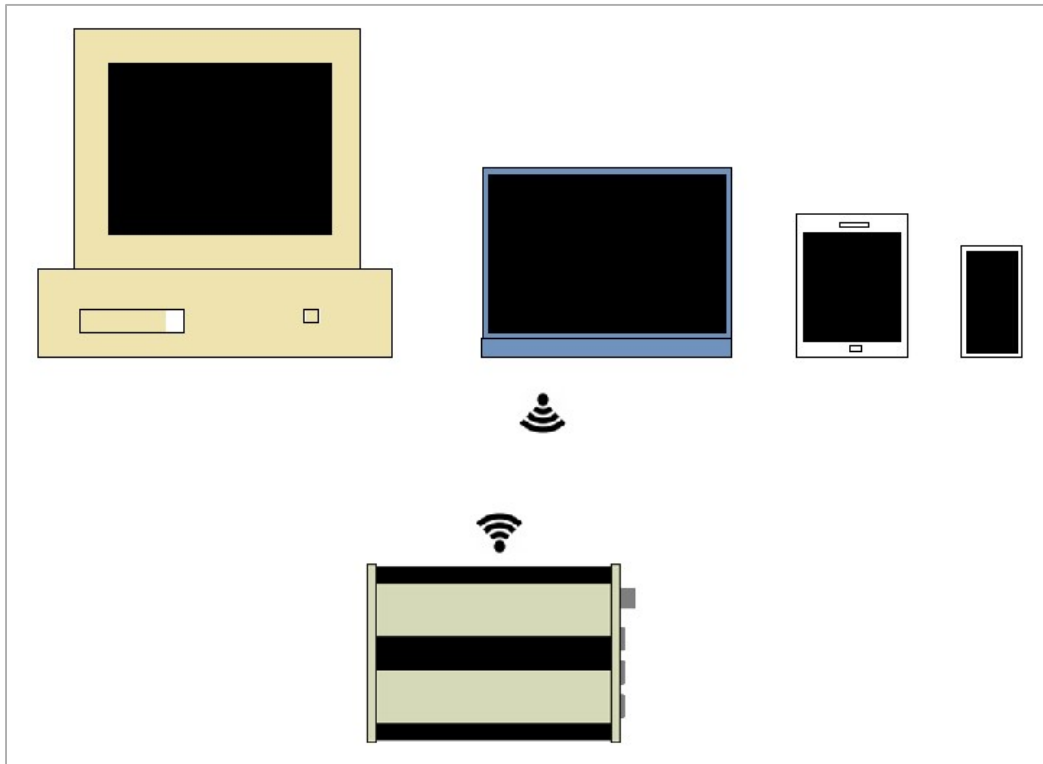


Figure 56. Scheme of Lenz connection

## 4.10. Collecting the data

Back to Rmonix software. On the left panel, click Preferences & Settings icon > then click on the Lenz settings icon .



Figure 57. Enable the device to collect data

Selecting the box activates data collection for the device, whether it's a PC, laptop, tablet, or smartphone. The system is ready to collect data. On a phone or tablet this is checked by default.

### Note

After the Lenz is successfully connected to the user device, three icons will appear on the left side panel: Lenz icon and battery icon . Take data icon appears when Use this PC for data collection box is checked.

### 4.10.1. Lenz information

Go to the left sidebar of Rmonix and click on the Lenz icon > it will pop up a window.

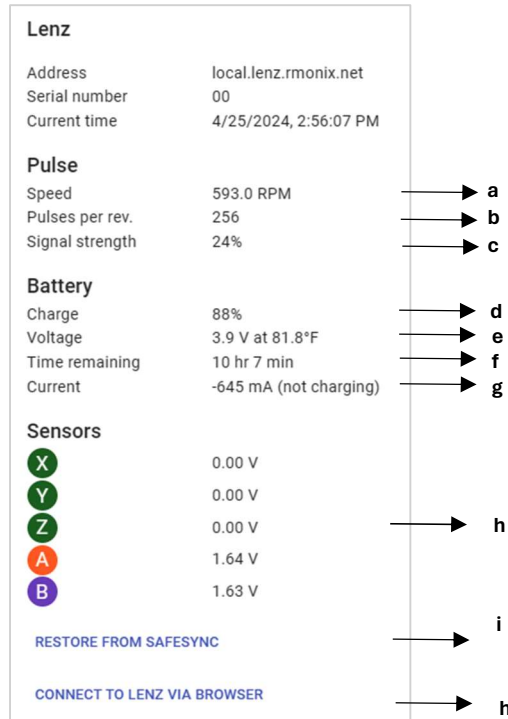


Figure 58. Lenz information.

- a. **Pulse test speed.** - Please note that the Pulse test speed is 594 RPM when Pulse is connected, but no speed reading instrument is connected to the Pulse. If Pulse is sensing the actual speed, that speed will be displayed instead.

**Note** -----

If Pulse isn't connected to Lenz, an inaccurate speed reading will appear. Additionally, verify whether the TDC signal setup is established through a wireless or wired connection. Please consult the "Lenz Settings" section of this document for guidance.

-----

- b. **Pulses per revolution.** – Please note that the Pulses per revolution
  - i. When Pulse is connected, but no speed-reading instrument is attached, the Pulses per revolution is 256.
  - ii. When Pulse is connected with an encoder, the Pulses per revolution is 1024.
  - iii. When Pulse is connected with a magnetic pickup, the Pulses per revolution is 1.
  - iv. When no pulse is connected or the wired option is enabled, the Pulses per revolution is 1.
- c. **Signal strength.** – It is a percentage value of the signal strength between Pulse and the Lenz. When the TDC signal setup is established via a wired connection, it will show "Direct cable input" on the display.
- d. **Charge.** – It is the percentage of the battery charge of the Lenz.
- e. **Voltage.** – The voltage of battery varies based on its state of charge, usage conditions, temperature, health, and whether it is currently charging or discharging.



