ERBESSD INSTRUMENTS®

DEFIANT

DEFIANT User Guide

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What is Defiant?

Defiant is a real-time data acquisition and machine monitoring system that **continuously captures and analyzes data from equipment as it operates.** Defiant uses advanced sensors and hardware to gather essential information such as vibration, temperature, speed, current and other parameters, providing instantaneous insights into machine performance. Defiant combines the capabilities of the Erbessd Phantom ***condition monitoring*** solution with ***continuous monitoring*** capabilities.

All Erbessd Instruments systems and data are protected by a comprehensive Information Security program. For details please visit the Erbessd website at: https://www.erbessd-instruments.com/data-security-and-it-security-statement/

Defiant is available in two Models:

EPH-D8 – 8 wired channels

EPH-D16 – 16 wired channels

Defiant Specifications

REAL-TIME MONITORING (WIRED CHANNELS)	
Channels	8 or 16 *(depending on the version)*
Data acquisition	Simultaneous reading *(no multiplexing)*
Sample rate	up t0 64khz
Fmax	25kHz
Resolution	16-bit
Sensor support	IEPE Accelerometers, pulse-train ouput sensors, proximity probes, displacement sensors, current transformers and any voltage-output sensor (AC and DC). *4-20mA *(with an external adapter)*, indicates future developement
Voltage input ranges (AC)	±2.5 V, ±5. V, ±10 V, ±20 V *(selectable per channel)*
Voltage input ranges (DC)	0-5 V, 0-10 V, 0-12.5 V *(selectable per channel)*
Recording types	Interval-based, time-of-day, overall-triggered
Short Burst Waveform Recording	3,276,800 lines of resolution *(102 seconds - @32khz)*
Long-Term Waveform Recording	Continuous recording, viewable in windows up to 100 seconds
Vibration monitoring real time overalls	Standard overalls: Acceleration, velocity, displacement, acceleration envelope, crest factor, kurtosis, skewness, peak-to-peak, etc.
Monitoring speed	<10ms depending on channels and overalls enabled
Connector type	Terminal block plug 3 positions, 3.81mm pitch *(DC input, AC input and Ground)*
Storage	256GB SSD *(up to 3 days of continuous data recording for 16 channels)*

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DIGITAL INPUT/OUTPUTS	
Number of channels	4
Channel types	Configurable as Dry Contact input or 0-12.5V/150mA digital output
Output channel control	Based on overall alarms
Connector type	Terminal block plug 2 positions, 3.81mm pitch

WIRELESS SENSOR SUPPORT	
Sensors support	Compatible with the full line of Phantom Wireless sensors *(vibration, speed, current, etc)*
Wiress range	100 m line sight / 200 m line sight *(long range mode)*
Wireless sensor protocol	BLE 5.0
Operating frequency	2.4 Ghz
Transmission Power	+/-8dBm
Antenna connector *(for BLE)*	RP-SMA Male connections
Antenna Gain *(for BLE)*	2.4Ghz Antenna 3dBi

SOFTWARE SUPPORT	
Analysis Software	Built-in, also compatible with Digivibe MX And Wiser Vibe
Cloud service support	EI Analytic *(eianalytic.com)* for cloud vibration monitoring, analysis and alarm notifications
Industrial protocols *(overalls only)*	Modbus TCP, Modbus RTU, OPC-UA
APIs *(overalls and time waveforms)*	MQTT, Websockets, REST

CONNECTIVITY	
Wired Network	Two 100M/10M Ethernet ports RJ45 *(for OT and IT Network)*
Wireless Network	WiFi 802.11 a/b/g/n
Wireless Security	WPA-2/WPA-3 *(PSK)* and WPA Enterprise *(802.1X)*
Antenna connector *(for WiFi)*	RP-SMA Male connections
Antenna gain*(for WiFi)*	2.4Ghz Antenna 3dBi

DEVICE SPECIFICATIONS	
Power supply	12V DC/3A *(power supply included, with replaceable IEC C13 cable)*
Dimensions	140mm x 140mm x 80mm
Weight	1kg
Housing material	Stainless Steel
Operating temperature	-7 to 60 °C *(20 to 140 °F)*
Protection grade	IP54
Mounting	Standard DIN Rail *(35 mm, 42 mm wide)*
SKU	EPH-D8 *(for 8 channel)* / EPH-D16 *(for 16 channel)*

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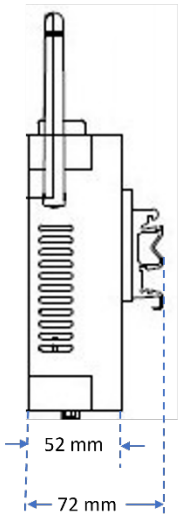
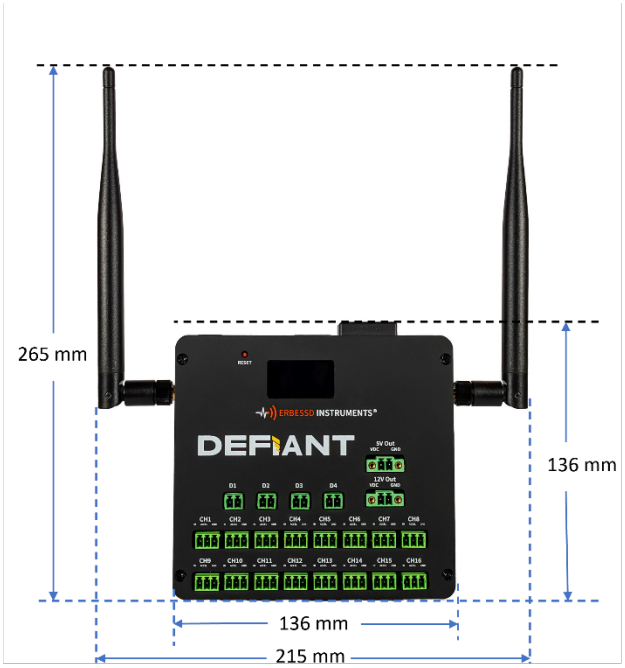
Dimensions





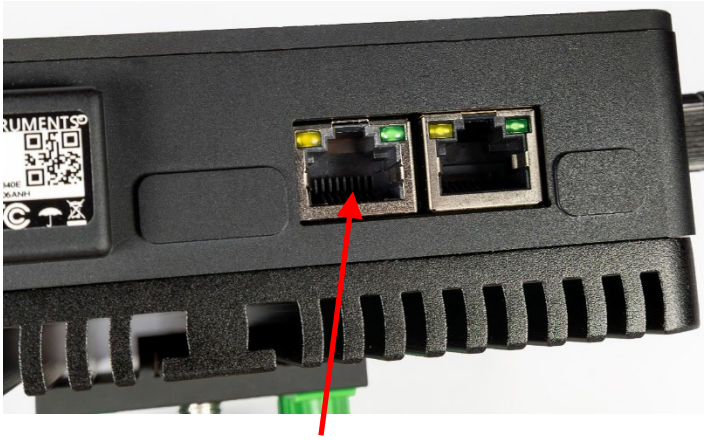
Defiant Connections

Top

- 2 x RJ-45 Ethernet ports – **Main** and **AUX**

Main port is used to connect to a local a data network. This port supports DHCP and Static IP addressing.

Aux port (aka Ethernet 2). Primarily used for connection to a data network for Modbus TCP/IP. Future Firmware release will allow the Aux port to be used for a Repeater network. Note-this interface will ignore any default route sent by the DHCP server. Manually entered routes are possible using the Add Custom Route feature. (see page 25)



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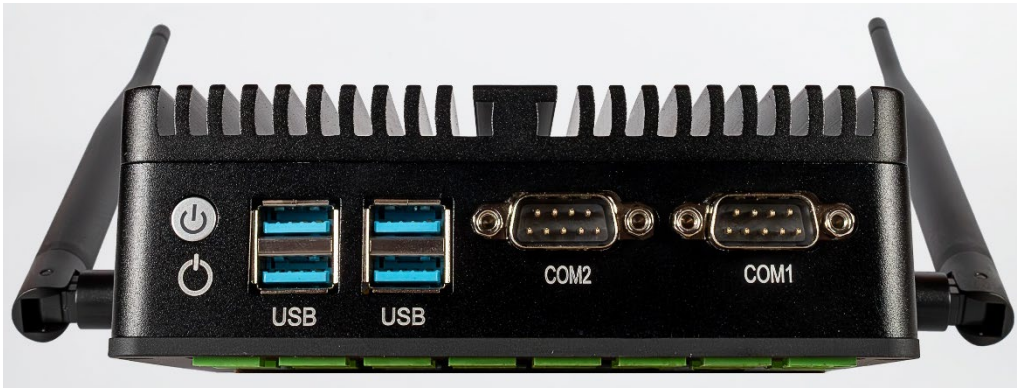
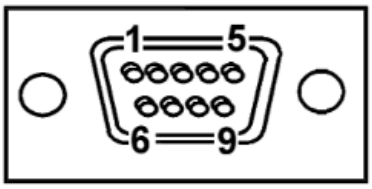
- Power connector

Defiant has a 5.5mm x 2.5 mm barrel-type power receptacle. The included power supply is 12VDC /3A.

Bottom

- Power switch (note the internal fan will run continously when power is connected, regardless of switch on/off postion. Press and hold the switch for 3+ seconds to power off the Defiant.
- 2 x DB-9 male - COM1 and COM2 Serial data ports. These are used for interfacing Modbus RTU via RS-232 protocol. An adapter from RS-232 to RS-485 may be required.





Pin 1	DCD
Pin 2	RXD
Pin 3	TXD
Pin 4	DTR
Pin 5	GND
Pin 6	DSR
Pin 7	RTS
Pin 8	CTS
Pin 9	RI

Note – only pins 2, 3 and 5 are typically required to interface with Modbus.

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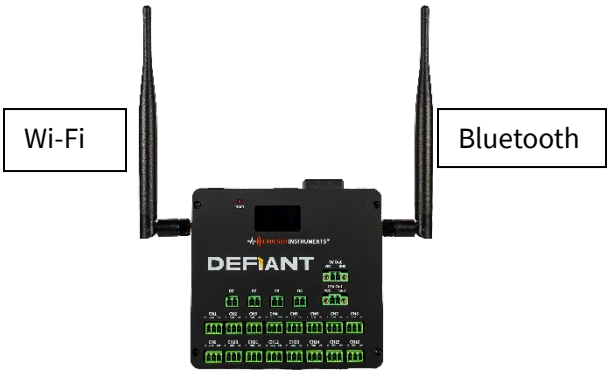
Antennae RP-SMA connectors.



Front

- Reset button. Press 5 seconds to reset Network configuration. Press for 10 seconds for full factory reset.
- OLED screen shows:
  - Main, Aux or WIFI connection and IP Addresses
  - Number of wireless sensors detected
  - EI-Analytic connection status.(OK , Fail or Not Connected). This third line of the display line cycles with the date/time.
  - Sampling Rate (**A**nalog to **D**igital **C**onversion)

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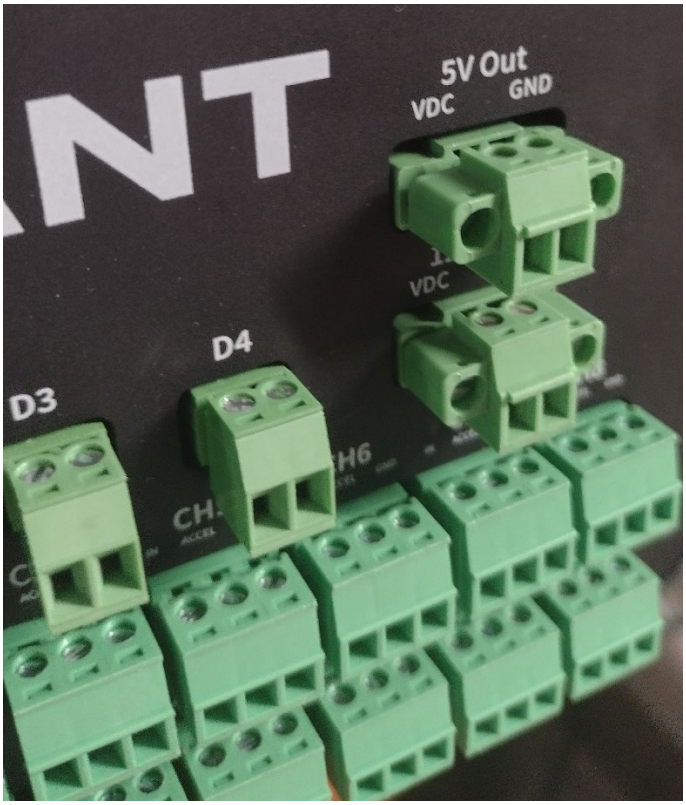
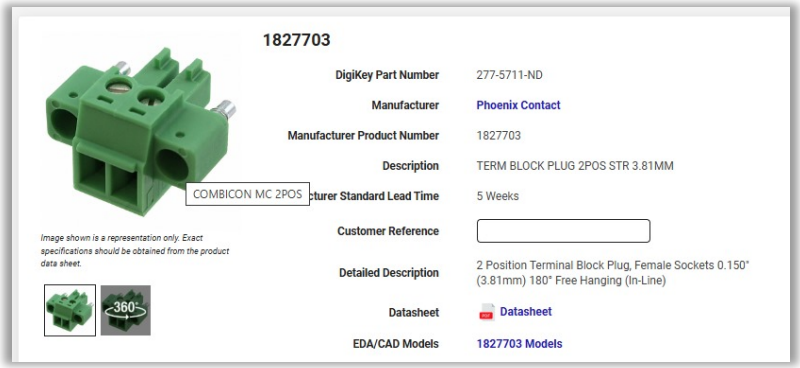
- 5 and 12 Volt DC power outputs use 2-Pin 3.81mm pitch connectors for screw-in type plugs. Max output power is 12V @ 2 Amps, 5V @ 500mA. **Defiant includes plugs for all receptacles**.

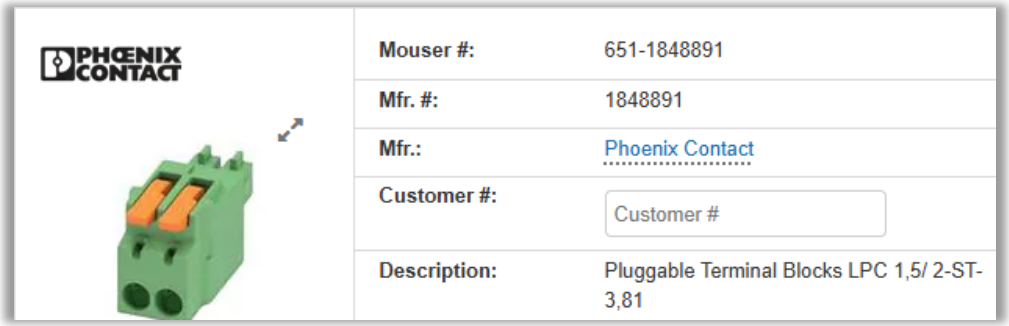


Extra plugs may be ordered from many online sources. Example of compatible screw-in plug:



- Digital Channels D1-D4 use 2-Pin 3.81mm pitch connectors.

Example of compatible plug:



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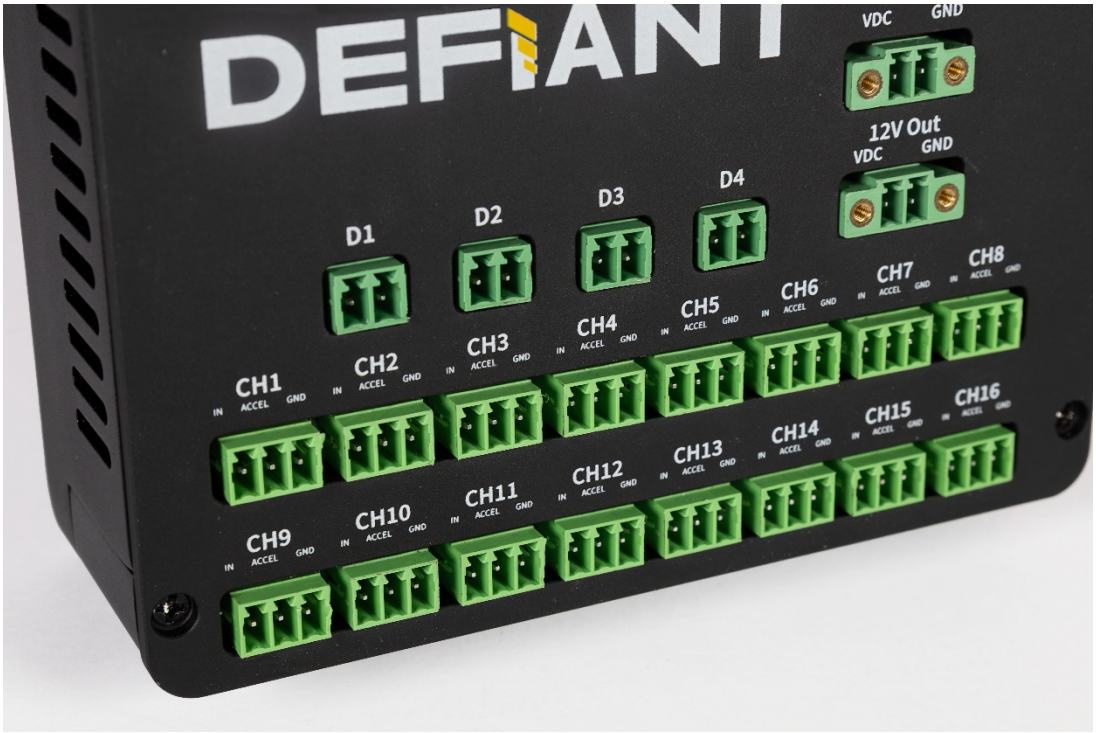
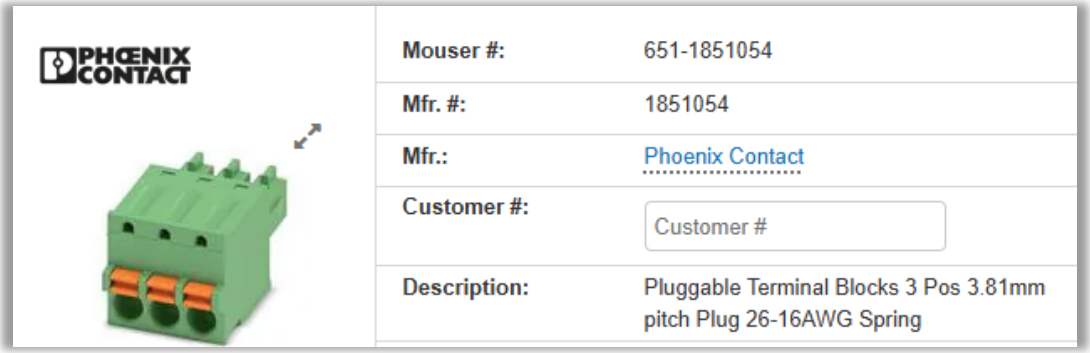
Wired Channels use 3-pin 3.81mm pitch connectors



Pins are labeled IN, ACCEL and GND.

Example of compatible plug:



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Rear

- Standard DIN rail mounts, 35 mm high x 42 mm wide x 20 mm deep(removeable)

Defiant System Configuration Options

There are 3 primary configuration models for receiving data from a Defiant system, described as follows:

Option 1 - Local Database

The Defiant system supports SQL CE databases, typically used on a PC. Defiant also supports SQL and MySQL databases, usually resident on a server.

- DigivibeMX Phantom software is required to manage the database and analyze sensor data.
- EI-Monitor software, which relays data from Defiant to a local database, also needs to be installed, preferably on the same PC/server as the database. Defiants send data to EI-Monitor on Ethernet **TCP port 11050**.
- The EI Monitor software relays data to a local database on **TCP port 1433** for SQL servers, or **TCP Port 3306** for MySQL servers.
- Static or Dynamic (DHCP) IP addressing is supported. When Static addressing is selected, the DNS server can also be configured.
- If the EI-Monitor and Defiant are configured in separate VLANs or subnets, routing between them must be established.
- The Web Portal (app.eianalytics.com) and the WiSER VIBE app for IOS/Android are not supported with local databases.
- Notifications via email/WiSER VIBE app are not supported with local databases.

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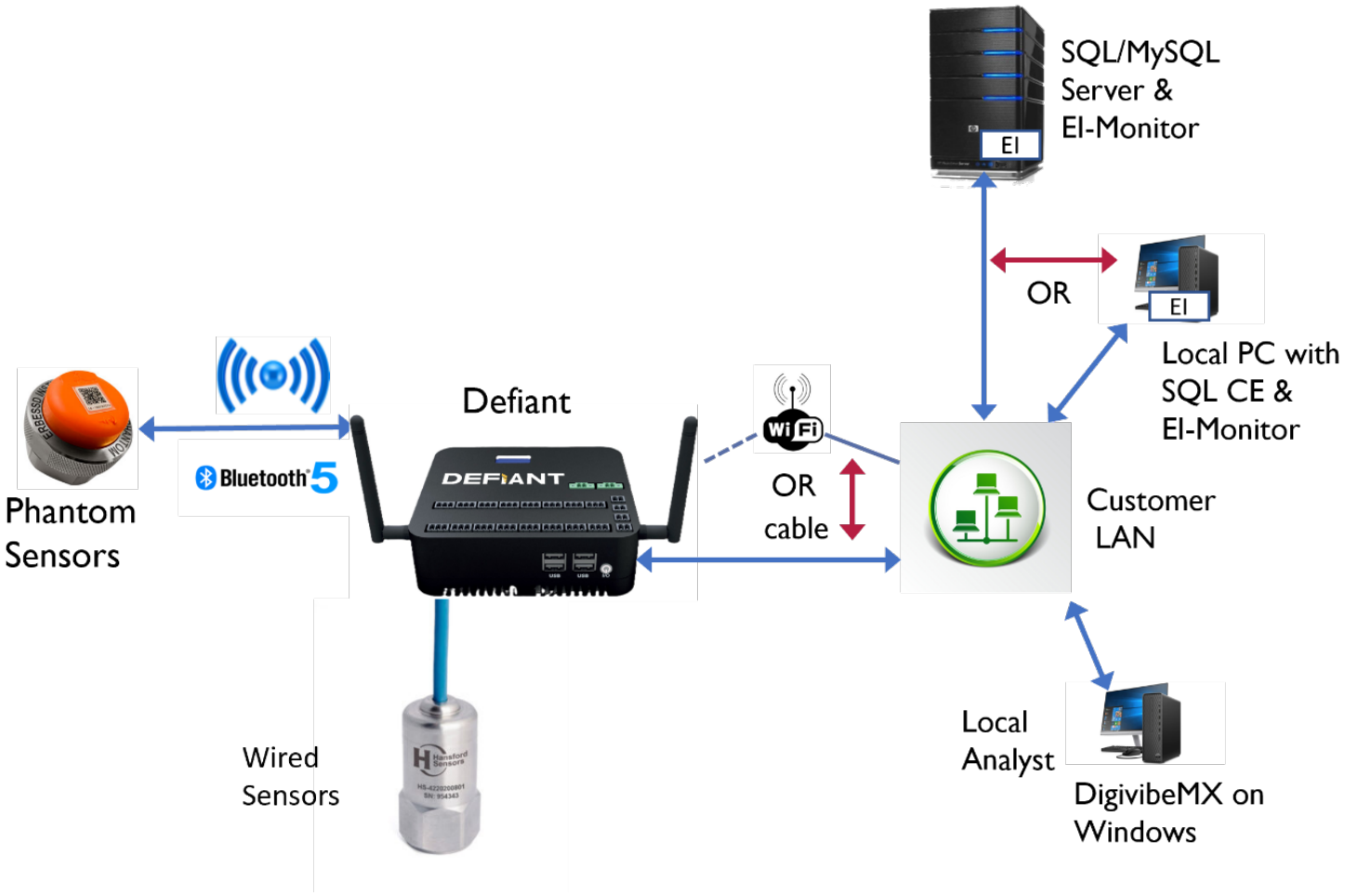

Local Database Diagram

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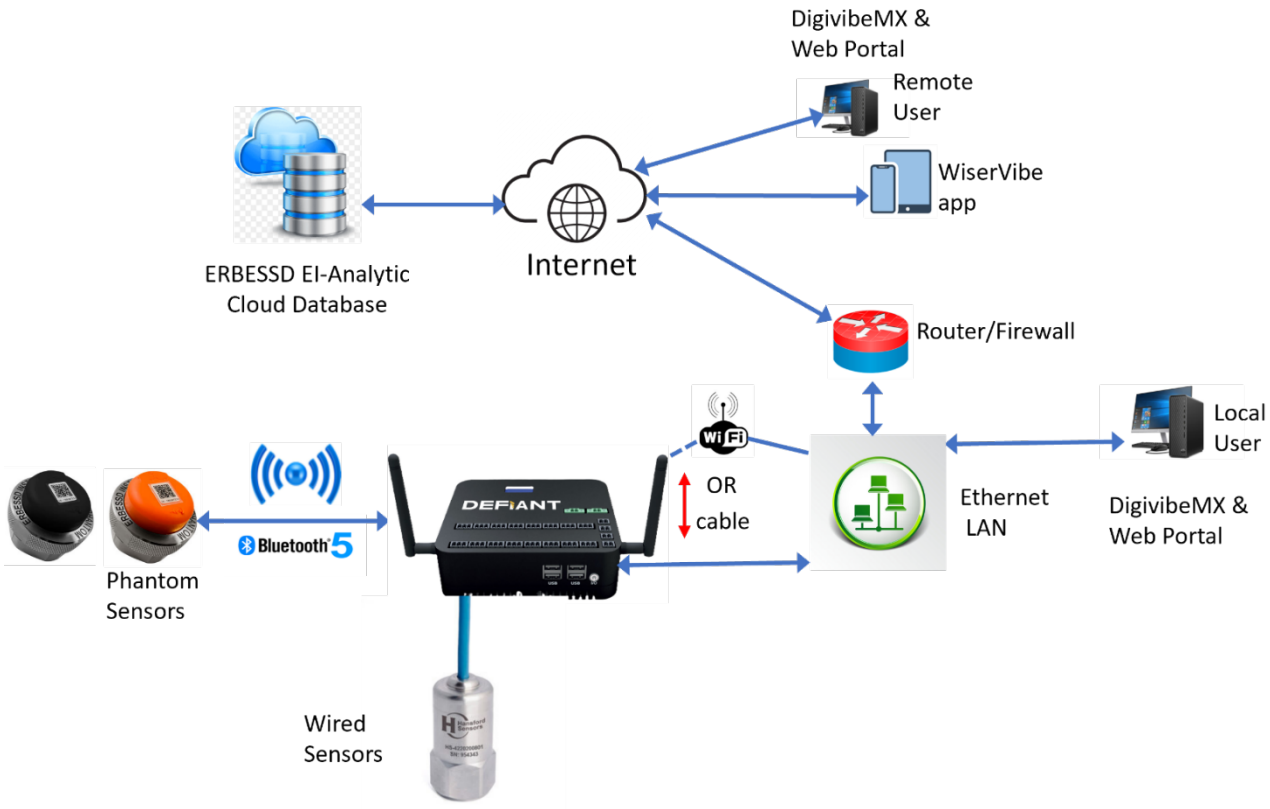
Option 2 - EI-Analytic Cloud Database Service

Erbessd Instruments EI-Analytic is a cloud-based monitoring and data integration service. A free account can be created with a size limit of 1 GB. Paid subscriptions start at 10 GB in size and can expand to multiple TB.

