Brüel & Kjær Vibro

A member of the NSK Group

Instructions

SETPOINT Condition Monitoring Software

Installation and Operations Manual

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Instructions - **SETPOINT Condition Monitoring Software**
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SOFTWARE VERSION
This instruction corresponds to the SETPOINT® CMS software version **8.0** and the corresponding SETPOINT® Connector software version **8.0**.

Brüel & Kjær Vibro GmbH
Wittichstrasse 6
64295 Darmstadt
Germany

Phone: +49 6151 428 0
Fax: +49 6151 428 1000

Brüel & Kjær Vibro A/S
Lyngby Hovedgade 94, 5 sal
2800 Lyngby
Denmark

Phone: +45 69 89 03 00
Fax: +45 69 89 03 01

BK Vibro America Inc.
1100 Mark Circle
Gardnerville NV 89410
USA

Phone: +1 (775) 552 3110

Hotline

Phone: +49 6151 428 1400
E-mail: support@bkvibro.com

Homepage

www.bkvibro.com

Corporate E-mail

info@bkvibro.com

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1 System Description

1.1 System Components

The SETPOINT® system consists of these components:

- VC-8000 rack with eSAM, UMM-CM and TMM-CM Modules
  - Configured via VC-8000 Setup software
- VCM-3 condition monitoring unit
  - Configured via VCM-3 Editor software
- BKV Collect wireless sensors connected via BKV Connect gateway
  - Configured via BKV Beyond service
- SETPOINT® CMS software, display application described in detail in this manual
- SETPOINT® Connector software, monitoring device to PI rack interface (or SD/ PC-XC card)
- PI AF Server (2012 with SP2 or later) and PI AF SQL Database (SQL EXPRESS or higher)
- PI AF Client (2012 with SP2 or later), for the hierarchy
- PI Server (2012 or later), for archiving data (static and dynamic)
- PI Vision (Optional), for visualization

Figure 1 shows the system components. Computers may be combined as discussed in **Section 2** depending on the number of assets and dynamic points.

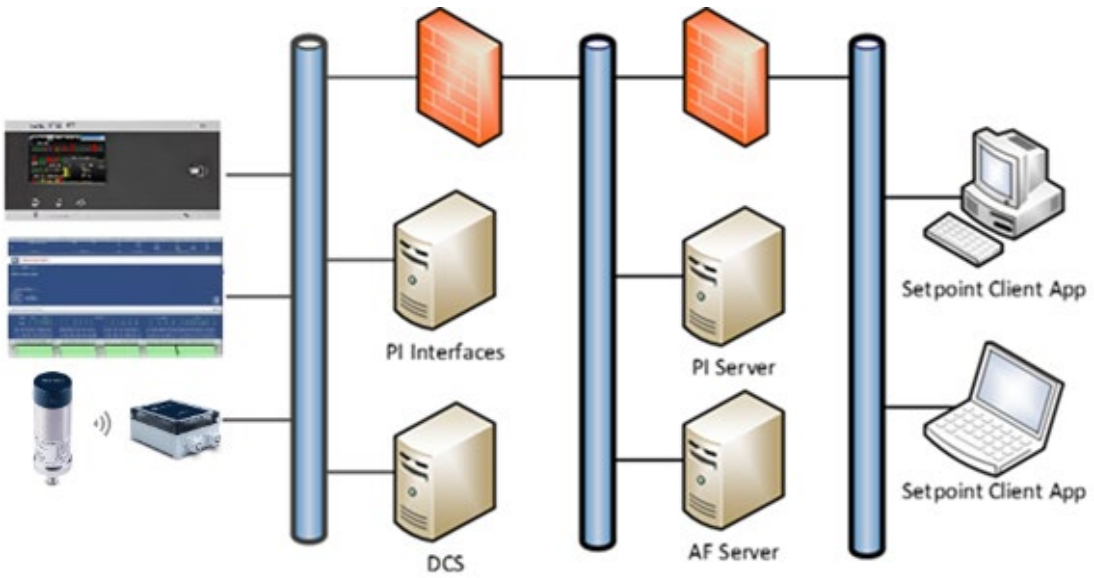


Figure 1: System Components

1.1.1 VC-8000

The VC-8000 is an API 670 machinery protection system that also incorporates high speed data acquisition for fast trending and collection of dynamic waveform data (time signals of vibration). The VC-8000 was designed so that the high bandwidth condition monitoring data is separated from the critical protection data. Referring to **Figure 2**, note these design concepts:

1. A separate alarm logic bus prevents condition monitoring data from affecting inter-module alarm voting.
2. A separate condition monitoring network separates high bandwidth condition monitoring information from other protection system access data.
3. A proprietary network separates the protection system processor from the display and condition monitoring system processor. This protocol does not allow changes to critical machine protection parameters from the display or condition monitoring system.
4. A separate Ethernet port connects the condition monitoring data server to the VC-8000 rack so that the high bandwidth condition monitoring data is separated from the critical protection data network.

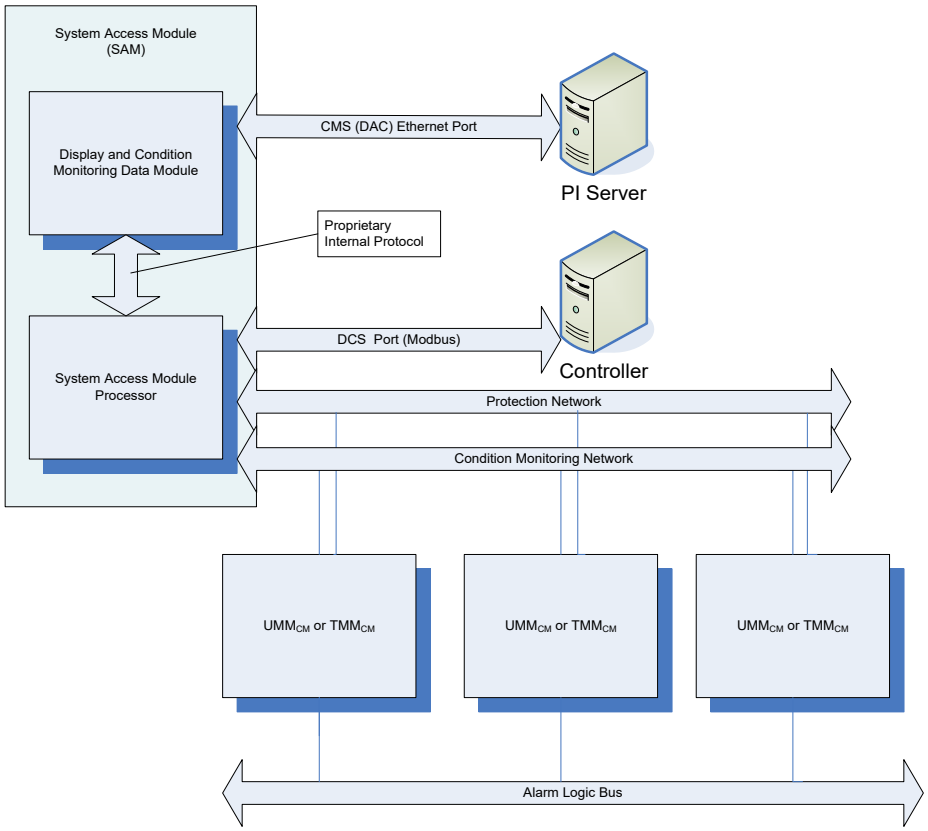


Figure 2: SETPOINT® Separation of Protection and Management

1.1.2 VCM-3

The VCM-3 is the cost effective 12 channel data acquisition hub targeted at monitoring of auxiliary machines, balance-of-plant (BOP) machines and less critical assets as part of enterprise Industry 4.0 digitization efforts. Multiple VCM-3 monitors can be connected to your network with wired technology, providing the next generation of asset condition monitoring without batteries or spotty occasional monitoring provided by route based or multiplexed systems.

1.1.3 BKV Collect Wireless Sensors via BKV Connect Gateway

BKV Collect is a wireless battery-operated sensor for condition monitoring and predictive maintenance. It measures tri-axial vibration and surface temperature of rotating equipment, such as pumps, motors and compressors. Abnormal machine vibrations or high temperatures may give early signs of failure due component imbalance, misalignment, wear or improper use of equipment.

Once BKV Collect is switched on, it starts automatically to measure and transmit data at pre-configured intervals. Depending on the configuration, BKV Collect sensors can send raw vibration data (waveforms) and pre-calculated values, such as RMS velocity, RMS acceleration and crest factor.

BKV Collect sensors operate in a mesh network and transmit sensor data to a BKV Connect gateway. When there is a need for high density of connected devices, a mesh network is the perfect solution for connectivity. In a mesh network, devices transmit their own sensor data and act as a relay for other devices. Relays provide the best and most efficient communication path to a gateway.

Using SETPOINT® Connector, **BKV Connect** gateways connect a mesh network of a few to several dozens of wireless devices to a backend such as AVEVA PI. BKV Connect can be connected over a wired Ethernet connection or wirelessly over a Wi-Fi connection.

For more information, please refer to BKV Wireless Sensor Solution instructions (C108377).

1.1.4 AVEVA™ PI System Components

SETPOINT® CMS is based on the AVEVA™ PI System™ platform, often used in the industry for process data management. Brüel & Kjær Vibro has developed methods with AVEVA™ for storing waveform data into the PI Server database and for presenting standard machinery diagnostic plots for viewing and analyzing dynamic waveforms and transient data (such as orbit, spectrum...). This section contains a brief overview of the AVEVA™ PI System™ components. For more detail, refer to the AVEVA™ website (https://www.aveva.com/en/products/aveva-pi-system/).

PI Asset Framework Server

PI Asset Framework™ (PI AF) lets you define a consistent representation of your assets and provide a structure for your information. SETPOINT® CMS uses PI AF Server to assign VC-8000 measurement points to your plant processes and machine trains. PI AF Server is included with PI Server 2012 and later and does not need to be purchased separately.

PI Server

PI Server is the real-time data collection, archiving and distribution engine that powers the PI System. Brüel & Kjær Vibro and AVEVA™ have developed interfaces for storing dynamic waveforms and transient machine condition data on the PI Server along with the standard process data.

PI Vision

PI Vision is a web-client visualization tool for the PI System that provides secure access to PI System data. PI Vision can provide displays while also supporting mobile browsers and customized views for small screen devices.

1.1.5 SETPOINT® Connector

The SETPOINT® Connector is a software service that interfaces between the VC-8000 rack and the PI servers. The computer running the SETPOINT® Connector must also have the AVEVA™ PI AF Client application installed.

NOTE!

This component was called “Setpoint PI Adapter” in older SETPOINT® releases (CMS 2022 R3 and earlier).

1.1.6 SETPOINT® CMS

SETPOINT® CMS is a display package that processes and presents the machinery data stored in the PI System database in standard machinery diagnostic plots such as trends, spectra, orbits, vector diagrams, as well as lists of events, pages, etc.... accessible on a page customizable according to the expert's wishes. The data remains stored in the PI server (or in an SD card, PC-XC), the CMS SETPOINT® application is only a customizable drive that only stores views and their settings. An analogy can be made with print file readers, "reader" regardless of the original document; CMS SETPOINT® presents the stored CMS data in a standard format as defined in the vibration analysis standards and guides. The expert will be able to obtain and display the desired combination and correlation of data as desired, print them, or export them to a file that can be shared with other colleagues or higher levels for more advanced analysis.

The computer running SETPOINT® CMS must also have the AVEVA™ PI AF Client application installed.

1.1.7 Types of Data

VC-8000, VCM-3 and BKV Collect send several different types of data that are stored in the PI System database (or in an SD/HD card, PC-XC). The software uses the various data types when creating the plot types as shown in **Table 1**.

Table 1: Data Types

Data Type	Description	Plot Using
Static	Processed and filtered values	Trend, Shaft Centerline
Vector Data	Amplitude and Phase vector measurement at a specified multiple of running speed. Requires a Phase Trigger assignment.	Bode, Polar, Filtered Orbit and Timebase
Synchronously Sampled Waveforms	Data samples are collected in evenly spaced phase increments according to the current running speed. Requires a Phase Trigger assignment. Requires the assignment of a phase reference.	Orbit, Timebase, Spectrum, Cascade, and Waterfall (in Orders)
Asynchronously Sampled Waveforms	Data samples are collected at a set sample rate.	Asynchronous Orbit, Timebase, Spectrum, Cascade, and Waterfall
Speed	Information on the relationship between the speed pulses and the synchronous waveform.	Orbit, Timebase, Spectrum in Orders
Status	Alarm and OK status for each channel and measurement.	Alarm List

1.1.8 Compression Algorithm

Static data

Static (trend/scalar) data is processed in the rack to produced derived values such as tracking filters and band pass measurements. It goes through three stages of compression before it is put in a PI archive:

- Signal Processing
  The firmware does the signal processing by filtering out non-machinery related data and deriving values (such as peak to peak amplitude). Every 80 ms samples are published.
- Exception Deviation
  The SETPOINT® Connector receives 80 ms data from a VC-8000 and only publishes it to the PI System if it has exceeded the exception deviation (also called dead band filtering) of the last published sample. Exception deviation is the amplitude difference between two samples. When the difference exceeds the predetermined threshold, the value is sent to PI. Alternatively, if the maximum time between published values has expired the sample will also be forwarded. Exception deviation is intended to filter out noise and reduce network traffic. Each channel type uses different exception deviation values adapted to the task.

  When in a transient state (when speed is between the configured low and hi trigger values) exception deviation is changed to ¼ of the configured limits and PI compression is bypassed (all values exceeding the exception deviation are recorded).

  Exception deviation values can be viewed and edited using PI System Management Tools.
- PI Compression (Swinging Door)
  The PI System receives the data and performs a swinging door compression algorithm to manage data storage. This algorithm draws a line going through the last two collected points and make a cone coming off the line based on the configured compression value. This value is stored if it exceeds the limits of the cone. When this happens, the value exceeding the limit, and the value preceding it are stored into the archive. All other samples between the stored values are thrown out because they are accurately represented by the stored values.

  (This tutorial helps visualize how exception deviation and swinging door compression algorithms work: https://www.youtube.com/watch?v=6-scv3oQ7Kk&feature=youtu.be)

Dynamic data

Dynamic data is time-based waveform data. It is sampled at a significantly higher rate to enable root cause analysis of machinery faults.

There are several methods for collecting waveforms. These are processed in a chain of responsibility if one method is active it trumps the methods that follow.

- Boost Mode allows contiguous waveform collection between a low and high trigger speed. It is designed to capture fast startups where other methods may not provide enough data. If boost mode is enabled and the speed is between the configured low and high speed triggers and the speed is changing the UMM will collect all the raw data.
- If the speed stops changing while still in the transient range the UMM will exit boost mode until speed begins changing again.
- If the buffer in the UMM fills up it will exit boost mode and resume normal collection until a certain percent of the buffer empties out. Each UMM channel has roughly a buffer that can hold up to 2 minutes of contiguous waveform data before exiting boost mode.

NOTE!

Boost collection can be triggered manually from the MPS Maintenance software.

- I-Factor
  The i-factor of a waveform is computed using multiple attributes. For a typical radial vibration channel with a phase trigger present, these attributes can include:
  - Overall amplitude
  - Amplitude of 2 user-defined bandpass regions
  - Bias (gap) voltage
  - Machine speed (i.e., phase trigger period)
  - 1X, 2X, and nX filtered amplitudes

When a change in any of these attributes exceeds a threshold, it triggers waveform storage. During a given interval, if more than one waveform has an i-factor above this threshold, the waveform with the largest i-factor will be saved. Thresholds can be manually configured or computed where it is adjusted automatically to collect one waveform per period on average.

- Delta RPM
  If the speed input changes more than the configured delta RPM a waveform will be published.
- Periodic Collection
  If no waveforms have been found interesting for a configured period of time the most interesting waveform will be published.
- Grouped waveform collection
  If one channel publishes a waveform then all other channels in the group also publish a waveform.

Dynamic data has no exception deviation or PI compression applied. If a waveform is published from the rack it is stored in the PI System.

1.2 Operation without Connection to a PI System

Setpoint® CMS also offers several options for collecting and viewing condition monitoring data when a network connection to a PI System is not available. All vibration data is still available, but these solutions lack the more advanced PI System features. However, you can import data from SETPOINT® SD, XC, or HD into a PI System to provide a highly flexible combination of on-line, networked condition monitoring and off-line, remote data collection.

These solutions are useful when:

- Network connections are unavailable
- The machines are located where installing and maintaining server computers is not practical.
- Event data is sent to remote experts for analysis
- Only SETPOINT® System data is required (no PI system data correlation is needed)

Refer to the sections in this manual dedicated to each of these solutions for more information.

Table 2: SETPOINT® Offline Solutions for VC-8000

SETPOINT® System	Description
SD	SD card data storage in the VC-8000. The system stores condition monitoring data on an SD card installed in the eSAM. Remove the card and view the data with SETPOINT® CMS. SETPOINT® SD is limited by the maximum SD card capacity of 32 GB.
XC	The SETPOINT® Connector service stores condition monitoring data in a folder on a PC networked to the rack. SETPOINT® XC can store larger amounts of data limited only by the available storage drive capacity.
HD	The eSAM stores condition monitoring data on an internal solid-state drive available in various sizes. View the data using SETPOINT® CMS software networked to the rack.

1.3 For more Information

Download datasheets and other SETPOINT® information at https://www.bkvibro.com/en/products/setpoint-condition-monitoring-software.html.

Document No.	Title
S1079330	VC-8000 Operation and Maintenance Manual Document
S1342998	VC-8000 Reciprocating Machine Addendum Document
S1160865	VC-8000 Hazardous Installation Manual
S1472326	VC-8000 Calibration Interval Application Note
S1354794	VC-8000 Functional Safety Assessment
C107762	VCM-3 Editor Installation Manual
C107760	VCM-3 Homepage Manual
C108377	BKV Wireless Sensor Solution instructions
C108376	BKV Connect 1 & 2 / BKV Collect 6 & 6 Ex Quickstart Guide

Get more information on the PI System at https://www.aveva.com/.

2 Planning Your System

There are several different implementations for the SETPOINT® CMS system. Each will be discussed in this section:

- Implementing a small system (< 300 Points of dynamic vibration channels).
- Implementing a large system (> 300 Points)
- Time Synchronization
- Protection from Network Failures

You can implement your SETPOINT® CMS System as part of an existing PI System or as a separate system.

2.1 Small Systems

For small systems, either a small AVEVA™ PI System (< 300 Points of dynamic vibration channels) or a standalone SETPOINT CMS-XC system can be used (< 100 Points of dynamic vibration channels). Please refer to the chapter on SETPOINT CMS-XC for more information about this topic.

You can install all AVEVA™ PI System software components and the SETPOINT® CMS software on a single stand-alone computer. Refer to the PI Asset Framework Installation and Upgrade Guide for installation information. The SETPOINT® CMS dynamic data collection creates data much faster than for standard process points, so the number of dynamic data points is much lower than the number of standard process points that AVEVA™ specifies. Brüel & Kjær Vibro recommends a computer with a minimum of:

- Windows 10, Windows 11, Windows Server 2019 or Windows Server 2022
- .NET Framework, Version v4.8 or higher
- Use SQL Server Express edition 2012 or higher
- 16 GB RAM
- 1 TB storage
- 8 processor cores (12 recommended)

Limit the total dynamic channel count to 300 channels or less. A dynamic channel is any channel that collects synchronous or asynchronous waveforms as listed in **Table 1**.

2.2 Using an Existing PI Server

If you are already using an AVEVA™ PI System, you can use your existing PI Server provided that:

- You have PI Server version 2012 or later.
- PI Asset Framework 2012 SP2 or later.

2.3 Large Systems

For systems with more than 10,000 assets, and moderate-to-high workloads and point counts, AVEVA™ recommends that you:

- Install Microsoft SQL Server on a separate computer from PI Server.
- Install PI AF server on either the PI Server or SQL Server computer.
- Use Microsoft SQL Server Standard or Enterprise edition instead of Express edition.

For best performance and improved security, AVEVA™ recommends that you install SQL Server on a different computer from PI Server. AVEVA™ also recommends at least two physical drives on the PI Server computer.

2.4 Other Installation Deployments

The PI Asset Framework Installation and Upgrade Guide discuss other installation deployments including high availability designs.

2.5 CMS Display Computer

When running the CMS Display application on a separate computer from the servers, the computer should have at least 8 GB RAM and a 5th Generation Core Intel processor or equivalent.

You also can run the CMS Display on the server computer and connect remotely. Your server will need a graphics card supporting Shader Model 3 and Direct X 9 to support CMS graphics.

2.6 Uninterruptable Power Supply (UPS)

Your PI Server must be installed with a UPS wired for graceful shutdown in the event of a main power loss. An unexpected loss of power can prevent the server from restarting normally when power is restored, resulting in data loss.

APPLICATION ALERT!

Unexpected loss of server power can result in loss of data. Use an uninterruptable power supply configured to gracefully shut down the server on power loss.

2.7 Time Synchronization

SETPOINT® CMS will automatically synchronize the VC-8000 rack system time with the PI Server computer time. These synchronization commands occur when the SETPOINT® Connector communication to the rack is started and once per day after that. Synchronization is typically to within 1 second. Alternatively, you can configure the VC-8000 rack for NTP time synchronization. Refer to the VC-8000 Operation and Maintenance Manual S1079330. NTP is capable of time synchronization to the millisecond level depending on the network architecture.
Table 7 lists the network ports that the system uses for time synchronization. When configured for NTP, the VC-8000 rack will ignore time synchronization requests from the SETPOINT® Connector or other sources.

2.8 Protection from Network Failures

Referring to **Figure 1** and **Figure 2**, the VC-8000 system has multiple levels of data buffering and storage to guard against data loss in the event of network interruption.

Data storage can be volatile, where store information is lost on power failure or system reset, or non-volatile where the information is stored on an SD card or Solid State Drive that will retain the data on a power failure or system reset.
Table 3 lists where the data is buffered, what network interruptions are backed up, and the amount of data or time duration that the interruption can last before data loss.

Table 3: Network Data Buffering

Buffering Location	Description	Amount
UMM	The UMM stores static and waveform data internally during periods of rapid machine changes or for protection against temporary communication interruption with the SAM such as during a SAM firmware upgrade or major configuration change. Volatile	3600 waveforms. Every 80 ms a measurement (static measurement data) is recorded. Quantity is across all channels but is not allocated per channel (e.g., an interesting channel to the I-Factor® can store more waveforms than non-interesting channels).
SAM	Internal data buffer used to hold data until it can be spooled to the PI System, XC, or the internal SD or HD. Provides protection against loss of data during short network interruptions between the rack and the SETPOINT® Connector or loss of data while changing the SD card. This module is available in two variants, bSAM is the "Basic" and eSAM the "enhanced" variant. The eSAM is required for condition monitoring. Volatile.	5 minutes typical waveform and static data storage.
HD	Internal solid-state drive (SSD) data storage. System can be configured to automatically backfill data from the HD to PI in the event of network interruption between the rack and the SETPOINT® Connector. Non-Volatile.	Depends on HD option purchased: 32 GB, 256 GB.
SD	Data is stored on the SD card. Backfilling from the SD card is a manual process. SD is an alternative to the HD to provide protection against network interruption between the rack and SETPOINT® Connector. See **Section 15**. Non-Volatile.	Depends on SD card size. Maximum is 32 GB.
PI Buffering	PI Buffering stores data in the case of communication loss between the SETPOINT® Connector and the PI Server. Recommended when the SETPOINT® Connector is located on a different computer than the PI Server. Non-volatile for files other than the current file.	Limited only by available space on the drive where the PI Buffering folder resides.

NOTE!

When the PI Server and SETPOINT® Connector are running on the same computer, PI Buffering provides no value and degrades performance. Turn off PI Buffering for this case.

When the PI Server and SETPOINT® Connector are running on the same computer, turn off PI Buffering using the following instructions:

Locate the PICLIENT.ini file. This should be located in the C:\Program Files\PIPC\dat folder

Change the Buffering attribute value to “0” from the default value of “1”.

3 SETPOINT CMS Enabled Hardware

3.1 UMMs and TMMs

VC-8000 modules must be condition monitoring enabled in order to stream data (static and dynamic) to the SAM's internal hard drive, SD card drive or PC-XC, and/or a connected AVEVA™ PI Server. Once the data has been stored to any of these mediums, it can be viewed with SETPOINT® CMS software.

NOTE!

This data stream includes both high-speed static data and dynamic (waveform) data and should not be confused with the low-speed static data provided to the DCS port(s) on the SAM. All modules provide data to the DCS NET (Ethernet) and (if present) DCS SER (serial) ports on the SAM. Refer to VC-8000 Operation & Maintenance Manual S1079330 for additional information on these DCS communication ports.

CM-ENABLED modules can be identified by their front panel label and by using the VC-8000 Maintenance software **Hardware Info** tab as shown in **Figure 3** (Refer to VC-8000 Operation and Maintenance Manual, S1079330). Although it is permissible to have a rack with a mix of CM and non-CM modules, only the CM-ENABLED UMMs and TMMs will be capable of providing any data (whether static or dynamic) for viewing in CMS software.

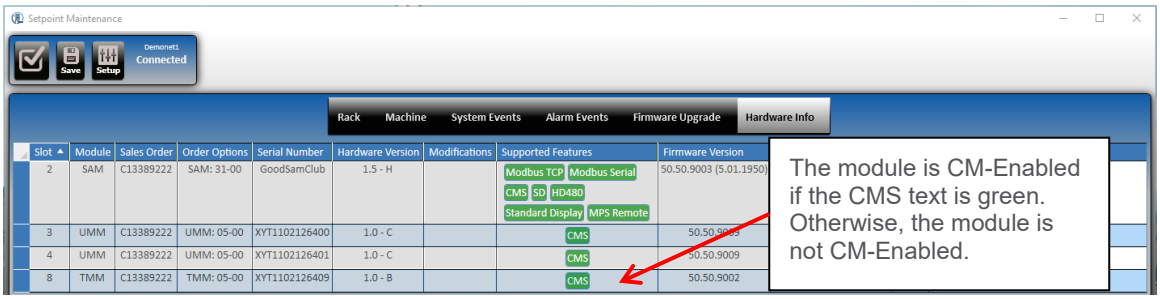


Figure 3: Identifying CM-Enabled Hardware

If you are upgrading an existing rack to support CMS connectivity, UMM and TMM modules may be converted to CM-ENABLED versions in the field, without a hardware change (contact Brüel & Kjær Vibro Service).

In addition to CM-ENABLED UMMs and TMMs, the rack must also have a CM-ENABLED eSAM. If the SAM is not CM-ENABLED, its CMS Ethernet port will be disabled, and no communications can occur. Nor will its SD Card slot or internal hard drive support CMS data. You cannot update a SAM to eSAM on site, you must return the module to the factory.

NOTE!

Even if your eSAM is CM-ENABLED, it must be using revision 3.0 firmware or higher. You can check your firmware revision using VC-8000 Maintenance software and apply newer firmware if applicable. Refer to VC-8000 Operation and Maintenance Manual S1079330 for additional information.

3.2 Upgrading VC-8000 Hardware

You can purchase CMS upgrades for existing hardware and install them locally or remotely. This section lists the basic steps to follow to obtain CMS enabler keys.

Use the Hardware Info screen from the front panel or the VC-8000 Maintenance software:

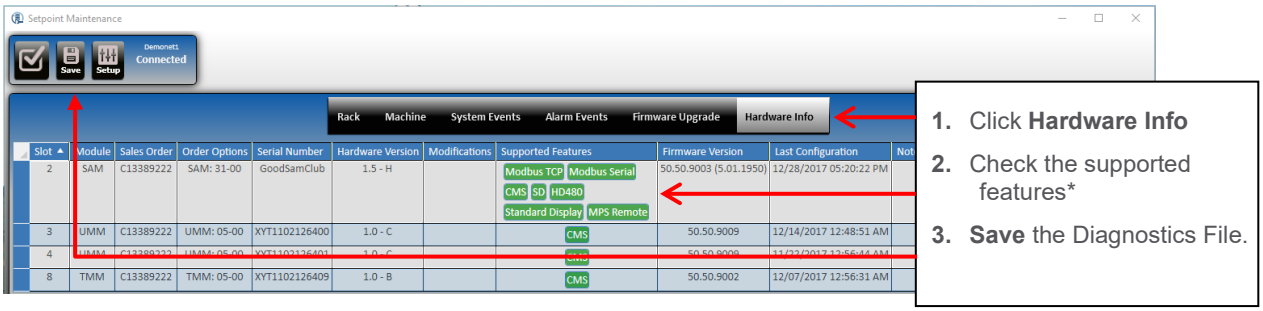


Figure 4: Retrieving the Hardware Information

*If the Supported Features column lists the feature but it is not green, the hardware is capable of supporting the feature, but it is not enabled. If the feature does not show up in the list, the hardware does not support the feature.

The modules must also have the required firmware revision to support the features. Firmware upgrades are available at https://www.bkvibro.com/products/setpoint-machinery-protection-system-vc-8000.html.

UMMs and TMMs require firmware revision 3.0 or higher for CMS functions. The following table lists the required SAM and Front Panel firmware revision by function:

Table 4: SAM Firmware Revision for Function

Function	Required Firmware Revision
CMS with PI-AF	3.0 or higher
CMS SD	4.02 or higher
CMS HD	5.0 or higher
CMS XC	3.0 or higher

Send the diagnostics file to Brüel & Kjær Vibro.
Brüel & Kjær Vibro will return a .setk file with enabler keys for your hardware.

Use the VC-8000 Maintenance software on the firmware update page, to apply the enabler keys.

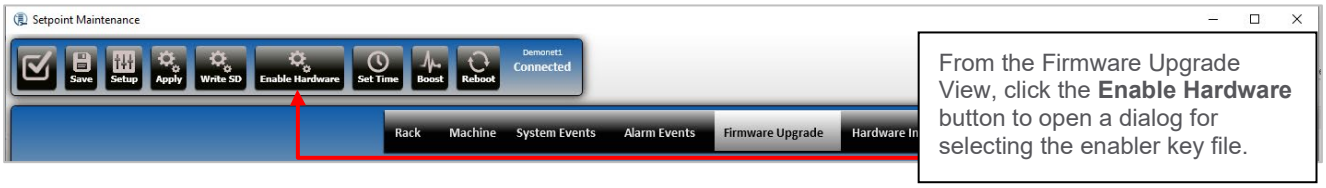


Figure 5: Enabling Hardware Features

Navigate to the .setk file of the module to be updated and click **Open**.

NOTE!

Each set of keys is specific to a module and may not be moved between modules.

4 Software Licensing

4.1 SETPOINT CMS Display Licensing

SETPOINT® CMS is provided free-of-charge and may be downloaded from our website. The license agreement is displayed during the installation process for this application and the user must accept this license in order to proceed with the installation.

4.2 SETPOINT® Connector Licensing

The SETPOINT® Connector software converts the data stream from the CMS port on the eSAM into a format readable by a PI Server. It functions similar to a PI Interface. This software can be downloaded from our website. The license agreement is displayed during the installation process and the user must accept this license in order to proceed with the installation.

4.3 AVEVA™ PI System™ Licensing

Necessary AVEVA™ PI System™ components for SETPOINT® CMS can be obtained directly from AVEVA™, or from Brüel & Kjær Vibro. When purchased from Brüel & Kjær Vibro, the license agreement is between the end user and Brüel & Kjær Vibro and consists of doc 1313253 along with the Brüel & Kjær Vibro customer order number. All software support comes directly from Brüel & Kjær Vibro in such situations.

When PI System components are purchased from AVEVA™ rather than from Brüel & Kjær Vibro, the license agreement is between the end user and AVEVA™, and document 1313253 does not apply. Support for the PI Server and other PI System components in this situation comes from AVEVA™. However, support for the SETPOINT® hardware, SETPOINT® Connector software, and SETPOINT® CMS comes from Brüel & Kjær Vibro.

4.3.1 PI System Tags

4.3.1.1 SETPOINT-supplied tags

A single measurement variable in the PI System is known as a tag. SETPOINT UMM-CM and TMM-CM modules can supply multiple measurements, including waveforms, and may thus consume several dozen tags per channel (refer to Table 6), depending on the channel type and configuration. When a PI System is provided by Brüel & Kjær Vibro as part of a CMS installation, tags for each UMM-CM and TMM-CM module are included using SETPOINT® p/n SWT-05 for UMM-CM and SWT-06 for TMM-CM. These part numbers cover an entire *module* (not a channel or a single measurement variable) by providing the requisite number of tags for any possible combination of channel types/configurations in the module. The licensing agreement for these tags is encompassed by document 1313253 and the Brüel & Kjær Vibro customer order number. These tags are restricted to use only with SETPOINT® data streams.

They are not to be used for measurements originating outside of your VC-8000 racks, except as noted in 4.3.1.2 below.

4.3.1.2 Process data tags

PI Servers provided by Brüel & Kjær Vibro are licensed for an additional 250 tags beyond those consumed by data originating in the VC-8000 rack(s). These additional 250 tags are intended for process variables pertaining to the machine(s), but which do not originate in the SETPOINT rack(s).

Examples include motor winding temperatures, generator loads, lube oil temperatures/flows/pressures, or compressor suction and discharge temperatures/flows/pressures that may come directly into a PLC or DCS. Such points can be supplied to the PI Server via a PI Interface using the appropriate protocol rather than via hardwiring through a VC-8000 rack. This licensing ensures that adequate tags are available for this supplementary machinery data, while restricting customers from using their Brüel & Kjær Vibro -supplied PI Servers as general-purpose process historians. Customers requiring more than 250 process data tags can work with AVEVA™ to convert their Brüel & Kjær Vibro PI Server to an “unrestricted” PI Server and secure any incremental necessary tags. Contact Brüel & Kjær Vibro for additional details.

4.3.1.3 Customer-supplied tags

When you use your existing PI Server with tags purchased directly from AVEVA™, the license agreement for your PI Server and tags is with AVEVA™. These tags are not restricted in how they may be used, except as governed by your AVEVA™ license. They can be used for SETPOINT® and non- SETPOINT® data streams, in any combination. However, in order to access this data once in the PI Server and display it with CMS Maintenance software, a PI Server Access (PSA) license is required as discussed in 4.3.2

4.3.1.4 Tag Requirements

Table 5 shows the number of tags required for SETPOINT® CMS. To calculate the total number of tags, use the VC-8000 Setup application and count the total number of measurements as seen on the **Measurement View** and the total number of waveforms as seen in the **Waveform Configuration View**. Then multiply these by the values shown in **Table 6**.

Table 5: PI System Tags Required

Use	Tags Required	Notes
SETPOINT® Connector Service	1	One required per computer running SETPOINT® Connector
Rack	1	For each rack
Measurement and Status	2	Per measurement
Waveform and Status	2	Per Synchronous or Asynchronous waveform
Waveform Interestingness Index (I-Factor®)	1	Per channel

Table 6: Tags Required by Channel Type

Universal Monitoring Module							
Channel Type	PI Tag Consumption			Data Returned			Measurements Available
				Waveform[1]		Non-WF	
	Max	Min	Typical	Sync	Async	Static[2]	
Accel – Std	23	4	17	●	●	●	9
Accel – Env	19	14	19	●	●	●	7
Accel – Aero	13	6	13	●	●	●	4
Accel – LF Intg	11	4	9	●	●	●	3
Accel – REB	11	8	11		●	●	4
Accel - REB slow	11	8	11		●	●	4
Acoustic	23	20	23		●	●	10
Axial Pos'n	9	4	7		●	●	3
Axial Pos'n sync	11	4	9	●	●	●	3
CE – Single	2	2	2			●	1
CE – Dual	6	6	6			●	3[5]
DE	4	4	4			●	2
CIDE	10	10	10			●	5[5]
RDE	10	10	10			●	5[5]
Discrete	2	2	2			●	1
Dyn. Pres.	15	4	9	●	●	●	5
Ecc	15	10	15	●	●	●	5
Impact	11	6	11	●	●	●	3
Phase Trig	11	4	7		●	●	4
Process Var	4	4	4			●	2
REBAM	11	8	11		●	●	4
RV-Std	25	4	17	●	●	●	10
RV - Air Mach	21	8	21	●	●	●	8
RV – Hydro	29	20	29	●	●	●	12
Shaft Abs	38	12	38	●	●	●	10[5]
Rev. Rot'n	20	14	20		●	●	7[5]
Tachometer	4	4	4			●	2
Valve Pos'n	4	4	4			●	2
Vel – Std	23	4	17	●	●	●	9
Vel – Aero	11	6	11	●	●	●	3
Vel- Hydro	29	20	29	●	●	●	12
Vel – LF Intg	9	4	9	●	●	●	2
Zero Speed	15	10	13		●	●	7[5]
Temperature Monitoring Module							
Temperature	6	2	2			●	3
Process Var	2	2	2			●	1
Rack[3]							
System[4]							

Notes:

1. **Waveform Data Tag Consumption**
2 tags for each sync waveform per channel
2 tags for each async waveform per channel
1 tag for interestingness index (I-Factor®) per channel (waveform-capable channels only)

2. **Static Data Tag Consumption**
2 tags for each measurement (1 for value, 1 for status)

3. **Rack Tag Consumption**
1 tag per rack

4. **System Tag Consumption** SETPOINT® Connector
1 tag per computer running SETPOINT® Connector

5. **Denotes configuration selection that uses two sensors and consumes two UMM channels.**
Measurement count is combined total for channel pair. If sync and/or async waveforms are indicated as available, they are available from each channel individually.

6. **Channels Not Listed**
For channels not listed, use the VC-8000 Setup software to view the number of active measurements. Multiply the number of active measurements by 2 and add to total according to note 2.

Example:

A system with one SETPOINT® Connector service connected to 3 racks. Each rack is collecting 96 measurements and 32 waveforms from 16 channels.

Total Tags = (1 tag x 1 Service) + (1 tag x 3 Racks) + (2 tags x 96measurements x 3 racks) + (2 tags x 32 waveforms x 3 racks) = 772 tags

4.3.2 PI Server Access (PSA) License

Brüel & Kjær Vibro - supplied PI Servers

When a PI Server is supplied by Brüel & Kjær Vibro, it is licensed to connect to any other applications provided by AVEVA™, including but not limited to PI Interfaces, PI-to-PI Interfaces, PI Vision, and DataLink. It is also licensed to connect to SETPOINT® CMS software and the SETPOINT® Connector software. It is not licensed to connect to any other third-party applications. For other third-party applications to access the data in a Brüel & Kjær Vibro -supplied PI Server, a PSA is required. Contact Brüel & Kjær Vibro for additional information.

AVEVA™-supplied PI Servers

When a PI Server is supplied by AVEVA™, it is licensed to connect to any other AVEVA™ software. However, to connect to third-party applications, including SETPOINT® CMS software and the SETPOINT® Connector software, a PSA is required. An unrestricted PSA, encompassing any third-party application, may be obtained directly from AVEVA™. A special SETPOINT® PSA, covering only SETPOINT® Connector and SETPOINT® CMS, is available from Brüel & Kjær Vibro. The SETPOINT® PSA is typically used when the customer wants to license one or more existing AVEVA™-supplied PI Servers for use with SETPOINT® data streams and SETPOINT® CMS display software.

4.3.3 PI Asset Framework (AF) Client License

SETPOINT® CMS requires that PI AF Client software be installed on the same computer in order to read data from a connected PI Server. PI AF Client is not required when CMS Display is used to open .cms files rather than connecting to a PI Server. During the installation of CMS Display software, the presence or absence of AF Client will be detected. If PI AF Client is absent, the user will only be able to open and view .cms files. If PI AF client is present, the user will also be able to connect to a PI Server containing SETPOINT® CMS data streams.

4.4 SD Card and Internal SAM Hard Drive Installations

When SETPOINT® data will not be streamed to a PI Server, and instead streamed to the SAM's SD Card or internal hard drive, no PI System components are required, and no PI System licensing is necessary. The only CMS software required is the SETPOINT® CMS display software, with the features enabled per **Section 3**.

5 Installation

5.1 Installing the PI System

Installing a PI system is only required when you wish to store your data in AVEVA™ PI/AF database. Please skip this step if you do not want to use a PI system, or if want to make use of an already existing PI system.

Refer to the AVEVA™ PI System™ installation manuals when installing the AVEVA™ PI System™ components. Refer to System Components for information about the minimum versions of the individual software components. The recommended installation order is:

1. SQL Server (version as required by the selected PI AF Server version)
2. PI AF Server
3. PI Server
4. PI AF Client
5. Reboot the Server

5.2 Installing SETPOINT® Connector

The SETPOINT® Connector is required when you wish to store your VC-8000, VCM-3 and/or BKV Collect data in either an AVEVA™ **PI/AF** database or a **CMS-XC** database (VC-8000 only; cf. chapter 13, CMS-XC Data Storage on a Local Computer).

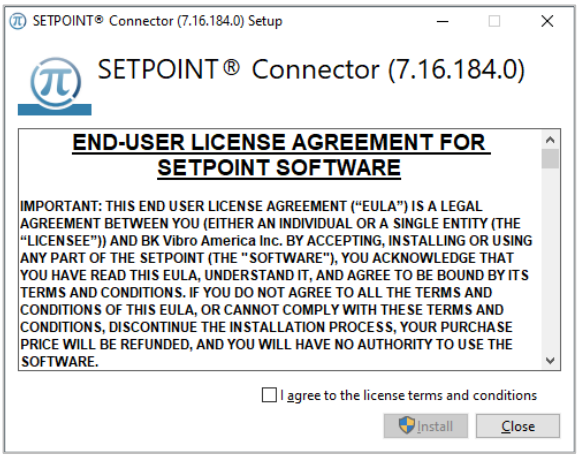
APPLICATION ALERT!

Server OS upgrades can cause the server to restart resulting in loss of data. Turn automatic updates off to prevent data loss.

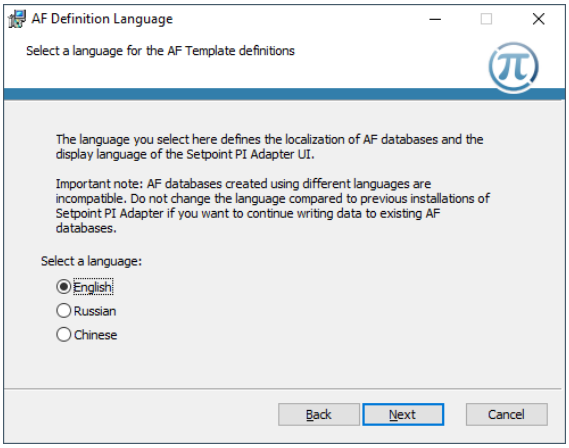
NOTE!

To be able to write data to AVEVA™ PI/AF databases, the computer running the SETPOINT® Connector must also have the PI AF Client 2012 with SP2 (or higher) application installed. Recommended version is latest release from AVEVA™. Note that the SETPOINT® Connector service (cf. section 5.2.1) needs to be restarted after installing or updating PI AF Client.

Click on the Setpoint_Connector_Setup.exe to install the SETPOINT® Connector and configuration application. Accept the license agreement and follow the instructions shown on the screen.



During the installation process, the language of SETPOINT® Connector can be selected.



Note that the selected langugae selected defines both, the SETPOINT® Connector display language *and* the language of AF templates. That is, attributes within AF databases created by the SETPOINT® Connector will be localized to the language selected here.

NOTE!

AF databases created using different languages for the AF templates are incompatible. Do not change the language compared to previous SETPOINT® Connector installations if you want to continue writing data to already existing AF databases.

In the next step, you will be prompted to enter **Service Log On Credentials** for the SETPOINT® Connector Service, as shown in **Figure 6**. If SETPOINT® Connector service is installed on the same computer as the PI Server and PI AF Server, you can select Run service as **Local System**. If not, fill in an Administrator account and password or other user with PI AF server write access logon information. Click the **Test Credentials** button to verify the Account and Password are valid.

NOTE!

When setting the account and password it is best to use an account whose password will never change; be aware that when account passwords change, the service password must also be updated.

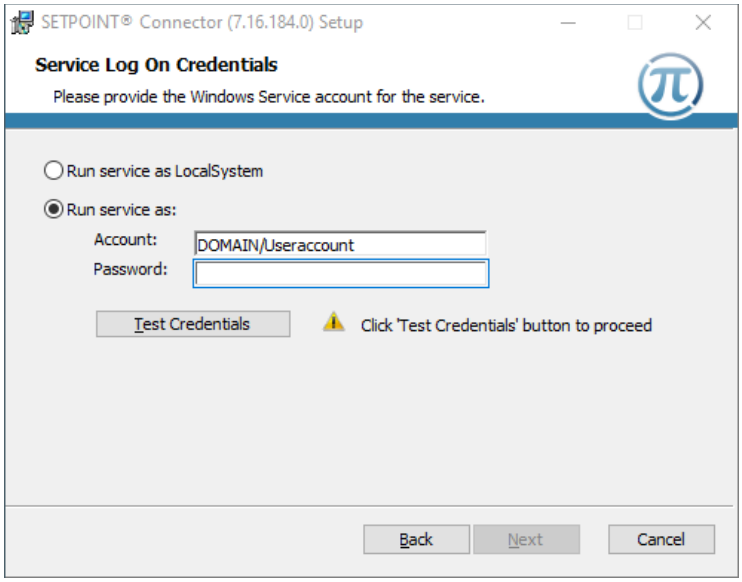
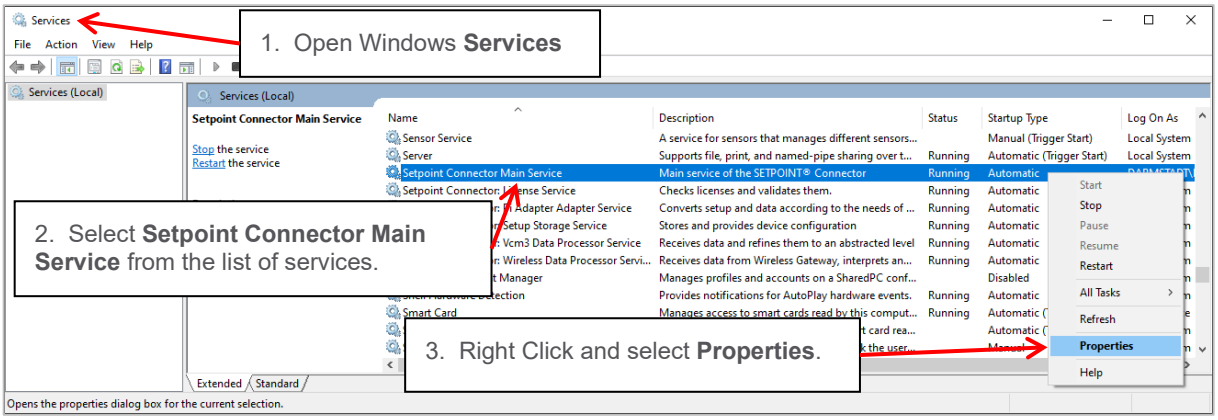
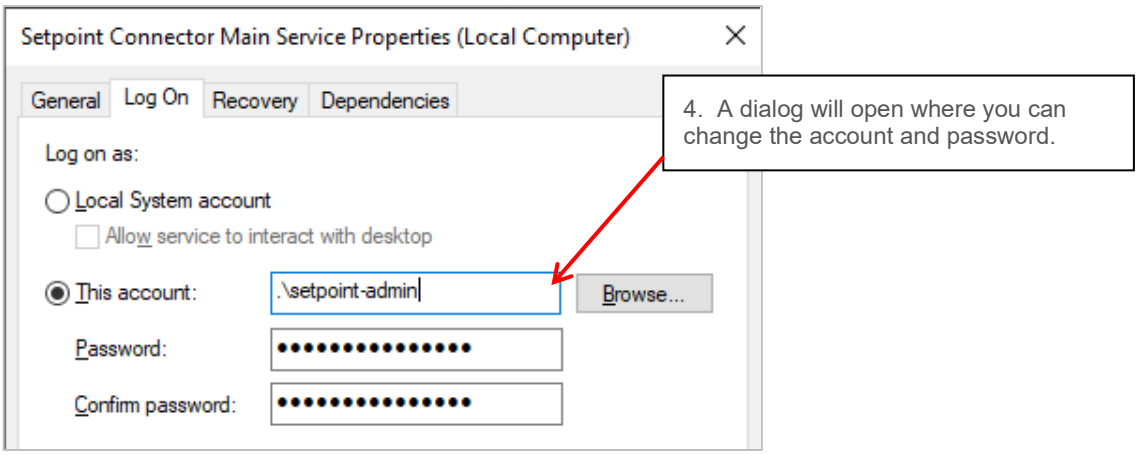


Figure 6: Setting the SETPOINT® Connector service Log On Credentials

5.2.1 Changing the SETPOINT® Connector Service Log On Credentials

If you need to change the log on account or password, or if you move the PI Server, PI AF Server, or SETPOINT® Connector to a different computer and need to use different credentials, you can change the log on credentials using the following instructions. To change the account or password used for the SETPOINT® Connector service, change the Log On properties of the SETPOINT® Connector service.





If the service fails to start, check the Windows Event Log for messages relating to SETPOINT® Connector.

5.3 Installing the SETPOINT® CMS Display Application

Click on the Setpoint_CMS_Setup.exe to install the CMS application. Accept the license agreement and follow the instructions shown on the screen.

NOTE!

To be able to connect to AVEVA™ AF databases, the computer running SETPOINT® CMS must also have the PI AF Client 2012 with SP2 (or higher) application installed. Recommended version is latest release from AVEVA™.

5.3.1 Add-ons

During the installation, additional useful components are provided in the
`C:\Program Files (x86)\Setpoint\Addons`
folder.

These components are located together with instructions in separate subfolders.

Example:
`\PIVision`
Contains the manual and fragments to relaunch the CMS viewer from PI-Vision.

6 Security

This section describes the minimum security configuration for SETPOINT® CMS operating with a PI Server. This includes:

- Setting User Permissions
- Opening Firewall Ports

The PI System provides many additional security features. Refer to the OSI document PI Server Configuring Security.

6.1 Setting User Permissions

The AVEVA™ PI System™ has security methods to protect against unauthorized writing, reading, or changing data in the databases. You can set access permissions by user following the AVEVA™ procedures. If you have an existing AVEVA™ PI System™, your system administrator will need to set up the permissions. Brüel & Kjær Vibro Service can also provide assistance in setting up security access.

Users will need Write/Change permission in order to:

- Change Reference Data or Overlays
- Change Bearing Clearance
- Change Reciprocating Compressor Gas Properties

To set user permissions for simple systems or for quick implementation, follow the instructions in this section. Start by opening the PI System Management Tools.

Expand Security in the tree and select **Mappings & Trusts**. Assign users to the PI System database as shown:

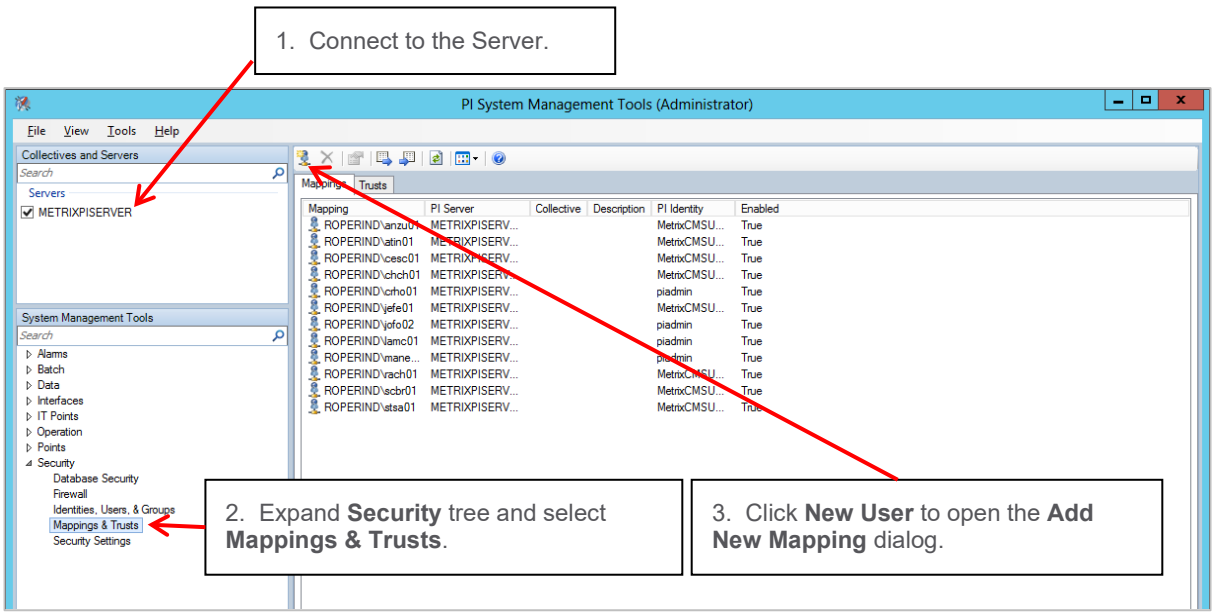


Figure 7: Adding Users

Referring to **Figure 8**, fill in the Windows Account for the new user. The Windows SID will fill in automatically. The Description is not required and can be left blank. The PI Identity sets the access level for the PI Server. Consult with your PI Administrator for the appropriate PI identity for the new user.

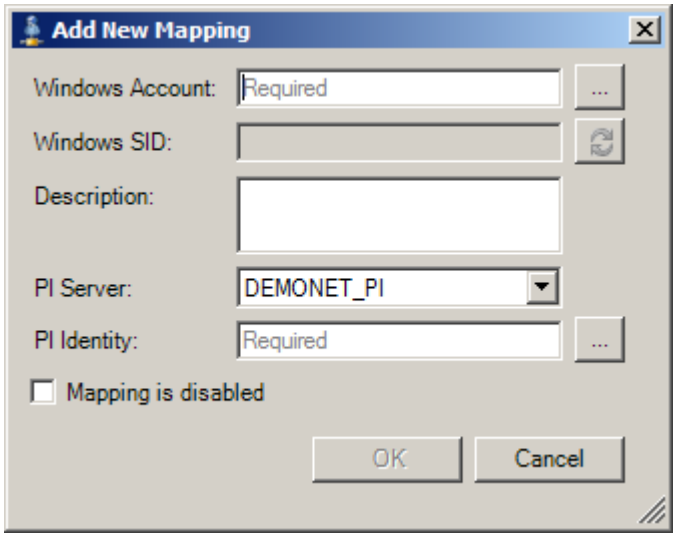


Figure 8: Add New Mapping Dialog

NOTE!

The server computer must be connected to the same network domain as the users you are adding.

NOTE!

Though you can map individual users to PI identities, it is not a recommended practice. OSI recommends using Domain Groups to manage access. Refer to the OSI document PI Server 2012 Configuring Security for best practices when creating and mapping Domain Groups.

6.2 Opening the Firewall Port on the Server

If you are running a firewall on your server, you will need to open the ports used by SETPOINT® CMS and/or the SETPOINT® Connector service. These ports are required:

Table 7: Communication Ports

Port	Description
8001	Communication and time synchronization between the VC-8000 rack and the SETPOINT® Connector.[1]
8002	Communication between the CMS Display Application and CMS-XC computer. Only required when using the CMS-XC option.
8003	Communication between the CMS Display Application and the CMS-HD enabled rack. Only required when using the CMS-HD option.[1]
8004	Communication for Remote-Access Configuration between MPS-Software and VC-8000 Rack. Only required when using MPS-Remote option.
8181	Communication between VCM-3 devices and SETPOINT® Connector (inbound)
8883	Communication between BKV Collect and SETPOINT® Connector (inbound)
5450	PI AF Client to PI Server
5457	PI AF Client to PI AF Server
137, 138, 139, 88	AF Server to Domain Controller
UDP 123	NTP Time Synchronization

[1] These ports should only be open for internal firewalls and are not intended to be open on firewalls to external networks.

NOTE!

The PI System Ports shown are defaults. Verify that you have opened the ports your PI System is configured to use.

Change the Firewall Ports from:

Control Panel -> System and Security -> Windows Firewall as shown below.

Figure 9: Windows Firewall Configuration

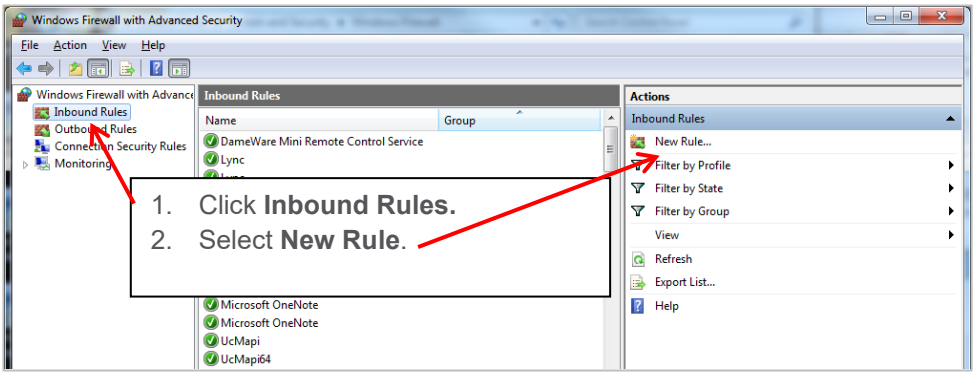


Figure 10: Windows Firewall Advanced Security

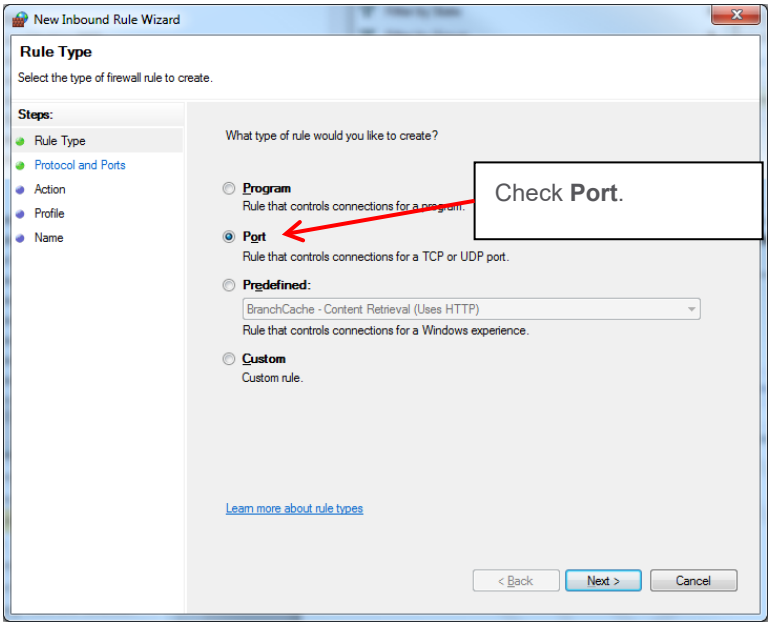


Figure 11: Setting the Rule Type

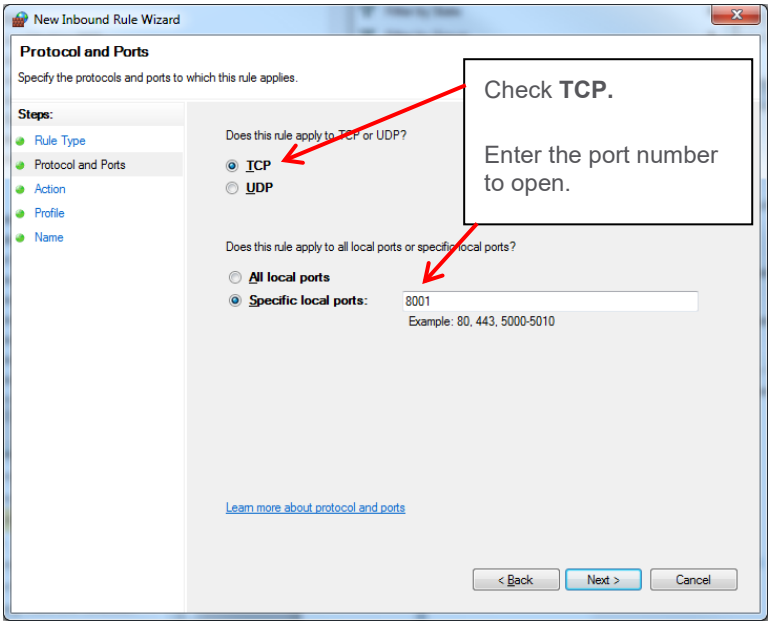


Figure 12: Specify the Port

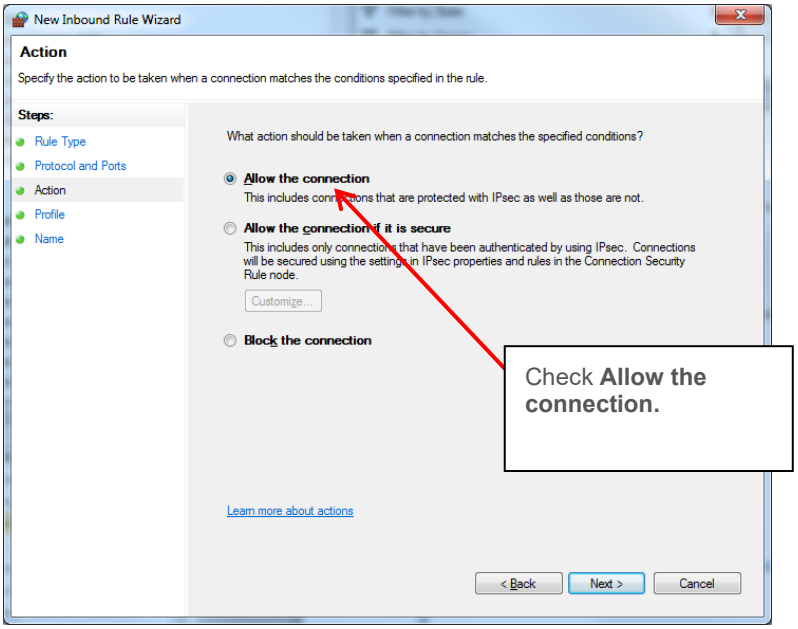


Figure 13: Allow the Connection

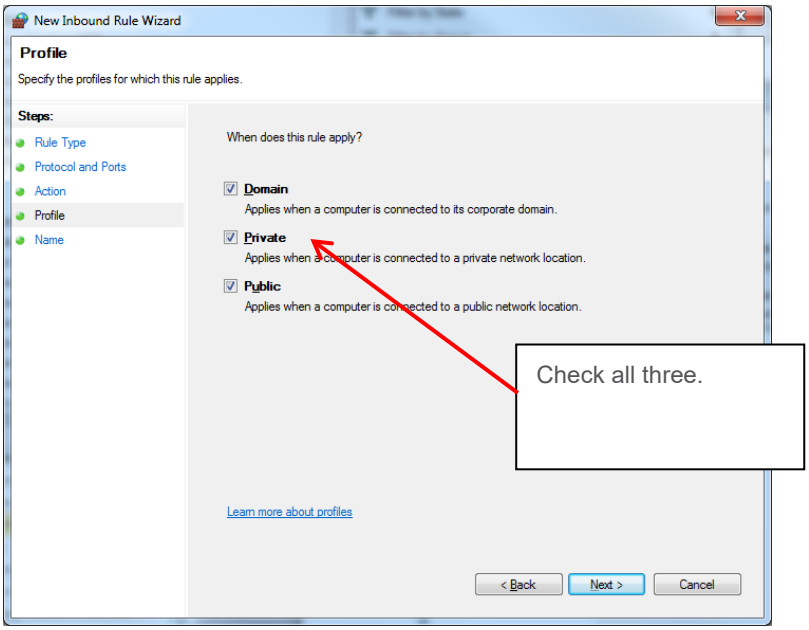


Figure 14: Setting the Rule Application

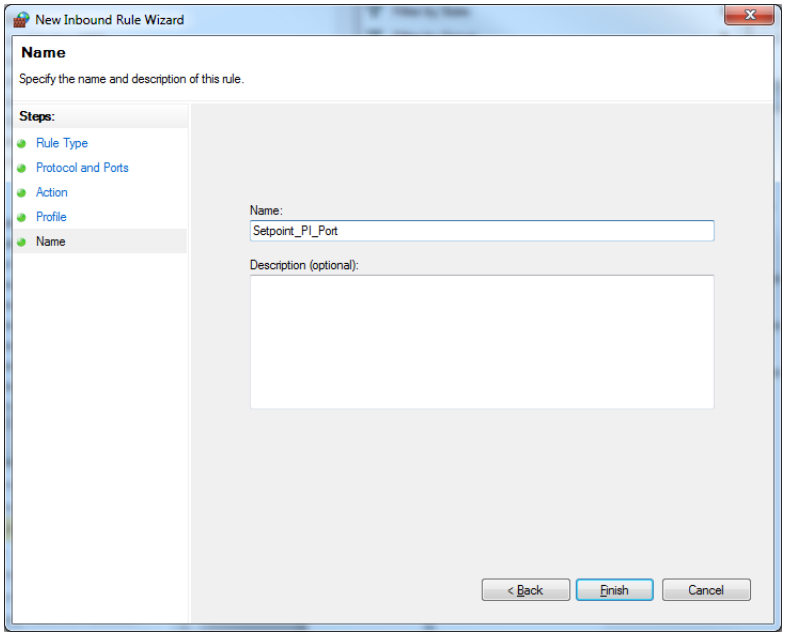


Figure 15: Setting the Port Rule Name

You will need to repeat the steps in **Figure 11** through **Figure 15** creating Inbound and Outbound rules for each of the ports shown in **Table 7**.

7 VC-8000 Configuration

You will need to configure your SETPOINT® system for proper operation. Configuration includes:

- Configuring the SAM CMS network settings
- Configuring the machine asset hierarchy
- Configuring the waveform collection parameters
- Configuring SETPOINT® Connector to connect to the VC-8000 rack and PI AF Server.
- Configuring PI AF System Explorer

7.1 Configuring the SAM

Use the VC-8000 Setup software to configure the VC-8000 rack. Refer to the VC-8000 Operation and Maintenance Manual S1079330.

7.1.1 Configuring the SAM Network Settings

This section describes how to configure the SAM network settings for communication with a PI System.

The SAM uses the CMS Ethernet port to communicate condition monitoring data to a PI System. You must set the SETPOINT® Ethernet network communication parameters to be compatible with your data acquisition computer and network.

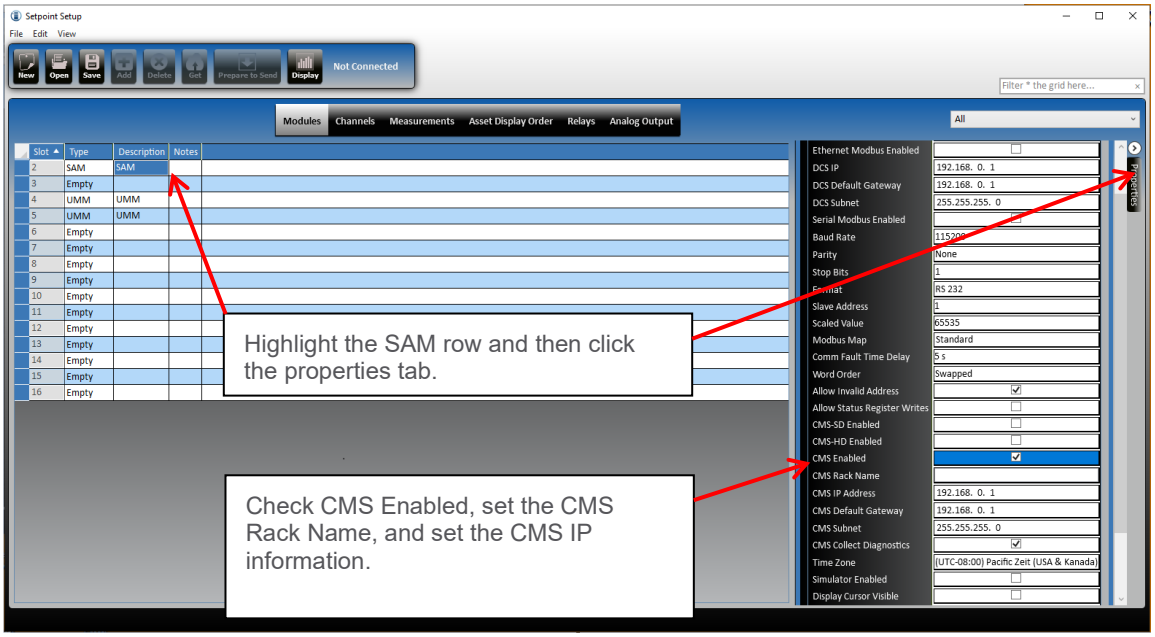


Figure 16: Opening the SAM Properties

Set the parameters below. Other parameters shown are for the SAM Modbus communication and are discussed in the VC-8000 Operations and Maintenance Manual.

CMS Rack Name

Assign a name to the VC-8000 rack. The SETPOINT® Connector uses this name when creating unique tags in the PI database. Each rack must have a unique name.

NOTE!

If you change the rack name, the SETPOINT® Connector will allocate new PI Tags. Use the Rack Alias (See **Section 8.2** and **8.5**) setting to avoid creating new tags if you change the rack name.

CMS Enabled

Check this box to turn on the CMS Ethernet port for connection to CMS (PI System or CMS-XC)

CMS-SD Enabled

Check this box to turn on recording to the SD card. The SAM must have been purchased with the SD card capability to activate this feature.

CMS-HD Enabled

Check this box to turn on recording to the internal drive. The SAM must have been purchased with the HD drive capability to activate this feature.

CMS IP Address

The Internet Protocol (IP) address is used by the Ethernet switching equipment to route packets. Each device on a network subnet must have a unique IP address. Consult your network administrator for a static IP address.

The default IP address is 192.168.0.2.

SETPOINT® only uses static IP addresses. DHCP (dynamic address assignment) is not supported.

CMS Subnet

The subnet mask is used to identify the IP address bits that define a subnet. Consult your network administrator for a valid subnet mask.

The default subnet mask is 255.255.255.0.

CMS Default Gateway

The default gateway is the address used when a client resides on a different subnet. Typically, the default gateway is the address of a router used to route packets between the subnets. Consult your network administrator for a valid default gateway IP address.

CMS Collect Diagnostics

The SETPOINT® CMS system collects diagnostics and statistics on data storage and bandwidth usage. Checking this option causes the SETPOINT® Connector to create PI tags and store the diagnostic values in the PI system.

NOTE!

The diagnostics will consume 22 PI tags for each rack. Be sure you have enough PI tags available when selecting this option.