**To prevent damage:**

*The Lenz will shut down once the battery voltage reaches 3.2 volts.*

- f. **Time remaining.** – It refers to the total amount of time that the Lenz device can remain operational or in use before it needs to be recharged or serviced.
- g. **Current.** – The value display will be increased when it is in charging mode.
- h. **Sensor voltages.** – When collecting data, the voltage values from sensors may fluctuate. For Channel T or X, Y, & Z channels, the voltage baseline is approximately ~22 volts. However, upon connecting a sensor, the voltage typically drops by approximately ~10 volts. Channel A & B channels' voltage baseline is approximately ~1.6 volts. However, the voltage typically drops by approximately ~.4 volts upon connecting a sensor.
- i. **SafeSync.** – Refer to the SafeSync section of this document.
- j. **Connect Lenz via browser (Advanced).** - This part of the guide is designed for advanced users. Do not attempt to make changes unless conducted or authorized by trained specialists at Resonance Systems offices or authorized service centers.
  - I. **System Information.** – Display the data, Firmware version, Disk space, and memory availability in the Lenz.
  - II. **Network.** – Covers network settings for portable and continuous mode.
  - III. **Firmware Updates.** – Allows checking for installing the latest firmware versions to keep the system updated.
  - IV. **Packages.** – Relevant information about installed packages
  - V. **Services.** – This window allows viewing the logs of multiple services. Helps in monitoring and troubleshooting background processes.
  - VI. **Continuous Mode.** – Provides settings to enable or disable uninterrupted long-term operation of the system.
  - VII. **Self-Test.** – Contains diagnostic tools for automated checks on hardware and software. Helps in early detection and resolution of issues.
  - VIII. **Mag PU.** – To test the signal of the magnetic pickup sensor.

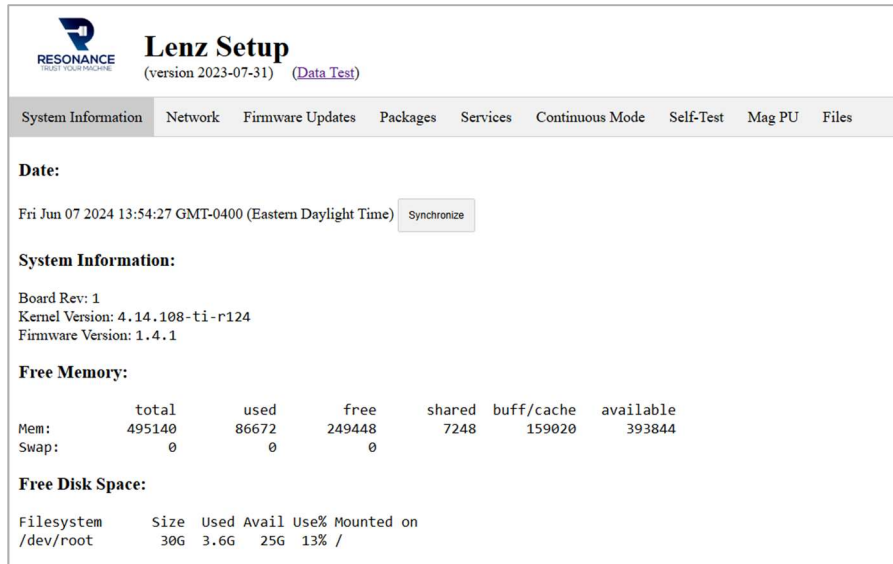


Figure 59. Lenz information

- IX. **Data Test.** – Under this section, you can access the oscilloscope mode of the system. For detailed instructions, contact Resonance Systems technical support. Refer to the Technical Support section of this document.

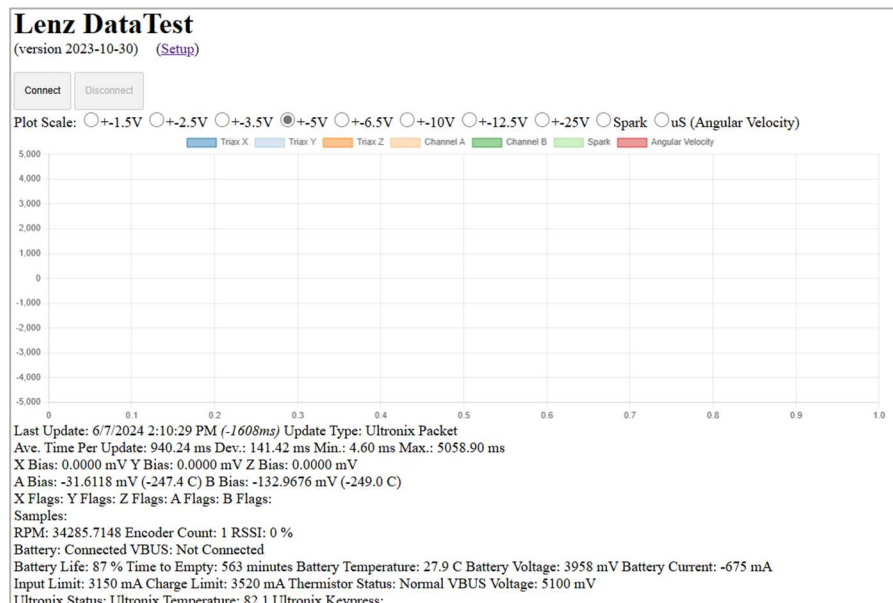


Figure 60. Oscilloscope mode (Advanced user)

### 4.10.2. Portable mode

On the left sidebar, click Take Data icon ☰ > then select the Grouping or Station > then click on the asset to collect data ⚙ > then on the second column click the New run icon ☰ > and hit the “Begin run 1” **BEGIN RUN 1** button.