Advantages of using the EI-Analytic cloud service to store Defiant data include:

- No need to backup data. (Data can be copied from the cloud to a local filesystem on demand)
- EI-Analytic provides a Web Portal (app.eianalytic.com) and supports the WiSER VIBE mobile app for IOS/Android, both of which can be used to manage a database as an alternative to DigivibeMX.
- A flexible Notification Manager feature to configure email and push notifications for threshold alarms.
- EI-Monitor software is NOT required, Defiants relay data directly to the EI-Analytic cloud database.
- Communications between Defiant and EI-Analytic are Secure, using HTTPS over **TCP port 3030.**
- Defiants attempt to connect with https://eiaws.eianalytic.com/PhantomService.svc/ upon bootup to start a secure session with EI-Analytic using TLS 2.1.
- A proxy server may be administered in the **General** Tab of the **Config** menu. All Defiant data forwarded to EI Analytic will be sent to the Proxy, which relays it to the EI-Analytic website. The Proxy will also support connections to the remote access server (used for logging into a Defiant from EI -Analytic).



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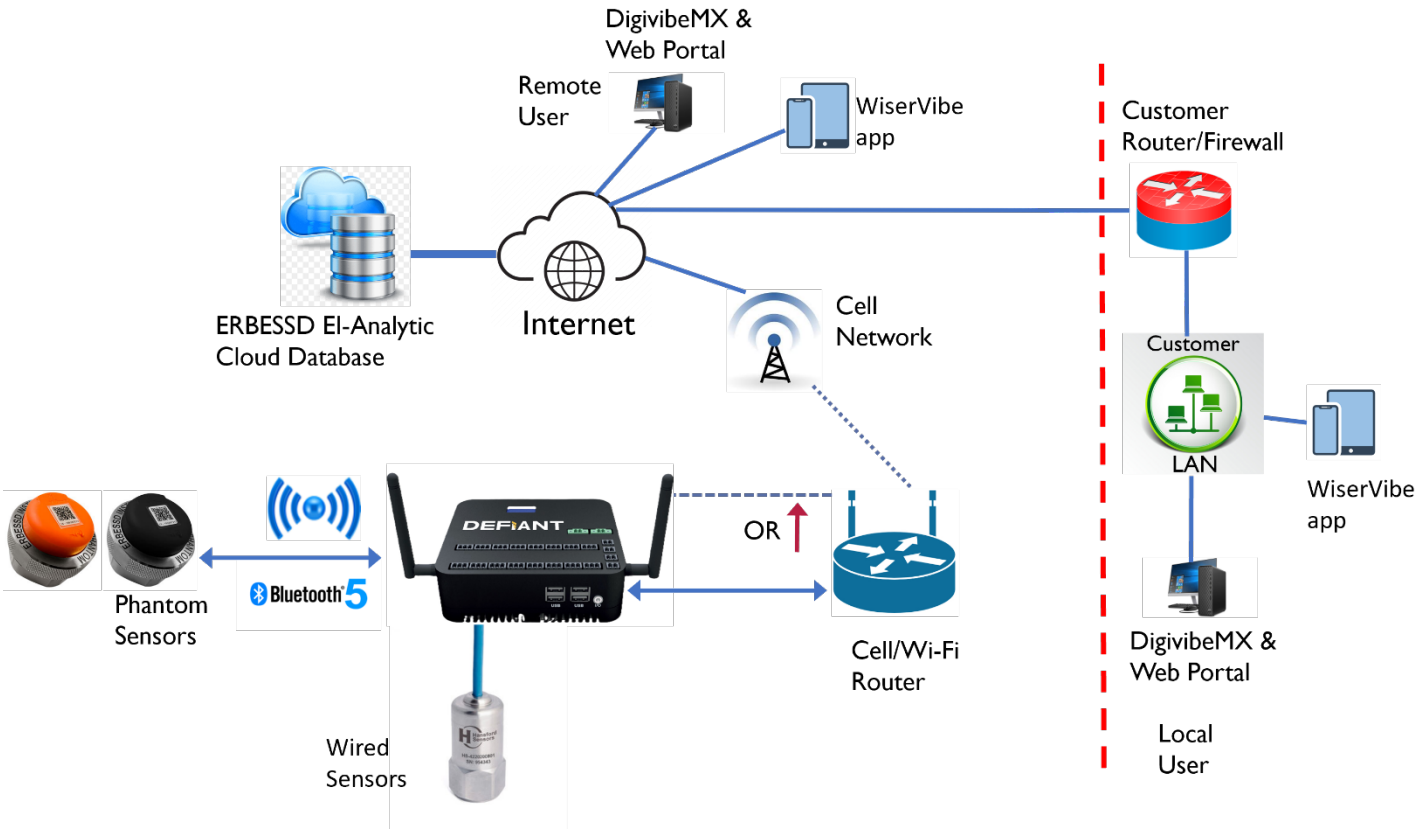
Option 3 – EI-Analytic Cloud Database via Cellular Network

This option is very popular in scenarios where using a customer network is not possible. A cellular data network (LTE or 5G) subscription is required to create an *overlay* network that has NO connection to a customer network.

This option offers:

- All the benefits of the Erbessd EI-Analytic database service.
- No IT involvement necessary (assuming local user can access Internet/HTTPS).
- All communications to EI-Analytic cloud are secured end-to-end using HTTPS on **TCP port 3030**.
- Defiants attempt to connect with https://eiaws.eianalytic.com/PhantomService.svc/ upon bootup.



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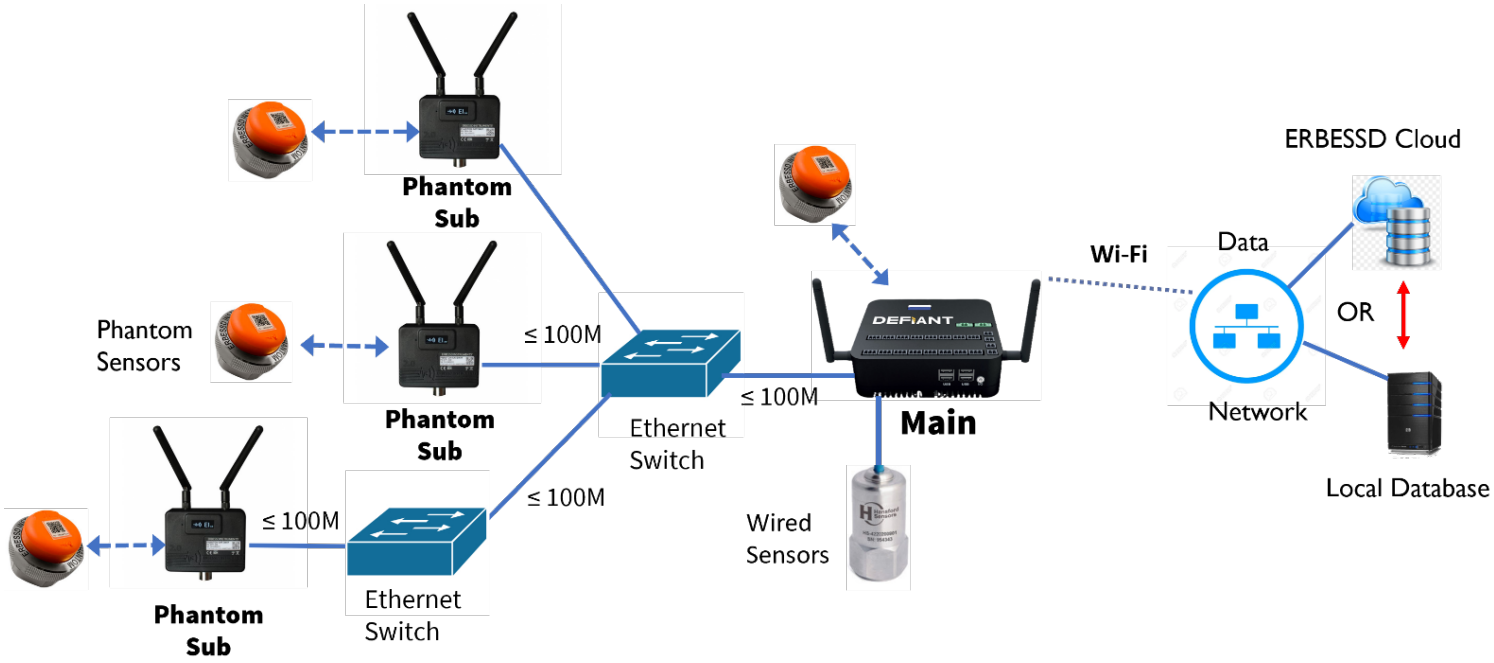
Repeater Networks

Defiant may currently be only configured as a **Main** Gateway in a Repeater network configuration.

Option 1 Wired Repeater network



- Only the Main Defiant unit is assigned an IP address by the network
- Main Ethernet port is used for Sub network, must use Wi-Fi connection to Data network
- Subordinates are assigned non-routable link-local IP addresses by the Main
- Sub Admin Consoles are accessed through the Main interface Repeater tab
- Global Collection Settings are configured only in the Main
- All wireless sensors are Paired to the Main
- Up to 7 Main/Sub networks may be configured – labeled A through G
- Future software updates will allow use of Aux ethernet port for Repeater networks

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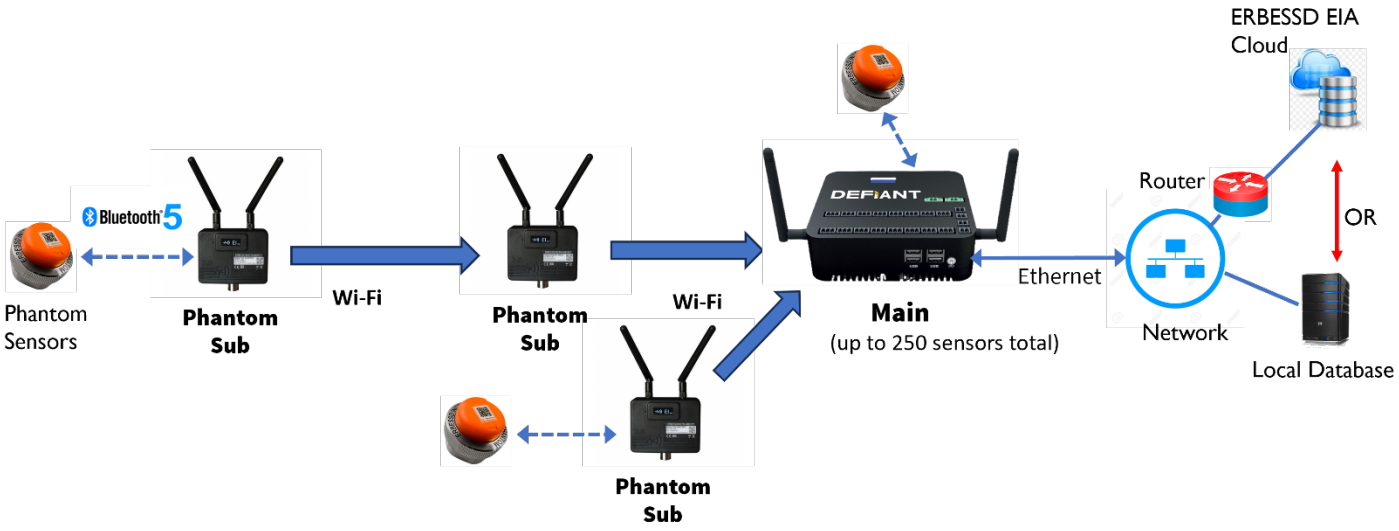
Option 2 Wireless Repeater network



- Defiant can only operate as a Main GW in the Repeater network.
- Wired Ethernet is required for the Main network connection to avoid Wi-Fi- congestion
- Subordinates are assigned non-routable link-local IP addresses by the Main
- Sub Admin Consoles are accessed through the Main interface Repeater tab
- Global Collection Settings are configured only in the Main
- Subordinates can connect directly or indirectly to the Main GW (mesh network)
- All wireless sensors are Paired to the Main GW
- Up to 7 Main/Sub networks may be configured – labeled A through G

Locating Defiants

Defiants require local power and must be located accordingly. They should be mounted as centrally as possible among the sensors they serve. The Defiant Admin Console Live State shows the signal strength of each wireless sensor in bar-graph format. The signal strength for Phantoms is rated as either Good(-50 to -75dBm), OK(-76 to -90dBm), or Poor (less than -90dBm).

Long Range Mode

The Long Range option can be used to increase the distance between a Phantom sensor and a Defiant to up to 200 meters line-of-sight. The Bluetooth scanning mode can be set to Regular, Long Range only, or both Long Range and Regular.

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Some important notes:

- When set to Long Range mode, Phantom sensor battery life is affected. An estimated 15-20% life cycle reduction should be expected.
- The available bandwidth between sensor and gateway in Regular mode is 1 Mbps, in Long Range mode it is reduced to 500 kbps.
- Defiants cannot scan in Regular mode and Longe Range mode simultaneously. It switches between Regular and Long Range mode for brief periods of time. In Regular mode, a Phantom sensor will attempt to communicate with a Defiant every 2 seconds. The actual amount of time varies by CPU load. However if the Defiant is operating in dual mode, that interval will increase to 10 seconds or more, again depending on load. This could impact any Phantoms that are powered locally and are set to provide data updates at frequent intervals. Example is an RPM Phantom set to continuous mode. Any Phantom with an update interval under 10 seconds will be affected by enabling Long Range mode. These include Current Phantom, Dry Contact, and others.

Wired Sensors

Defiant is able to interface with most sensors available today.

- IEPE accelerometers
- Velocimeters
- Proximity probes
- Pressure sensors
- Pulse train sensors
- Current transformers
- Any sensor with 0-5VDC, 0-10VDC, or 0-12VDC output
- Any sensor with ±2.5VAC, ±5VAC, or ±10VAC output.
- 4-20 mA sensors with external adapter (4-20mA to 0-10Volt)
- 2-pin accelerometers connect to ACCEL and GND
- 3 -pin accelerometers connect to 5VDC, IN and GND
- 0-10 Volt sensors or 4-20mA sensors with adapter connect to IN and GND
- Velocimeters, Proximity Probes, Pressure sensors, Pulse train sensors and Current transformers all connect to IN and GND

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Wireless Sensors

All Erbessd Phantom wireless products are compatible with Defiant.

- EPH-V10/V11/V15/V16/V17/V18 vibration sensors
- EPH-C31 current sensors
- EPH-G60/61/62/63 general purpose sensors
- EPH-S40 speed sensors
- EPH-T20/T25 temperature sensors
- EPH-T70 thermographic camera
- EPH-U13/U14 all-in-one sensors
- GP-8 universal wireless adapter

Digital Inputs and Outputs

Defiant has 4 Input/Output connectors, labeled D1 through D4.

When assigned as an **Input**, they detect contact closure. This is effectively the same as an EPH-G62 Dry Contact Phantom sensor channel.

As an **Output**, a Digital channel may be set to switch between 0 VDC and 12VDC, based on a configurable parameter. Max current output per channel is 150 mA.

Installation

Software Installation

DigivibeMX Phantom Software Installation

Digivibe software is required to manage backups and file deletions from an EI-Analytic cloud database.

From USB or Download: Open the *DigivibeMX_P_DV11P.11xx* folder location in Windows Explorer.

Open the IMPORTANT INSTALLATION INFORMATION text file and follow the instructions provided. Currently this includes:

1. Install the MySQL connector by double-clicking on mysql-connector-net-6.5.4.
2. Install SSCE Runtime by double-clicking on SSCERuntime_x64-ENU.
3. Install the WebView2plugin by double- clicking on MicrosoftEdgeWebview2Setup.exe.
4. Install *DigivibeMX* by double-clicking on the setup.exe file.

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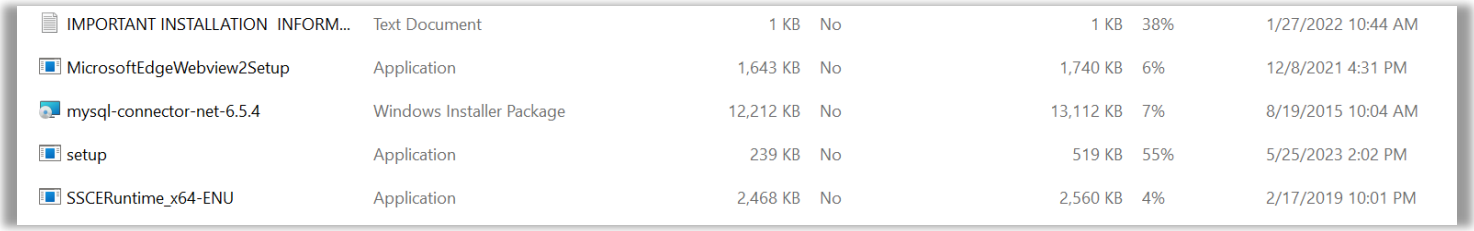
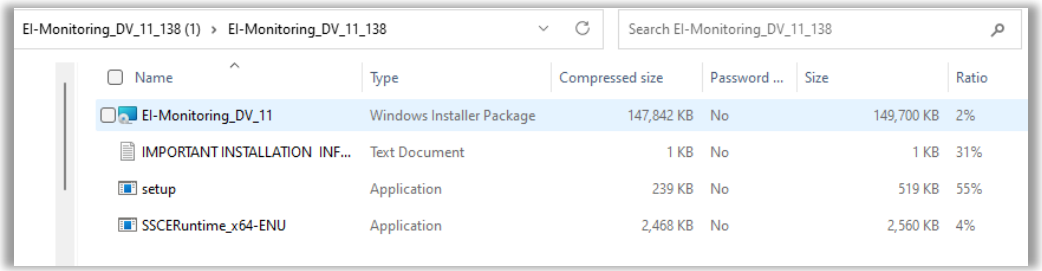


IMPORTANT INSTALLATION INFORM...	Text Document	1 KB	No	1 KB	38%	1/27/2022 10:44 AM
MicrosoftEdgeWebview2Setup	Application	1,643 KB	No	1,740 KB	6%	12/8/2021 4:31 PM
mysql-connector-net-6.5.4	Windows Installer Package	12,212 KB	No	13,112 KB	7%	8/19/2015 10:04 AM
setup	Application	239 KB	No	519 KB	55%	5/25/2023 2:02 PM
SSCERuntime_x64-ENU	Application	2,468 KB	No	2,560 KB	4%	2/17/2019 10:01 PM

EI-Monitor Software Installation

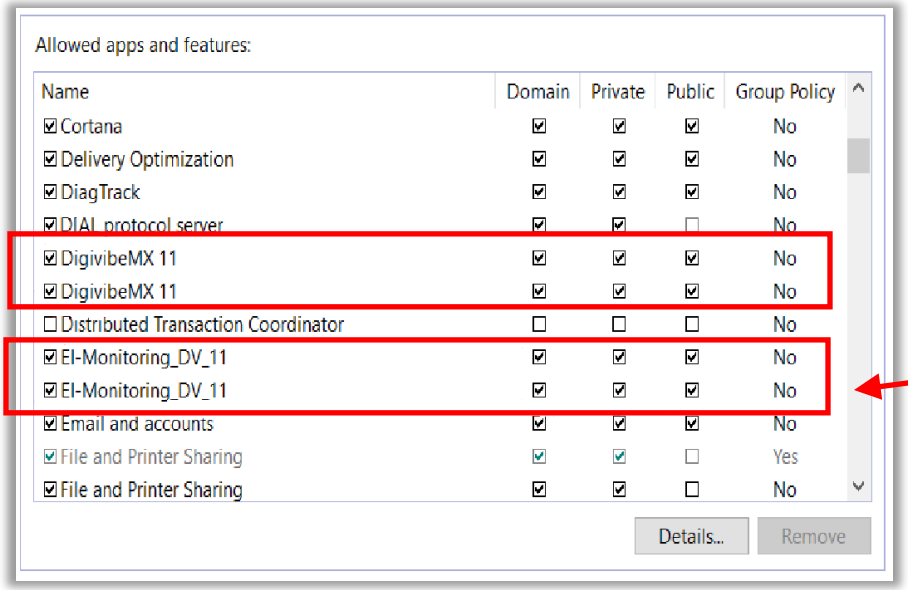
A **local** database requires EI-Monitor software to be installed, preferably on the same PC or server where the database resides. EI-Monitor is included at no cost, along with DigivibeMX Phantom and the SQL connectors. Open the EI-Monitoring_11 file folder and double-click the **SSCERuntime_x64-ENU** if you did not do so during the DigivibeMX software install and are using SQL CE. Then double-click on **Setup** to install EI-Monitor.



Name	Type	Compressed size	Password ...	Size	Ratio
EI-Monitoring_DV_11	Windows Installer Package	147,842 KB	No	149,700 KB	2%
IMPORTANT INSTALLATION INF...	Text Document	1 KB	No	1 KB	31%
setup	Application	239 KB	No	519 KB	55%
SSCERuntime_x64-ENU	Application	2,468 KB	No	2,560 KB	4%

Required Permissions in a Secure / Network IT Environment

Both DigivibeMX and EI-Monitoring require Read/Write permissions to C:\Program Files and C:\ProgramData (hidden folder). Antivirus and Firewall programs on a user's computer may interfere with these permissions and with Phantom system communications. Users in a secure / Network IT environment may require administrator assistance to enable these required permissions.



For Local databases only

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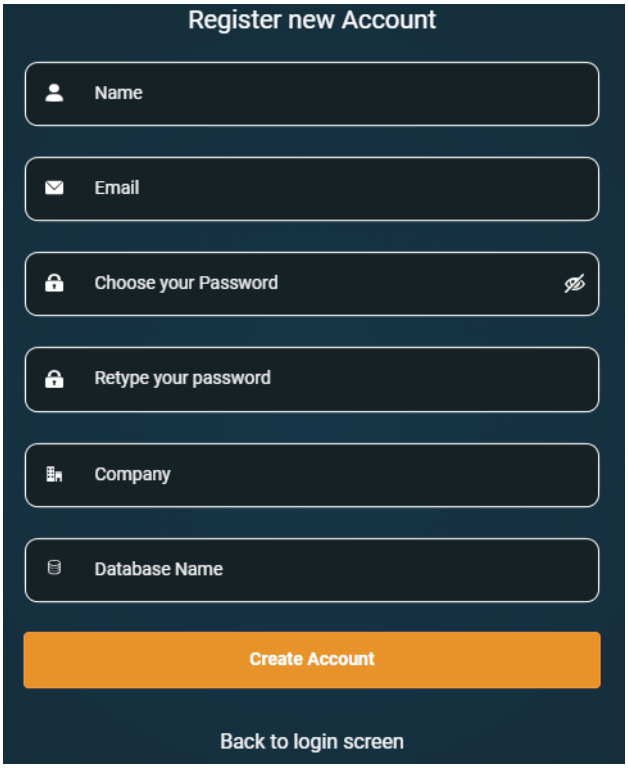
Setup EI-Analytic Account

This is required to set up your cloud database. However, even if you plan on using a local database, you can create and use a free EI-Analytic account to register and manage your Defiants and sensors remotely via the secure HTTPS web interface. Otherwise, managing your Phantom system must be done from the same network as the Defiant(s) to make communication possible.



1. Go to app.eianalytic.com and click on New Account.
2. Enter a Name for the account.
3. Add the Email and password info, the address does not need to be valid, in fact if multiple users will access the account, it would be preferable to create a generic Username in email address format (Ex: user@companyname.com). However, if email notifications are desired when a sensor in the database enters an alarm condition, an actual email address should be used. To have a paid subscription service activated, please provide Erbessd Instruments Technical Support your EI-Analytic account Username at info@erbessd-instruments.com.
4. Enter a Company name – this must be all lowercase letters and/or digits 0-9 . The only special character allowed is an underscore.
5. The Database Name must be all lowercase letters and/or digits 0-9 . The only special character allowed is an underscore.

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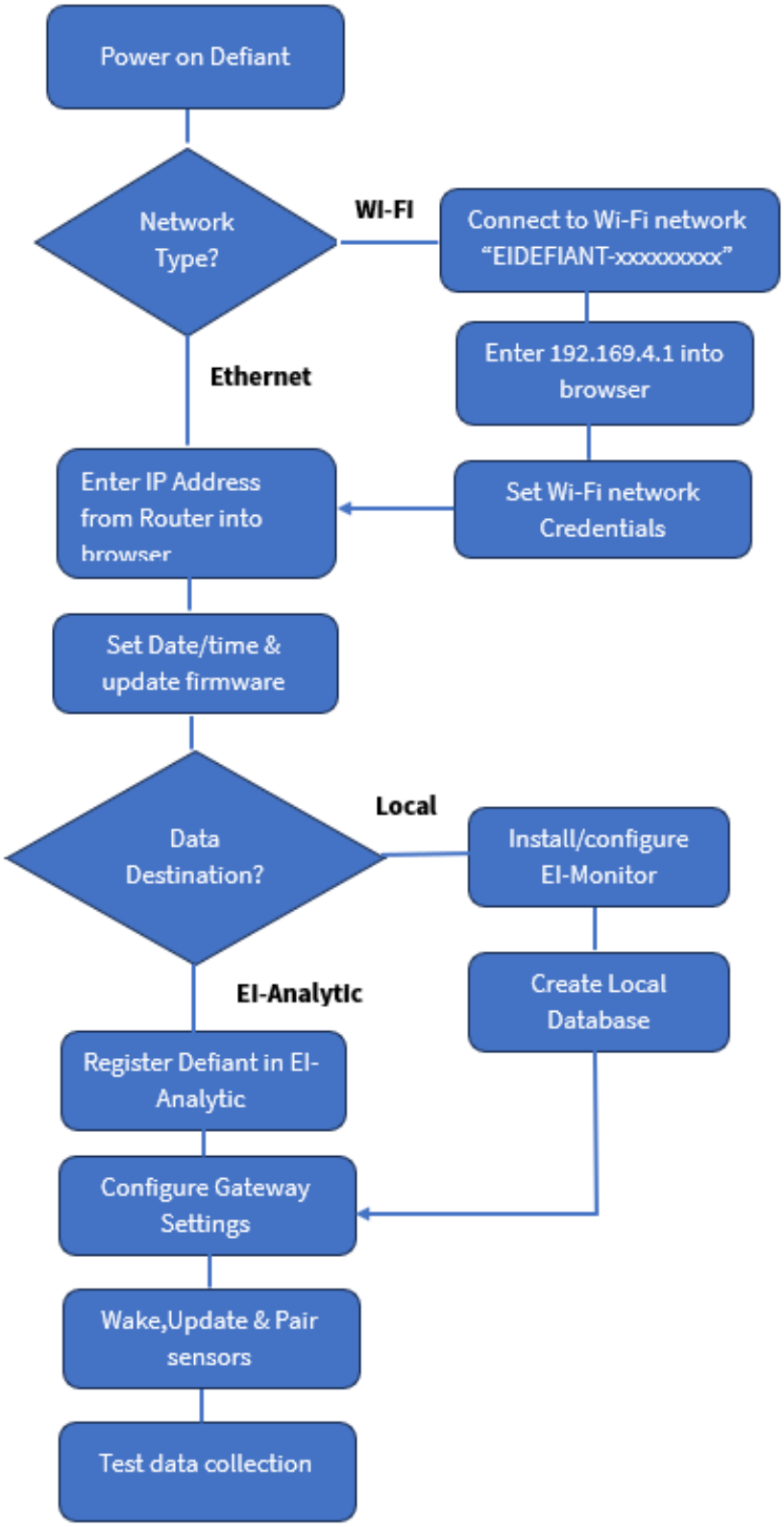
Installation Flowchart



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Step1 - Power On

Attached the Antennae and plug in the power source. When power is connected to Defiant, it will automatically boot. The power switch may be used to power down or recycle the power to a Defiant. Press and hold the switch for 3+ seconds to cycle power. The onboard CPU fan will run whenever power is present, regardless of the power switch position.