7.1.2 Configuring the SAM CMS Data Storage

The eSAM, when licensed, can store CMS data in several different ways:

- CMS SD: Stores data on a Secure Digital (SD card) up to 32 GB
- CMS HD: Stores data on an internal solid state drive up to 256 GB
- CMS XC or DAC: Spooled to an external computer for storage on an AVEVA™ PI Server or on an external drive

Enable these by checking the box in the SAM Properties:

7.2 Configure the Machine Asset Hierarchy

The PI Asset Framework imports your plant and machine hierarchy from the VC-8000 rack. Use the VC-8000 Setup software to configure the hierarchy by opening the **CMS Framework View** from the **Channels View** as shown in **Figure 17**.

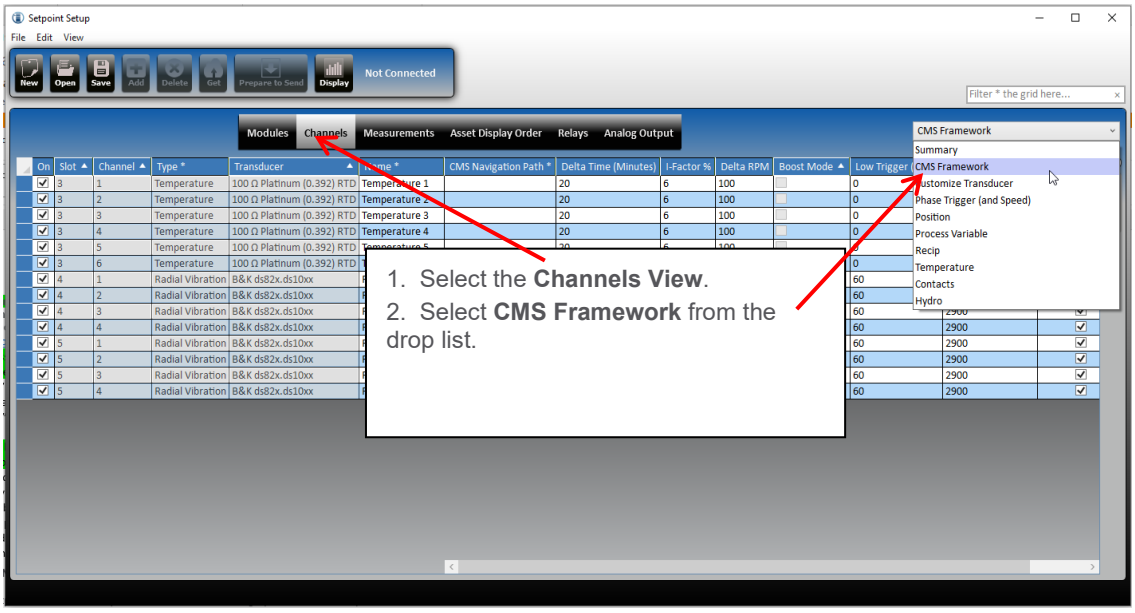
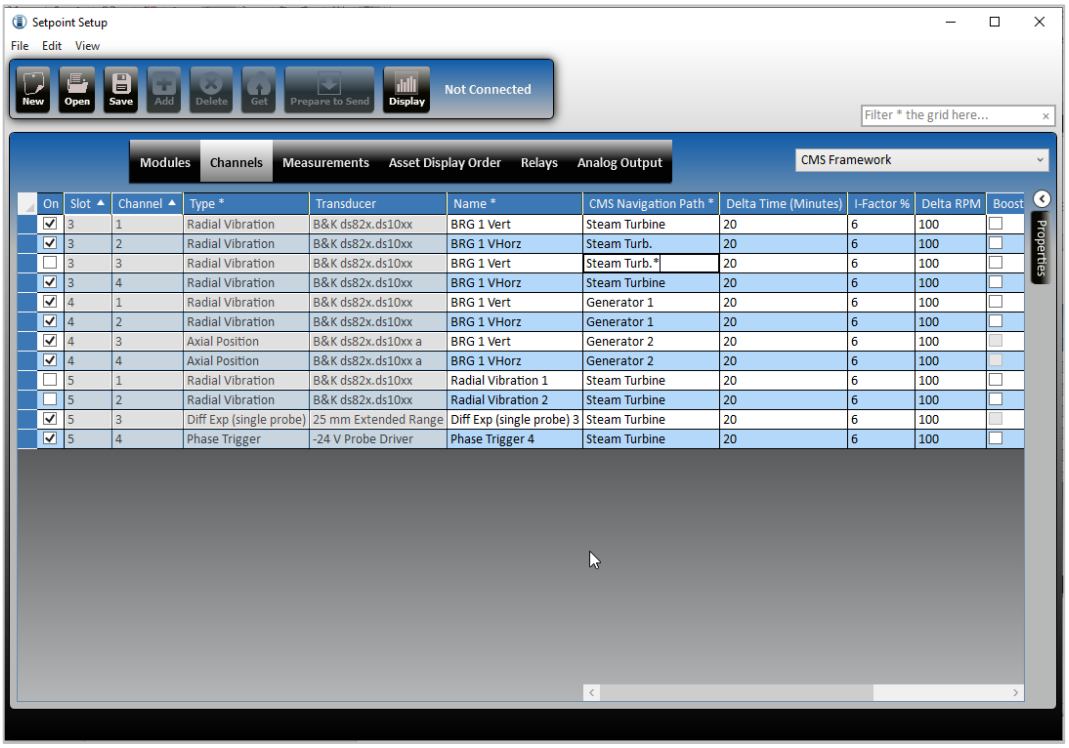


Figure 17: Opening the CMS Framework View

Configure the parameters described below from the CMS Framework View (**Figure 18**).



On	Slot	Channel	Type *	Transducer	Name *	CMS Navigation Path *	Delta Time (Minutes)	I-Factor %	Delta RPM	Boost
☑	3	1	Radial Vibration	B&K ds82x.ds10xx	BRG 1 Vert	Steam Turbine	20	6	100	☐
☑	3	2	Radial Vibration	B&K ds82x.ds10xx	BRG 1 VHorz	Steam Turb.	20	6	100	☐
☐	3	3	Radial Vibration	B&K ds82x.ds10xx	BRG 1 Vert	Steam Turb.*	20	6	100	☐
☑	3	4	Radial Vibration	B&K ds82x.ds10xx	BRG 1 VHorz	Steam Turbine	20	6	100	☐
☑	4	1	Radial Vibration	B&K ds82x.ds10xx	BRG 1 Vert	Generator 1	20	6	100	☐
☑	4	2	Radial Vibration	B&K ds82x.ds10xx	BRG 1 VHorz	Generator 1	20	6	100	☐
☑	4	3	Axial Position	B&K ds82x.ds10xx a	BRG 1 Vert	Generator 2	20	6	100	☐
☑	4	4	Axial Position	B&K ds82x.ds10xx a	BRG 1 VHorz	Generator 2	20	6	100	☐
☐	5	1	Radial Vibration	B&K ds82x.ds10xx	Radial Vibration 1	Steam Turbine	20	6	100	☐
☐	5	2	Radial Vibration	B&K ds82x.ds10xx	Radial Vibration 2	Steam Turbine	20	6	100	☐
☑	5	3	Diff Exp (single probe)	25 mm Extended Range	Diff Exp (single probe) 3	Steam Turbine	20	6	100	☐
☑	5	4	Phase Trigger	-24 V Probe Driver	Phase Trigger 4	Steam Turbine	20	6	100	☐

Figure 18: The CMS Framework View

CMS Navigation Path

The CMS Navigation Path provides a method for creating a hierarchy (machine groups and measuring points) in PI AF. You can view the hierarchy using PI System Explorer as shown in **Figure 19**.

The backslash (\) separates the asset levels.

The asterisk (*) following a level determines where the **CMS Navigation Path** will be truncated when displayed on the home screen.

Example:

An **CMS Navigation Path** set to Alky*\Compressor 65CC201\ would create two levels:

+ Alky

    + CompressorCC201

“Alky” would appear at the top asset level.

The hierarchy appears in the PI System Explorer, as shown in the further example below:

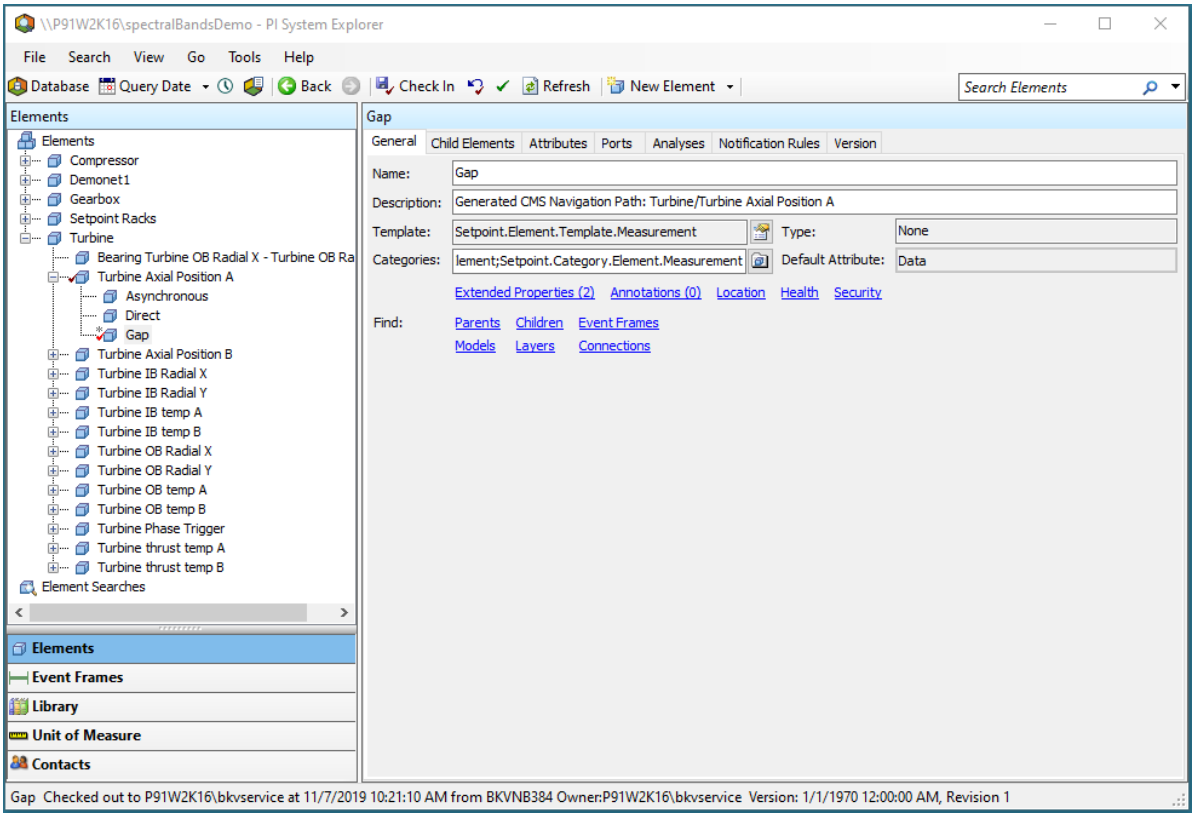


Figure 19: PI System Explorer Hierarchy

In this case the **CMS Navigation Path** was entered as:

Turbine\

7.3 Configure Data Collection Rates

Data collection rates are set on the **CMS Framework View**. This section describes how to set these parameters.

7.3.1 Delta Time (Minutes)

The Delta Time sets the maximum amount of time that can elapse between storing the most interesting waveform. The Delta Time ensures that waveforms are collected periodically, even when the machine condition is not changing enough to trigger I-Factor % threshold.

Whenever the Delta Time elapses, SETPOINT® CMS stores the waveform that has changed the most during the collection interval. Worst case, the maximum time between stored waveforms can be twice the Delta Time.

Setting a short Delta Time can cause the SETPOINT® CMS to collect very large amounts of data as shown in Table 8. SETPOINT® CMS will automatically collect and store more waveforms during transient conditions so the Delta Time does not need to be set low to achieve good waveform collection when the machine state is changing.

Table 8: Delta Time Data Storage for 2048 Sample Waveforms

Delta Time	Data Stored for 1 Channel over 1 Year	Data Stored for 300 Channels over 1 Year
1 minute	25.8 GB	7.7 TB
20 minutes	1.3 GB	390 GB
2 hours	216 MB	65 GB
1 day	18 MB	5.4 GB

NOTE!

Data collection during transient operation can be much higher than steady state. Size your hard drive space accordingly.
For reference, a machine startup collecting sixty 2048 points waveforms would require approximately 1.8 MB for each channel associated with a phase trigger and 0.9 MB for each channel not associated with a phase trigger.

7.3.2 I-Factor %

The SETPOINT® monitor will freeze a dynamic waveform sample when any of the measured variables change by the configured % of the danger setpoint. If there is no danger alarm set, the monitor uses the percentage of the configured full scale.

Example:

The configured radial vibration danger alarm is 4 mils pp

The current vibration level is 1.5 mils pp.

The I-Factor % is 3%

If the data value changes by 0.12 mils pp (3% of 4 mils pp) then the UMM will collect a dynamic waveform. This will occur in either direction, if the amplitude increases to 1.62 mils pp or drops to 1.38 mils pp.

7.3.3 Adaptive I-Factor

Adaptive I-Factor® is a tool that learns the machine changes and automatically adjusts the I-Factor % Change Threshold to increase or decrease waveform collection. For example, if the system detects that the machine routinely changes vibration levels by 4% during normal operation, adaptive i-ness (I-Factor®) will raise the I-Factor % threshold above 4% to prevent the system from collecting excessive waveforms. The adaptive (I-Factor®) process learns the operation over a period of time so that sudden changes will always initially be interesting and drive for high data collection. The data collection will gradually slow down as the condition persists.

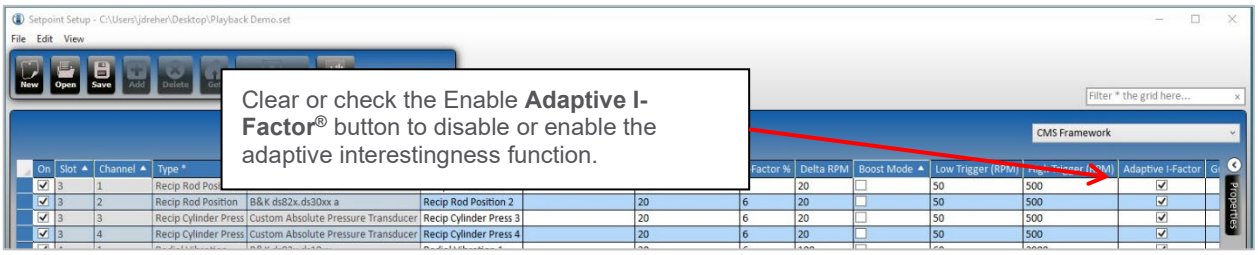


Figure 20: Enabling Adaptive I-Factor

Adaptive I-Factor® is enabled by default on dynamic channels and is recommended for long term data collection (excessive acquisition reduction, increase on too quiet a machine).

7.3.4 Dynamic Collection on Speed Change (Delta RPM)

The speed of an associated Phase Trigger is also included in the determination of when to collect dynamic data. Set the speed change interval on the Channel CMS Framework View as shown in **Figure 21**. You can set different delta RPM intervals regardless of whether the channels are using the same Phase Trigger or not.

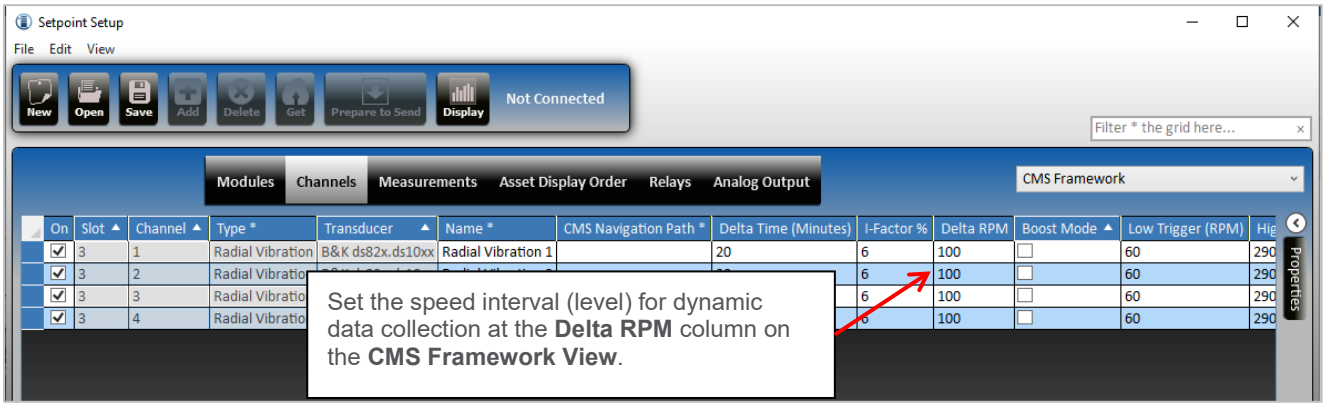


Figure 21: Setting Speed Change for Dynamic Data Collection

NOTE!

The Delta RPM value causes the monitor to collect dynamic waveform data at this interval. Static data collection is independent. There is not a fixed ratio between static and dynamic data collection.

7.4 Configuring Waveform Collection Parameters

SETPOINT® CMS uses configuration information that is set in the VC-8000 Setup application when the VC-8000 is configured.

NOTE!

If you created your rack configuration with VC-8000 Setup software older than version 3.0, you would need to manually add in the waveforms. Refer to the VC-8000 Operations and Maintenance manual for information on adding measurements.

7.4.1.1 Channel Pairs for Orbits

Channel Pairs for Orbits Channel pairs are fixed as channels 1 and 2 or channels 3 and 4 on a UMM. Each channel of the pair must be configured for the same channel type, associated with the same phase trigger, and belong to the same asset path.

The following channel types are supported for channel pairing:

- Radial Vibration
- Shaft Absolute Radial Vibration
- Hydro Radial Vibration
- Diagnostic Proximity Channel
- Acceleration Channel
- Velocity Channel

The configured transducer's orientations determine which channel is "X" and which is "Y".

CAUTION!

To define the acceleration and velocity channels as channel pair requires VC-8000 Setup Software version MPS2019 SP1 (7.3.xxx).

7.4.1.2 Setting sample rates

Follow the instructions in this section for setting the waveform sample rates.

CAUTION!

The VC-8000 Setup Software resets the monitors after configuration which can interrupt machine protection.

Enter the Waveform Configuration View from the Measurements View as shown in **Figure 22**.

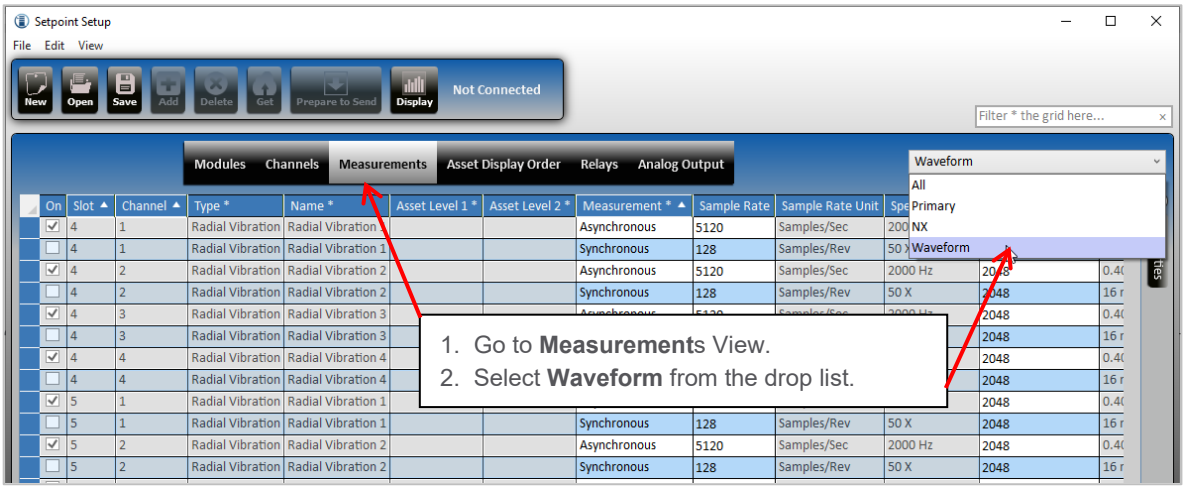


Figure 22: Entering the Waveform Configuration View

7.4.1.3 Configuring Synchronous Waveforms

Synchronous Waveform data collection is configured in terms of the number of samples collected per shaft revolution, evenly spaced in phase. Higher sample rates give better Orbit and Timebase resolution but more coarse resolution for spectrums displayed in orders. More samples (or revolutions) take longer to collect and provide greater spectrum resolution.

Table 9: Synchronous Sampling Configuration

Rate	Maximum Speed	Number of Samples	Revolutions	Spectrum Range, Resolution (Hz, cycles / min)	Collection time at 3600 rpm
128X	12,500 rpm	1024	8	50X, 0.125X	133 ms
		2048	16	50X, 0.0625X	267 ms
		4096	32	50x, 0.0313X	533 ms
		8192	64	50X, 0.0156X	1.06 s
		16384	128	50X, 0.0078X	2.13 s
		32768	256	50X, 0.0039X	4.25 s
64X	25,000 rpm	1024	16	25X, 0.0625X	267 ms
		2048	32	25X, 0.0313X	533 ms
		4096	64	25X, 0.0156X	1.06 s
		8192	128	25X, 0.0078X	2.13 s
		16384	256	25X, 0.0039X	4.25 s
		32768	512	25X, 0.002X	8.52 s
32X	50,000 rpm	1024	32	12.5X, 0.0313X	533 ms
		2048	64	12.5X, 0.0156X	1.06 s
		4096	128	12.5X, 0.0078X	2.13 s
		8192	256	12.5X, 0.0039X	4.25 s
		16384	512	12.5X, 0.002X	8.52 s
		32768	1024	12.5X, 0.001X	17.07 s
16X	100,000 rpm	1024	64	6.25X, 0.0156X	1.06 s
		2048	128	6.25X, 0.0078X	2.13 s
		4096	256	6.25X, 0.0039X	4.25 s
		8192	512	6.25X, 0.002X	8.52 s
		16384	1024	6.25X, 0.001X	17.07 s
		32768	2048	6.25X, 0.0005X	34.13 s

The collection time is dependent on speed. The software shows the data collection time for a machine running at 60 Hz (3600 rpm). You can estimate the data collection time for your machine speed by multiplying the time shown by 3600 rpm and dividing by your machine speed in rpm.

NOTE!

Reciprocating Compressor channels support higher synchronous sample rates. Refer to the Reciprocating Compressor Manual.

7.4.1.4 Configuring Asynchronous Waveforms

You can change the asynchronous sample rate and number of samples collected to optimize your spectrum display. Remember, as the number of lines increases, the amount of time it takes to collect the spectrum increases. If the machine speed is changing, this can cause smearing of the spectrum.

Table 10: Asynchronous Sampling Configuration

Sample Rate	Span	Number of Samples	Spectrum Lines	Resolution (Hz, cycles / min)	Time to Collect
256 sps	100 Hz	1024	400	0.25 Hz, 15 cpm	4 s
		2048	800	0.125 Hz, 7.5 cpm	8 s
		4096	1600	0.0625 Hz, 3.75 cpm	16 s
		8192	3200	0.0313 Hz, 1.875 cpm	32 s
		16384	6400	0.0157 Hz, 0.9375 cpm	64 s
		32768	12800	0.0078 Hz, 0.4688 cpm	128 s
512 sps	200 Hz	1024	400	0.5 Hz, 30 cpm	2 s
		2048	800	0.25 Hz, 15 cpm	4 s
		4096	1600	0.125 Hz, 7.5 cpm	8 s
		8192	3200	0.0625 Hz, 3.75 cpm	16 s
		16384	6400	0.0313 Hz, 1.875 cpm	32 s
		32768	12800	0.0156 Hz, 0.9375 cpm	64 s
1280 sps	500 Hz	1024	400	1.25 Hz, 75 cpm	0.8 s
		2048	800	0.625 Hz, 37.5 cpm	1.6 s
		4096	1600	0.3125 Hz, 18.75 cpm	3.2 s
		8192	3200	0.1563 Hz, 9.375 cpm	6.4 s
		16384	6400	0.0781 Hz, 4.688 cpm	12.8 s
		32768	12800	0.0391 Hz, 2.344 cpm	25.6 s
2560 sps	1000 Hz	1024	400	2.5 Hz, 150 cpm	400 ms
		2048	800	1.25 Hz, 75 cpm	800 ms
		4096	1600	0.625 Hz, 37.5 cpm	1.6 s
		8192	3200	0.3125 Hz, 18.75 cpm	3.2 s
		16384	6400	0.1563 Hz, 9.375 cpm	6.4 s
		32768	12800	0.0781 Hz, 4.688 cpm	12.8 s

Sample Rate	Span	Number of Samples	Spectrum Lines	Resolution (Hz, cycles / min)	Time to Collect
5120 sps	2000 Hz	1024	400	5 Hz, 300 cpm	200 ms
		2048	800	2.5 Hz, 150 cpm	400 ms
		4096	1600	1.25 Hz, 75 cpm	800 ms
		8192	3200	0.625 Hz, 37.5 cpm	1.6 s
		16384	6400	0.3125 Hz, 18.75 cpm	3.2 s
		32768	12800	0.1563 Hz, 9.375 cpm	6.4 s
12800 sps	5000 Hz	1024	400	12.5 Hz, 750 cpm	80 ms
		2048	800	6.25 Hz, 375 cpm	160 ms
		4096	1600	3.125 Hz, 187.5 cpm	320 ms
		8192	3200	1.5625 Hz, 93.75 cpm	640 ms
		16384	6400	0.7813 Hz, 46.875 cpm	1.28 s
		32768	12800	0.3906 Hz, 23.438 cpm	2.56 s
25600 sps	10000 Hz	1024	400	25 Hz, 1500 cpm	40 ms
		2048	800	12.5 Hz, 750 cpm	80 ms
		4096	1600	6.25 Hz, 37.5 cpm	160 ms
		8192	3200	3.125 Hz, 187.5 cpm	320 ms
		16384	6400	1.5625 Hz, 93.75 cpm	640 ms
		32768	12800	0.7813 Hz, 46.875 cpm	1.28 s
51200 sps	20000 Hz	1024	400	50 Hz, 3000 cpm	20 ms
		2048	800	25 Hz, 1500 cpm	40 ms
		4096	1600	12.5 Hz, 750 cpm	80 ms
		8192	3200	6.25 Hz, 375 cpm	160 ms
		16384	6400	3.125 Hz, 187.5 cpm	320 ms
		32768	12800	1.5625 Hz, 93.75 cpm	640 ms

7.4.1.5 Deleting a Waveform

By default, SETPOINT® CMS collects waveforms on all configured channels. To save space in the database, you may want to turn off data collection for some waveforms. **Figure 23** shows how to remove a waveform from data collection.

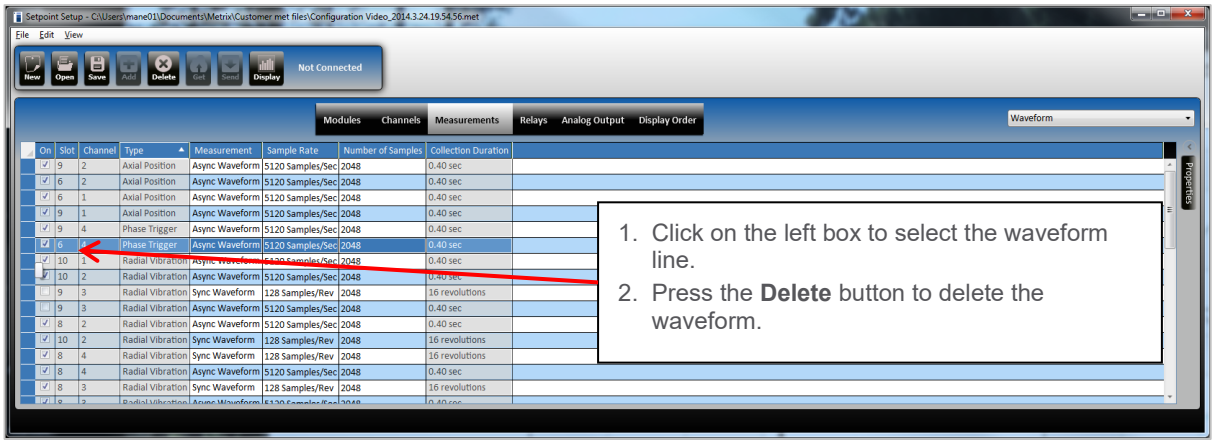


Figure 23: Deleting a Waveform

7.4.1.6 Adding a Waveform

If you decide to restart waveform collection for a deleted waveform, follow the steps below to add the waveform to the data collection.

To add a waveform, go to the **Measurements** tab, choose **All** in the drop-down box and click the **Add** button on the **Measurement Configuration View**. Click the monitor module, and then the channel. A list of available added measurements will appear as shown in **Figure 24**.

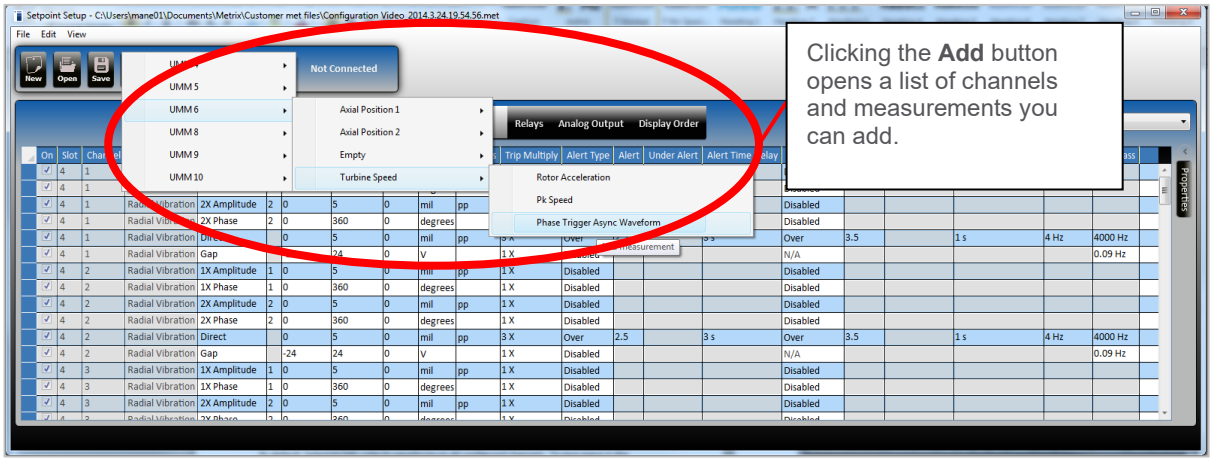


Figure 24: Adding Measurements

The new waveform will appear in the Waveform Configuration View as shown in **Figure 22**.

7.5 Boost Mode and Compression Configuration

The VC-8000 rack contains high speed memory for continuously sampling and recording dynamic waveform data during fast transient events. This function provides a rich dataset even for machines that start up or coast down in seconds and results in superior plots when compared to systems that take waveform snapshots during transients.

NOTE!

Use boost mode for machines that change speed for less than 2 minutes (not including soak time). For machines that ramp slower, standard sampling will provide a good data set.

NOTE!

You must assign a phase trigger to the channel to use boost mode. Channels that do not support phase trigger assignments currently do not support boost mode.

A channel enters boost mode when the measured speed is between the high and low trigger speeds and the speed is changing by at least one configured delta rpm interval. A channel exits boost mode when the speed is outside the low and high trigger speeds, or a phase trigger speed error occurs. A channel will also stop boost continuously recorded data when the speed is not changing by the configured delta rpm interval for 10 seconds. This suspends the high speed sampling during temperature soak intervals. During the soak interval, SETPOINT® will continue to collect waveforms if an interesting event occurs.

If the high speed memory fills before the transient event is complete, SETPOINT® will revert to standard sampling.

NOTE!

Boost mode collects a large amount of data. Transferring the data to CMS can take up to 45 minutes. SETPOINT® will continue to collect data using standard sampling if another transient event occurs before the previously recorded data is uploaded.

To enable boost mode, navigate to the **CMS Framework View** and check the **Boost Mode** box as shown in **Figure 25**. Then set the **Low Trigger** and **High Trigger** values. SETPOINT® will sample the channel continuously when the measured speed is between the low and high trigger values until the internal buffers fill.

Set the **Low Trigger** to a value greater than expected slow roll value. The **Low Trigger** turns off boosted data collection when the machine is on turning gear. If the machine is not slow rolled and stops at 0 rpm, set the **Low Trigger** to 10 rpm.

Set the **High Trigger** to a value below steady state running speed less any normal operation speed fluctuations. The **High Trigger** turns off boosted data collection when the machine has reached steady state.

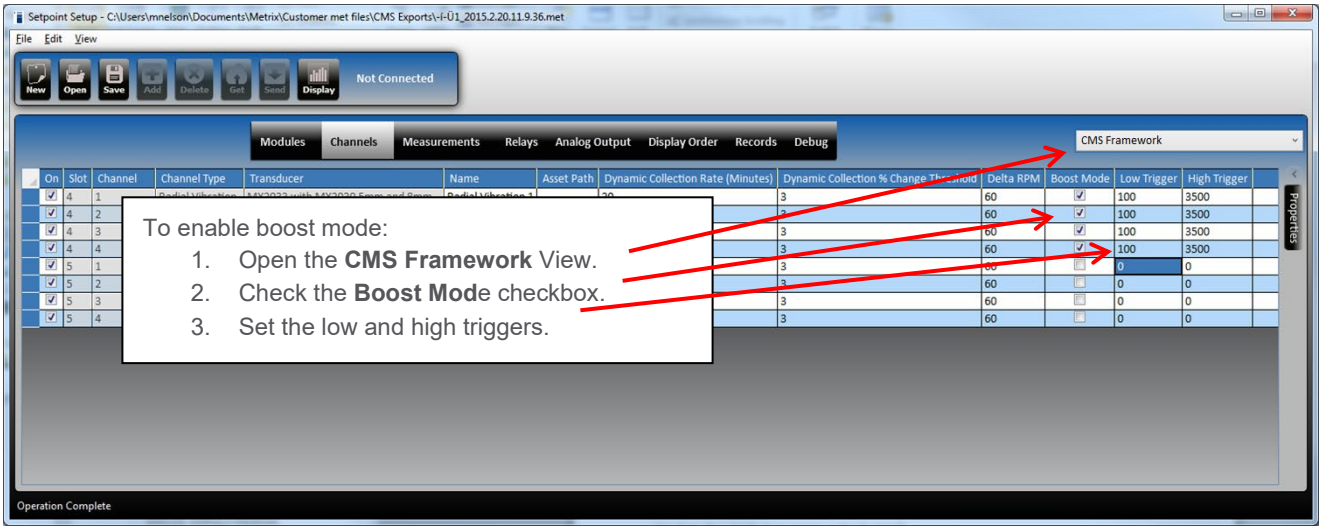


Figure 25: Boost Mode Configuration

NOTE!

Even on slower starting machines, enabling boost mode and setting the high and low triggers around the critical speeds can provide a richer data set while the vibration is changing rapidly. The system will automatically revert to normal sampling if the memory fills.

NOTE!

If the boost Low Trigger and High Trigger are set to the same value, the system will not enter boost mode.

CMS also uses the **High Trigger** and **Low Trigger** values to adjust the static data compression levels. When the speed is between the high and low trigger speeds, the machine is in a transient condition and the compression levels are reduced. When outside this range, the machine is assumed to be in steady state or slow-roll condition and the normal compression levels (as seen in the PI System Management Tools) are applied.

7.6 Associating Vibration Channels with a Cylinder Throw

NOTE!

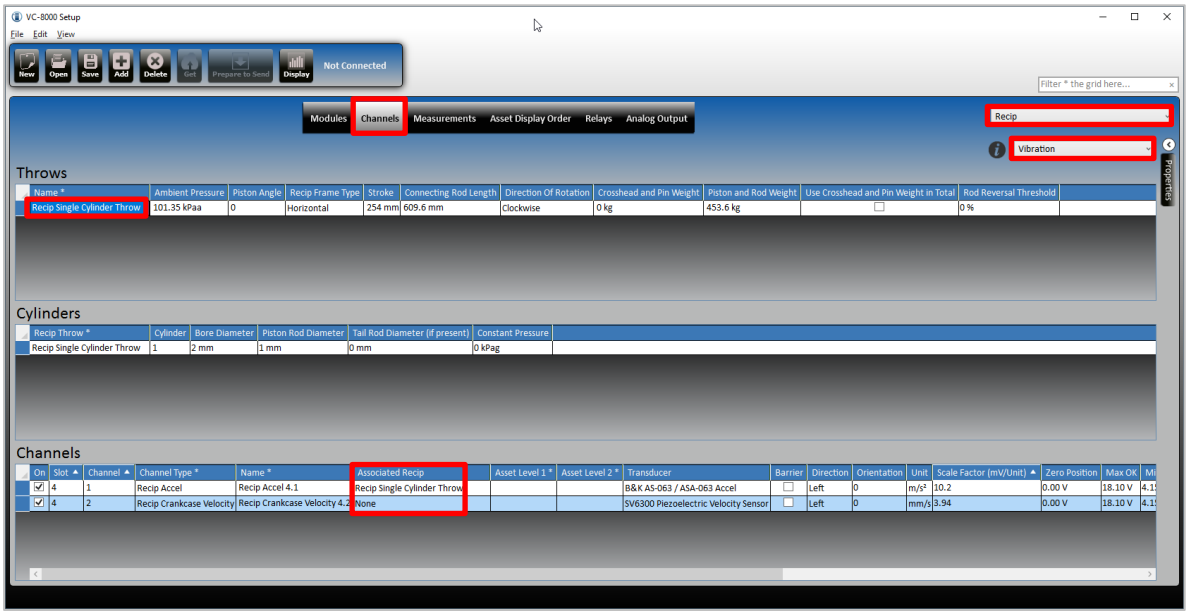
This section only covers the aspect of associating vibration channels with a cylinder throw of a reciprocating compressor for diagnostic purposes. For detailed information on using your device for monitoring reciprocating machinery, please refer to the VC-8000 Reciprocating Machine Addendum (S1342998).

Acceleration and velocity channels (denoted by *Recip Accel* and *Recip Crankcase Velocity*, respectively) can be associated with such a cylinder throw in order to be able to plot dynamic vibration data as a function of the Crank Angle. This is in contrast with rod position (*Recip Rod Pos*) and cylinder pressure (*Recip Cylinder Press)* channels, which must always to be associated with a *cylinder throw* in the reciprocating compressor configuration.

NOTE!

Please make sure you are using the latest versions of VC-8000 firmware and VC-8000 Setup software to use this feature. It is *not* supported in VC-8000 Setup software versions 7.15 (released in April 2023) and before.

To associate a vibration channel with a cylinder throw using VC-8000 Setup, open the **Channels** tab and switch to the **Recip → Vibration** view. In the **Throws** table, select the cylinder throw you want to associate a channel with (*Recip Single Cylinder Throw* in the example below). The **Channels** table will then list all channels of type *Recip Accel* and *Recip Crankcase Velocity* that are either already associated with the selected cylinder throw (channel *Recip Accel 4.1* in the example below), or not yet associated with any cylinder throw (channel *Recip Crankcase Velocity 4.2* in the example below). Finally, modify the current association from the **Associated Recip** column of the **Channels** table. Note that a vibration channel can only be associated with a single cylinder throw.



8 Configure Data Collection and Storage

The SETPOINT® Connector Setup software provides an interface for:

- Configuring data storage locations
- Adding new data connections (VC-8000 racks, VCM-3 devices, BKV Collect sensors)
- Deleting data connections
- Viewing connection status
- Starting and stopping data collection
- View system status logs

NOTE!

Configure your databases and collection options before adding racks or starting data collection.

8.1 The SETPOINT® Connector File Tab

From the SETPOINT® Connector, select the File tab to perform these functions:

- Select PI AF Servers and Databases
- Configure CMS-XC
- Access Log Files
- Advanced Options and Maintenance Tools
- View the SETPOINT® Connector Version

8.1.1 PI AF Settings

PI System to configure AVEVA™ PI System™ data collection.

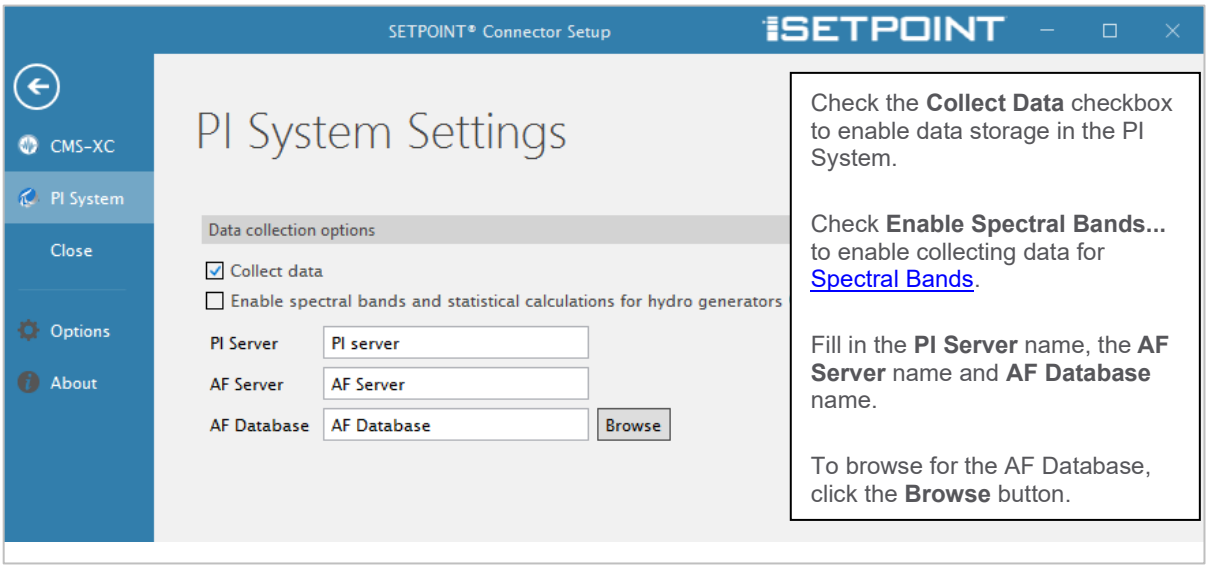


Figure 26: SETPOINT® Connector PI System Settings

NOTE!

If the AF Database configured does not exist, SETPOINT® Connector will automatically create a new database with the configured name.

8.1.2 CMS-XC Settings

CMS-XC stores static and dynamic data from the device into files on a local computer storage drive. CMS-XC files can be directly accessed from SETPOINT® CMS making CMS-XC files suitable for primary data acquisition or for backup to a PI System. XC is similar to the SD card feature but allows the data to be stored on a drive on any computer networked to the rack.

Refer to **Section 13** in this manual for more information on CMS-XC.

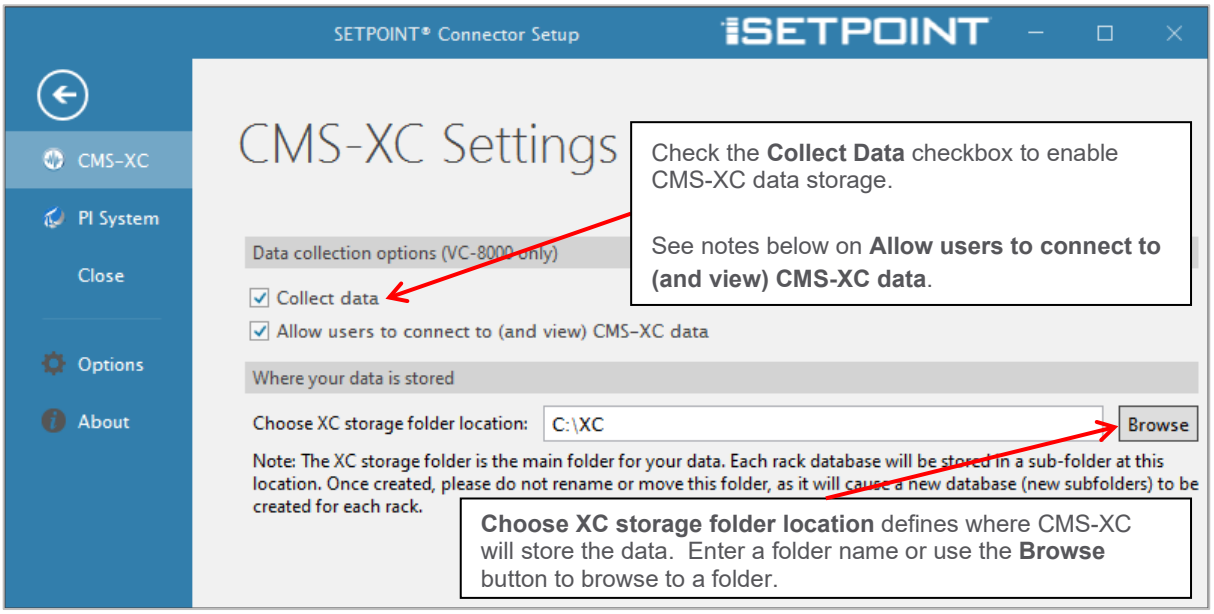


Figure 27: CMS-XC Configuration

The **Allow users to connect ...** option allows other computers to view live data using SETPOINT® CMS. Clear the **Allow users to connect ...** checkbox if CMS-XC is only used for backing up data, otherwise check the **Allow users to connect ...** checkbox to allow viewing live data. When the **Allow users to connect ...** checkbox is cleared, you can upload the data to the PI System or open the XC database as a file and view historical data.

IMPORTANT!

CMS-XC will continue to store data until all available storage space is used. It will overwrite old data when the storage drive is full. Brüel & Kjær Vibro recommends using a separate partition for CMS-XC data if the computer is also performing other important functions.

8.1.3 Options

The **Options** view provides several advanced options and maintenance tools:

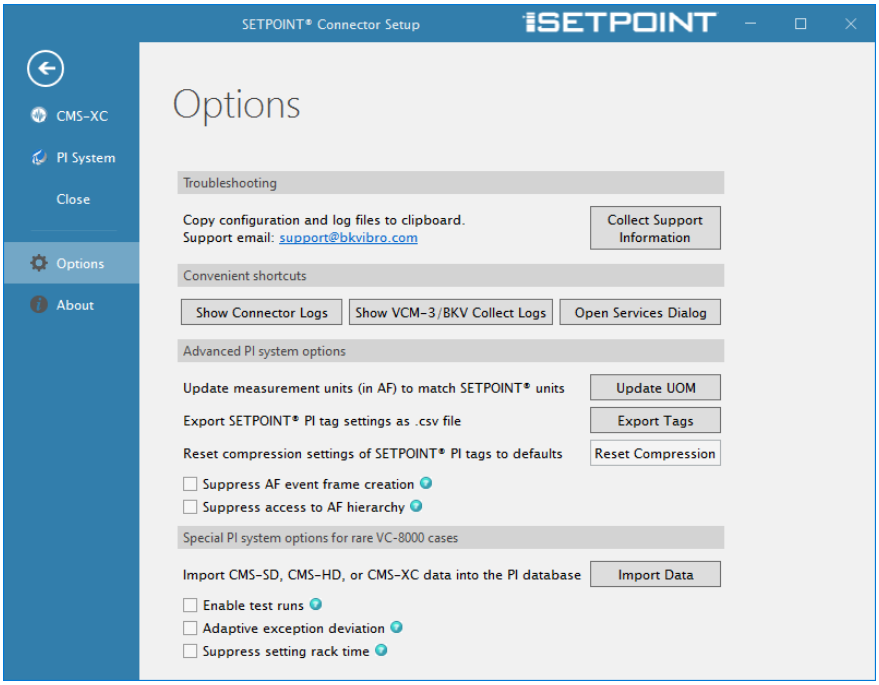


Figure 28: SETPOINT® Connector Options View

8.1.3.1 Collect Support Information

In case of problems with the functionality of SETPOINT® Connector, you can use this button to copy troubleshooting information to the clipboard. The copied information includes log and configuration files for SETPOINT® Connector. It does *not* include measurement data.

Please always include this information when contacting our support.

8.1.3.2 Show Connector Logs

The **Show Connector Logs** option opens a Windows folder containing the SETPOINT® Connector system logs. The logged information can be used to troubleshoot general problems with the functionality of the service.

8.1.3.3 Show VCM-3/BKV Collect Logs

The **Show VCM-3/BKV Collect Logs** option opens a Windows folder containing additional log information around VCM-3 and BKV Collect devices. The logged information can be used troubleshoot problems related to the data acquisition from these device types.

8.1.3.4 Open Services Dialog

Clicking this button opens the Windows Services dialog. You can change settings made during the SETPOINT® Connector installation (such as the log on account) from the Services dialog by right clicking the SETPOINT® Connector service and selecting **Properties**.

NOTE!

Stopping or resetting the SETPOINT® Connector service from the Windows Services dialog will close the SETPOINT® Connector interface and stop data storage.

8.1.3.5 Updating the Units of Measure (UOM)

The **Update UOM** function overwrites the PI System units of measure using the rack configuration and the computer location setting. Use this feature to change unit formats used in different countries.

8.1.3.6 Exporting PI Tag Information

Clicking the **Export Tags** button opens a dialog that allows selecting a location for saving a .csv file containing detailed information about SETPOINT® PI tag usage and settings. This file can be reviewed with another program like Microsoft Excel.

8.1.3.7 Resetting PI Tag Compression Settings

Under normal operating conditions, the SETPOINT® Connector only sets the compression levels when the PI System tags are first created. Later changes to the VC-8000, VCM-3 and/or BKV Collect channels do *not* change the compression such that any changes made in PI System Management Tools to optimize compression are not overwritten. However, when using devices with different machine assets, you may need to change compression settings from a previous job. Click the **Reset Compression** button to return the compression settings to the default settings.

Reset Compression reverts the PI System compression settings back to the SETPOINT® defaults. This is important if you have changed channel types within the device (e.g., from displacement to velocity) and the compression settings need to change accordingly.

NOTE!

The **Reset Compression** function will overwrite any manual changes made to the PI system compression settings.

8.1.3.8 Suppress AF Event Frame Creation

If set, alarm events created by the device will not be forwarded to AF. This can be useful when device alarming capabilities are being used locally (e.g., on site), but AF analysis rules are used for centralized alarm generation and management. Note that this setting affects all devices managed by the present instance of the SETPOINT® Connector.

CMS-XC connections ignore this setting.

8.1.3.9 Suppress Access to AF Hierarchy

Can be used for scenarios where SETPOINT® Connector must not have write access to the target AF database (e.g., due to cybersecurity requirements). If set, SETPOINT® Connector will not attempt any changes to the AF hierarchy but continue to write data to the PI database. Note that the AF hierarchy needs to be established manually to enable connected systems (such as SETPOINT® CMS or PI-Vision) to access the necessary attributes for display.

8.1.3.10 Importing Data into the PI Database (VC-8000 only)

Use the **Import Data** button to import CMS-SD, CMS-HD, or CMS-XC data into the PI System as discussed in **Section 15**.

8.1.3.11 Enable Test Runs (VC-8000 only)

Check **Enable Test Runs** if you are using the SETPOINT® CMS system with one VC-8000 rack for different assets as described in **Section 20.3.**

8.1.3.12 Adaptive Exception Deviation (VC-8000 only)

Adaptive exception deviation is an alternative compression algorithm for scalar data that automatically adjusts exception deviation thresholds based on the amount of data being historized. It is useful for machines where the signals vary greatly during normal operation. When active, the system will automatically increase the exception deviation threshold to limit the amount of data stored.
Brüel & Kjær Vibro recommends activating this feature when using the SD card Import Data feature.

Adaptive exception deviation targets a data rate of no more than one sample per second per scalar measurement. Thresholds for exception deviation are adjusted until this level is met. During machine startup/shutdown this functionality is disabled. Adaptive exception deviation is useful to provide high resolution data during transient periods but optimize data collected during steady states while minimizing the maintenance needed for the PI System. This compression algorithm is ideal for optimizing high resolution vibration data for diagnostics and long-term storage.

8.1.3.13 Suppress Setting Rack Time (VC-8000 only)

Please contact your Brüel & Kjær Vibro service representative before activating this option. Leave this cleared for normal operation.

If the rack **Time Source** of a VC-8000 device is set to **CMS (DAC)**, SETPOINT® Connector sets the rack time based on the SETPOINT® Connector system time. Note that, due to the transport delay, measured values and machine behavior are then no longer synchronized exactly. In some scenarios (e.g., if multiple instances of SETPOINT® Connector collect data from a single VC-8000 rack), a SETPOINT® Connector should not try to set the rack time, even if the rack **Time Source** is set to **CMS (DAC)**. This can be achieved using the present setting.

8.1.4 About

Click About to see the SETPOINT® Connector revision as shown in **Figure 29**.

Figure 29: SETPOINT® Connector Revision

8.2 Adding a Connection to a VC-8000 Rack

Click **Add** to add a data connection to a VC-8000.

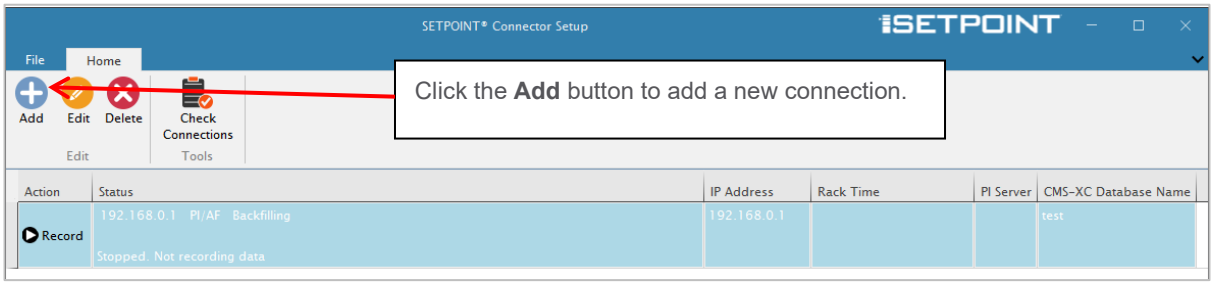


Figure 30: Adding a VC-8000 Rack in SETPOINT® Connector

In the dialog shown shown in **Figure 31**, set the **Connection Type** to “VC-8000”.

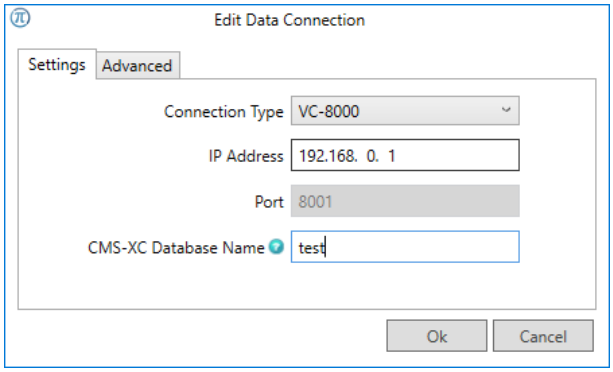


Figure 31: Settings for a VC-8000 Data Connection

Set the rack **IP Address** as set in **Section 7.1.1.** The **Port** field is for information only and is fixed at 8001. The **CMS-XC Database Name** will cause the system to create new database files using this name at the location specified in the CMS-XC configuration (**Section 8.1.2**). More information about these settings is given in **Table 12**.

Click **OK** to complete the process of adding a data connection.

Table 11: VC-8000 Data Connection Configuration Parameters

Setting	Description
IP Address	The VC-8000 System Access Module (SAM) IP Address configured for the SAM CMS Ethernet connection.
Port	The communication port is the Ethernet communication port that CMS is using. The port must be opened through firewalls between the VC-8000 rack and the SETPOINT® Connector. Normally you will not change this from the default value.
CMS-XC Database Name	Specifies the folder name where SETPOINT® Connector will store the XC file data.

The **Advanced** tab shown in **Figure 32** contains less frequently used configuration options.

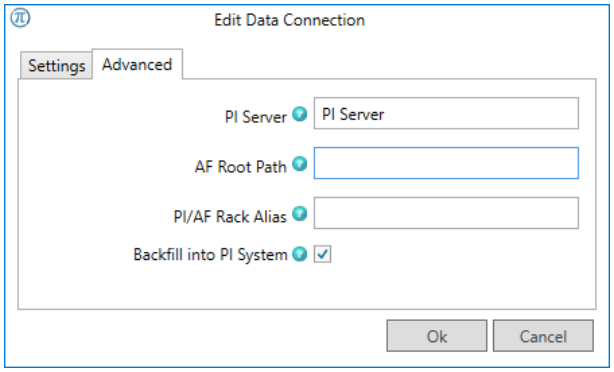


Figure 32: Advanced Settings for a VC-8000 Data Connection

See descriptions of these fields in **Table 12**.

Table 12: VC-8000 Data Connection Configuration Parameters

Setting	Description
PI Server	The **PI Server** network name or IP Address. Manually editing this field is only required if the PI Server for this data connection differs from the global **PI AF Settings**. Leave this field blank if you are only using CMS-XC.
AF Root Path	SETPOINT® Connector appends each channel's asset path to the root path when building the PI AF Hierarchy (see **Section 7.2**). Use the **AF Root Path** when the same VC-8000 rack is used with different assets such as in test stand or portable diagnostic applications.
PI/AF Rack Alias	The **Rack Alias** is used when creating PI Tags. PI tags are created using the pattern Rack Alias/Slot/Channel. If the Rack Alias is not specified, SETPOINT® Connector will create new tags using the Rack Name. You can use the Rack Alias to change the rack name without creating new PI tags.
Backfill into PI System	Refer to **Section 14.4** for information on PI Backfilling.

NOTE!

SETPOINT® Connector can resolve PI servers by name (DNS) or by IP Address.
PI AF client must be installed on the service computer and the service started before configuring SETPOINT® Connector.

8.3 Adding a Connection to VCM-3 and/or BKV Collect Devices

NOTE!

Data collection from VCM-3 and BKV Collect devices is supported for the destination **PI/AF** only. **CMS-XC** storage is supported for **VC-8000 only**.

It is important to note that *all* VCM-3 and BKV Collect devices are managed within a *single* data connection. Click **Add** to add such a data connection.

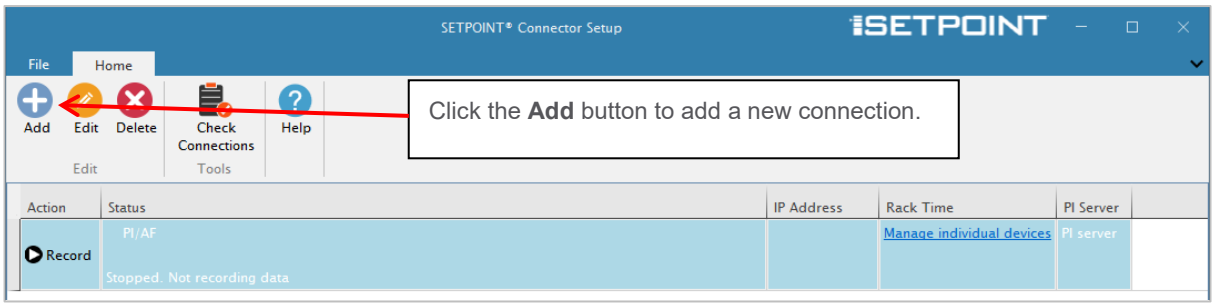


Figure 33: Adding a Connection to VCM-3 and/or BKV Collect Devices in SETPOINT® Connector

In the dialog shown shown in **Figure 34**, set the **Connection Type** to ”VCM-3 and/or BKV Collect”.

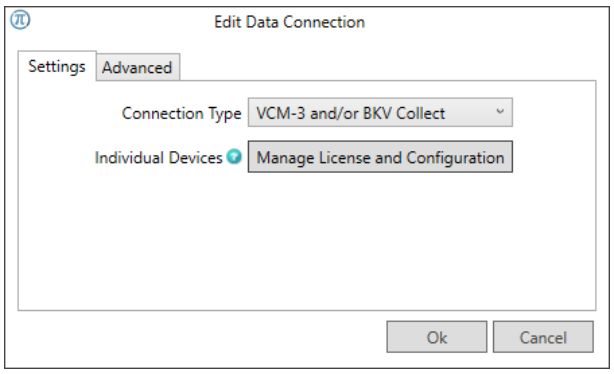


Figure 34: Settings for a Data Connection to VCM-3 and/or BKV Collect Devices

Only a single such entry needs to be configured per SETPOINT® Connector Setup installation. This entry can support multiple VCM-3 and BKV Collect devices. The corresponding entry on the main SETPOINT® Connector Setup screen always shows IP address 127.0.0.1 (cf. **Figure 33**).

Click **Manage License and Configuration** to manage individual VCM-3 and BKV Collect devices that are sending data to SETPOINT® Connector. The corresponding steps are described in detail in the following sections.

The **Advanced** tab contains less frequently used configuration options. More information about these settings is given in **Table 12** (see previous section).

Click **OK** to complete the process of adding the data connection.

8.3.1 Activity Panel for VCM-3 and BKV Collect Devices

Status information about licensing, configuration and communication of individual devices is shown in the **Activity Panel for VCM-3 and BKV Collect**.

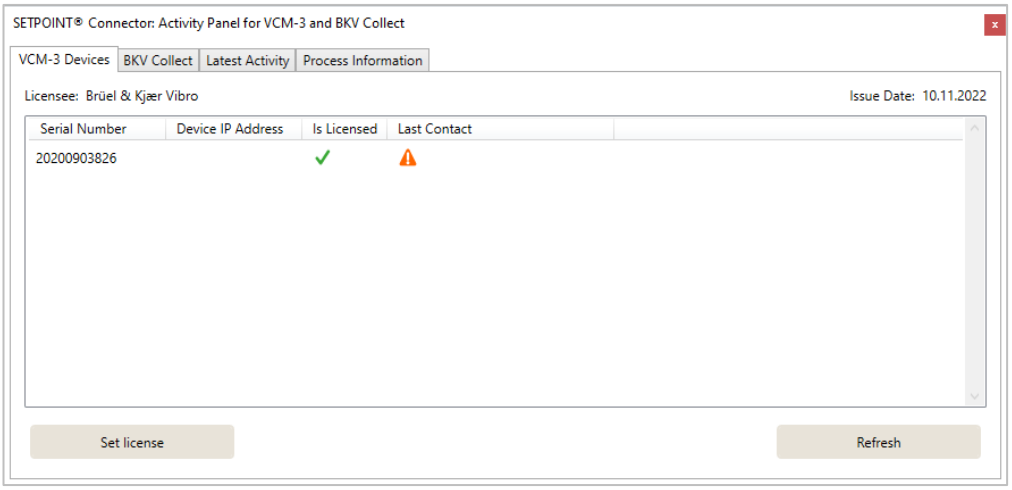


Figure 35: Activity Panel for VCM-3 and BKV Collect

The corresponding dialog window (see **Figure 35**) contains four tabs:

- **VCM-3 devices:** Shows connection and license information for each individual VCM-3 device. When working with VCM-3 devices, use this tab to initially load the license file (.lic) that lists the serial numbers of VCM-3 devices that are licensed connecting to SETPOINT® Connector. See **Section 8.3.2** for more details.
- **BKV Collect:** Shows connection and configuration information for each individual BKV Collect device. When working with BKV Collect devices, use this tab to initially load the SETPOINT® configuration exported from BKV Ignite. See **Section 8.3.3** for more details.
- **Latest Activity:** Shows information about messages received from VCM-3 and BKV Collect devices. Mainly used for investigating device connection problems.
- **Process Information:** Shows information about individual services related to communication with VCM-3 and BKV Collect devices. Mainly used for troubleshooting.

8.3.2 Managing VCM-3 Devices

The **VCM-3 Devices** tab (see **Figure 36**) shows connection and license status information for each individual VCM-3 device. Licensed devices are shown with a green tick. If a licensed device has never reported to SETPOINT® Connector, a warning is shown (cf. example below). Use the **Refresh** button to update the display.

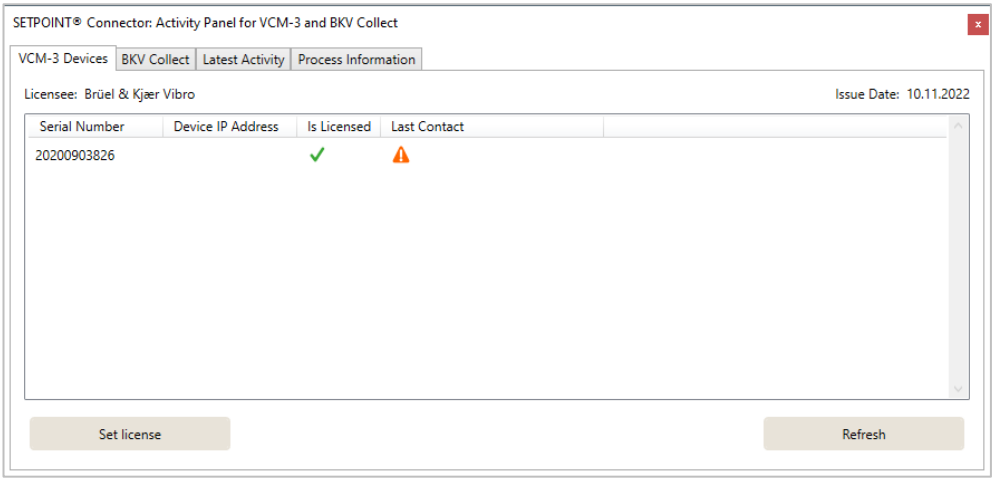


Figure 36: VCM-3 Devices Tab

To enable a VCM-3 device to send data to a SETPOINT® Connector you have to:

- Assign a unique device number to the device (see 8.3.2.1)
- Setup time synchronization on the device (see 8.3.2.2)
- Configure the device to send ("push") data to SETPOINT® Connector (see **8.3.2.3**)
- Add a license file (see **8.3.2.4**)

Some of the above settings have to applied from the VCM-3 device homepage. Please refer to the VCM-3 Homepage Manual (C107760) for more information about accessing and using the VCM-3 device homepage. In case of problems with any of the below steps, please refer to the VCM-3 Troubleshooting Guide (C108291).

8.3.2.1 Assign a VCM-3 Device Number

The VCM-3 device number is required to uniquely identify data collected by VCM-3 devices, independently of the device serial number. The VCM-3 device number defines the data storage location (PI Tag Name) for all data recorded by a particular device. For example, given a VCM-3 with a device number 'VCM3North', all created PI Tags will follow the pattern 'Setpoint Connector.VCM3North.*'.

NOTE!

The VCM-3 device number **must** be unique across all VCM-3 devices that store data to the same PI server. Otherwise, measurement data may be lost or compromised.

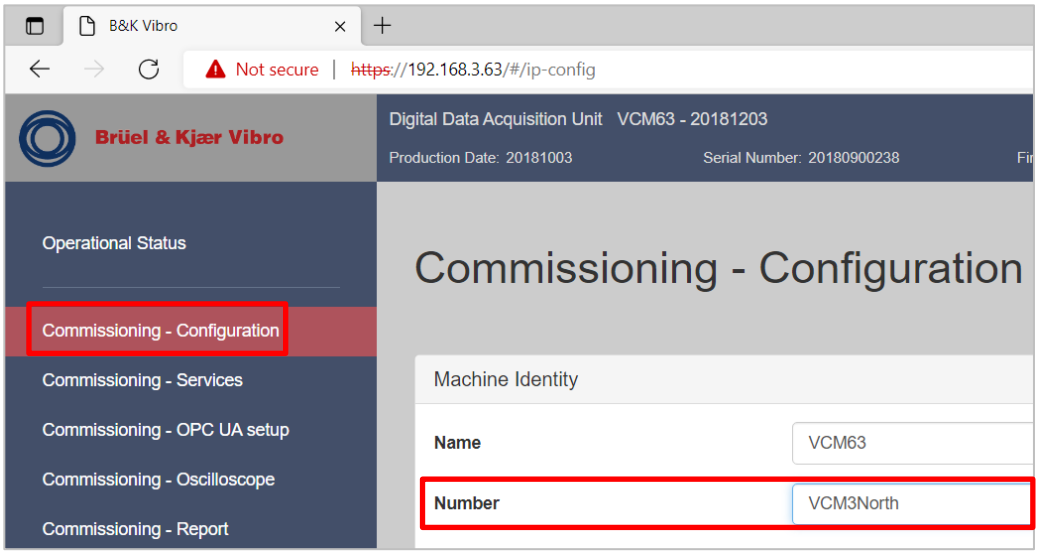
NOTE!

Changing the VCM-3 device number of device for which data collection has already been started in SETPOINT® Connector will cause data to be stored in new PI Tags. Historical data stored in the original PI Tags will not be deleted but will become inaccessible from within your SETPOINT® solution.

NOTE!

To perform an *in-place* replacement of a VCM-3 device (reusing the existing PI tags and thus retaining historical data), transfer the VCM-3 device number of the old device to the new device. Note that we strongly recommend disconnecting the old before performing this action. Moreover, please note that the license file will need to be updated such that it includes the serial number of the new VCM-3 device (see 8.3.2.4).

The VCM-3 device number can be configured via the **Commissioning - Configuration** section of the VCM-3 device homepage, using the field **Number**.



NOTE!

The VCM-3 device number may only contain the following characters: 0-9, a-z, A-Z. Please be aware that the VCM-3 device homepage **does not validate this restriction**. However, data collection from SETPOINT® Connector will fail if the VCM-3 device number is undefined or contains invalid characters.

NOTE!

In previous releases of SETPOINT® Connector, the VCM-3 device number was restricted to integer numbers (numerals 0-9). Please use a compatible version of SETPOINT® Connector (CMS 2022 R3 or newer) when using non-integer VCM-3 device numbers.