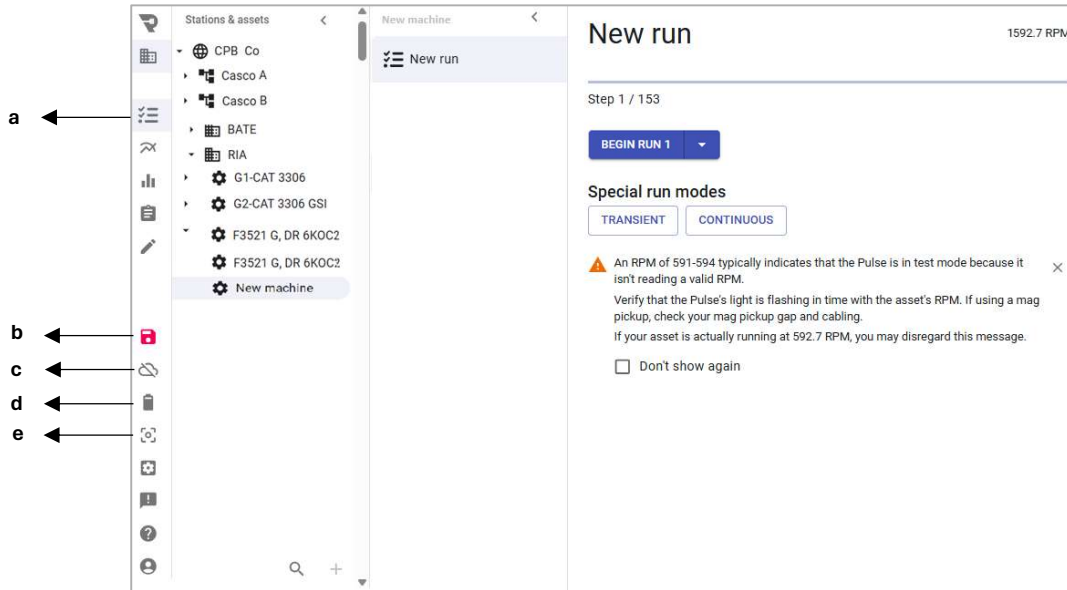


Figure 61. Before collecting data

Continue by selecting the starting point, also referred to as a step, of the route. By default, this is the first point organized during the route setup. For more details, refer to the “Route” section of this document.

Press the "Capture" button **CAPTURE** to gather the data, then select "Next" **NEXT** to proceed to the following step. Continue this process until the route is completed. Once the route is complete a “Finish” button **FINISH** will appear.

**Note** -----

In the route, a point is referred to as a step because it consists of one or more points.

If more than one run is needed to collect data, then on the second column click the Run icon ☰ > then hit the “Start New Run 2” **START A NEW RUN 2** button.

-----

- a. **Capture Data** – This icon appears when the Lenz is connected.
- b. **Save** – This icon appears when there are unsaved changes.
- c. **Offline** – This icon appears when there is no internet connection.
- d. **Battery** – This icon indicates the battery status of the Lenz.
- e. **Lenz** – Refer to the "Lenz Information" section of this document for more details.

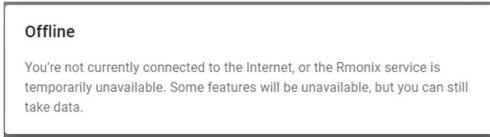


Figure 62. Offline Message

f. **Photo** – Tap the camera icon to take photos while collecting data.