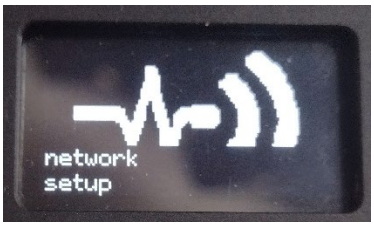
Step 2 -Connect to Network

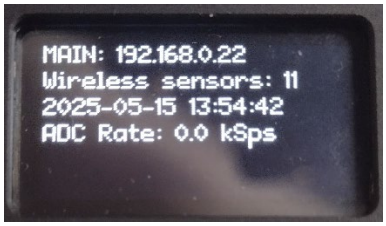
Option 1 – Ethernet Connection

Plug an RJ-45 network patch cable into the Main Ethernet port and power on the Defiant.

It will proceed through the startup sequence. The network Router should assign an IP address to the Defiant, which will be shown on the OLED screen.

The OLED screen will show a progression of boot steps, including:





If the Defiant does NOT obtain an IP address, it will default to **A**ccess **P**oint mode (AP), as shown below.

If an IP address is not assigned, Factory Reset the Defiant by pressing the reset button, left of the OLED screen, and hold for 10 seconds until the screen shows it has reset. Cycle the power to the Defiant.

If an IP address is still not assigned, you may need to troubleshoot the Ethernet connection, or administer a *static* IP address (see below), depending on your network. (private vs corporate). If you are in a corporate network environment, contact your local IT group for support.

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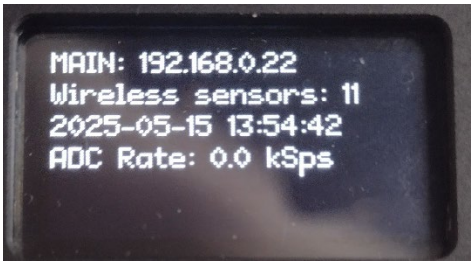
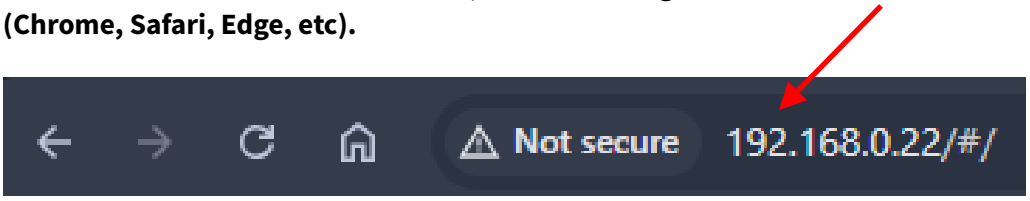
In this example, the Defiant was assigned address **192.168.0.22**.

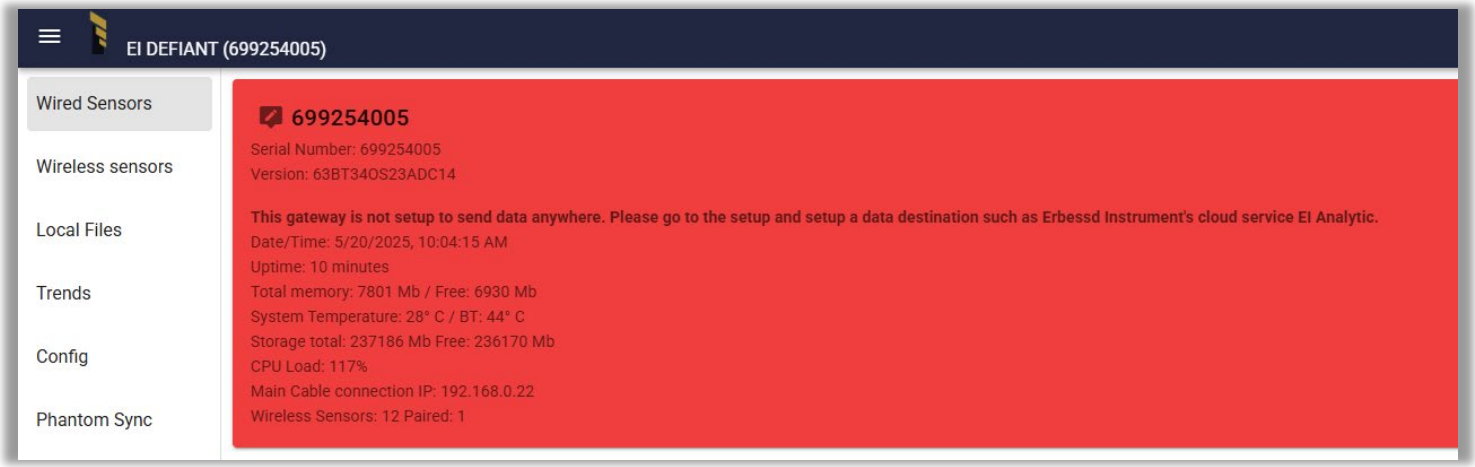


To access the Defiant Admin Console, enter the assigned IP address in the address bar of any web browser (Chrome, Safari, Edge, etc).



YOU MUST BE CONNECTED TO THE SAME NETWORK as the Defiant for this to function.

The Defiant Admin Console will open.



Once the Defiant is registered in EI-Analytic, remote access will be possible from the EI-Analytic web page using the Admin Console link function.

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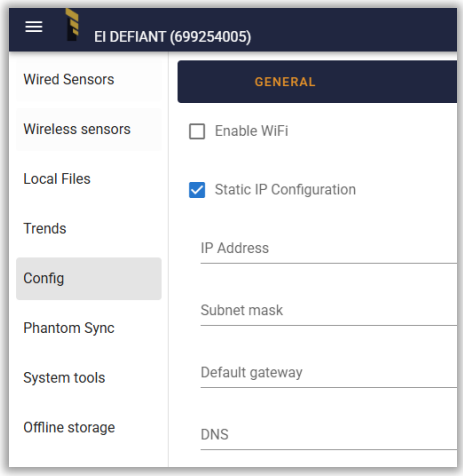
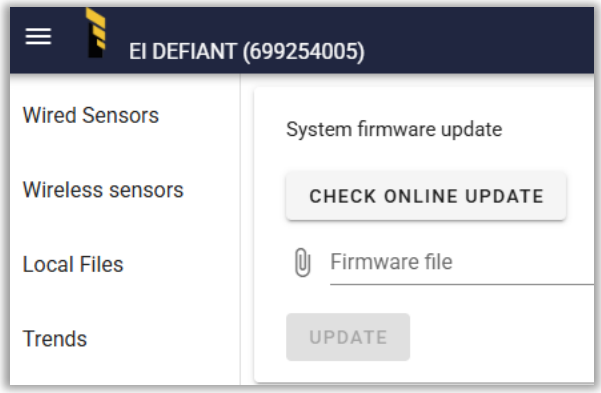
To set **static** addressing, open the **Config** menu and click **Static IP Configuration** in the **General** tab.Enter the IP address, subnet mask, default Defiant and optionally the DNS address. Consult with your local IT administrator to obtain this info, if possible. Otherwise, enter:



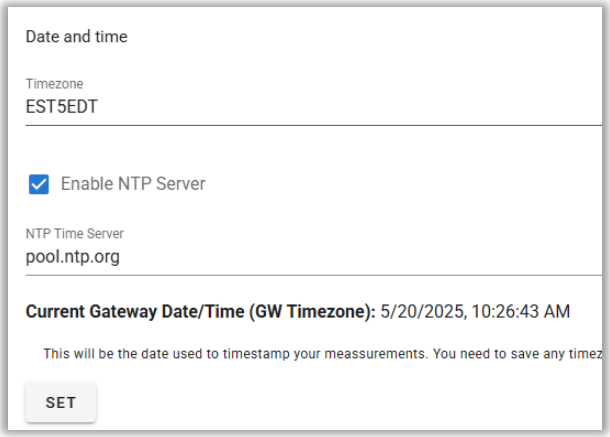
- An unused IP address on the network
- 255.255.255.0 for the subnet mask
- Your router's address(always the .1 address in the network, e.g. 192.168.0.1) in the default gateway field.
- DNS -set to the same address as the default gateway, or 8.8.8.8.

Click **Save;** the Defiant will restart and any changes will be applied.

Check the Firmware version to ensure the Defiant has the latest version. Click the **System Tools** tab on the main menu and select the **System Firmware update** button. Press the **Check Online Update** button to view the current and available versions. If they differ, the **Update** button will be available. (Internet access is required).



Set the Time Zone from the **System Tools** tab on the Main menu. Select the location from the drop down box. The Network Time Protocol Server may be specified or the default **pool.ntp.org** can be used. If the Defiant loses connection to a network clock source, its internal clock will free-run.



After resetting, check the Date/Time to see if they are correct.

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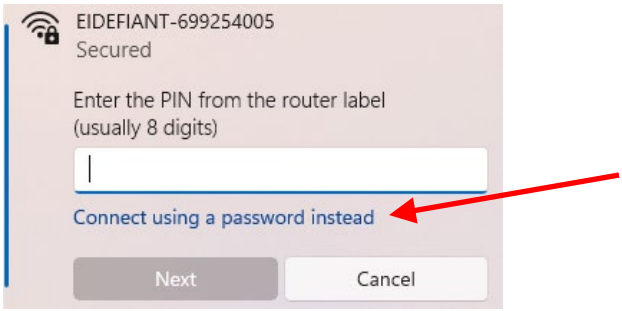
Option 2 – Wi-Fi Connection

To connect a Defiant to a Wi-Fi network, power it on with no ethernet cable connected and allow it to boot into **A**ccess **P**oint (AP) mode.

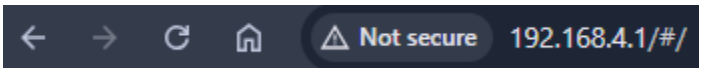
The Defiant will broadcast a Wi-Fi- network SSID with the name "**EIDEFIANT-XXXXXXXXX**". and assign itself an IP address of **192.168.4.1 (AP)**.

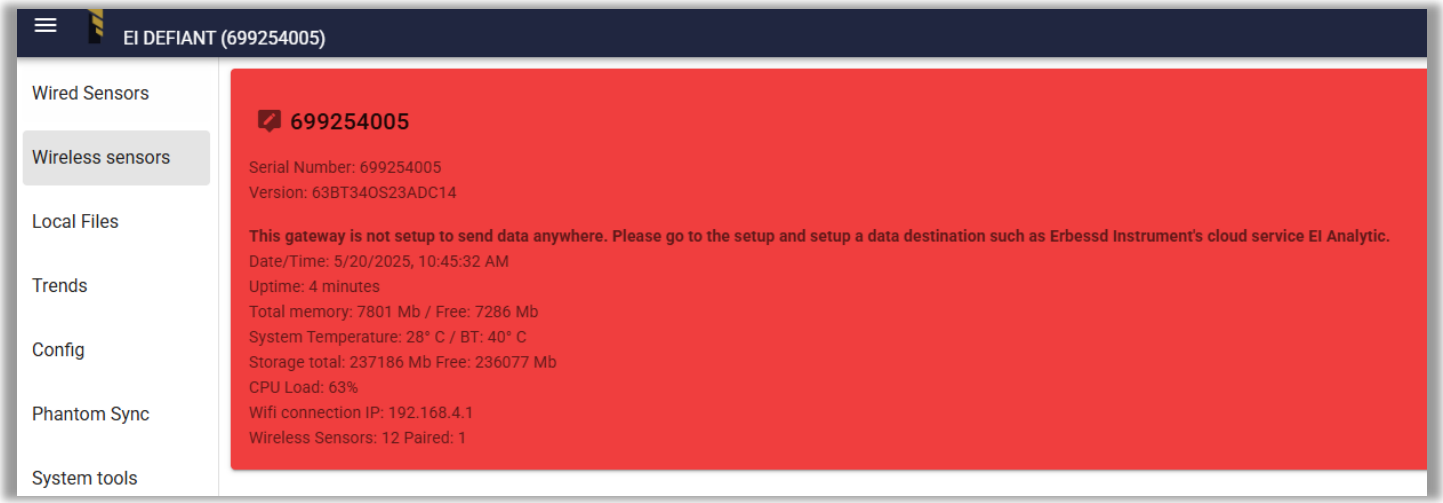
Look for the **EIDEFIANT** name in the **available Wi-Fi networks** of any PC, tablet or phone. Press **Connect**.



DO NOT ENTER A PIN, choose the **connect using a password instead** option and enter the password - **88888888** (eight 8 times).

Open any browser and enter **192.168.4.1** in the address bar.





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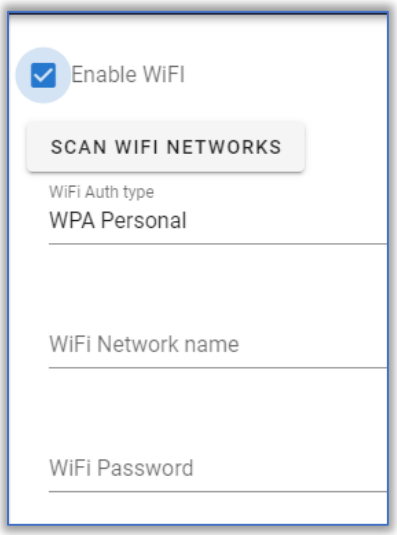
1. Click on the **Config** menu and **Enable Wi-Fi**. In the **General** Tab.
2. You can scan available Wi-Fi networks or enter the **WiFi network name** directly. There is also a selector for **Auth Type**: WEP, WPA (Personal or Enterprise), or Open Network.
3. In the **Wi-Fi Password** section, enter the password of the selected network. You can view the password or hide it with the buttons.
4. Press **Save**, the Defiant will restart.
5. Check the OLED display as the Defiant reboots, you should see the newly assigned IP address.



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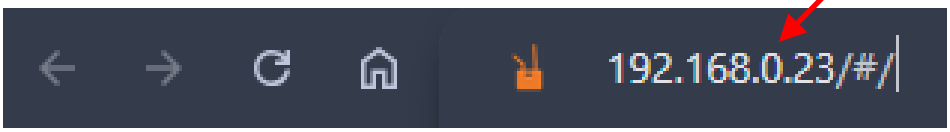

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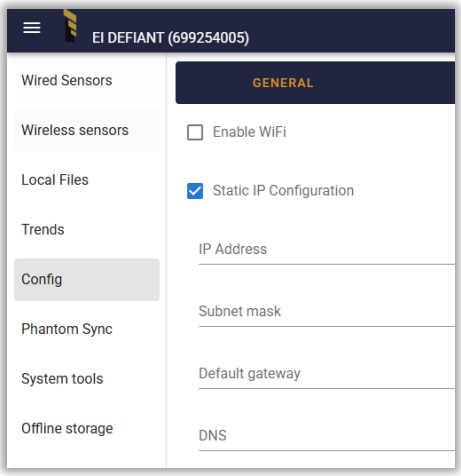

- An unused IP address on the network
- 255.255.255.0 for the subnet mask
- Your router's address(always the .1 address in the network, e.g. 192.168.0.1) in the default gateway field.
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Click **Save;** the Defiant will restart and any changes will be applied.

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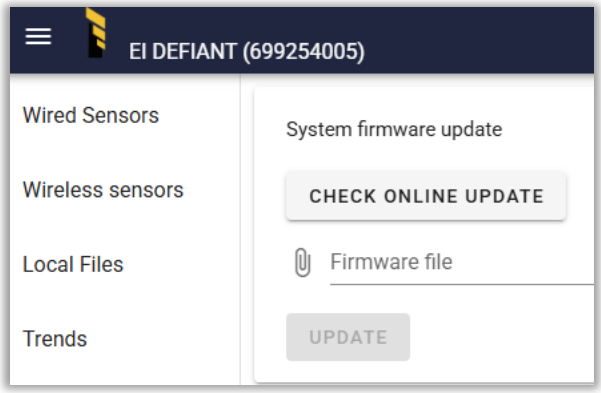

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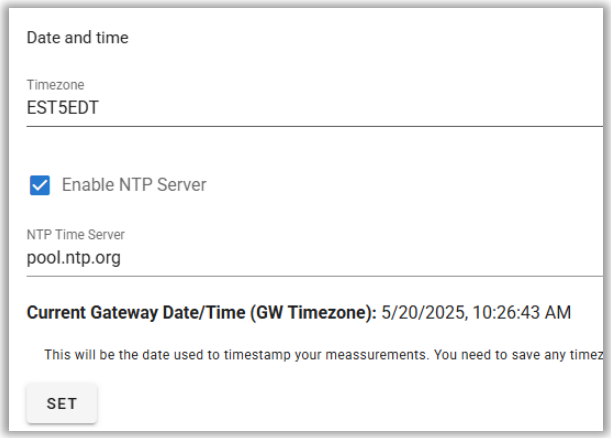

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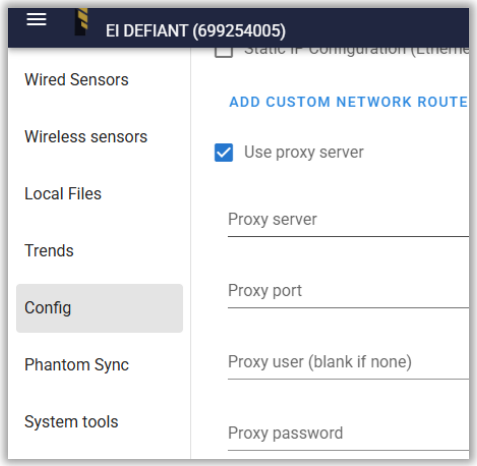
Proxy Server Support

A proxy server may be administered in the **General** Tab of the Defiant Admin Console. A Proxy server can provide a single point of contact for all Internet-bound Defiant traffic. Proxy servers provide improved security by managing all web traffic (filters, Firewalls), relaying bidirectional data between source and destination.

All Defiant data forwarded to EI Analytic will be sent to the Proxy, which relays it to the EI-Analytic website. The Proxy will also support connections to the remote access server (used for logging into a Defiant from EI -Analytic).



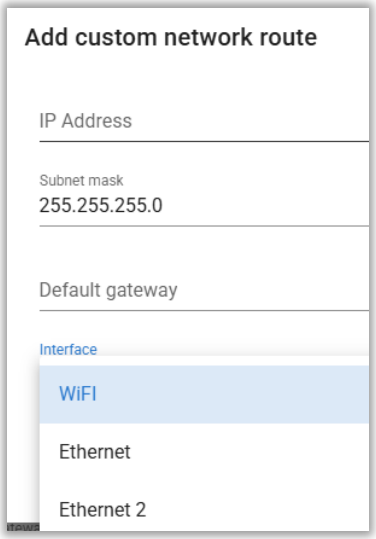
Enter the Proxy server URL, the TCP port used, and optionally a Proxy User name and password.

Defiants use the CONNECT method for establishing communication with a Proxy. This method requests that a Proxy establish a HTTP tunnel to a destination server, and if successful, forward data in both directions until the tunnel is closed. For details see: https://developer.mozilla.org/en-US/docs/Web/HTTP/Methods/CONNECT

Testing was conducted using SQUID (a web caching proxy) see https://www.squid-cache.org/

Add Custom Network Route

This allows a chosen IP address and default gateway to be set for any of the 3 network interfaces, Wi-Fi, Main and Aux.



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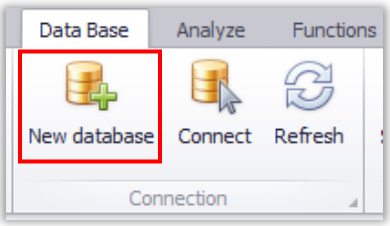
Step 3 – Create a Local Database

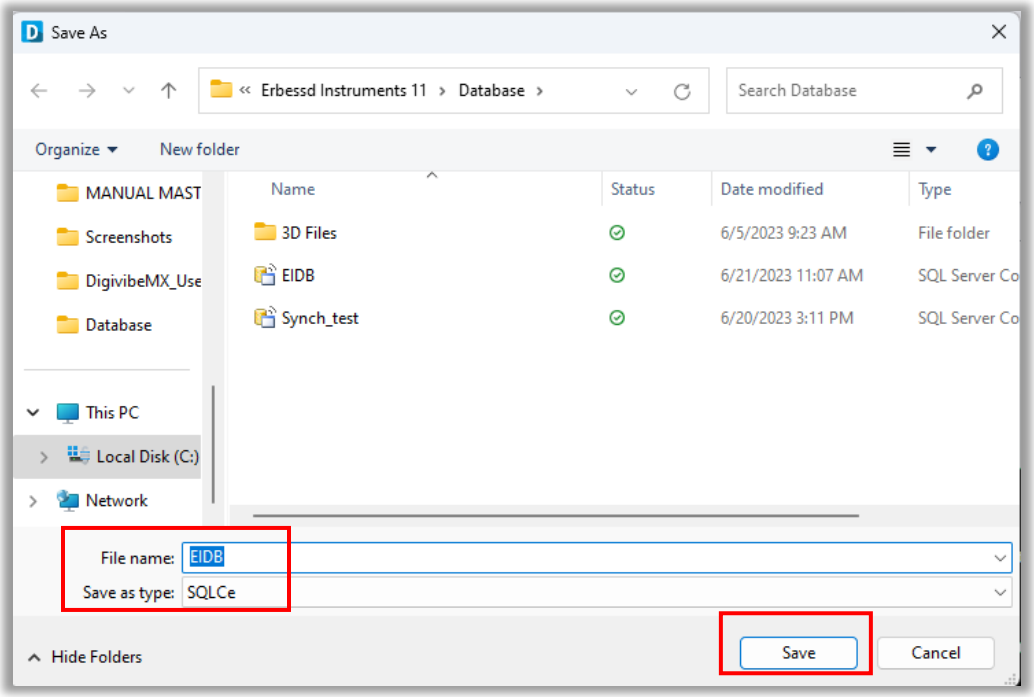
Option 1: Create Single-User SQLCe Database on a Local PC



A local SQLCe database is created on a PC using DigivibeMX Phantom software. Even if an EI-Analytic cloud database is used for data storage, it is best practice to create a local database. This can be used to backup the EI-Analytic cloud DB, or allow analysis to be done offline.(EI-Analytic databases may be Synchronized or Backed up using tools in Digivibe MX.)

Click on **Database** in the DigivibeMX11 main menu, then select New database.

The **Save As** window opens to the default database location (Documents > Erbessd Instruments 11 > Database). Specify an alternate location, if desired. Enter the name of the new database in the File Name text field**.** Save as type: SQLCe.



Click the Save button to save the new database. Click Yes for any notification boxes that may appear after the database file is created.

NOTE: SQLCe databases have a 4GB capacity limit. Because of this, DigivibeMX will store the full signal files OUTSIDE the SQLCe database file structure. The signal files represent approximately 85% of the storage space requirements for a database, the rest is configuration info – Machines, Phantoms, Routes, etc. **Note** - SQLCe will only allow file storage on a PC's C: Drive, external drives are not supported.

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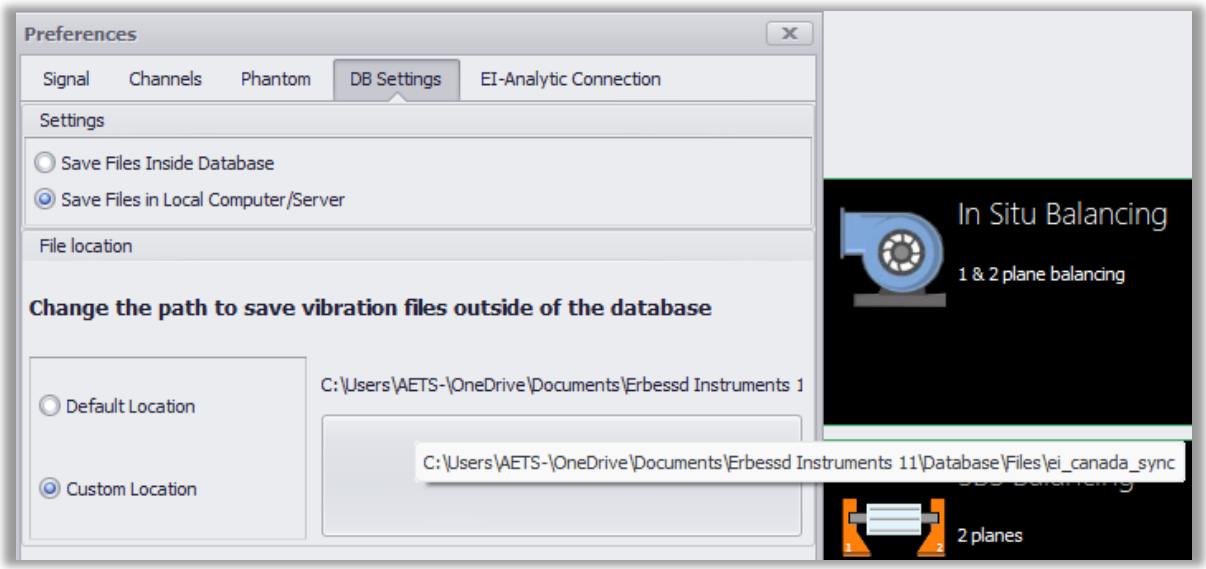
There is an option to KEEP the signal files inside the SQLCe file folder, however it may be necessary to periodically thin the SQLCe database of old data, or synchronize the database structure to a new SQLCe database to avoid having the database refuse new data because it has reached its maximum allowable capacity.