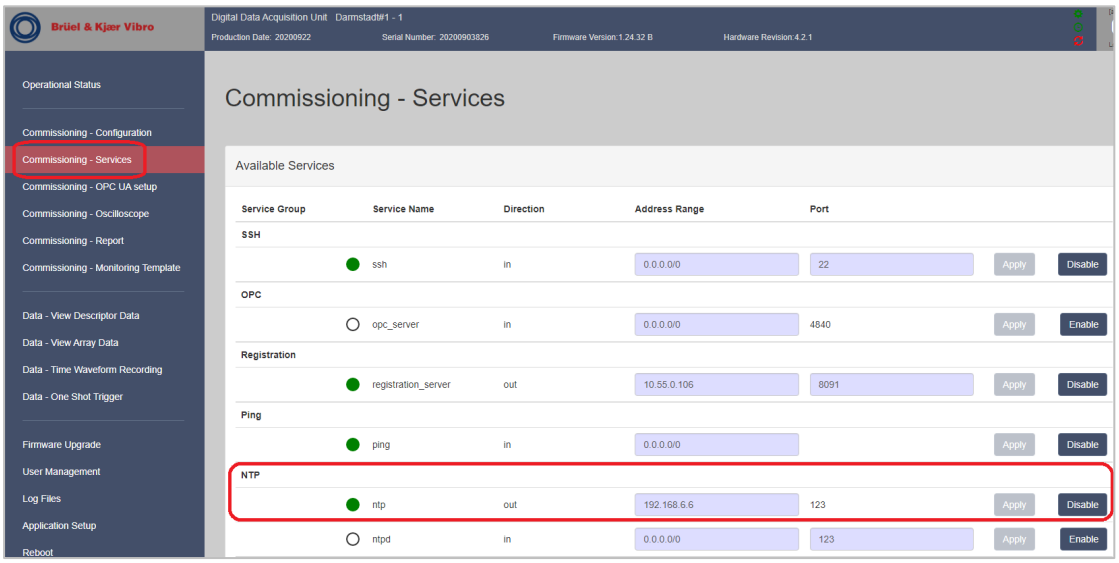
8.3.2.2 Setup Time Synchronization on the Device

It is highly recommended to activate time synchronization via NTP on the VCM-3 device. Please make sure that PI/AF server, the SETPOINT® Connector machine, and the VCM-3 use synchronized time sources to avoid time differences. In the extreme, the PI/AF server may discard measurement values that are considered to be too far in the future from its point of view.

NOTE!

The internal clock of VCM-3 devices is reset at each reboot. Until proper time synchronization has been re-established, a corresponding device will mark recorded data samples as invalid to ensure that only consistent data is being historized.

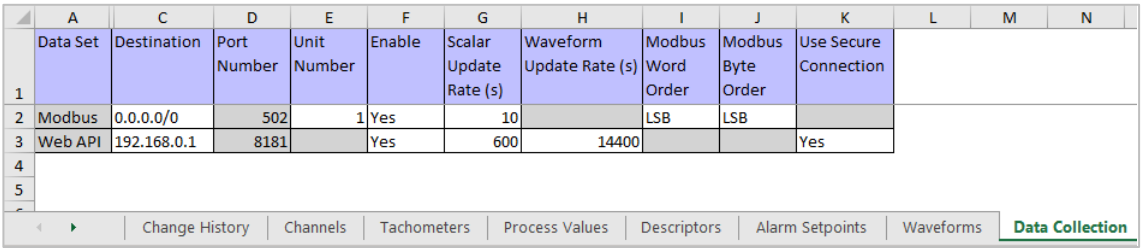
NTP can be configured via the **Commissioning - Services** section of the VCM-3 device homepage:



When NTP has been set up correctly, the **Operational Status** section of the device homepage will show the message **Time: Synchronized**:

8.3.2.3 Configure VCM-3 to Send Data to SETPOINT® Connector

Use the VCM-3 Editor to configure the VCM-3 device. Within the VCM-3 Editor, navigate to the **Data Collection** tab and set the **Web API Destination** to the IP address of the system where the SETPOINT® Connector is installed. Make sure **Use Secure Connection** is set to **Yes**. Please refer to VCM-3 Editor Installation Manual (C107762) for more detailed information.



	A	C	D	E	F	G	H	I	J	K	L	M	N
1	Data Set	Destination	Port Number	Unit Number	Enable	Scalar Update Rate (s)	Waveform Update Rate (s)	Modbus Word Order	Modbus Byte Order	Use Secure Connection			
2	Modbus	0.0.0.0/0	502	1	Yes	10		LSB	LSB				
3	Web API	192.168.0.1	8181		Yes	600	14400			Yes			
4													
5													

Change History | Channels | Tachometers | Process Values | Descriptors | Alarm Setpoints | Waveforms | Data Collection

NOTE!

VCM-3 devices publish recorded data via the **Web API** at regular intervals (cf. **Scalar Update Rate (s)** and **Waveform Update Rate (s)** above). It may thus take several minutes until a VCM-3 device first establishes a connection with SETPOINT® Connector.

8.3.2.4 Add a License File

To successfully forward data to the PI/AF database, you need a license file that contains entries for all VCM-3 devices to be connected. You have received this license file with your order. The license file is created based on the VCM-3 device **serial numbers**. This serial number is located on the device and can also be viewed on the VCM-3 device homepage. If you want to include additional VCM-3 devices in the condition monitoring system, please request an *updated* license from your sales representative, stating the serial numbers of all devices to be connected to this SETPOINT® Connector instance.

To import a license file click **Set License** and select the (.lic) file provided by your sales representative. Confirm by clicking **Open**.

8.3.3 Managing BKV Collect Devices

The **BKV Collect** tab (see **Figure 36**) shows configuration and status information for each individual BKV Collect device. If a configured device has never reported to SETPOINT® Connector, a warning is shown (cf. second entry in the example below). Use the **Refresh** button to update the display.

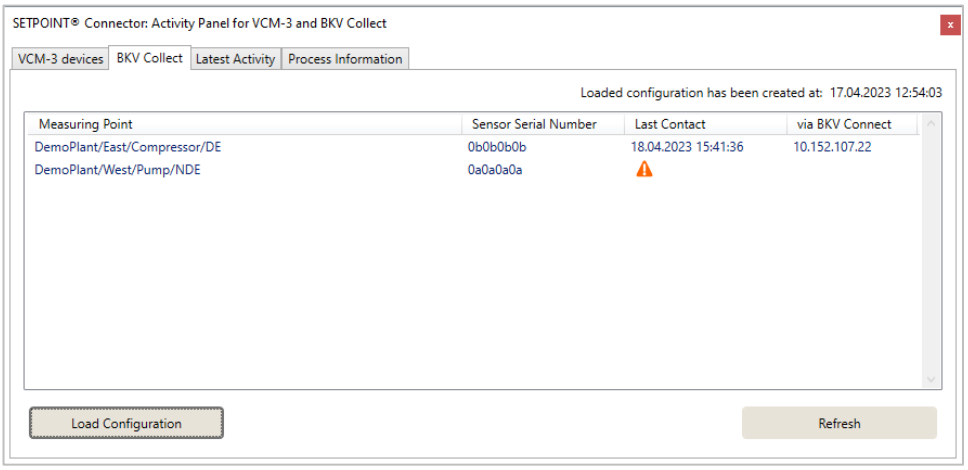


Figure 37: BKV Collect Tab

NOTE!

Access to the **BKV Beyond** platform is required to be able to use **BKV Beyond Ignite** and **BKV Deploy** mentioned below. Please contact your sales representative for further information on obtaining the corresponding credentials.

NOTE!

The following steps assume that the basic condition monitoring configuration (including plants, areas, assets, measuring points and sensors) has already been setup in **BKV Beyond Ignite**, and that a corresponding installation project for **BKV Deploy** has already been created. For more information about these topics in general, please refer to the BKV Connect 1 & 2 / BKV Collect 6 & 6 Ex Quickstart Guide (C108376) and BKV Wireless Sensor Solution instructions (C108377).

To enable a BKV Collect device to send data to a SETPOINT® Connector you have to:

- During gateway commissioning, use **BKV Deploy** to configure network settings and to setup time synchronization on the BKV Connect gateway (see **8.3.3.1**)
- During gateway commissioning, use **BKV Deploy** to setup the BKV Connect gateway for communication with SETPOINT® Connector (see **8.3.3.2**)
- Load a SETPOINT® configuration file exported from BKV Beyond Ignite (see 8.3.3.3)

8.3.3.1 Setup Network Settings and Time Synchronization on the BKV Connect Gateway

To change network and time synchronization settings of a gateway during commissioning using **BKV Deploy**, open the **Registration & Configuration** screen and follow the instructions to connect to the gateway in **configuration mode**. Then use the **Launch admin app** button (see **Figure 38**) to open the corresponding configuration screen.

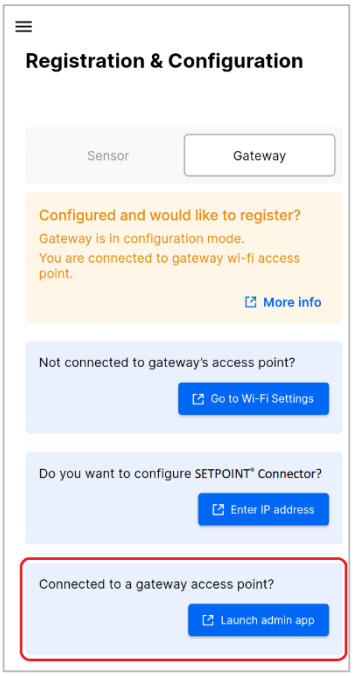


Figure 38: Launch Admin App for Configuration of Time Synchronization Settings

Within the **admin app**, navigate to the network settings to configure network settings, device time and time synchronization settings.

It is highly recommended to activate time synchronization via NTP on the BKV Connect gateway. Please make sure that PI/AF server, the SETPOINT® Connector machine, and the BKV Connect gateway use synchronized time sources to avoid time differences. In the extreme, the PI/AF server may discard measurement values that are considered to be too far in the future from its point of view.

NOTE!

Communication between the BKV Connect gateway and SETPOINT® Connector will fail if BKV Connect device time is not set correctly. Please set the BKV Connect device time (either manually or, preferably, via NTP).

BKV Connect gateways that are connected to the public internet are configured such that they use a publicly available NTP time source by default. Gateways not connected to the public internet and gateways that shall use a different time source need to be re-configured during the commissioning process.

NOTE!

When using NTP, please make sure your firewall is configured to allow connections from the BKV Connect gateway to NTP server via port 123.

8.3.3.2 Setup BKV Connect Gateway for Communication with SETPOINT® Connector

To configure a BKV Connect gateway for SETPOINT® communication during commissioning using **BKV Deploy**, open the **Registration & Configuration** screen and follow the instructions to connect to the gateway in **configuration mode**. Then use the **Enter IP address** button (see **Figure 39**) to set the IP address of the computer where SETPOINT® Connector is running.

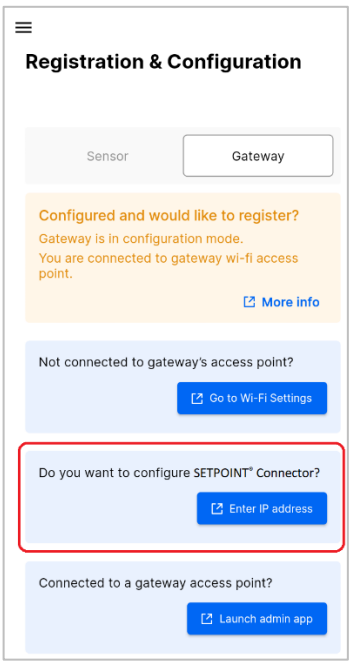


Figure 39: Configuration of SETPOINT® Connector IP Address in BKV Deploy

NOTE!

Please make sure your firewall is configured to allow connections from the BKV Connect gateway to SETPOINT® Connector via port 8883.

8.3.3.3 Load a SETPOINT® configuration file exported from BKV Beyond Ignite

The configuration defined in **BKV Beyond Ignite** defines the structure of plants, areas, assets and measuring points, and thus forms the basis of the integration of BKV Collect sensors into your condition monitoring solution. SETPOINT® Connector will use this information to create PI tags and the initial structure of the AF database. Additionally, this configuration defines the measurement profiles of the individual sensors. SETPOINT® Connector will forward these sensors configuration settings to the individual BKV Collect devices once they connect for the first time.

NOTE!

Using the default sensor configuration, 31 PI tags will be created for each BKV Collect sensor. The actual number of PI tags being consumed depends on the sensor configuration defined in BKV Beyond Ignite.

Export the configuration from BKV Beyond Ignite using the **SETPOINT CONFIGURATION** button from the plant overview (see **Figure 40**).

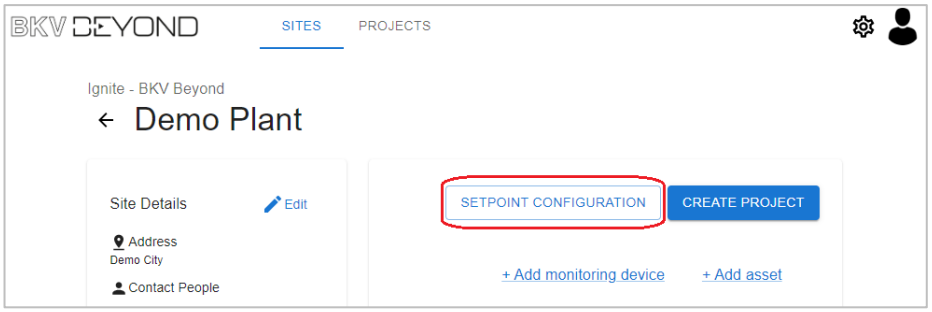


Figure 40: Exporting a Configuration File for SETPOINT® Connector from BKV Beyond Ignite

This will open a screen where the assets to be included in this exported configuration can be selected (see **Figure 41**). Please select all assets whose data shall be collected using the present installation of SETPOINT® Connector. In most cases, a single of SETPOINT® Connector installation, so all assets can be selected. Complete the export by clicking **EXPORT CONFIGURATION**.

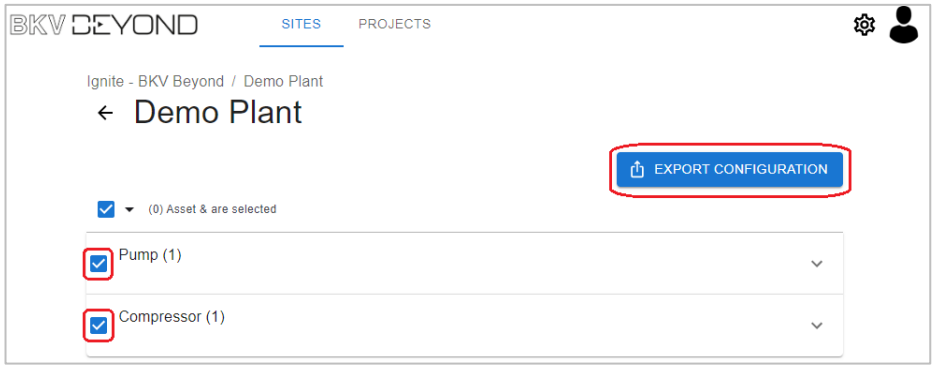


Figure 41: Selecting Assets to be Exported

The generated configuration file (.json) will automatically be downloaded onto your computer. Use the **Load Configuration** button on the BKV Collect tab (see **Figure 42**) to import the configuration into SETPOINT® Connector.

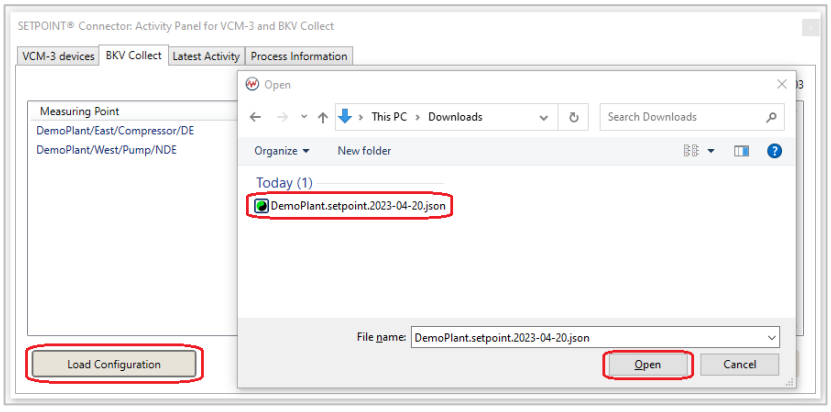


Figure 42: Loading a Configuration File into SETPOINT® Connector from the BKV Collect Tab

After loading the configuration, the BKV Collect tab will list all measuring points and, if defined, associated BKV Collect sensors (see **Figure 43**).

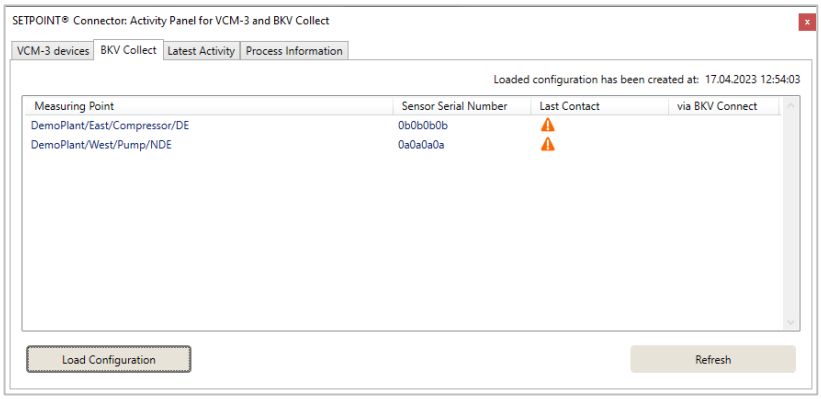


Figure 43: BKV Collect Tab Display after Loading a Configuration File into SETPOINT® Connector

The values displayed in the columns **Last Contact** and **via BKV Connect** will update as soon as the configured BKV Collect sensors establish a connection to SETPOINT® Connector via one of the BKV Connect gateways configured in the previous sections.

NOTE!

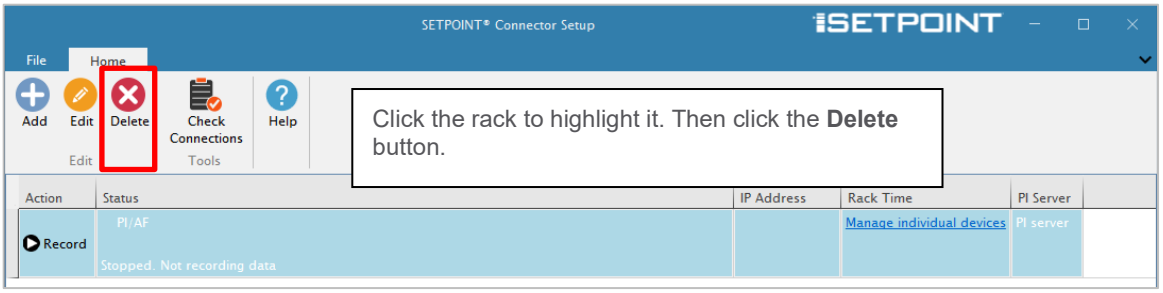
To update the SETPOINT® Connector configuration after making changes in BKV Beyond Ignite or via BKV Deploy, repeat the steps discussed above. The new configuration file will *replace* the existing configuration thile retaining existing data stored in AF and PI.

NOTE!

To perform an *in-place* replacement of a BKV Collect sensor (reusing the existing PI tags, and thus retaining historical data), use BKV Deploy to register the new sensor at the corresponding measuring point (replacing the registration of the old sensor). After synchronizing this information with the BKV Beyond platform, re-export the corresponding SETPOINT® configuration file and load it into SETPOINT® Connector following the steps described above.

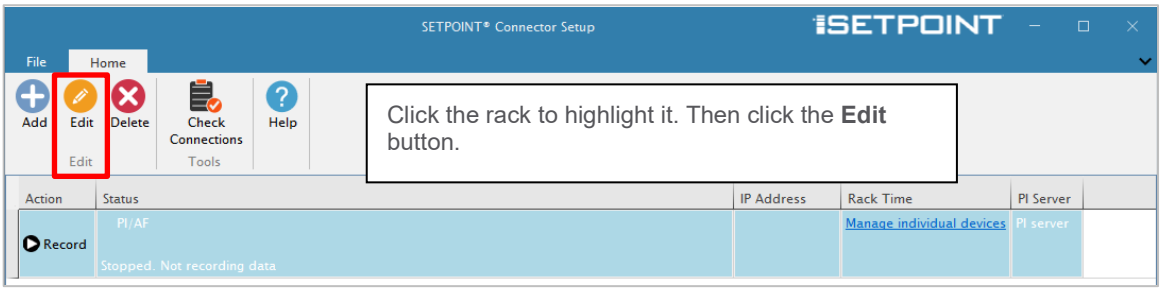
8.4 Deleting a Data Connection

Follow these steps to delete a data source.



8.5 Editing Data Connection Settings

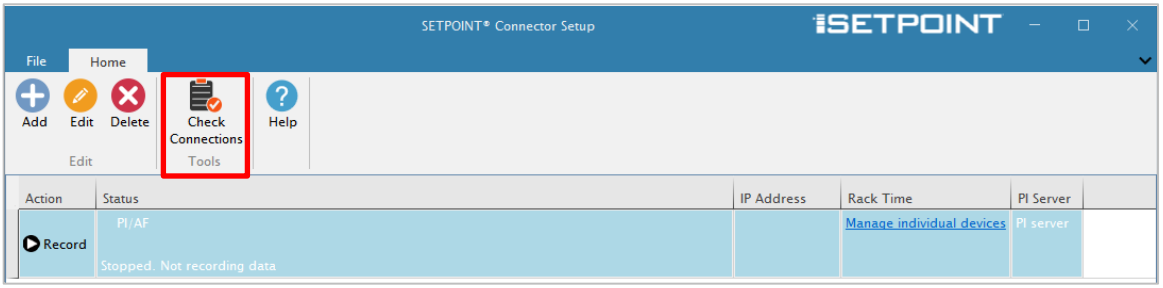
Follow these steps to change rack information.

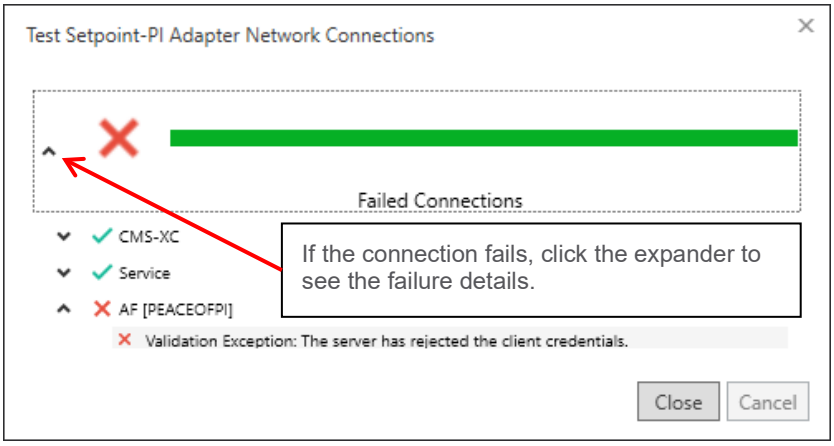


The Edit Rack Settings dialog will open as shown in **Figure 31** and **Figure 32**.

8.6 Checking Data Connections

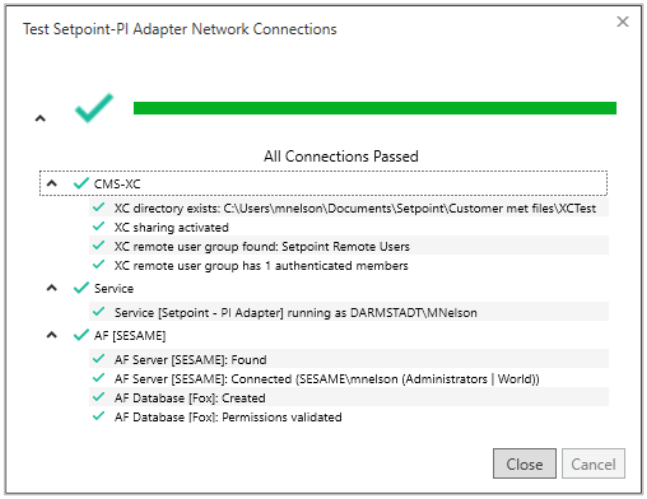
To check security and network settings for XC, PI/AF, and rack connections, please use the **Check Connections** button from the **Home** tab of SETPOINT® Connector.





The number of entries in the dialog window depends on the number of rack connections and the number database targets that are selected for data collection (CMX-XC and/or PI/AF). In the above example, no racks where configured, the CMS-XC connection was valid, the Service started and was running correctly but the client login credentials for the AF server were invalid. If the AF database does not exist, the check will verify that the user has permission to create the database.

In the following example all connections and parameters are valid:



NOTE!

When using VCM-3 and/or BKV Collect devices, **Check Connections** validates the internal communication with auxiliary services running to the same machine as SETPOINT® Connector. An error message refering to **Network access available** within the **VCM-3 and BKV Collect [127.0.0.1]** group thus indicates a problem with respect to the **Mosquitto Broker** service instead of a network problem. In this case, (re)start the **Mosquitto Broker** service from the Windows Services control pane, and re-run **Check Connections**. Please contact your Brüel & Kjær Vibro service representative if the problem persists.

8.7 Viewing Connection Status

The main SETPOINT® Connector Setup screen shows the configured data connection and their connection statuses as shown in **Figure 44**. The rack name that shows is set in the rack configuration.

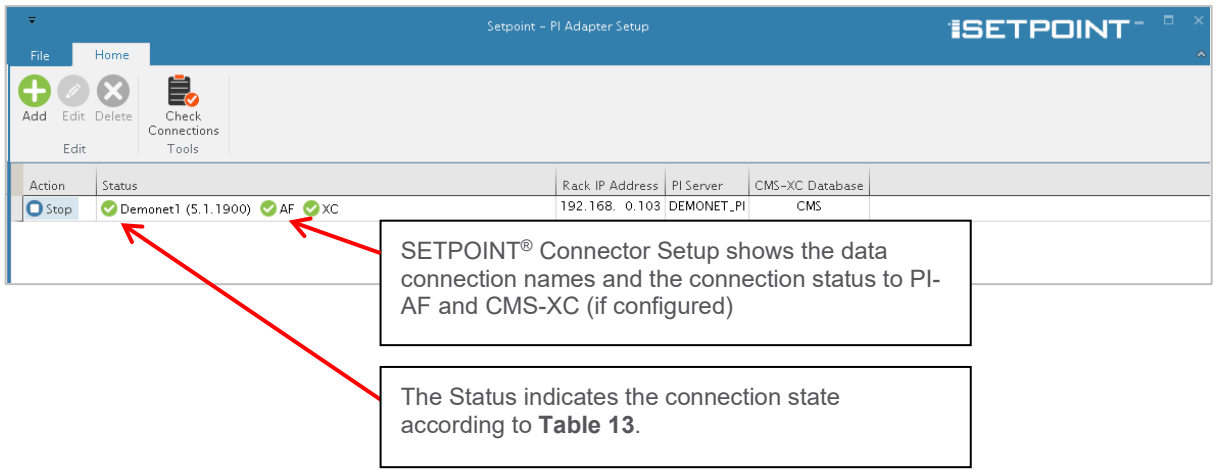


Figure 44: Main screen of SETPOINT® Connector Setup

Table 13: SETPOINT® Connector Status

Status	Description
Configuring	The service is starting up or checking data connection configuration changes. If the configuration has changed, the service builds the PI AF hierarchy from the device configuration, allocating tags, and loading the hierarchy into the PI/AF server.
Collecting	The service is running and collecting data from the listed data connection.
No Status shown.	The service is stopped and is not collecting data from the listed device connection. The Action button will change to the record button.

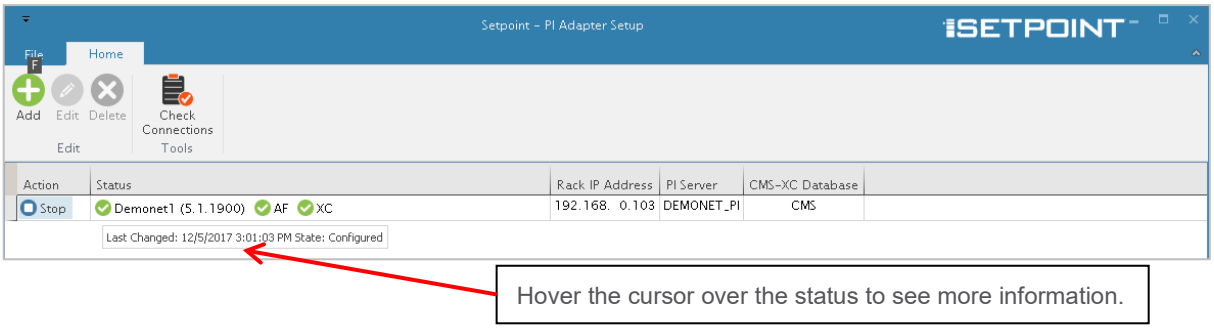


Figure 45: Connection Information

8.8 Starting and Stopping Data Collection

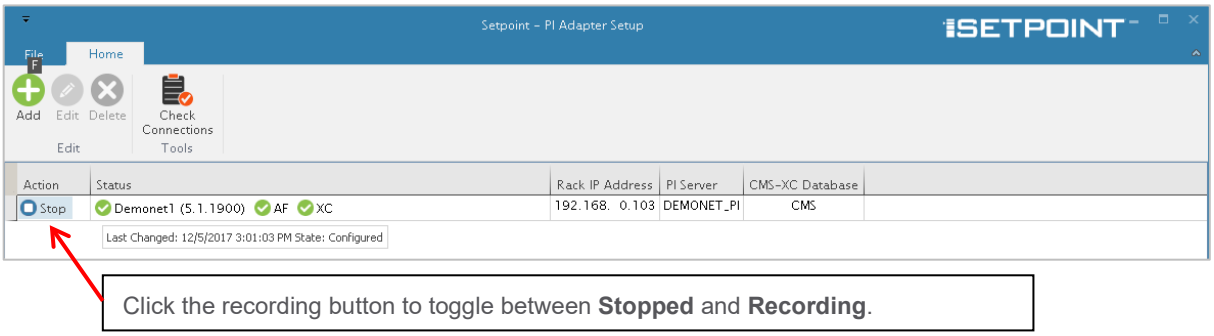


Figure 46: Starting and Stopping Data Collection

Table 14: SETPOINT® Connector Actions

Status	Description
	The connection is not collecting data. Click the record button to start data collection.
	The service is running and collecting data from the listed input data source. Click the button to stop data collection.

8.9 Configure PI Database

The SETPOINT® CMS system can create very large amounts of data depending on how often the machine conditions change. You can configure the PI database to use: A) a fixed number of archive files and overwrite, or B) to create new archive files until the storage space fills and then stop. For more information on these, refer to the AVEVA™ PI database manuals and tutorial videos. This section gives a brief overview of the storage modes and how they impact SETPOINT® CMS data collection.

8.9.1 Automatic archive creation

Automatic archive creation is the default with newer versions of the AVEVA™ PI database. As archive files fill, the PI system will continue to create new archives of the same size as the primary archive until the disk is full. Default operation is to stop data collection when all storage space is used. If the tuning parameter Archive_AutoArchiveFileRoot shows a path, the system is in automatic archive creation mode. If this parameter is blank, the system is in archive shift mode (see **Section 8.9.2**).

You can set the PI System to overwrite data (Auto Shift) when the storage space is full by setting the tuning parameter Archive_OverwriteDataOnAutoShiftFailure to 1 as shown in **Figure 47**.

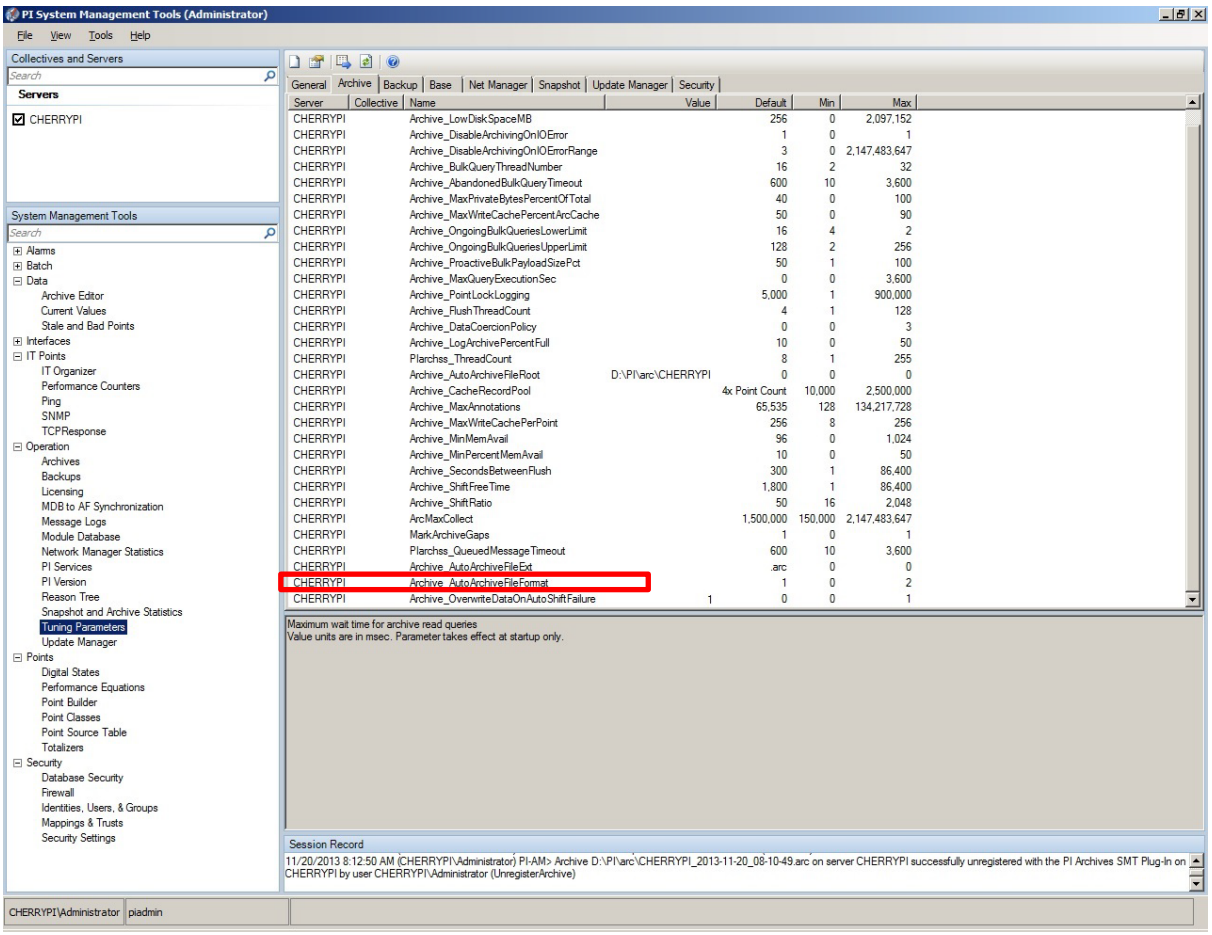


Figure 47: PI Database Tuning Parameters

NOTE!

No machine data is saved when all archives are filled and the overwrite parameter is off. To avoid missing critical machine data, set the system to overwrite or periodically monitor the available storage space.

NOTE!

The database can overwrite important machine reference data unless configured otherwise. Monitor storage space to prevent database wrapping or mark reference archives to prevent overwriting.

8.9.2 Archive shift

In archive shift mode you set up a fixed number of archive files to fill the allocated storage space. For example, if you allocated 10 GB for PI system data, create 100 archives of 100 MB each. After filling all the available archives, the PI System will overwrite the oldest archives.

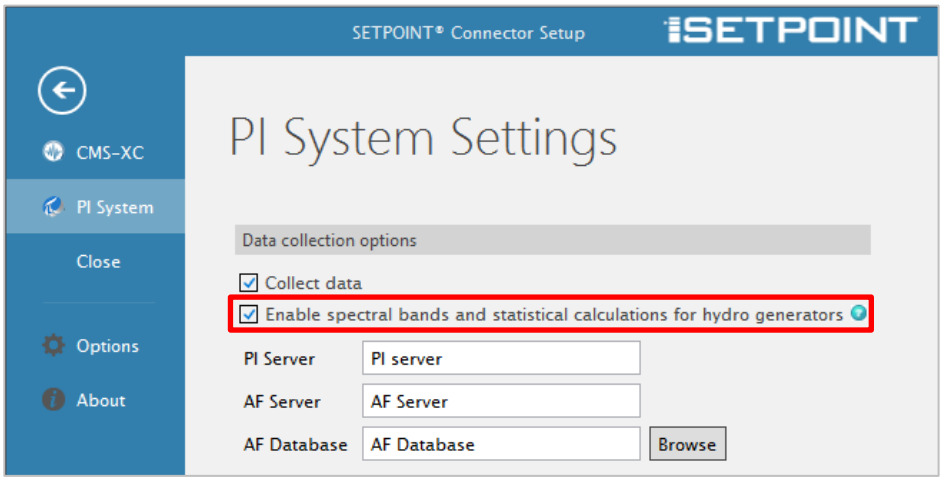
NOTE!

The database can overwrite important machine reference data unless configured otherwise. Monitor storage space to prevent database wrapping or mark reference archives to prevent overwriting.

9 Spectral Bands and Statistical Calculations for Hydroelectric Generators

Spectral Bands and Statistical Calculations for Hydroelectric Generators are two sets of additional measurements that can be computed by the SETPOINT® Connector.

A dedicated service calculates the corresponding measurement values from dynamic waveform data in the SETPOINT® Connector process. You can enable this feature by by checking File -> PI System Settings -> Enable spectral bands and statistical calculations for hydro generators.



NOTE!

Spectral Bands and Statistical Calculations for Hydroelectric Generators are only available for AF databases. Other storage options like SD, HD and XC are not supported. SETPOINT® Connector requires PI AF Client (version 2.10.5 or higher) to be installed. Spectral Band measurements and Statistical Calculations can be exported to a CMS file.

NOTE!

Spectral Bands and Statistical Calculations for Hydroelectric Generators require additional PI Tags to store measurement data. Please make sure SETPOINT® Connector has sufficient permissions, and that the corresponding license covers the creation of additional PI Tags. In case of problems, please refer to the Troubleshooting section.

Note that it is possible to enable this feature without configuring racks for data recording. In this *dedicated* mode, a SETPOINT® Connector can perform calculations on data recorded by one or multiple SETPOINT® Connector instances running on different servers.

9.1 Spectral Bands

A Spectral Band measures signal energy on a frequency range of interest. It may be trended like other scalar firmware measurements such as Direct, Bandpass, 1X, 2X and nX. Every recorded waveform, starting from the time of Spectral Band creation, is the basis of a new measurement value. A Spectral Band measurement has the timestamp of the last sample of the waveform.

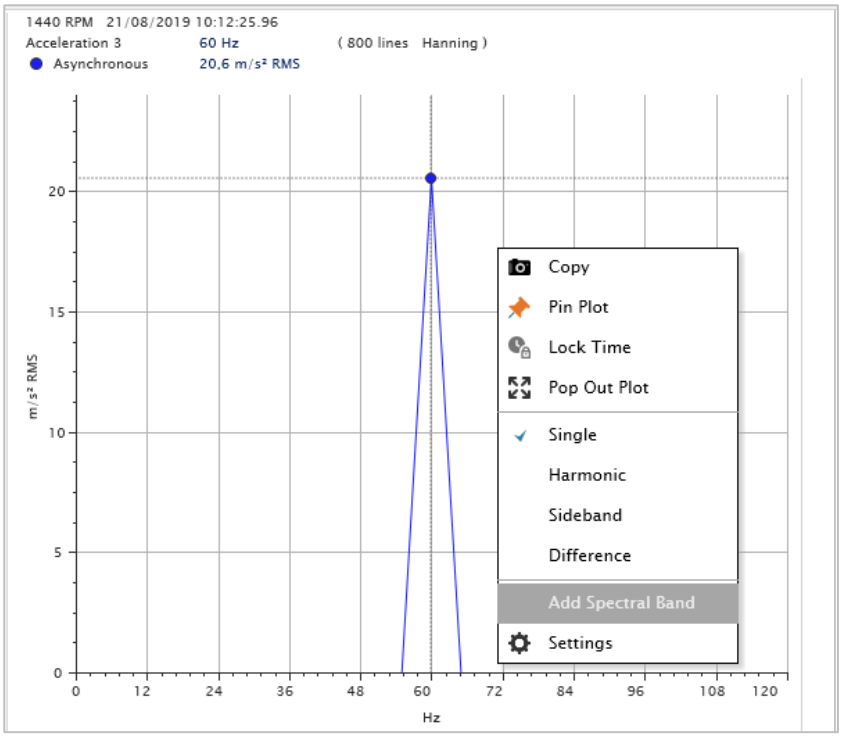
To use Spectral Bands, follow these steps

- Enable Spectral Bands calculations in SETPOINT® Connector (see above)
- Add Spectral Band measurement(s) using Spectrum Plot in SETPOINT® CMS

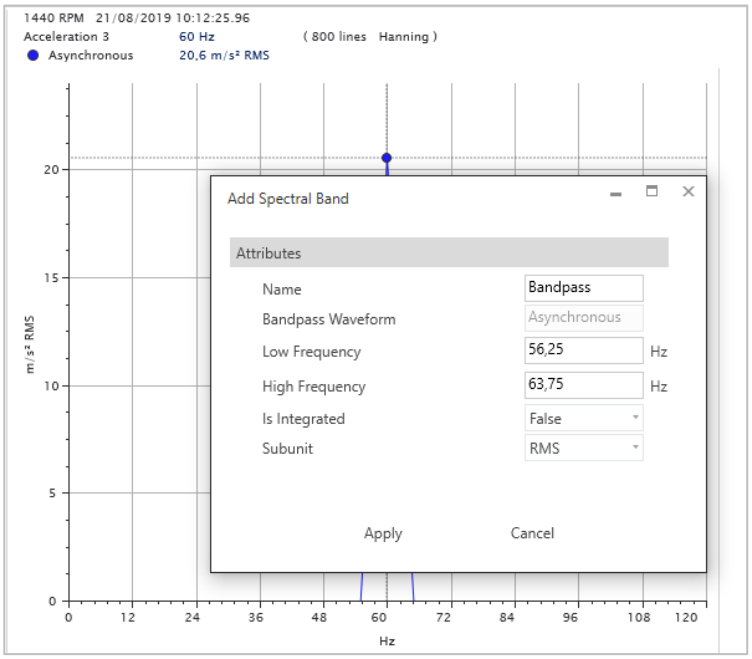
9.1.1 Add a Spectral Band

Use the Spectrum plot to add new Spectral Band measurements for the selected assets.

- Right-Click to open the context menu and choose **'Add Spectral Band'**.

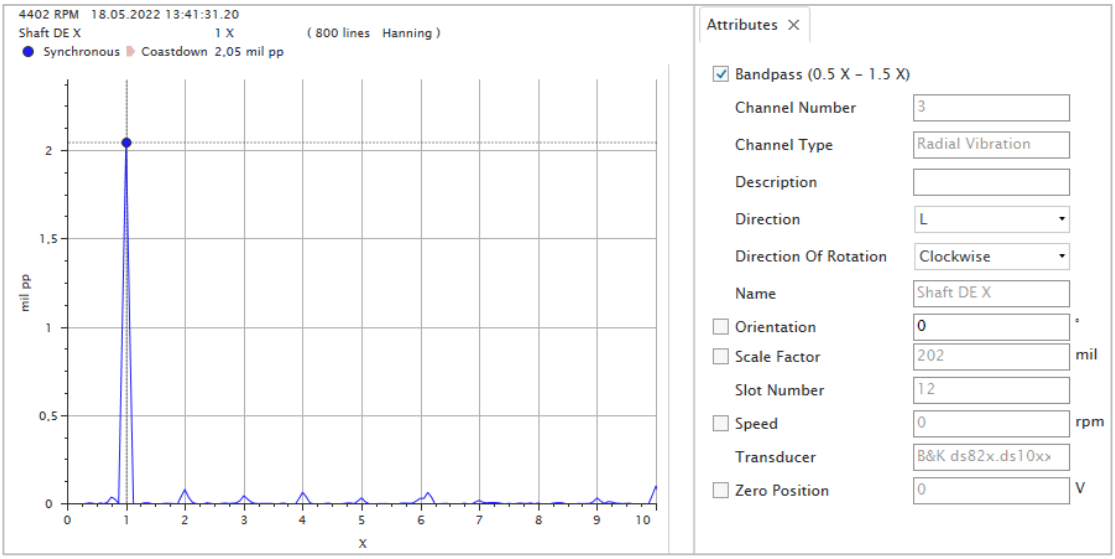


- Specify its name and frequency range and confirm with Apply.

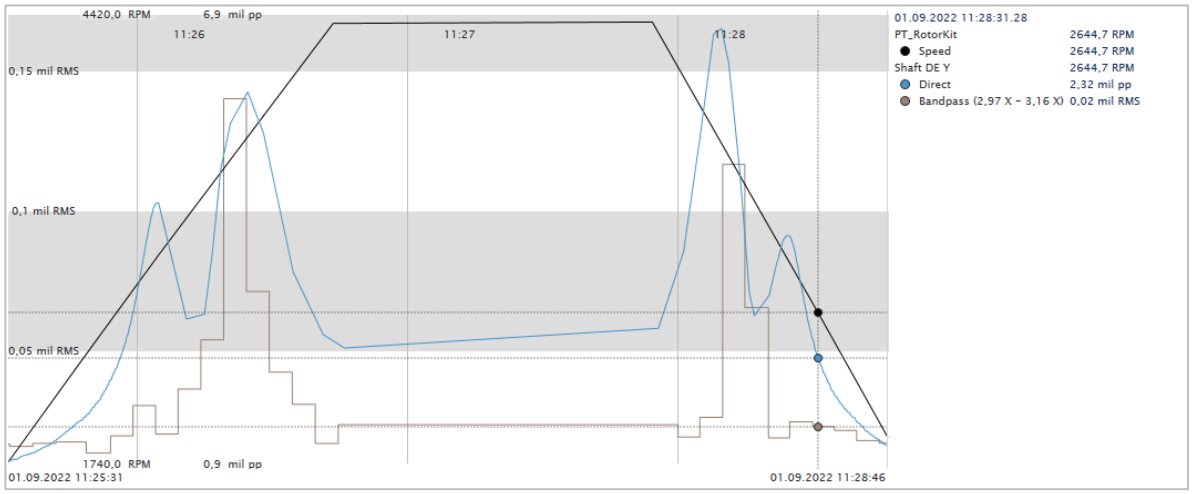


To activate a Spectral Band, select the desired asset in the Navigation. The created Spectral Band will then appear in the Attributes pane.

- Click (activate) Spectral Band.



Now the Spectral Band is generated for all future measurements and can be viewed in the Timeline and Trend Plot.



NOTE!

To store the computed measurement values, this feature requires one additional PI tag per Spectral Band. These PI tags will be created automatically by SETPOINT® Connector. Please make sure you have sufficient PI tags available before adding a Spectral Band measurement.

NOTE!

A Spectral Band measurement on a full spectrum is not supported.

NOTE!

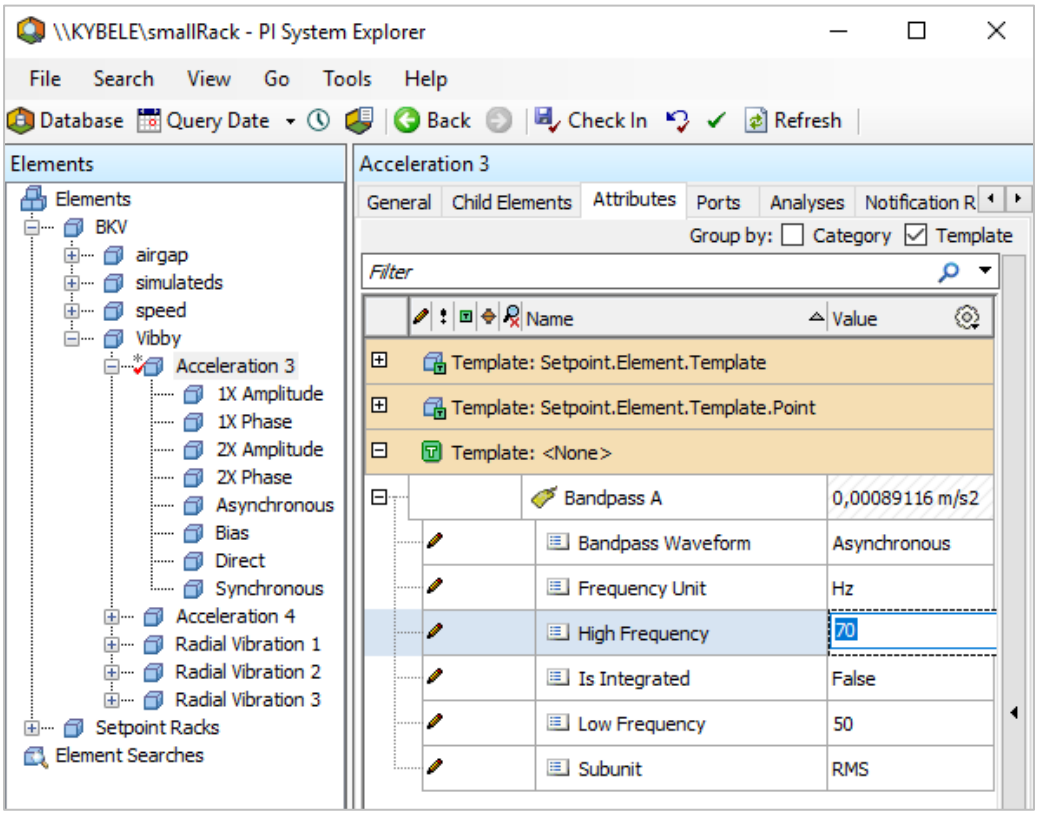
Notice that only RMS subunits are supported.

9.1.2 Edit a Spectral Band

Use PI System Explorer to make necessary changes. Stop SETPOINT® Connector service while making changes to AF.

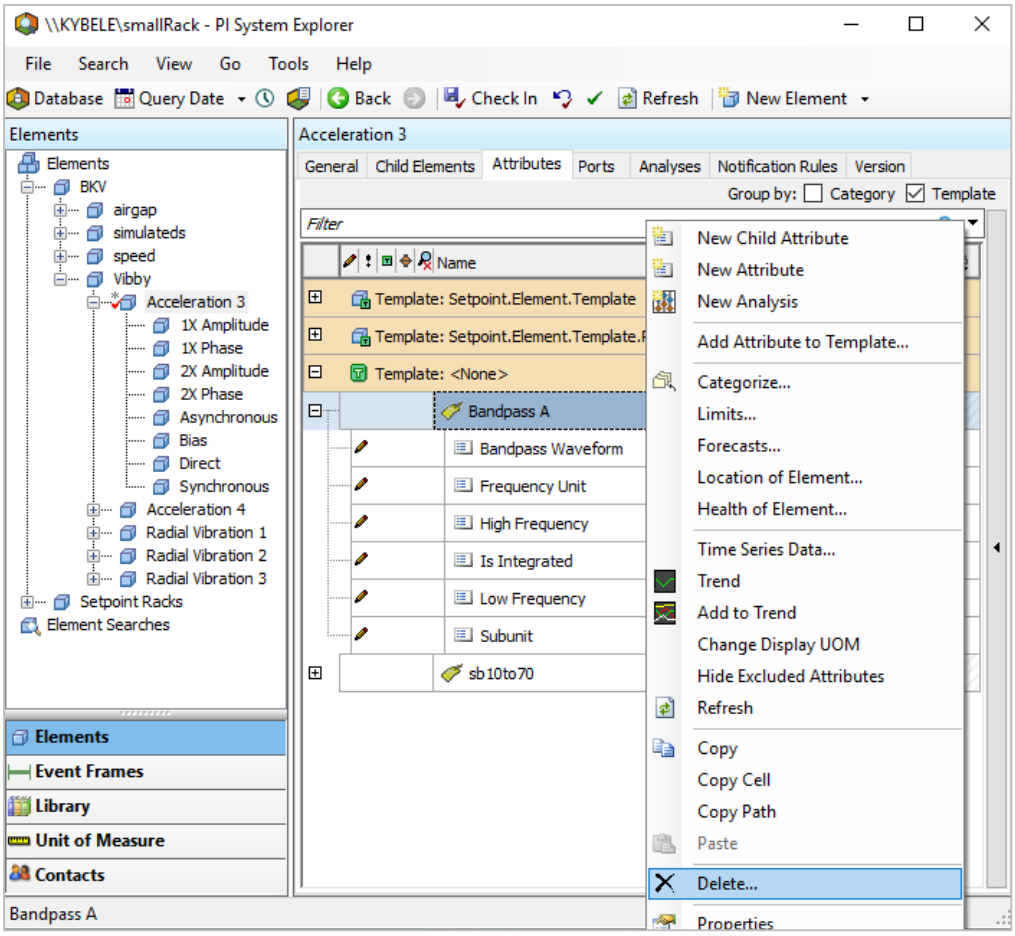
NOTE!

When frequency range of a Spectral Band is changed its existing values are not invalidated and they are not recalculated using the new frequency range!



9.1.3 Remove a Spectral Band

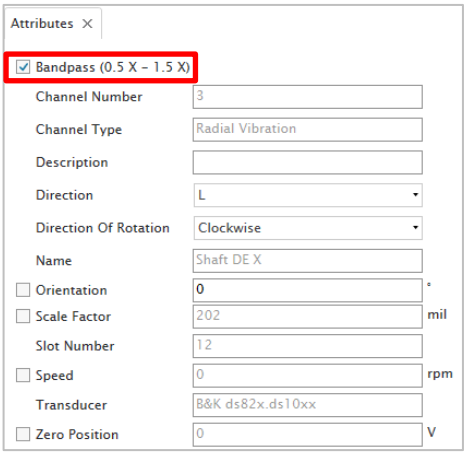
To stop computing Spectral Band measurement values use PI System Explorer to remove the Spectral Band attribute. Stop SETPOINT® Connector service while making changes to AF.



Use PI System Management Tool to remove the corresponding PI tag and associated data set if necessary.

9.1.4 Trending Spectral Bands

Spectral Bands are represented as Attributes that can be presented on the Trend plot in SETPOINT® CMS. Note that spectral bands are not visualized on Spectrum plots.



9.2 Statistical Calculations for Hydroelectric Generators

Large Hydroelectric Generators typically are typically equipped with four or more Air Gap sensors to monitor the rotor and the stator for common failure conditions. In particular, **Rotor Profile** waveforms collected by a VC-8000 rack for individual **Air Gap** channels contain detailed information about the condition of individual rotor poles and stator sections. These can be used for root cause analysis, for example using the Unrolled Rotor Profile Plot, the Unrolled Stator Profile Plot, and the Circular Rotor Profile Plot.

On the other hand, statistical data computed from this detailed information is highly useful for detecting changes in the machine behavior without requiring manual analysis of the individual channel data sets. SETPOINT® Connector can thus compute three statistical measurements across the **Rotor Profile** waveforms of all **Air Gap** channels associated with a particular Hydroelectric Generators:

- **Air Gap Minimum**: The minimum air gap value measured across all poles and channels
- **Air Gap Maximum**: The maximum air gap value measured across all poles and channels
- **Air Gap Average**: The averege of all air gap values measured across all poles and channels

These three measurements can then be monitored for changes, thus yielding a simple early warnining indicator for subtle deformations of rotor and/or stator.

To use Statistical Calculations for Hydroelectric Generators, follow these steps:

- Configure the Hydroelectric Generator in the VC-8000, see section 9.2.1
- Enable Spectral Bands calculations in SETPOINT® Connector, see beginning of chapter 9
- Access the statistical data, see section 9.2.2

NOTE!

Statistical Calculations for Hydroelectric Generators are only supported for VC-8000 racks.

NOTE!

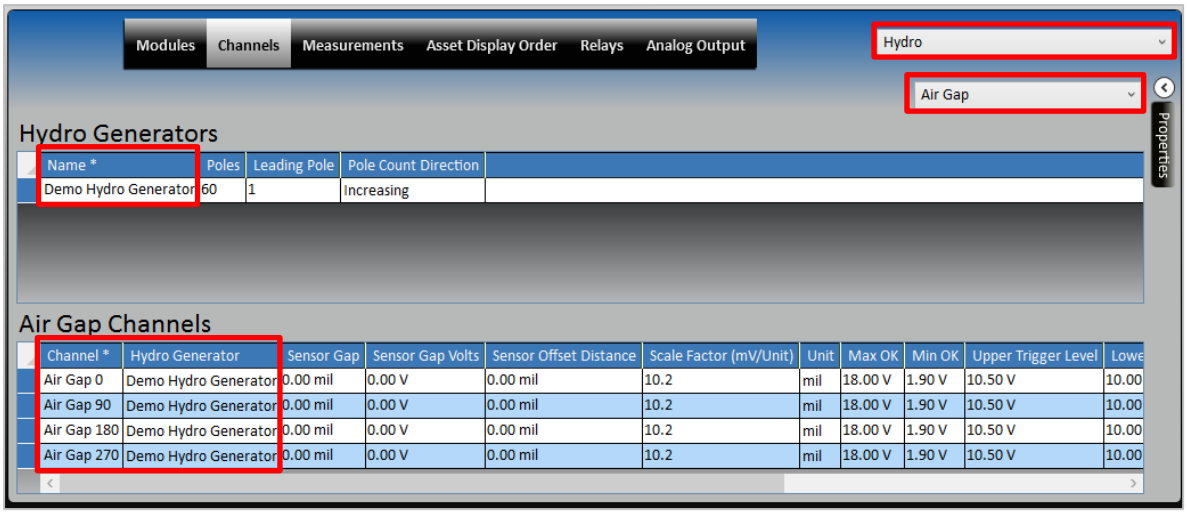
For storing calculation results and status information for the three abovementioned measurements, 6 additional PI Tags are required per Hydroelectric Generator.

9.2.1 Hydroelectric Generator Setup

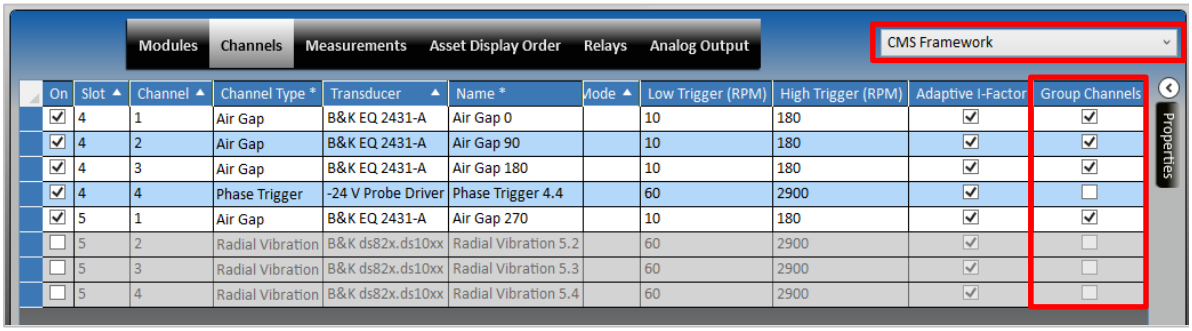
NOTE!

This section only covers the aspects of the VC-8000 configuration that are relevant for Statistical Calculations for Hydroelectric Generators. Please refer to the VC-8000 Operation and Maintenance Manual S1079330 for additional information on setting up your device monitoring of this type of machine.

Statistical Calculations for Hydroelectric Generators are based on all **Rotor Profile** waveforms from all **Air Gap** channels associated with a particular **Hydro Generator** within the rack configuration.In the example below, four **Air Gap** channels have been associated with a **Hydro Generator** with the user-defined name „Demo Hydro Generator“. Note that this **Hydro Generator** name will be used when initially placing the additional measurements in the AF hierarchy (cf. following section 9.2.2).



Here, the three statistical measurements will thus be calculated across 240 per pole values (60 pole values as recorded in **Rotor Profile** waveforms four individual channels). Note that this requires synchronized waveform collection, which is why the **Group Channels** option must be selected for all relevant channels:

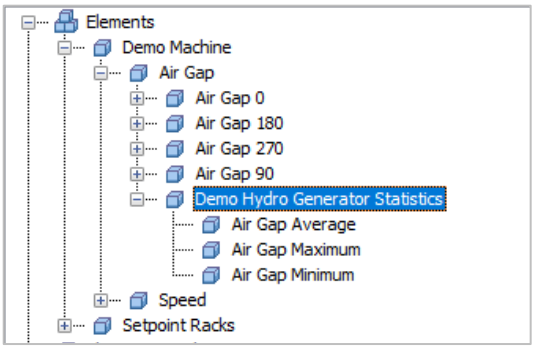


9.2.2 Storage und Usage of the Statistical Data

After configuring the VC-8000 rack and enabling the statistical calculations, SETPOINT® Connector will create

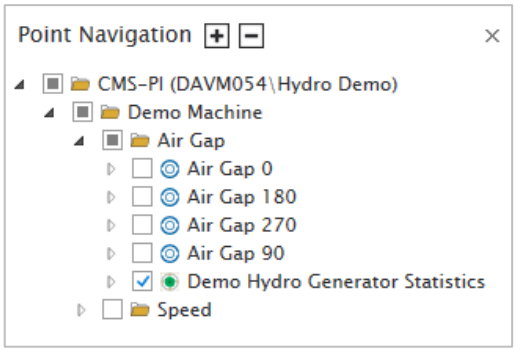
- 6 PI Tags to hold the computed measurement data as well as status information
- An additional **Hydro Generator** node in the AF hierarchy, as a sibling of the associated **Air Gap** channels
- Three additional **Measurement** nodes (**Air Gap Minimum**, **Air Gap Maximum**, and **Air Gap Average**) as children of the **Hydro Generator** node

The initial name of the newly created **Hydro Generator** node will be based on the name defined in the rack configuration (cf. previous section). For example, if the name „Demo Hydro Generator“ has been assigned in the VC-8000 configuration, then the **Hydro Generator** node will be created with the name “Demo Hydro Generator Statistics”:



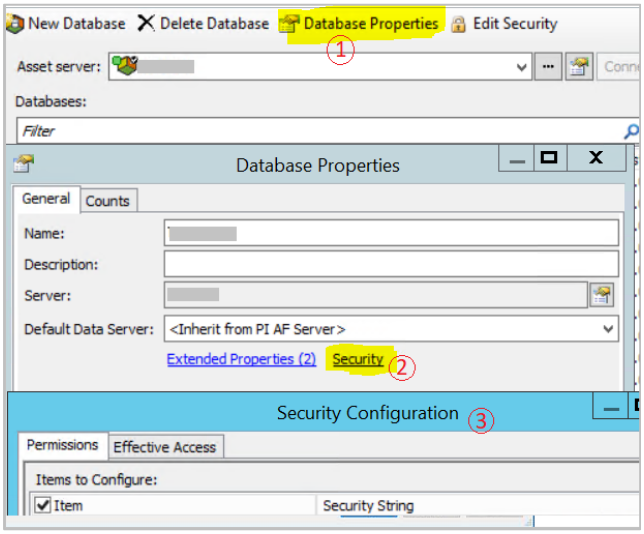
Note that users are free to rename the **Hydro Generator** node and/or move it to another location in the AF hierarchy.

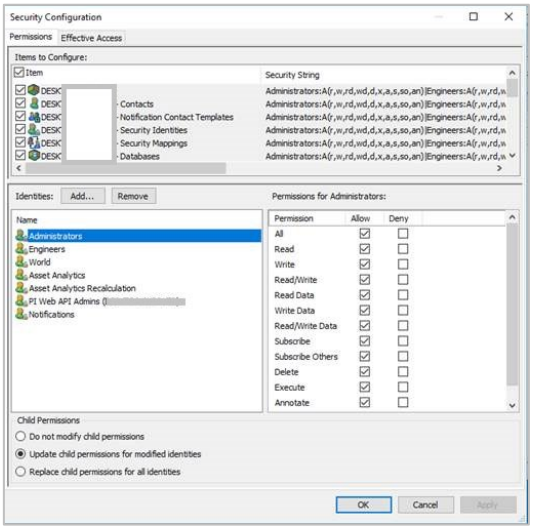
From within SETPOINT® CMS, the statistical measurements can easily be trended by selecting the corresponding entry in the Point Navigation.



9.3 Troubleshooting

Please make sure correct permissions are assigned when using Spectral Bands and/or Statistical Calculations for Hydroelectric Generators. Full rights must be granted so that the corresponding user can create new PI Tags for storing measurement values.





Spectrum plot context menu has an option 'Add Spectral Band', but it is disabled

NOTE!

"Spectral Band data collection must be enabled to configure and trend in CMS" in **Section 9.1.4**

SETPOINT® Connector Setup -> File -> PI System has no checkbox 'Enable Spectral Bands'

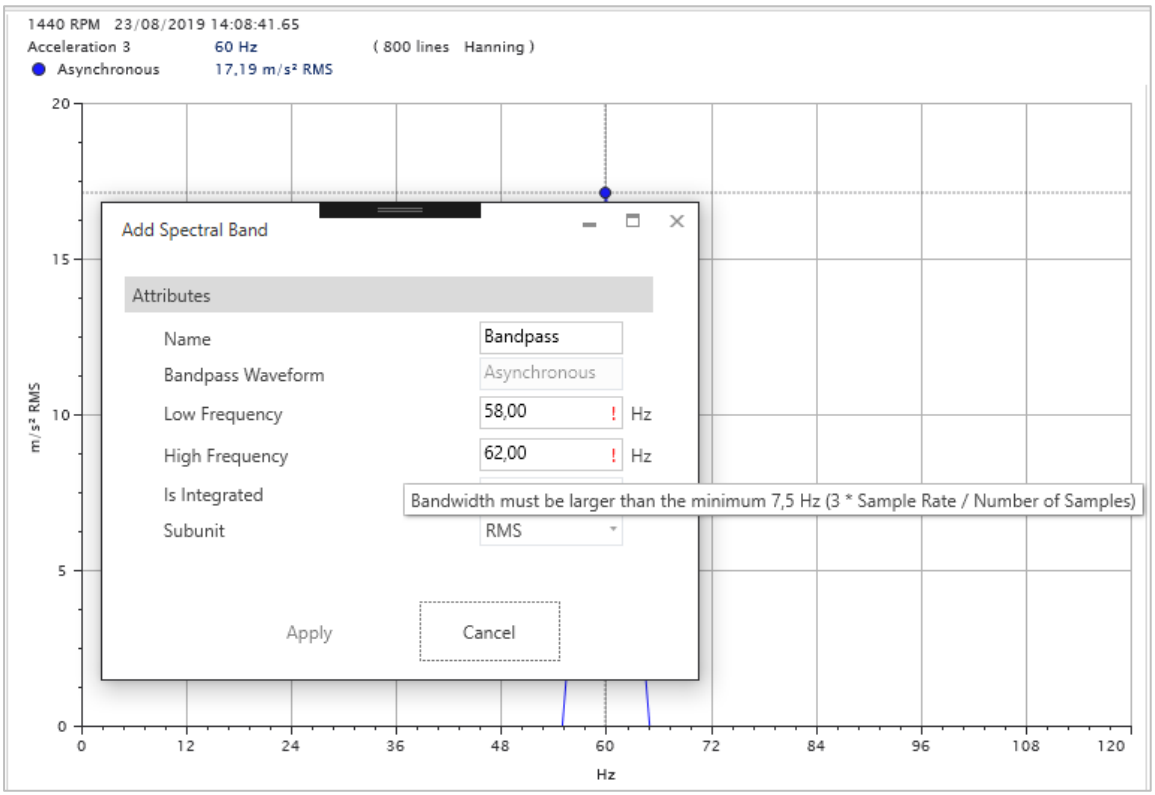
NOTE!

PI AF Client 2.10.5 or higher on the system running SETPOINT® Connector in **Section** Error! Reference source not found.

Spectral Bands are enabled but Spectrum plots still has a disabled option 'Add Spectral Band'

- Establish a new connection with the AF database so the change can be detected.

Spectrum plot says the minimum bandwidth is 7.5 Hz, but I need a Spectral Band with 4 Hz bandwidth



The ratio of sample rate and number of samples determines minimum bandwidth of a Spectral Band:

*minimum bandwidth = 3 * sample rate / number of samples*

Assuming an acceleration channel with default waveform parameters we get

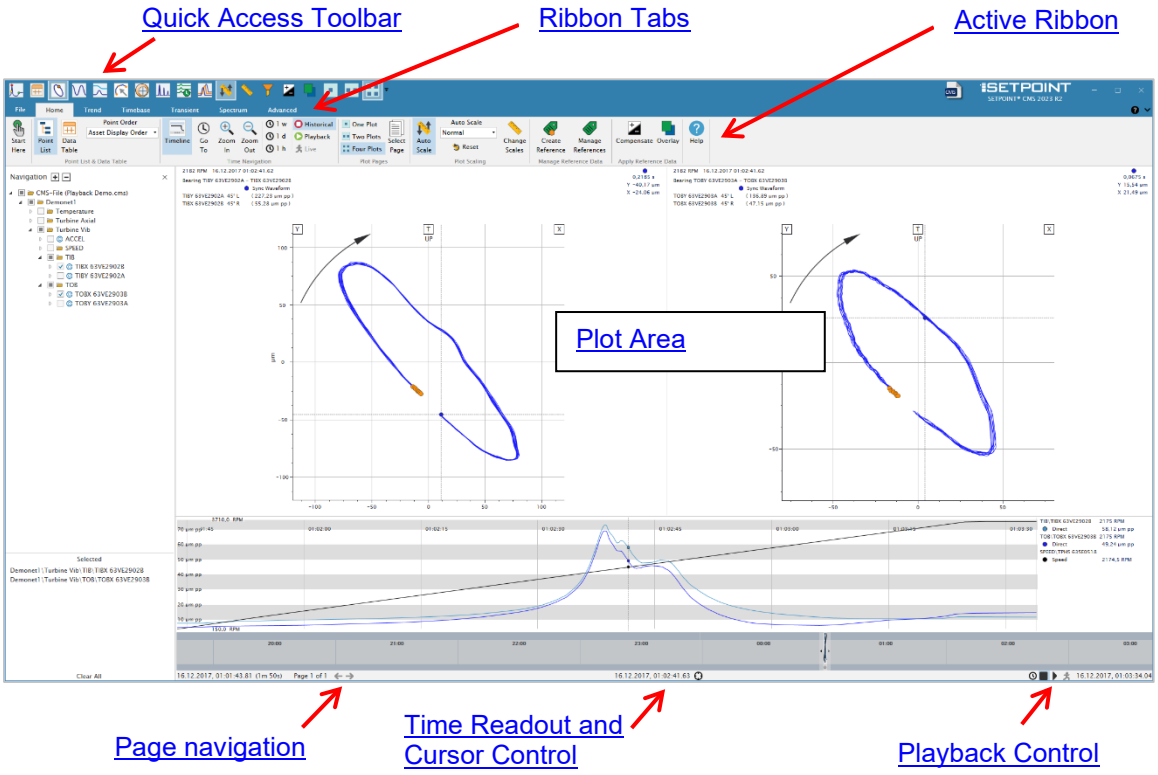
*minimum bandwidth = 3 * 5120 / 2048 = 7.5 Hz*

Use VC-8000 Rack Setup to change either of these waveform parameters in order to a get the desired minimum bandwidth (e. g decrease the sample rate)

*minimum bandwidth = 3 * 2560 / 2048 = 3.75 Hz*

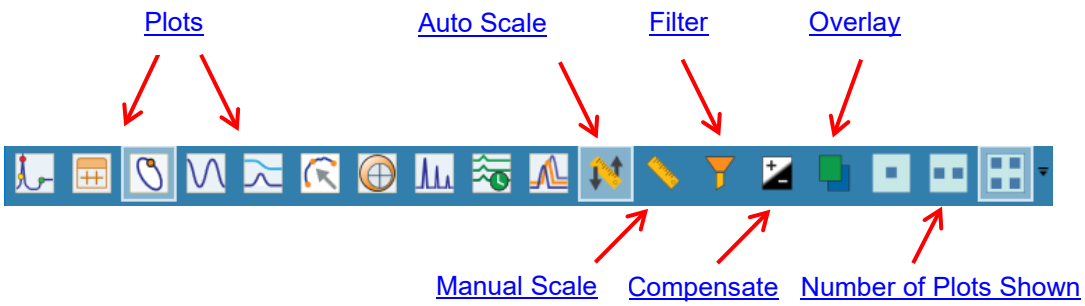
10 CMS Display Software Features

This section provides an overview of the CMS Display software layout and functions.