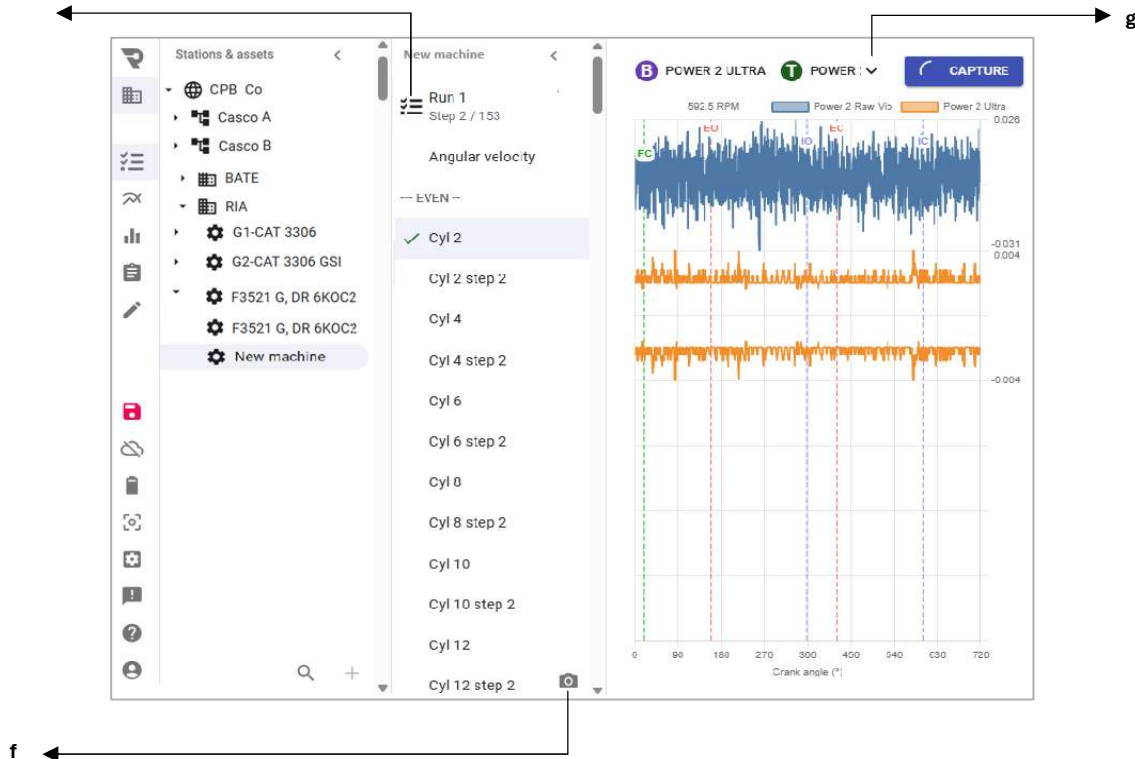


Figure 63. Collecting data

g. **Channels dropdown (Advanced)** – Click on the dropdown icon to view the details of the channels. Add or modify the type of data to collect on each channel. By doing this, user is responsible for ensuring having appropriate connectors, sensor types and Rmonix software configurations on this connector - channel.



Figure 64. Special mode / Channels dropdowns.



### 4.10.3. Special run mode

#### 4.10.3.1. Transient mode

Follow the next steps:

1. Get access to the special run modes and hit the “Transient” **TRANSIENT** button.

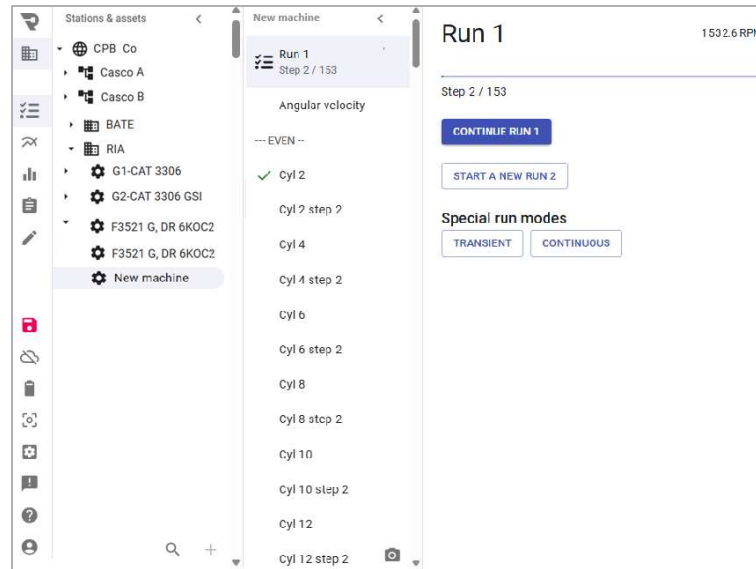


Figure 65. Start a new run, transient or continuous mode.

2. Set up the data collection interval & if needed set a speed reference to start acquiring data.

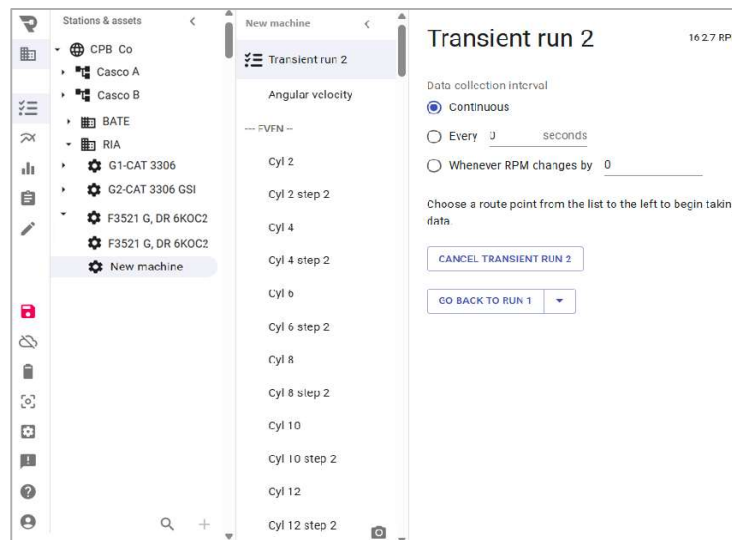


Figure 66. Transient run setup

3. On the second column choose a route point or step to begin data gathering.
4. Be sure to connect the sensor(s) to their respective channels. To start collecting, hit the “Start” **START** button.
5. Rmonix will collect data until the user hits the “Finish” **FINISH** button.