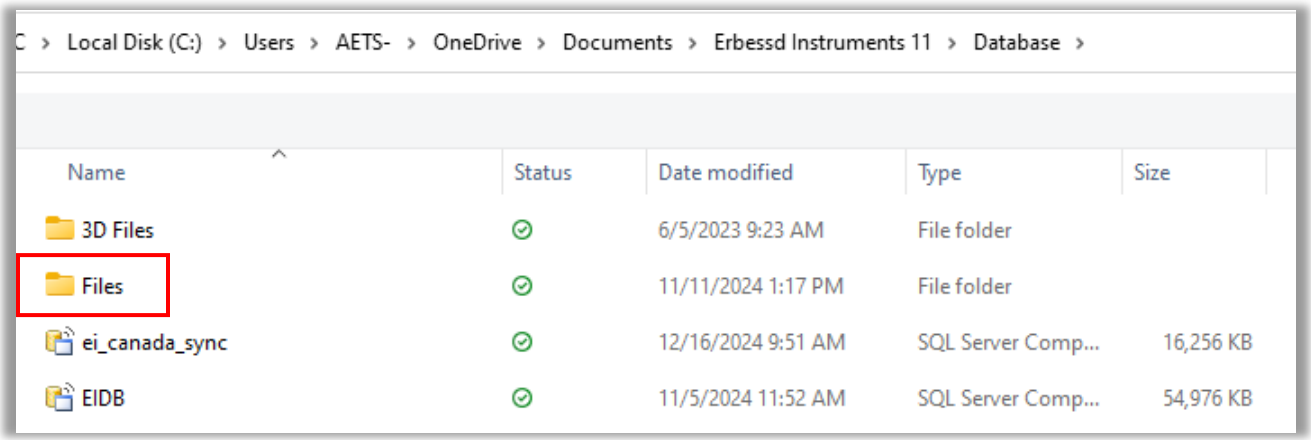
To set the destination folder for local SQLCe database signal files, open DigivibeMX and connect to a local SQLCe database. Open the Configuration>Preferences>DB Settings tab: **Note** – this tab only appears when Digivibe is connected to a local DB.



Choose the location for saving signal files:

- **Inside the Database** (counts toward the 4Gb limit), or.
- **In Local computer** – in another folder on the computer, but outside the Database file structure.

By default, all signal files will be saved in a folder called "**Files**", which resides in the Erbessd Instruments 11>Database folder:



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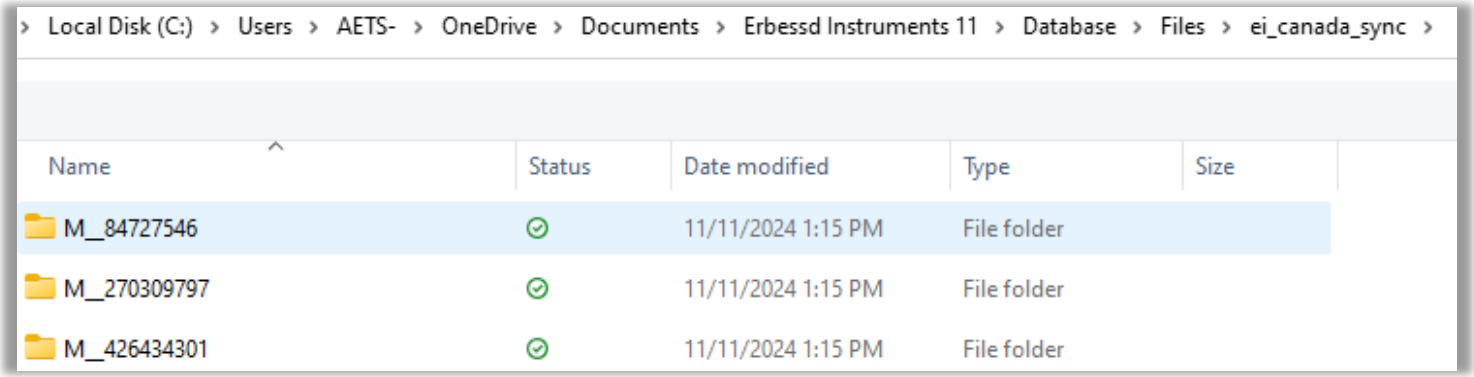
Click the **Custom Location** radio button to choose another location on this computer (must be on the C: drive!)

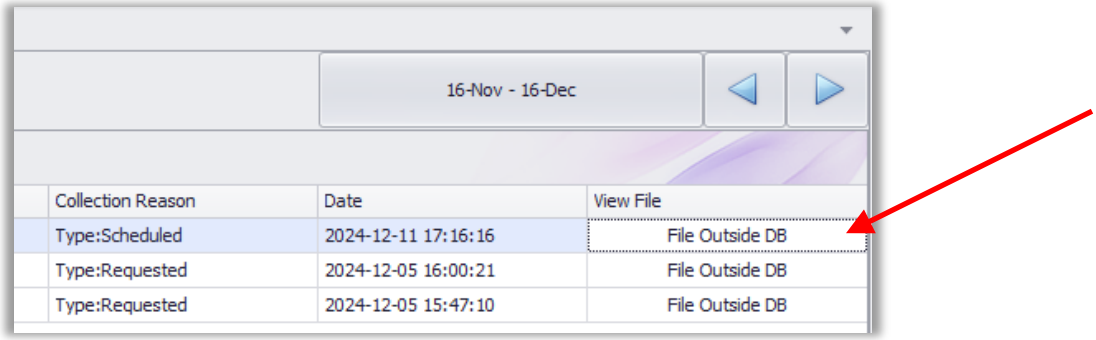
With this option, a local SQLCe database will contain only RMS and configuration data. (Machine, Phantom, Routes, etc.)

All Signal files, sorted by Machine are stored in the **Files** Folder in the local Database.

Opening the database in the **Files** folder reveals the folders for each Machine's signal files, sorted by Machine ID:



When viewed in DigivibeMX, the Historic Measures window shows "File Outside DB" in the View File column.



Option 2 – Multi-User SQL Database on a Network Server

DigivibeMX software cannot create a new SQL Server, MySQL or SQL Azure network database. The empty database must be created independently, then DigivibeMX is mapped to the database location. Once connected, DigivibeMX will create the required fields and tables. Locating the SQL Server or MySQL database on a shared network server will require entering the destination server's IP address. Locating an SQL Azure database will require the TCP address. Accessing the database may also require a database administrator Username and Password authentication. Be prepared with this information before proceeding. Consult a local IT administrator or SQL database administrator for assistance.

For MySQL,a step-by-step installation procedure can be found on the Erbessd website at https://www.erbessd-instruments.com/tutorials/mysql-server-installation/

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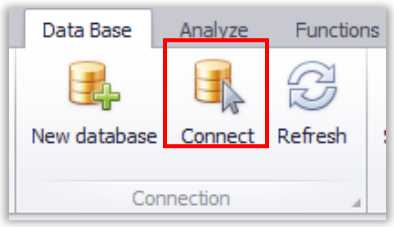
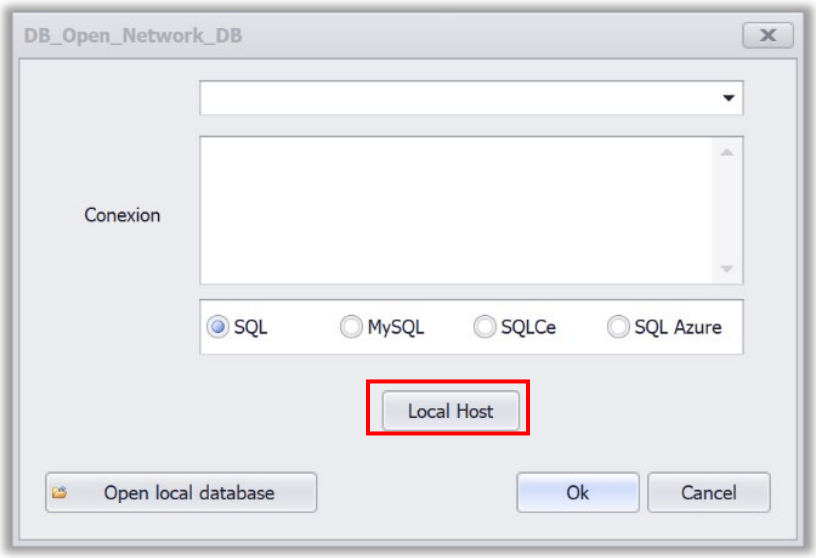
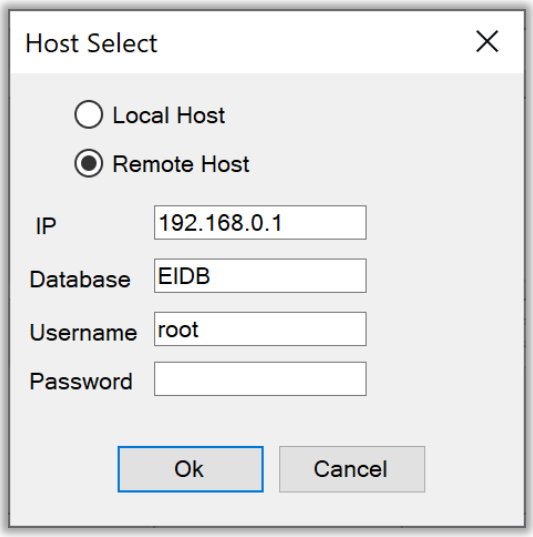
Open the Data Base Menu in DigivibeMX. Select Connect on the Connection toolbar.



The **DB_Open_Network_DB** window opens. Select SQL, MySQL or SQL Azure database format. Click Local Host button to continue. The **Host Select** window opens.





For a SQL Server or MySQL database, enter the server's IP address. For an SQL Azure database, enter the TCP address. Then enter the Database name. Enter the Username and Password, if required. Click the OK button to continue.

The destination address connection string will appear in the DB_Open_Network_DB Connection window. Click the **Ok** button to connect.

Configure EI-Monitor software

EI-Monitor software is used to relay data from Defiant to a common SQL database.

1. Launch EI-Monitor software on the PC/server.

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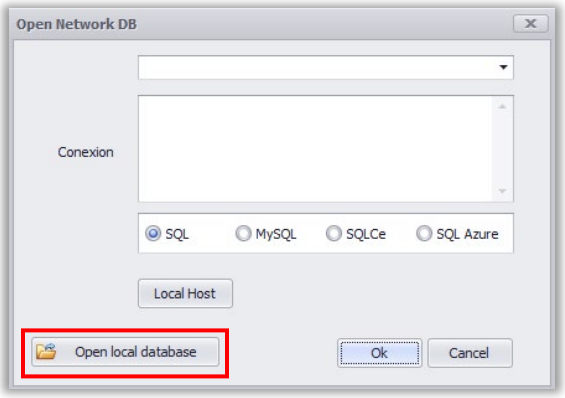
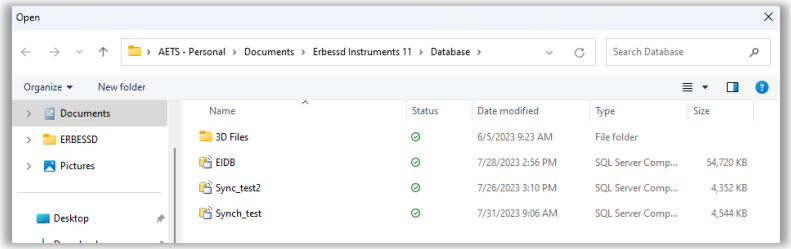
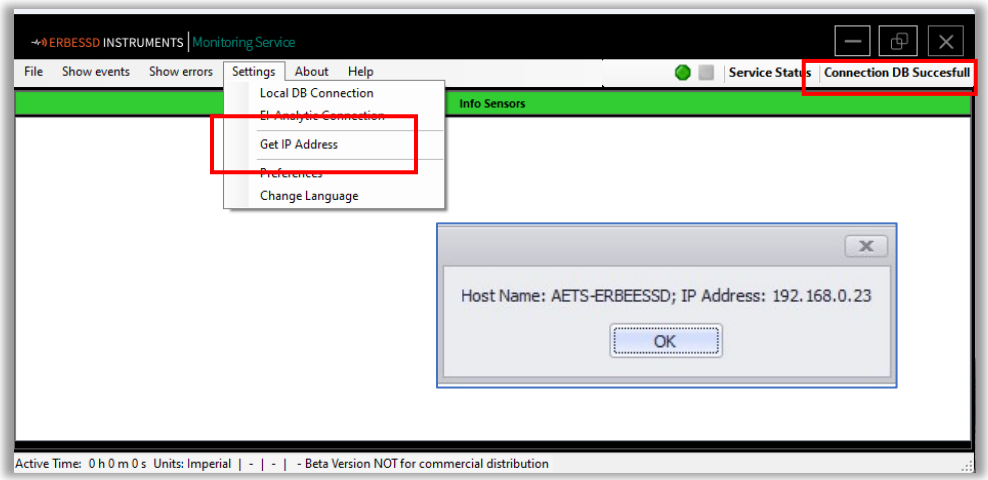
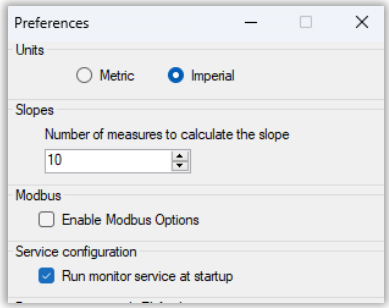
2. When opening the first time, the **Open Network DB** window will automatically launch. For SQLCe, check the radio button and choose a local database by clicking Open local database. Navigate to the desired local DB and press **OK**.





3. For a SQL , MySQL or Azure database, click the appropriate radio button and press the **Local Host** button. Enter the database info and press OK.
4. The main menu will then open, and a Connection DB Successful message is displayed in the banner.
5. Select the **Settings** menu and click on Preferences. Check the box for **Run monitor service at startup**.
6. Get IP Address. This is the IP address of the device running EI-Monitor. Make note of this address, you will need to administer it in the Defiant. See details below.





IMPORTANT: **NEVER** close the EI-Monitoring program. This will interrupt communications between the Defiant and database. EI-Monitor must always be operating in the background. If the computer running EI-Monitor is shut down or restarted, the Defiants will store data collections in their Offline Storage SD card(up to 100k files) until EI-Monitor restarts.

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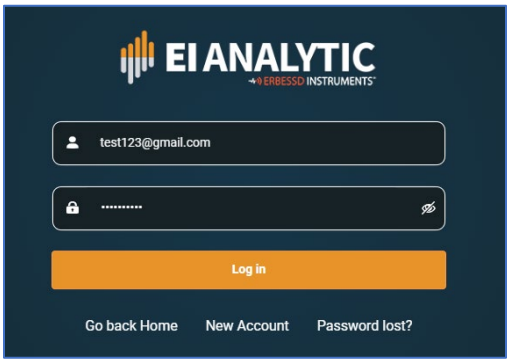
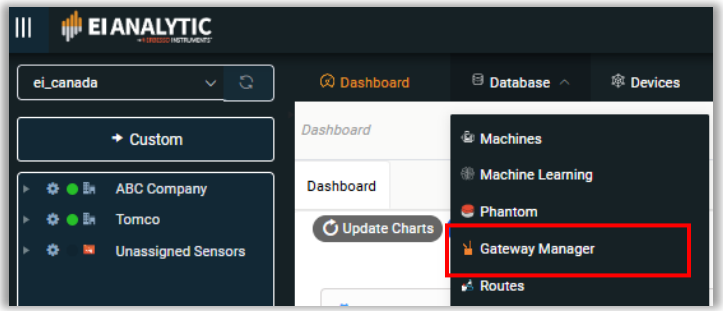
Step 4 –Configure the Data Destination

Option 1 - Send Data to EI-Analytic

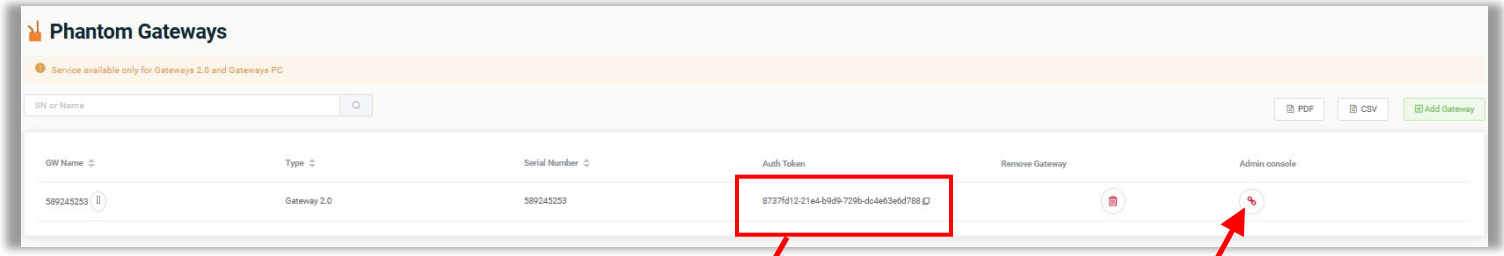
For a Defiant to send data to an EI-Analytic cloud database, it must first be registered. To register a Defiant:

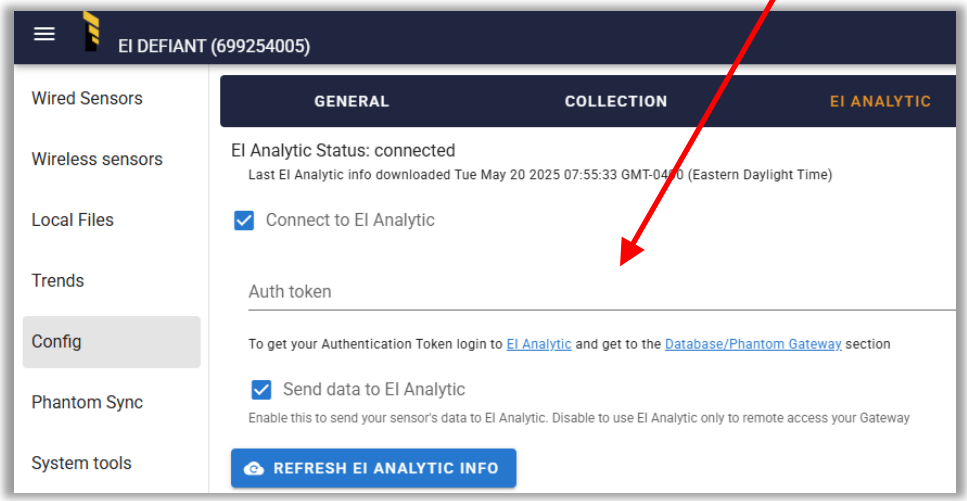
1. Login to the EI-Analytic account and database that the Defiant will be associated with at www.eianalytic.com.
2. Select Gateway Manager from the **Database** menu.
3. Click the **Add Gateway** button.
4. Enter the Defiant serial number.
5. Click **Add Gateway.**





6. Once the Defiant is registered, **copy** the Auth Token and **paste** it into the **EI-Analytic** screen on the Defiant Admin Console Config Menu>EI-Analytic tab:





Once registered, click the Admin console link to remotely access a Defiant.

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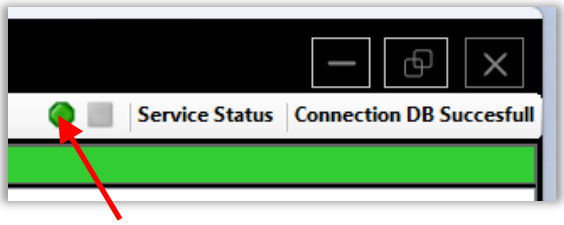
7. Ensure both **Connect to EI-Analytic** and **Send data to EI-Analytic** boxes are checked as shown.
8. Click **Save** and the Defiant will restart. Upon reboot it will start sending data to the EI-Analytic database.

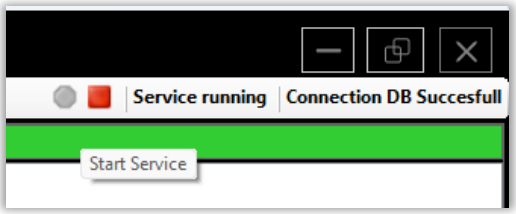
Option 2 - Configure Defiant for a Local DB

1. Open the Config menu and select Send data to EI-Monitor/PhantomLib.
2. Enter the IP address of the computer/server from step 6 in this field. **Note** - Network routing must be possible between Defiants and the EI-Monitor PC/server.
3. Select **Save**. The Defiant will then restart.

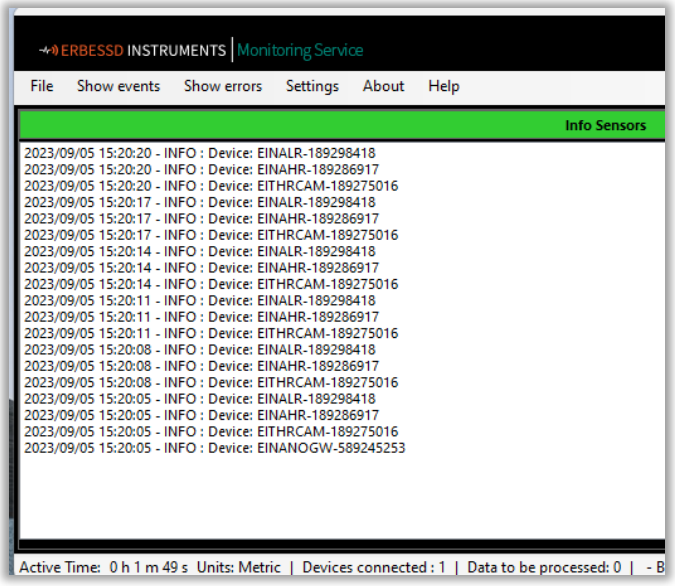
Note: A static IP address or use of a Hostname is required for the EI-Monitor PC/Server to ensure the address never changes. This will cause the database to go off-line.

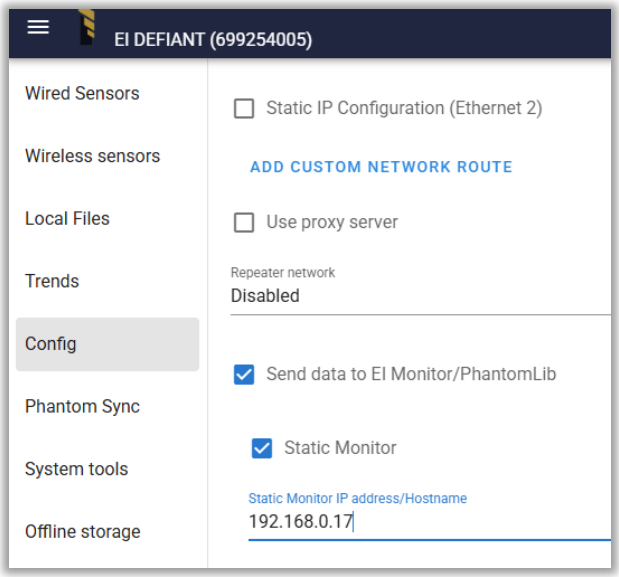
4. Return to EI-Monitor software and click the green octagon to start the service. The banner will change to "Service running". To stop the data collection service, click the red stop button.





The main screen of EI-Monitor defaults to the **Show Info** mode. Upon startup a message from each Defiant is sent with its serial number, followed by messages scrolling on the screen every few seconds from each sensor.





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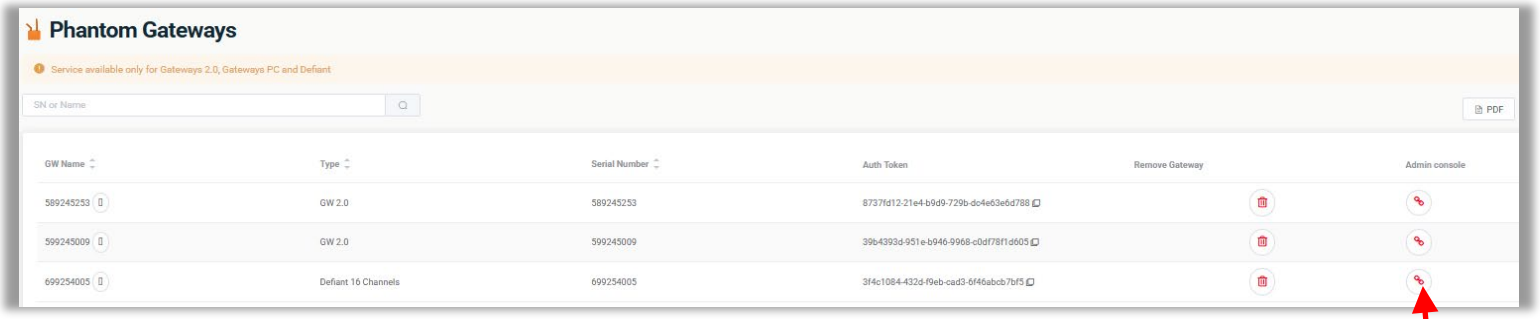
Remotely Accessing a Defiant

Once registered, Defiants can be accessed through the EI-Analytic web interface. This requires the following steps:

1. Login to your EI-Analytic account where the Defiant is registered.
2. From the **Database** drop-down menu choose **Gateway Manager**.



Click on the Admin console link icon for the desired Defiant. A new browser tab will open, providing full access to manage the Defiant and all connected sensors. **Note** – you can set a password for access to the Defiant Console.

Step 5 – Create Machine Database

The main database component is the **Machine.**

Machines can be administered in three ways:

1. From DigivibeMX software (on a Windows device).
2. The EI-Analytic web portal (requires EI-Analytic cloud database account, supports any web browser).
3. Using the WiSER VIBE mobile app (requires EI-Analytic cloud database account, supported on iOS or Android devices.)

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Detailed instruction for adding Machines, can be found in either the Phantom Setup Guide, the EI-Analytic User Guide or the Wiser Vibe User Guide. All are available on the Erbessd Instruments web site.