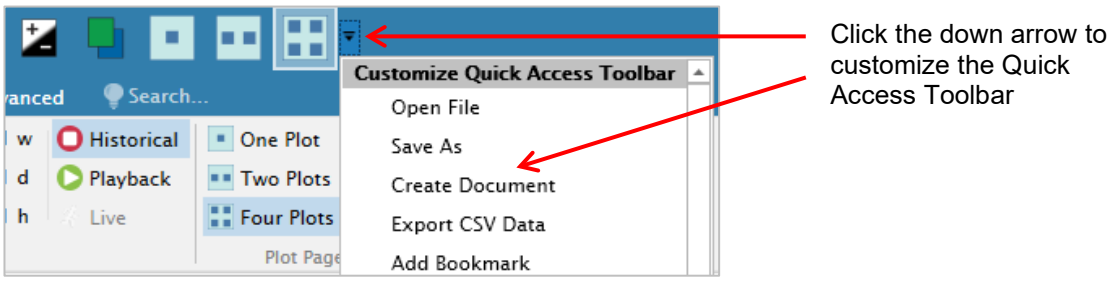


Quick Access Toolbar

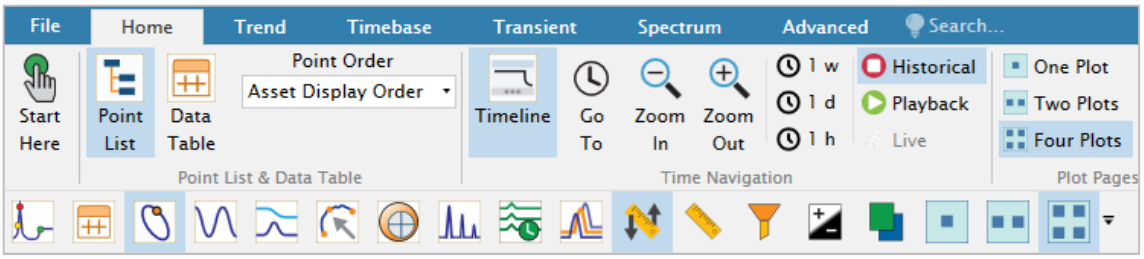
The Quick Access Toolbar at the top of the screen provides direct access to commonly used functions.



You can customize the Quick Access Toolbar using the drop arrow on the right:



Here, you can hide or show buttons, or move the Quick Access Toolbar to below the ribbon.



Ribbon Tabs

Using default settings, SETPOINT CMS has seven main tabs:

- File Tab
- Home Tab
- Trend Tab
- Timebase Tab
- Transient Tab
- Spectrum Tab
- Advanced Tab

Use the links above to find information on each tab function.

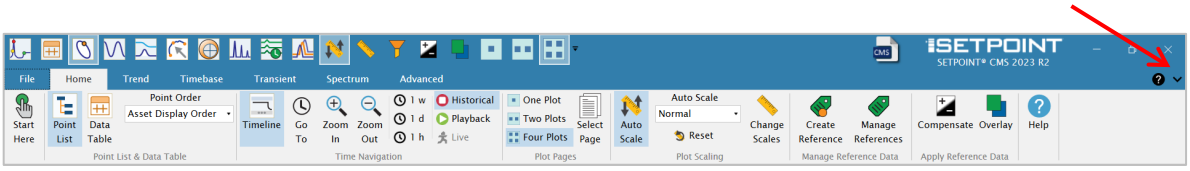
The Home Tab provides access to the features commonly used at each step of the data analysis process, whereas the Advanced Tab contains less commonly used features.

The remaining tabs are centered around plot groups and their corresponding options. Optionally, three more such tabs can be activated using Start Here:

- Recip Tab
- Hydro Tab
- Compressor Map Tab

Active Ribbon

You can hide or show the ribbon to increase the plot area. The default is to show the ribbon. To hide the ribbon, click the icon at the right side of the display.



When the ribbon is hidden, the icon changes to a down arrow. Click the arrow to show the ribbon.

You can also show or hide the ribbons by double-clicking on the tab name.

Plot Area

Plots for analyzing the data are placed in the plot area. After configuring your data, you can increase the plot area for analysis.

Panes

Panes provide access to detailed information and are opened and closed as you perform certain operations. You can show or hide panes to increase the plot area.

- Navigation Pane
- Pages Pane
- Scales Pane
- Reference Data Pane
- Attributes Pane
- Events Pane

Time Readout and Cursor Control

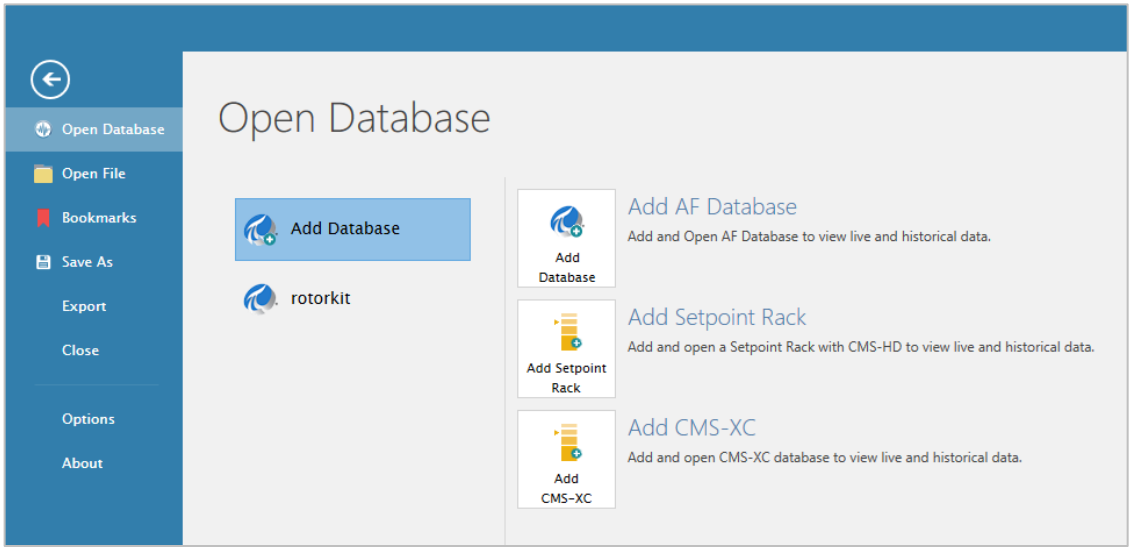
The time readout information and cursor controls are shown at the bottom of the screen. Using these controls, you can move to the current time or synchronize cursors.

Playback Control

Use the playback controls to replay recorded data or to view live data (a bit like a recorder, with an accelerated function).

10.1 The File Tab

Navigate to the data you need to analyze using the **File** tab.



From the **File** tab, you can

- Connect to a PI Server database
- Set a default database
- Open a saved .cms file
- Open a bookmarked dataset
- Save a .cms file
- Bookmarks
- Export plots and reports
- Set default units
- Change the screen colors
- View the software revision

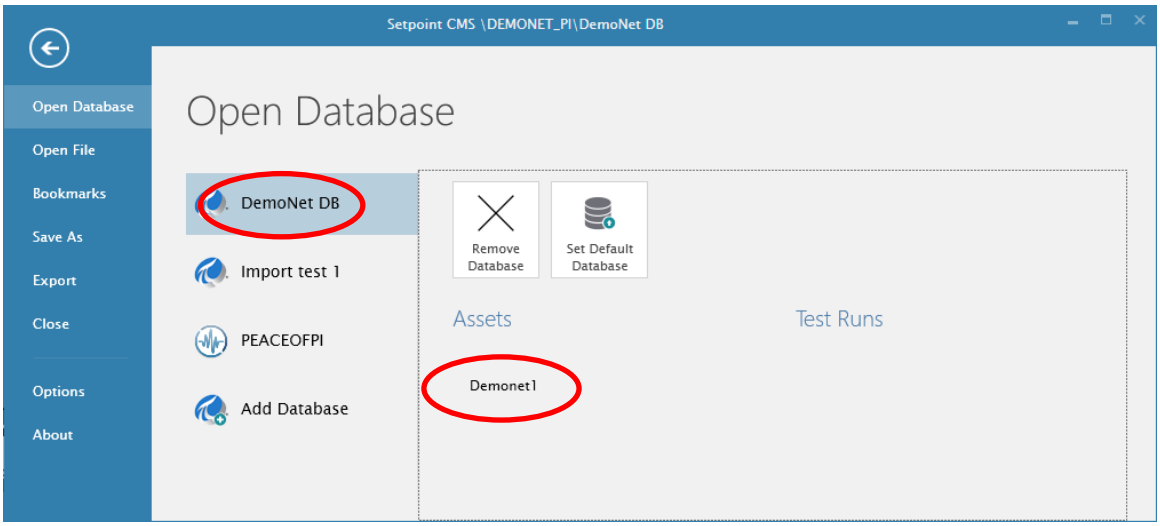
Go to Home Tab

10.1.1 Open a Data Source

Connect to a database using the Open Database button on the File Tab. You can connect to PI AF databases, CMS-XC computers, or directly to racks with internal storage (CMS-HD).

10.1.1.1 Connecting to a Recent PI AF Database, CMS-XC Computer or Rack

If you have connected to the server before, the server will appear in the list of recent items. Clicking on the server name and asset name will connect SETPOINT® CMS to that server and asset.

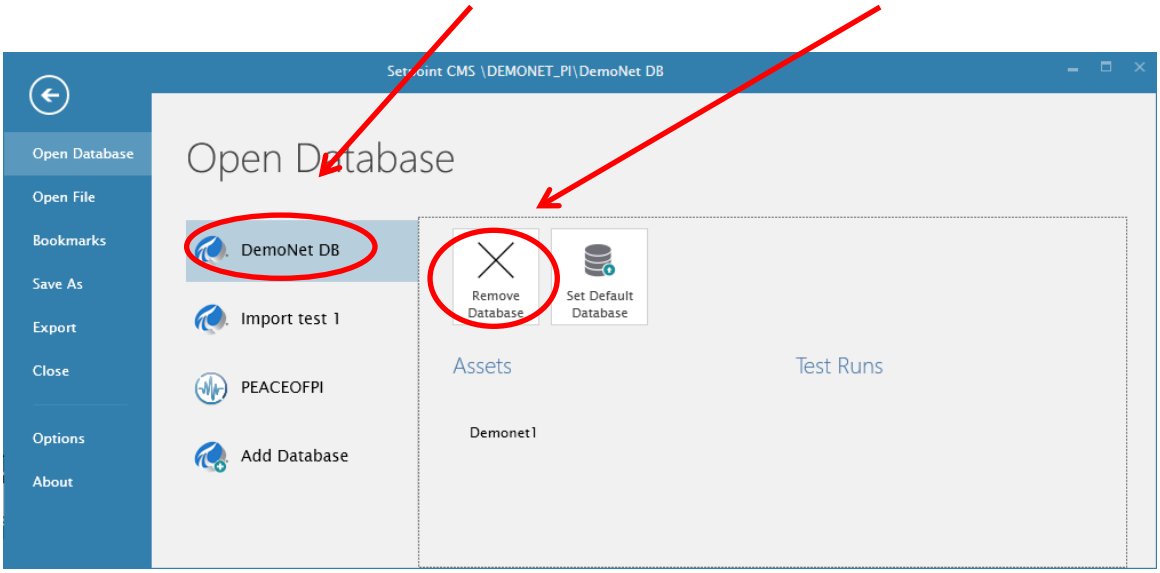


NOTE!

If the CMS-XC computer or Rack was configured with a password, you will be prompted to enter your password.

10.1.1.2 Removing a Database

To remove a database, click on the database name and then click the **Remove Database** button.

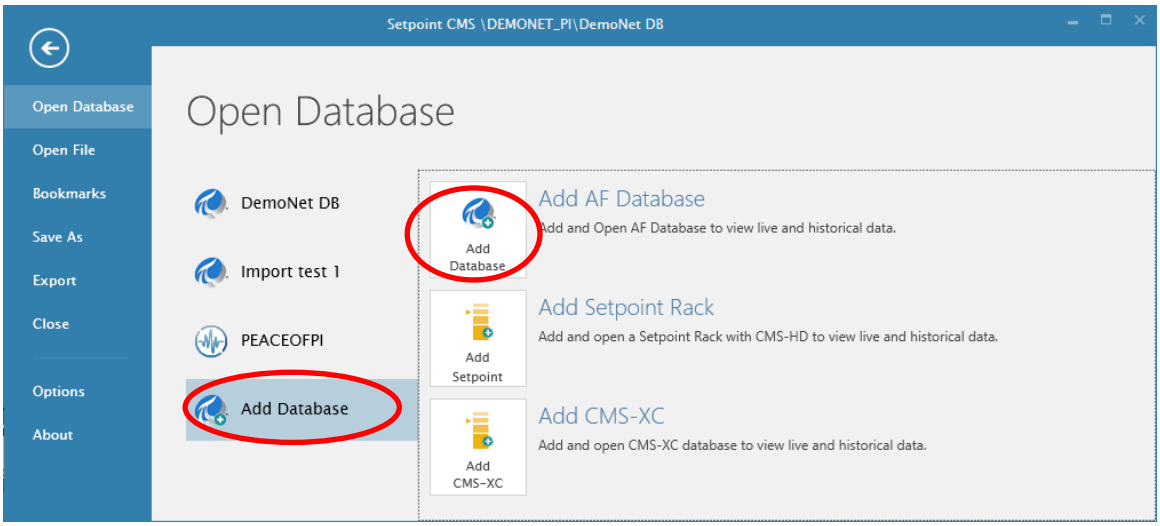


NOTE!

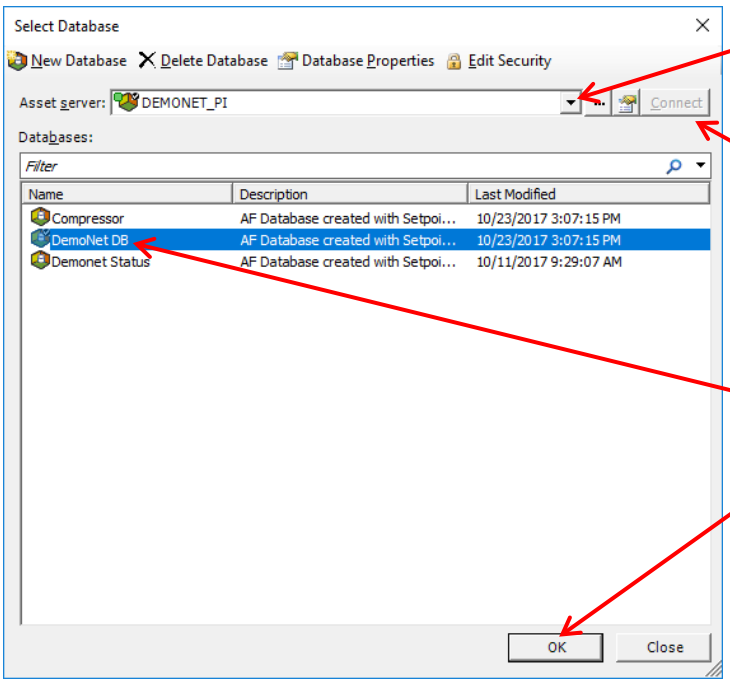
If you delete the currently open database and do not open another database before closing CMS, the next time you open CMS, CMS will restore the deleted database.

10.1.1.3 Connecting to a New PI AF Database

If you are connecting to a new server, select **Add Database** then click the **Add AF Database** button.



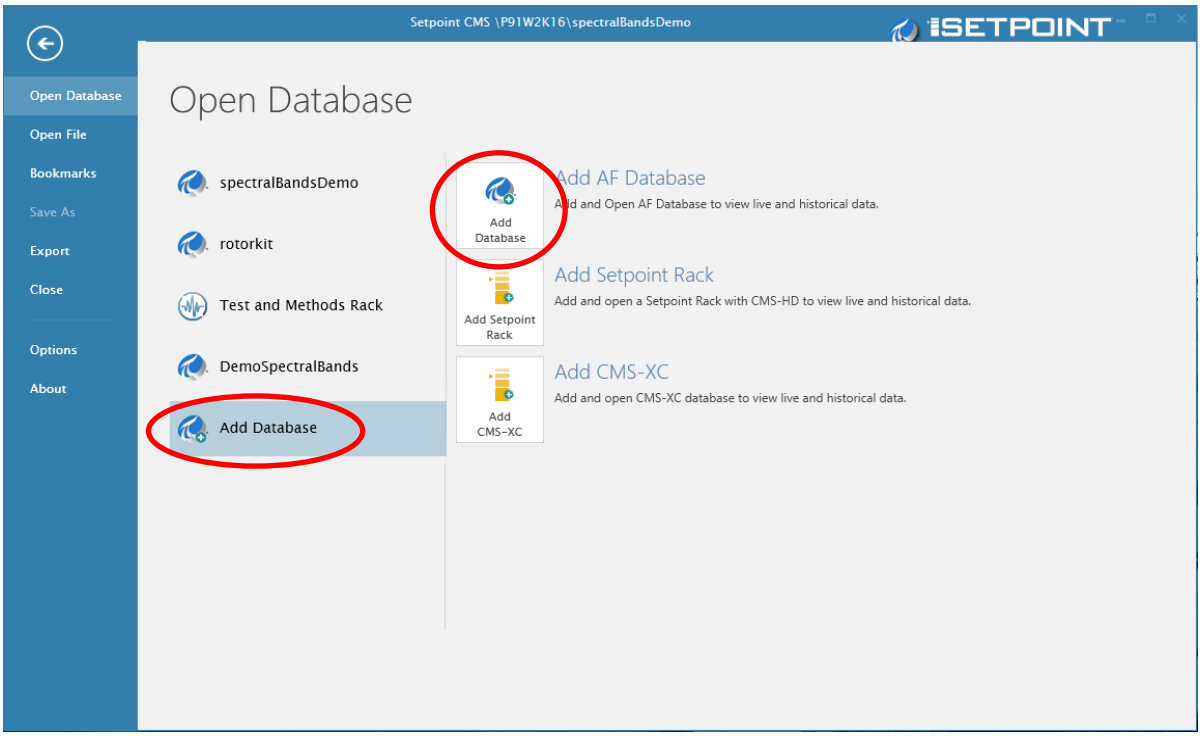
The Select Database window will open:



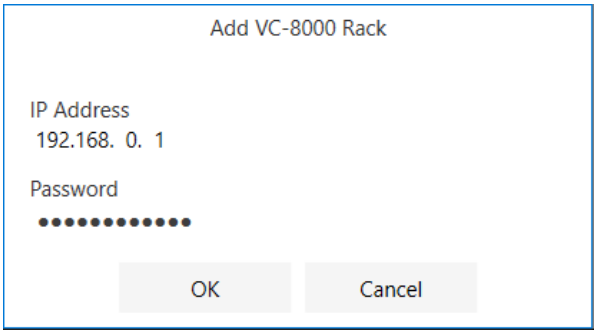
1. Click the arrow to get a drop list of the available PI AF Servers.
2. Click the **Connect** button to establish the connection with the PI AF Server. Note: If you are already connected to that server, the **Connect** button will be disabled.
3. Select your machine database from the list of databases shown.
4. Click **OK**.

10.1.1.4 Connecting to a Rack

If you are connecting directly to a rack with CMS-HD capability, select **Add Database** and then click the **Add Setpoint Rack** button.



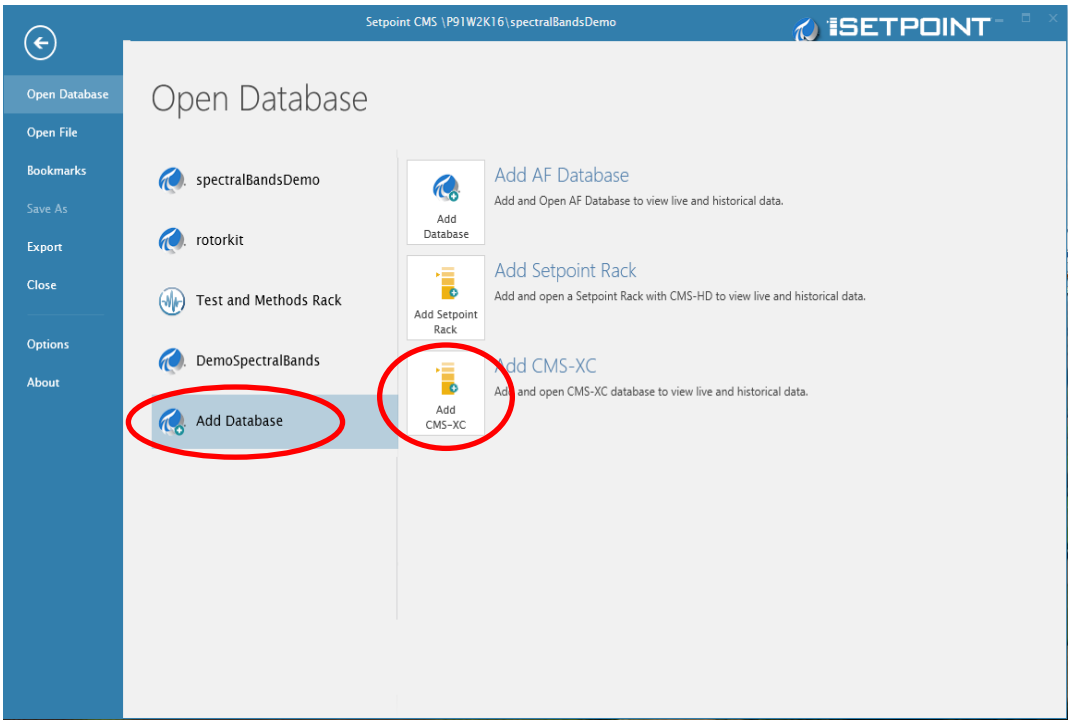
Enter the rack IP Address and password as set in the SAM network configuration.



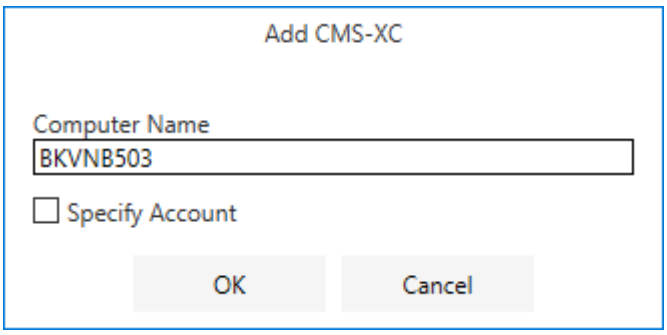
Click **OK** to establish the connection.

10.1.1.5 Connecting to a CMS-XC Computer

If you are connecting to a new CMS-XC computer, select **Add Database** then click the **Add CMS-XC** button.



A dialog opens where you enter the CMS-XC computer network name.

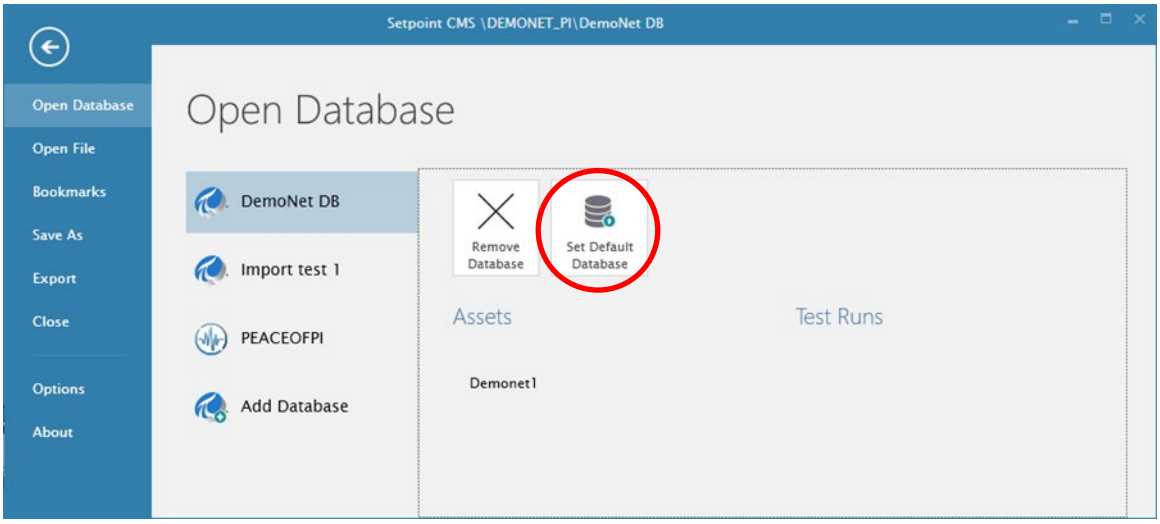


Check the **Specify Account** button if the computer security settings require a specific User Name and password must be specified.
Click **OK** to finish the connection and return to CMS.

The software will show a dialog indicating if the connection was successful or failed.

10.1.1.6 Setting Default Database

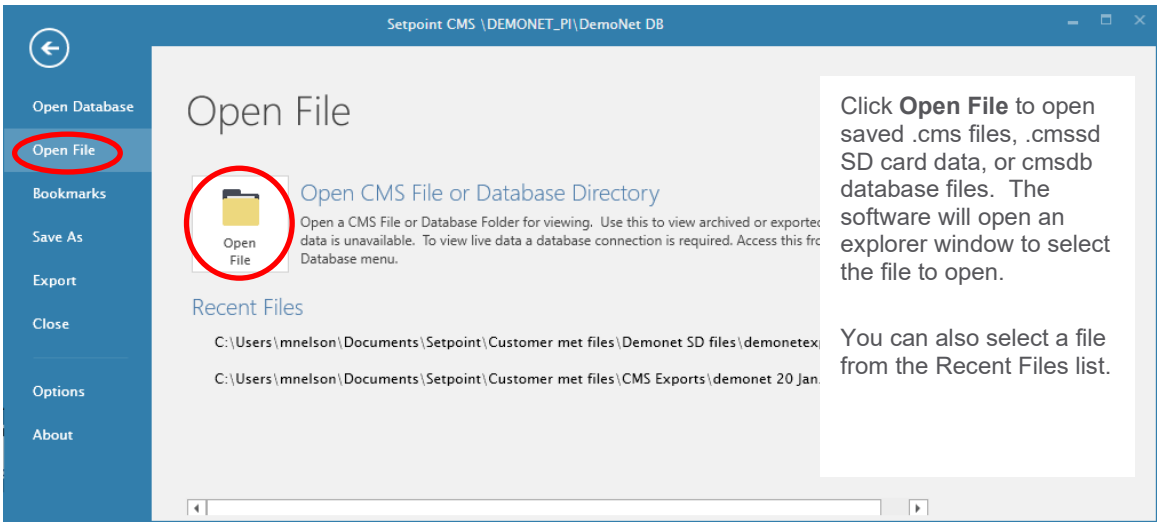
A CMS user can set a global default database so that any user logging onto the CMS computer will default to the global database. To set the default database, click on the recently opened database that you want to set as the default and click the **Set Default Database** button.



A pop-up box opens indicating that the default database has been set to the currently open database. Click OK to return to CMS.

10.1.1.7 Opening Saved Data from a .cms or cmssd File

Follow the instructions in this section to open and view data saved from SETPOINT® CMS or saved on an SD card installed in the VC-8000 rack. You can use any computer that meets the SETPOINT® CMS computer requirements. You do not need the AVEVA™ AF Client installed when viewing saved data.



When opening data stored from an SD card, the file type will be CMSSD. Data saved from the SETPOINT® CMS program will be a .cms file type.

The assets in the imported file will show up in the Navigation Pane. Since SETPOINT® CMS then expects to be viewing offline saved files, CMS closes any display connections to an online database.

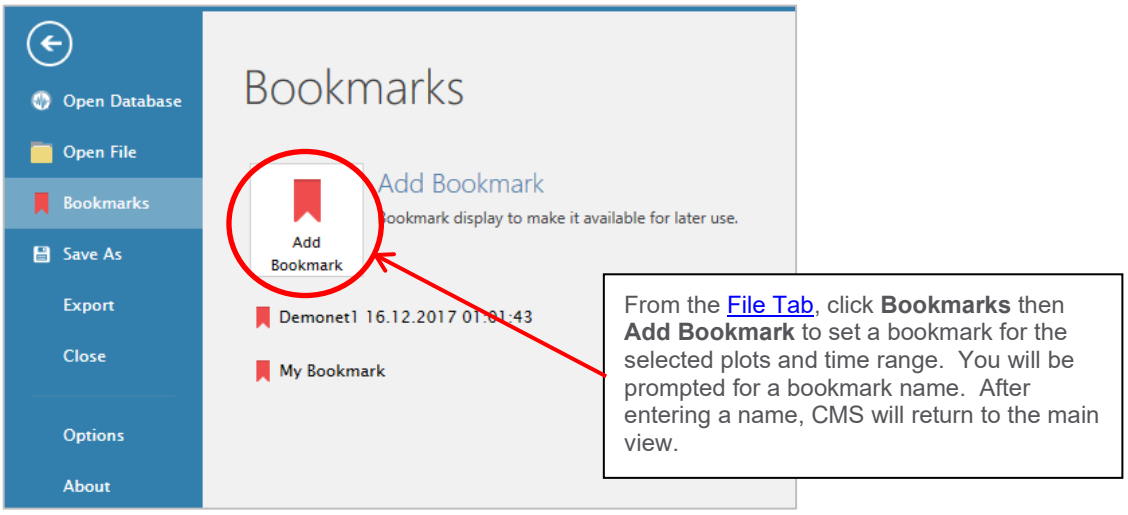
When viewing saved data, all controls are active. Note that the timeline data only shows the data in the time range set at the time the data was saved.

NOTE!

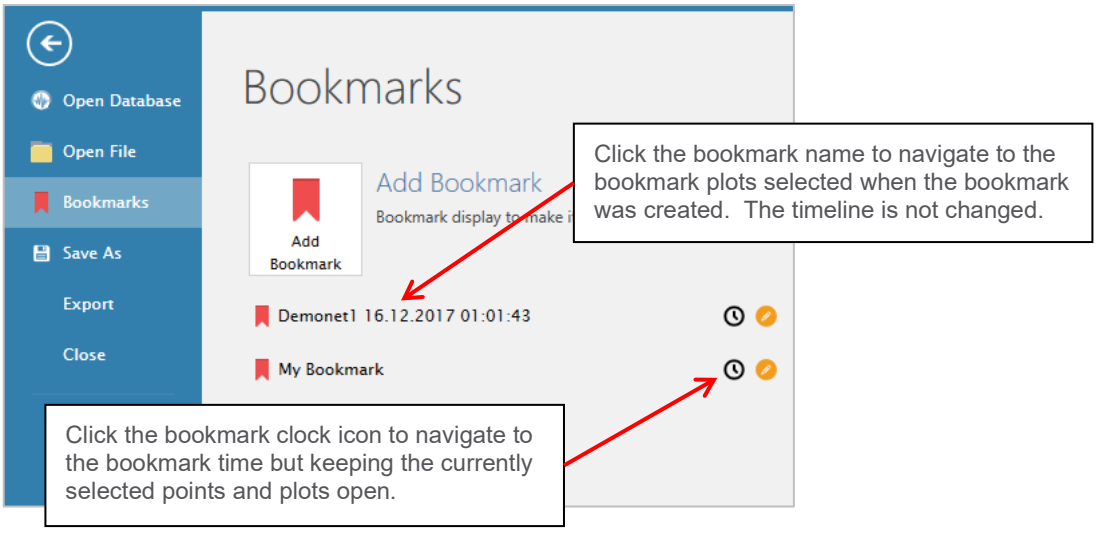
When using SETPOINT® CMS version 2017 or later you can double click a .cms file to open CMS using that file.

10.1.2 Adding a Bookmark

You can bookmark a time range and set of plots for quick access in the future. Use the bookmark feature to mark times of specific machine events you want to return to or to create plot arrangements that you want to reuse.

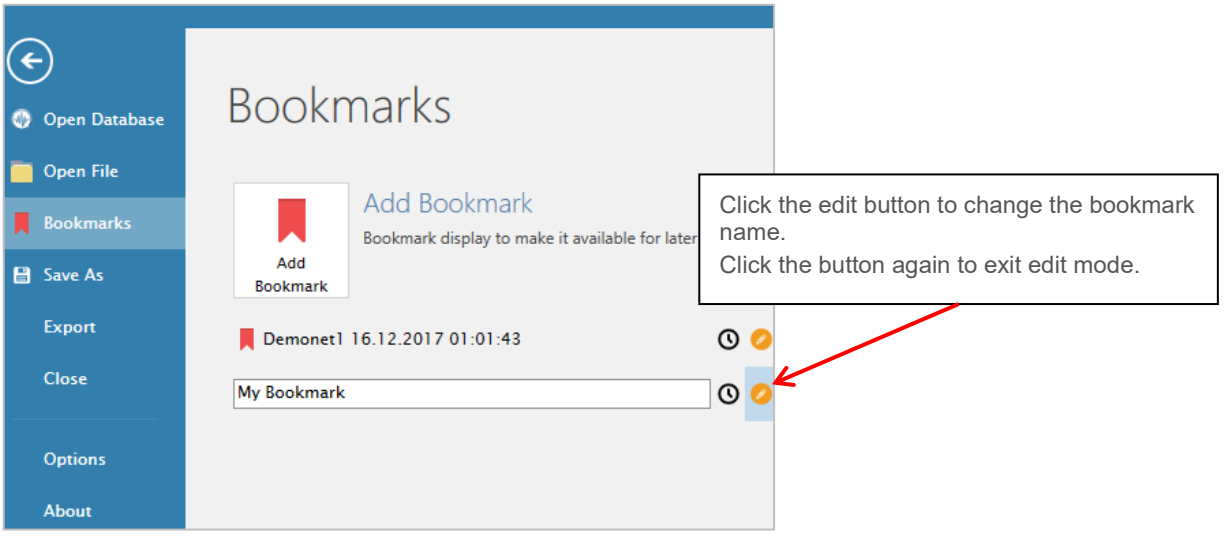


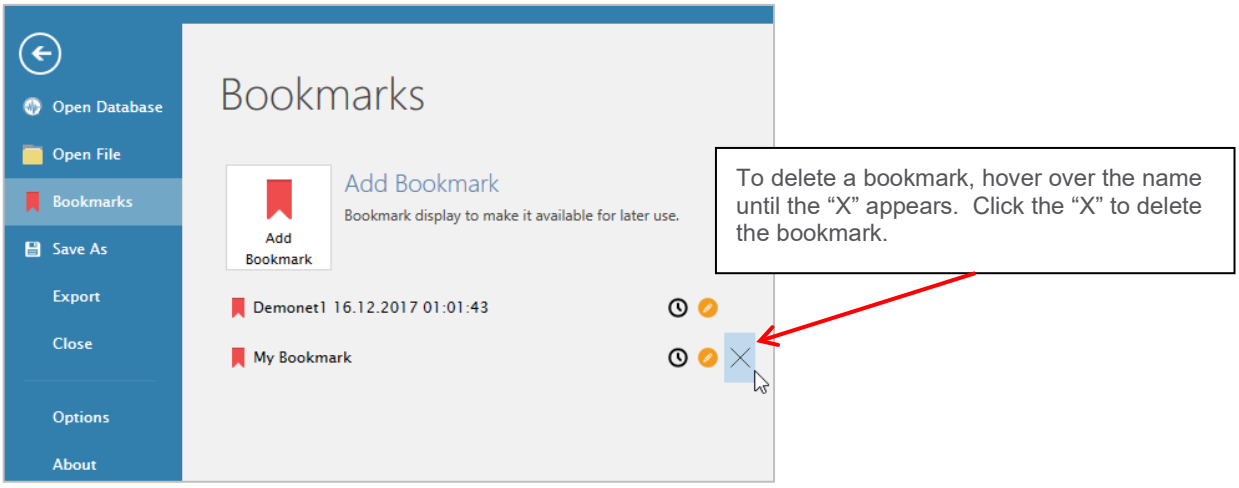
10.1.3 Using Bookmarks



NOTE!

Clicking on a bookmark opens the saved view. All plots with a pin are displayed, even if this plot is not set in the **Home** tab. Remove the pin in the plot display to remove a single plot or use the Clear Pins button (in the View tab) to remove all placed pins.





10.1.4 Saving a Data File

The SETPOINT® CMS data file Save/Open functions allows you to save a range of data in a file. You can then open this file directly into SETPOINT® CMS for viewing the data on a computer not connected to the PI System database or SD card files.

Data Save/Open is useful for:

- Sending data to Machinery Diagnostic Engineers who do not have network access to your database.
- Archiving a specific range of data to document an event.
- Saving information for review by Brüel & Kjær Vibro Services.

The **Save As** function exports all the database data in the set time range for the selected asset.

After selecting the data points and time range,

IMPORTANT!

The save data function only exports data for the selected asset and points. Be sure that all points you want data for are selected before saving.

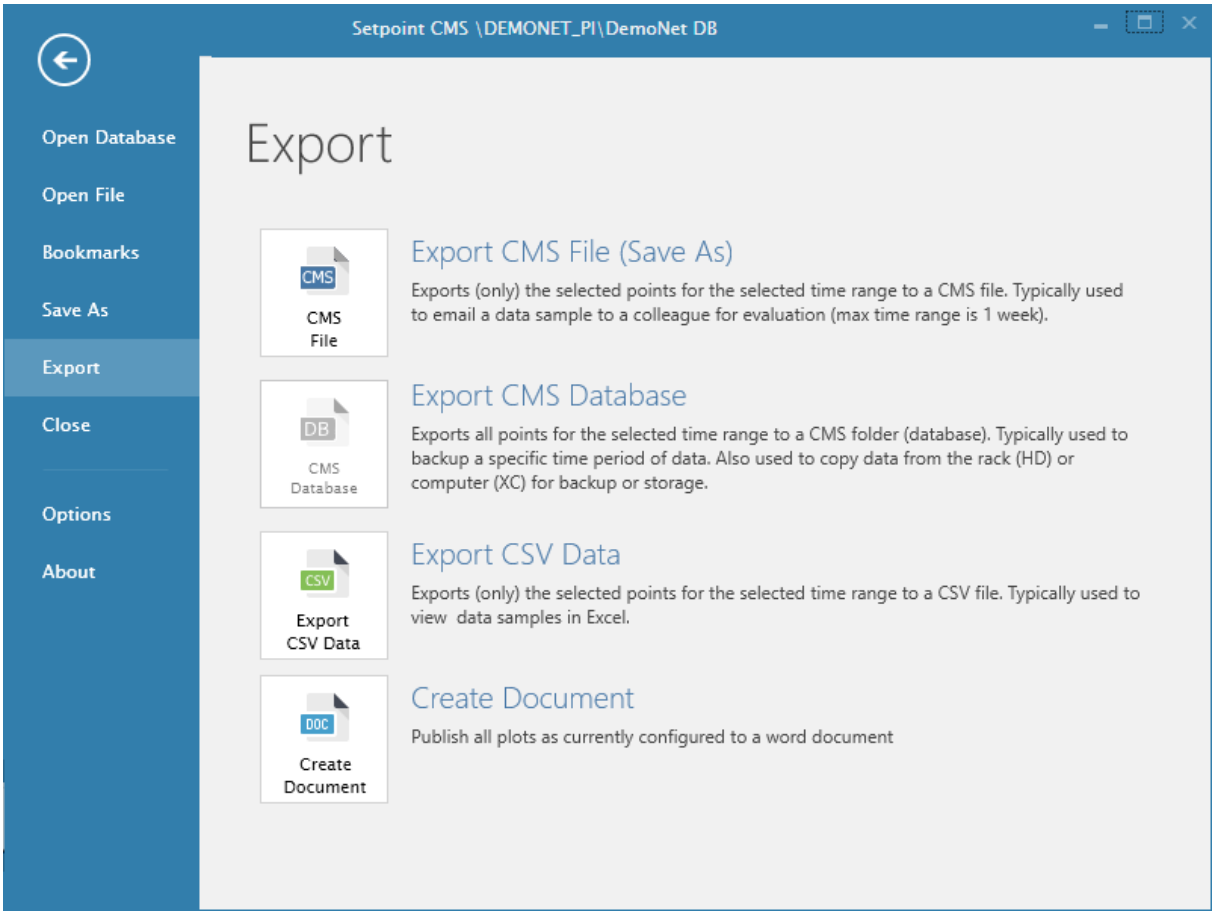
NOTE!

A large dataset can take a long time to save. Select only the time range and points you need.

When the file creation starts, CMS shows a progress dialog.

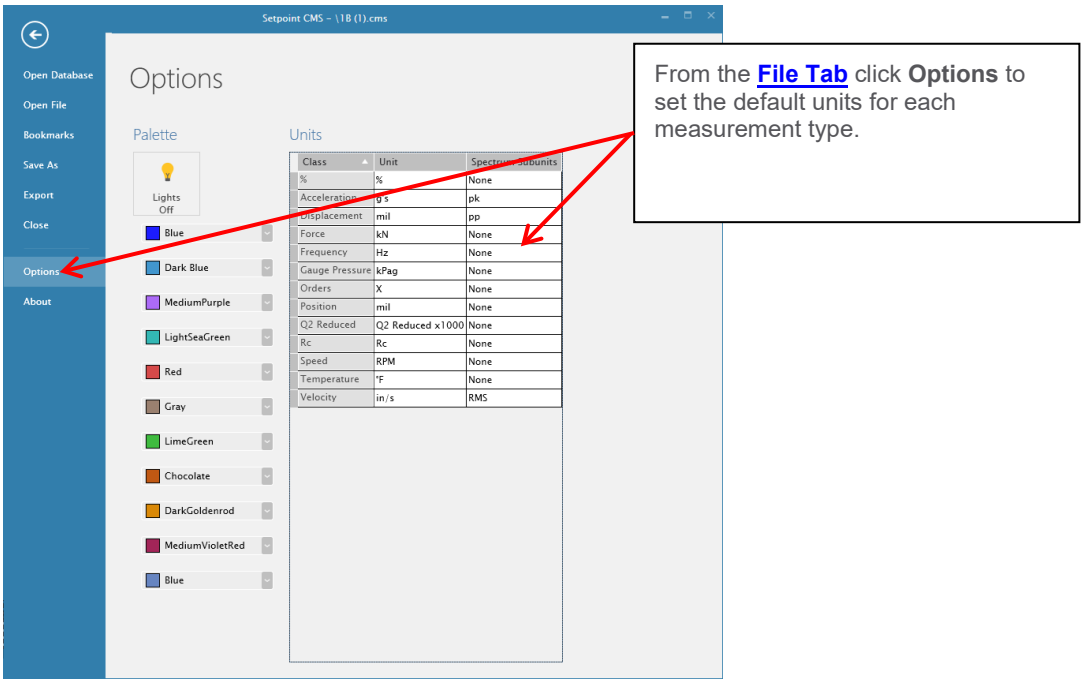
10.1.5 Export

See **Section 11.4** Documenting for information on the Export functions. The Export menu provides overviews of the different formats you can export the data as:



10.1.6 Setting Units and Spectrum Subunits

The default units apply to all plots. After changing units, all open plots will redraw using the new units and subunits. New plots will open using the current unit settings.

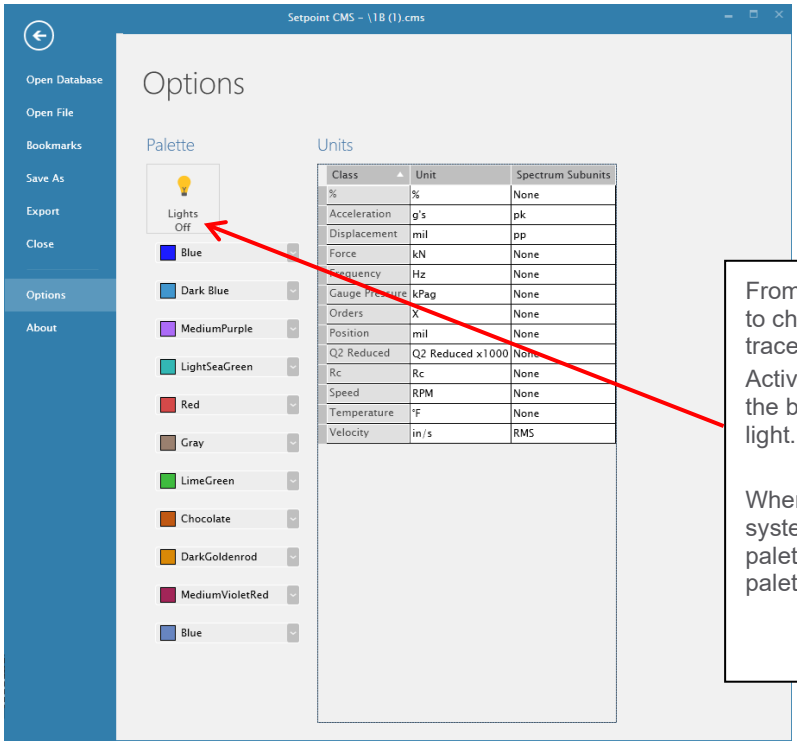


Spectrum processing can present the spectrum scaled in peak, peak to peak, or RMS. Generally, you will set the spectrum subunits (or detector) the same as the direct measurement for comparison between the spectrum and trend plots.

10.1.7 Changing Display and Trace Colors

SETPOINT® CMS has two separate color palettes for use with dark or light backgrounds highlighted (lights off) in a dimmed control room for example, or with a normally illuminated light screen.

The listed colors apply in order to the channels placed on the plot.

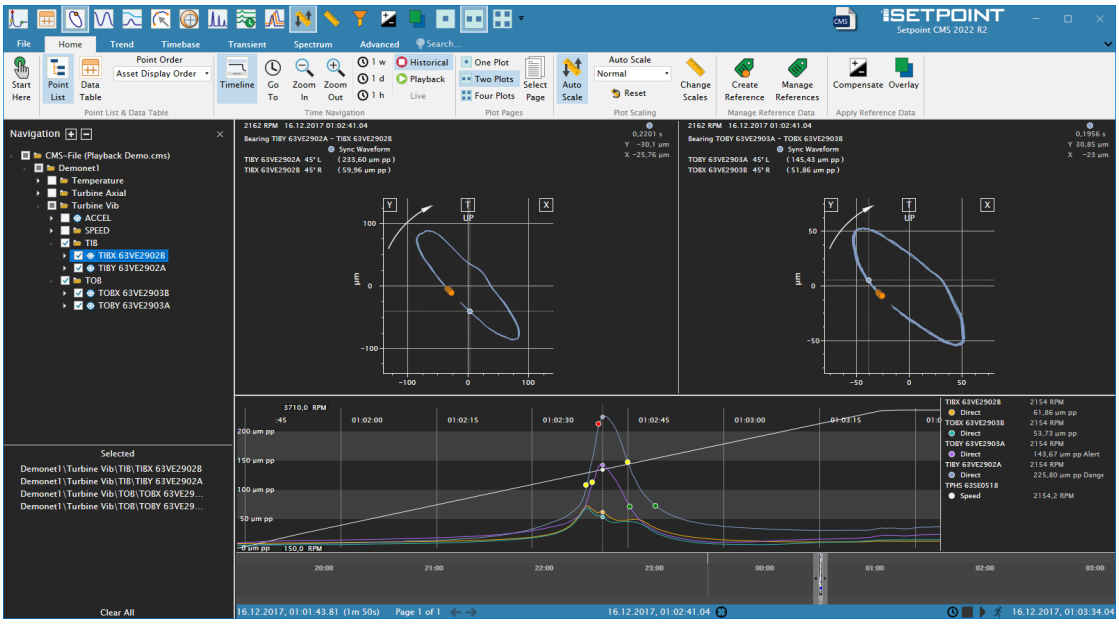


From the File Tab click **Options** to change the background and trace color.

Activating the **Lights** changes the background from dark to light.

When the button is light, the system will use the "light" palette. When dark, the "dark" palette.

With the palette above, the first trace plotted will be Blue, the second trace Dark Blue, etc. The following figure shows an example of the dark palette:

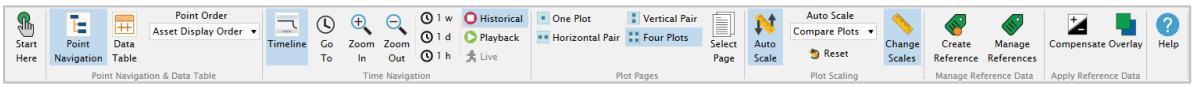


10.1.8 View the Software Revision

From the **File Tab** click **About**. The software revision will display:

10.2 The Home Tab

The **Home** tab shown below is where you make choices on what data to analyze and what plots to present.



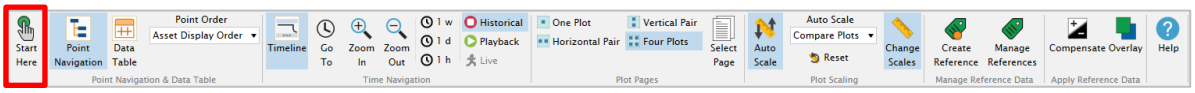
From the **Home** tab, you can:

- Customize CMS using Start Here
- Activate the Point Navigation (Navigation Pane)
- Show or hide Data Table
- Change the desired Point Order
- Show or hide the Timeline
- Manually set the dynamic cursor time
- Zoom the selected time range in or out
- Set the time range size
- Playback or View Live Data
- Select number of plots to be displayed per page
- Control and navigate plot pages
- Control auto scaling
- Control manual scaling
- Create a reference sample
- Manage reference data
- Select whether to compensate data
- Show or hide overlay data

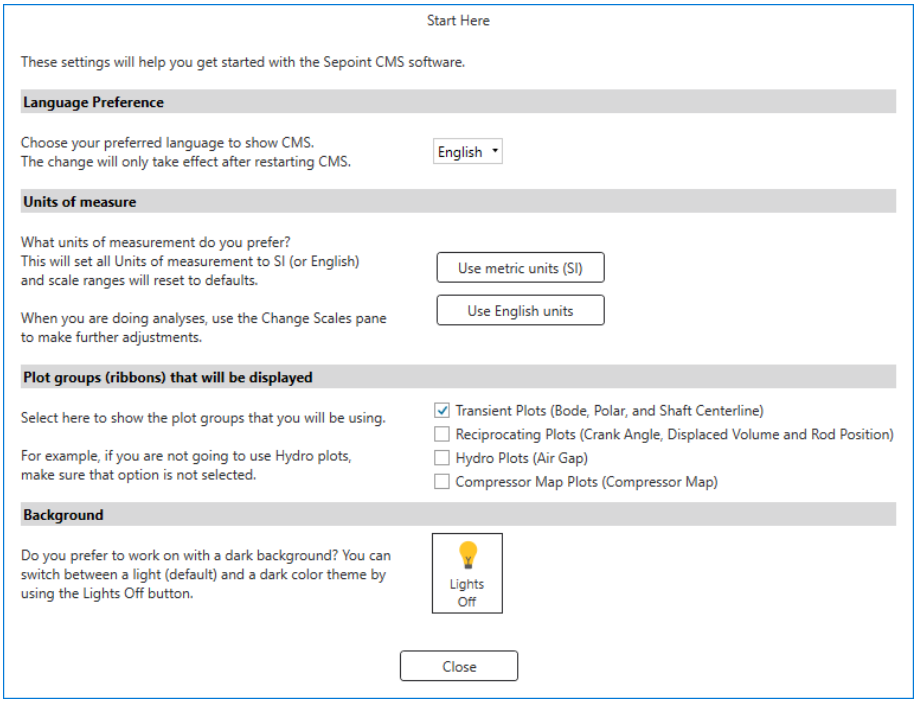
Go to Trend Tab

10.2.1 Start Here

Click the Start Here button on the Home Tab



to open the corresponding dialog box:



This dialog is intended for initially setting up SETPOINT CMS according to your personal preferences and requirements.

Language Preference

Allows users to select their preferred display language. A restart of SETPOINT CMS is required before changing this setting has an effect.

Units of measure

This section allows users to reset *all* display units to the two most common choices. Further adjustments can be made from the Changes Scales pane.

Plot groups (ribbons) that will be displayed

SETPOINT CMS includes four optional ribbon tabs (Transient, Recip, Hydro and Compressor Map) that are centered around plot types for specific purposes. By default, only the Transient tab is activated. Users can change this selection to show or hide plot groups such that SETPOINT CMS shows exactly the plots and options that are required at a particular installation.

Hiding a plot group will hide:

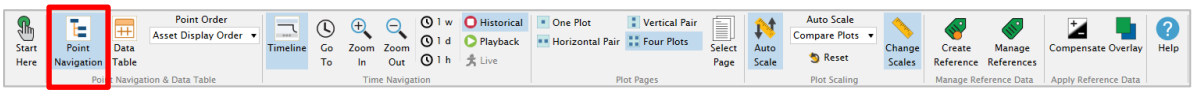
- the corresponding ribbon tab
- corresponding plots from the Quick Access Toolbar
- related entries from the Changes Scales pane

Note that hidden plot groups can easily be restored from that dialog, and that all corresponding settings will be retained by SETPOINT CMS.

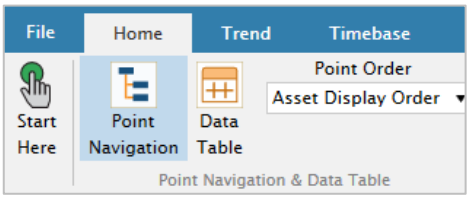
Background

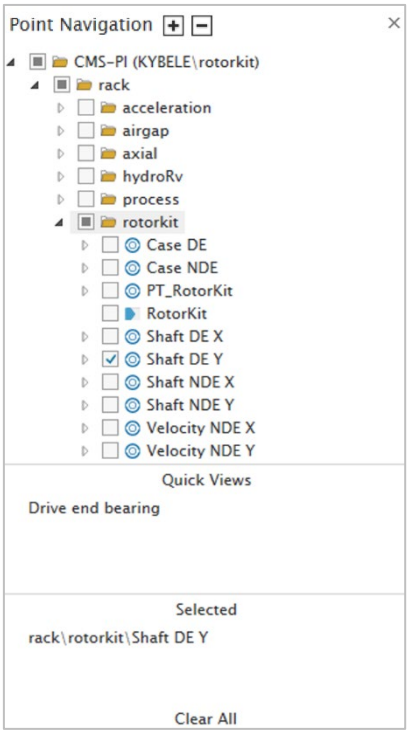
See Changing Display and Trace Colors.

10.2.2 Point Navigation (Navigation Pane)



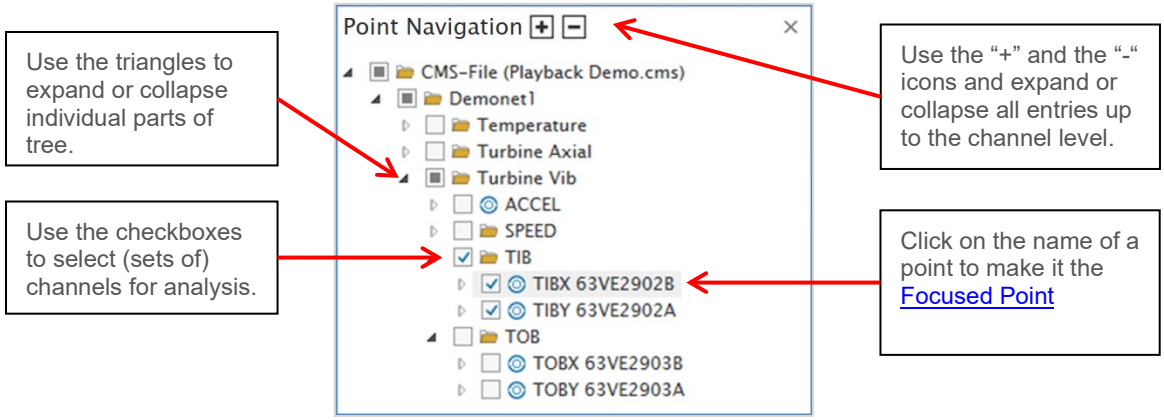
Click the Point Naivgation button on the Home Tab to open the Navigation Pane, which consists of three main parts (from top to bottom):
The Point Hierarchy (Tree View), the Quick Views area (AF only) and the Selected area





10.2.2.1 Point Hierarchy (Tree View)

The upper part of the Navigation Pane shows a hierarchical view on all Points within the current database. It allows you to quickly select and edit which points for analysis.



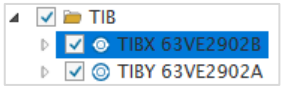
In the above example, the point "TIB" has been selected, which implies that all its child nodes ("TIBX 63VE2902B" and "TIBY 63VE2902A") are selected. As "TIBX 63VE2902B" and "TIBY 63VE2902A" are channels (indicated by the blue sensor icon), the corresponding data will be displayed in all relevant parts of SETPOINT CMS.

Note that each channel contains a list of measurements, and that SETPOINT CMS will automatically select a suitable measurement to be displayed in a plot. Users thus rarely need to interact with individual measurements, except in advanced scenarios like working with Attributes.

NOTE!

If the Navigation Pane is blank, verify that you have configured an asset path in the configuration.

10.2.2.2 Focused Point



Clicking the name of a point in the navigation pane will make it the Focused Point. In the above example, the Focused Point is "TIBX 63VE2902B". The following actions depend on the Focused Point:

- Elements listed in the Quick Views Area section will update when the Focused Point changes.
- Newly created Quick Views will be associated with the Focused Point.
- The Attributes Pane always shows the attributes of the Focused Point.

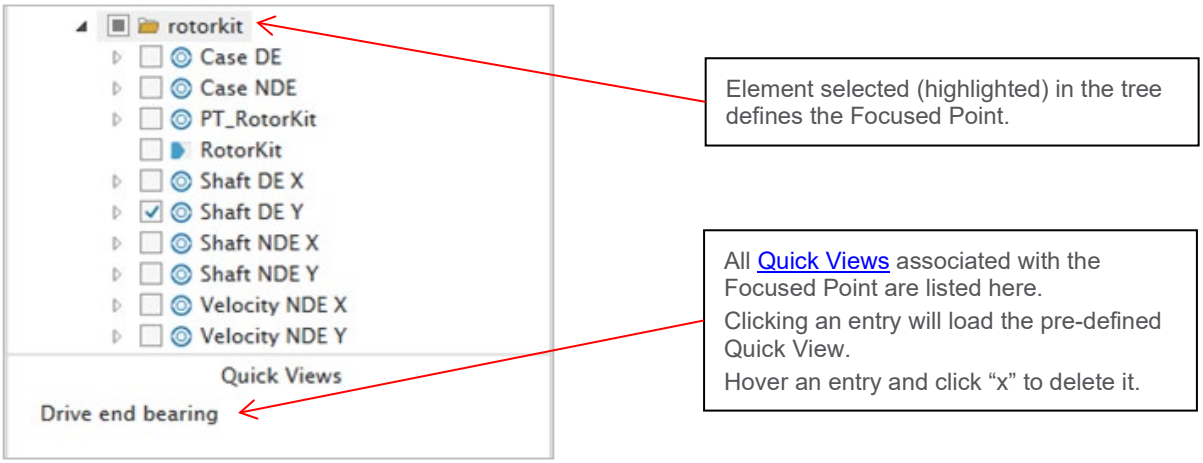
10.2.2.3 Quick Views Area

The Quick Views area lists all Quick Views that have been defined for the Focused Point.

NOTE!

This area will be hidden if you are not connected to PI AF database.

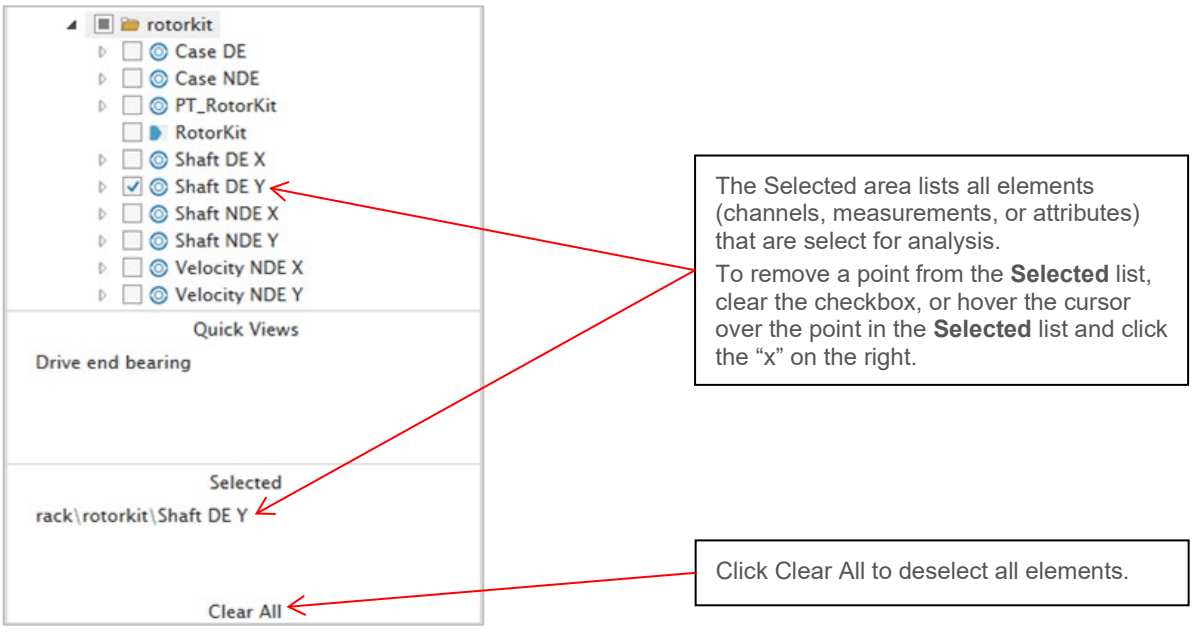
In the following example, the Focused Point is “rotorkit”, which has a single Quick View called “Drive end bearing”.



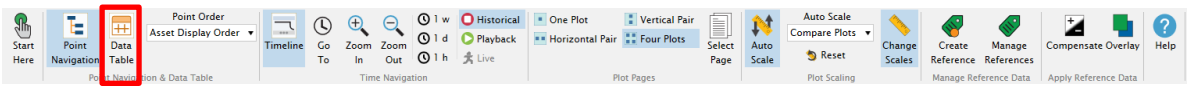
10.2.2.4 Selected Area

All checked points are selected for display and are thus listed in the **Selected** section of the navigation pane. This may include channels (most common), measurements or even individual Attributes.

In the example below, a single channel is selected: “Shaft DE Y”.

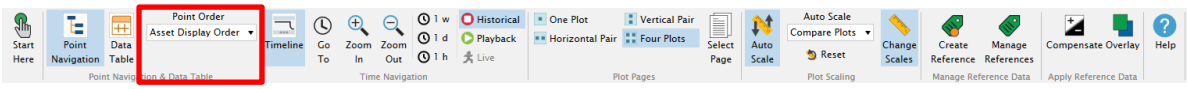


10.2.3 Show or Hide the Data Table



Shows or hides the Data Table.

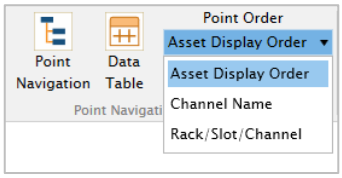
10.2.4 Sort Plots, Traces and Data Table Entries using Point Order



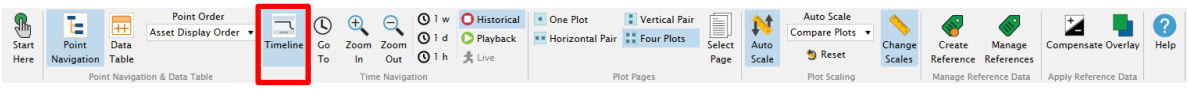
The **Point Order** combo box provides the user three options to change the order of

- Plots of the same type in main plot area
- traces on Small Trend and Large Trend
- entries in the Data Table

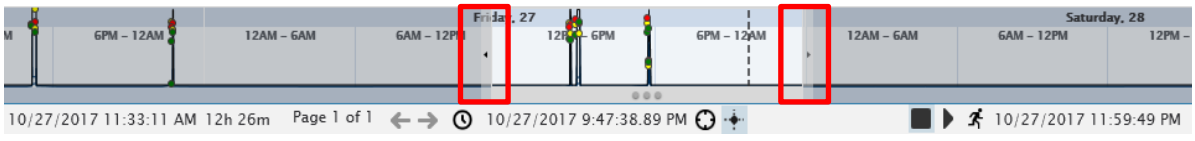
By default, the Point Order follows the **Asset Display Order** defined by the VC-8000 device. With this setting, channels will appear in the same order as they appear on the VC-8000 front panel display. Alternatively, points can be sorted alphabetically (**Channel Name**), or by their physical location on the device (**Rack/Slot/Channel**).



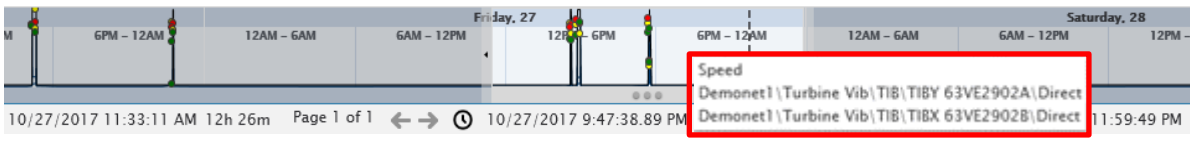
10.2.5 Show or Hide the Timeline



The **Timeline** button controls visibility of the Timeline at bottom of the screen. It provides an overview of the data. The Timeline Pane shows trend data for the first Selected Point, and, if applicable, its associated speed. You can use the Timeline Pane to select the time range of data you want to analysis. Note that **Timeline** always shows a *larger* time range, where the selected time range demarcated by the time start and time end sliders.

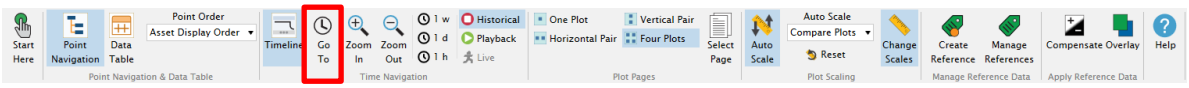


To see which data points are shown in the timeline, hover over the timeline trace:

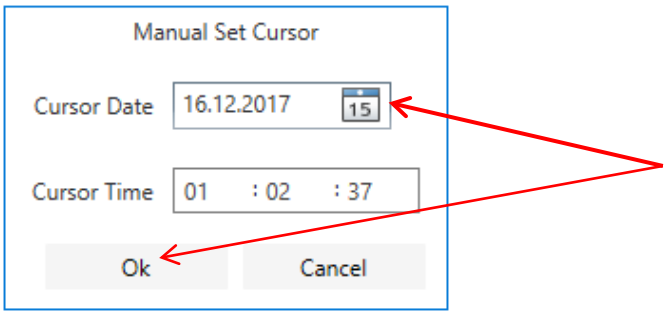


To select the active trace to plot, right click on the timeline.

10.2.6 Manually Set the Dynamic Cursor Time using Go To

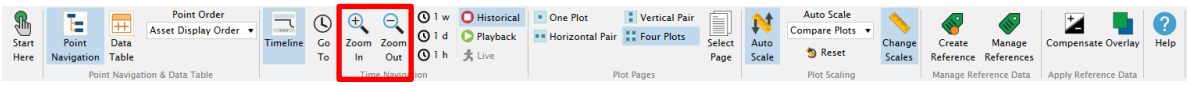


You can quickly navigate to a time instant by manually setting the date and time of the Dynamic Cursor. The selected time range will be centered around the set time.

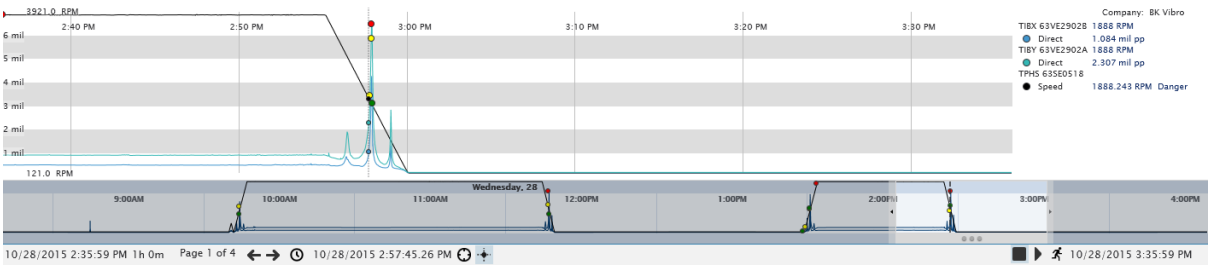


Set the date on the calendar and the cursor time. Then click **OK** to move to the set time.