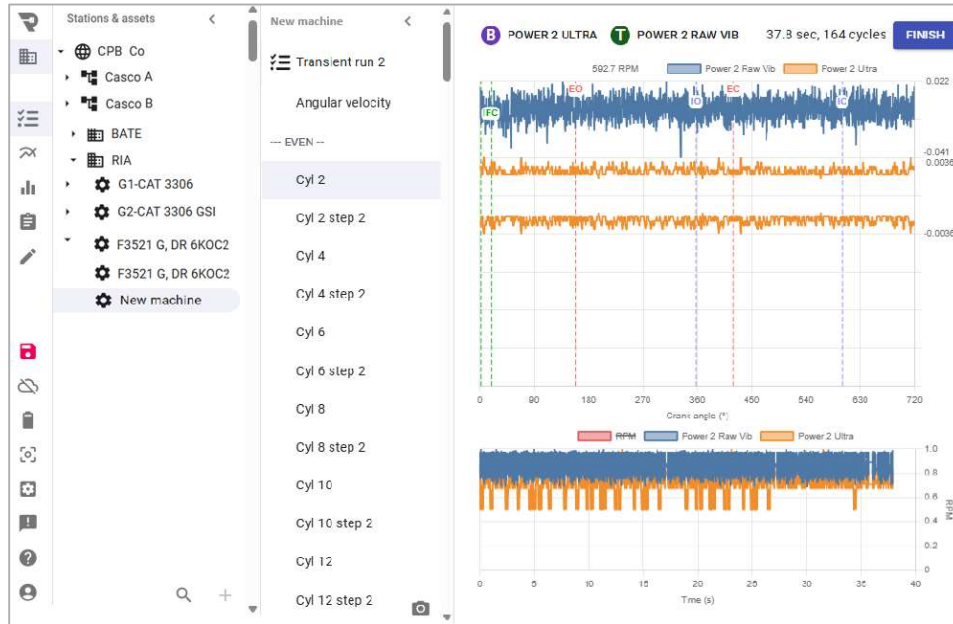


Figure 67. Live transient mode data gathering.



**Warning:**

We don't enforce any specific time limits. But is possible that the web app quits working on periods of more than 1 hour.

### 4.10.3.2. Continuous mode

Follow the next steps:

1. Get access to the special run modes and hit the “Continuous” **CONTINUOUS** button.
2. Choose the route of preference (If it were more than one) and set the data collection interval.

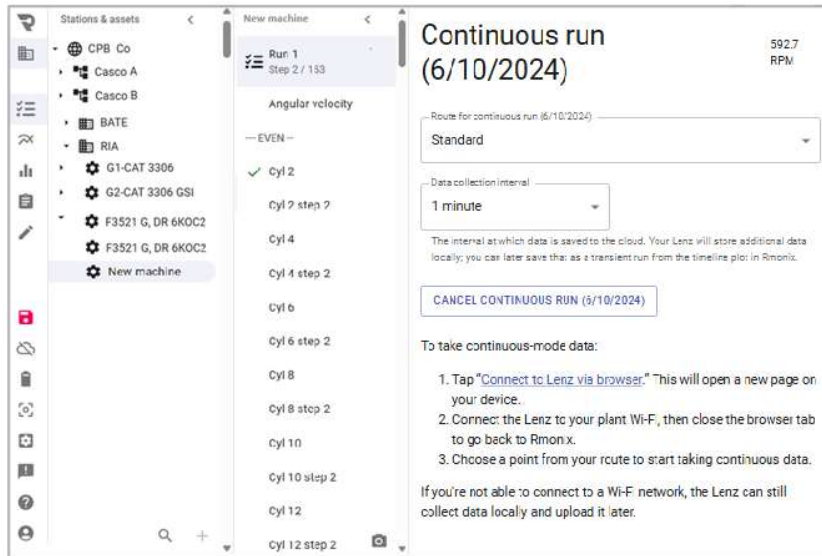


Figure 68. Start a new run, transient or continuous mode.

3. Click on “Connect to Lenz via Browser”, and a new window will open > Next, select your preferred Wi-Fi network to join and type in the password if required. Once connected, the Lenz will be online through this network.

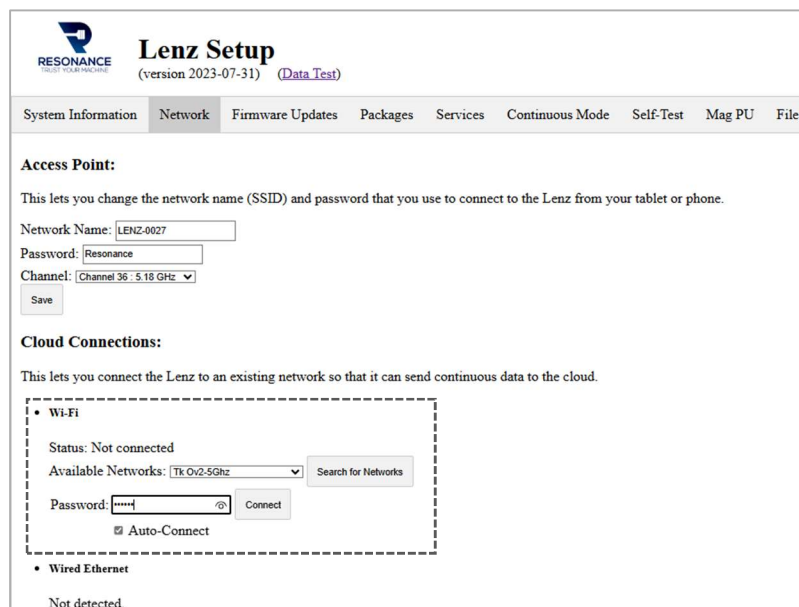


Figure 69. Continuous mode. Join the network.