Phantom Setup Guide https://www.erbessd-instruments.com/wp-content/uploads/2025/03/Phantom-Setup-Guide-v5-2.pdf

Latest **Digivibe User Guide**: https://static.erbessd-instruments.com/guides_manuals/digivibemx/digivibemx11_user_manual.pdf

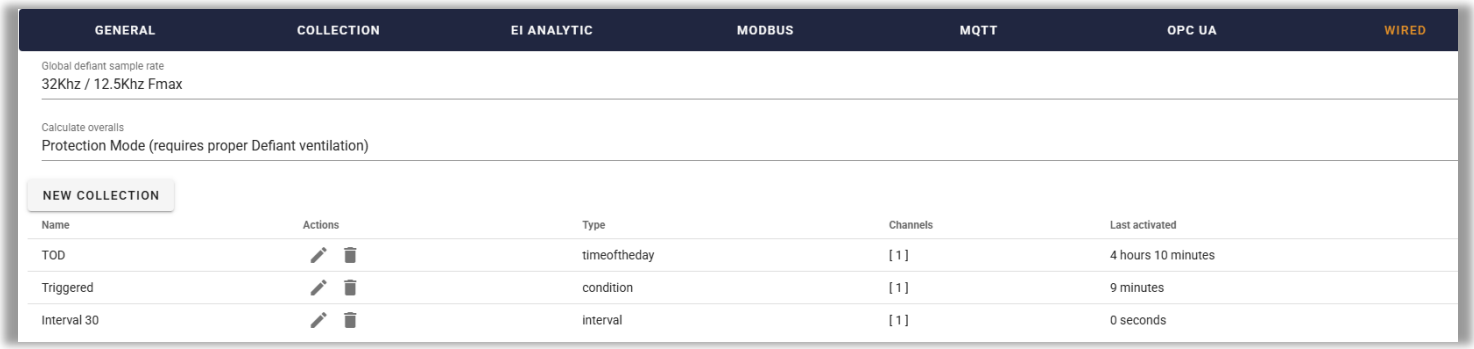
EI-Analytic User Guide: https://www.erbessd-instruments.com/wp-content/uploads/2025/03/EI-Analytic-User-Guide-v2-15-2.pdf

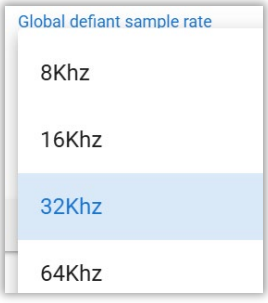
WiSER Vibe mobile App User Guide: https://www.erbessd-instruments.com/wp-content/uploads/2023/12/WiserVibe-Pro-User-Guide_NEW-x.pdf

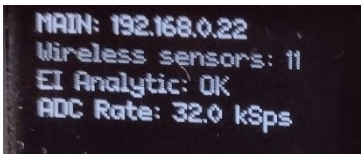
Step 6 - Defiant Settings

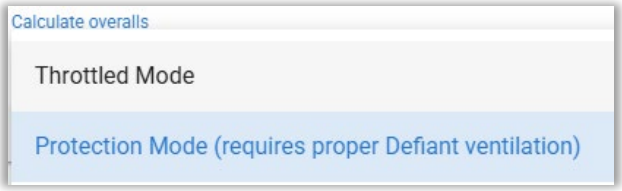
Wired Channels

The **Wired** tab of the **Config** menu contains settings for the **Global Sample Rate** and **Calculation Mode**. This is also where Collections are created for wired channels.









The Sampling Rate is shown on the OLED screen (ADC Rate).

For the **Calculate Overalls** parameter, set to **Protection mode** when using Digital Channels (D1-4) or with Modbus or OPC UA integrations. This increases CPU load and generates more heat, so proper ventilation is required. Overall values are still calculated every 50 ms in Throttled mode.

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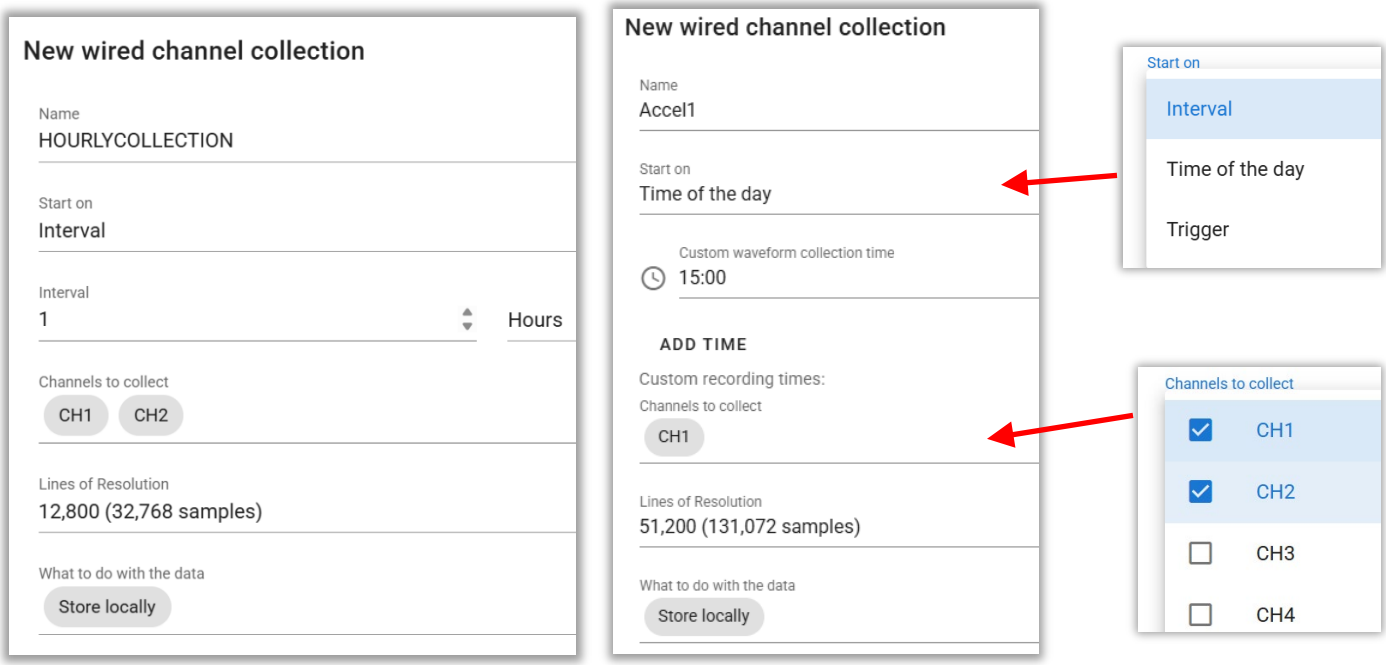
Collections

Click NEW COLLECTION to create Collections for wired devices.

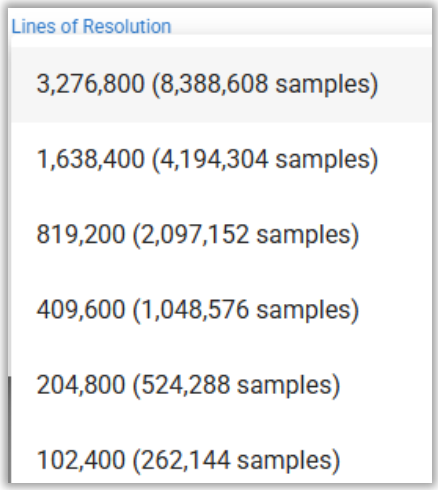
Examples of Collections using the **Start on** parameter, one using Interval(collect data once an hour) and the second using a specific time-of-day:



Note – when multiple channels are chosen for recording in a Collection, they are recorded synchronously. This permits phase analysis of the resulting data.

Lines of Resolution range from 200 to 3,276,800.

When a sampling rate above 204,800 (the limit for continuous recording) is chosen for a Collection, the recording is saved as a **Short TWF**. The maximum rate of 3,276,800 with the default sampling rate of 32 KHz will result in a 262 second recording with a file size of 16 MB created



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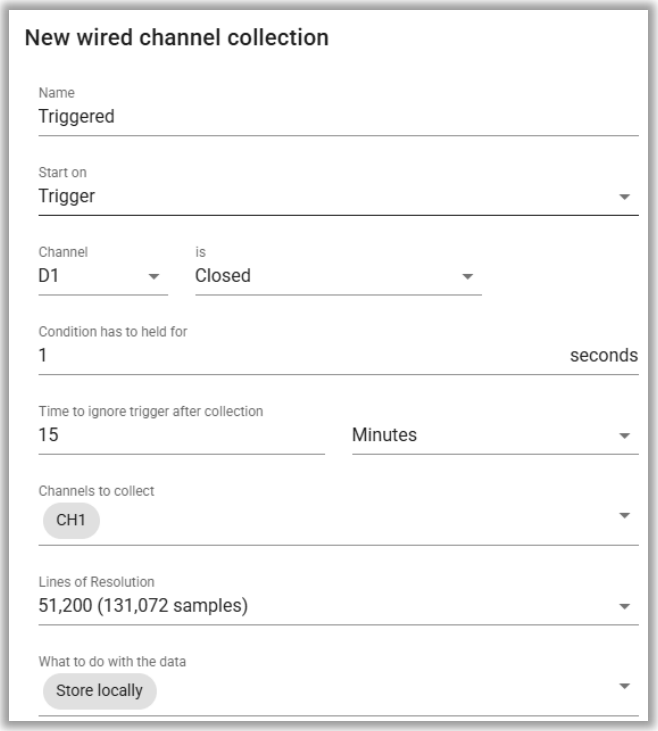
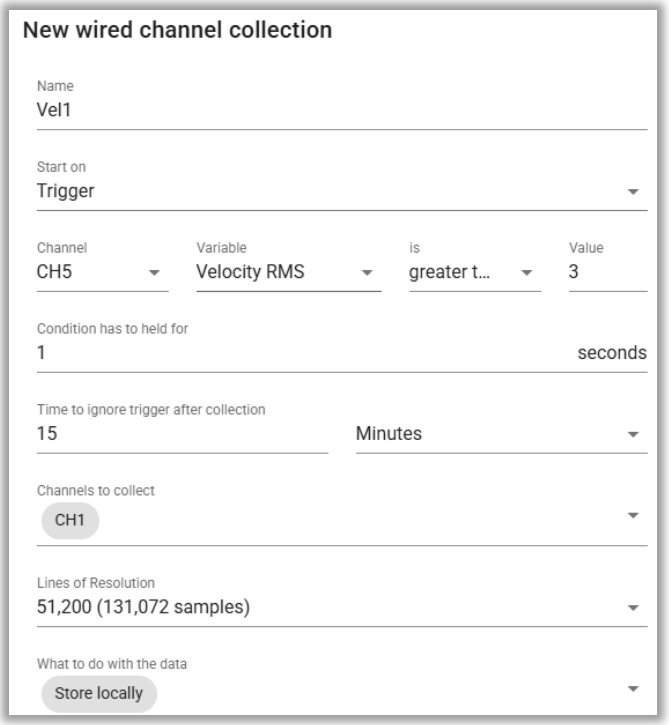
Examples of **Triggered** collection. Digital or Analog channels may be used to trigger a collection.

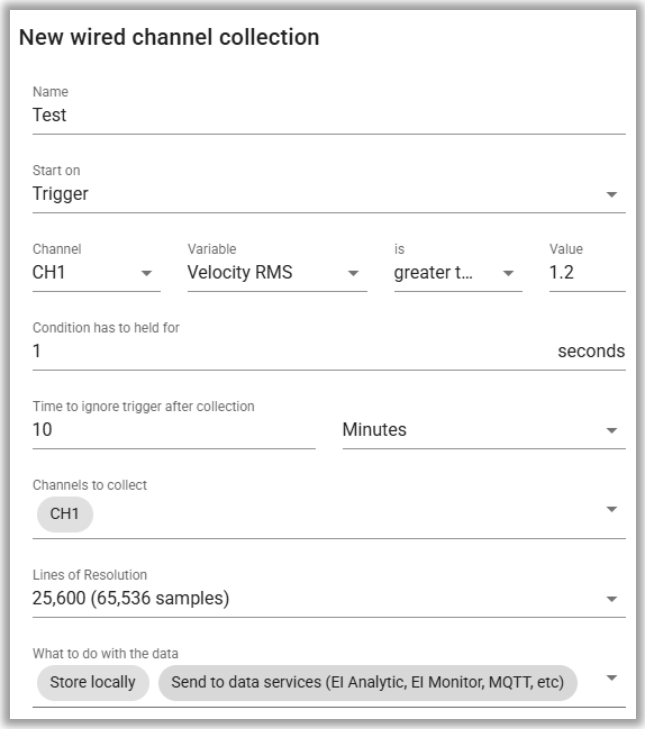




In the first example, Digital channel 1 will cause a collection with 51,200 LoR to be taken every 15 minutes IF Digital channel 1 (D1) status is Closed. In the 2nd example, channel 1 will collect data every 15 minutes if the RMS Velocity on channel 5 is above 3 mm/s.

A given channel may *trigger itself* to take a collection as well.

In this example, channel 1 will take a 25,600 LoR collection if the velocity RMS on channel 1 is over 1.2 mm/sec. This is repeated every 10 minutes.



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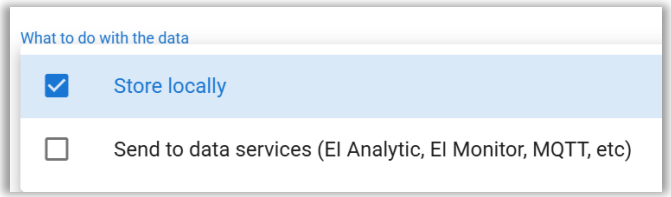
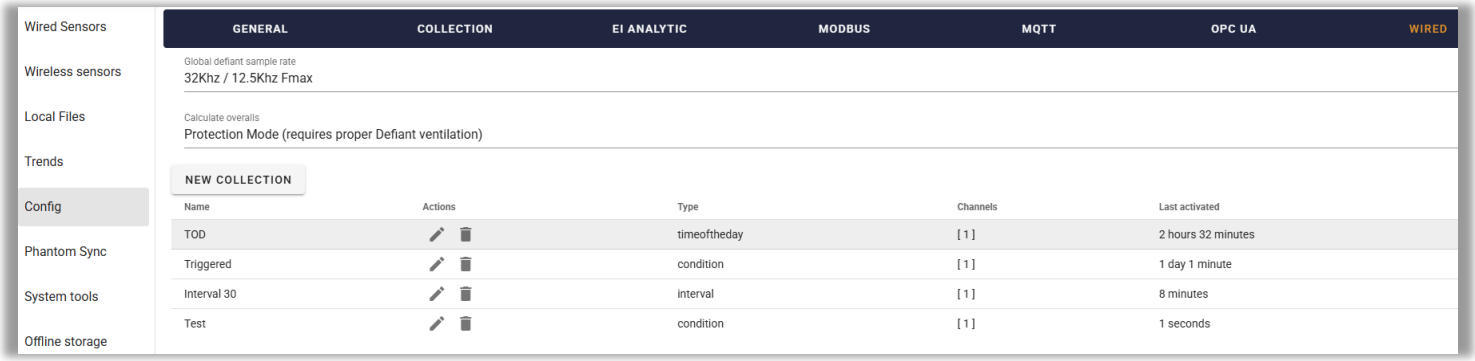
Choose **where to store the data**. The internal 256 GB SSD is used to store Collections measurements locally. Collections can also be sent to a local database via EI-Monitor, or to an EI-Analytic cloud database. Or BOTH options may be selected. Future firmware releases will support copying the local SSD files to a USB drive. (Defiant is equipped with 4 - USB 3.0 ports)

Note – only data collected at 409,600 (1,048,576 samples)Lines of Resolution or less is supported by EI Analytic or EI-Monitoring.



All collections are listed on the **Wired** tab and can be edited or deleted here:



Wireless

Phantom wireless sensors are fully supported by Defiant, with the same interface as offered by Phantom Gateways.

For details regarding installation of Phantom sensors, please refer to the Phantom Setup Guide V5, found on the Erbessd website here: https://www.erbessd-instruments.com/wp-content/uploads/2025/03/Phantom-Setup-Guide-v5-2.pdf

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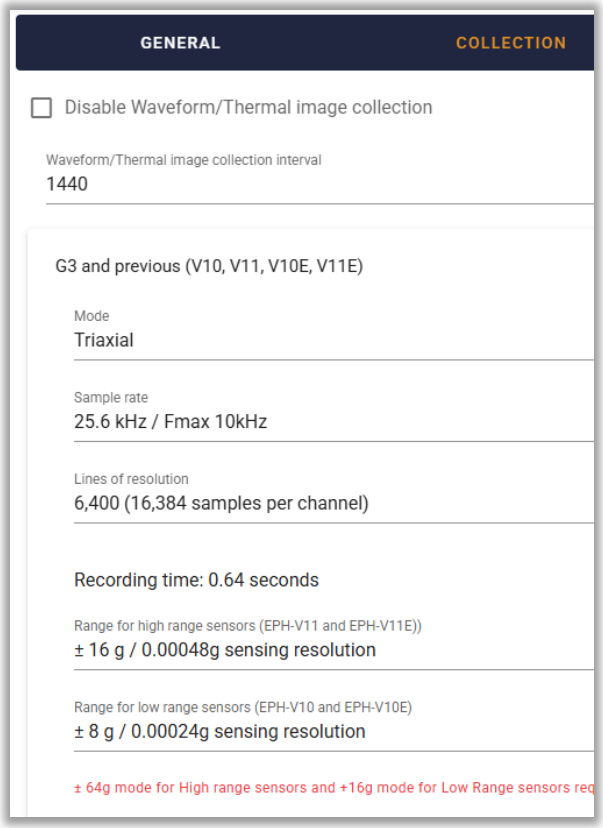
Wireless Global Collection Settings

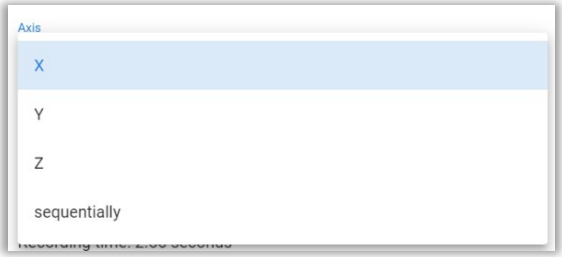
The **Collection** tab on the Config menu is used to configure the Global Settings for Phantom wireless vibration sensors.



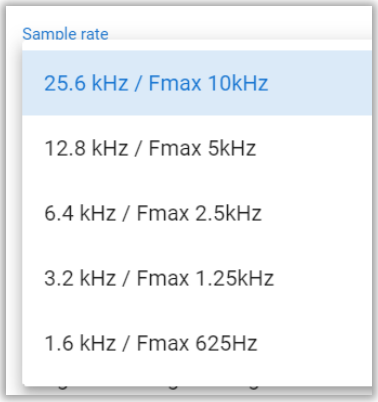
Disable Wavefrom/Thermal image collection - stops data collection of Time Waveform data from all vibration sensors and thermographic images from Phantom EPH-T70 sensors. RMS values will continue to be reported.

Waveform/Thermal Image Collection Interval :This is the collection interval for Time Waveform data from vibration sensors, and thermographic images from Phantom EPH-T70 sensors. It can be configured in days, hours, or minutes. The minimum interval for Phantom vibration sensors is 10 minutes. The default is 720 minutes(12 hrs).

Mode switches the type of data collection between **Triaxial** (three axes simultaneously) or **Single Axis** (one axis or three axes sequentially). When you select **Single Axis**, the **Axis** option will appear, where you can choose the axis on which you want to collect data (**x, y** or **z**), or if you want to collect on all axes **sequentially**.



Sample rate allows choice of rate and related Fmax of the sensor.



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The following tables show the relation between recording time, sampling rate and Fmax.

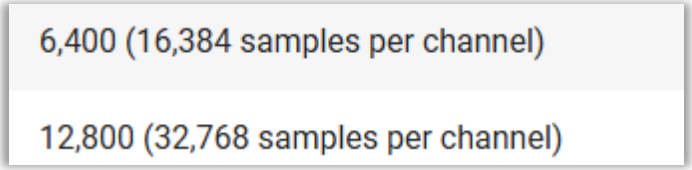
V10, V17, V10E and V15 High Sensitivity sensors

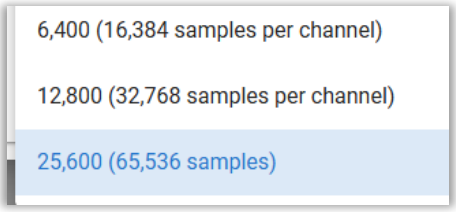
Recording time (s) 3 axes	0.64	1.28	2.56	5.12	10.24	20.48	40.96	81.92
Recording time (s) 1 axes	2.56	5.12	10.24	20.48	40.96	81.92	163.84	327.68
Sample rate (Hz)	25,600	12,800	6400	3200	1600	800	400	200
Max frequency (Hz) [x,y]	4000	4000	2500	1250	625	312.5	156.25	78.125
Max frequency (Hz) [z]	1800	1800	1800	1250	625	312.5	156.25	78.125
Lines of Resolution	Triaxial-12,800 Single Axis-25,600							
Spectral noise (@10 Hz)	130 µg√Hz							

V11, V18, V11E and V16 High Range sensors

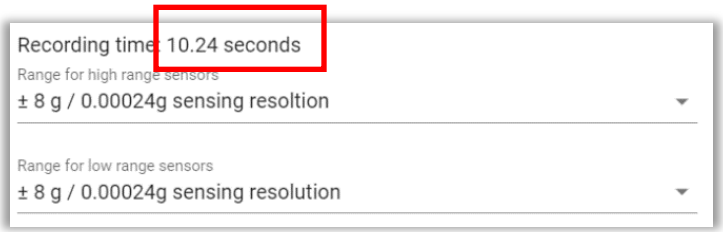
Recording time (s) 3 axes	0.64	1.28	2.56	5.12	10.24	20.48	40.96	81.92
Recording time (s) 1 axes	2.56	5.12	10.24	20.48	40.96	81.92	163.84	327.68
Sample rate (Hz)	25,600	12,800	6400	3200	1600	800	400	200
Max frequency (Hz) [x,y]	10,000	5000	2500	1250	625	312.5	156.25	78.125
Max frequency (Hz) [z]	5100	5000	2500	1250	625	312.5	156.25	78.125
Lines of Resolution	Triaxial-12,800 Single Axis-25,600							
Spectral noise (@10 Hz)	630 µg√Hz							

Triaxial mode supports 6400 or 12,800 resolution lines; :**Single axis** mode supports up to 25,600 resolution lines:





According to the selected collection type, sample rate and resolution lines, the collection time will change and will be displayed in **Recording time**.



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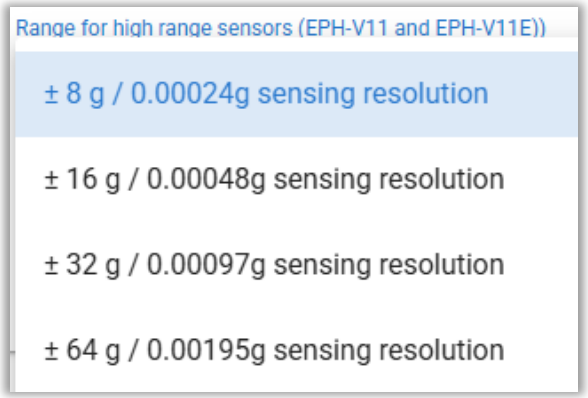
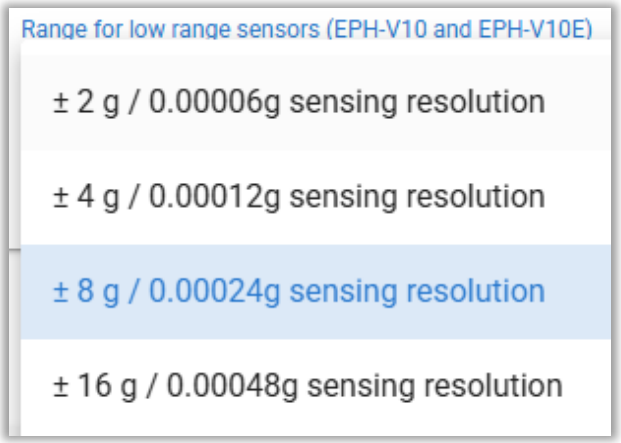
Select the default dynamic range forwhich the sensors will collect data.

For high range sensors (V11), choose from the following options. **Note** ±64 g requires sensor firmware version 190.



For high sensitivity sensors (V10), choose from the following options:



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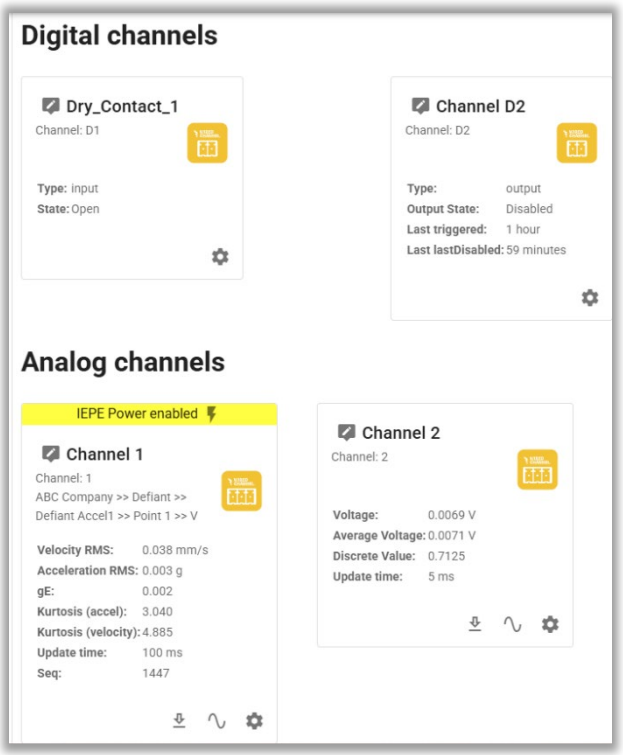
Wired Sensor Live State

The Wired Sensor screen shows the status of all Digital and Analog channels along with other useful information.