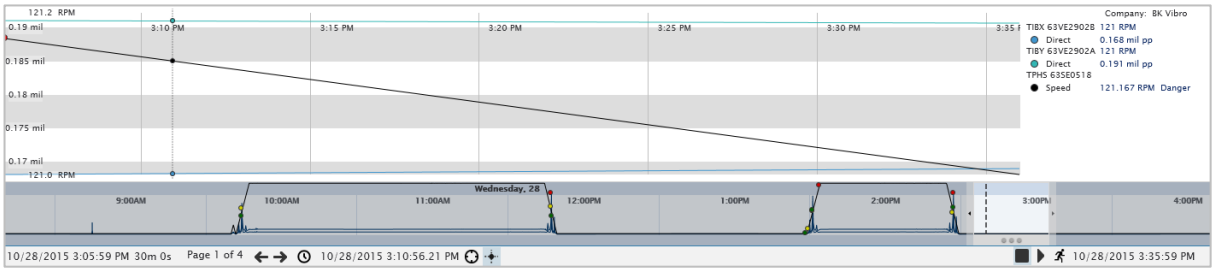
10.2.7 Zoom the Selected Time Range In or Out



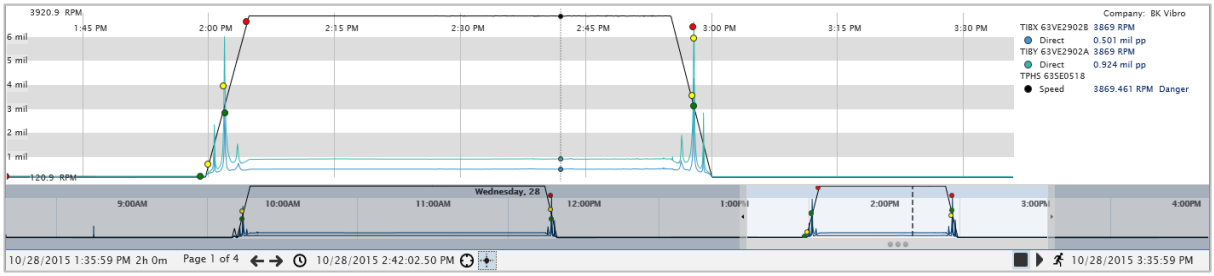
Clicking the **Zoom In** button halves the selected time range. The **Zoom Out** button doubles the selected time range. Note that both zoom functions are anchored at the *end* time range. In the example, below the selected time range ends at 03:35:59 PM and the duration is 1 hour, 0 minutes.



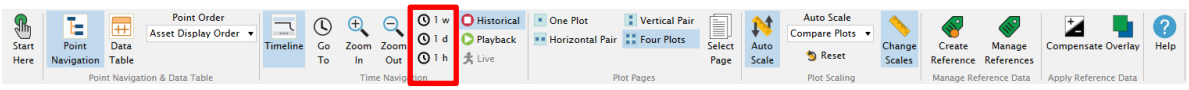
Clicking the **Zoom In** button reduces the duration to 30 minutes. The time range end remains the same:



Clicking the **Zoom Out** button from the original 1 hour selected time range increases the selected time range to 2 hours.



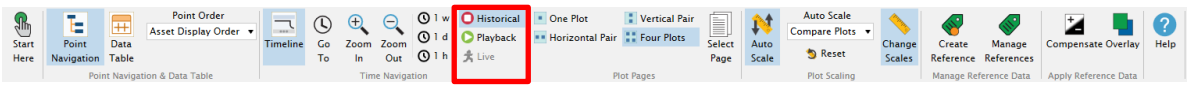
10.2.8 Set the Time Range Size



The time range size buttons set the selected time range duration in the timeline. The end time remains constant. The begin time moves in time to set the duration.

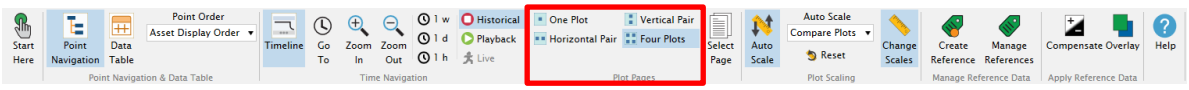
Button	Duration	Timeline Length
1 w	1 week	13 weeks
1 d	1 day	14 days
1 h	1 hour	8 hours

10.2.9 Playback or View Live Data



Please refer Playback Function and View Live Data, respectively.

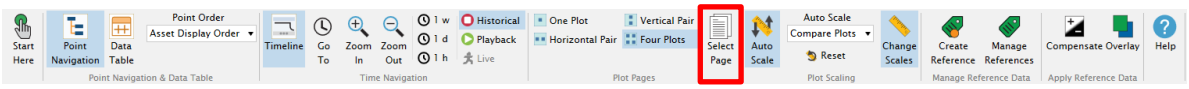
10.2.10 Select Number of Plots to be Displayed per Page



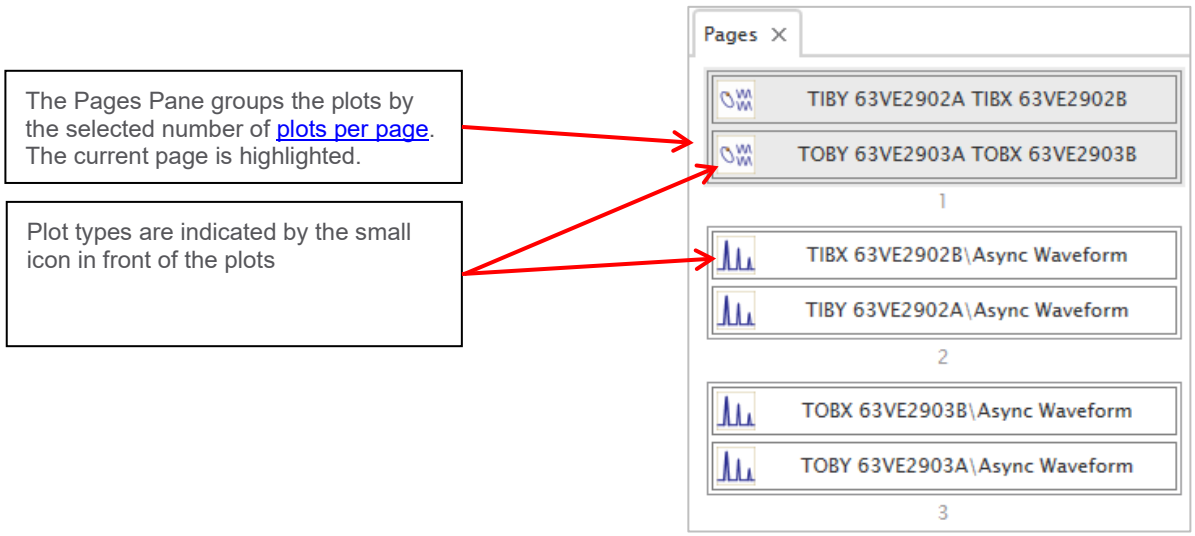
Defines how many plots are displayed (at maximum) in the main plot area. Options are **One Plot**, **Horizontal Pair** (two plots side by side), **Vertical Pair** (two plots stacked vertically), and **Four Plots** (in a two-by-two grid).

For more information on this topic, see Paging Plots.

10.2.11 Select Page (Pages Pane)

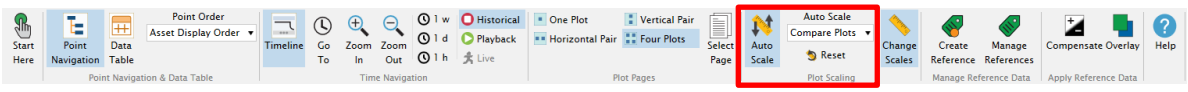


Depending on the number of points and graphs selected, and the number of graphs per page, SETPOINT CMS will automatically create and adjust the number of pages required. Open the Pages Pane for selecting the plots shown by clicking the **Select Page**.



For more information on this topic, see Paging Plots.

10.2.12 Auto Scale

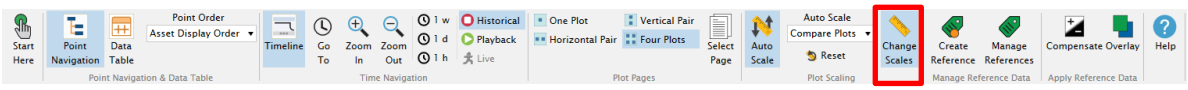


You can scale plots automatically according to the data using the **Auto Scale** button. **Auto Scale** selects the best full scale to optimize the data presentation for the plots. It can either scale each plot independently (**Normal**) or all plots of the same type together (**Compare Plots**).

When scaling in **Compare Plots** mode, the scale will automatically adjust to the size of the largest values viewed across all visible plots of the same type using the same unit (e.g., all visible Spectrum plots in acceleration units). When paging plots or moving the dynamic cursor, the scale will stay at the *largest* value seen. To reset the scale in **Compare Plots** to the data that is *currently* on screen, use the **Reset** button.

Disable **Auto Scale** to scale plots manually. For more information on plot scaling, please refer to Scaling Plots.

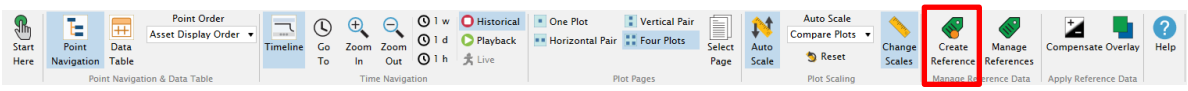
10.2.13 Change Scales (Manual Scales Pane)



Click the **Change Scales** button to open the Scales Pane. Use the Scales Pane to manually scale plots of a particular type, or to change the display unit.

For more information on plot scaling, please refer to Scaling Plots.

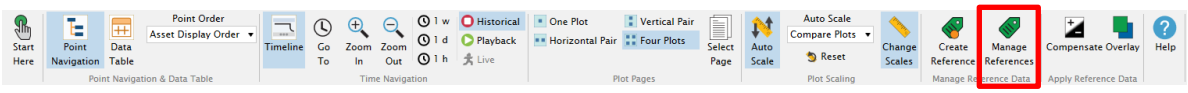
10.2.14 Create a Reference Sample



Reference data marks a data set at a specific time for use in compensation or for comparison.

To add a new reference data set, set the dynamic cursor to the time of the desired reference data then click the **Create Reference** button. The References pane will show the new sample.

10.2.15 Manage Reference Data (References Pane)



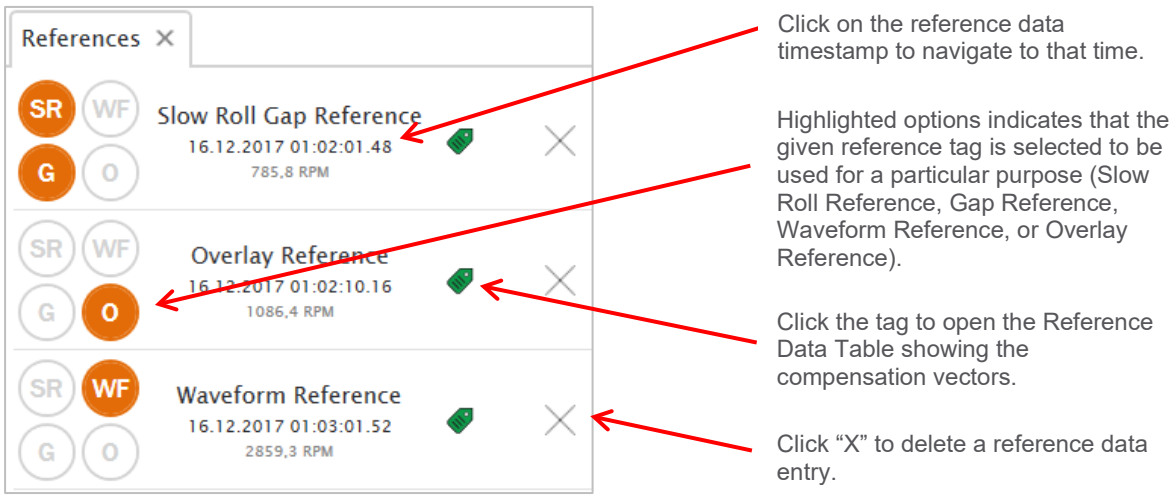
Click the **Manage References** button on the Home Tab to open the **References** pane. The reference data pane opens on the right side of the screen.

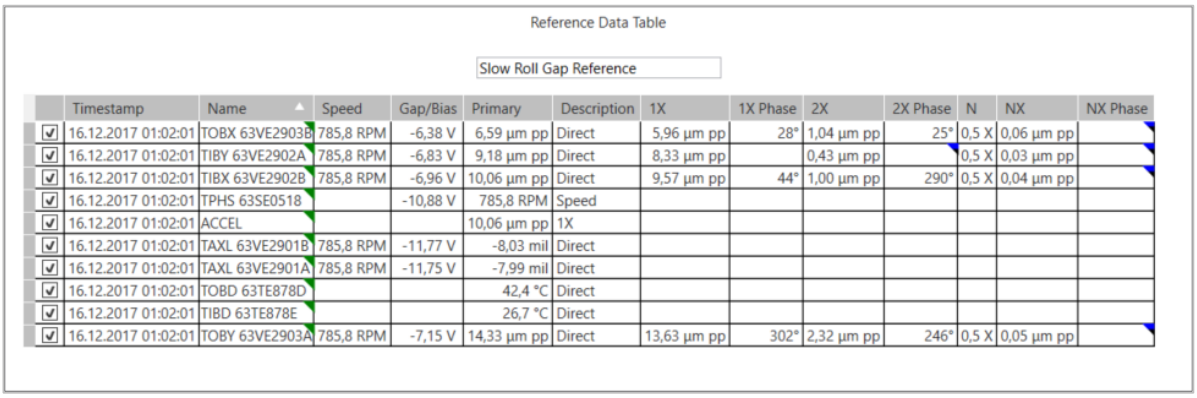
You can use different reference samples for slow roll compensation, waveform compensation, and gap compensation or for overlaying.

Reference Type	Description	Applicable Plots
Slow Roll 	Vector compensation. The Slow Roll compensation vector is subtracted from the plotted vectors.	Filtered Orbit. Filtered Timebase. Bode Polar
Waveform 	Waveform compensation. The reference synchronous waveform is subtracted from the data waveform before plotting.	Unfiltered Synchronous Orbit. Unfiltered Synchronous Timebase. Spectrum, Cascade, Waterfall plots when plotted in orders of running speed.
Gap 	Sets the gap at the starting position to the selected reference gap.	Shaft Centerline
Overlay 	Sets the sample to overlay on plots along with the current data.	Orbit, Timebase, Spectrum overlay the waveform at the reference sample time. Bode, Polar, and Shaft Centerline plots overlay data from the selected time range when the reference sample was created.

The highlighted compensation shown with the symbol above indicates that CMS is using the reference sample for that function. The following picture shows a sample used for all functions:

The example below shows various changes you can make from the **References** pane.




Reference Data Table

Slow Roll Gap Reference

	Timestamp	Name	Speed	Gap/Bias	Primary	Description	1X	1X Phase	2X	2X Phase	N	NX	NX Phase
☑	16.12.2017 01:02:01	TOBX 63VE2903B	785,8 RPM	-6,38 V	6,59 µm pp	Direct	5,96 µm pp	28°	1,04 µm pp	25°	0,5 X	0,06 µm pp	
☑	16.12.2017 01:02:01	TIBY 63VE2902A	785,8 RPM	-6,83 V	9,18 µm pp	Direct	8,33 µm pp		0,43 µm pp		0,5 X	0,03 µm pp	
☑	16.12.2017 01:02:01	TIBX 63VE2902B	785,8 RPM	-6,96 V	10,06 µm pp	Direct	9,57 µm pp	44°	1,00 µm pp	290°	0,5 X	0,04 µm pp	
☑	16.12.2017 01:02:01	TPHS 63SE0518		-10,88 V	785,8 RPM	Speed							
☑	16.12.2017 01:02:01	ACCEL			10,06 µm pp	1X							
☑	16.12.2017 01:02:01	TAXL 63VE2901B	785,8 RPM	-11,77 V	-8,03 mil	Direct							
☑	16.12.2017 01:02:01	TAXL 63VE2901A	785,8 RPM	-11,75 V	-7,99 mil	Direct							
☑	16.12.2017 01:02:01	TOBD 63TE878D			42,4 °C	Direct							
☑	16.12.2017 01:02:01	TIBD 63TE878E			26,7 °C	Direct							
☑	16.12.2017 01:02:01	TOBY 63VE2903A	785,8 RPM	-7,15 V	14,33 µm pp	Direct	13,63 µm pp	302°	2,32 µm pp	246°	0,5 X	0,05 µm pp	

NOTE!

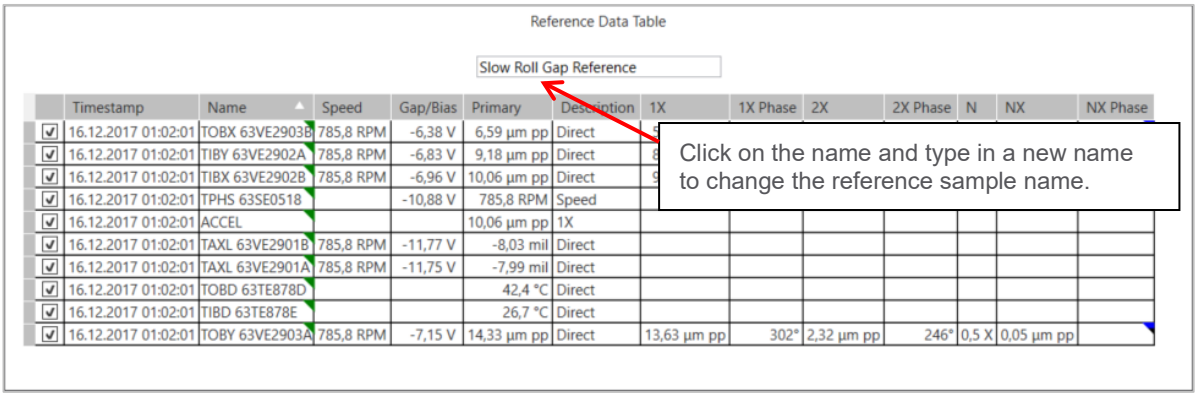
You cannot change reference data when viewing live data.

NOTE!

CMS-HD, CMS-SD und CMS file store reference data at the rack level. When using OSI PI-AF and CMS-XC you can store reference data at the asset level.

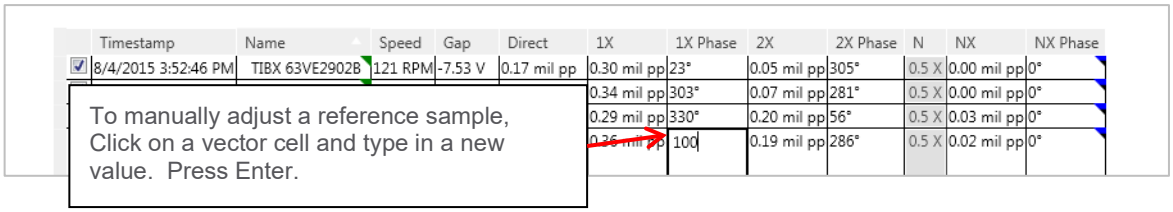
10.2.15.1 Renaming a Reference Sample

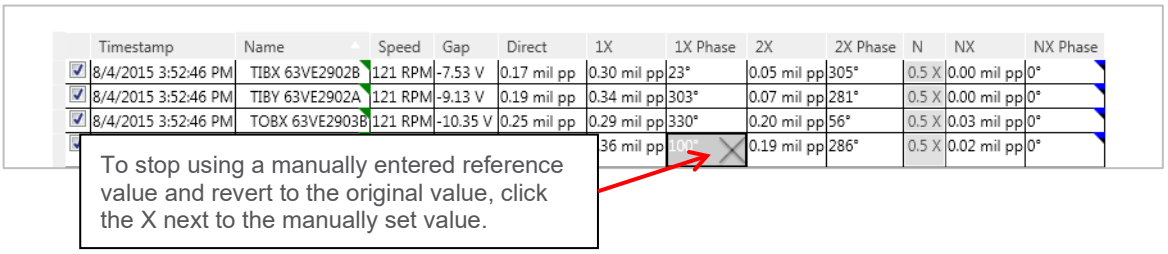
You can change the reference data sample name in the Reference Data Table.

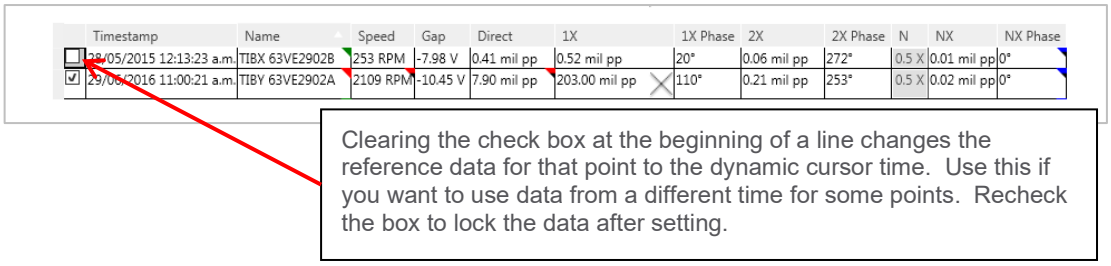


10.2.15.2 Manually Entering a Compensation Vector

Manually enter a compensation vector from the Reference Data Table.

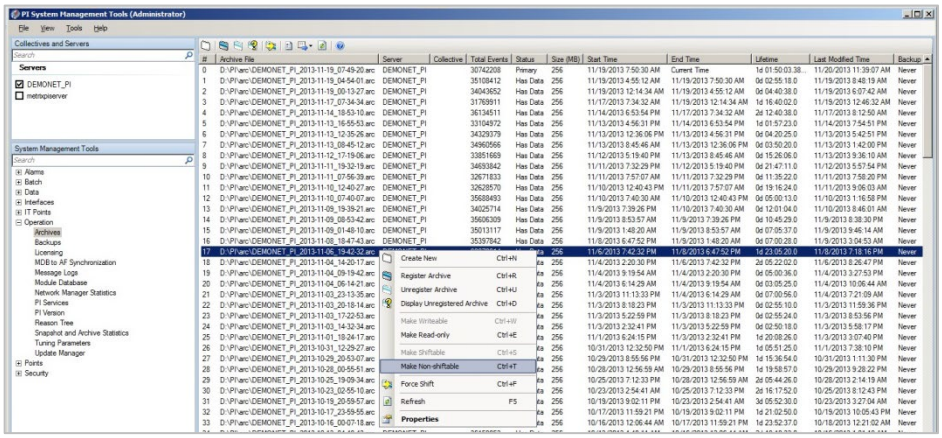




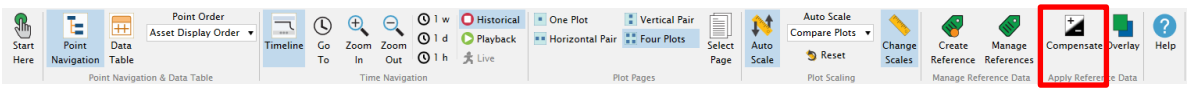


10.2.15.3 Locking a Reference Data Archive

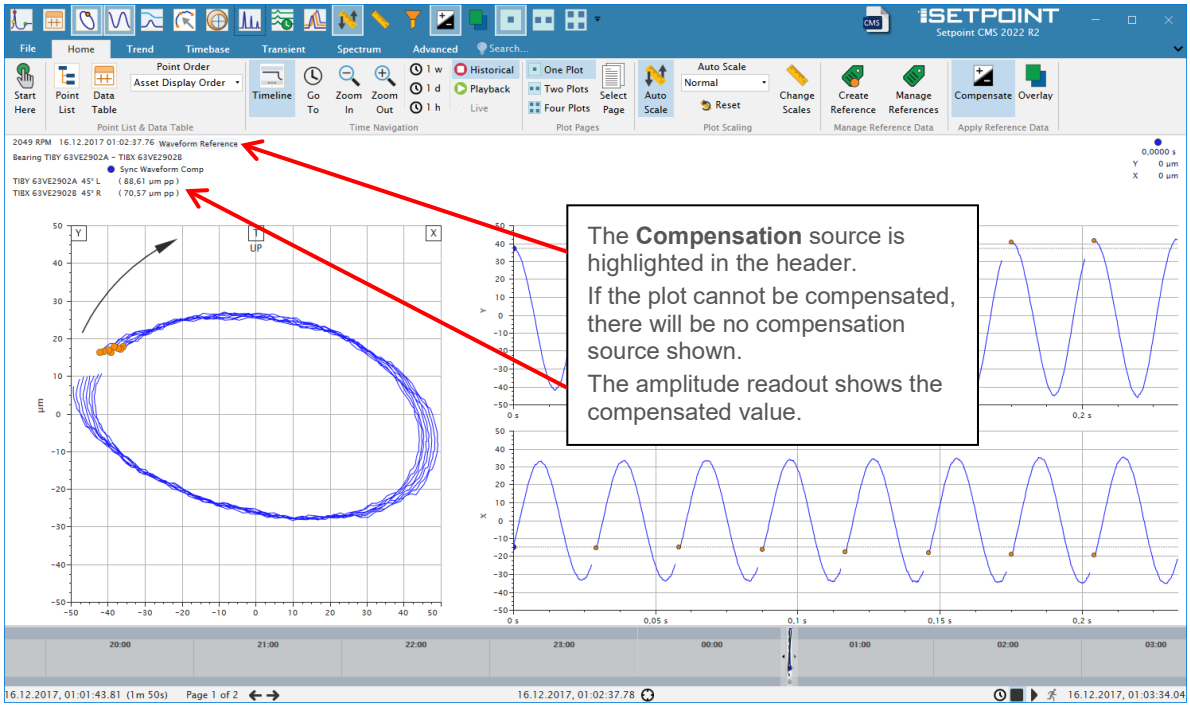
To avoid overwriting reference data, you can mark specific archive files to prevent overwrites. Use the PI System Management Tools, navigate to Operation -> Archives. Right click the archive you want to prevent from overwriting and select “Make Non-shiftable” as shown below.



10.2.16 Activating Compensation



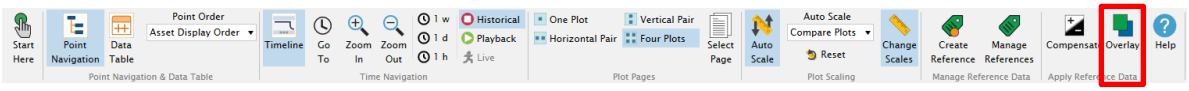
Click the **Compensate** button to activate Compensation.



NOTE!

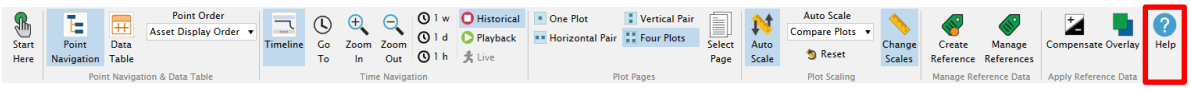
If you have not yet selected a reference tag, the plot will show an error message.

10.2.17 Showing and Hiding Overlays



Click the **Overlay** button to overlay reference data on supported plot types. Please refer to Using overlays for more information.

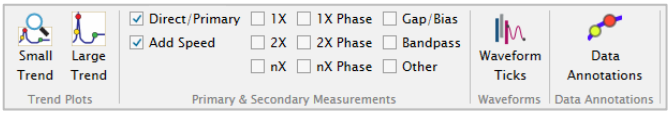
10.2.18 Open the Manual



Use the **Help** button to quickly open the present document in your default PDF viewer.

10.3 The Trend Tab

The **Trend** tab contains configuration for how Trend type plots are displayed.

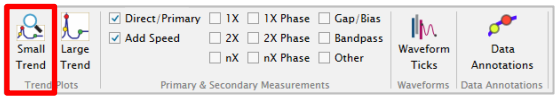


From the **Trend** tab, you can:

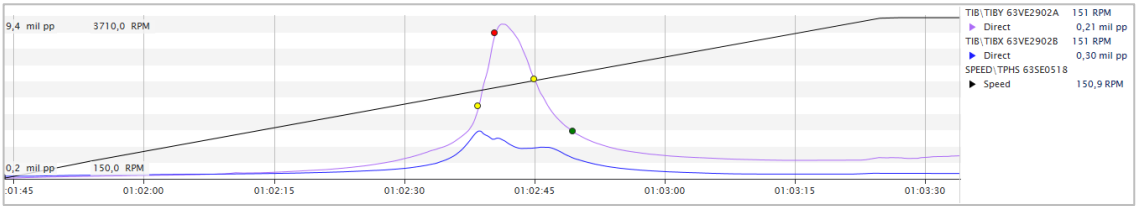
- Show or hide the Small Trend (Navigation Trend)
- Show or hide the Large Trend
- Select primary and secondary measurements to be displayed on trends
- Show or hide waveform tick marks
- Show or hide data annotations

Go to Timebase Tab

10.3.1 Show or Hide the Small Trend



The **Small Trend** button controls the visibility of the Small Trend pane at to be lower part of screen (above the Timeline).

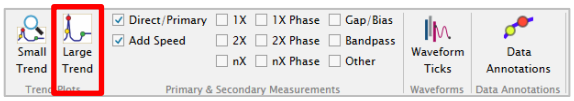


The **Small Trend** pane shows the time range that is currently selected for analysis. It is a trend plot that remains visible on any plot page, thus providing context about the data that is currently being analyzed in the main plot area. Traces will be added for each selected channel. The default selection of measurements per channel to be shown can be customized.

The cursor position on the **Small Trend** defines the Dynamic Cursor Time.

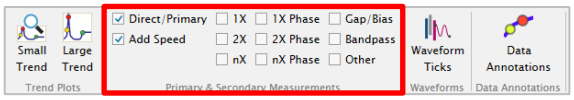
You can show or hide traces and rubber band zoom the selected time region in the same manner as on the Large Trend plot.

10.3.2 Show or Hide the Large Trend

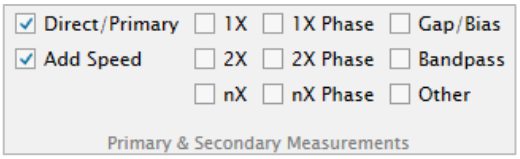


The **Large Trend** button controls the visibility of the Large Trend plot. Traces will be added for each selected channel. The default selection of measurements per channel to be shown can be customized.

10.3.3 Select Primary and Secondary Measurements to be Displayed on Trends



You can define the measurements to be displayed on Small Trend and Large Trend plots from the **Primary & Secondary Measurements** section of the **Trend** ribbon.



Options **Direct/Primary** and **Add Speed** should be activated for most uses cases. **Direct/Primary** ensures that the most important (primary) measurements are being trended for all selected channels. The **Add Speed** option, on the ther hand, additionally adds a trend of the speed measured by phase triggers associated with at least one of the currently selected channels.

Additional measurements can be added by checking the corresponding options. For example, if you want to only see 1X vector measurements, check the **1X** box. The following tables show the association of the measurements to the options available in the **Primary & Secondary Measurements** section.

Channel Type	Measurements	Trend Group
Acceleration	Direct (primary)	Direct/Primary
	Bias	Gap
	1X Amplitude and Phase	1X, 1X Phase
	2X Amplitude and Phase	2X, 2X Phase
	Bandpass Accel	Bandpass
	nX	nX, nX Phase
Accel Slow RMS	Direct (primary)	Direct/Primary
	Bias	Gap
Acoustic	Direct (primary)	Direct
	Bias	Gap
	Band-pass filters 1 to 8	Bandpass
Aero Accel	Aero 1X Tracking Filter (primary)	Direct/Primary
	Band-pass 1	Bandpass
	Band-pass 2	Bandpass
	Bias	Gap
Aero Velocity Tracking	1X Tracking Filter	Direct/Primary
	Band-pass	Bandpass
	Bias	Gap
Aero Velocity Bandpass	Primary Band-pass	Direct/Primary
	Added Band-pass	Bandpass
	Bias	Gap
Axial Position, Axial Position w/ sync	Axial Position	Direct/Primary
	Gap	Gap
	Axial Vibration	Bandpass
Case Expansion	Direct	Direct/Primary
Case Expansion (2 ch)	Differential Case Expansion	Direct/Primary
	Direct 1	Other
	Direct 2	Other

Channel Type	Measurements	Trend Group
Diagnostic Acceleration	Direct (primary)	Direct/Primary
	Bias	Gap
	1X Amplitude and Phase	1X, 1X Phase
	2X Amplitude and Phase	2X, 2X Phase
	nX Amplitude and phase	nX, nX Phase
Diagnostic Proximity	Direct	Direct/Primary
	Gap	Gap
	1X amplitude and phase	1X, 1X Phase
	2X amplitude and phase	2X, 2X Phase
	nX amplitude and phase	nX, nX Phase
Diagnostic Velocity	Direct	Direct/Primary
	Bias	Gap
	1X amplitude and phase	1X, 1X Phase
	2X amplitude and phase	2X, 2X Phase
	nX amplitude and phase	nX, nX Phase
Diff Exp Single Probe	Direct	Direct/Primary
	Gap	Gap
Diff Exp Comp Input	Composite	Direct/Primary
	Direct 1	Other
	Direct 2	Other
	Gap 1	Gap
	Gap 2	Gap
Diff Exp Dual Ramp	Composite	Direct/Primary
	Direct 1	Other
	Direct 2	Other
	Gap 1	Gap
	Gap 2	Gap
Diff Exp Single Ramp	Composite	Direct/Primary
	Direct 1	Other
	Direct 2	Other
	Gap 1	Gap
	Gap 2	Gap

Channel Type	Measurements	Trend Group
Discrete Input	Digital State	Direct/Primary
Dynamic Pressure	Direct	Direct/Primary
	Bias	Gap
	Pressure Band-pass 1	Bandpass
	Pressure Band-pass 2	Bandpass
	Pressure Band-pass 3	Bandpass
Eccentricity	PP Eccentricity	Direct/Primary
	Gap	Gap
	Min	Other
	Max	Other
	Ecc Position	Other
Enveloped Acceleration	Direct	Direct/Primary
	Bias	Gap
	Cage	Bandpass
	IRBP	Bandpass
	ORBP	Bandpass
	Ball Spin	Bandpass
	2X Ball Spin	Bandpass
Hydro Radial Vibration	Direct	Direct/Primary
	Gap	Gap
	1X Amplitude	1X
	2X Amplitude	2X
	Bandpass 1	Bandpass
	Bandpass 2	Bandpass
	Bandpass 3	Bandpass
	Bandpass 4	Bandpass
	Bandpass 5	Bandpass
	Bandpass 6	Bandpass
	Bandpass 7	Bandpass
	Bandpass 8	Bandpass

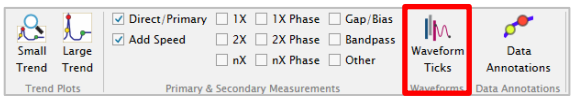
Channel Type	Measurements	Trend Group
Hydro Velocity	Direct	Direct/Primary
	Bias	Gap
	1X Amplitude	1X
	2X Amplitude	2X
	Bandpass 1	Bandpass
	Bandpass 2	Bandpass
	Bandpass 3	Bandpass
	Bandpass 4	Bandpass
	Bandpass 5	Bandpass
	Bandpass 6	Bandpass
	Bandpass 7	Bandpass
	Bandpass 8	Bandpass
Low Frequency Acceleration	Direct	Direct/Primary
	Bandpass	Bandpass
	Bias	Gap
Low Frequency Velocity	Direct	Direct/Primary
	Bias	Gap
Phase Trigger	Speed	Direct/Primary
	Gap	Gap
	Rotor Acceleration	Other
	Peak Speed	Other
Process Variable	Direct	Direct/Primary
	Bias	Gap
Radial Vibration	Direct	Direct/Primary
	Gap	Gap
	1X amplitude and phase	1X, 1X Phase
	2X amplitude and phase	2X, 2X Phase
	nX	nX, nX Phase
	Band-pass 1	Bandpass
	Band-pass 2	Bandpass

Channel Type	Measurements	Trend Group
Radial Vibration Air Machine	Direct	Direct/Primary
	Gap	Gap
	1X Amplitude	1X
	2X Amplitude	2X
	3X Amplitude	nX
	4X Amplitude	nX
	Bearing, Resonance, Resonance (2nd)	Bandpass
Radial Vibration with Smax	Smax	Direct/Primary
	Direct	Direct/Primary
	Gap	Gap
	1X amplitude and phase	1X, 1X Phase
	2X amplitude and phase	2X, 2X Phase
REBAM Channel	Direct	Direct/Primary
	Gap	Gap
	Rotor Region	Bandpass
	Prime Spike	Bandpass
REB Acceleration & REB Acceleration (Slow)	Overall	Direct/Primary
	Prime Spike	Bandpass
	HF Demodulated	Bandpass
	Bias	Gap
Recip Crankcase Velocity	Direct	Direct/Primary
	1X amplitude and phase	1X, 1X Phase
	2X amplitude and phase	2X, 2X Phase
	Bias	Gap
Recip Impact	Impact Count	Direct/Primary
	Maximum	Direct/Primary
	Bias	Gap

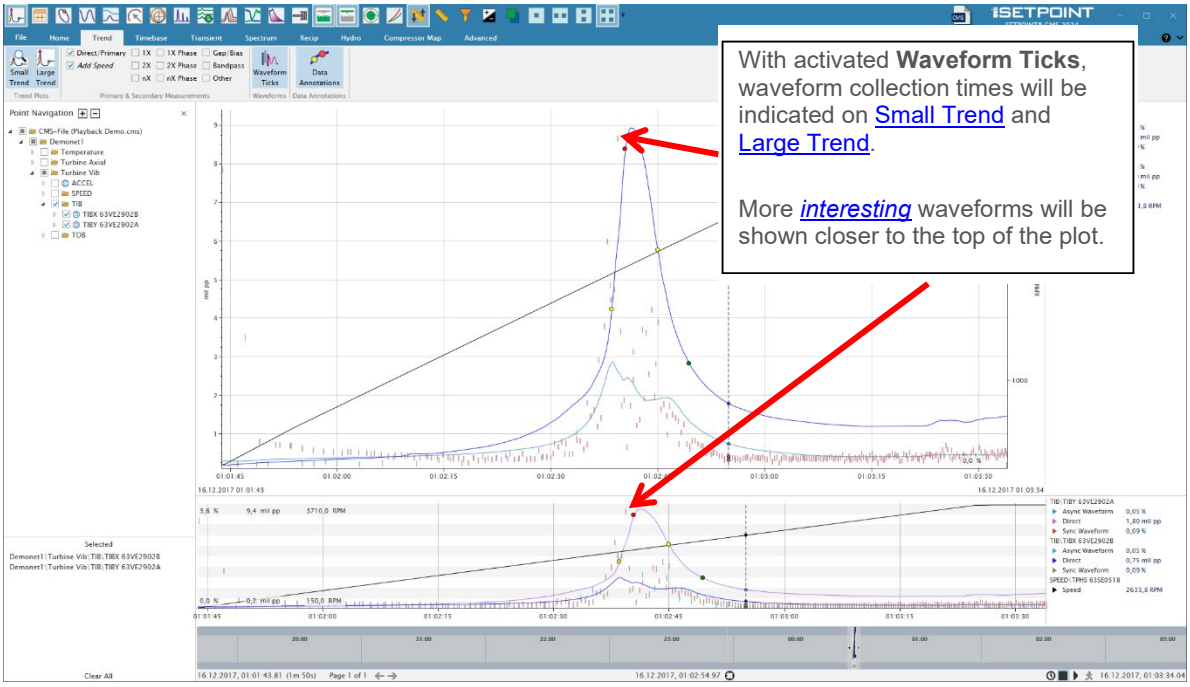
Channel Type	Measurements	Trend Group
Recip Cylinder Pressure	Discharge Pressure	Direct/Primary
	Suction Pressure	Direct/Primary
	Compression Ratio	Other
	Maximum Pressure	Other
	Minimum Pressure	Other
	Peak Rod Compression	Other
	Peak Rod Tension	Other
	Rod Reversal Degrees	Other
Recip Rod Drop	Average Piston Position	Direct/Primary
	Rod Runout	Other
	Average Gap	Gap
	Triggered Piston Position	Other
	Triggered Gap	Other
Recip Rod Position	Direct PP	Direct/Primary
	Gap	Gap
	1X amplitude and phase	1X, 1X Phase
	Crank Angle	Other
	Rod Pos Magnitude	Other
	Rod Pos Phase	Other
Reverse Rotation	Rev Speed	Other
	Num Rev Rotations	Other
	Rev Peak Speed	Other
	Forward Speed	Other
	Gap 1	Gap
	Gap 2	Gap
Shaft Absolute RV	Shaft Abs Direct	Direct/Primary
	Direct	Direct/Primary
	Gap	Gap
	1X amplitude and phase	1X, 1X Phase

Channel Type	Measurements	Trend Group
Shaft Absolute Vel	Velocity Direct	Direct/Primary
	Intg Direct	Bandpass
	Bias	Gap
	1X amplitude and phase	1X, 1X Phase
	2X amplitude and phase	2X, 2X Phase
Simulated Phase Trigger	Speed	Direct/Primary
Tachometer	Speed	Direct/Primary
	Gap A	Gap
Tracking REB Acceleration	Overall	Direct/Primary
	1X amplitude and phase	1X, 1X Phase
	Bias	Gap
	Ball Spin	Bandpass
	2X Ball Spin	Bandpass
	Cage	Bandpass
	HF Demodulated	Bandpass
	IRBP	Bandpass
	ORBP	Bandpass
Valve Position	Direct	Direct/Primary
	Bias	Gap
Velocity	Direct	Direct/Primary
	Bias	Gap
	1X amplitude and phase	1X, 1X Phase
	2X amplitude and phase	2X, 2X Phase
	nX amplitude and phase	nX, nX Phase
	Bandpass	Bandpass
Zero Speed	Zero Speed	Direct/Primary
	Speed	Direct/Primary
	Gap	Gap
	Peak Speed	Other

10.3.4 Show or Hide Waveform Tick Marks

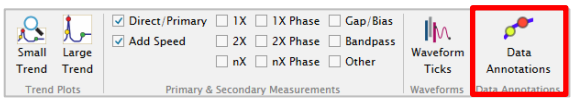


The **Waveform Ticks** button controls whether waveform collection times will be indicated by dashes (ticks) on Small Trend and Large Trend.



The vertical position of the tick mark visualizes the interestingness of the waveform. Typically, many waveforms will be recorded during transient phases or unusual events. You can change the axis scale from the % setting in the Change Scales pane.

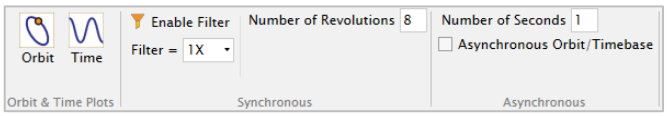
10.3.5 Show or Hide Data Annotations



The **Data Annotations** button controls the visibility of annotations (Alarm Markers and State Markers) on Small Trend and Large Trend.

10.4 The Timebase Tab

The **Timebase** tab contains configuration for how Orbit, Timebase, and Orbit/Timebase plots are displayed.



From the **Timebase** tab, you can:

- Show or hide the Orbit, Timebase, or combined Orbit/Timebase plot
- Enable and adjust filtering
- Adjust the Number of Revolutions for Synchronous Waveforms
- Adjust the Number of Seconds for Asynchronous Waveforms
- Show or Hide Asynchronous Orbit, Timebase, and Orbit/Timebase plots

Go to Transient Tab

10.4.1 Show or Hide the Orbit, Timebase, and Orbit/Timebase Plot

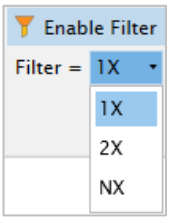
The **Orbit** and **Time** buttons control the visibility of Orbit and Timebase plots. Note that, if **Orbit** *and* **Time** are activated simultaneously, a combined Orbit/Timebase plot will be shown for suitable channel pairs.

10.4.2 Enable and Adjust Filtering

Filtering applies to the Orbit, Timebase, and Orbit/Timebase plots. When filtering is enabled, these plots will visualize the 1X, 2X, or nX vector as waveforms *instead* of showing the unfiltered waveform. Here, "nX" denotes the user-defined multiple of the running speed that has been configured in the device (for example, 0.5X or 3X).

To filter Orbit, Timebase, or Orbit/Timebase plots to a specific vector:

1. Click the **Enable Filter** button.
2. Select the multiple of the running speed to visualize.



NOTE!

To show filtered data, the UMM must be configured to measure the 1X, 2X, or nX vector. Missing vector data cannot be by SETPOINT CMS.

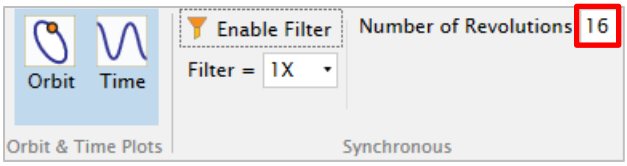
NOTE!

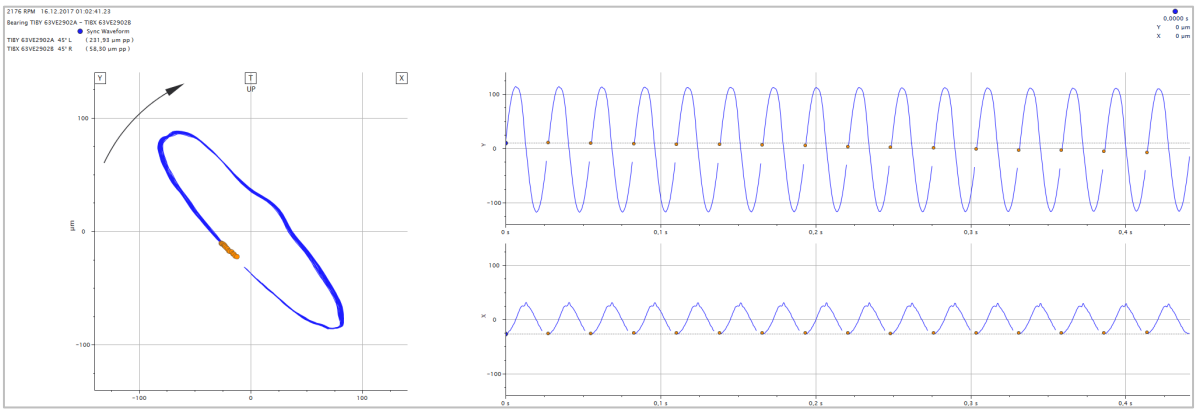
If the vectors are integrated, the filtered waveform will also be integrated.

10.4.3 Adjust the Number of Revolutions for Synchronous Waveforms

You can change the number of shaft revolutions shown on Orbit, Timebase, and Orbit/Timebase plots from the default value of 8 revolutions. Note that this feature only applies to Synchronous waveforms. For the asynchronous case, please refer to Adjust the Number of Seconds for Asynchronous Waveforms.

For example, changing **Number of Revolutions** to 16 results in the Orbit with 16 revolutions plotted:





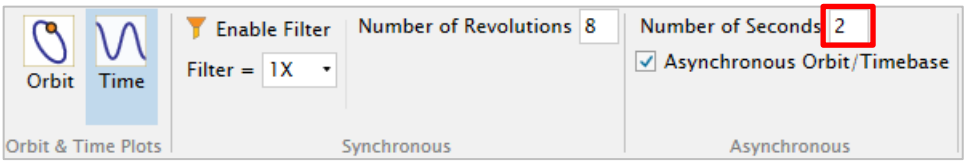
The maximum **Number of Revolutions** shown is limited by the dataset. Boost mode data supports much higher numbers of revolutions. The following table illustrates the number of revolutions collected (when not in boost mode) when using the example of the default setting of 2048 samples per waveform. Note that 1024X and 512X sample rates are only available for reciprocating compressor channel types.

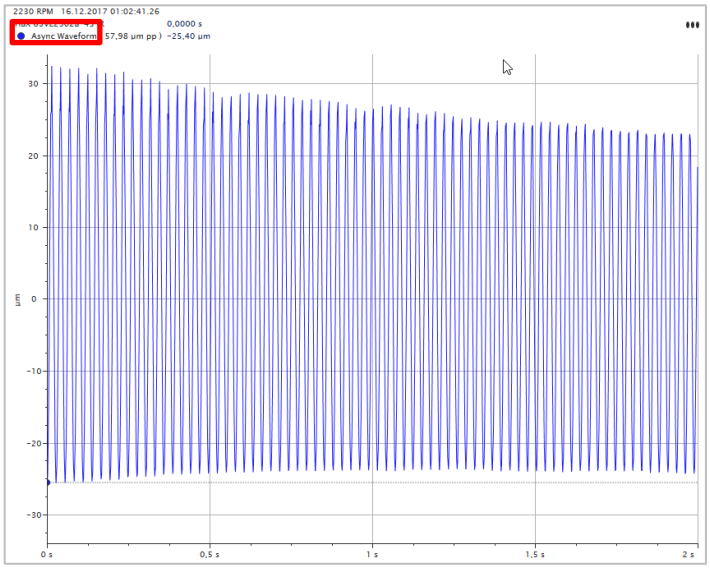
Sample Rate	Revolutions
1024X	2
512X	4
128X	16
64X	32
32X	64
16X	128

10.4.4 Adjust the Number of Seconds for Asynchronous Waveforms

You can change the displayed length of a waveform shown on Orbit, Timebase, and Orbit/Timebase plots from the default value of 1 second. Note that this feature only applies to Asynchronous waveforms. For the synchronous case, please refer to Adjust the Number of Revolutions for Synchronous Waveforms.

For example, changing the **Number of Seconds** to 2 will result in a time range of 2 seconds on asynchronous Timebase plots:





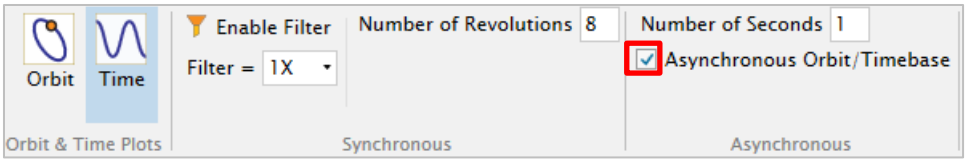
The maximum **Number of Seconds** shown is limited by the dataset. Boost mode data supports much longer waveforms.

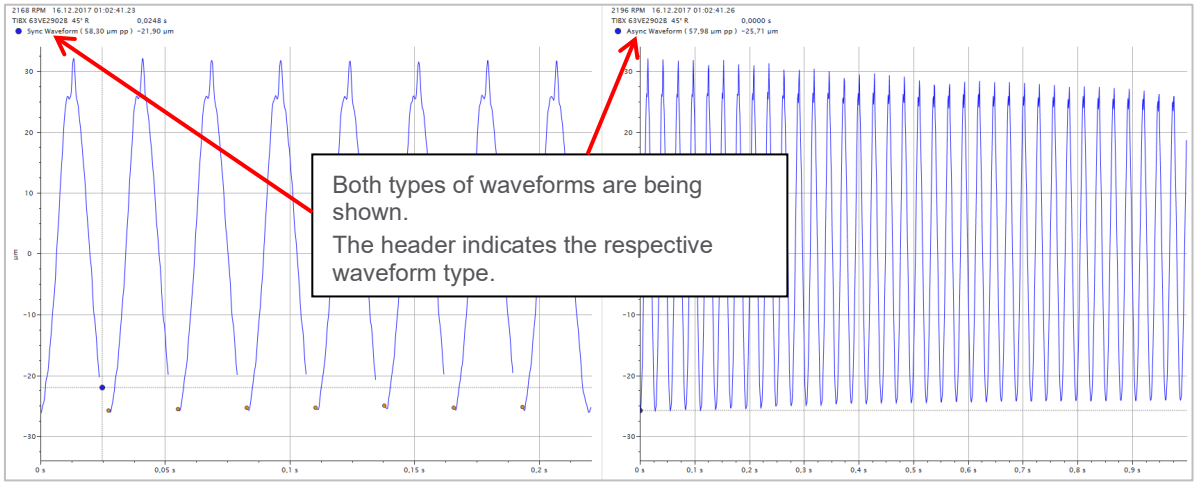
By default, SETPOINT CMS will only show the Synchronous Waveform where applicable. Please refer to Show or Hide Asynchronous Orbit/Timebase for changing this setting.

10.4.5 Show or Hide Asynchronous Orbit, Timebase, and Orbit/Timebase plots

By default, SETPOINT CMS will preferentially show Orbit, Timebase, and Orbit/Timebase plots based on the synchronously sampled waveform. That is, if both types of waveforms have been recorded for a particular channel, only the synchronous waveform plot will be displayed. To *additionally* view the asynchronously sampled waveform asynchronous data, check the **Asynchronous Orbit/Timebase** checkbox.

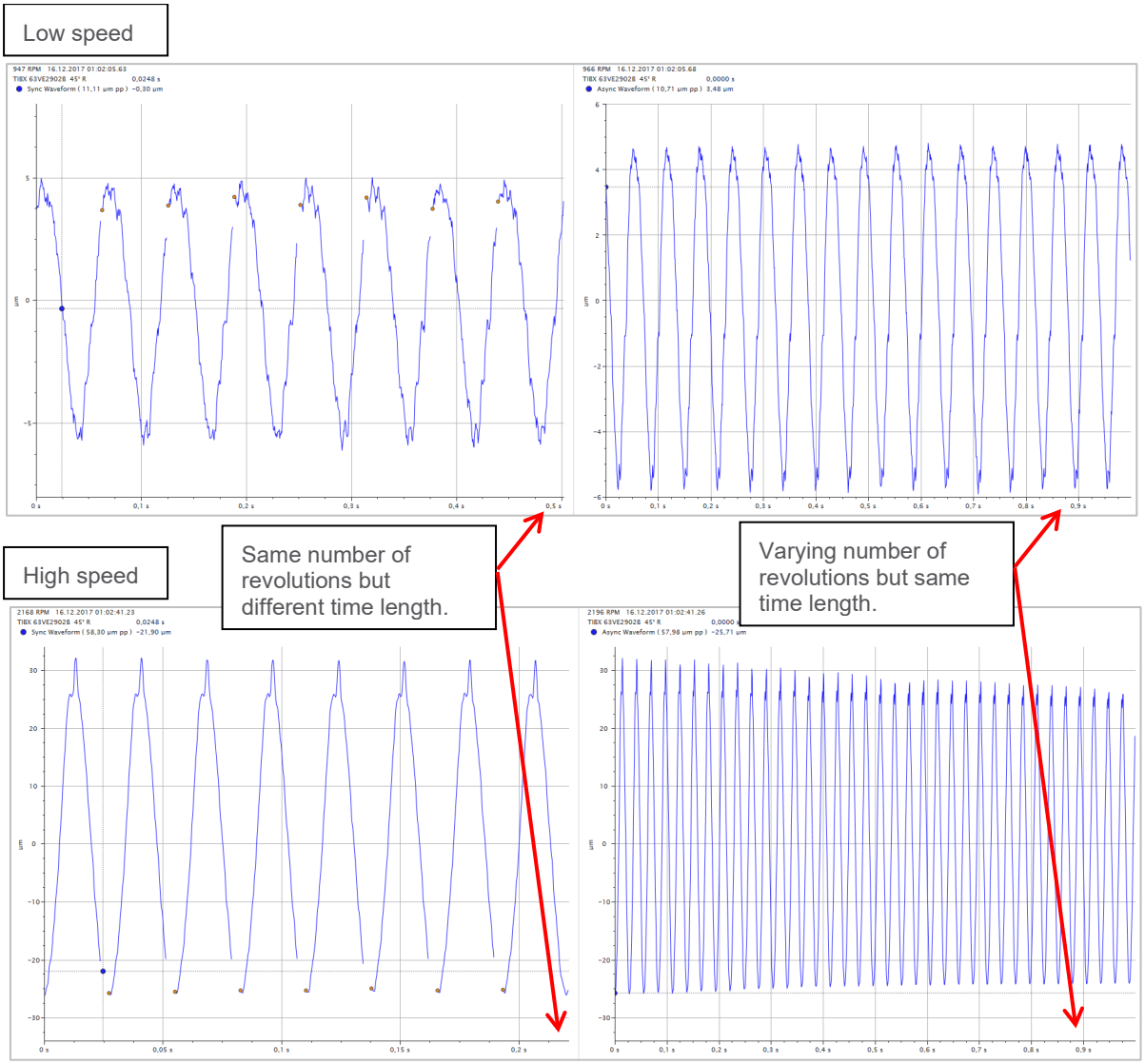
For example, activating **Time** and **Asynchronous Orbit/Timebase** for a standard Radial Vibration channel will lead to the following display:





Asynchronous Orbit, Timebase, and Orbit/Timebase plots will not have phase trigger marks and cannot be filtered or compensated. The synchronous waveform always shows the number of configured shaft revolutions. The temporal waveform length thus varies when the machine speed changes. The asynchronous waveform, on the other hand, will show fewer revolutions at low speed and more at higher speeds, where the temporal length of the waveform is constant.

The following example illustrates these differences by comparing the same pair of plots (synchronous in the left column, asynchronous in the right) at a low running speed (top row) and a high running speed (bottom row):



10.5 The Transient Tab (optional)

The **Transient** tab contains configuration for how Bode, Polar, and Shaft Centerline plots are displayed.

Note that the **Transient** tab is visible by default but can be hidden from the Start Here dialog.

From the **Transient** tab, you can:

- Show or hide the Bode and the Polar plot
- Select vector measurements to be displayed on Bode and Polar plots
- Show or hide Direct measurements on Bode plots
- Use time labels instead of speed labels on Polar plots
- Show or hide the Shaft Centerline plot
- Use time labels instead of speed labels on Shaft Centerline plots

Go to Spectrum Tab

10.5.1 Show or Hide the Bode and the Polar Plot

The **Bode** and **Polar** buttons control the visibility of Bode and Polar plots.

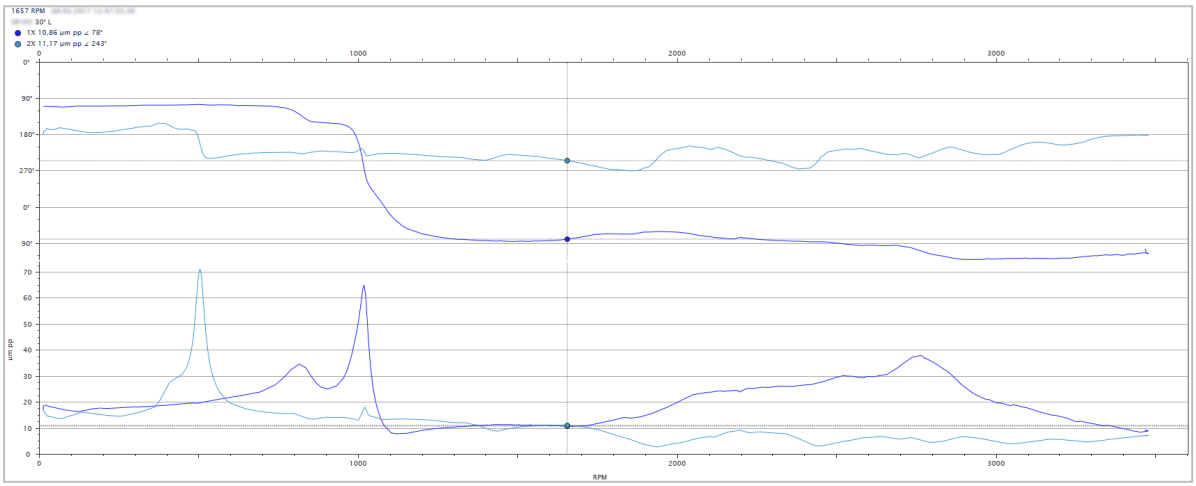
10.5.2 Select Vector Measurements to be Displayed on Bode and Polar Plots

Choose which vector data values to plot on the Bode and Polar plots. By default, these plots will show **1X** amplitude and phase only. Activate **2X** and/or **nX** to compare different sets of vector data. Here, **nX** denotes the user-defined multiple of the running speed that has been configured in the device (for example, 0.5X or 3X).

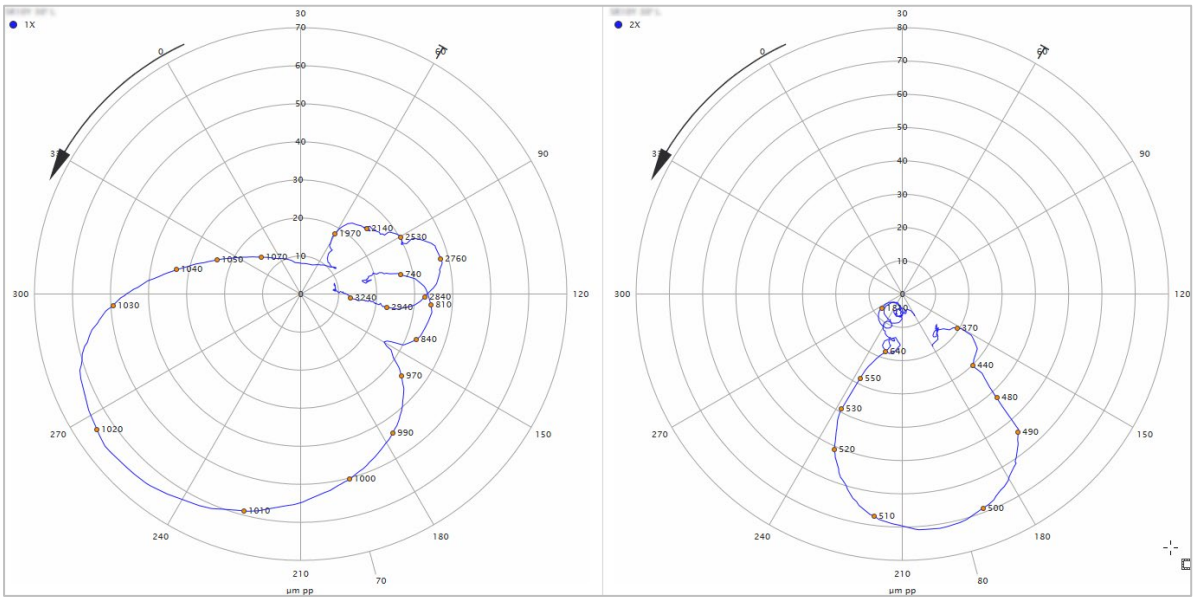
NOTE!

If Bode or Polar plots are activated with no vector selected, the Bode plot will open showing the 1X vector.

When activating multiple sets of vector data, **Bode** plots will show multiple traces (one per selected vector data) within a single plot:

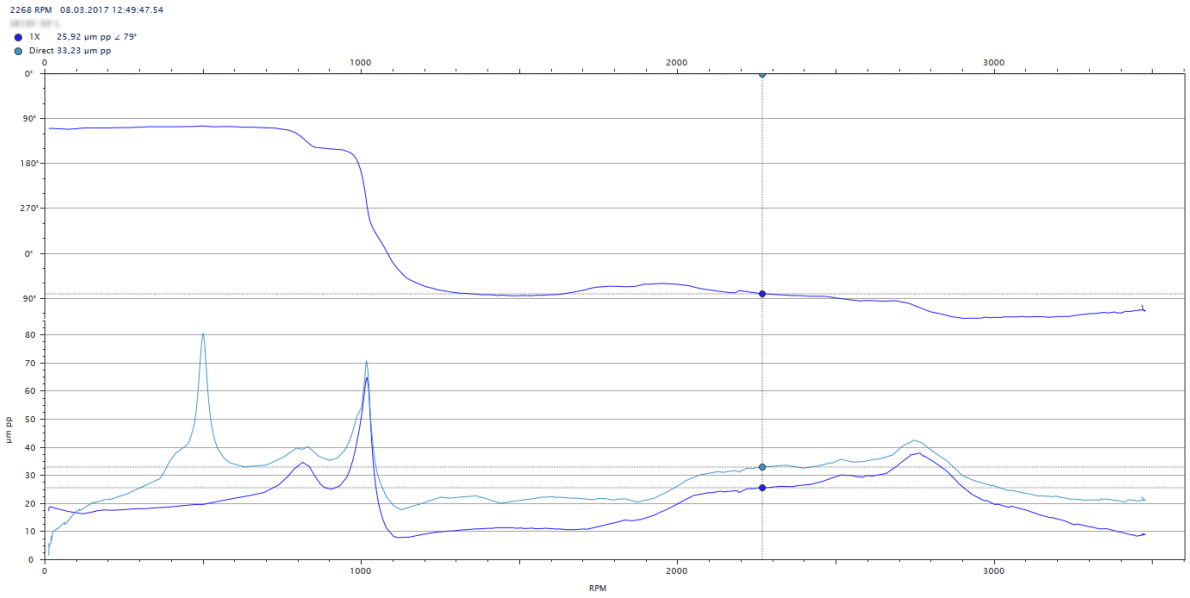


Polar plots, on the other hand, will show each set of vector data in a separate plot:



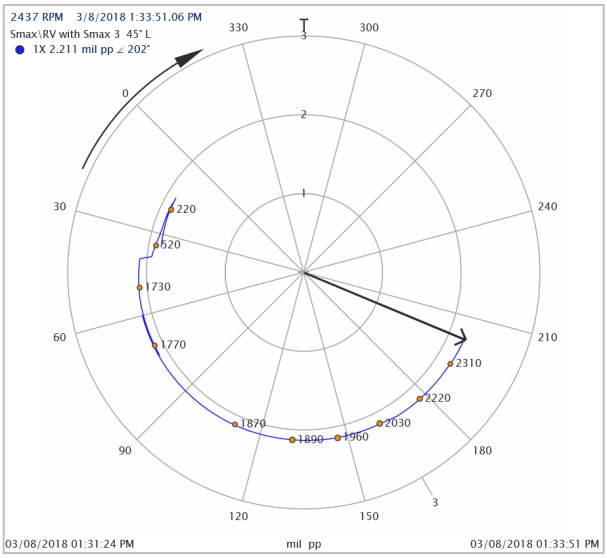
10.5.3 Show or Hide Direct Measurements on Bode Plots

In addition to vector measurement data, **Direct** (overall) data can be overlaid on the amplitude part of Bode plots using the **Direct (Bode)** checkbox. This allows users to quickly determine how the individual vector data sets influence the Direct (overall) measurement.

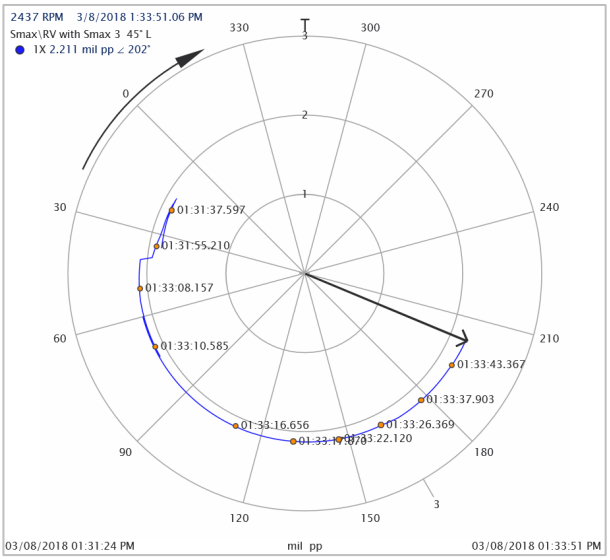


10.5.4 Use Time Labels instead of Speed Labels on Polar Plots

The **Show Time (Polar)** checkbox labels Polar plots with the sample time. When the **Show Time (Polar)** checkbox is cleared (default), the points are labelled with the speed.



Points labelled with speed



Points labelled with time

10.5.5 Show or Hide the Shaft Centerline Plot

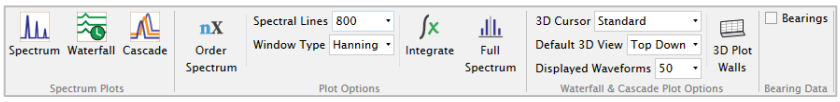
The **Shaft Centerline** button controls the visibility of Shaft Centerline plots.

10.5.6 Use Time Labels instead of Speed Labels on Shaft Centerline Plots

Similar to the equivalent functionality for Polar plots, the **Show Time** checkbox labels Shaft Centerline plots with the sample time. When the **Show Time** checkbox is cleared (default), the points are labelled with the speed.

10.6 The Spectrum Tab

The **Spectrum** tab contains configuration for how Spectrum, Waterfall, and Cascade plots are displayed.

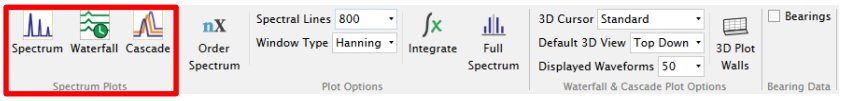


From the **Spectrum** tab, you can:

- Show or hide the Spectrum, the Waterfall and the Cascade plot
- Enable the Order Spectrum
- Adjust the Number of Spectral Lines
- Select the Spectrum Window Type
- Enable Integration
- Enable the Full Spectrum
- Select the 3D Cursor
- Select the Default 3D View
- Adjust the number of Displayed Waveforms
- Enable 3D Plot Walls
- Enable Bearing Cursors

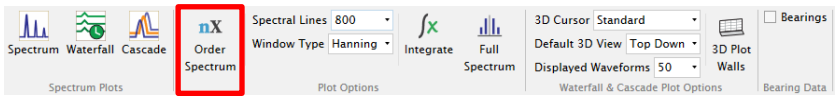
Go to Recip Tab

10.6.1 Show or Hide the Spectrum, the Waterfall and the Cascade Plot



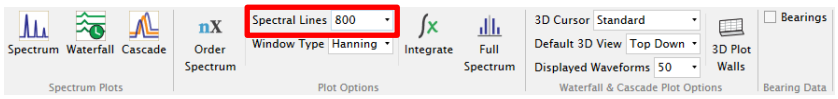
The **Spectrum**, **Waterfall** and **Cascade** buttons control the visibility of Spectrum, Waterfall, and Cascade plots.

10.6.2 Enable the Order Spectrum



The **Order Spectrum** option controls whether the X axis of Spectrum, Waterfall, and Cascade will be in frequency (**Order Spectrum** deactivated) units or multiples of running speed (**Order Spectrum** activated), denoted by “X”. Select this option to generate the spectrum data from the synchronously sampled waveform.