4. Back to the Rmonix window. Now Lenz is collecting continuous data.

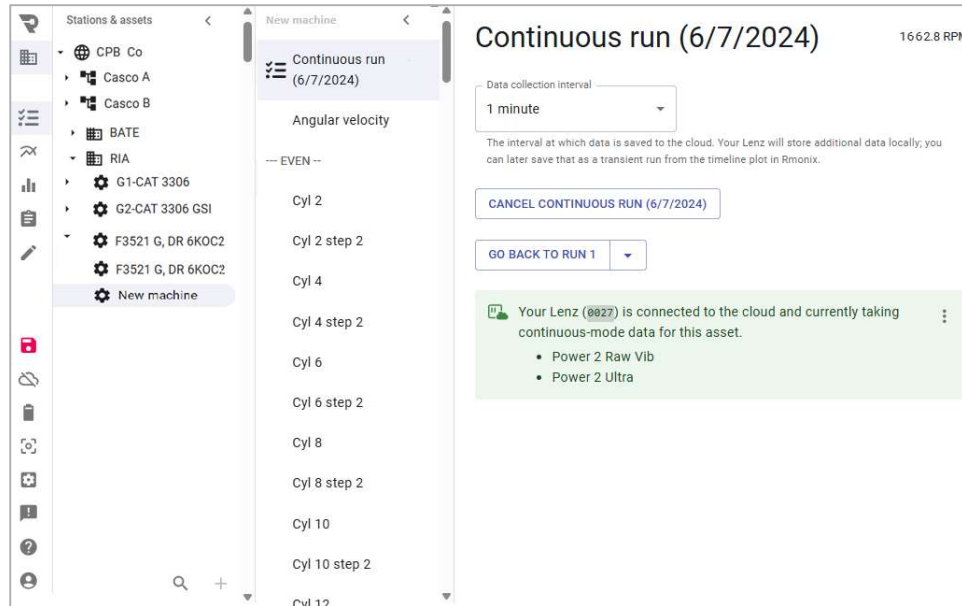


Figure 70. Live continuous mode.

**Note**

Lenz will start collecting data regardless of whether there is an internet connection or not.

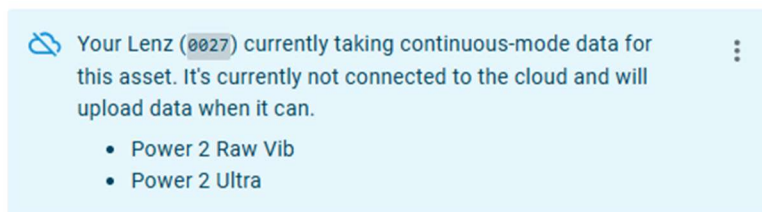


Figure 71. Message when Lenz is taking continuous data without an internet connection.



**Reminder:**

To use the Lenz again as a portable device in non-continuous mode, hit the Cancel Continuous Run, disconnect it from the Wi-Fi network and cycle up the Lenz.

### 4.11. Uploading the data

Once the run is completed Rmonix needs access to the internet to upload the data to the cloud.

When Rmonix is connected to the internet, a pop-up message appears at the bottom of the Rmonix window, offering the user the option to upload the data to the cloud.

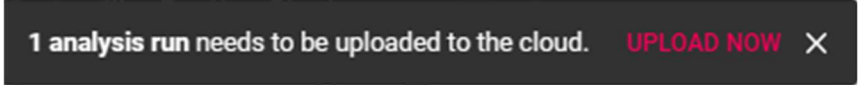


Figure 72. Popup message to upload the data to the cloud.

If the user rejects to upload of the data, whichever is the case, Rmonix has the option to do it later.

On the left sidebar, click Preferences & Settings icon > then click on the “Analysis runs on this device” icon > then hit the Upload now button or click on the three dots icon and choose to Upload now .

**Note** -----

The Analysis runs on this device it appears when the device is enabled for data collection. Refer to the Lenz settings of this document.

-----

This lists data that you've recently taken on this PC. Older data is automatically removed to save space once it's uploaded to the cloud.

[UPLOAD NOW](#)

Asset	Date ↓	Run # ↓	Uploaded	Points	Options
Without Lenz - Photos	5/17/2024	1		1	<ul style="list-style-type: none"> <li> Upload now</li> <li> Delete</li> <li> Export &gt;</li> </ul>

Figure 73. Analysis runs on this device screen.

### 4.12. Analyze the data

On the left sidebar, click the Stations & Assets icon > then select the Grouping or Station > then click on the asset to analyze data > then on the second column click on the component to analyze > or click on the dropdown icon and choose the part to analyze.