- The storage capacity status of the internal SSD is shown. Space used is listed by Continuous TWF , Short TWF, Overalls and the Upload Queue (aka Offline Storage).
- Uptime is the elapsed time since the last system restart.
- CPU load maxes out at 400% (4 core CPU)



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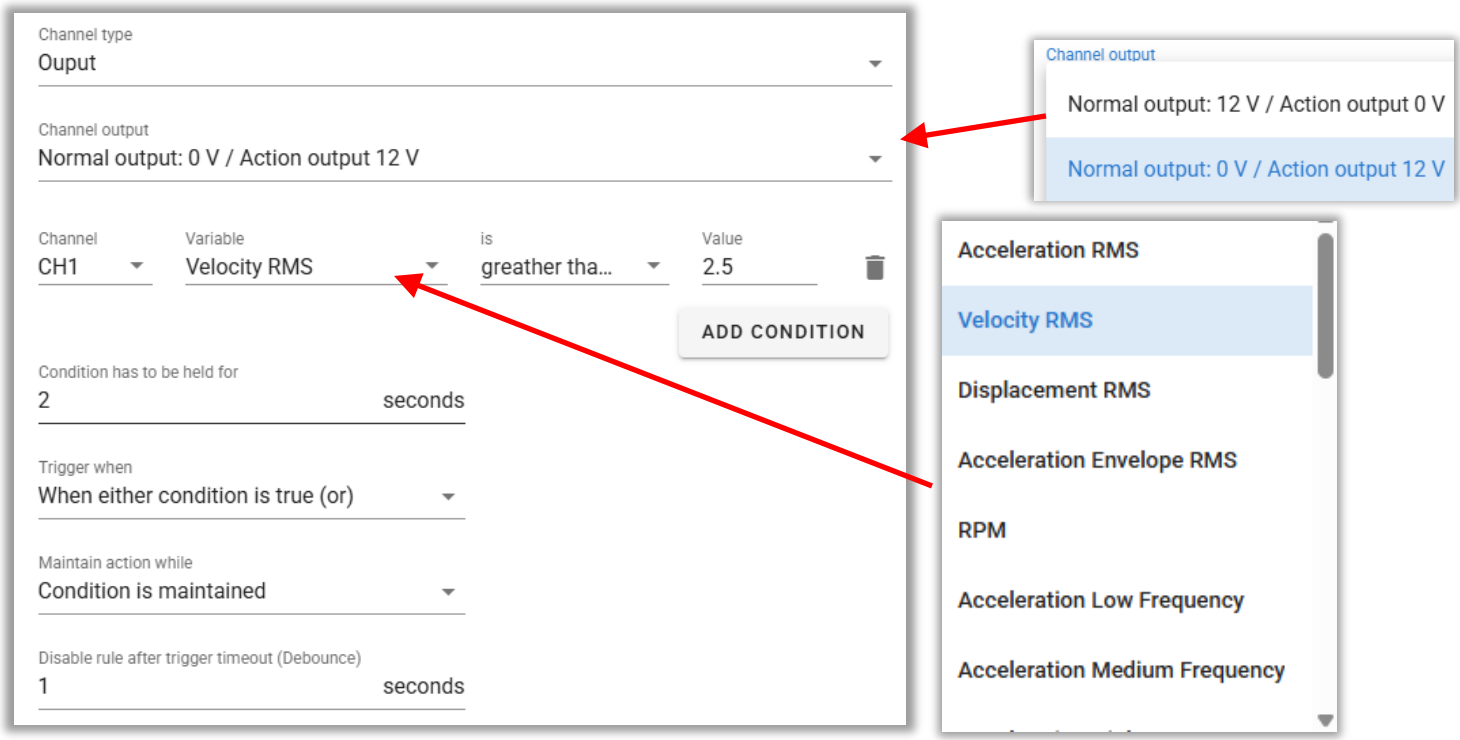
Digital Channels

Digital Channels 1-4 can be set to either Input or Output mode. When assigned as an Input, they detect contact closure. This is effectively the same as an EPH-G62 Dry Contact Phantom sensor.

As an output, a Digital channel may be set to provide 0 VDC or 12VDC based on a configurable parameter associated with one of the analog channels.

For Inputs there are no settings. The state is open or closed.

For outputs, select between 0 VDC or 12 VDC when the condition is met.



Note - The **Value** field is Metric units for velocity.

Multiple Conditions may be added with output activated when either or both conditions are true.

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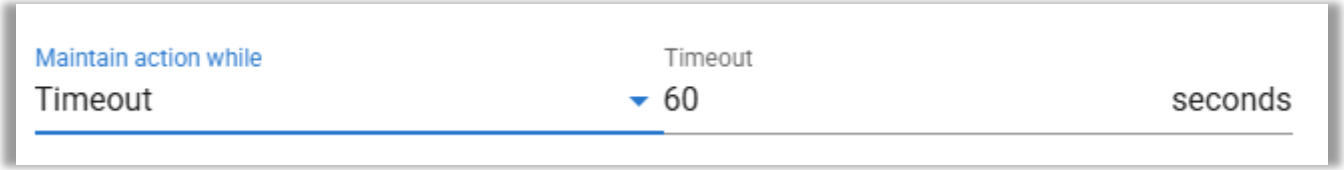
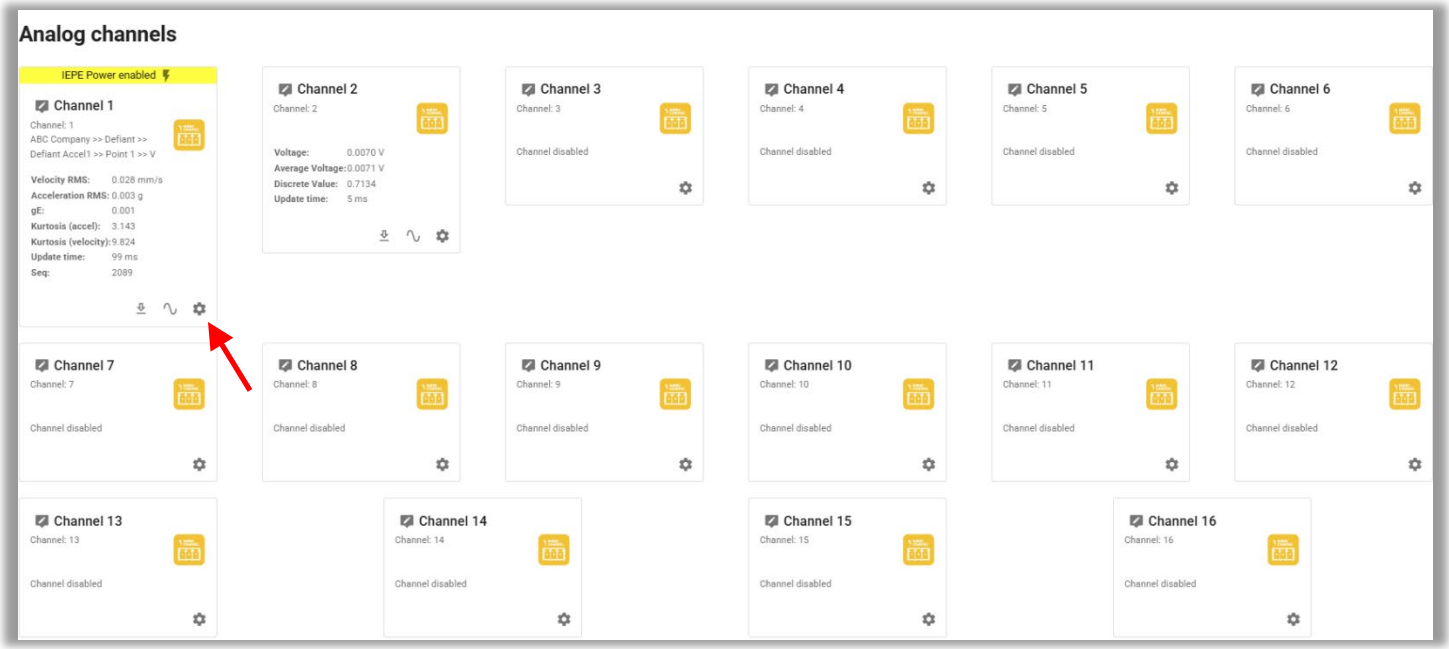
The **Maintain action** field determines if the 0 or 12 VDC is maintained for as long as the condition is true or if it will Timeout:



The **Disable Rule after trigger** field (aka Debounce) sets a time buffer after a trigger occurs, before the next trigger is recognized.

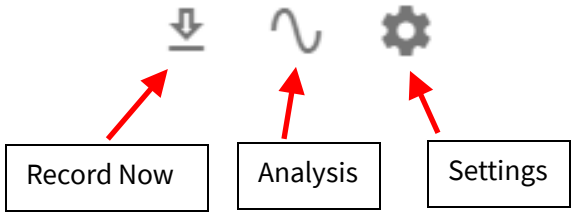
Analog Channels

Defiant models support 8 or 16 channels, depending on the model purchased.



Each Channel has 3 function buttons.

Click the Gear icon to configure an analog channel.



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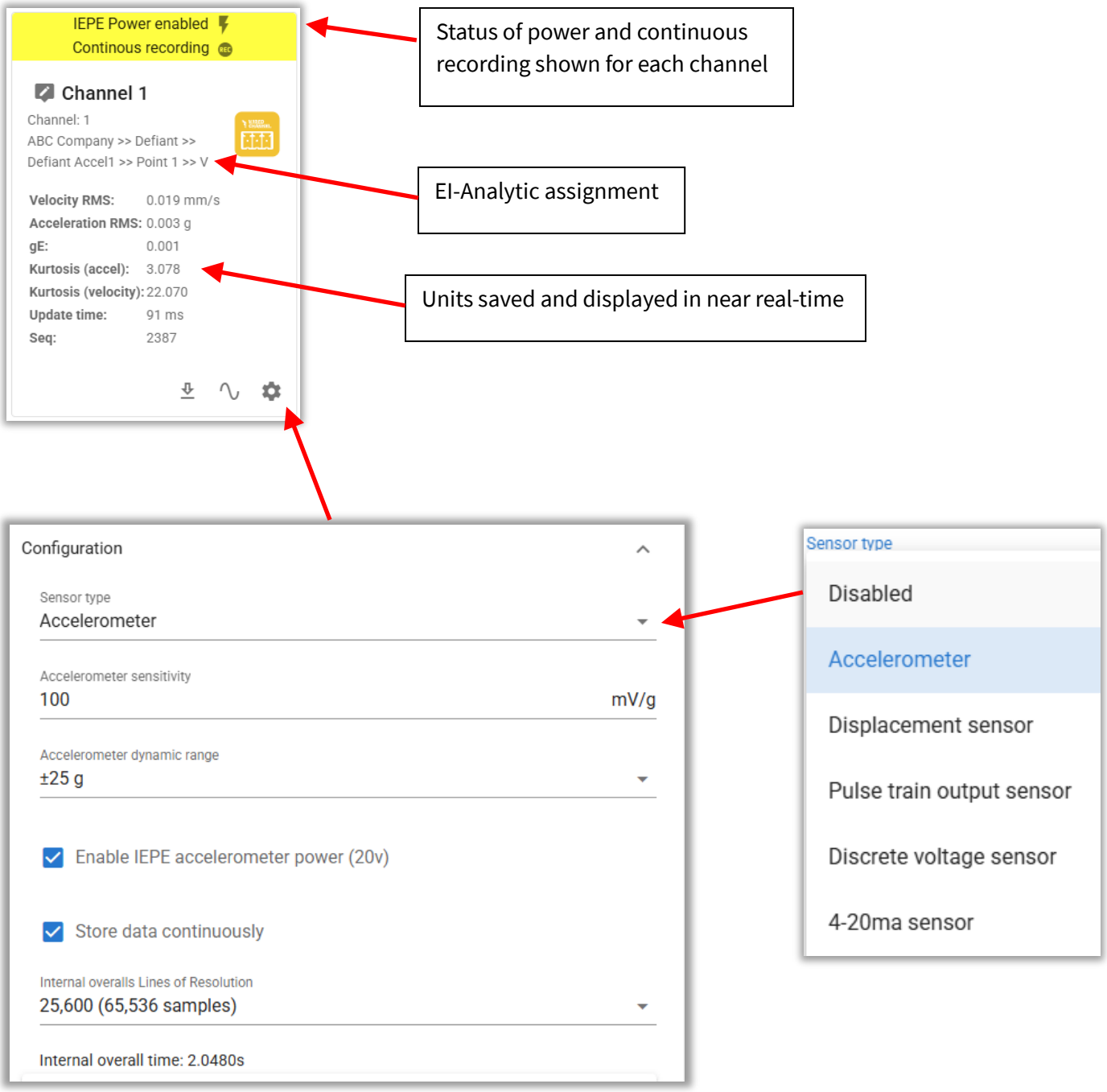

For 2-pin IEPE accelerometers, you can enable **20V accelerometer power** to drive the sensor.Do not select this for other sensors that do not require accelerometer power, it may damage the sensor.

Click **Store data continuously** for full-time collection of data from this channel. The data stored on the internal SSD will eventually start to overwrite once it has reach capacity.

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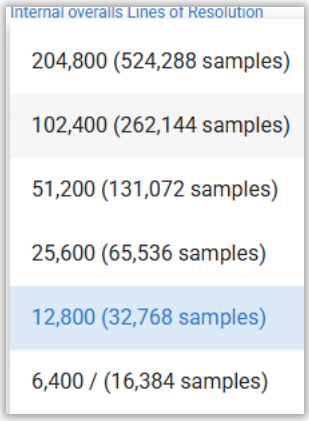
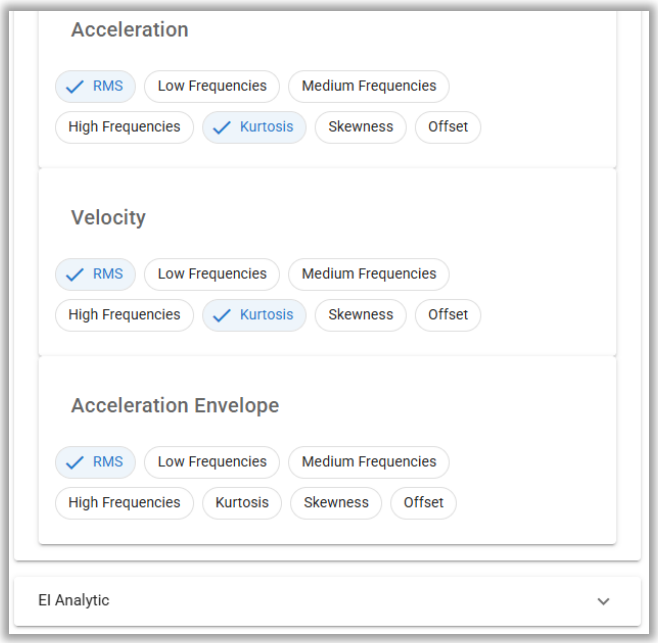
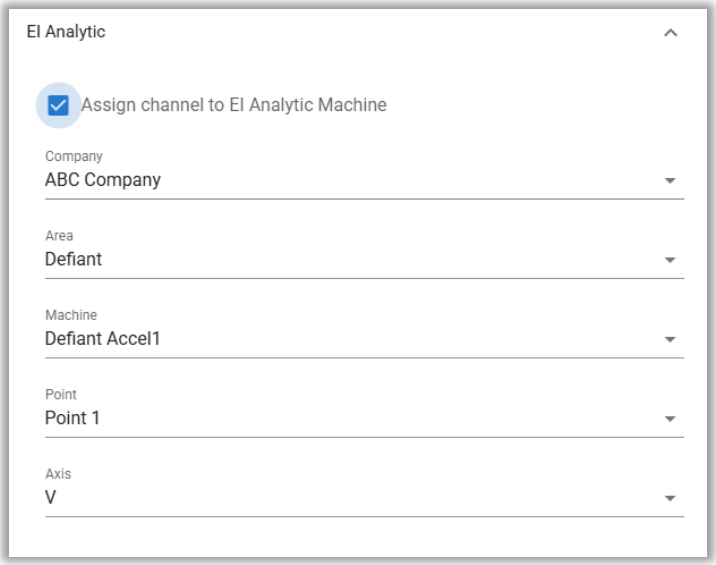
Set the **Lines of Resolution**. The internal overall time is displayed to show the length of recording taken when not in continuous mode. Values range from 200 to 204,800.



Choose the units of Acceleration, Velocity and Acceleration Envelope to be saved and also displayed on the Live State screen.



To assign the data collected from an analog channel to a Machine/Point/Axis in EI-Analytic or a local DB, enter the info:



Press **SET** to save.

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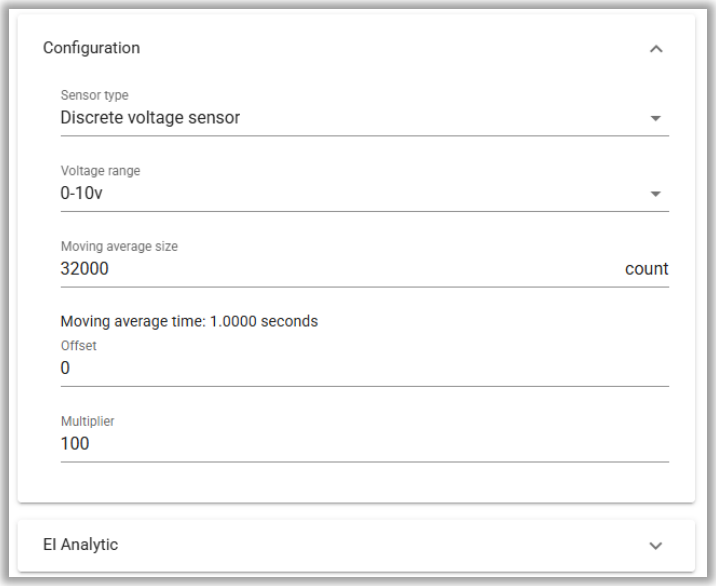
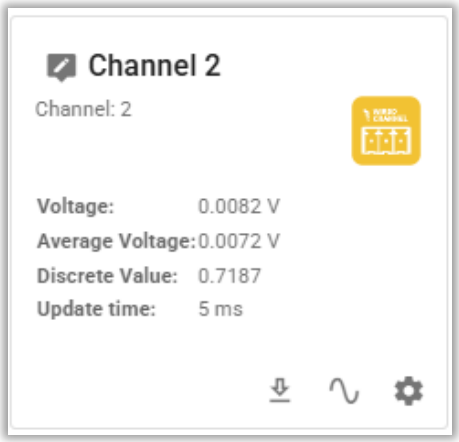
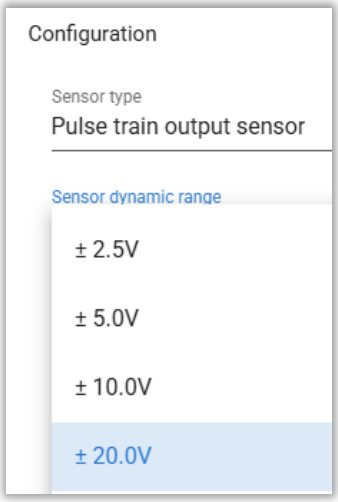
When configuring a channel as a **Discrete Voltage sensor**, extra fields allow for data manipulation.

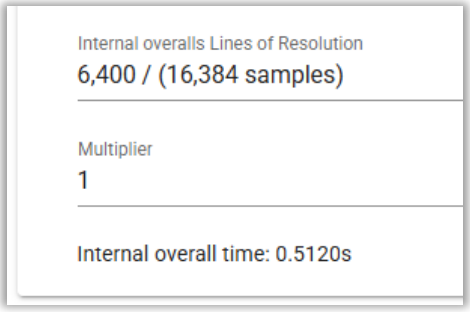
The moving average size defines the number of samples to average. In the example of 32,000, it will average the input voltage every second since the Global Sampling Rate is set to 32kHz. An Offset and a Multiplier may be set to manipulate the output units. (Average Voltage * Multiplier) + Offset=Discrete Value. In this example an average voltage of 3.0382 is multiplied by 100 to show a discrete value of 303.8223 units. The Discrete Value of an analog channel may be used as a condition to activate a Digital channel output (apply or remove 12 VDC).





When configured for a **Pulse Train output sensor**, select the dynamic range voltage, the Lines of Resolution and a Multiplier if needed.





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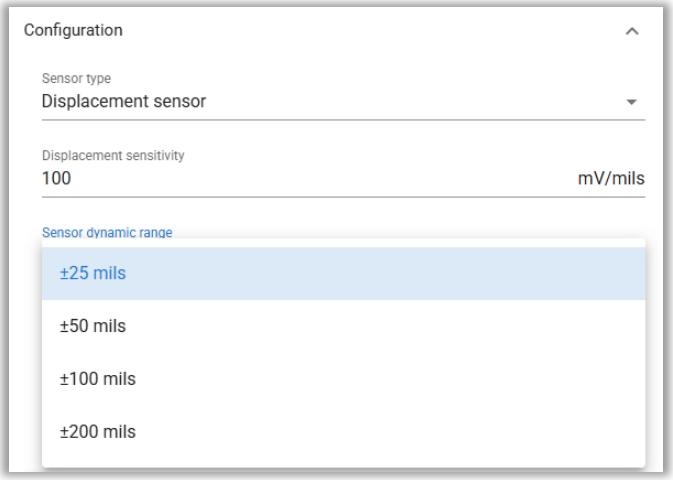
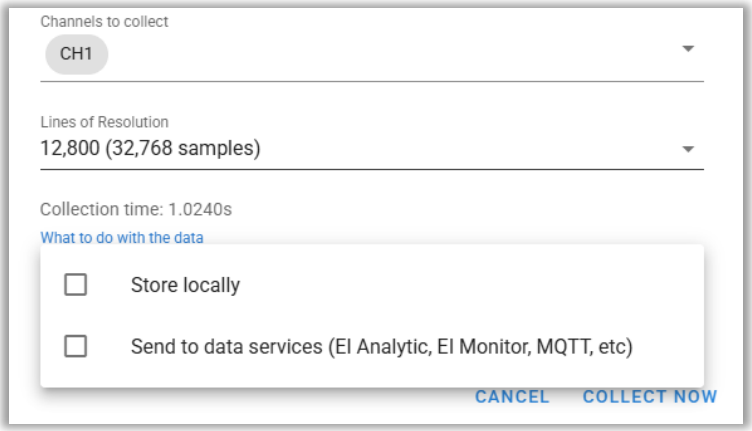
For a **Displacement sensor**, enter the Displacement sensitivity in mV/mils and the Dynamic Range in mils:



Record Now

To collect on-demand data, click the Record Now button: 



Enter the channels, LoR and data destination, then click **Collect Now**.

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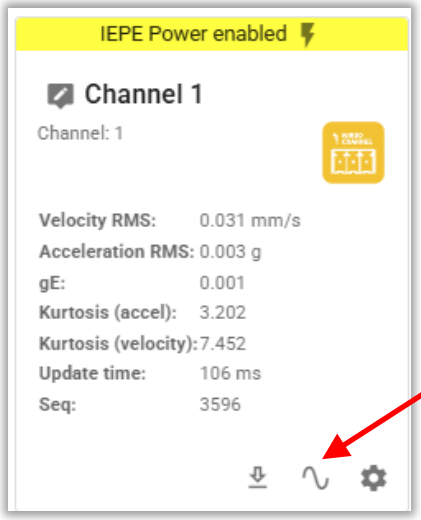
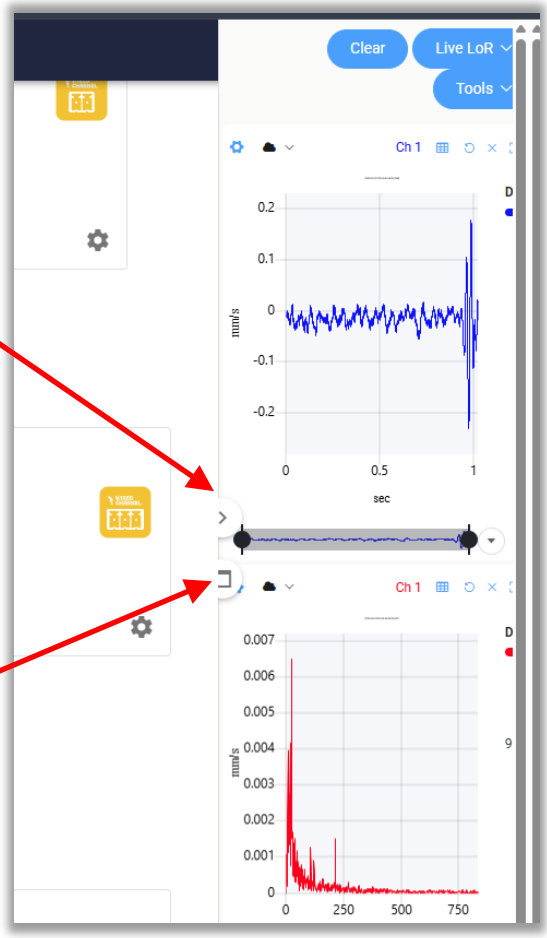
The Analysis Window

When the Analysis button is pressed for a channel, the Analysis window opens from the right side of the screen.



Collapse window

Expand window



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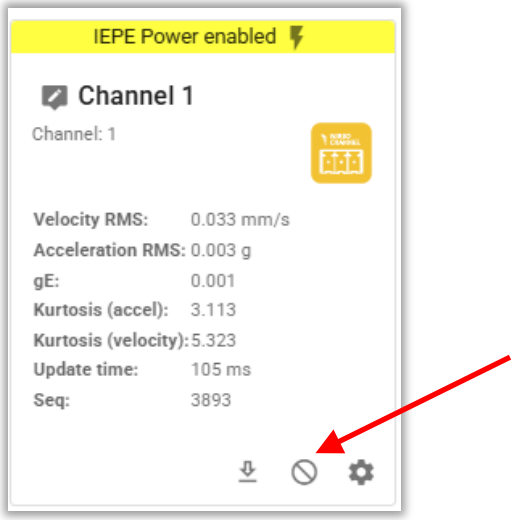
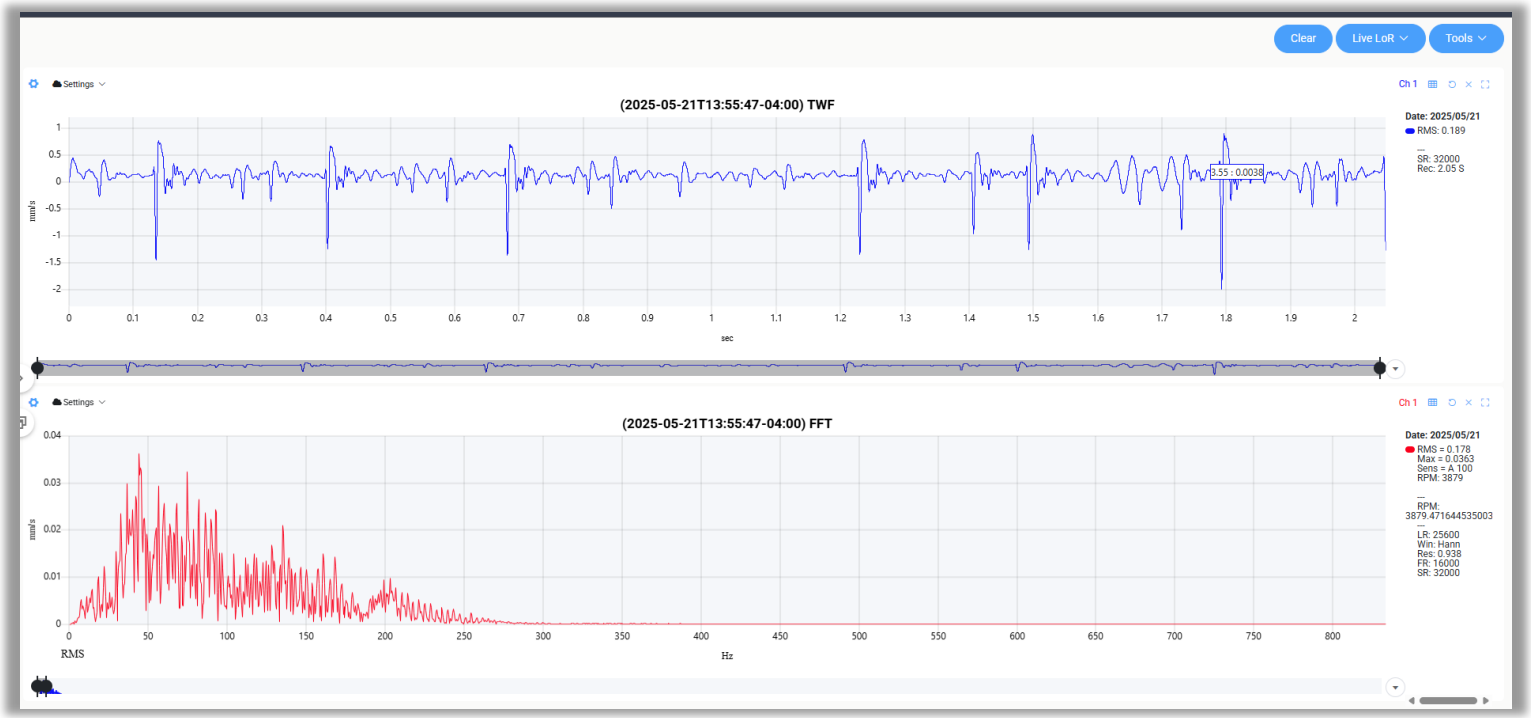
The Analysis window shows real-time data from the selected channel until the Analysis button is toggled:



The Analysis window consists of the Time Waveform, the FFT, Legends on the right side and many features for analysis.