10.6.3 Adjust the Number of Spectral Lines



Allows you to adjust the spectral resolution of Spectrum, Waterfall, and Cascade plots. Increasing the **Spectral Lines** will reduce the width of peaks the plot, which is beneficial when identifying and discriminating specific fault frequencies.

NOTE!

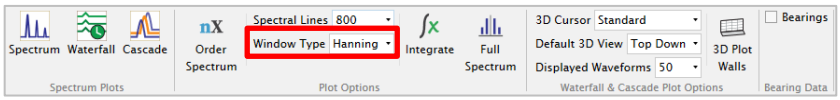
When using many **Spectral Lines**, the time range covered by the analyzed waveform can increase significantly. This can affect the quality of the spectrum data if the machine conditions change significantly across this time range. Most significantly, significant changes of the machine speed can have a severe impact on Spectrum, Waterfall, and Cascade plots that are *not* order-normalized. Please consider using an Order Spectrum in this case.

If the selected number of **Spectral Lines** exceeds the maximum allowed by the sampling configuration defined in the device, SETPOINT CMS will limit the **Spectral Lines** such that no interpolation occurs. The plot header shows the actual number of **Spectral Lines** being used.

NOTE!

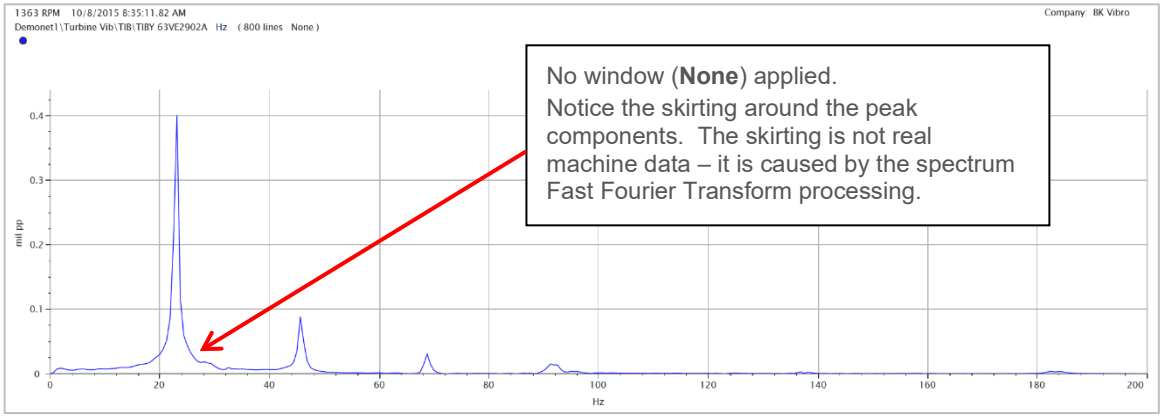
Waterfall and Cascade plots limit the actual **Spectral Lines** to 800 for performance reasons.

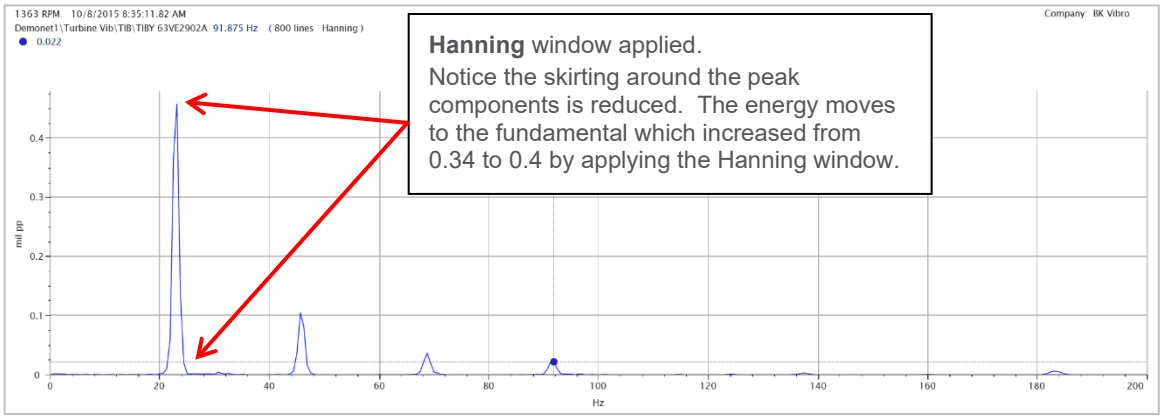
10.6.4 Select the Spectrum Window Type

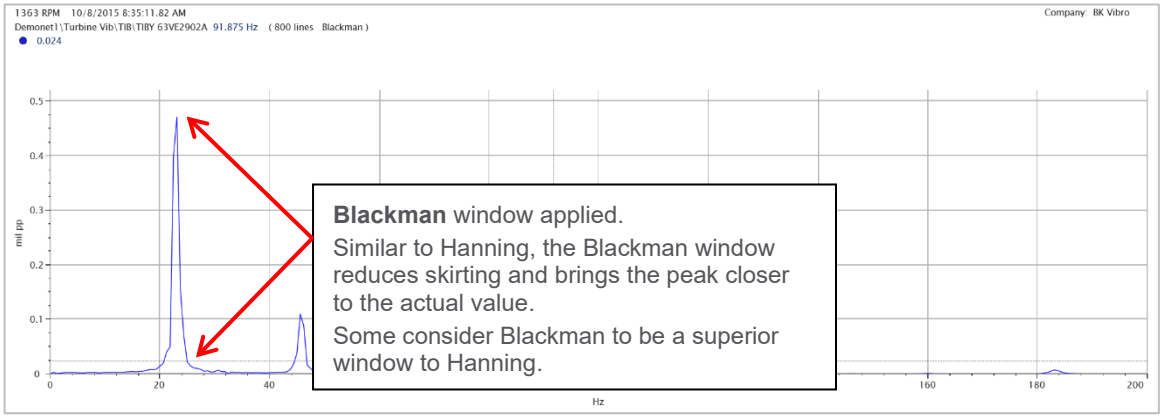


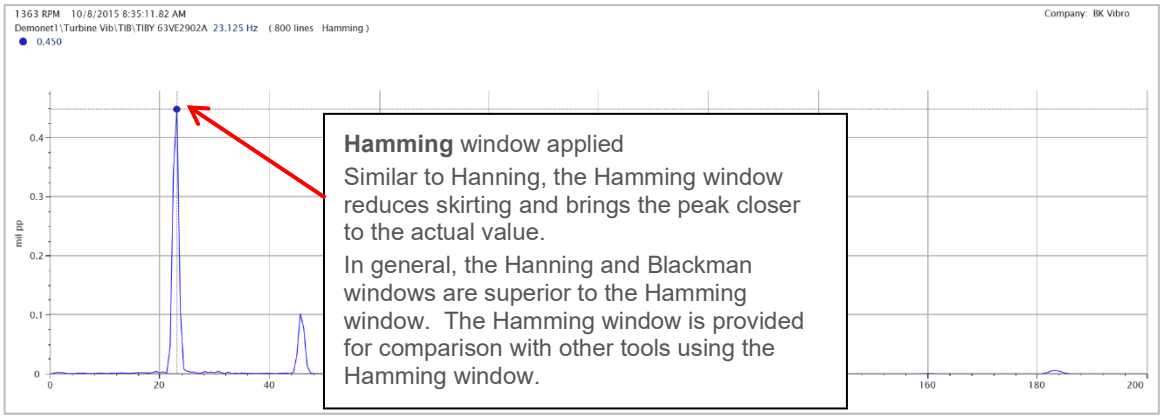
Windowing enhances the spectrum display with respect to amplitude and frequency accuracy. The **Window type** applies to all open Spectrum, Waterfall, and Cascade plots. The default setting (**Hanning**) is suitable for most applications.

The following examples illustrate the effects of the various window types.

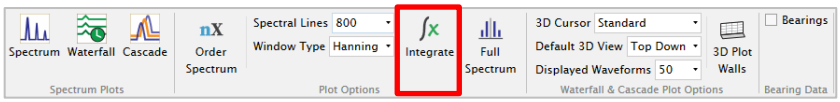








10.6.5 Enable Integration



Click the **Integrate** button to integrate Spectrum, Waterfall, and Cascade plots from user-defined

- acceleration units to velocity units, and
- from velocity units to displacement units.

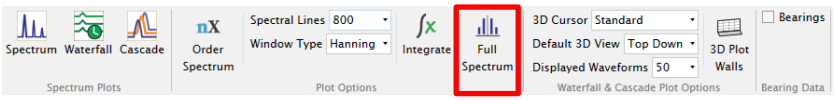
NOTE!

On Spectrum, Waterfall, and Cascade plots, spectral components below 1/T Hz (T is the waveform duration) are set to zero as even minimal numerical rounding errors will be amplified significantly due to the high integration gain at low frequencies.

NOTE!

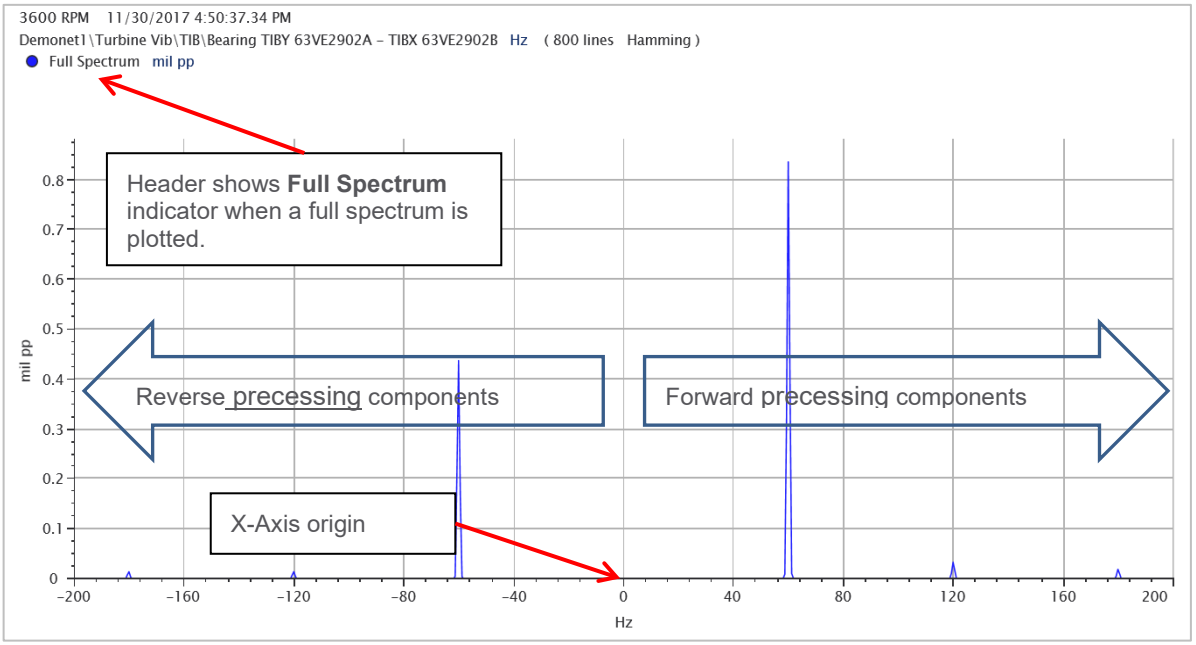
Integration is only available on Spectrum, Waterfall, and Cascade plots. Orbit and Timebase plots cannot be integrated.

10.6.6 Enable the Full Spectrum

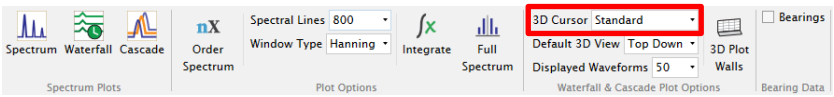


SETPOINT CMS generates the full Spectrum, Waterfall, or Cascade from a XY probe pairs. The resulting **Full Spectrum** is the spectrum of the shaft orbit, with forward and reverse vectors that define the orbit.

Full Spectrum plots can be displayed in frequency units as well as in orders of running speed (Order Spectrum). On plots showing a **Full Spectrum**, the X-Axis extends in the positive *and* the negative direction. Full spectrum plot cursors show both, forward and reverse precessing values for the selected frequency or order. Here, we use the example of a **Full Spectrum** in frequency units:

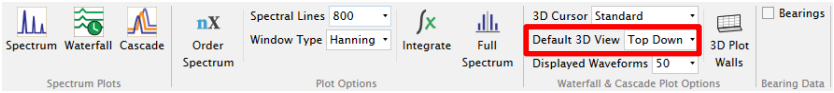


10.6.7 Select the 3D Cursor



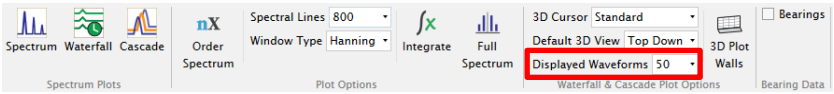
The **3D Cursor** control applies to Cascade and Waterfall plots only. Standard mode causes the cursors to track the X-Axis point when using the Up/Down arrow keys to move between spectrums. Track Orders causes the cursor to follow the current order. For example, if you click on the 1X harmonic component in Track Orders mode and then use the arrow keys to move to the next spectrum, the cursor will move to the 1X harmonic regardless of the speed.

10.6.8 Select the Default 3D View



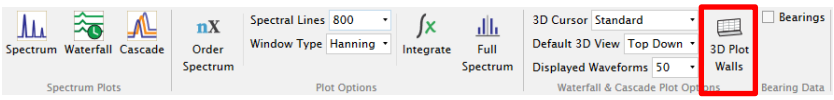
You can rotate the Cascade and Waterfall plots to different viewing angles to better see the harmonic content. The default 3D view sets the way a new Cascade or Waterfall plot will open. Options are South East (**SE**), South South West (**SSW**), South West (**SW**), and **Top Down**.

10.6.9 Adjust the Number of Displayed Waveforms

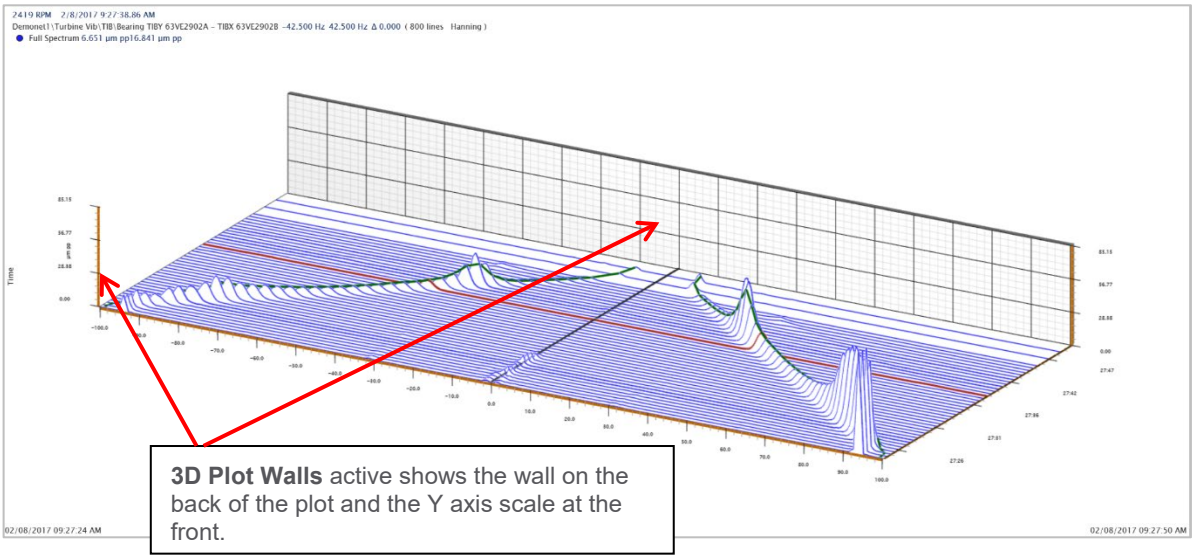


Displayed Waveforms applies only to Cascade and Waterfall plots. This is the maximum number of spectrums that CMS will display on these plots based on the signal samples. A large spectral display limit provides more detail but takes longer to load.

10.6.10 Enable 3D Plot Walls

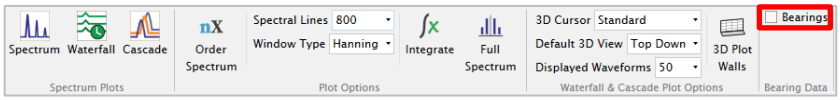


You can display or hide the Y axis scales and back wall on the Cascade and Waterfall plots.

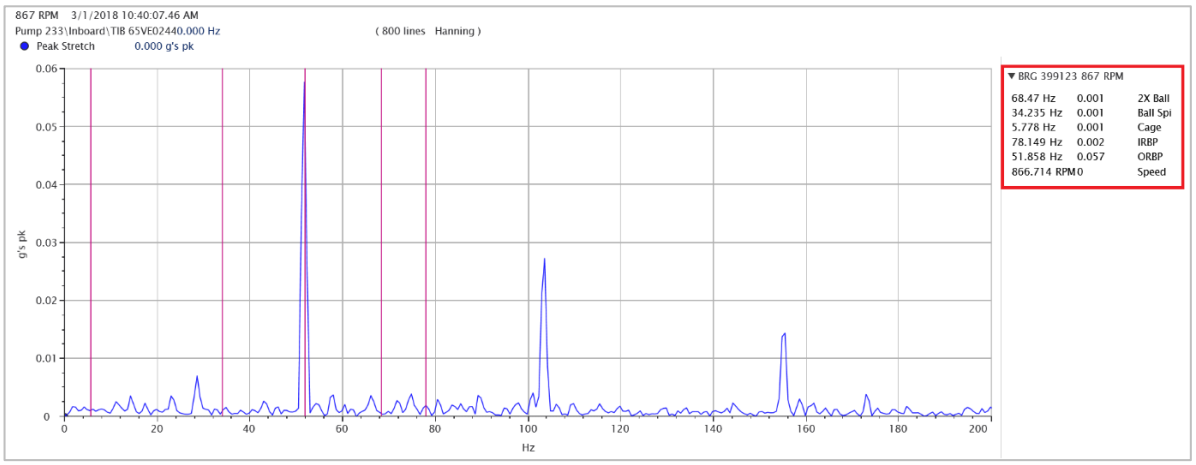


3D Plot Walls active shows the wall on the back of the plot and the Y axis scale at the front.

10.6.11 Enable Bearing Cursors



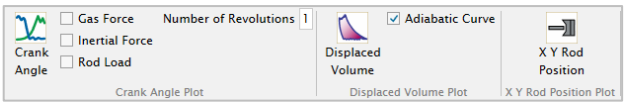
If bearing frequencies are assigned to the point (reference REB Solutions Manual S000002001), checking **Bearings** will display the bearing frequency cursors on the spectrum plot. The bearing frequency cursors are shown on the plot and the cursor names and amplitudes are shown on the right.



10.7 The Recip Tab (optional)

The **Recip** tab contains configuration for how Crank Angle, Displaced Volume and X Y Rod Position plots are displayed.

Note that the **Recip** tab is *hidden* by default but can be activated from the Start Here dialog.

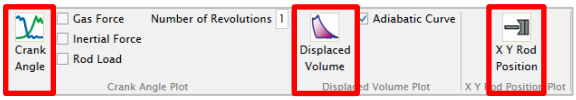


From the **Recip** tab, you can:

- Show or hide the Crank Angle, Displaced Volume, and X Y Rod Position plot
- Show or hide Gas Force, Inertial Force and/or Rod Load on Crank Angle plots
- Adjust the Number of Revolutions displayed on Crank Angle plots
- Show or hide the Adiabatic Curve on Displaced Volume plots

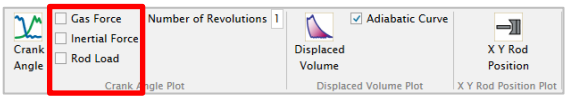
Go to Hydro Tab

10.7.1 Show or Hide the Crank Angle, Displaced Volume, and X Y Rod Position Plot



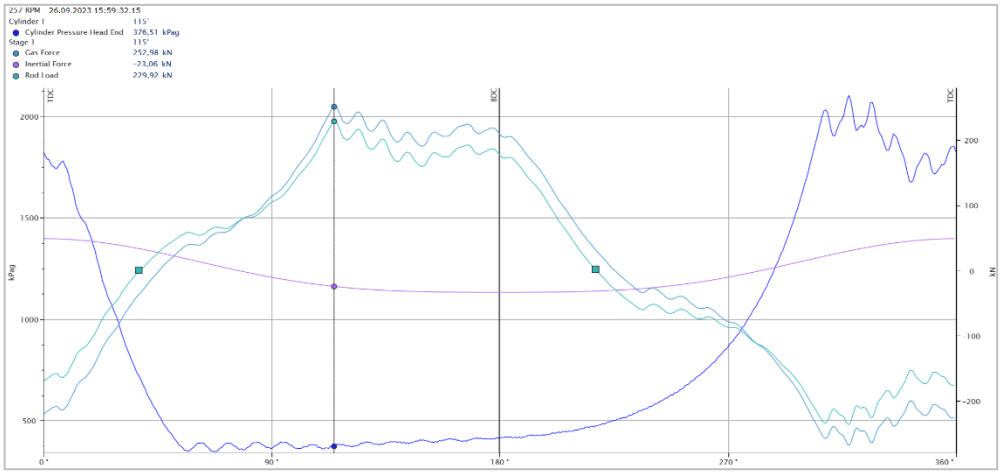
The **Crank Angle**, **Displaced Volume,** and **X Y Rod Position** buttons control the visibility of Crank Angle, Displaced Volume and X Y Rod Position plots.

10.7.2 Show or Hide Gas Force, Inertial Force and/or Rod Load on Crank Angle Plot

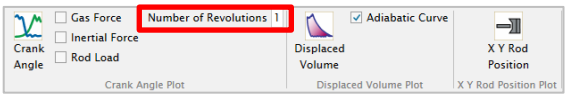


By default, the Crank Angle plot shows vibration and pressure data only.
Use the **Gas Force**, **Inertial Force** and/or **Rod Load** checkboxes to additionally show the corresponding data on Crank Angle plots with at least one pressure trace.

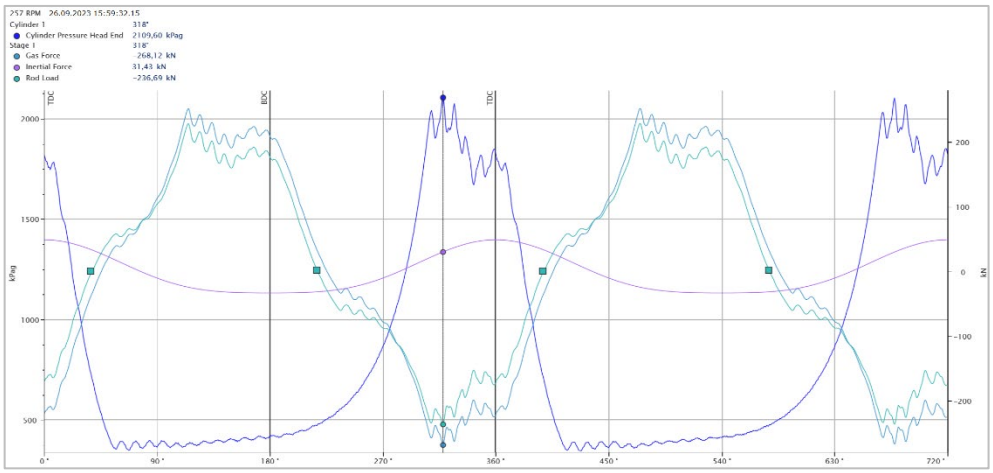
Note that **Rod Load Reversal Points** will only be displayed if the **Rod Load** option is checked.



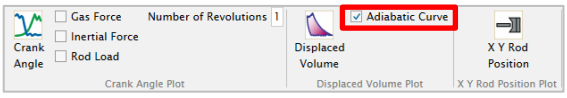
10.7.3 Adjust the Number of Revolutions



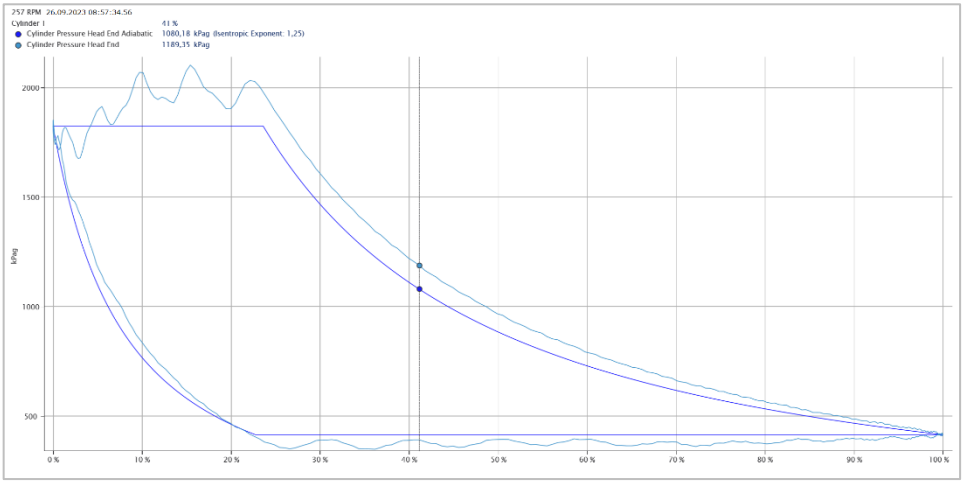
Change the **Number of Revolutions** to see a data sample plotted over more or fewer revolutions on the Crank Angle plot.



10.7.4 Show or Hide the Adiabatic Curve



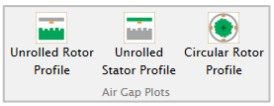
The **Adiabatic Curve** checkbox controls the visibility of the theoretical pressure curve in Displaced Volume plots. Note that the **Isentropic Exponent** of the compressed gas and the physical **Cylinder Clearance** of the cylinder need to be configured to get meaningful results (cf. section 11.2.13.1).



10.8 The Hydro Tab (optional)

The **Hydro** tab contains configuration for how Unrolled Rotor Profile, Unrolled Stator Profile, and Circular Rotor Profile plots are displayed.

Note that the **Hydro** tab is *hidden* by default but can be activated from the Start Here dialog.

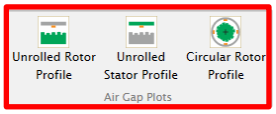


From the **Hydro** tab, you can:

- Show or Hide the Unrolled Rotor Profile, Unrolled Stator Profile, and Circular Rotor Profile Plot

Go to Compressor Map Tab

10.8.1 Show or Hide the Unrolled Rotor Profile, Unrolled Stator Profile, and Circular Rotor Profile Plot



The **Unrolled Rotor Profile**, **Unrolled Stator Profile**, and **Circular Rotor Profile** buttons control the visibility of Unrolled Rotor Profile, Unrolled Stator Profile, and Circular Rotor Profile plots.

10.9 The Compressor Map Tab (optional)

The **Compressor Map** tab contains configuration for how Compressor Map plots are displayed.

Note that the **Compressor Map** tab is *hidden* by default but can be activated from the Start Here dialog.

From the **Compressor Map** tab, you can:

- Show or hide the Compressor Map plot

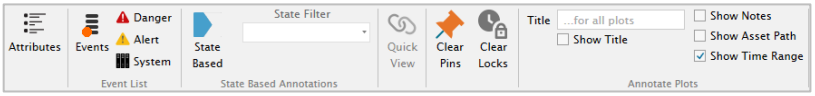
Go to Advanced Tab

10.9.1 Show or Hide the Compressor Map Plot

The **Compressor Map** button controls the visibility of Compressor Map plots.

10.10 The Advanced Tab

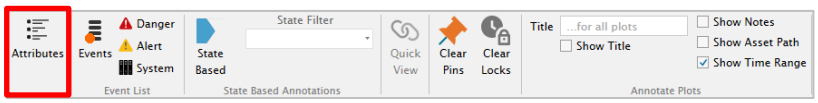
The **Advanced** tab contains features of SETPOINT CMS that are typically used by advanced users, or that are limited to special applications.



The **Advanced** tab contains configuration for how CMS will show your plots.

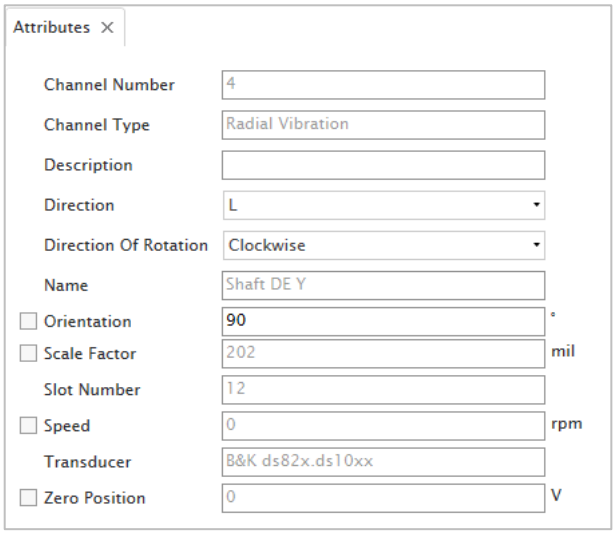
- Show the Attributes Pane
- Show and filter events on the Events Pane
- Enable state-based displays
- Select a state filter
- Create a Quick View
- Clear pinned or time-locked plots
- Show or hide a custom plot title in plot headers
- Show or hide custom notes in plot headers
- Show or hide the Asset Path in plot headers
- Show or hide the time range on plots

10.10.1 Attributes (The Attributes Pane)



Most points and assets have additional attributes that are stored in the database. Attributes can include configuration values, alarm limits, or PI AF analysis results. If **Attributes** are activated, all attributes of the Focused Point are displayed in the corresponding pane on the right.

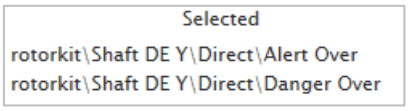
In the example below, **Attributes** of a channel called “Shaft DE Y” are displayed.



Attributes may or may not be editable, depending on the type of setting and, in case of an PI/AF database, access rights.

10.10.1.1 Trending Attribute Values

You can plot **Attributes** preceded by a checkbox. Checking the box adds the attribute to the Selected list.

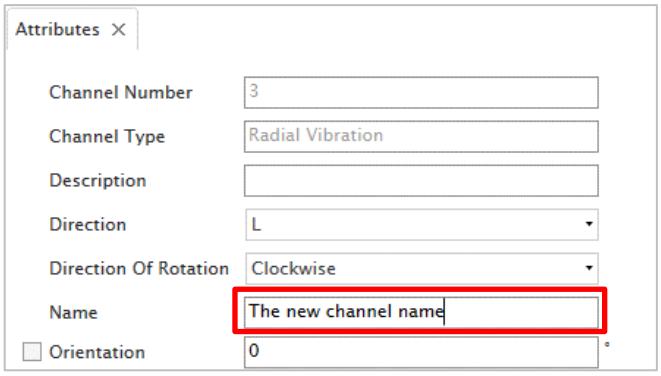


NOTE!

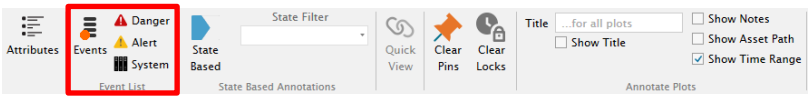
If the firmware supports state-dependent alarm limits, these are displayed in the Trend as a function of the active machine state. Otherwise, the attribute is displayed as a static, unchangeable value.

10.10.1.2 Editing Channel Names

In a CMS file, channel names can be edited to make them clearer when diagnosing machines.

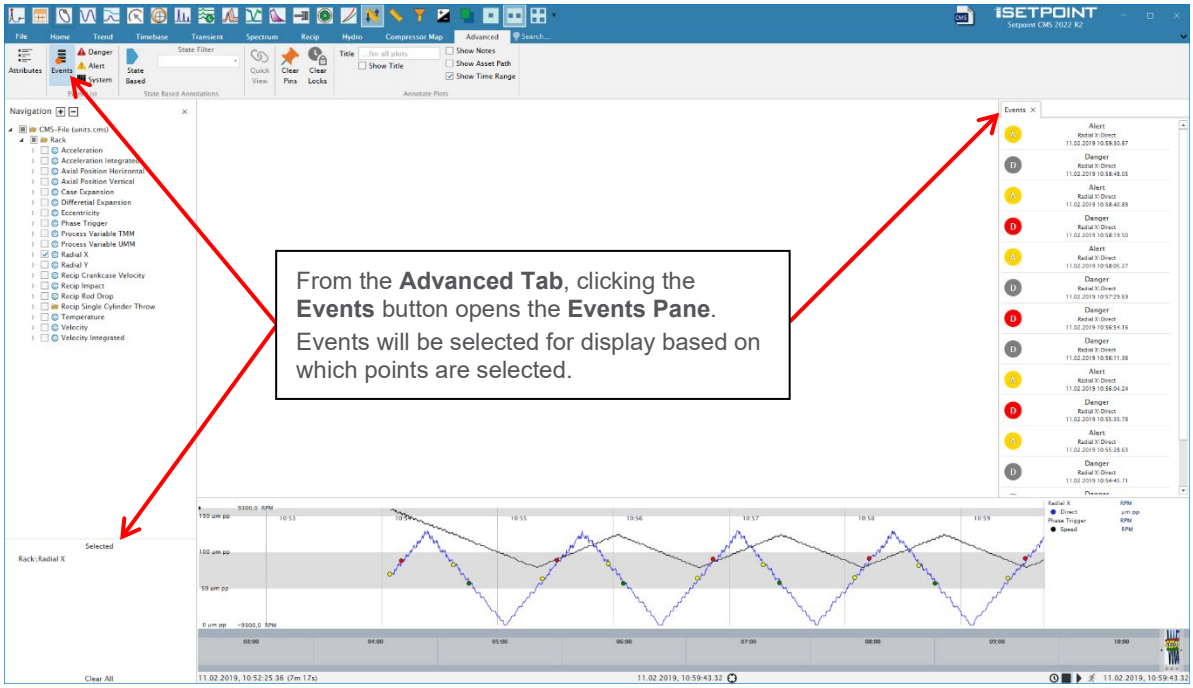


10.10.2 Show and Filter Events (The Events Pane)

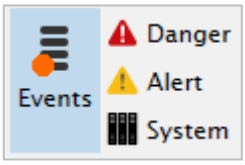


Click the **Events** button to open the Events Pane. The Events Pane shows alarm, state and system events that occurred within the time range displayed in the Timeline. Note that this time is larger than the time range currently selected for analysis.

You can navigate directly to points and time ranges corresponding to the events directly from these lists.



You can filter the event list to only show **Danger**, **Alert**, or **System** events by clicking the buttons shown.

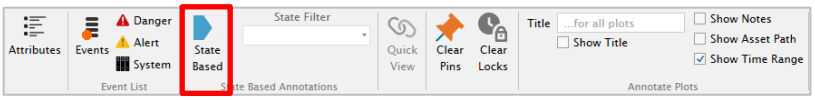


All events are shown if no buttons are active.

NOTE!

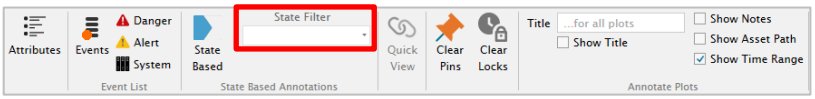
The **Events** list is filtered to show events for the selected points. The list will also include top level system events.

10.10.3 Enable State Based Displays



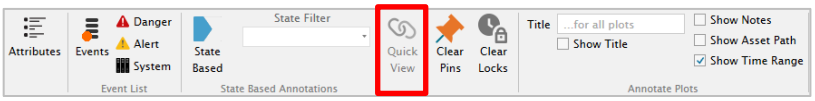
The **State Based** button controls whether state-based coloring of analysis plots is activated. Please refer to Using Machine States and Manual States for more information.

10.10.4 Select a State Filter



When using Machine States, users can filter the data displayed on the Small Trend and the Large Trend using a **State Filter**. Please refer to Using Machine States and Manual States for more information.

10.10.5 Create a Quick View



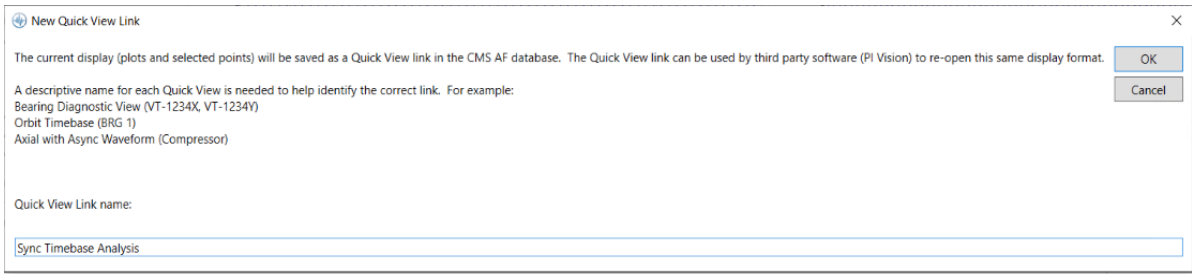
Quick views provide a display that is accessible to external applications and systems. Third-party applications such as PI Vision or a web page can link to CMS through a URL. Clicking the **Quick View** button will create such a display based on the current state of SETPOINT CMS.

NOTE!

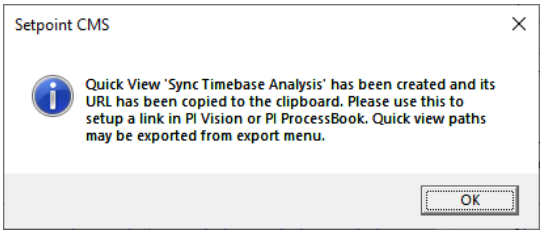
Quick View is only available for AF database and requires the privilege to change AF elements attributes.

10.10.5.1 Creating a Quick View

Select points and plots needed for your analysis. Click an entry of the Navigation Pane to make it the Focused Point. The newly created Quick View will be associated with this element. Finally, click on **Quick View** to open a dialog where an expressive name can be assigned to the **Quick View**:



Click **OK**. Upon success you will be informed that a Quick View URL has been created and copied to your clipboard.

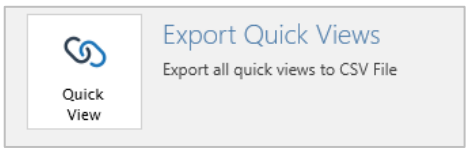


Now, you can paste URL from your clipboard into Attribute <Quick View> of the Asset in PI System Explorer and this Attribute can later be used to launch the SETPOINT® CMS application and restore your original analysis view.

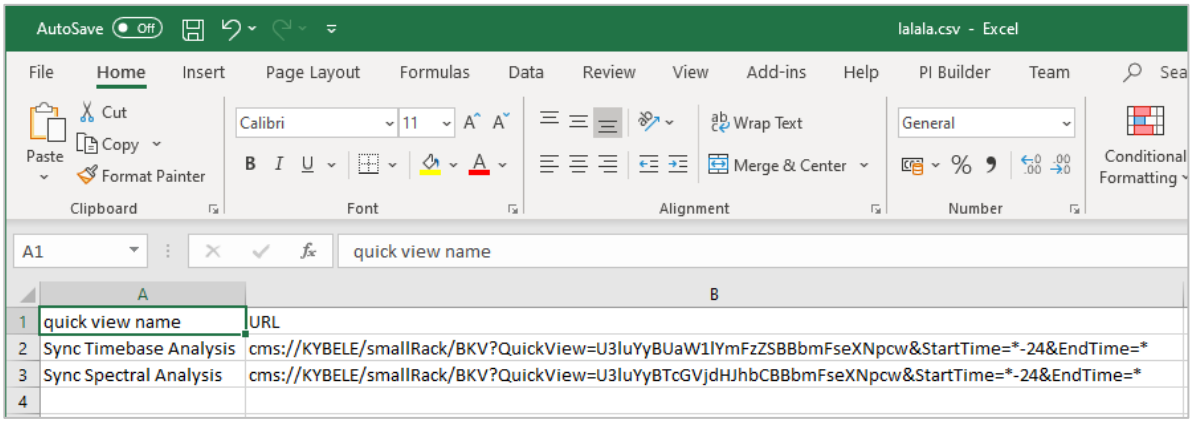
Refer to Section 20.1 for instructions on integrating with PI Vision.

10.10.5.2 Export Quick Views to CSV

From the file menu select **Export** and the **Export Quick Views** button to export all quick views to a CSV file.



A standard file Save dialog prompts you to name the export file. Upon success the CSV file will be opened in Excel.

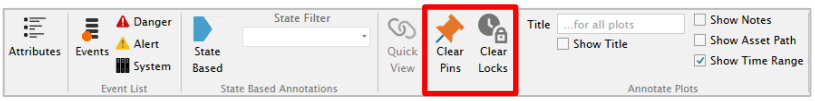


10.10.5.3 Using Quick Views from within SETPOINT CMS

Quick Views are automatically associated with an entry of the Navigation Pane. You can thus restore the display defined by the Quick View from the Quick Views Area of the Navigation Pane.

Note that plots restored by selecting a Quick View will be pinned. When you are done with working with a particular Quick View, you can either select a different Quick or use Clear Pins to remove all pinned plots.

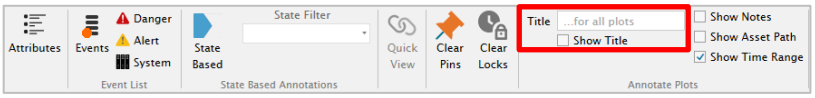
10.10.6 Clear Pins and Clear Locks



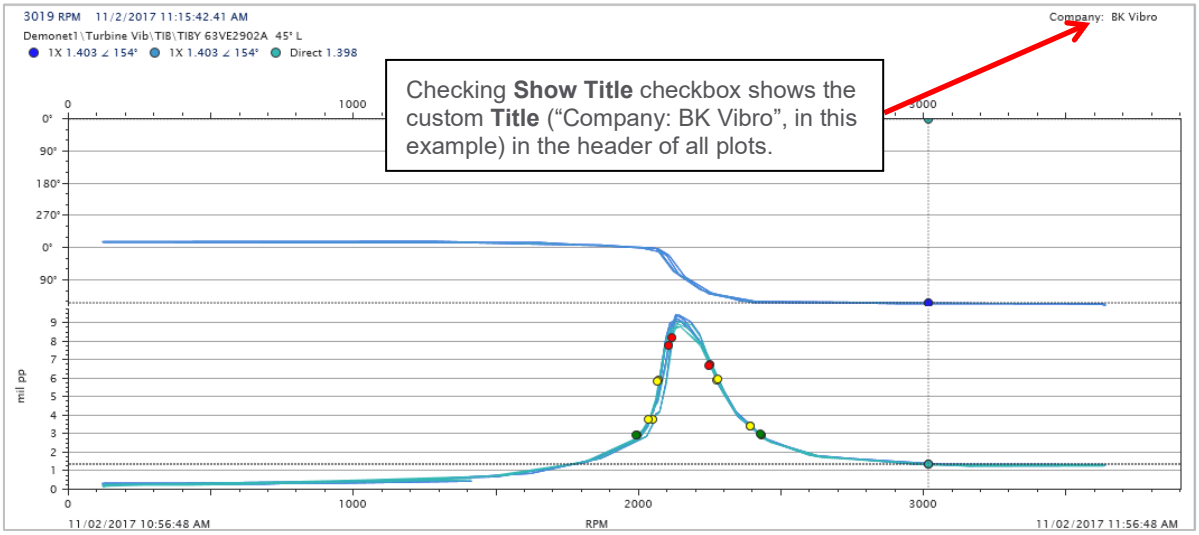
The **Clear Pins** button un-pins *all* plots that are currently pinned.

Similarly, the **Clear Locks** button un-locks *all* plots that are currently time-locked.

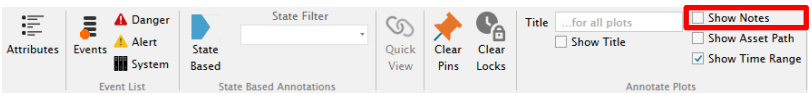
10.10.7 Show or Hide a Custom Plot Title in Plot Headers



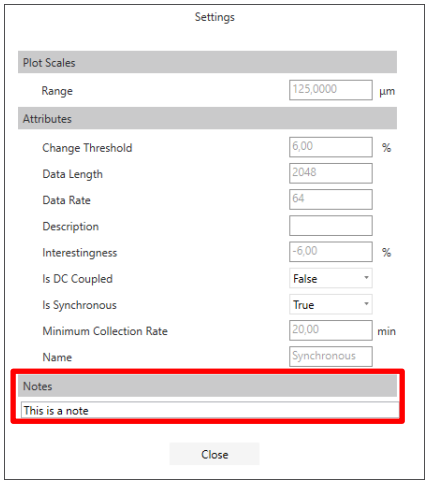
The plot title controls allow you to annotate analysis plots with a custom **Title** that is shown in the plot header. This is useful for annotating reports, but you may want to hide this information during analysis using the **Show Title** checkbox to maximize the available plot area.



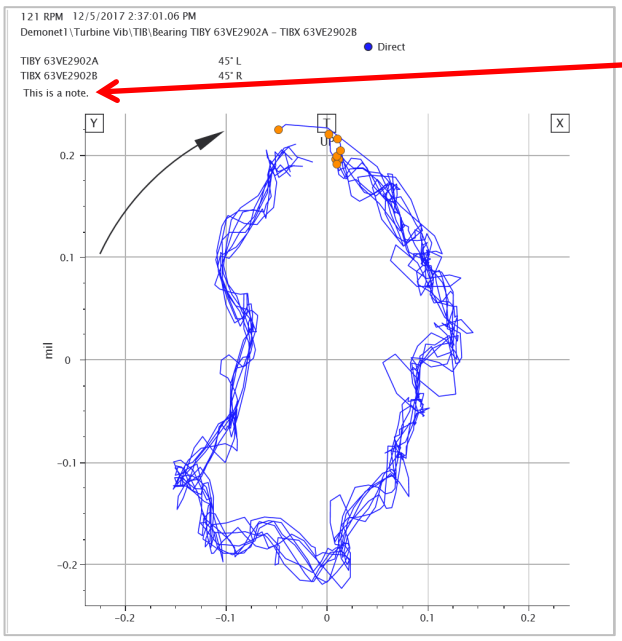
10.10.8 Show or Hide Custom Notes in Plot Headers



Users can add notes to individual plots via the plot settings dialog:

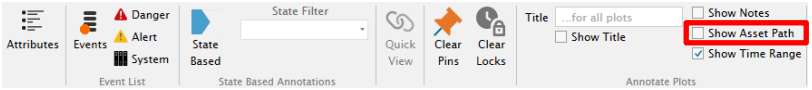


The **Show Notes** checkbox controls whether these annotations are displayed in the plot header. This is useful for annotating reports, but you may want to hide this information during analysis to maximize the available plot area.

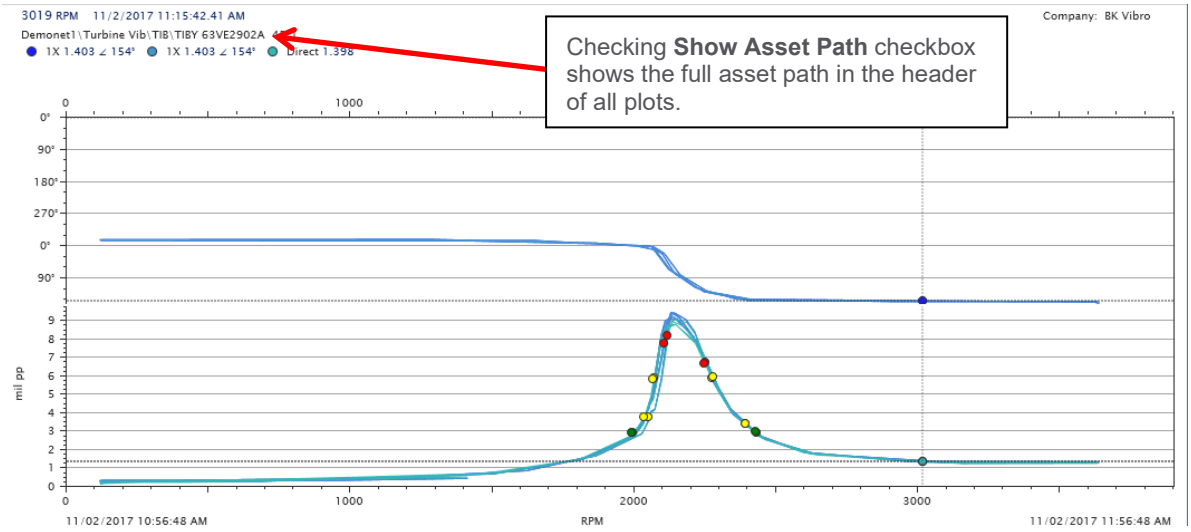


Checking **Show Notes** checkbox displays the note defined in the plot settings. Notes are set individually for each plot.

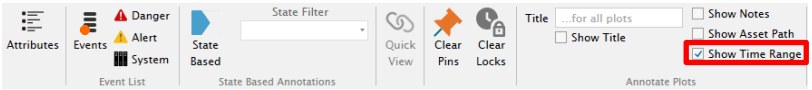
10.10.9 Show or Hide the Asset Path in Plot Headers



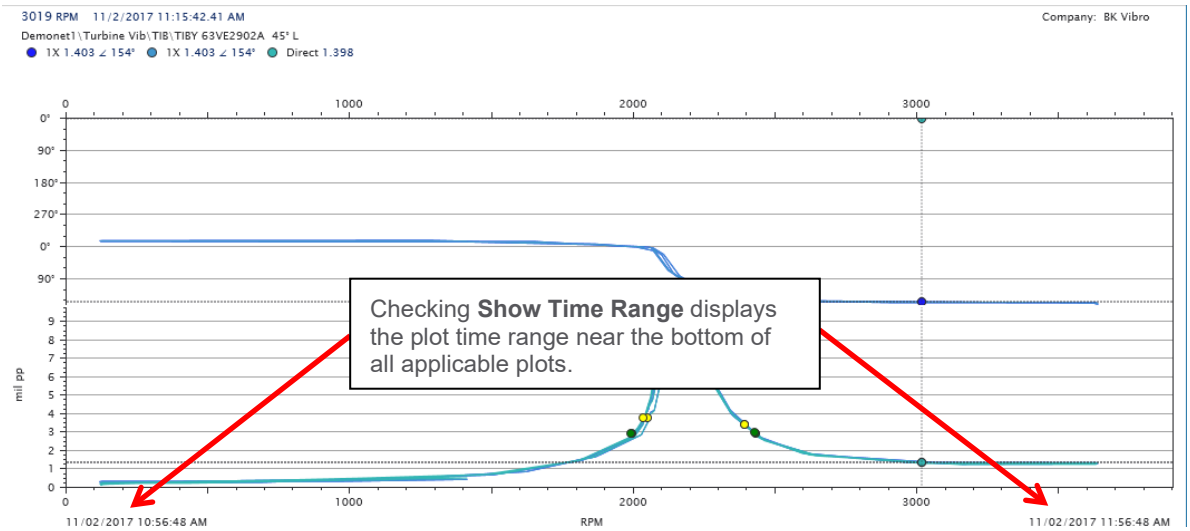
By default, SETPOINT CMS will only show the names of the channels that are displayed in the individual plots. Select **Show Asset Path** to display the full asset path instead:



10.10.10 Show or Hide the Time Range



When **Show Time Range** is active, the plot time range displayed by the plot is displayed near the bottom of each plot.



Note that this setting does not apply Orbit, Timebase, Orbit/Timebase and Spectrum plots.

11 Using the CMS Display Software

This section lists the basic flow for using the SETPOINT CMS Display Software and discusses typical ways to perform tasks.

The basic flow consists of:

- First time use: Setting up SETPOINT CMS using Start Here
- Opening a data source
- Selecting points for analysis using the Navigation Pane
- Selecting the data time range
- Choosing and configuring plots
- Analyzing the data
- Documenting your work by creating a report

11.1 Setting the Global Time Range and Dynamic Cursor

CMS uses two key *global* time parameters for plotting data:

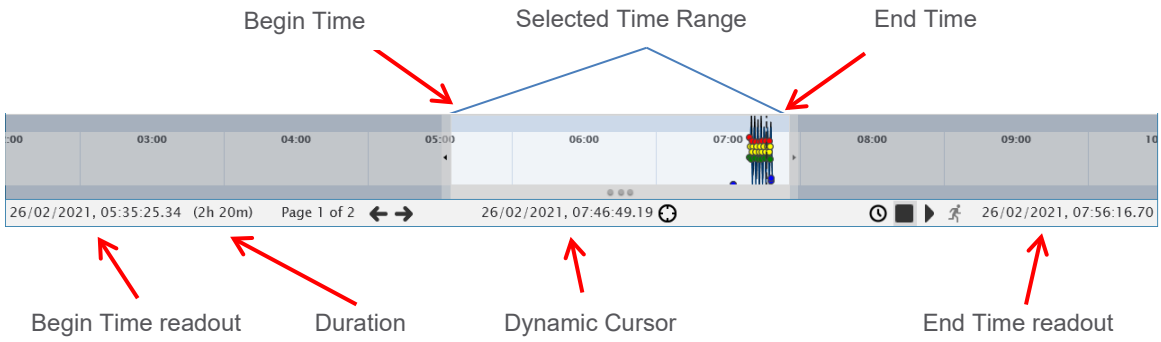
Selected Time Range:

Selects a set of data between the **Begin Time** and the **End Time**. The **Selected Time Range** sets the data shown in Small Trend, Large Trend, Bode, Polar, Shaft Centerline, Waterfall, and Cascade plots.

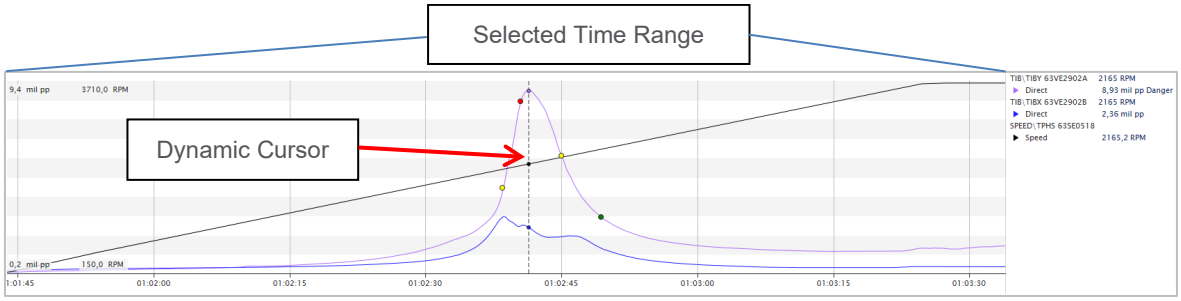
Dynamic Cursor:

A specific point in time. SETPOINT CMS uses the **Dynamic Cursor** time when selecting the static data sample for Data Table, *filtered* Orbit, and *filtered* Timebase plots. Moreover, SETPOINT CMS uses the **Dynamic Cursor** time when selecting the dynamic (*waveform*) data for Orbit, Timebase, Spectrum Plot, Crank Angle, Displaced Volume, X Y Rod Position, Unrolled Rotor Profile, Unrolled Stator Profile, and Circular Rotor Profile plots. Navigating to a time from the Events Pane or Reference Data Pane sets the **Dynamic Cursor** to the event or reference time.

You can use the Timeline Pane to select the time range of data you want to analysis.



The **Dynamic Cursor** can most easily be set from the Small Trend plot, which shows the **Selected Time Range**:



The following options for setting the global time range are supported by SETPOINT CMS:

- Move to current time or most recent time
- View data from a specific time range
- View data around an event or state change
- Zoom in on selected data
- Move selected range from the Timeline

NOTE!

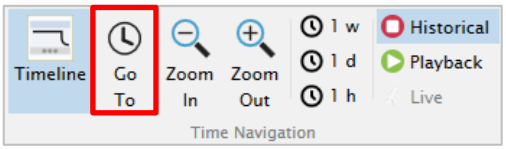
SETPOINT® CMS shows date and time in the regional format according to the Windows regional settings (Control Panel -> Region -> Formats)

11.1.1 Move to Current Time or Most Recent Time

Click the clock icon to move the selected time range such that the **End Time** coincides with the most recent time available in the selected data source. For online data sources (AF PI, CMS-XC, CMS-HD), the most recent time available time is the current time. For offline data sources (CMS-File, CMS-SD), the most recent time available is the last data sample within the current database.

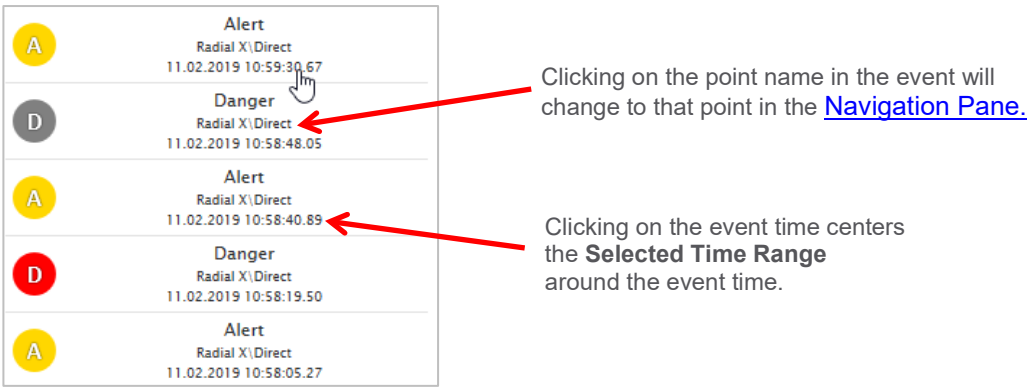
11.1.2 View Data from a Specific Time Range

When you know the time of a machine event you want to analyze, such as a machine startup at 12 pm on December 1, 2015, use Go To on the Home to navigate directly to that time.



11.1.3 View Data around an Event or State Change

When you are looking for an event or state change, such as an alarm or machine startup, you can automatically set the point and time range from the Events Pane.



11.1.4 Zoom in on Selected Data

Once the selected time range includes the data you want to analyze, there are several ways to zoom in or out to see more detail or data before or after the event.

Using the Zoom In and Zoom Out buttons

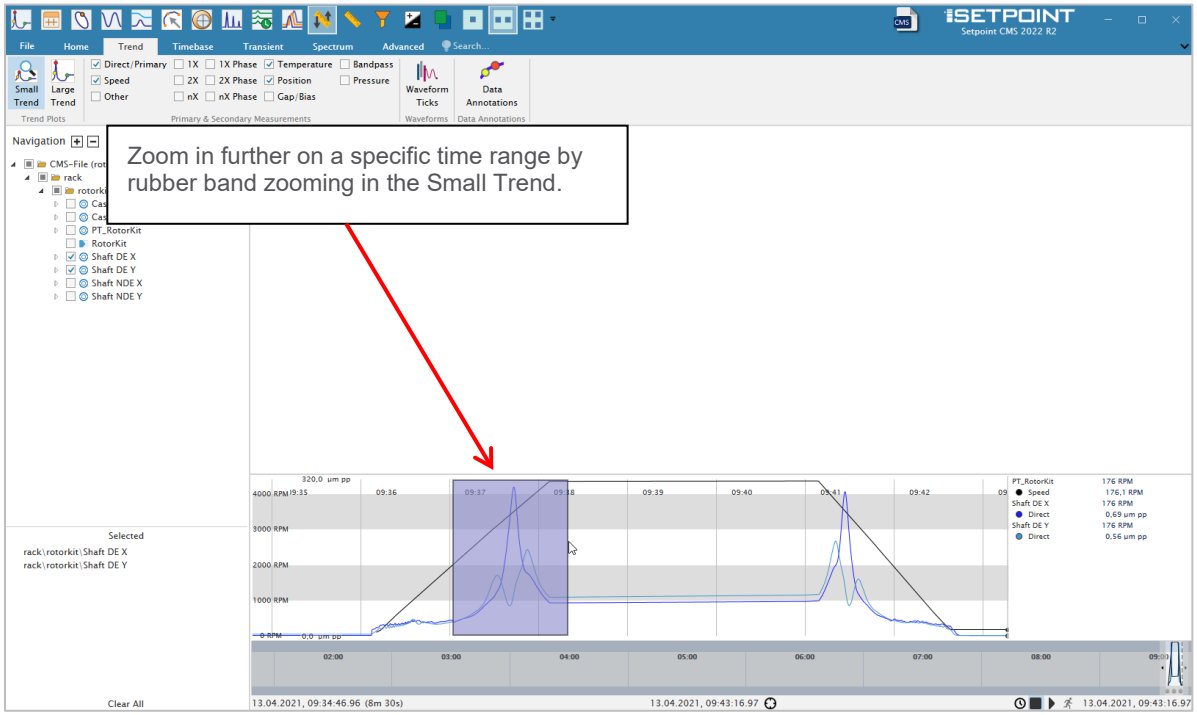
You can also use the Zoom In and Zoom Out buttons to adjust the time range.

Move the Timeline Handles

Click either the **Begin Time** or **End Time** and drag to adjust the selected time.

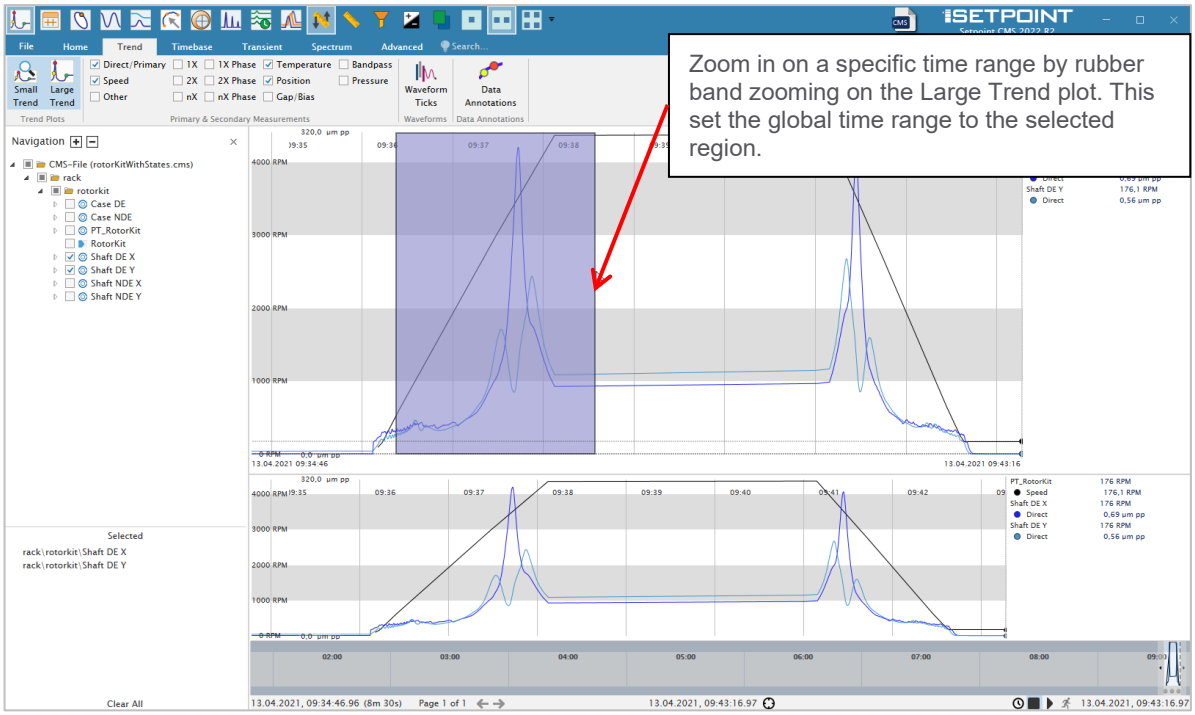
Zoom in the Small Trend

Open the Small Trend from the Trend Tab. Drag the mouse across the Small Trend to rubber-band zoom on a section of data.



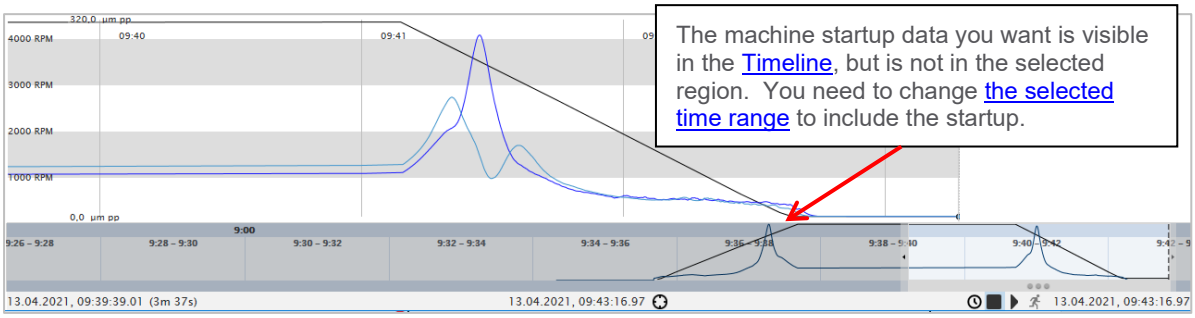
Zoom on the Large Trend

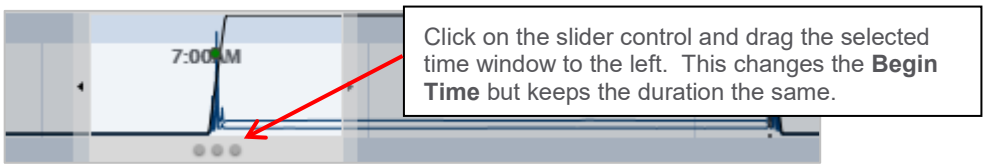
Open the Large Trend from the Trend Tab. Drag the mouse across the Large Trend to rubber-band zoom on a section of data.



11.1.5 Move Selected Range from the Timeline

If the data of interest is shown in the Timeline, but not Selected, you can use the time slider control to adjust the **Begin Time** and the **End Time** simultaneously.

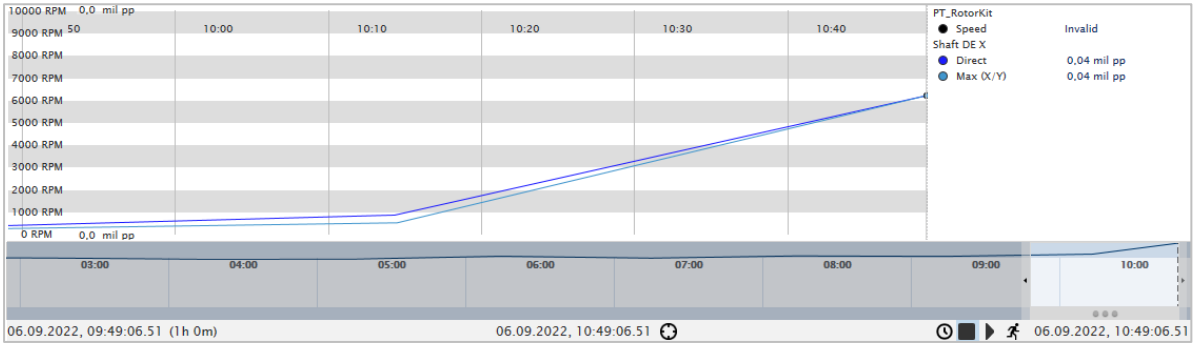




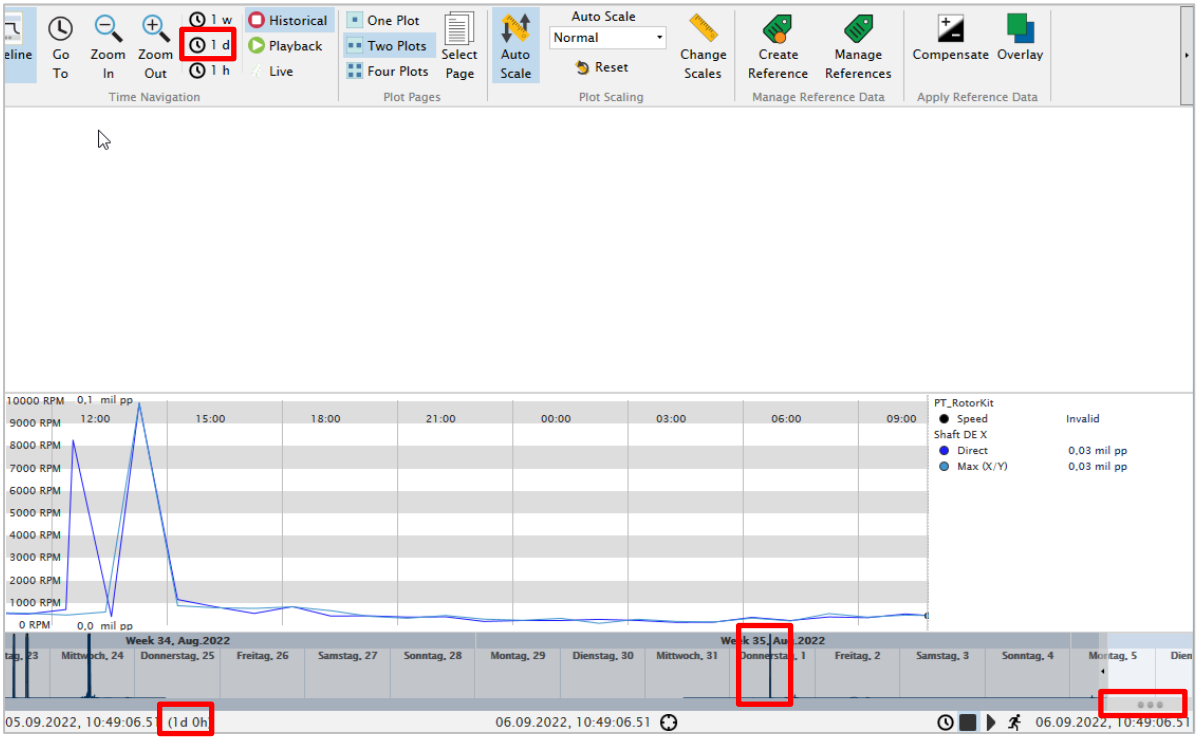
Alternatively, you can increase the selected time range by any of the methods discussed in the previous sections.