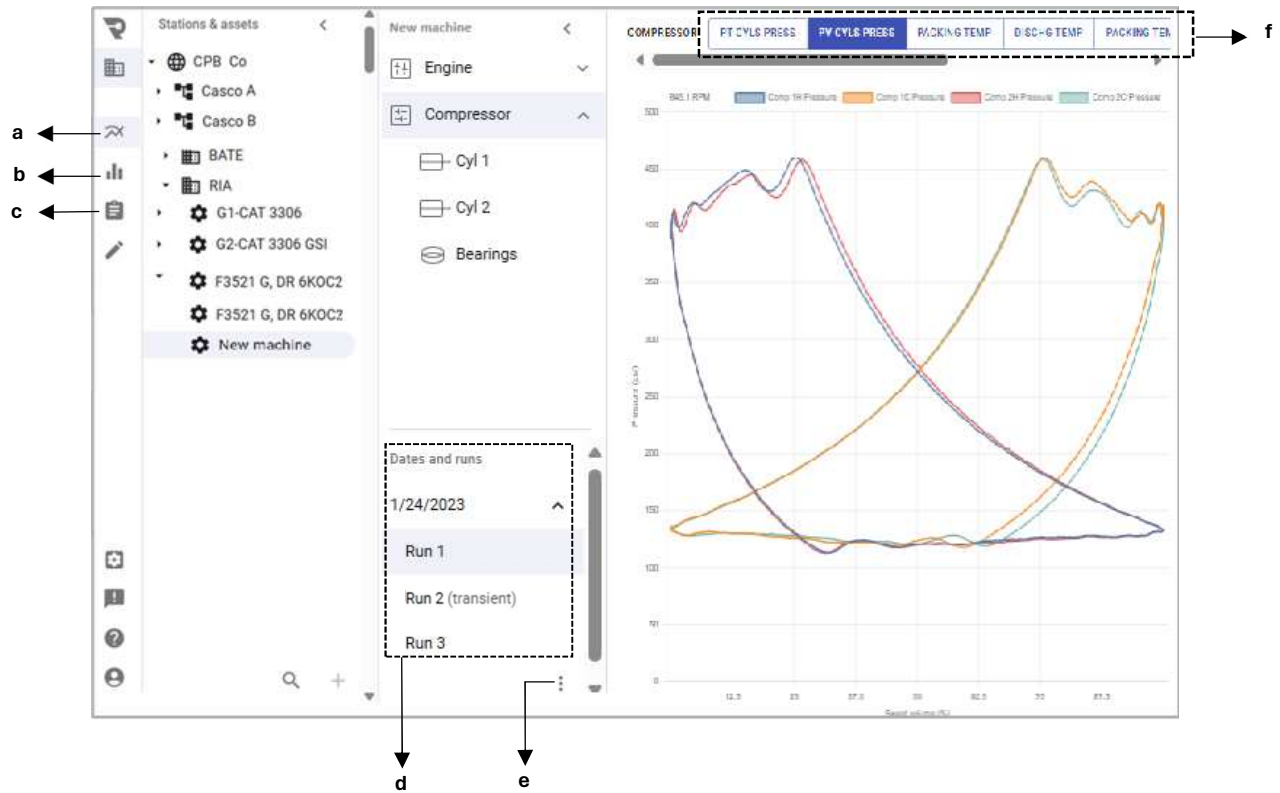







Figure 74. Crank angle data analysis

- a. **Crank-angle.** – Click on Reciprocating Analysis icon  to view crank-angle data.
- b. **FFT / Vibration.** – Click on the Vibration / FFT Analysis icon  to view vibration frequency domain data.
- c. **Reports.** – Click on the Report icon  to view the performance and vibration reports.
- d. **Dates.** – Choose the data and / or the number of Run to analyze.
- e. **Manage runs.** – Click on the three dots icon  to analyze the data by comparing dates and components.
- f. **Plots.** – Select your preferred plot to analyze the data. To modify the plot, right-click on it and choose "Customize Plot"  from the list or refer to the "Plot Definitions" section of this guide.

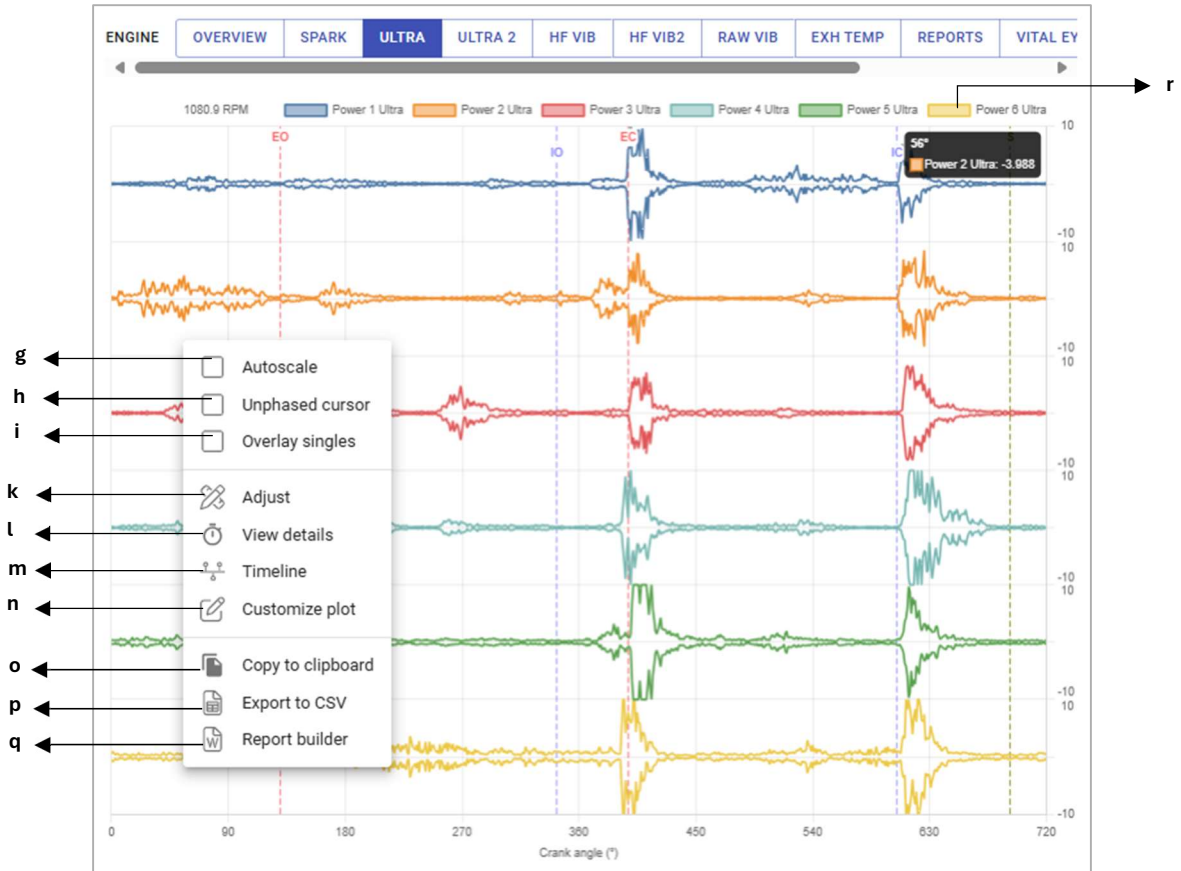



Figure 75. Analyzing the data. Right click option.