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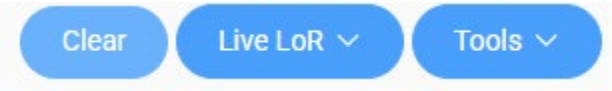
Three toolbars at top right contain:



Clear – Clear the TWF and FFT display.

Live LoR allows changing the real-time Lines of Resolution.

Optional **Tools** include :

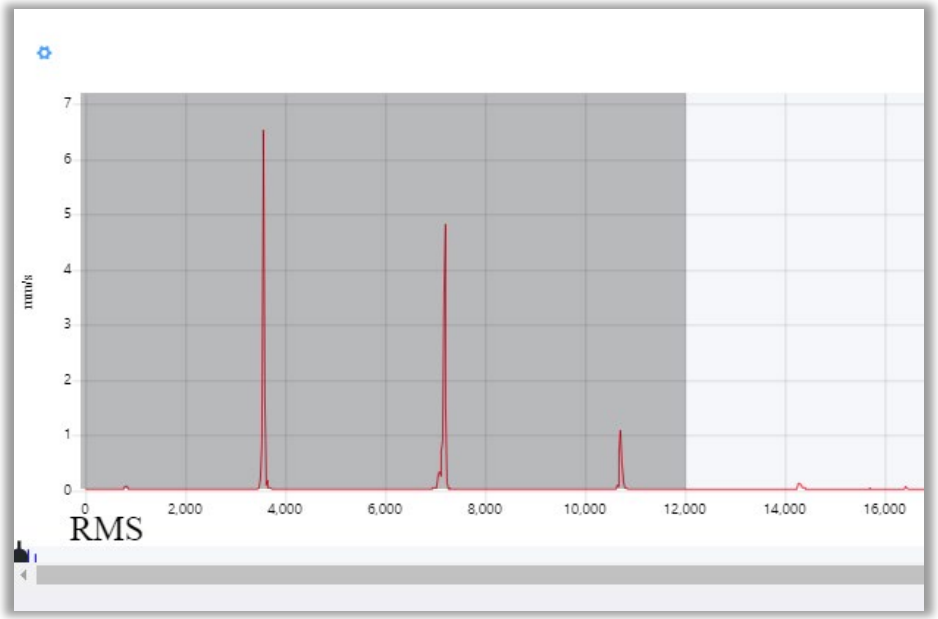
- Circular Time Waveform
- Orbits (requires opening 2 channels)
- Bode Plot (requires a reference channel)

Horizontal and Vertical zoom

Horizontal or vertical zoom is supported by drawing with the cursor. Use a mouse or trackpad to click, hold and drag over the area of the signal you want to enlarge. The zoom bar below the TWF and FFTcan also be used to zoom horizontally on the graph, however you cannot use this bar to zoom vertically.

Horizontal zoom:

Drag the cursor over the area to zoom, it will be highlighted in grey :



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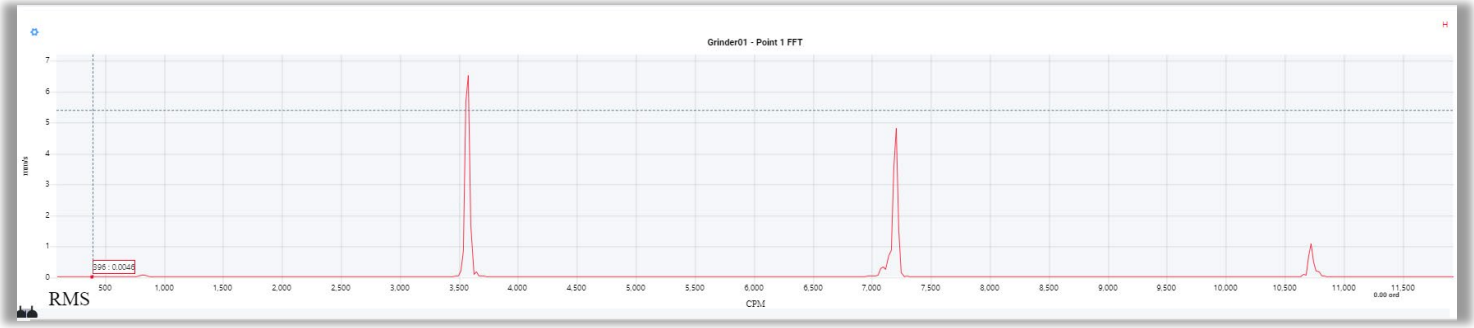
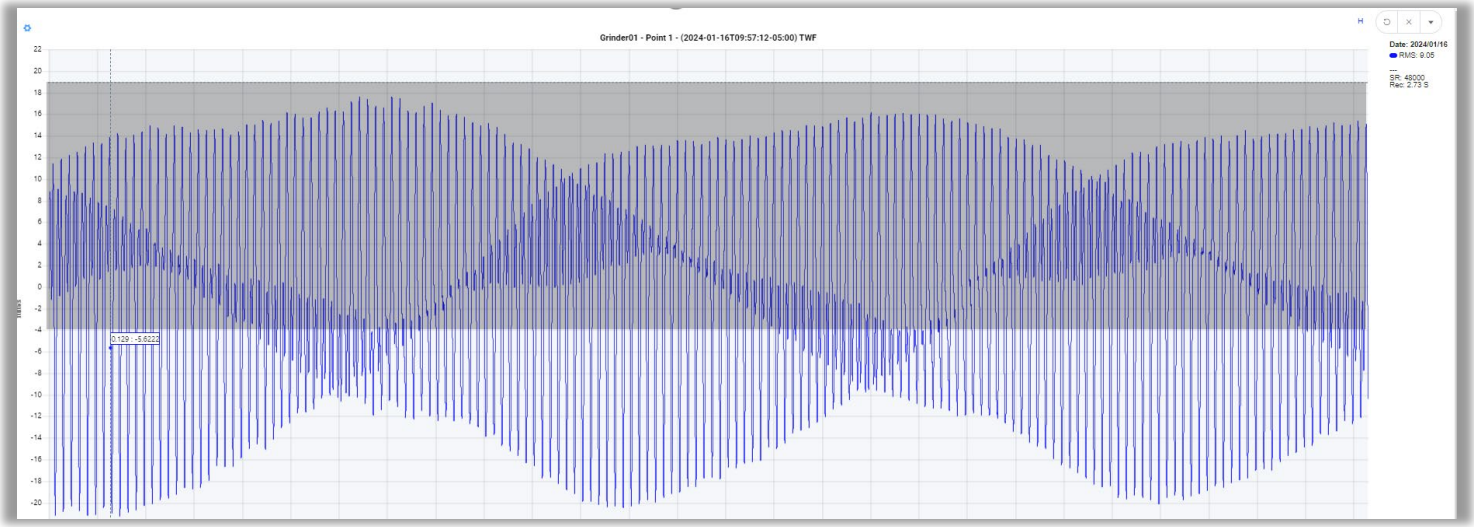
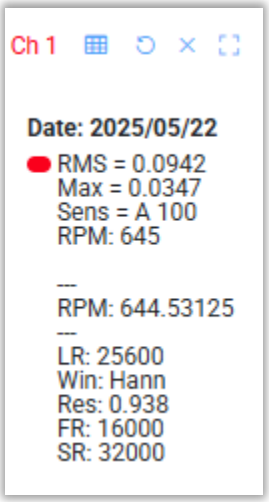
Enlarged view:



Vertical Zoom:

Use a mouse or trackpad to select the vertical area to zoom:





Undo Zoom
The Undo tool found at top right of TWF and FFT graphs, deletes the last zoom that was made, vertical or horizontal.

Delete Zoom
The deletes the zoom on the graphic, returning to the default setting.

Expand TWF & FFT
Use to toggle the TWF, or FFT graph from split screen to full screen mode.

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Analysis tools

Press the settings button at the upper left corner of the graph to access the TWF/FFT tools.

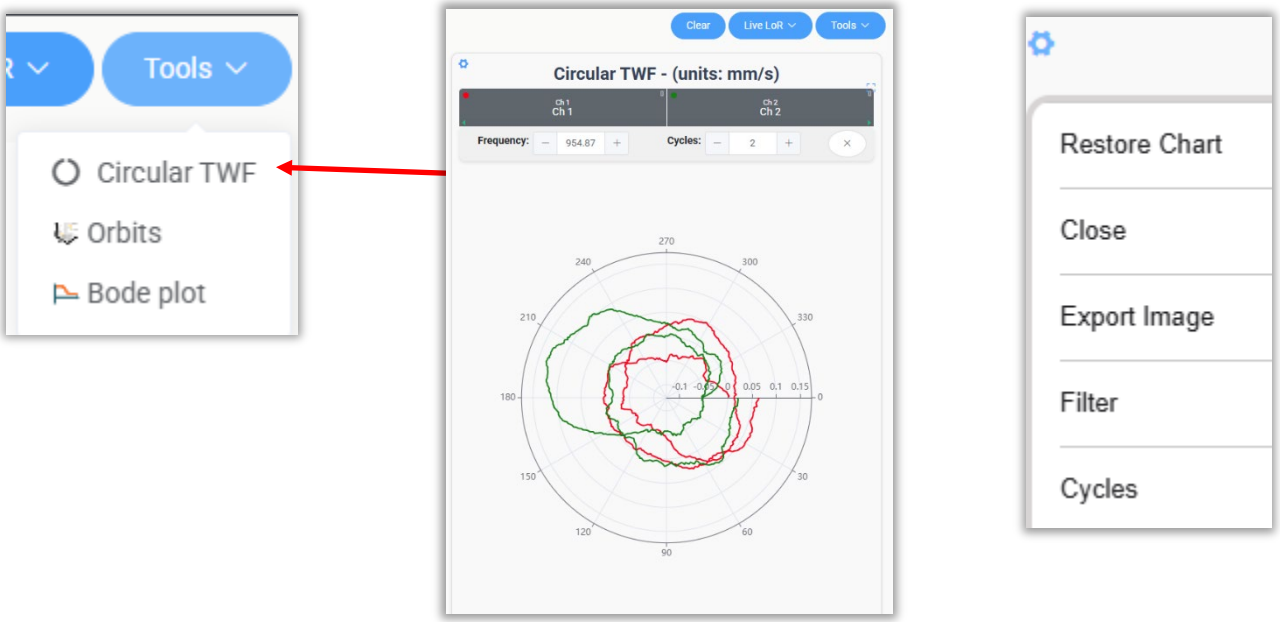
Not all tools are available when performing analysis in Defiant. For more detailed analysis, use the EI-Analytic web interface or Digivibe software to open the signal files (when stored in EI-Analytic or a local Database).

See the EI-Analytic User Guide for complete details regarding the TWF and FFT tools.

https://www.erbessd-instruments.com/wp-content/uploads/2025/03/EI-Analytic-User-Guide-v2-15-2.pdf

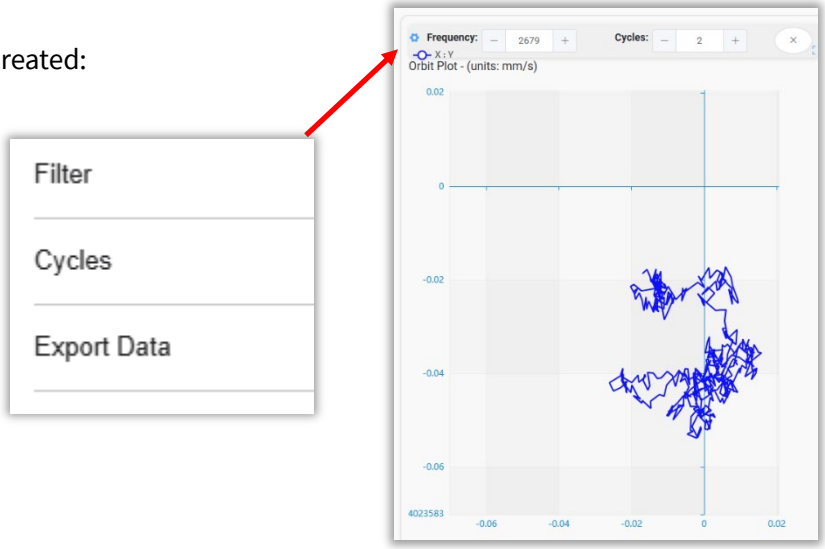
Circular Time Waveform

Can be added to the Analysis window from the Tools drop-down:



Orbits

With 2 channels opened an Orbit plot can be created:



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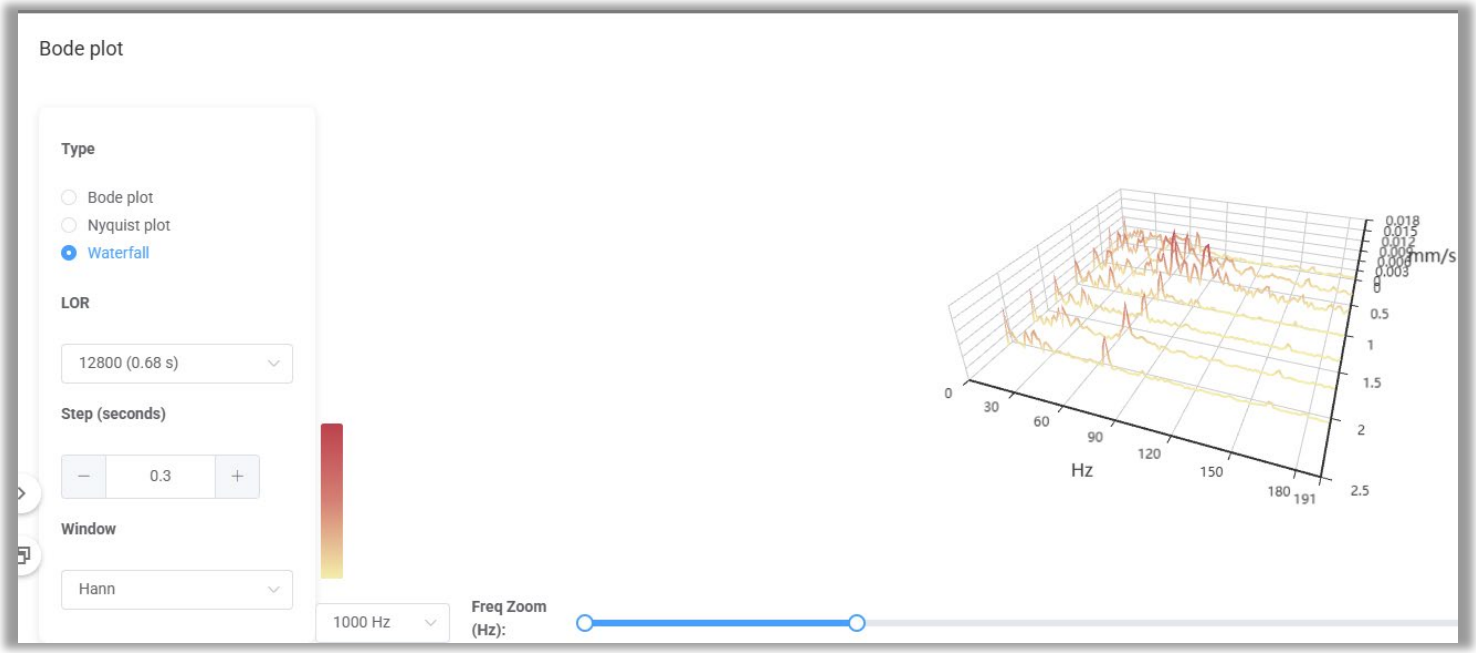
Bode Plot

This feature has three options:

- Bode plot
- Nyquist plot
- Waterfall

Example of a Waterfall:

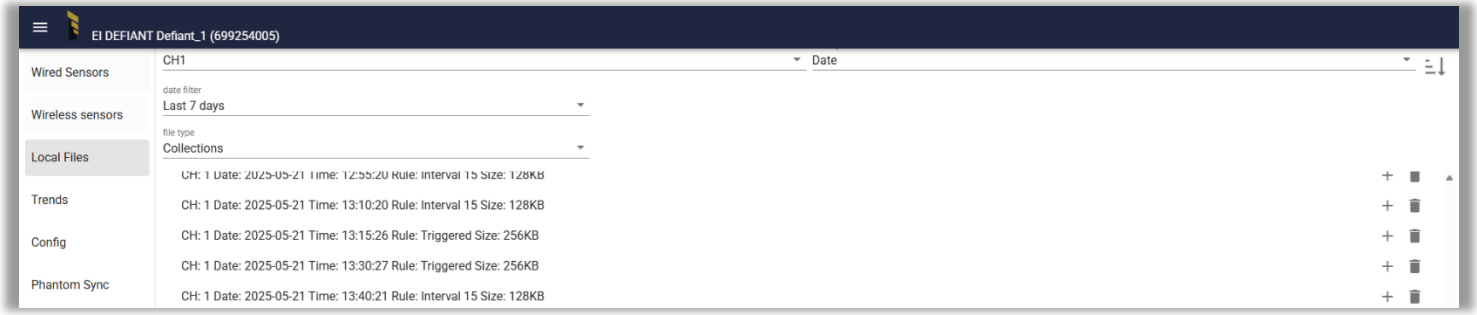


Local Files

Defiant stores data collected from analog wired channels on the internal SSD when the **Save Locally** option is chosen.

As previously described, Collections can be configured in the **Config>Wired** tab of the Defiant Admin Console.

The **Local Files** tab on the main menu shows all saved collections:



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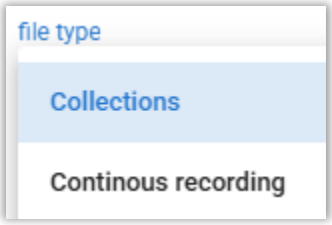
Local files can be displayed by Channel and by Date, which can be filtered. Sort order can be switched between ascending and descending.

There are two types of collection files:



- To open a file in the Analysis window, click the **+** icon on the right side of the screen.
- Only one type of file may be selected for viewing at a time.
- Each entry includes a time stamp and the collection rule in addition to the file size.
- To delete, click the garbage can icon. Once deleted, the file cannot be restored.
- Multiple files may be opened with their signals overlaid in the Analysis window.
- Each channel is shown as a separate color. Each can be toggled on/off by clicking the channel number.

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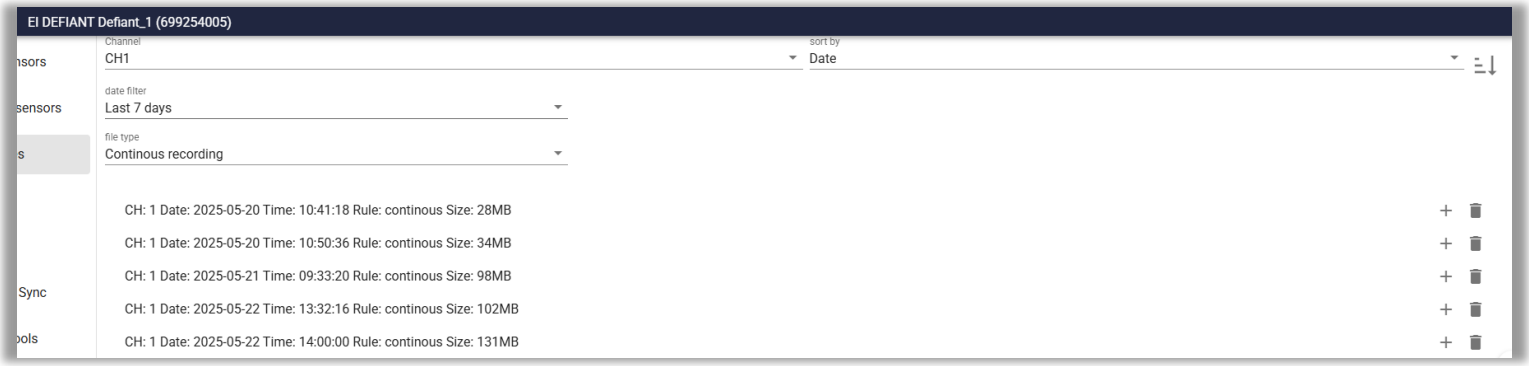
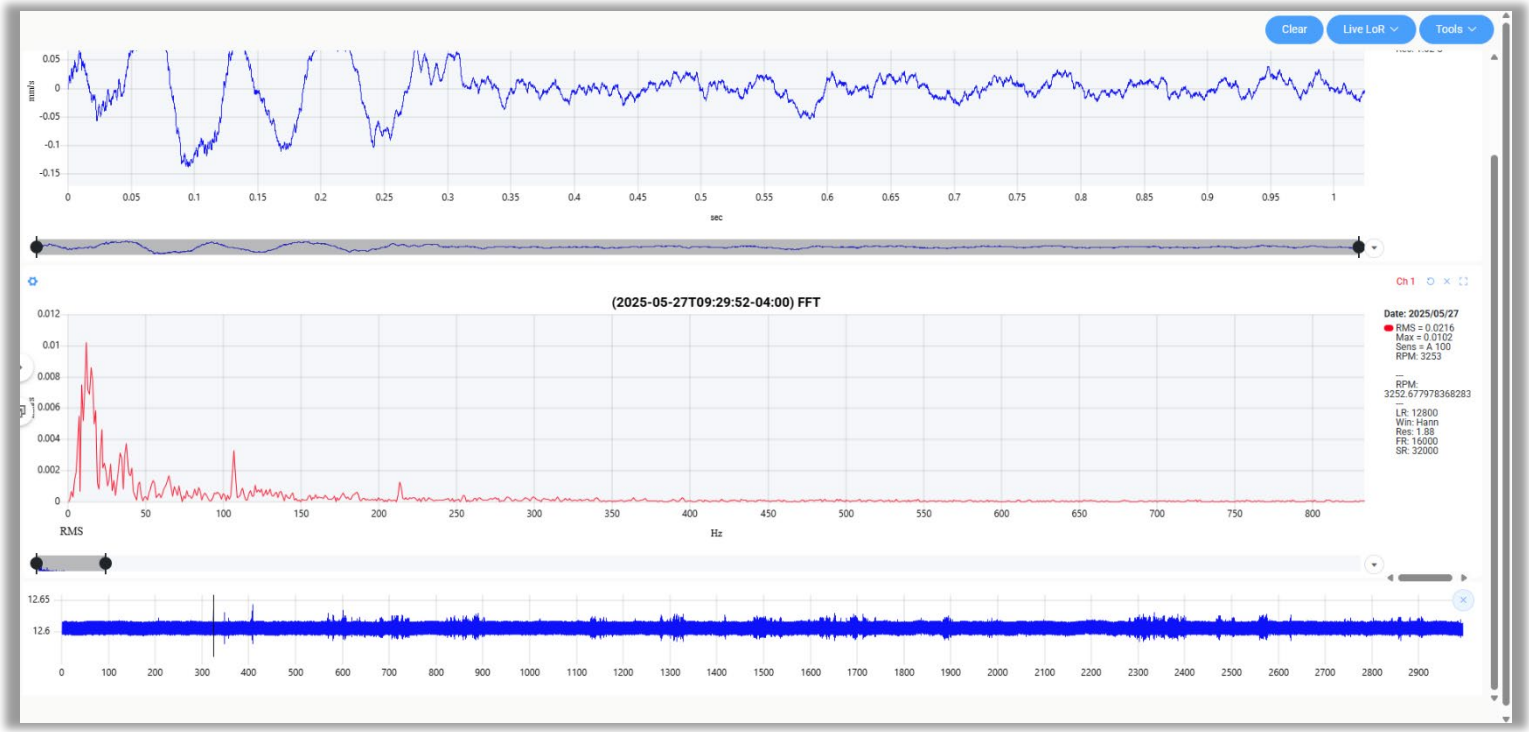
Viewing Continuous files

Example of Continuous collections.



- To open a file in the Analysis window, click the **+** icon on the right side of the screen.
- Each entry includes a time stamp in addition to the file size.



When viewing continuous recording files use the time graph at the bottom which shows the entire length of the recording, up to 1 hour, in seconds. Click an area of the time graph to expand and see the associated TWF and FFT.

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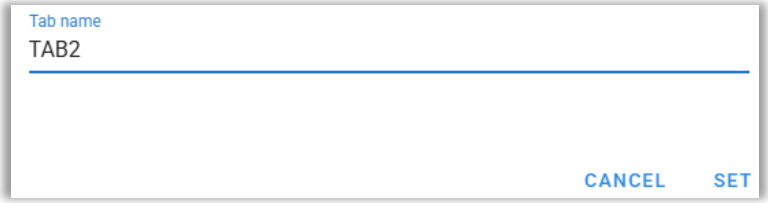
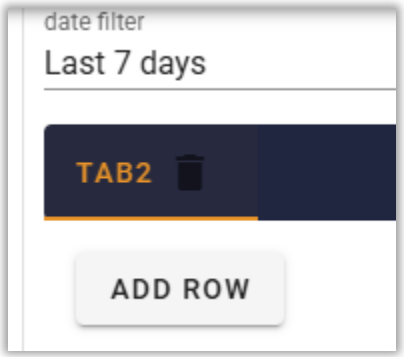
Trends

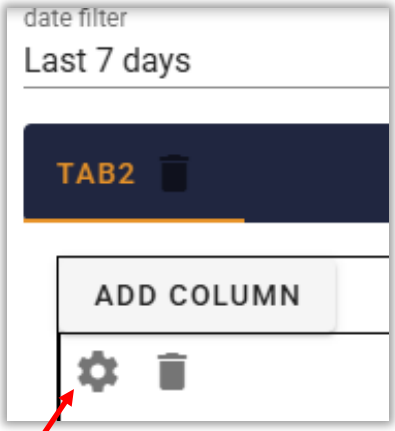
The Trends tool has a tabbed display. Click the Edit icon to see the ADD TAB button:

Enter a name for the Tab.