11.1.6 Discover Data not Shown in the Timeline

In the example below, the **Timeline** is not showing the shutdown that occurred several days before the current period of non-operation:



Increasing the time range size will show more days in the timeline:

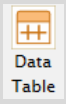
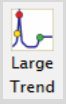
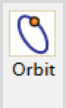
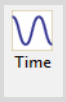
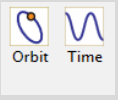
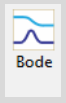
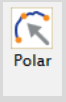
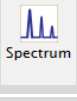
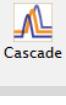


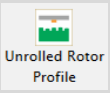
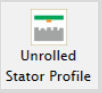
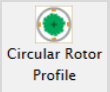
Alternatively, slide the time range control all the way to the left or right to view data from an older or newer time period.

11.2 Plots

After navigating to a point, clicking the plot buttons the respective ribbon tab open that plot type for the selected points.

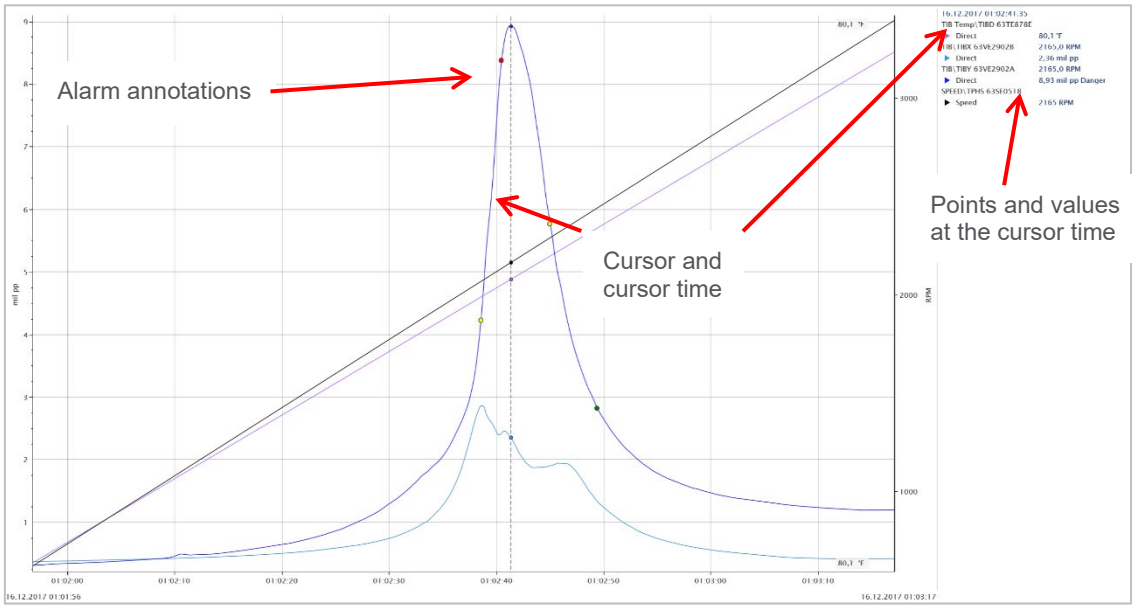
The plot buttons and their location are shown below, followed by descriptions of each available plot type.

Plot	Ribbon Tab Location	Description
	Home	The Data Table displays static measurement values in a tabular view.
	Trend	The Large Trend plot shows static measurement values as a function of time.
	Timebase	The Orbit plot is a two-dimensional path of shaft centerline motion as viewed from an orthogonal transducer pair (XY).
	Timebase	The Timebase plot is the instantaneous amplitude plotted as a function of time. Single or multiple channels can be displayed simultaneously, whether from the same bearing or multiple bearings.
	Timebase	Selecting the Orbit and Time buttons simultaneously will show a combined Orbit/Timebase plot that shows the orbit and the corresponding waveforms side by side.
	Transient	The Bode plot allows you to view the 1X, 2X, or nX forward vector amplitude and phase as a function of shaft rotational speed.
	Transient	The Polar plot shows vector amplitude and phase data plotted on polar coordinates.
	Transient	The Shaft Centerline plot shows the movement of the shaft average centerline position over time, which is useful in particular in the transitional phases).
	Spectrum	The Spectrum Plot allows you to view the vibration amplitude as a function of frequency in either half or full spectrum formats which displays the precession.
	Spectrum	The Waterfall plot shows spectrums collected over a period of time as a function of time (it will be used on nominal statements instead).
	Spectrum	The Cascade plot shows spectrums collected as a function of speed, (it will be used instead for transient states).

Plot	Ribbon Tab Location	Description
 Crank Angle	Recip	The Crank Angle button plots reciprocating compressor measurements as a function of the compressor crank angle position.
 Displaced Volume	Recip	The Displaced Volume plot displays reciprocating compressor measurements as a function of the compressor cylinder displaced (swept) volume.
 X Y Rod Position	Recip	The X Y Rod Position plot shows reciprocating compressor X-Y rod position.
 Unrolled Rotor Profile	Hydro	The Unrolled Rotor Profile plot displays the profile of the rotor of a hydroelectric generator based on the data from a single Air Gap sensor. Measurements are evaluated by the distance (gap) between rotor and stator and are plotted versus pole numbers.
 Unrolled Stator Profile	Hydro	The Unrolled Stator Profile visualizes deviations of the stator of a hydroelectric generator from a perfectly circular shape. To this end, it displays the distance (gap) of multiple Air Gap sensors to a reference rotor pole.
 Circular Rotor Profile	Hydro	The Circular Rotor Profile plot displays the profile of the rotor based on the data from one or multiple connected Air Gap sensors. Measurements are evaluated by the distance (gap) between rotor and stator.
 Compressor Map	Compressor Map	The Compressor Map plot shows the operating point, surge control line, and surge limit line for a centrifugal or axial compressor.

11.2.1 Large Trend

The **Large Trend** plot shows static values plotted against time.



Begin Time

End Time

When analyzing a trend plot you can:

- Change the time range
- Auto Scale the Y axis
- Manually scale the Y axis
- Zoom in on a section of data
- Use cursors to see the values
- Show when signals entered and exited alarms
- Visualize state changes/markers
- Change which channels show
- Change which measurements show
- Plot alarm set points on the Trend
- Change the sequence of traces

NOTE!

You can also quickly hide or show Trend traces. Click on the trace name in the legend to hide the trace. The trace name will be greyed out. Click it again to show the trace.

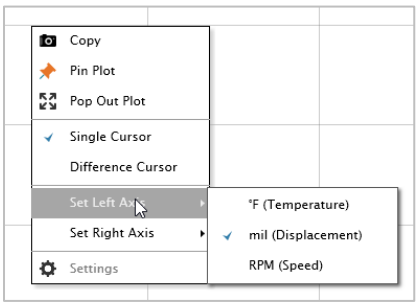
Go to Plots overview

11.2.1.1 Selection of Primary and Secondary Scales

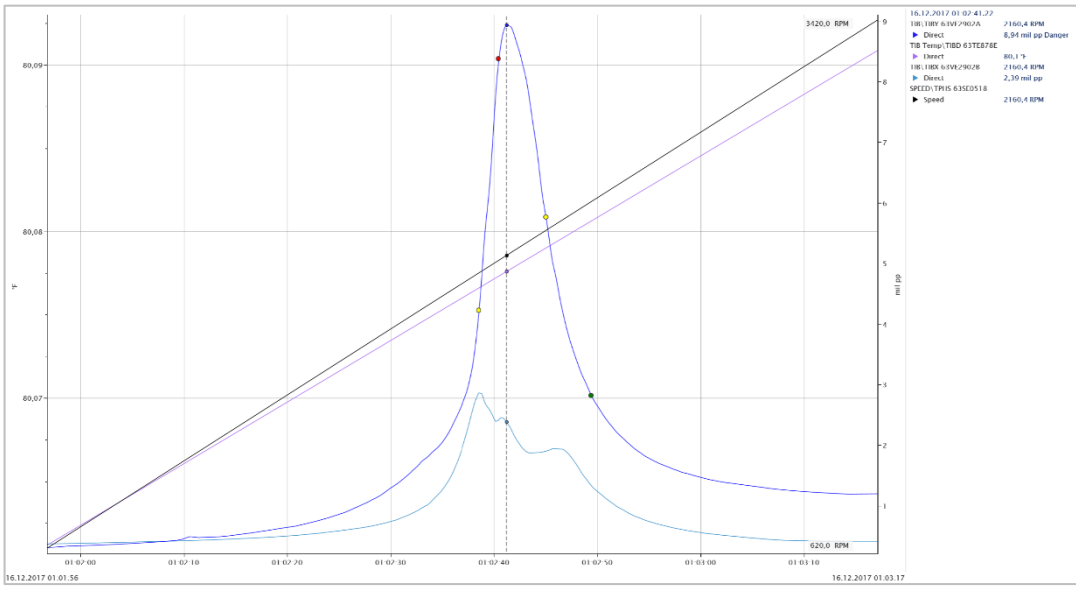
The Large Trend plot can combine data with different scale types (such as Displacement and Speed), and thus contains three types of Y-Axis scales (cf. screenshot above):

- The primary Y-Axis is displayed on the left. It preferentially shows the range of vibration data if present
- If data with least two different units is currently visible, the secondary Y-Axis is displayed on the right. It preferentially shows the speed range of the selected data if present
- If data with more than two different scale types is visible, one or multiple tertiary Y-Axis scales are diplayed. For these, only the minimum and maximum scale value is shown as an overlay on the plot.

SETPOINT CMS allows users to customize the Y-Axis selection using the **Set Left Axis** and **Set Right Axis** commands. These options are available from the plot context menu that can be accessed by right-clicking the plot, or by clicking on the ellipsis in the upper right plot corner. The currently selected Left/Right Axis is marked by a checkmark. Click on another entry to change the selection.



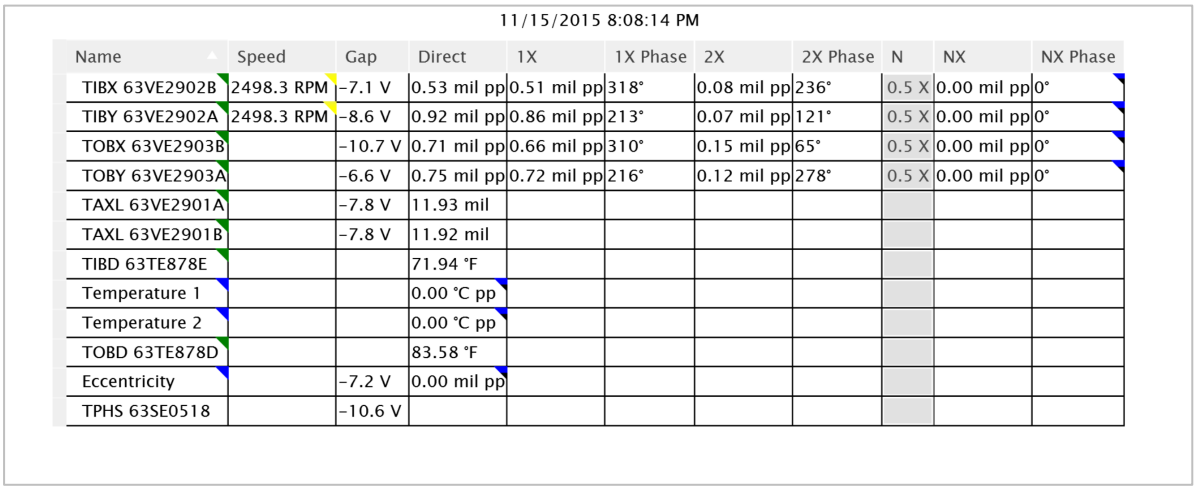
In the following example, **°F (Temperature)** has been set as **Left Axis**, and **mil pp** has been set as **Right Axis**. The **RPM Speed** range has thus been auto-selected as a tertiary scale.



11.2.2 Data Table

The data table shows the measurement numerical values (all) for the selected points at the dynamic cursor position.

It also displays the status of alarms are enabled. The order of the traces shown in the table can be changed by the Point Order combo box on the Home tab.



11/15/2015 8:08:14 PM

Name	Speed	Gap	Direct	1X	1X Phase	2X	2X Phase	N	NX	NX Phase
TIBX 63VE2902B	2498.3 RPM	-7.1 V	0.53 mil pp	0.51 mil pp	318°	0.08 mil pp	236°	0.5 X	0.00 mil pp	0°
TIBY 63VE2902A	2498.3 RPM	-8.6 V	0.92 mil pp	0.86 mil pp	213°	0.07 mil pp	121°	0.5 X	0.00 mil pp	0°
TOBX 63VE2903B		-10.7 V	0.71 mil pp	0.66 mil pp	310°	0.15 mil pp	65°	0.5 X	0.00 mil pp	0°
TOBY 63VE2903A		-6.6 V	0.75 mil pp	0.72 mil pp	216°	0.12 mil pp	278°	0.5 X	0.00 mil pp	0°
TAXL 63VE2901A		-7.8 V	11.93 mil							
TAXL 63VE2901B		-7.8 V	11.92 mil							
TIBD 63TE878E			71.94 °F							
Temperature 1			0.00 °C pp							
Temperature 2			0.00 °C pp							
TOBD 63TE878D			83.58 °F							
Eccentricity		-7.2 V	0.00 mil pp							
TPHS 63SE0518		-10.6 V								

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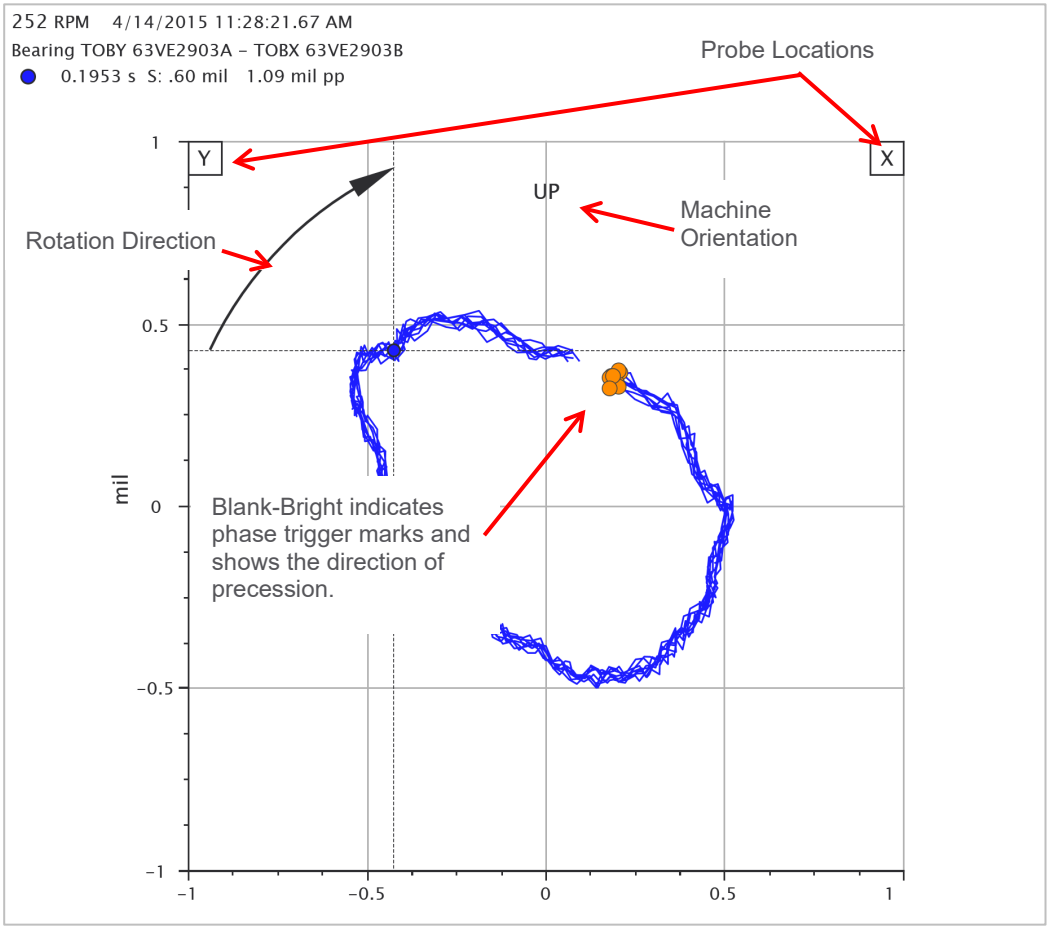
11.2.3 Orbit Plot

The Orbit Plot shows the dynamic shaft motion (waveform) in relation to a pair of orthogonal transducers.



You can adjust your Orbit plot using these options:

- Filtering to 1X, 2X or nX components
- Compensate
- Adjusting the number of Revolutions shown
- Show asynchronous data
- Manually scale the X and Y axis
- Auto Scale
- Change the Machine Orientation
- Overlay Data

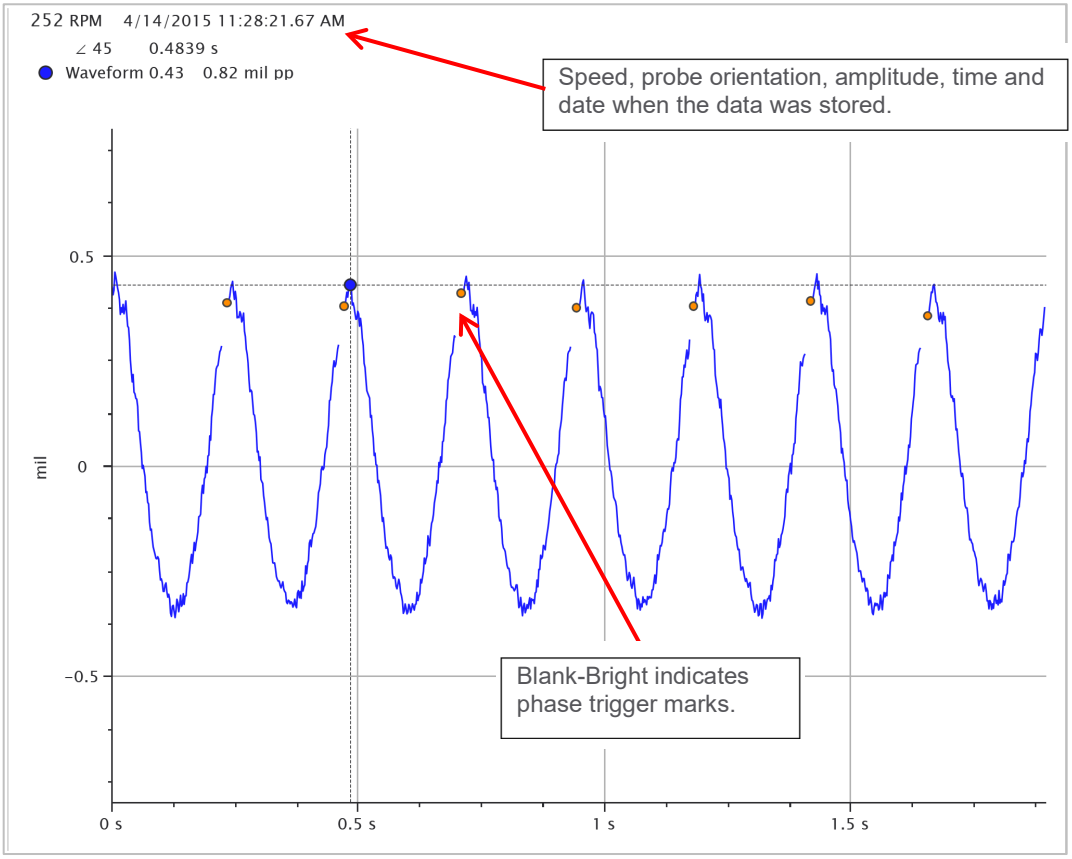
Go to Plots overview

NOTE!

If only one channel of an XY Pair is selected, CMS will find the paired sensor and plot the Orbit.

11.2.4 Timebase Plot

The Timebase plot shows the dynamic transducer signal (waveform) plotted against time similar to the presentation that would be seen on an oscilloscope.



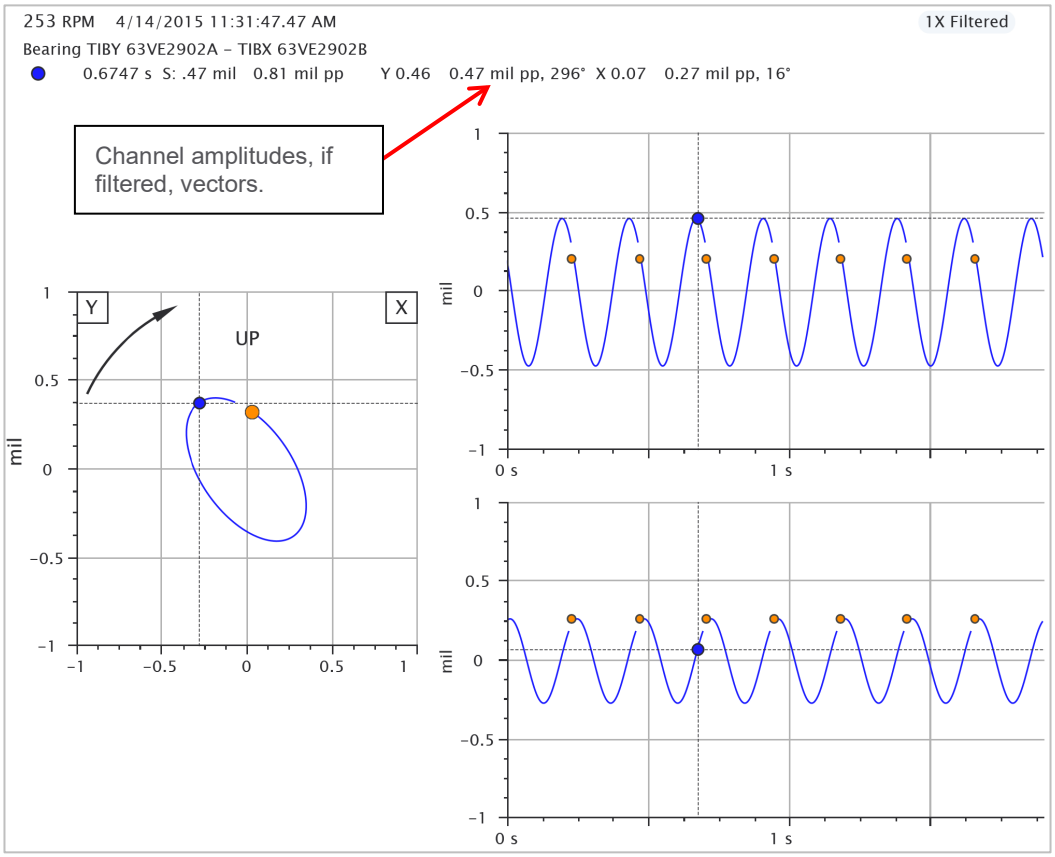
You can adjust your Timebase plot using these options:

- Filtering to 1X, 2X or nX components
- Compensate
- Adjusting the number of Revolutions shown
- Show asynchronous data
- Manually Scale the Y-Axis
- Auto Scale
- Zoom in on a section of the plot
- Overlay Data

Go to Plots overview

11.2.5 Orbit/Timebase Plot

The Orbit/Timebase plot shows both the Orbit and Timebase plots for the XY channel pair.



You can adjust your Orbit/Timebase plot using these options:

- Filtering to 1X, 2X or nX components
- Compensate
- Adjusting the number of Revolutions shown
- Show asynchronous data
- Manual Scale
- Auto Scale
- Change the Machine Orientation Reference
- Overlay Data

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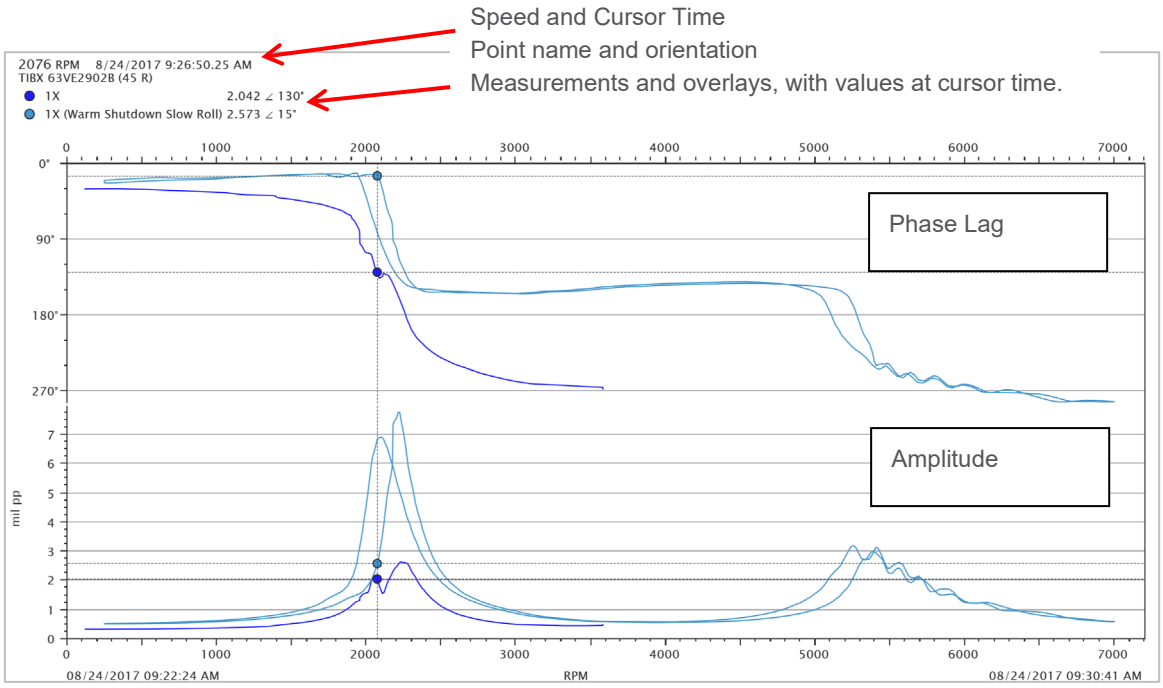
11.2.6 Bode Plot

The Bode plot shows 1X, 2X, or nX vector amplitude and phase as a function of shaft rotational speed.



When analyzing a Bode Plot, you can:

- Show 1X, 2X, and/or nX data
- Show Direct data
- Compensate
- Auto Scale the speed and amplitude axis
- Manually set the speed and amplitude axis
- Overlay Data

NOTE!

You can also quickly hide or show Bode traces. Click on the trace name in the legend to hide the trace. The trace name will be greyed out. Click it again to show the trace.

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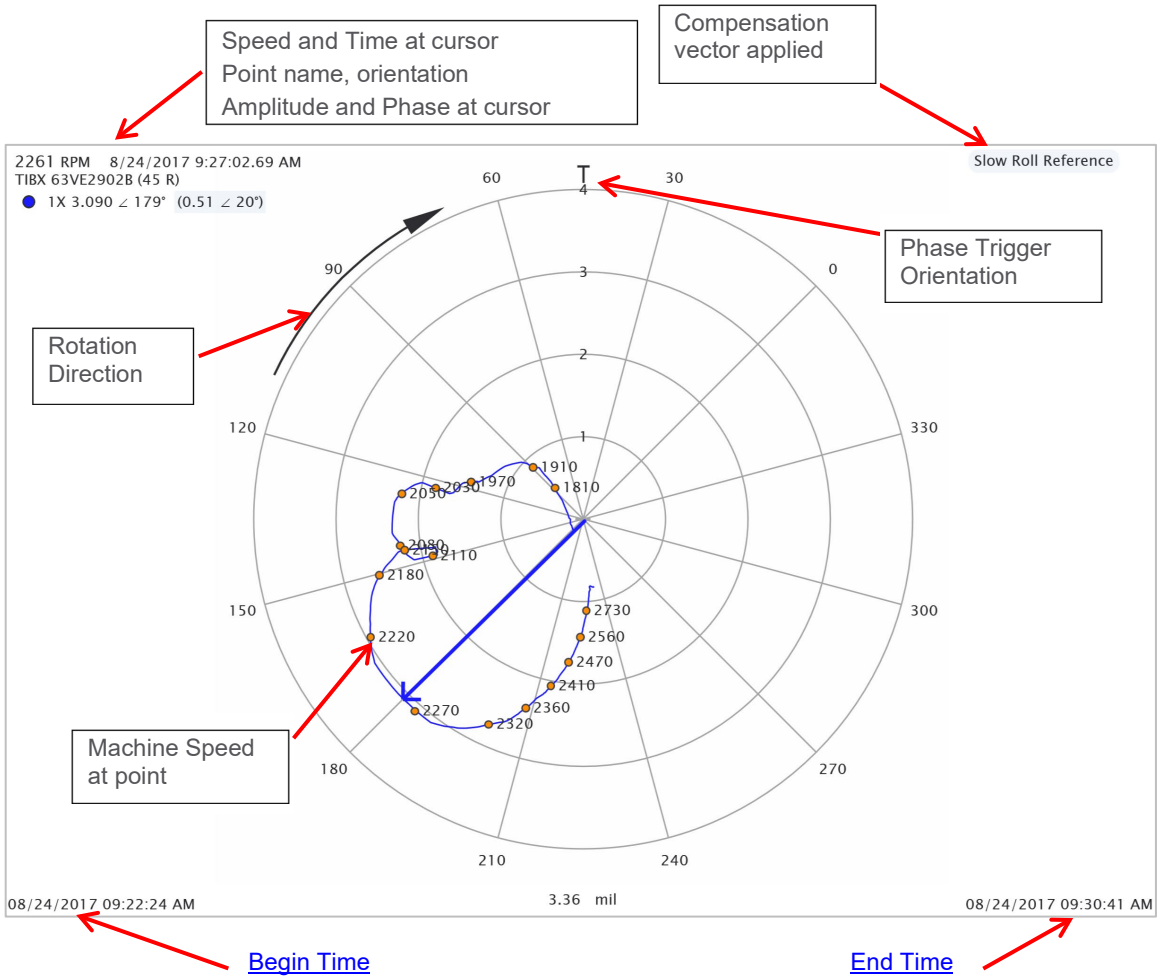
11.2.7 Polar Plot

The Polar plot shows vector amplitude and phase data plotted on polar coordinates.



When analyzing Polar plots, you can:

- Show 1X, 2X, or nX data
- Compensate
- Auto Scale the speed and amplitude axis
- Manually set the speed and amplitude axis
- Overlay Data
- Label points with speed or time

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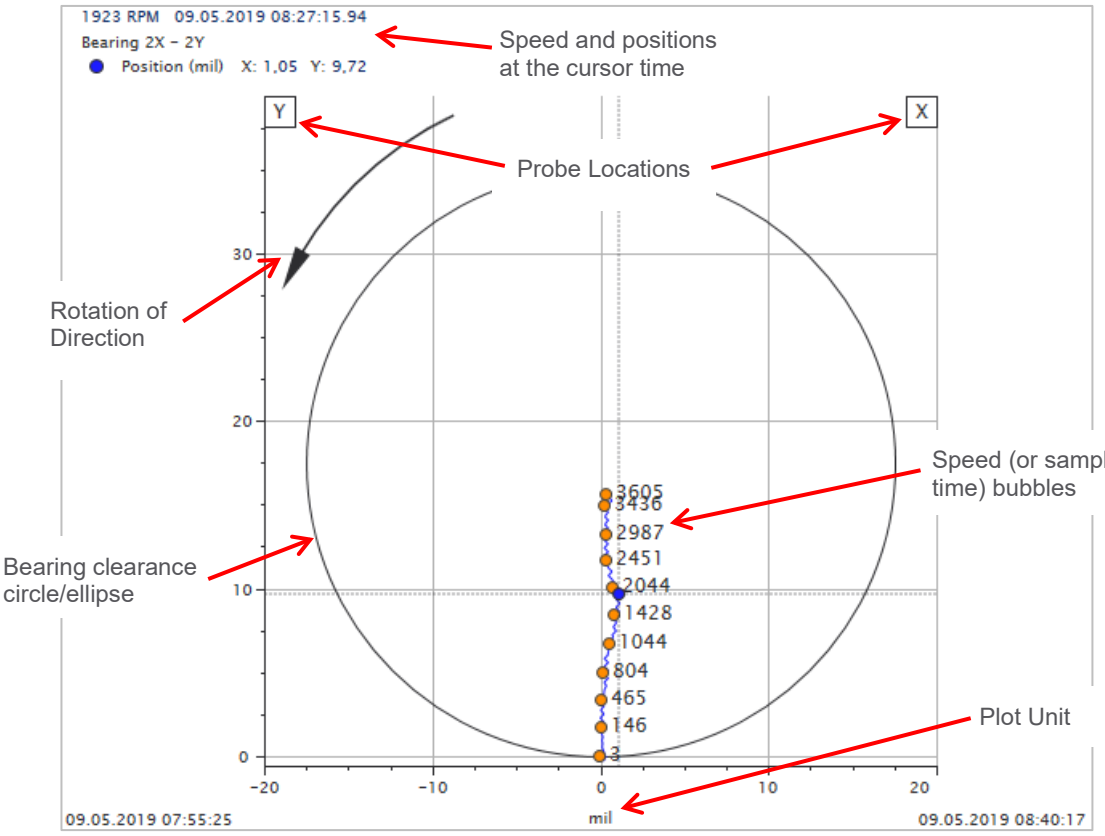
11.2.8 Shaft Centerline Plot

The Shaft Centerline plot shows the movement of the *average* shaft centerline position over time, or shaft rotational speed. The average centerline position is determined from XY displacement probe DC gap voltages.



The Shaft Centerline plot requires configuration of the:

- plot start point (initial gap)
- clearance boundary
- shaft reference location

When analyzing a Shaft Centerline plot, you can:

- Machine Orientation
- Overlay Data
- Label points with speed or time

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11.2.8.1 Setting the Start Reference (Initial Gap)

The Shaft Centerline plot will default to setting the first sample in the time range to the plot zero location. Alternatively, you can plot the data with the zero position at a set gap reference location.

To set a starting reference:

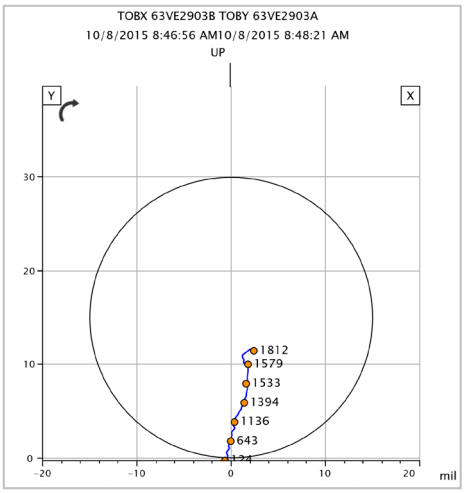
1. Set a reference sample for the dataset.
2. Choose the reference sample as the “gap” reference.
3. CMS will draw the shaft absolute plot starting at the gap value of the selected reference sample.

11.2.8.2 Setting the Shaft Reference Location

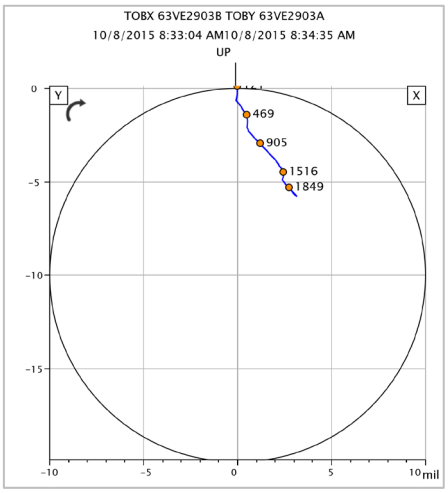
The shaft reference location (or start position) sets where to begin plotting the shaft centerline movement and represents the plot origin (0,0). Set the start position from the Plot Settings Pane. Typical options for exemplary machine orientations are given in the table below.

Machine Orientation	Typical Shaft Reference Location
Horizontal	Bottom
Vertical	Center
Overhung Rotor	Top

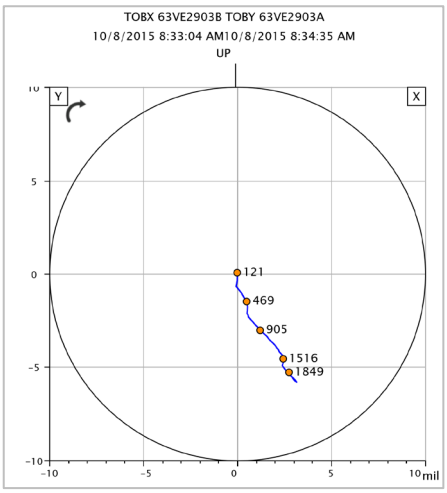
Bottom:



Top:



Center:



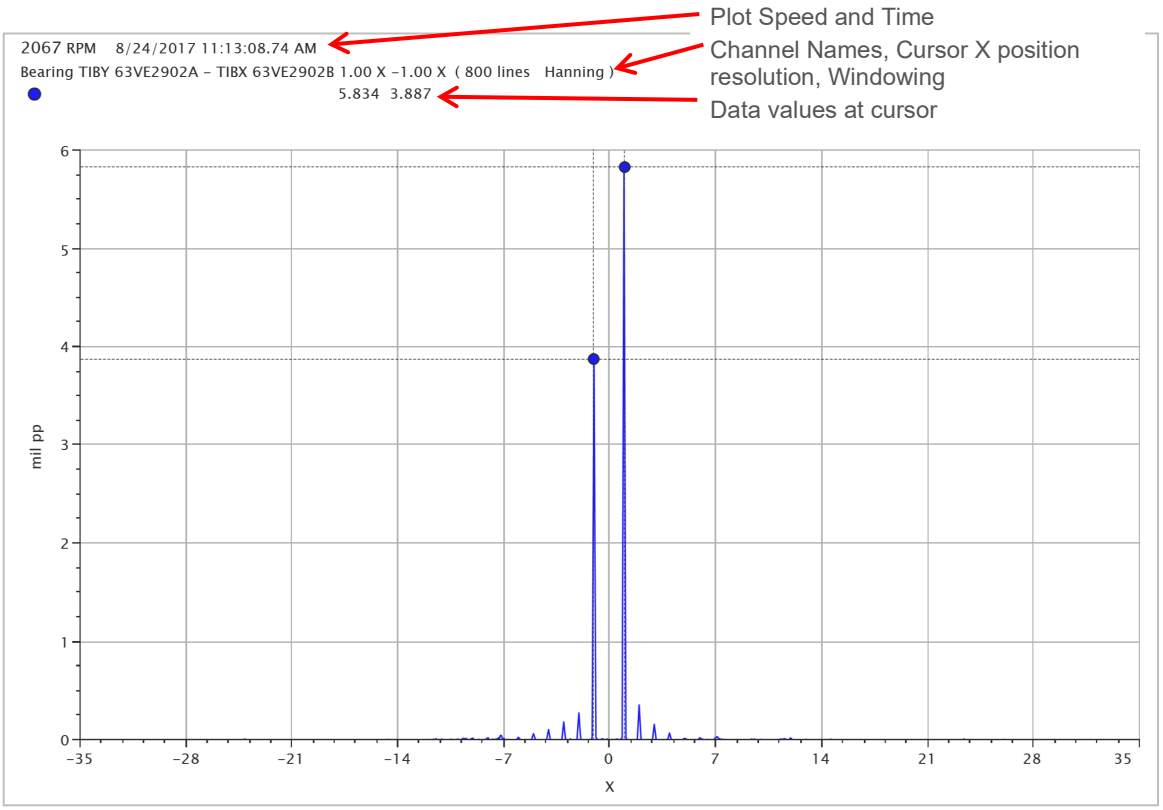
NOTE!

Autoscaling the shaft absolute plot can cause the bearing clearance to be outside the plot scales and to not be shown.

11.2.9 Spectrum Plot

This screen allows you to view the vibration amplitude as a function of frequency (FFT: Fast Fourier Transform), in either half or full spectrum formats in a pair of X-Y channels.

Example here: Full-Spectrum



The Spectrum plot allows the configuration of the following elements:

- Change the number of spectral lines shown
- Change the windowing
- Show data in orders of running speed or frequency
- Show the full spectrum
- Integrate velocity or acceleration spectra
- Overlay Data
- Show Bearing Cursors
- Configure Spectral Bands

The X axis scaling always uses the manual scales. You can auto scale or manually scale the Y axis.

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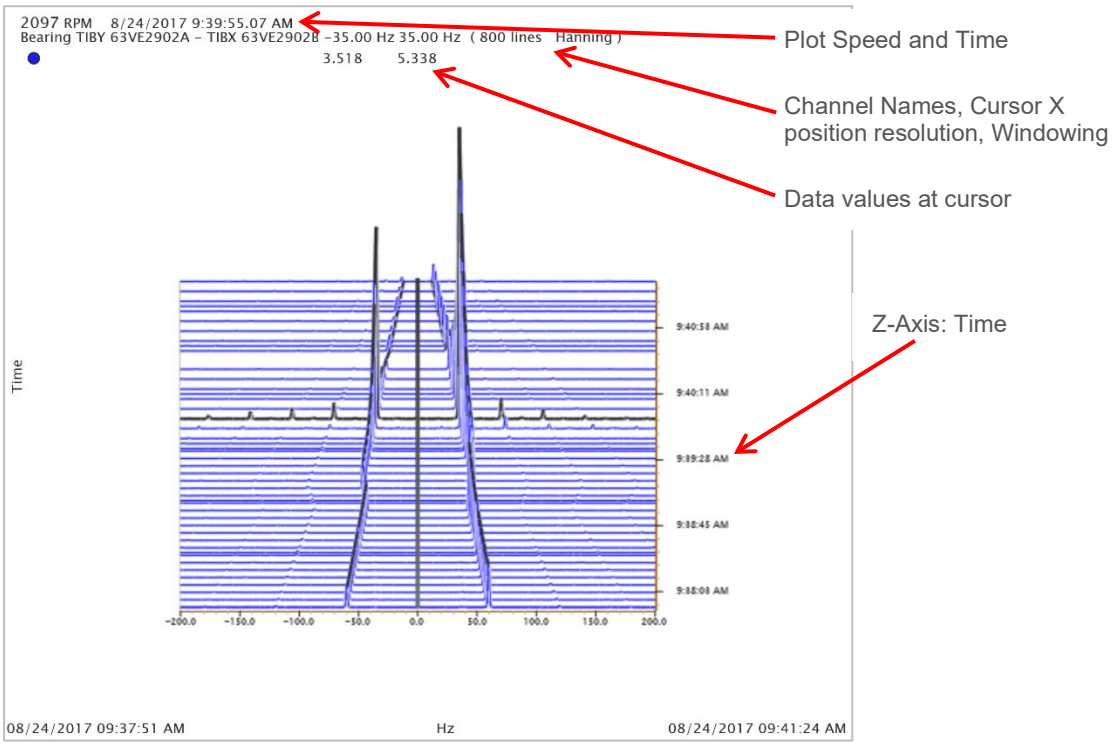
11.2.10 Waterfall Plot

The waterfall plot shows spectrums collected over a period of time as a function of time (Z-Axis).

Example here is a Waterfall using Full Spectrum:



NOTE!

The Waterfall plot is limited to 3200 lines.

When analyzing waterfall plots, you can:

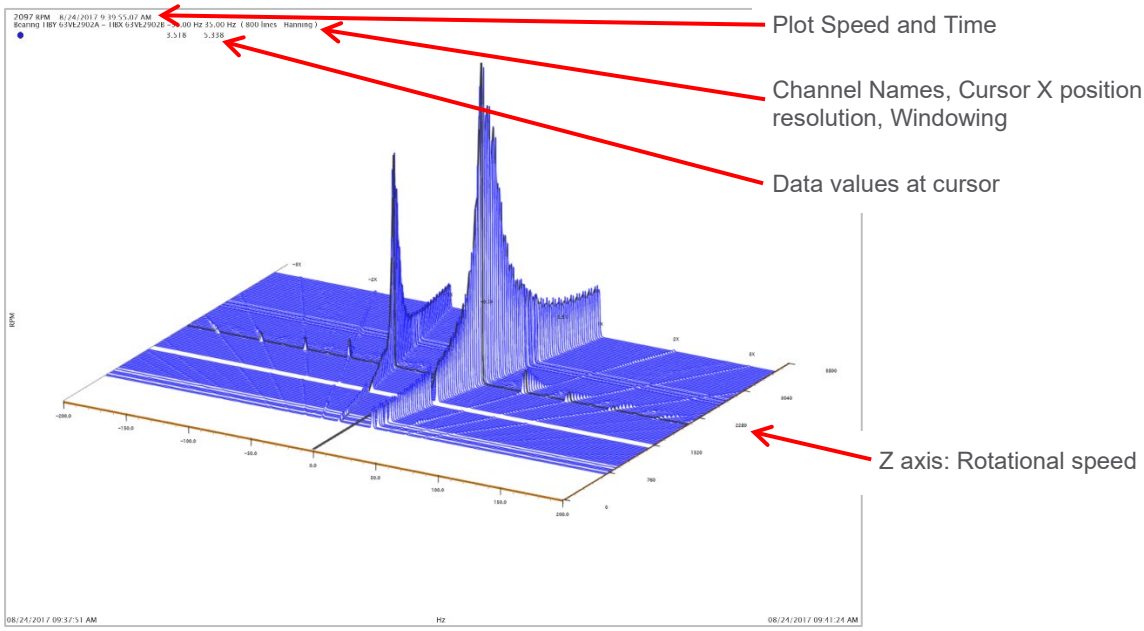
- Change the spectrum resolution
- Change the maximum number of spectrums shown
- Apply windowing
- Plot with the x axis in orders or frequency
- Plot full or half spectrum
- Show plot walls
- Integrate velocity spectrums to displacement or acceleration spectrums to velocity
- Auto or manual scale
- Rotate the plot
- Enlarge or shrink the plot
- Reset the plot to the default view

Go to Plots overview

11.2.11 Cascade Plot

The Cascade plot shows spectrums (half or full) collected over a certain time period depending on changes in speed (Z-Axis).

Example here is a Cascade using Full Spectrum:



NOTE!

The Cascade plot is limited to 3200 lines.

When analyzing Cascade plots, you can:

- Change the spectrum resolution
- Change the maximum number of spectrums shown
- Apply windowing
- Plot with the x axis in orders or frequency
- Plot full or half spectrum
- Show plot walls
- Integrate velocity spectrums to displacement or acceleration spectrums to velocity
- Auto or manual scale
- Rotate the plot
- Enlarge or shrink the plot
- Reset the plot to the default view

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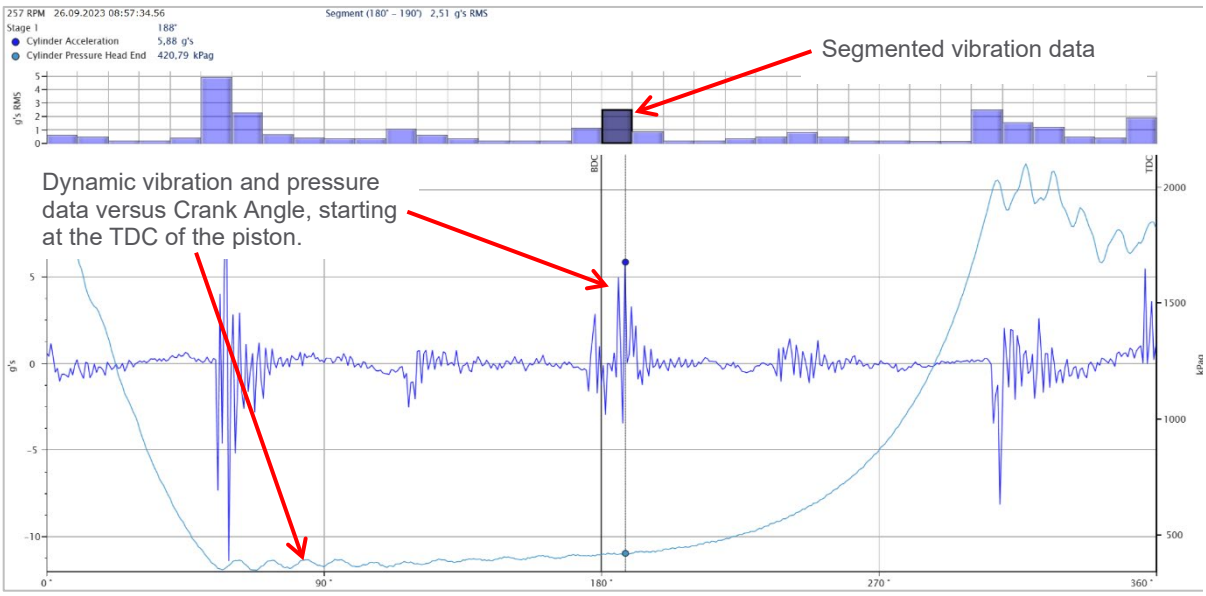
11.2.12 Crank Angle Plot

The Crank Angle plot shows vibration and pressure data as a function of the degrees of rotation of the crankshaft (Crank Angle) of a recipocrating compressor. An angle of 0° is defined as the Top Dead Center (TDC) position of the piston inside the given cylinder, whereas 180° corresponds to the Bottom Dead Center (BDC).

When selecting vibration channels associated with a cylinder throw (cf. section 7.6), one Crank Angle plot per vibration channel will be created, where the upper part displays *segmented* vibration data (see next page).



With the **Crank Angle** plot, you can:

- Adjust the number of revolutions shown
- Show or Hide Gas Force, Inertial Force and/or Rod Load
- Manual Scale
- Auto Scale
- Overlay Data

Go to Plots overview

11.2.12.1 Segmented Vibration Data

When selecting vibration channels associated with a cylinder throw, *segmented* vibration data can be plotted versus Crank Angle segments.

NOTE!

Please refer to section 7.6 for advice on setting up your VC-8000 for analysing data from reciprocating machinery. Vibration data will not be visible on the Crank Angle plot when not configured accordingly.

For acceleration and velocity data, 36 segment values per revolution are calculated from the waveform data. Each segment value is then given by the the root mean square (with respect to the segmentwise average) over 10° of crank rotation. For rod position data, 8 segment values per rotation are calculated. Each segment value is then given by the maximum peak-to-peak distance over 45° of crank rotation.

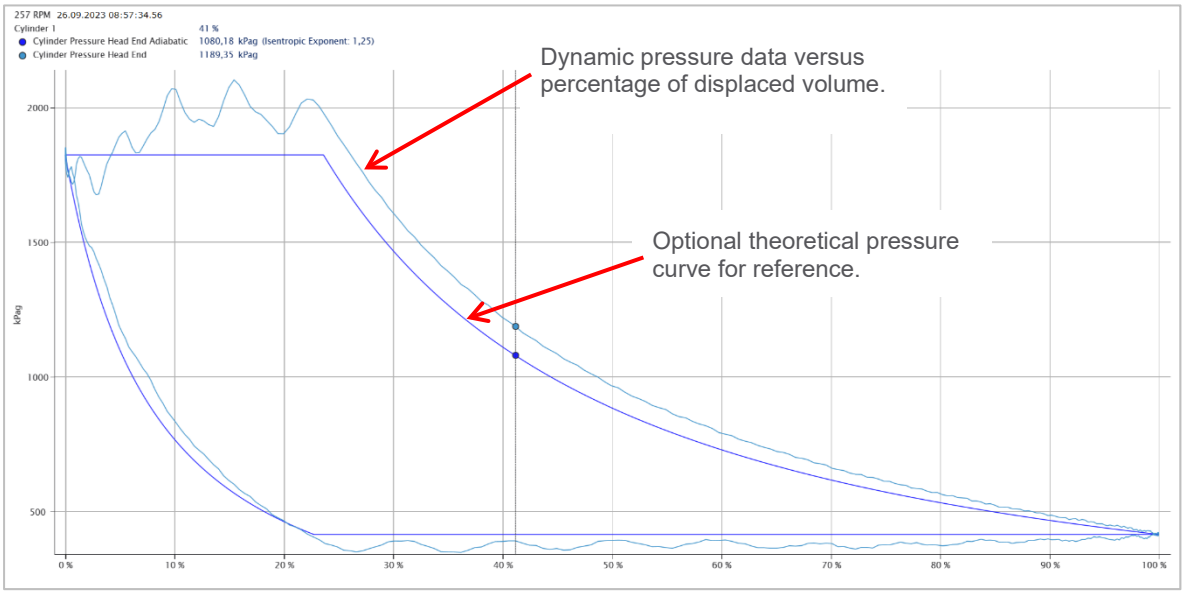
NOTE!

Segmented data displayed on the Crank Angle plot is computed from the unfiltered synchronus waveform. This allows for a detailed analysis of the condition of reciprocating machinery. For machine protection, on the other hand, segmented measurements must be based on *filtered* synchronous data in order to avoid spurious machine shutdowns. Segmented measurement data provided by the VC-8000 may thus be lower than corresponding values displayed in the Crank Angle plot.

11.2.13 Displaced Volume Plot

The Displaced Volume plot shows pressure data as a function of displaced (swept) cylinder volume, given in percent. A volume percentage of 0% is defined as the Top Dead Center (TDC) position of the piston inside the given cylinder, whereas 100% corresponds to the Bottom Dead Center (BDC) position.

Optionally, dynamic pressure data can be compared to the theoretical pressure curve assuming adiabatic conditions. The theoretical curve is a useful tool when diagnosing compressor faults. Note that the **Isentropic Exponent** of the compressed gas and the physical **Cylinder Clearance** of the cylinder need to be configured to get meaningful results (see next page).



With the **Displaced Volume** plot, you can:

- Show or hide the adiabatic curve
- Manual Scale
- Auto Scale
- Overlay Data

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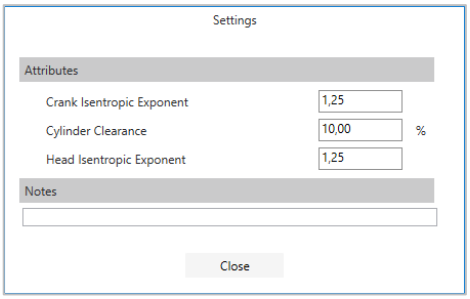
11.2.13.1 Configuring the Adiabatic Curve

In order to use the adiabatic curve as a tool for analysis, you must configure the **Isentropic Exponent** of the compressed gas mixture. Use an Equation of State solver (purchased or available on the Internet) to calculate the isentropic exponent for the head and crank chambers.

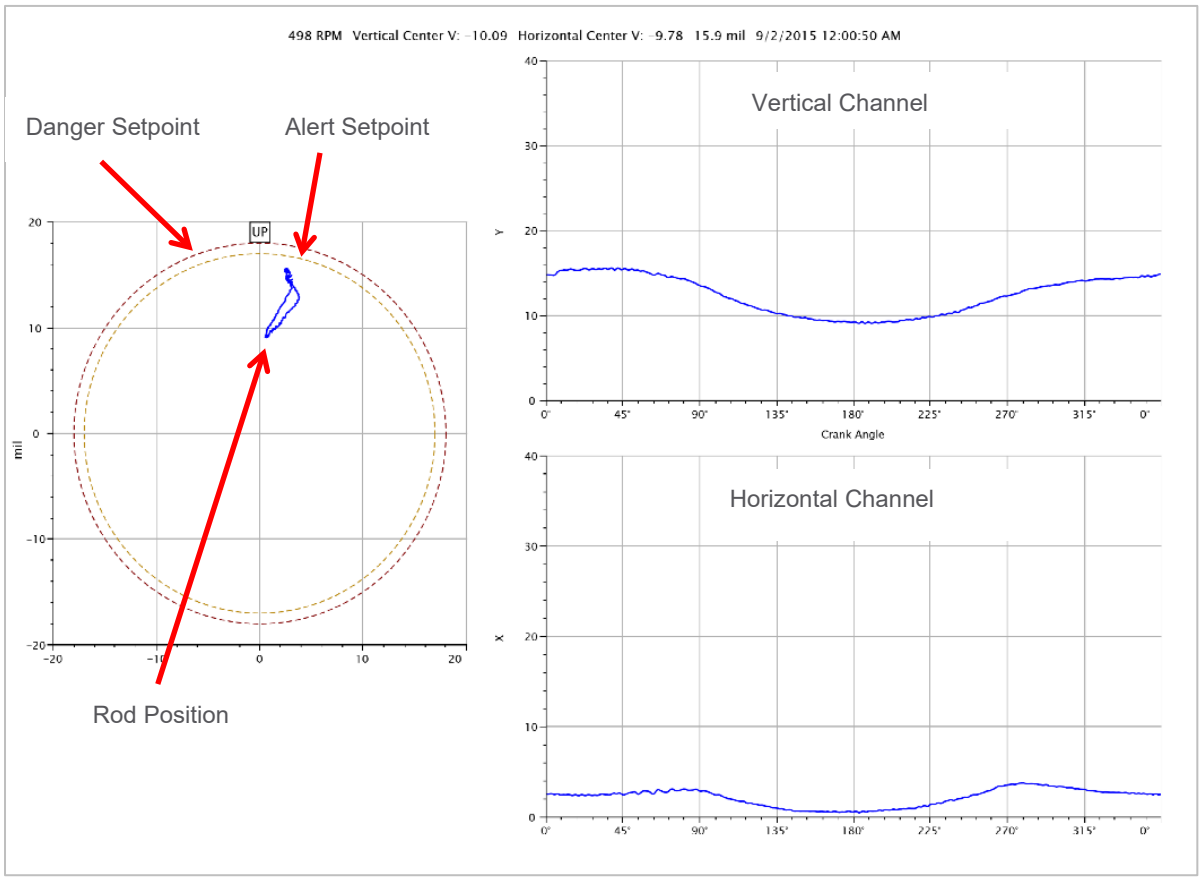
Moreover, the physical **Cylinder Clearance** has to be defined. This value is expressed as a percentage defined by the ratio of the *unswept* cylinder volume (also called *clearance volume*) to the *swept* cylinder volume.

Both values can most easily modified from the Plot Settings of a Crank Angle plot:



11.2.14 X Y Rod Position Plot

The X Y Rod Position plot visualizes the absolute movement of the piston rod connected to a cylinder within a recipocrating compressor. For that purpose, it makes use of data from an orthogonal pair of rod position channels (one horizontal, one vertical).



NOTE!

If only one channel of a rod position channel is selected, CMS will find the paired sensor and create the X Y Rod Position plot.

With the **X Y Rod Position** plot, you can:

- Adjusting the number of Revolutions shown
- Show Alarm Limits
- Manual Scale
- Auto Scale
- Overlay Data

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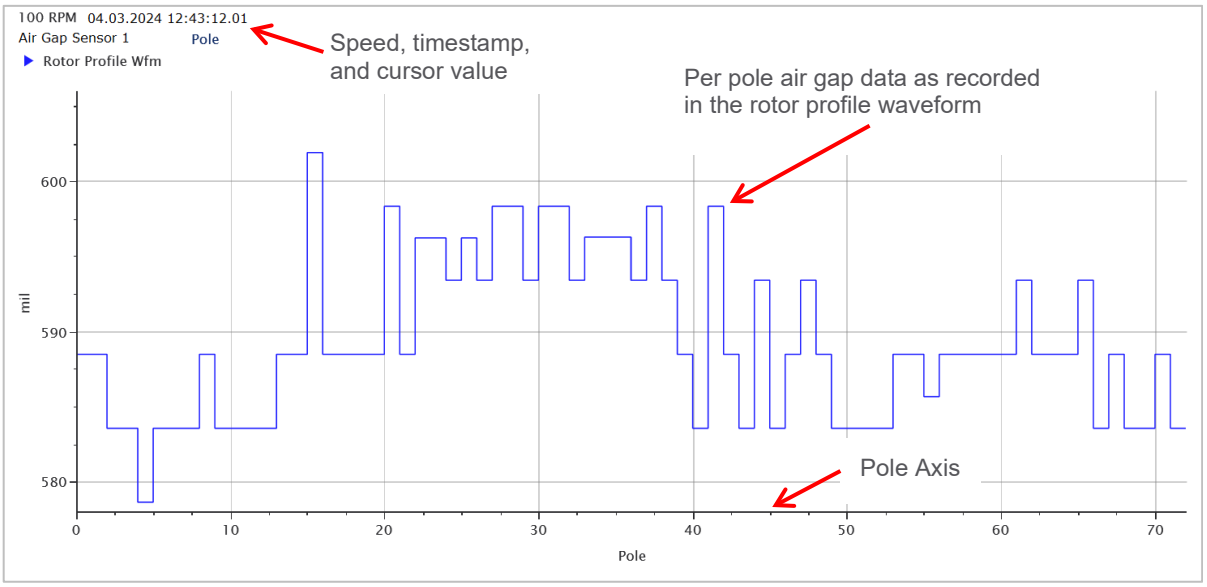
11.2.15 Unrolled Rotor Profile Plot

The Unrolled Rotor Profile plot displays the physical gap between the rotor and the stator of a hydroelectric generator, based on the rotor profile waveform of a single Air Gap channel.



The plot is thus very similar to a Timebase Plot of the same data, with two important differences:

- The X-Axis is given in terms of rotor poles, starting from pole 1
- If the rotor profile waveform contains two or more revolutions, the minimum gap value per pole across all revolutions is shown

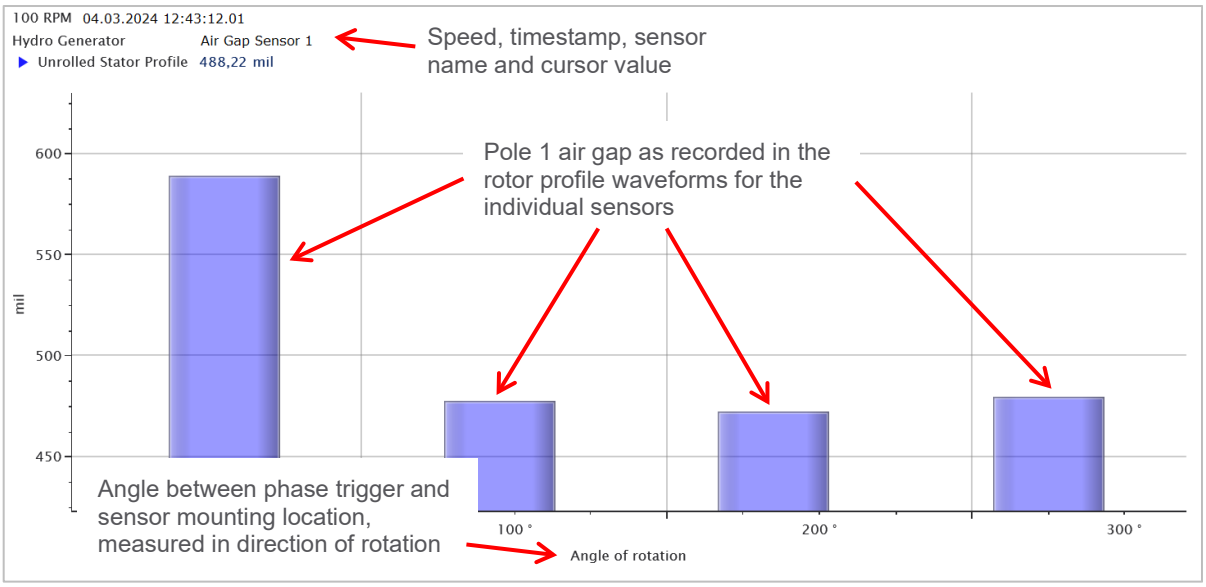
You can adjust your plot using these options:

- Manually Scale the Y-Axis
- Auto Scale
- Zoom in on a section of the plot
- Overlay Data

Go to Plots overview

11.2.16 Unrolled Stator Profile Plot

The Unrolled Stator Profile plot visualizes the shape of the stator of a hydroelectric generator by combining rotor profile waveform data from multiple Air Gap sensors. In particular, the pole 1 gap for the individual sensors is plotted as a bargraph, where the X-Axis location is given by the angle of rotation of this pole as it passes a given sensor. As a result, the differences in the pole 1 gap measured by different sensors can be compared at a glance.



If the individual rotor profile waveforms contain two or more revolutions, the minimum pole 1 gap value per sensor across all revolutions is shown.

You can adjust your plot using these options:

- Manually Scale the Y-Axis
- Auto Scale
- Overlay Data

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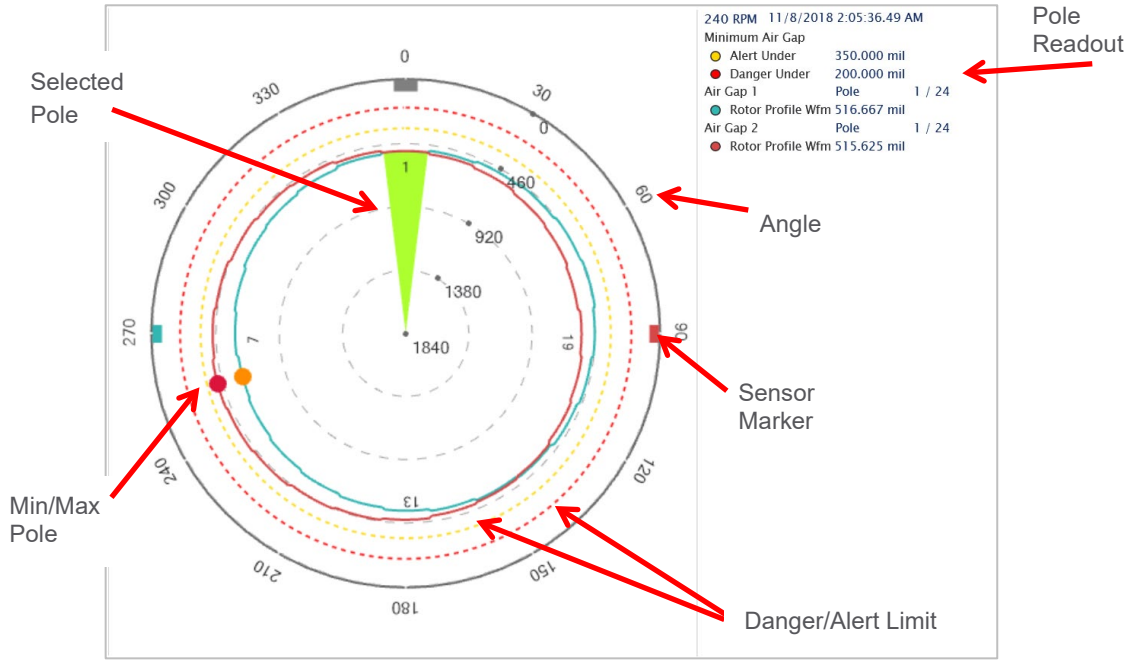
11.2.17 Circular Rotor Profile Plot

The Circular Rotor Profile plot presents the physical gap between the rotor and the stator of a hydroelectric generator on a circular canvas. It makes use of the rotor profile waveforms of one or multiple Air Gap channels. Minimum and maximum poles are highlighted on the rotor profiles. Sensor locations are marked around the outer circle. The order of the displayed angles (outside of the circle) and pole numbers (drawn within the plot) follow from the configured rotation direction and pole number direction.

The following plot shows an example where the rotation is clockwise, and the pole numbering is counterclockwise:



Alert and danger limits are drawn on the plot to visually track how close a pole is to a setpoint.

While moving the mouse from pole to pole, each area is highlighted. When selecting a pole, the following readout is presented on the right or the top pane of the plot:

- Rotating speed and timestamp
- The gap values of each sensor at the selected pole. If the rotor profile waveforms contain two or more revolutions, the minimum gap value per pole across all revolutions is shown
- Selected pole index and the number of total poles (example 1/24)
- Alarm limits which are defined by the Minimum Air Gap under same Air Gap channel

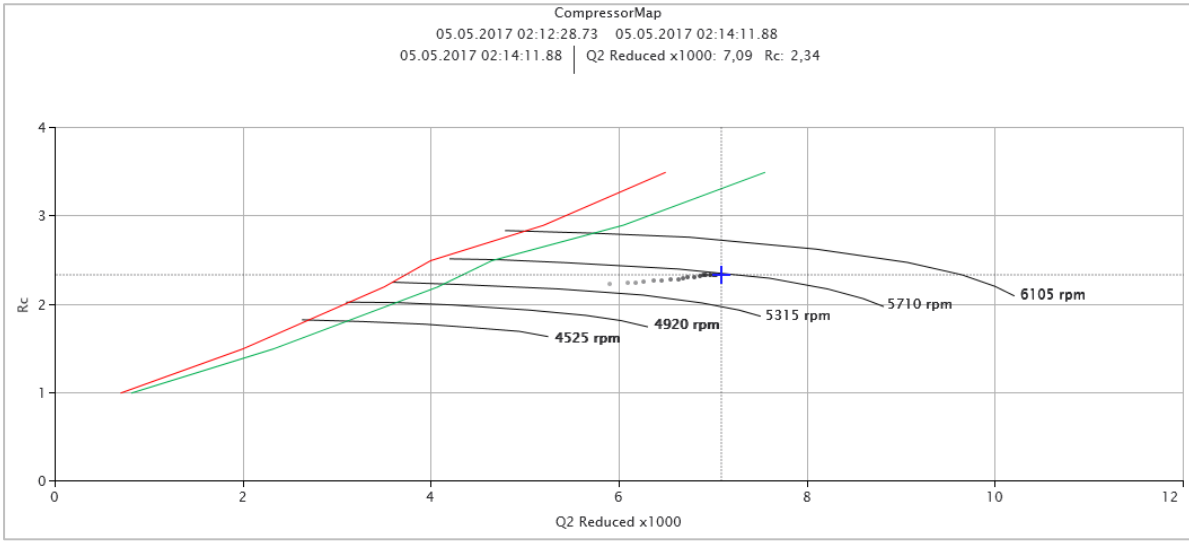
You can adjust your plot using these options:

- Manually Scale the Y-Axis
- Auto Scale
- Overlay Data

Go to Plots overview

11.2.18 Compressor Map Plot

The Compressor Map plot shows the operating point, surge control line, and surge limit line for a centrifugal or axial compressor.



NOTE!

Using Compressor Map plots required a specialized setup. Please contact your Brüel & Kjær Vibro service representative if you are interested in using this plot type.

11.3 Analyzing the Data

This section describes various tasks you can perform while analyzing your data. These include:

- Scaling Plots automatically or manually
- Paging through plots
- Zooming in on a plot
- Maximizing the plot area
- Popping out a plot to a full screen window
- Rotating and Sizing Waterfall and Cascade Plots
- Using cursors
- Using overlays
- Viewing live data
- Playing back recorded data
- Changing plot settings
- Viewing alarm markers
- Displaying alarm levels on Trend plots
- Adapting the channel ordering
- Compensating the data
- Selecting a compensation sample
- Pining plots
- Time-locking plots
- Using machine states and manual states
- Resolving error messages

11.3.1 Scaling Plots

SETPOINT CMS can scale plots automatically or manually.