- g. **Autoscale.** - The autoscale function automatically adjusts a plot's scale to fit all data points within the visible area, ensuring clear and optimal visualization.
- h. **Unphased cursor.** - The unphased cursor is a tool used in data analysis to track or match events that are related to each other. It helps users identify phase relationships and differences between signals.
- i. **Overlay singles.** - The overlay singles feature allows multiple data signals to be displayed on the same plot, enabling direct comparison and analysis of different datasets.
- j. **Calculations (engine pressure and compressor plots only).** - Provides information and analysis regarding the performance of the compressor. It presents key parameters such as Flow balance, Valve loss, VE, Clearance, and others, allowing users to monitor and optimize the operation of the compressor for optimal performance and efficiency.
- k. **Adjust.** - Opens a sidebar that allows you to modify various settings such as scales, TDC, RPM, smoothing, and other parameters for precise data analysis and customization.
- l. **View details.** - Opens a popup window that displays the stamp of date and time, # of cycles, samples and speed collected. Click on the view icon to view  single scans.

**Note** -----

To exclude multiple or single scans, right click on the screen and click on edit or exclude ✂. Then follow the instructions and save it.

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- m. Timeline.** - This enables users to examine a sequence of snapshots of past data relevant to the current plot, facilitating the observation of trends over time. Additionally, it includes a date slider for focusing on specific date ranges. By clicking on a point in the timeline plot, users can swiftly navigate to the corresponding date for detailed analysis.
- n. Customize plot.**- Refer to the "Plot Definitions" section of this guide.
- o. Copy to clipboard.** - Copying to clipboard allows users to easily transfer selected plot or (as a picture) from Rmonix to an external applications.
- p. Export to CVS.** - Exporting to CSV allows users to save data from Rmonix in a format compatible with spreadsheet applications such as Microsoft Excel or Google Sheets. This feature enables users to analyze, manipulate, and share data outside of Rmonix, facilitating further analysis, reporting, or collaboration.
- q. Report builder.** – It opens a right panel to create or build the Report Builder. Please note that it is available as an add-on.
- r. Legend.** – Clicking on an item in the legend hides all traces except the one selected. Click once more to reveal all traces with the selected one hidden. Click again to display all traces.

### 4.12.1. Keyboard & mouse shortcuts

Next is the list of the keyboard shortcuts when a plot is displayed using a PC:

*Table 4. Keyboard and mouse shortcuts*

/	Search stations & assets
{ , }	Previous / next assets
[ , ]	Previous / next component, measurement location or report
< , >	Previous / next data or run
1 -9	Select a plot within current component
?	Display keyboard shortcuts
Shift	On crank-angle plots, present a vertical inline reference
Scroll up or down mouse wheel	Zoom in or out
Double click the mouse button	Re-center the plot



## 5. Glossary

**A/B cycle:** When taking data on a 4-stroke engine, Rmonix can automatically detect which revolution the engine is on, without making you manually select “Flip A/B cycle”.

**Auxiliary load:** Auxiliary load refers to additional load or power demand placed on a system or component beyond its primary function.

**Binary chunk transfer:** Binary chunk transfer is a method of transferring data in binary format, typically used for efficient transmission and storage of large datasets.

**Cross-channel phase:** Cross-channel phase refers to the phase relationship between different channels or signals, often used in vibration analysis to assess system behavior.

**Flow balance:** In compressor performance analysis, flow balance refers to the flow as calculated at suction conditions divided by the flow as calculated at discharge conditions. On a healthy cylinder end, flow balance should be at or near 1.0

**High-frequency Vibration:** High-frequency vibration refers to vibrations with frequencies higher than the normal operating range. These vibrations often indicate potential issues such as bearing faults, valve related issues or mechanical resonance.

**Mechanical Efficiency:** Mechanical efficiency refers to the ratio of useful mechanical work output to the energy input in a mechanical system, often used in the assessment of engine or machinery performance.

**Peak Pressure:** Peak pressure is the maximum pressure reached during a particular phase of an engine's operation, such as combustion.

**Phase:** Phase refers to the relationship in timing or position between two or more signals. In vibration analysis, phase is often used to assess the synchronicity or correlation between different vibration measurements.

**Phase (Crankshaft):** In the context of a crankshaft, phase refers to the angular position of the crankshaft relative to a reference point, such as Top Dead Center (TDC).

**Power Pressure:** Power pressure is the pressure exerted during the power stroke of an engine's piston. It is a critical parameter in engine performance analysis.

**PV:** PV may refer to Pressure Volume, a parameter used in compressor performance analysis to assess the relationship between pressure and volume during the engine's operation.

**Raw Vibration:** Raw vibration refers to unprocessed vibration data directly collected from sensors without any filtering or manipulation.

**SafeSync:** The SafeSync feature allows it to continuously save analysis data to the Lenz as it's collected. This ensures that your data is backed up and accessible, even if something happens to your tablet or phone

**SI:** SI stands for International System of Units, which is the modern form of the metric system used in scientific and technical contexts worldwide.

**Smoothing:** Smoothing typically refers to the process of reducing noise or fluctuations in ultrasonic signals to enhance their clarity and reliability. It involves averaging or filtering techniques to create a smoother representation of the data.

**TDC:** TDC stands for Top Dead Center, which is the position of a piston at the highest point in its stroke.

**TDC offset:** TDC offset refers to the angular deviation of the crankshaft's Top Dead Center from its reference position.

**Valve events:** Valve events refer to the opening and closing of intake and exhaust valves in an engine, referring to the crank angle.

**VEMS:** The Valve Event Monitoring System is a patent sensor developed by Resonance Systems as a part of the online monitoring kit.

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