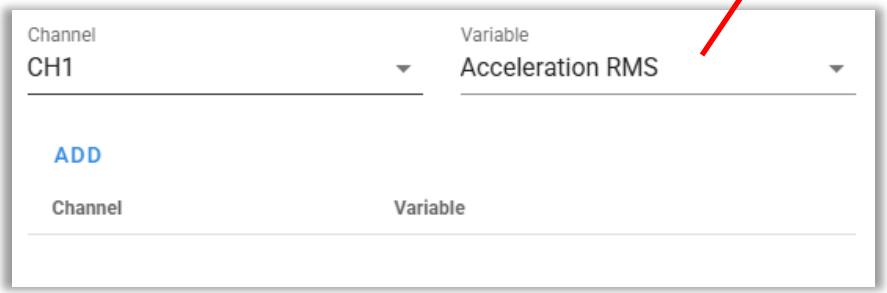


Click ADD ROW and ADD COLUMN if desired.





Then select the settings:



Click the blue **ADD** button to include a unit in the trends graph.

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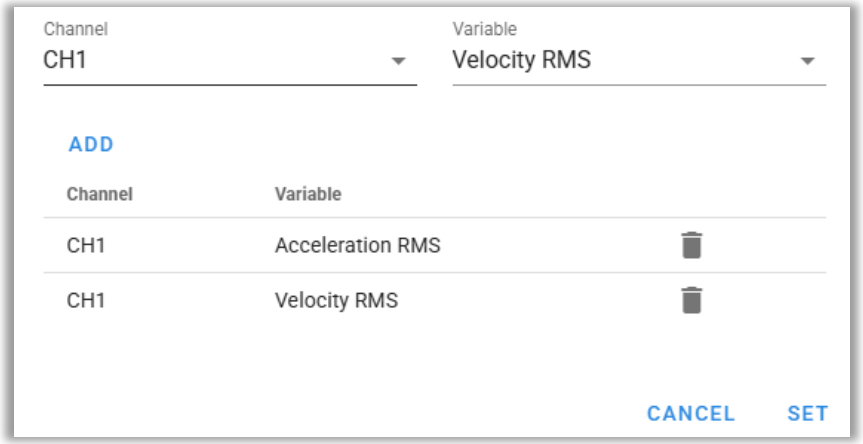
Multiple units may be added. Press **SET** to save.



Click the Refresh button.

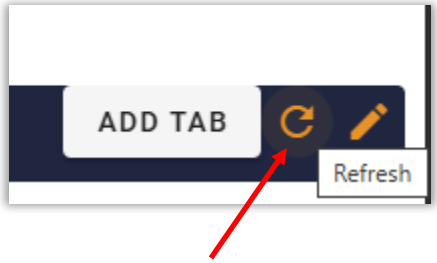
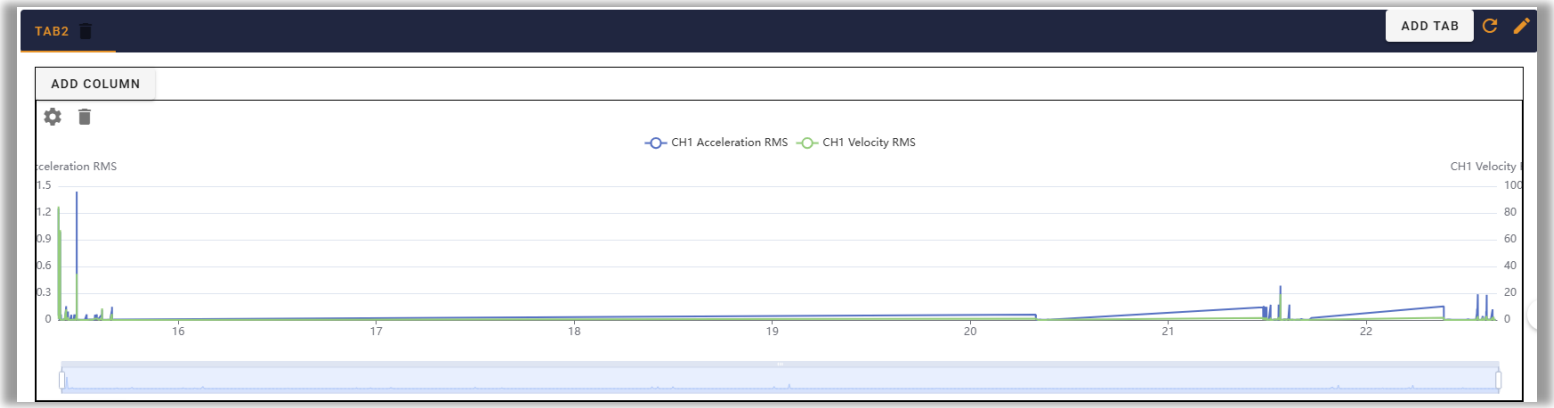
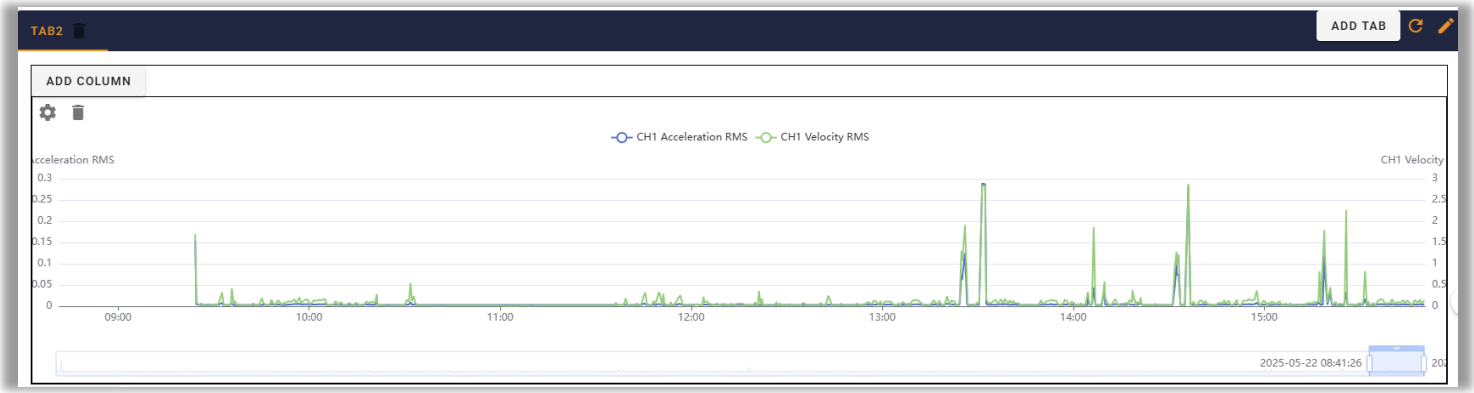


Chart data will now be displayed:



Multiple Tabs may be added to easily switch between views.

Use the slider at the bottom to manipulate the date/time range shown on the chart.



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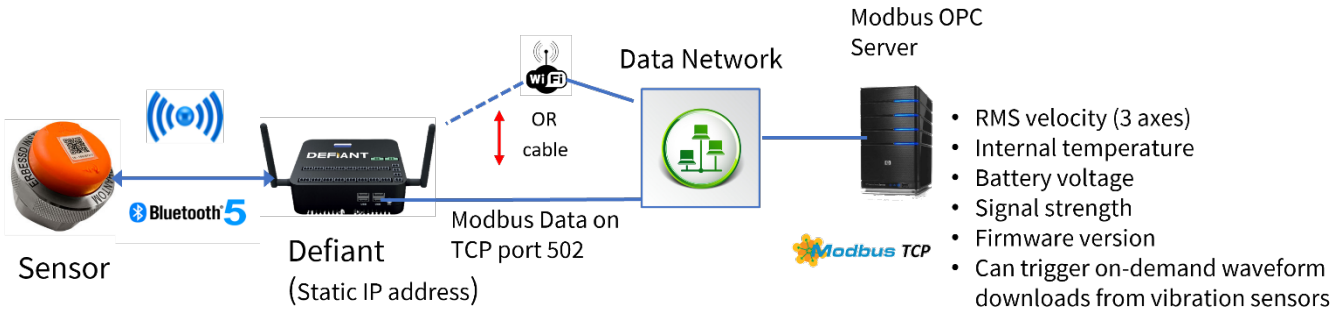
Modbus

Defiant supports Modbus TCP and Modbus RTU integrations. Defiant can operate as a Modbus *server* , configured to store sensor data in registers internally. Defiants configured for Modbus TCP listen on well-known **TCP port 502** for incoming requests from Modbus *clients*. Defiants do not initiate contact with Modbus clients, only respond to them. Upon request, they send their register contents to the client.

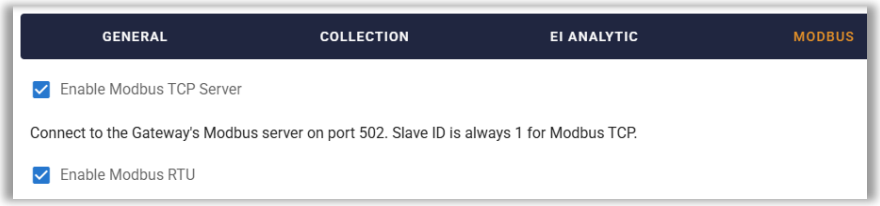


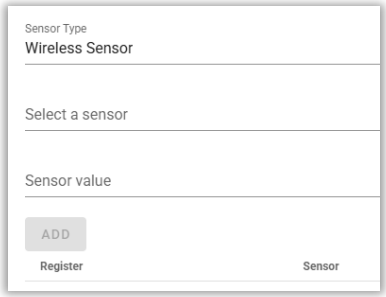
The information stored varies by sensor type. For details regarding the data formats for all Phantom sensors , see the Erbessd website at: https://www.erbessd-instruments.com/docs/phantom/modbus-integration/.

NOTE - Static IP addressing must be used on a Defiant for Modbus TCP integration. ONLY the Main Defiant in a Repeater Network is configured as a Modbus server. All Modbus data from Subordinate gateways is stored in the Main Defiant.

To activate the Modbus server feature:

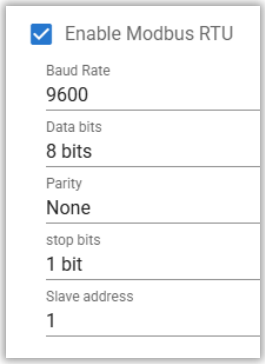
1. Open the Modbus tab on the Main Menu and check either **Enable Modbus TCP server** or **Enable Modbus RTU.**





2. For Modbus TCP, select a sensor type Wired or Wireless
3. Pick a sensor from the **Select a sensor** drop-down field.
4. The sensor value depends on the type of sensor chosen (Vibration units, temperature, speed, current, etc).
5. Press ADD.

For Modbus RTU, enter the Baud rate, number of data bits, parity, stop bits and slave address. DB-9 connector labeled COM1 is used to connect via RS-232.



Then complete steps 2-5 as above.

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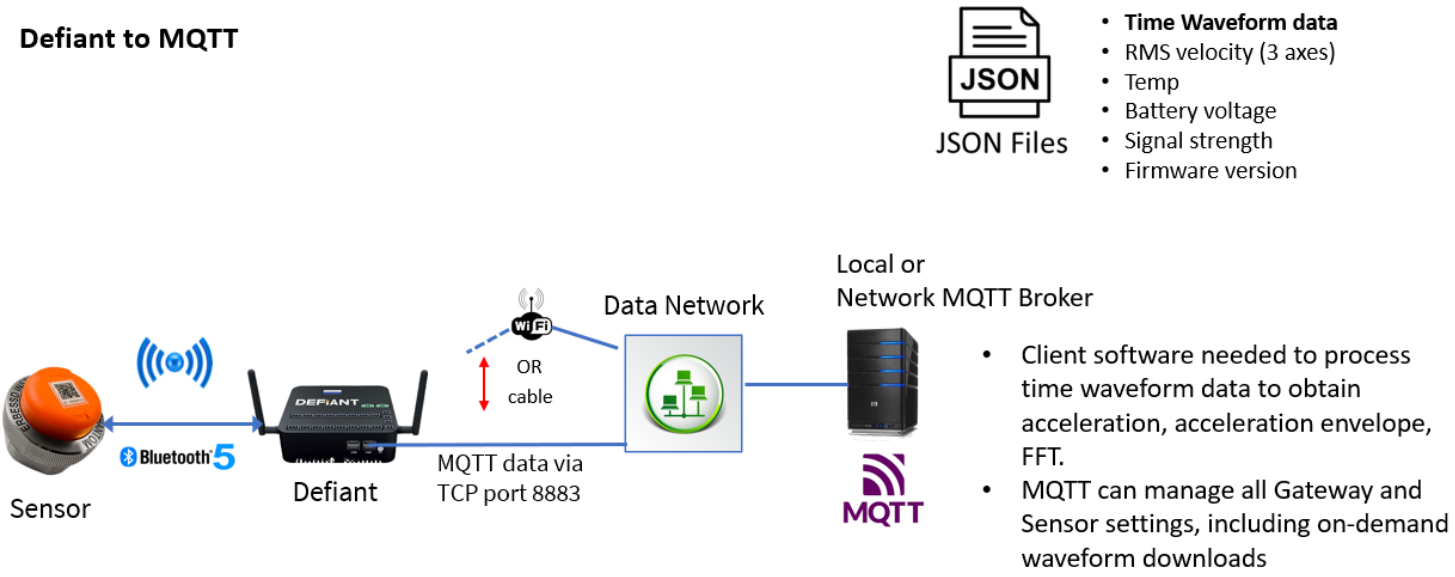
MQTT

Defiant supports MQTT protocol integration. It acts as a MQTT client and can connect to any compatible MQTT broker from version 3.1.1 up to MQTT 5. **Note** – In Repeater Networks, Subordinate gateways send MQTT data to the Main Defiant, where the interface to the MQTT broker is configured.



Example MQTT JSON message:

Topic: eitesttopic QoS: 0


```
{"rssi":-56,"type":3,"version":178,"phantomCode":189281421,"gwSerial":4294967295,"seq":27,"advFlags":6,"batteryType":1,"battery":3.07,"temperature":23.75,"updateInterval":10,"txPower":8,"minRMSFreq":30,"maxRMSFreq":1000,"rms":[0.42,0.15,0.08],"range":8,"recordingSettings":0}
```


2022-12-08 12:38:28:758

With vibration sensors, the full time waveform data is sent in a nested Array containing 3 subarrays, one for each Axis.

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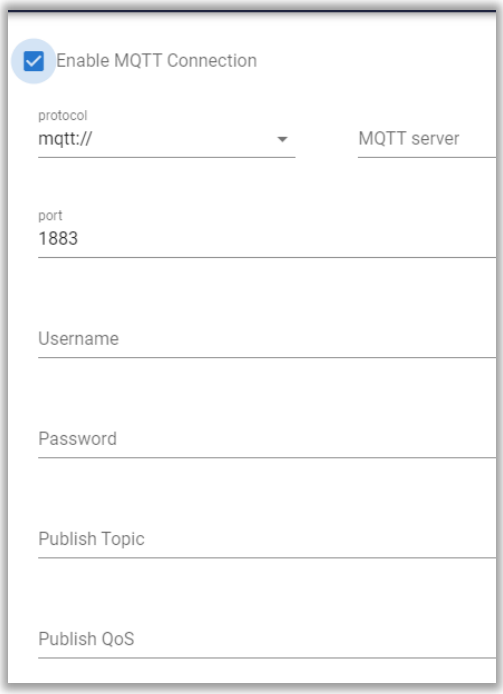
To set up MQTT, open the MQTT tab in the Defiant Admin Console Config screen and click **Enable MQTT connection**.



Protocol: Can be either mqtt://, mqtts://, ws:// or wss:// depending on the transport supported by your MQTT broker.

MQTT server: Is the hostname or IP address of your MQTT broker.

Port: The network port your MQTT broker is listening on.

Username: The (optional) username to connect to your MQTT broker.

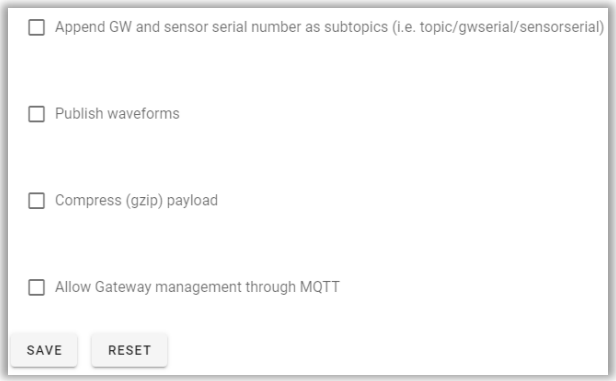
Password:The (optional) password to connect to your MQTT broker.

Publish Topic: The topic where the Defiant will be publishing the sensor data and will subscribe for commands.

Publish QoS: A Quality Of Service (QoS) tag can be applied to the MQTT data allowing management of the data packet priority on the network. (Data packets with higher QoS tags get routed first) When in doubt, use 0.

Append GW and serial number as subtopics is an option for formatting the data.

Publish waveforms: Whether or not to publish complete time waveforms to MQTT. These measurements represent about 160kB of data per waveform. They require additional post processing to render an FFT.



Allow Gateway management through MQTT: Allow full Defiant management so that clients connected to the same broker can change all Defiant and sensor settings.

Save: Will save the settings and the Defiant will restart.

Reset: Will reset all settings to their previous values.

- After you save the settings the Defiant will restart. After it restarts it will try to connect to the MQTT broker and show a state in the MQTT section at the top.
- MQTT is supported at the same time as any other protocol supported by the Defiant, including EI Analytic, EI Monitor, OPC UA and Modbus.
- The Defiant will start publishing messages every time a sensor updates its data (Sensor Update interval) or whenever a time waveform measurement is taken, e.g., alarm or on-demand.

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The JSON messages contain the following standard fields:

Variable Name	Description
dataType	can be either "collection" or "stateupdate". "collection" refers for time waveforms for vibration sensor. Every other sensor dataType is "stateupdate", vibration sensors report "stateupdate" for its internal rms measurement
type	Sensor type
phantomCode	Sensor's serial number
gwSerial	Defiant serial number
timestamp	The time in seconds since 1970 where this measurement was taken.
battery	Battery level in volts
batteryType	Battery type. 1/6D (1), AAA(2), CR2032(3), CR2477(4)
temperature	Sensor internal temperature (in Celsius)
version	Firmware version
rssi	Sensor signal strength

For more information regarding MQTT, visit the Erbessd website at :

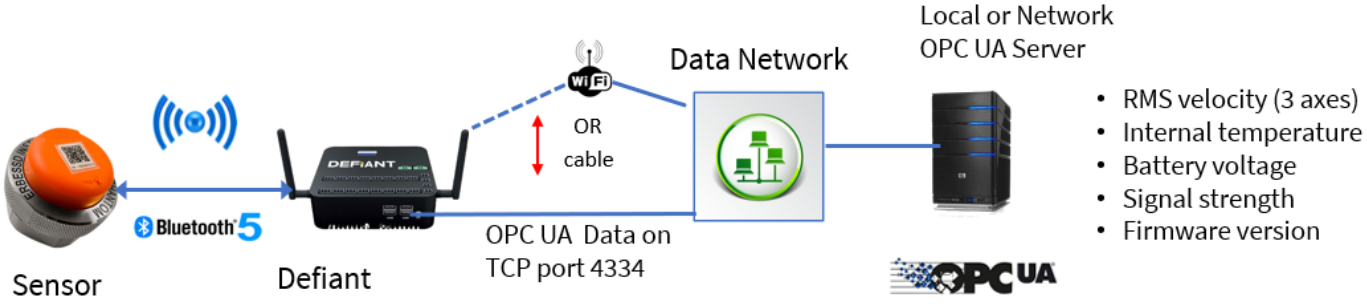
https://www.erbessd-instruments.com/gateway-2-0-mqtt-support/

OPC UA

Defiant supports the OPC UA industrial protocol. All sensor *processed* data is available through OPC. Subordinate gateways forward OPC data to the Main Defiant for connection to the OPC UA server.

Note - Due to how the OPC UA protocol works, the full time waveform or FFT is not available.

Defiant acts as a OPC UA server and listens for TCP connections on port 4334.



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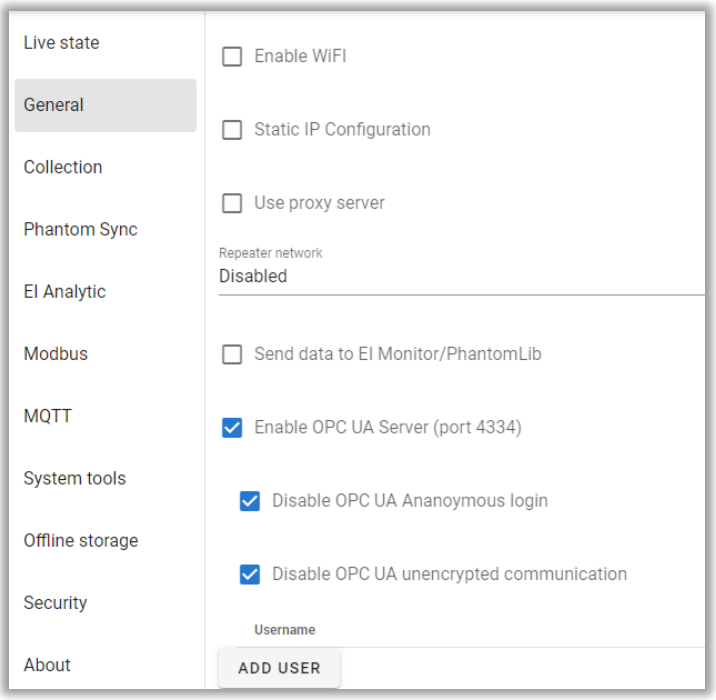
To activate OPC UA, simply check the box in the General tab of the Defiant Admin Console.

The OPC UA feature supports multiple User logins or an Anonymous login. Unencrypted communication can also be disabled (use encryption only).



Click **ADD USER** to administer OPC UA Users and passwords:

- The OPC UA server interface can be active at the same time as any other protocols supported by Defiant, including EI Analytic, EI Monitor, MQTT and Modbus.
- After the OPC UA server has been enabled, access the server using the following URL format with a OPC UA client: opc.tcp://192.168.1.2:4334/UA/PhantomGW, where 192.168.1.2 is replaced by the IP Address of your Defiant. For an Anonymous login use Security Mode none and Security Policy None.
- The OPC UA is organized in a tree like structure. Defiant is shown under the root folder as an Object folder, under which all the sensor serial numbers will be shown. Under each serial number there will be a number of different variables depending on the sensor type.

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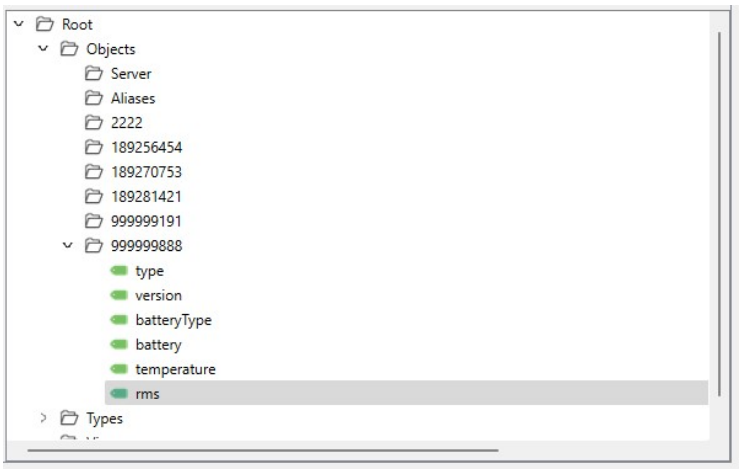

OPC messages contain the following standard fields:

Variable Name	Description
type	Sensor type
battery	Battery level in volts
batteryType	Battery type. 1/6D (1), AAA(2), CR2032(3), CR2477(4)
temperature	Sensor internal temperature (in Celsius)
version	Firmware version

OPC messages also contain the following metrics, calculated in the gateway for each full time waveform measurement received:

Variable Name	Description
ACF	Acceleration crest factor
APEAK	Max acceleration amplitude seen in the timewave form
ARMS	RMS over the whole acceleration spectrum
DCOFFSET	This is the acceleration constant, i.e., gravity, included in the acceleration
HIGHFREQ	Acceleration measured from 5khz to 10khz
MAX FREQ	Peak frequency in Hz
VRMS	The Velocity RMS value measured from 10Hz to 1KHz

The VRMS value is derived from an in-sensor calculation of the spectrum from 10 to 1KHz (hard-coded). The interval is set via the In-sensor settings **Sensor Update** interval as administered from the Admin Console.

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For more details regarding OPC UA, visit the Erbessd website at:

https://www.erbessd-instruments.com/opc-ua-tutorial/

System Resets

The Defiant has a two-tier Reset mechanism.

Tier 1 – Insert a small screwdriver or similar reset tool into the small hole located just left of the OLED display. Press and hold the internal reset button for about **5 seconds** until the display changes. The **Basic Config Reset** screen will appear on the display. If you release the button, the Defiant will restart. This will delete all network configuration, but keep the sensor configurations.

Tier 2 - After you see the **Basic config reset** message, continue to press the button for **another 10 seconds** until the **Factory Resetting** message is displayed. This level of reset returns all Defiant settings to factory values. Recycle the power to the Defiant once the **Factory Reset** message is displayed.

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Contacting Erbessd Instruments Technical Support

If at any point this guide does not answer your questions or resolve an issue, please contact Erbessd Instruments technical support using any of the following methods:

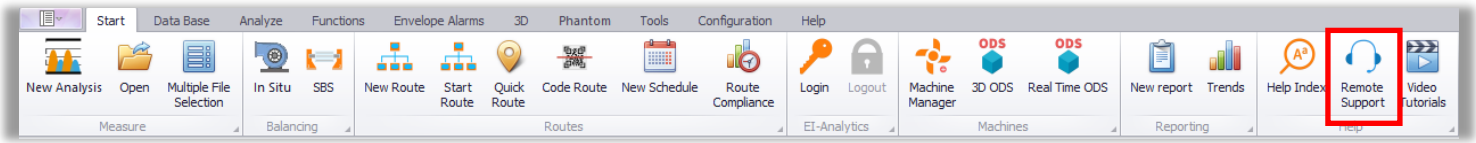
1. Visit our website and leave us a support ticket, to report minor software/firmware/device functionality concerns. Go to www.erbessd-instruments.com. From the Support menu, select Log A Ticket. Or initiate a Live Chat.

2. For more urgent assistance, contact our support team by email at: support@erbessd-instruments.com

3. For the most immediate emergency assistance, contact us by phone at +1 877-223-4606 (International Toll Free)

Erbessd Instruments technical support staff use TeamViewer remote support software to provide real-time remote PC support. A download link for the free QuickSupport version of TeamViewer is provided in the DigivibeMX software.

Click Remote Support on the DigivibeMX Start Menu to download TeamViewer QuickSupport. Allow the program to download, install and launch. Then be prepared to provide the TeamViewer User ID and Password it provides to the responding Erbessd Instruments support engineer.



For additional information, please visit the Tutorials section of our website at: https://www.erbessd-instruments.com/erbessd-tutorials/

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