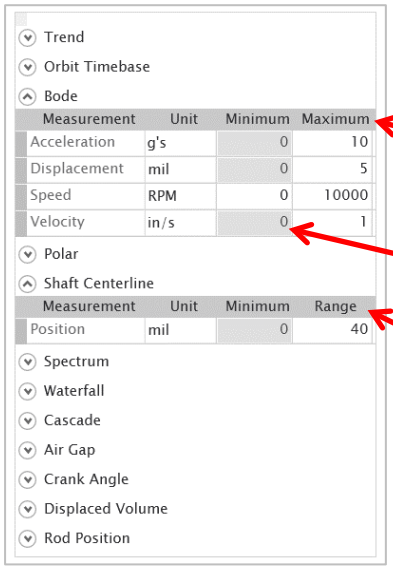
Auto Scale

When using Auto Scale, SETPOINT CMS selects the best axis scales to optimize the data presentation for the plots. This is recommended for most applications. Automatic scaling is available for the Y-Axis of all plot types and units. Note, however, that the X-Axis of Spectrum, Waterfall, and Cascade plots is always scaled manually.

SETPOINT CMS can scale each plot independently (**Normal**) or all plots of the same type together (**Compare Plots**). When scaling in **Compare Plots** mode, the scale will automatically adjust to the size of the largest values viewed in the plot.

Manual Scale

When Auto Scale is deactivated, SETPOINT CMS defaults to the global manual scale limits defined in the Manual Scales pane. Here, manual limits can be defined *per plot type* and *per scale type* (e.g., **Acceleration**, or **Speed**):



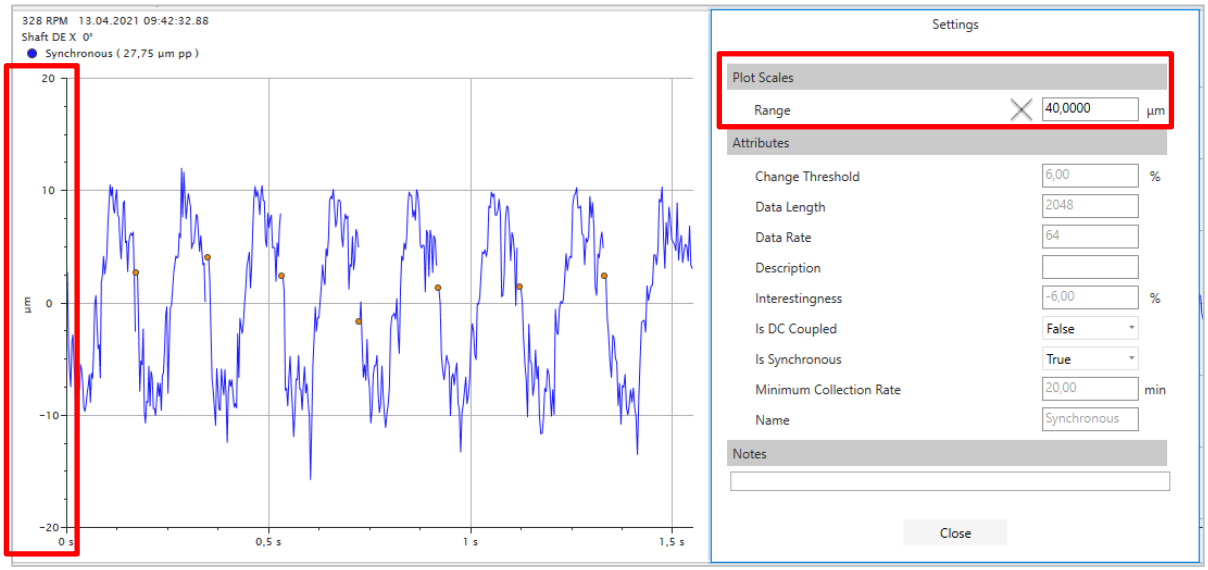
You can set the **Maximum** for each plot type and each scale type. When **Auto Scale** is turned off, plots using the given unit will scale to the set value.

Minimum values are used only on the Trend and Reciprocating Compressor plots. Unused **Minimum** cells will be disabled.

Some plots like Orbit/Timebase, Shaft Centerline, Rod Position use **Range** instead of **Maximum**.

Note that SETPOINT CMS can handle measurement data in units that are not listed in the Manual Scales pane. Corresponding traces will always be scaled *automatically*.

Individual plots, on the other hand, can be scaled manually (**Per Plot Scaling**) from the plot settings dialog:



Note that this option is only available when Auto Scale is turned off.

NOTE!

Per plot scaling is not supported on Large Trend, Crank Angle and Displaced Volume plots.

11.3.2 Paging Plots

This section describes the ways to page through the plots.

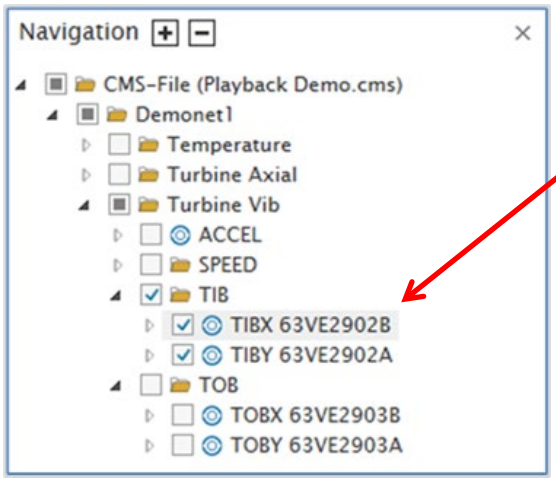
For an overview over existing pages, open the Pages pane. You can also page plots or open the Pages pane using the controls at the lower left of the screen as shown below.

Click on the right or left arrows at the bottom of the screen to page to the next or previous plot. The arrows are not active if there is only one plot page. You can also use the Alt key and the left and right arrow keys to page plots.

Click on “Page” to open up the Pages Pane. The Pages Pane shown below gives a preview of the plots on each page and allows quick navigation between pages.

11.3.2.1 Paging through Plot Types for a Group of Channels

Follow these instructions when you want to view the same plot type for several channels.



Select the points or bearings that you want to view using the Navigation Pane.

1) Select the plot types you want to compare.
2) Set the number of plots shown on a page to 2 or 4.
3) Use the Pages Pane to page through the plots.

11.3.2.2 Paging through different plots for a channel or bearing

To page through the various plot types for a single channel or bearing follow the links for these steps:

1) Select the channel or bearing using the Navigation Pane.
2) Activate the desired plots.
3) Use the Pages Pane or the page arrows to page through the plots.

11.3.2.3 Get Two Plots Next to Each Other for Comparison

There are several ways to get two plots next to each other for comparison.

If the plot types are different but are on the same channel, you can remove unwanted channels from the selected data.

Example: Put Orbit/Timebase and full spectrum side by side for a bearing:

1) Use the Navigation Pane to select the bearing and remove other points from the selected data list.
2) Select two plots per page.
3) Turn on Orbit, Timebase, and Spectrum plots and turn the other plots off.
4) Set the spectrum for Full Spectrum.

If the plots are the same type but on different channels:

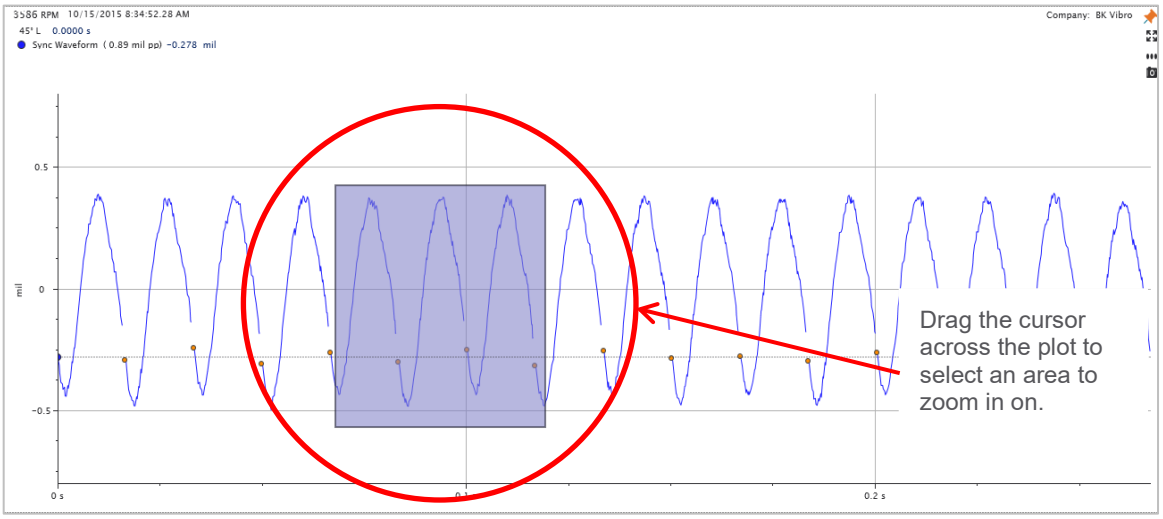
1) Use the Navigation Pane to select the desired channels and remove other points from the selected data list.
2) Select two plots per page.
3) Turn on the plot type you want and turn the others off.

If the plots are of different types and on different channels:

1) Pin the plots that you want to compare.
2) Select two plots per page.
3) Turn off all plot types so only the pinned plots display.

11.3.3 Zooming in on a Plot

You can rubber-band zoom on the Timebase, Shaft Centerline, and Spectrum plots as shown:



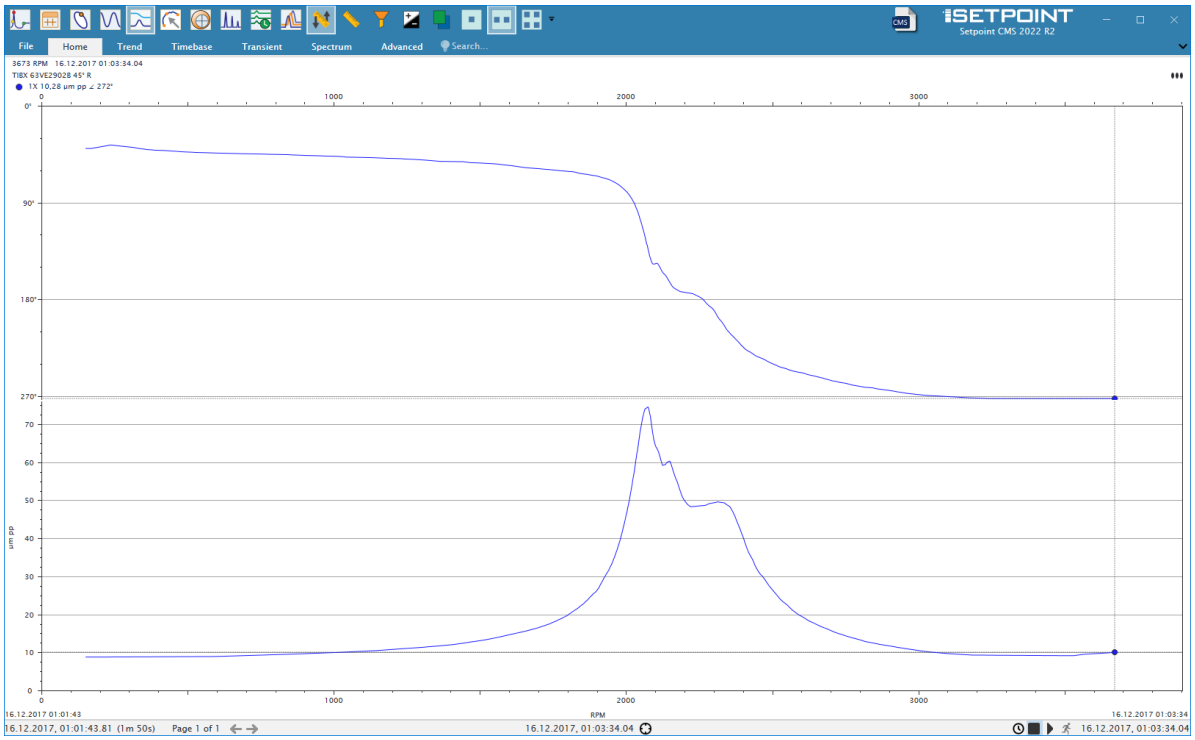
Alternatively, you can use the mouse scroll wheel to zoom in or out on these plot types.

11.3.4 Increasing the Plot Area

You can increase the area available for viewing plots by:

- Collapsing the ribbon
- Hiding panes, e.g., the Navigation Pane
- Hiding the Timeline
- Hiding the Small Trend

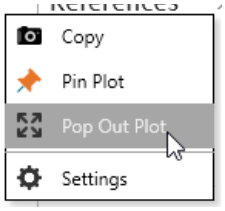
The following figure shows the plot area maximized:



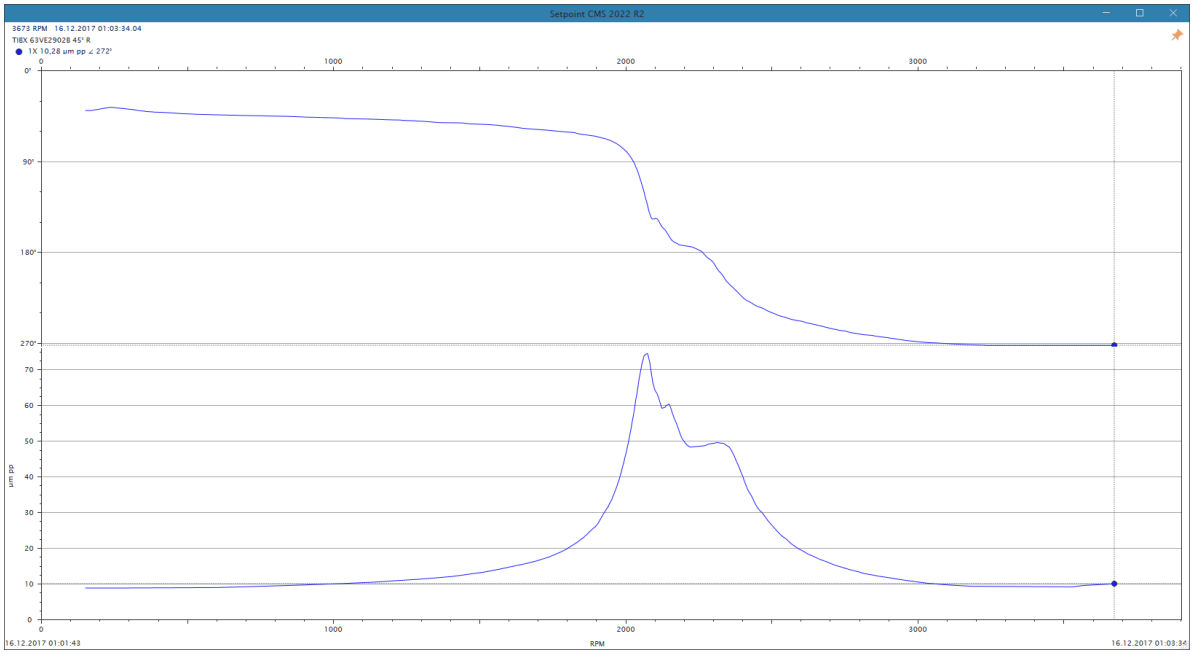
Alternatively, you can display a single plot in a separate, full screen window.

11.3.5 Popping Out a Plot to a Full Screen Window

You can quickly expand a plot to fill the full screen by clicking the full screen icon. Hover the cursor over the plot to show the plot controls in the plot upper right corner. Then click the **Pop Out Plot** button:



The newly created window can be moved and resized:

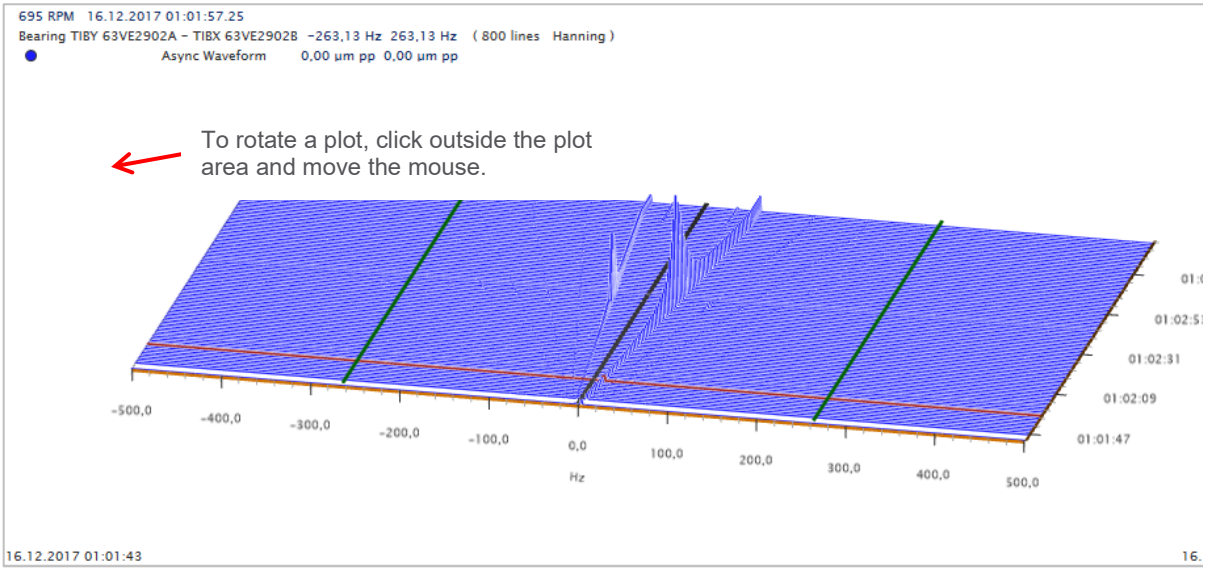


If full screen window has already been opened, popping out another plot will *replace* the currently displayed.

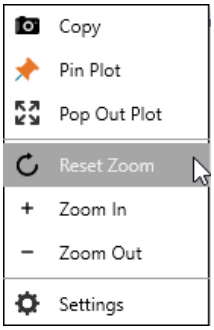
Press the Escape (ESC) key to exit full screen mode.

11.3.6 Rotating and Sizing Waterfall and Cascade Plots

You can rotate and size the Waterfall and Cascade 3D plots, which first load in the selected default view.



To restore a 3D plot to the default rotation, hover the cursor over the plot to show the plot controls in the plot upper right corner. Then click **Reset Zoom**.



To change the size of the plot, click **Zoom In** or **Zoom Out** in the same menu. Alternatively, use the mouse scroll wheel.

11.3.7 Using Cursors

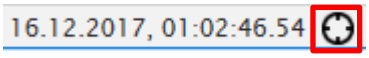
Cursors provide you with a numerical readout of the value at a specific point on the plot. Click on plot to activate a **Single** cursor. This type of cursor is available on all plot types.

Use the right/left arrow keys to move the cursors to the right or left. Hold down the arrow key to move the cursor faster.

Each plot in the main plot area has individual cursor that generally point to different points in time, speeds, or frequencies. You can synchronize the cursors time with other plots in two ways:

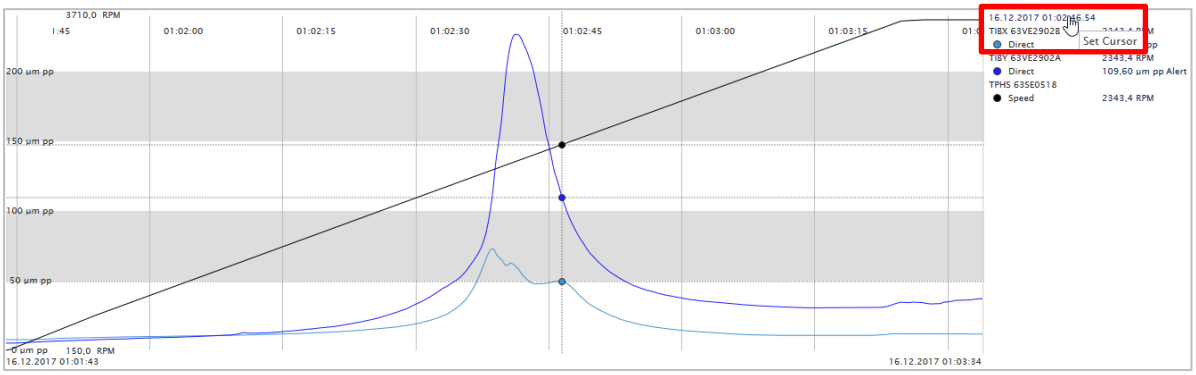
Synchronizing Cursors using Set Cursors

Click the **Set Cursors** button at the bottom of the screen to move the cursor on Large Trend, Bode, Polar, Shaft Centerline, Waterfall, and Cascade plots to the dynamic cursor time.



Synchronizing Cursors from a Plot Header

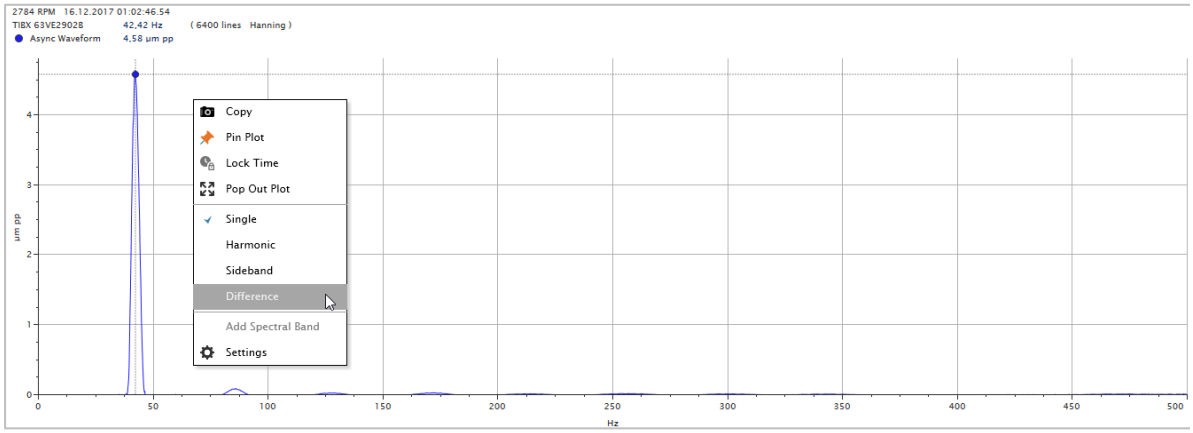
You can synchronize the cursor times of all active Large Trend, Bode, Polar, Shaft Centerline, Waterfall, and Cascade plots by clicking on the time readout in the plot header:



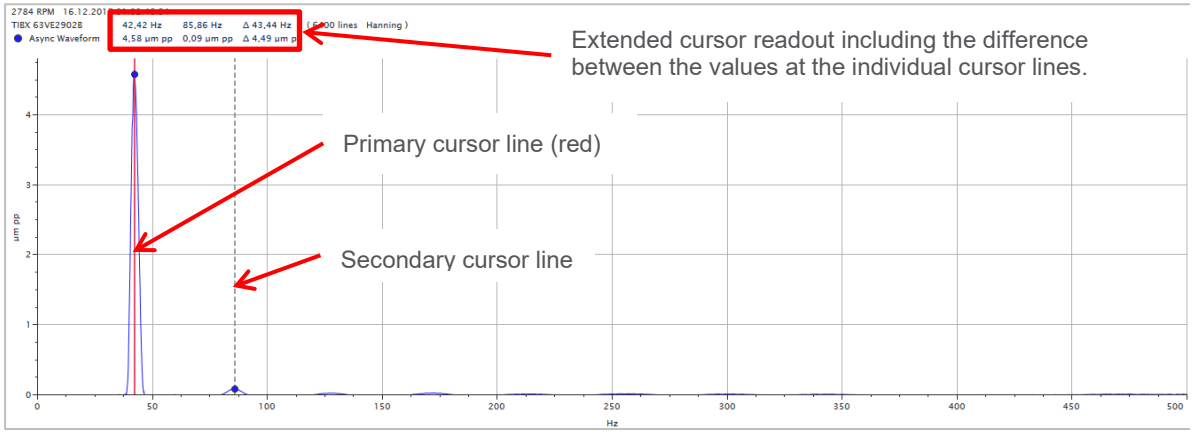
Note that this will also move the dynamic cursor time to the same position.

11.3.7.1 Difference Cursors

Difference Cursors are supported on Large Trend, Timebase and Spectrum plots. To activate the **Difference Cursor**, click on the corresponding entry in the plot context menu:



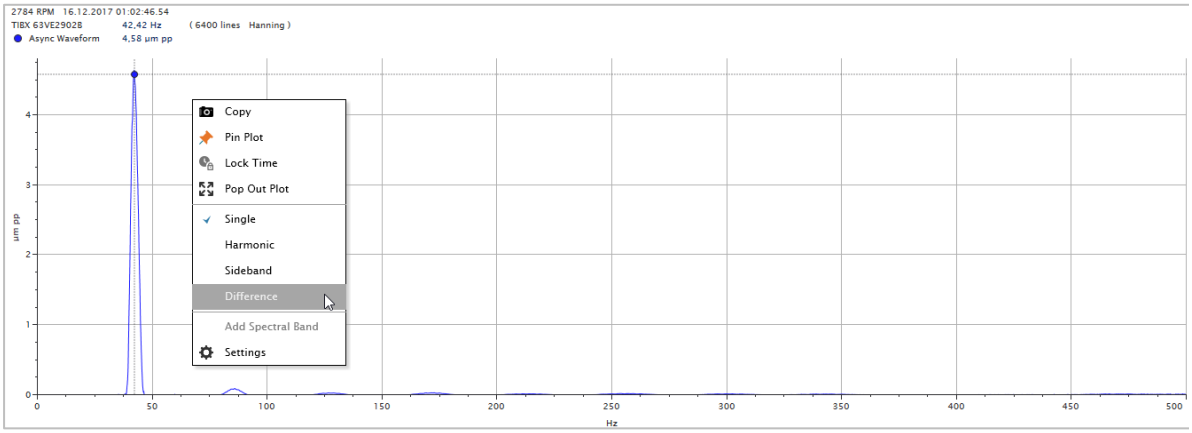
This will add a secondary cursor line and a corresponding readout to the plot:



The secondary line maintains its distance to the primary cursor line when being move. Grab the secondary cursor line and move it to change the distance between the cursor lines.

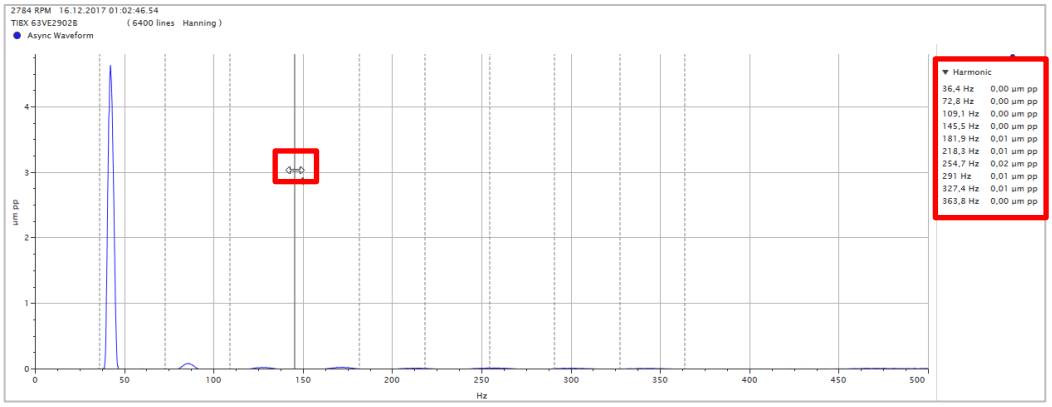
11.3.7.2 Harmonic and Sideband Cursor

Harmonic and Sideband Cursors are supported on Spectrum plots only. To activate the **Harmonic Cursor** or the **Sideband Cursor**, click on the corresponding entry in the plot context menu:

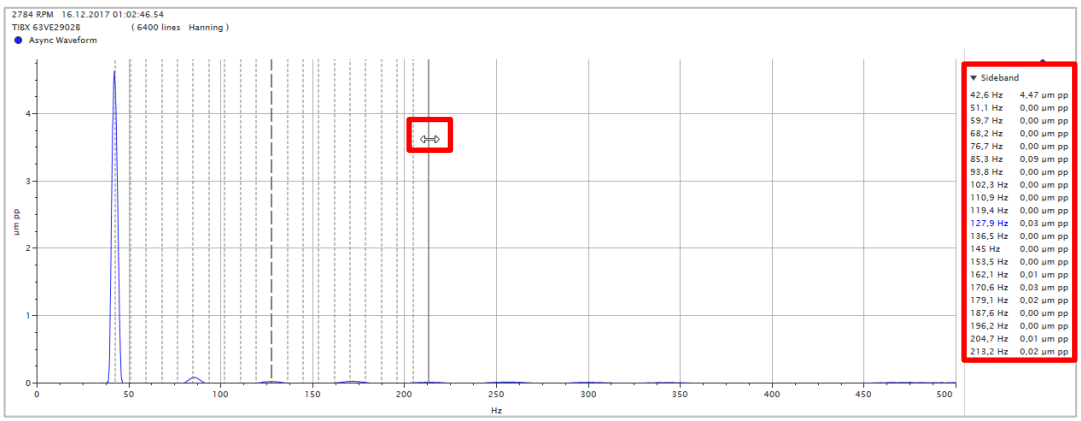


In both cases, cursor readouts will be presented in a side pane. Grab individual cursor lines to change the cursor position and the distances between the cursor lines.

Harmonic Cursor



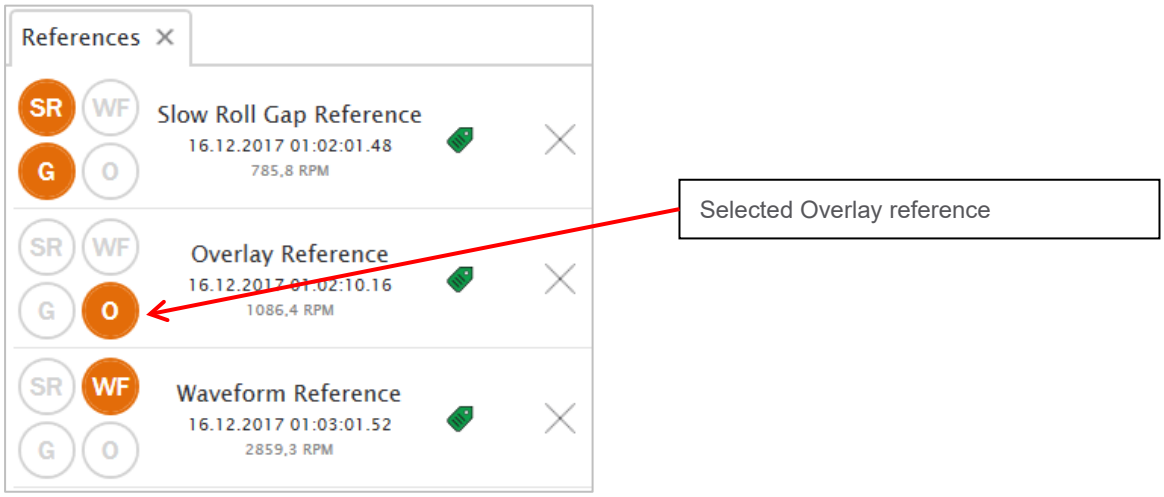
Sideband Cursor



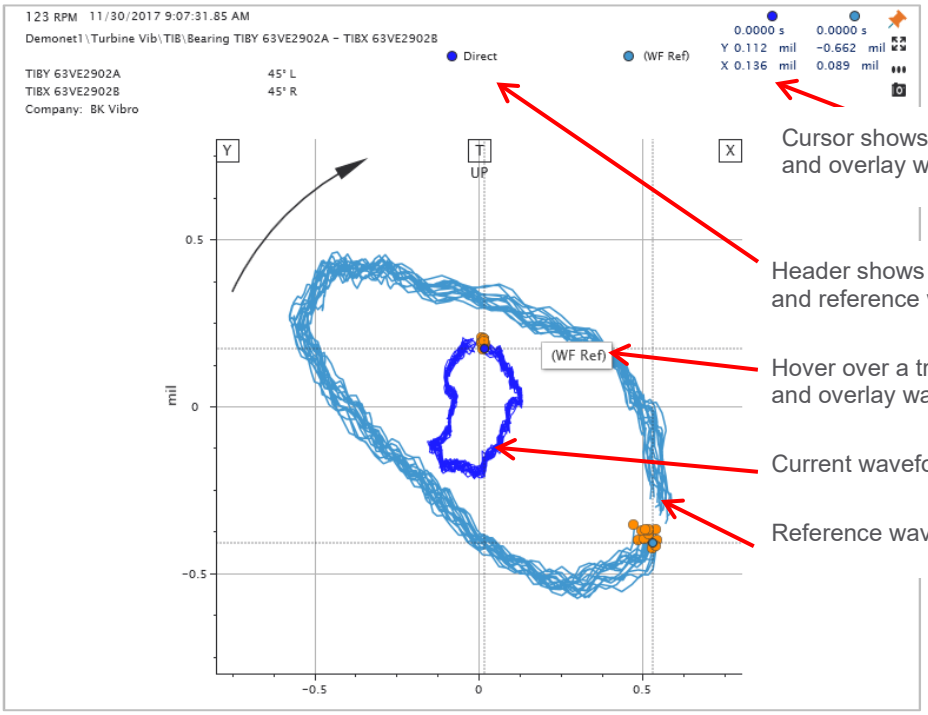
11.3.8 Using Overlays

You can overlay a selected data set on the plot along with the currently selected data. The overlay function uses reference data samples. To overlay data:

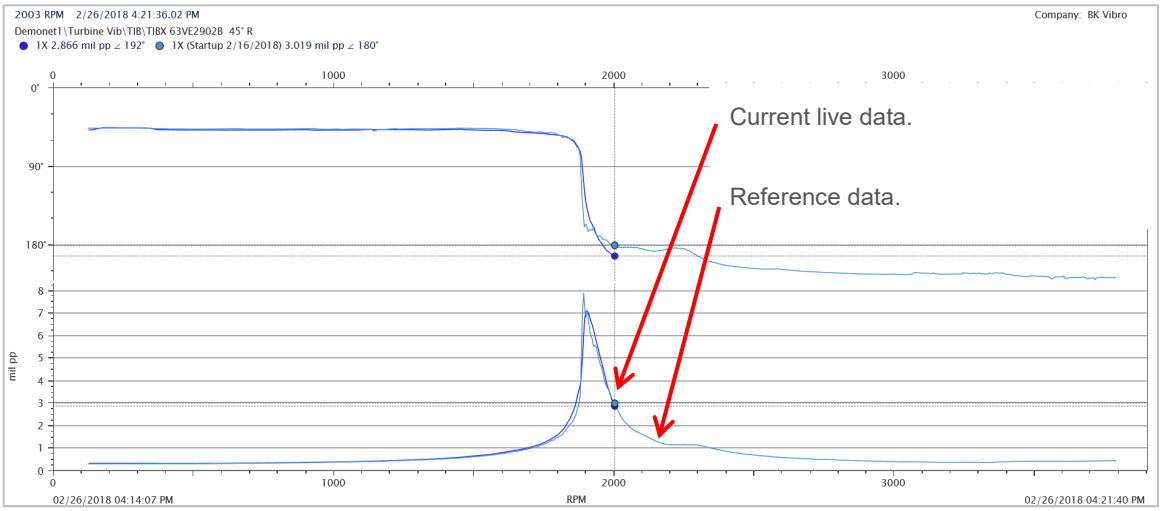
1. Add a reference data sample for the data you wish to overlay.
2. Select the reference data sample you want to overlay.
3. Activate Overlay.



When **Overlay** is active, the waveform from the selected reference time will be plotted along with the current waveform:



You can activate overlays simultaneously to viewing live data. This is very useful with Bode, Polar, and Shaft Centerline plots for comparing the current live values with a reference:



11.3.9 Viewing Live Data

Clicking the **Running Man** button at the bottom of the screen causes all of the plots to update automatically as new data is loaded into an online database (AF PI, CMS-XC, or CMS-HD).

Click the square **Stop** button to stop live mode.

NOTE!

When viewing live data, plots are updated every 2 seconds. If the data is changing rapidly, when you exit live mode, you will see additional information filled in from the historical database.

NOTE!

In live mode, Cascade and Waterfall plots will stop updating when they reach the displayed waveform limit. Increase the number of displayed waveforms or decrease the selected time range to resume updates.

11.3.10 Playback Function

In playback mode, the software takes the selected time range and plays the data back from dynamic cursor time to end time. To start playback, click on the **Play** button at the bottom of the screen.

You can speed up the playback by repetitively clicking the playback button. The playback button changes to indicate the playback rate:

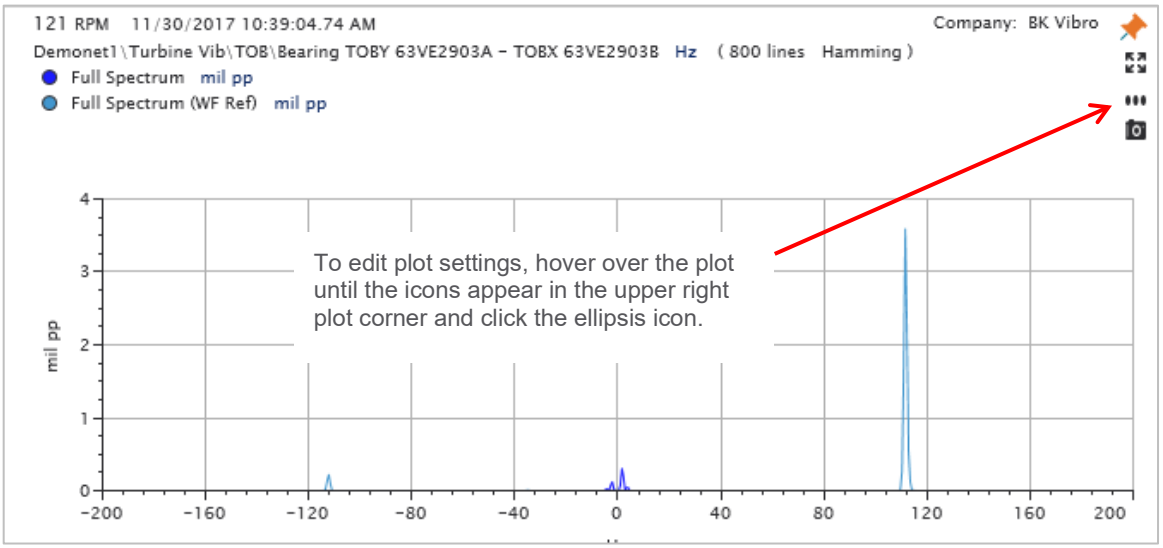
Icon	Description
	Data plays back in real time.
	Playback is sped up by a factor of 4.
	Playback is sped up by a factor of 16.

Playback starts from the dynamic cursor location. Click the square **Stop** button to stop playback mode.

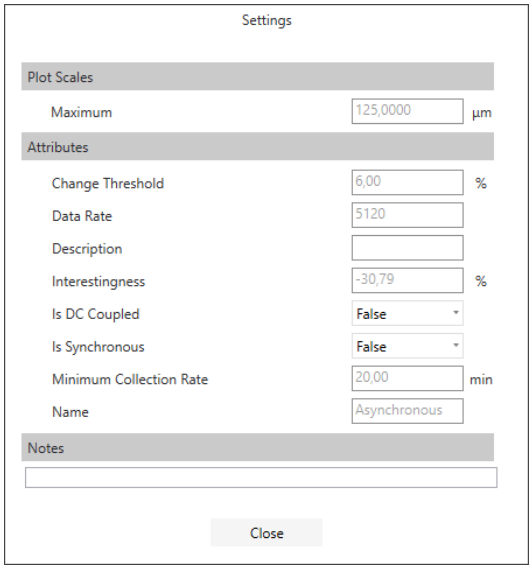
11.3.11 Changing Plot Settings

SETPOINT CMS requires various pieces of information about a point to correctly display and annotate plots. For example, the Shaft Centerline plot requires bearing clearances in order to place them on the plot. SETPOINT CMS stores this information within the active database.

The **Plot Settings** dialog can be opened by right clicking a plot, or by clicking on the ellipsis in the upper right corner of a plot (only displayed when hovering the plot). The icon is grayed out if there are no configurable settings for this particular plot.



An exemplary **Plot Settings** dialog looks as follows:



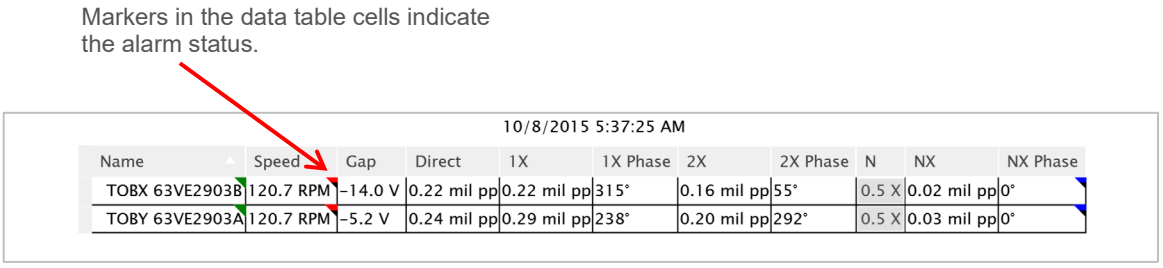
The Plot Scales setting can be used for Per Plot Scaling.

Which settings are available from this dialog depends on the individual plot types and, if applicable, on the configuration of the AF-PI database. Typical settings include:

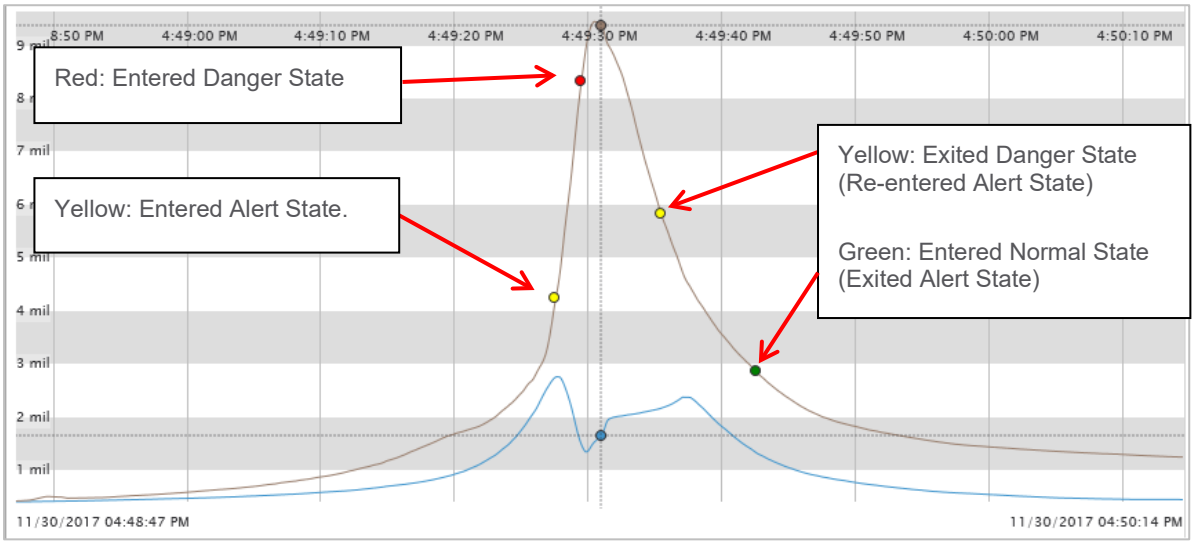
Setting	Description	Applicable Plot Type
Horizontal Bearing Clearance	The bearing clearance in the horizontal direction.	Shaft Centerline
Vertical Bearing Clearance	The bearing clearance in the vertical direction.	Shaft Centerline
Shaft Reference Location	The location in the bearing where the shaft is when the machine is at rest: Top, Bottom, or Center.	Shaft Centerline
Machine Orientation	Provides a reference designation to where 0 degrees is. For a horizontal machine this will typically be “Up”. However, for a vertical machine the orientation may be another designation such as “North”.	Shaft Centerline, Orbit
Alert Level	Plots a circular region corresponding to the entered alert level.	Rod Position
Danger Level	Plots a circular region corresponding to the entered danger level.	Rod Position
Notes	Free text field for plotting a note on the plots. The notes are unique for each plot.	All

11.3.12 Viewing Alarm Markers

You can view measurement alarm status using markers on the Trend plot or using the Data Table.



Activate Data Annotations to show markers on Small Trend and Large Trend plots that show a change in the measurement alarm status. This is a powerful tool that graphically shows which channels entered alarm first (First Out) and the following alarm sequencing.



NOTE!

The markers are only shown if there are alarms configured for the measurements used by the plot and Data Annotations are active. For example, the Trend plot showing only 1X amplitude and phase and will only show alarm markers if there are 1X amplitude or phase alarms configured.

NOTE!

If multiple alarms occur at the same time (for example, a rapidly increasing vibration exceeds the alert and danger setpoints simultaneously) only the most severe status is shown.

NOTE!

Alarm markers include the configured alarm time delay. If a machine transitions rapidly from no alarm through both alert and danger levels, danger may be indicated before alert (if alert has a longer configured time delay).

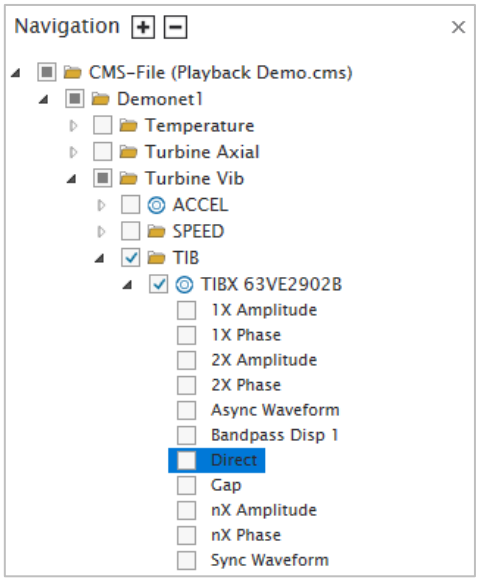
The Data Annotations setting also controls whether state markers are displayed on Small Trend and Large Trend.

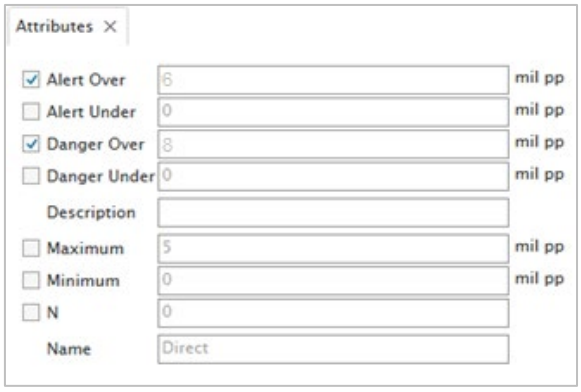
11.3.13 Plot Alarm Levels on Trend

You can plot alarm limits on Small Trend and Large Trend plots.

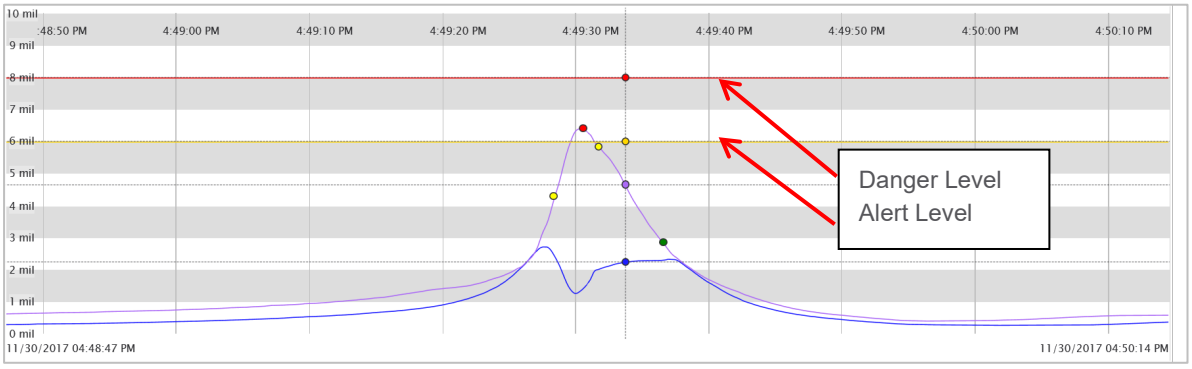
To add an alarm level to a plot, open the Attributes Pane. In the Navigation Pane, expand the asset path until you get to the measurement where the alarm levels are set. Click the alarm levels to select them.

The following example shows how to add traces representing the configured **Alert Over** and **Danger Over** limits to the plot:





The figure below shows that the defined alarm limits are presented on the plot. In this example, the alarm limits for the *blue* measurement are displayed. This measurement does not exceed the alarm limits, so no alarm is marked here for this trace.



11.3.14 Adapting Channel Ordering in the Navigation Pane

The Point Order setting defines how plots and Data Table entries are sorted. However, this setting does *not* influence the order of points in the Navigation Pane. This is due to the hierarchical nature of tree display which requires more information to sort entries and sub-trees properly.

As a result, SETPOINT CMS orders Navigation Pane entries alphabetically based on the **Description** field. By default, CMS loads the **Description** field with the point name such that the default point order is alphabetical by point name. You can change the point order by prepending a numerical value at the beginning of the **Description** field, as shown in the table below. For example, to number the channels for 2 bearings down a machine train, you could append the highlighted numbers:

Bearing	Channel	Description Field
Driver Outboard	1	1.1 Driver OB RV X
	2	1.2 Driver OB RV Y
Driver Inboard	3	2.1 Driver IB RV X
	4	2.2 Driver IB RV Y

Adding the highlighted numbers in the **Description** field as shown will cause these points to be ordered from outboard bearing to inboard, X then Y. If two channels have the same number appended, these two channels will be ordered alphabetically using the text following the numbers.

A good scheme to follow is to number in a hierarchy from highest to lowest level separating each level with dot. For example:

1. Machine

1.1 Case

1.1.1 Bearing 1

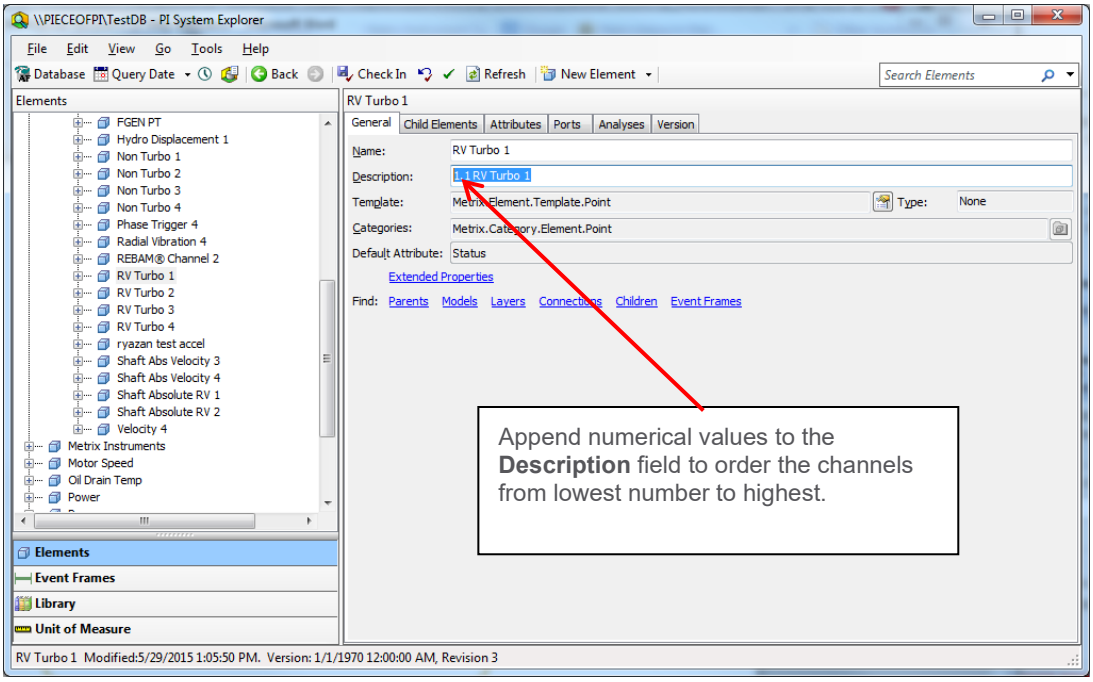
1.1.1.1 X Probe

1.1.1.2 Y Probe

1.1.2 Bearing 2

1.1.2.1 X Probe

1.1.2.2 Y Probe



NOTE!

You will need to reload the database (e.g., by closing and reopening SETPOINT CMS) to see the channel ordering change.

11.3.15 Compensation

Compensation allows you to remove unwanted noise content from the signal you are analyzing. Removing mechanical and electrical runout, scratches, or shaft bow enhances the clarity the dynamic shaft information. This section discusses the supported types of compensation, and the steps to configure and use them.

SETPOINT CMS cam perform three types of compensation: **Slow Roll**, **Waveform**, and **Gap** compensation.

The basic steps to using compensation are:

- Creating one or more reference data samples
- Select the sample to use for compensation
- Turn on/off compensation

11.3.15.1 Slow Roll (Vector) Compensation

Compensation applied to filtered Timebase, filtered Orbit, Polar, and Bode plots uses **Slow Roll** (or "vector") compensation. **Slow Roll** compensation subtracts the selected reference vector from the vibration vector, and plots the data based on the resulting vectorial difference.

11.3.15.2 Waveform Compensation

You can apply **Waveform** compensation to any dynamic data plot collected synchronously. This includes the Orbit and Timebase (for synchronous waveforms), as well as Spectrum, Cascade, and Waterfall plots (that are in orders of running speed).

Waveform compensation subtracts the reference waveform from the current waveform *sample-by-sample* and is very effective at removing unwanted frequency components up to ½ the sampling rate (Nyquist frequency).

NOTE!

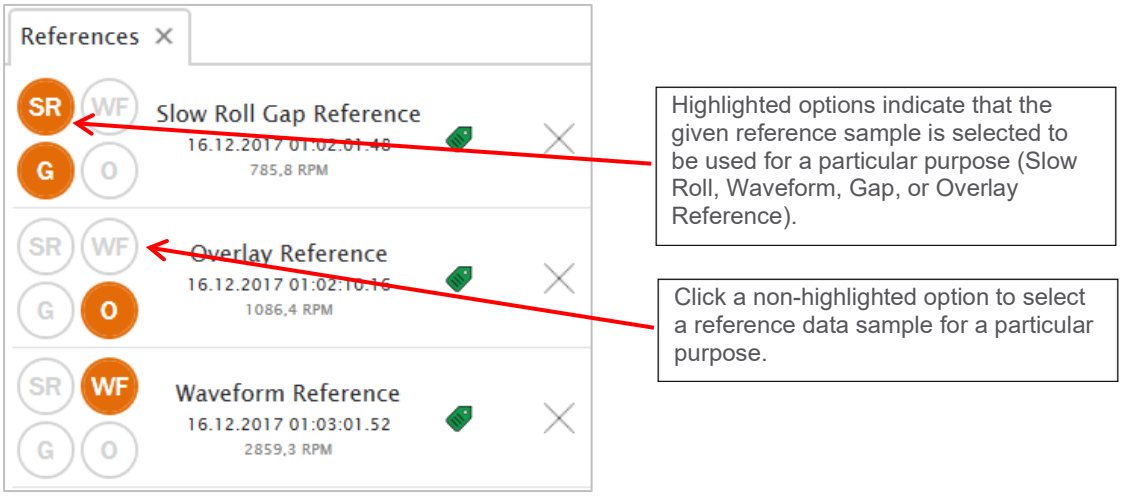
Waveform compensation requires synchronous waveform data, which depends on a Phase Trigger association.

11.3.15.3 Gap Compensation

Gap compensation subtracts the selected reference gap voltage (e. g., taken in a stopped state) from the gap value readings before plotting. **Gap** compensation is used primarily with the Shaft Centerline plot.

11.3.16 Select a Compensation or Overlay Reference Sample

Select the reference sample for compensation from the Reference Data pane. You can use different reference data samples for **Slow Roll** compensation, **Waveform** compensation, and **Gap** compensation. Note that only one reference sample can be active per compensation type at a time.



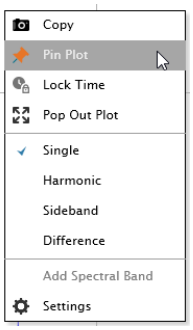
Individual measurement values stored within a reference data table can be viewed and edited from the Reference Data Table.

11.3.17 Pinning Plots

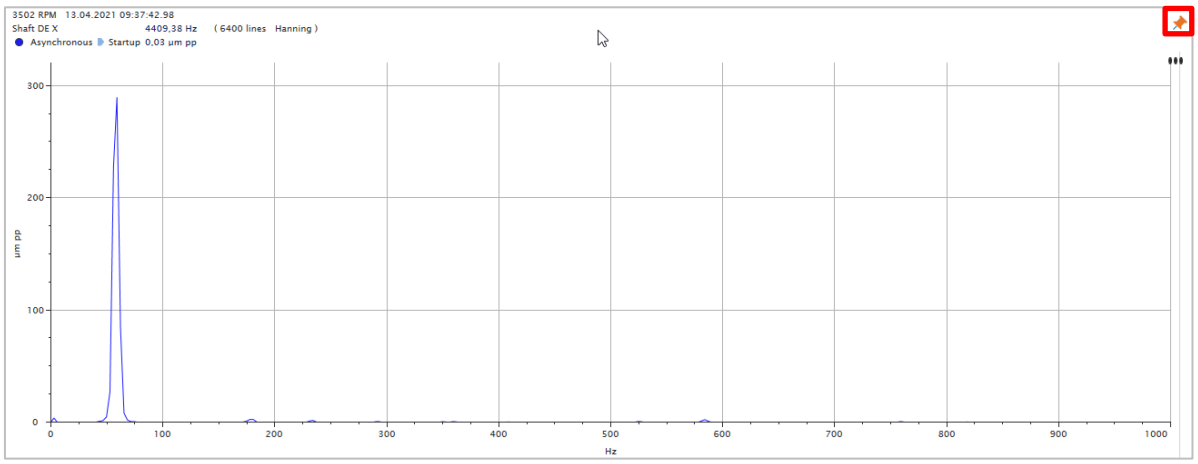
Pinning a plot causes the plot to be displayed, regardless of which Plots are currently activated. Plot pinning is useful when you want to compare several specific plots, or for selecting plots for reporting.

Pinned plots will change time range or time as the selected time or the dynamic cursor are changed, but they will retain the compensation and filtering settings that were active when the plot was pinned.

To pin a plot, right-click the plot and click **Pin Plot** in the corresponding context menu:



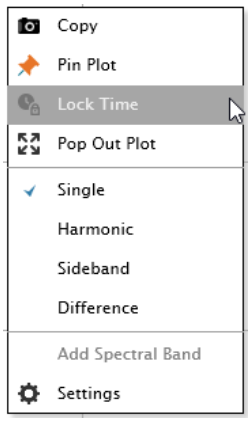
A pinned plot is displayed with pin icon in the upper right corner:



To unpin (remove) a pinned plot, click pin icon. You can also use the Clear Pins button to clear all pinned plots with a single click.

11.3.18 Lock Time

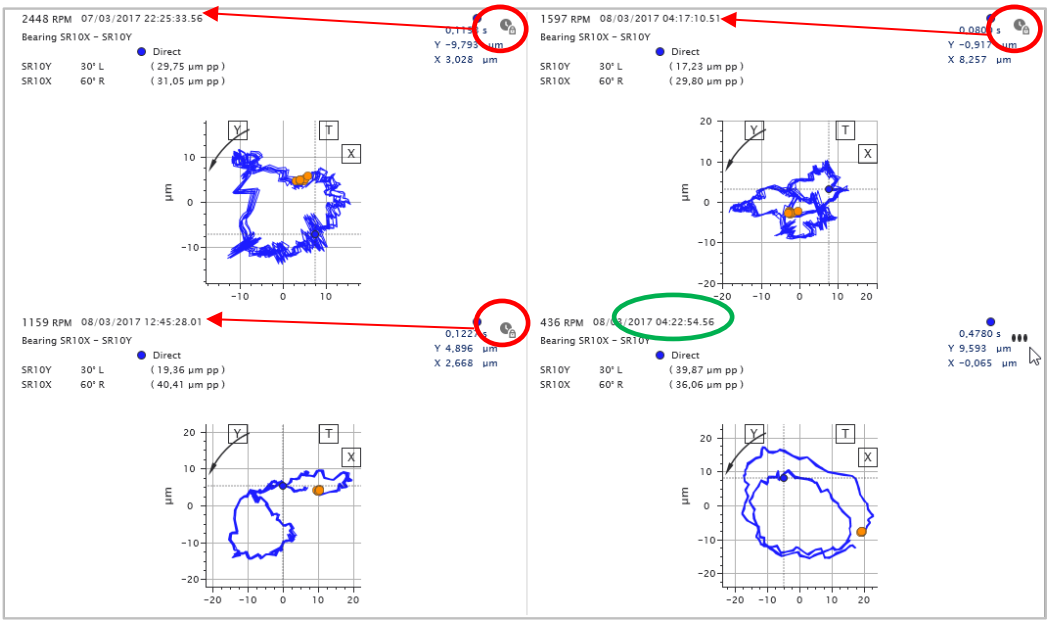
Right click and select **Lock Time** to freeze time for a given plot such that multiple plots *for the same channel* can be reviewed at different time instances.



NOTE!

The Lock Time function is applicable to Spectrum, Timebase and Orbit plots.

In the following example, three graphs are locked at three different time instances, which are different from the fourth (unlocked):



Click the **Time Lock** icon on a locked plot to unlock (remove) it. You can use the Clear Locks button to remove all locked plots with a single click.

11.3.19 Using Machine States and Manual States

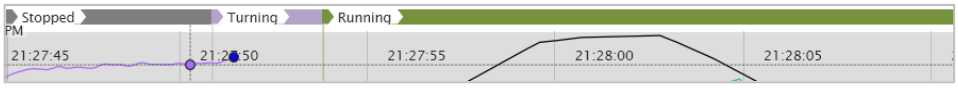
SETPOINT CMS can annotate plots with information about the state a machine was in when data sample was collected. Two types of states are supported:

- **Machine States** determined by a VC-8000 rack during data collection
- **Manual States** that can be added manually by the user

NOTE!

Machine States (or “rack-based states”) need to be licensed and configured from the VC-8000 Setup software.

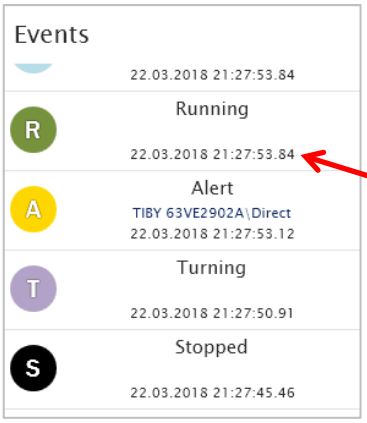
Both types of states are displayed in Small Trend and Large Trend plots when Data Annotations are activated. They are visualized in the **States Bar** at the top of the plot:



Machine States and **Manual States** can be used simultaneously, for example to further annotate a data set that already contains **Machine States**.

Some plot types can be colored based on the active state.

States *changes* are listed on the Events Pane. This is useful for selecting a time range centered around an event of interest:

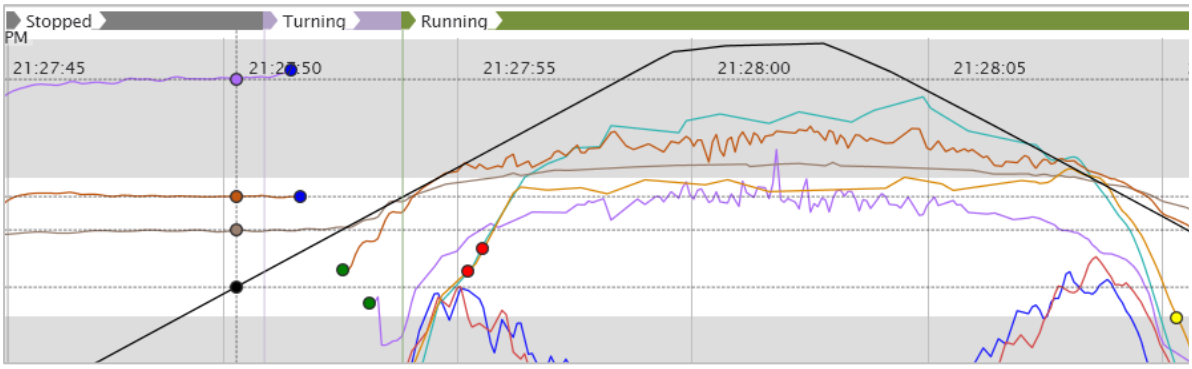


Clicking on a Machine State or Manual State time centers the selected time range around the event time.

11.3.19.1 Machine States (Rack-Based States)

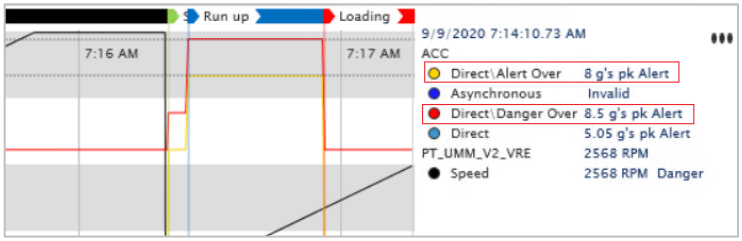
Machine States are configured from the VC-8000 Setup software, including name and color. Unlike **Manual States**, they cannot be edited from within SETPOINT CMS.

In the example below, the states “Stopped”, “Turning” “Running” have occurred sequentially on the same machine:



If assets from more than one machine are selected, up to 2 rows of states can be displayed simultaneously.

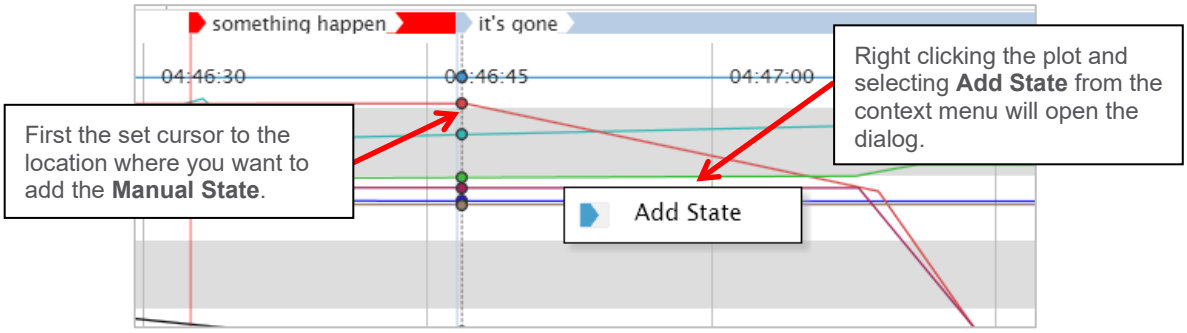
Measurements can have different alarm limits per machine state. When trending the alarm limits of a corresponding measurement, SETPOINT CMS will visualize these limits as a step function of the active **Machine State**:



11.3.19.2 Adding Manual States

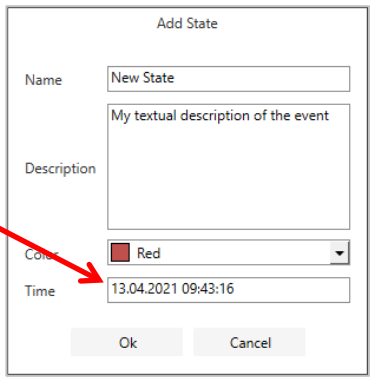
Manual States are useful for annotating relevant events during analysis.

To add a **Manual State**, open the Small Trend plot and set the dynamic cursor time to the relevant time location. Then right click the Small Trend plot and click **Add State** from the plot context menu.



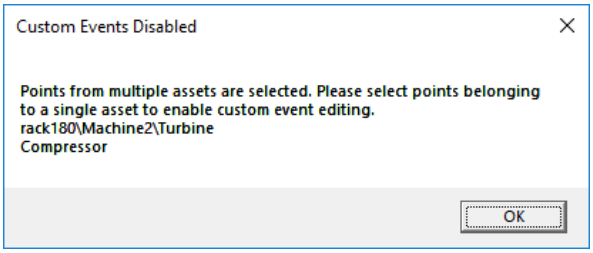
In the corresponding dialog, you can define the desired **Name**, **Description** and **Color** associated with the **Manual State** can be defined.

The dynamic cursor time is automatically assigned to the **Manual State**. It cannot be edited from the dialog.



NOTE!

A state marker can only be added to one selected asset (asset path defined with *). If there are more assets selected while adding, an error message will be shown.



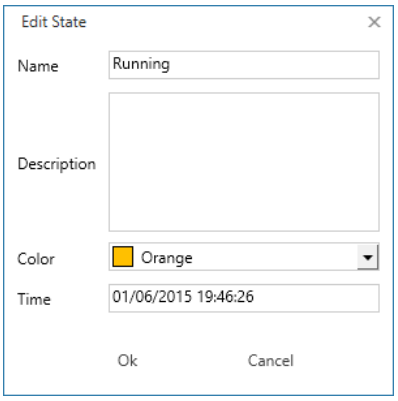
Please deselect all the other assets and retry adding a Manual State.
If there is no asset path defined in the hierarchy, the state will be added under root node by default.

11.3.19.3 Edit or Delete a Manual State

An existing **Manual State** can be edited or removed from Small Trend and Large Trend plots by right clicking the corresponding entry in the States Bar.

Right click the Manual State in the **States Bar** at the top of the Small Trend or Large Trend to open the context menu.

Select **Edit State** to modify the **Name**, **Description**, or **Color** of a **Manual State** from the corresponding dialog. Note that the **Time** cannot be edited.



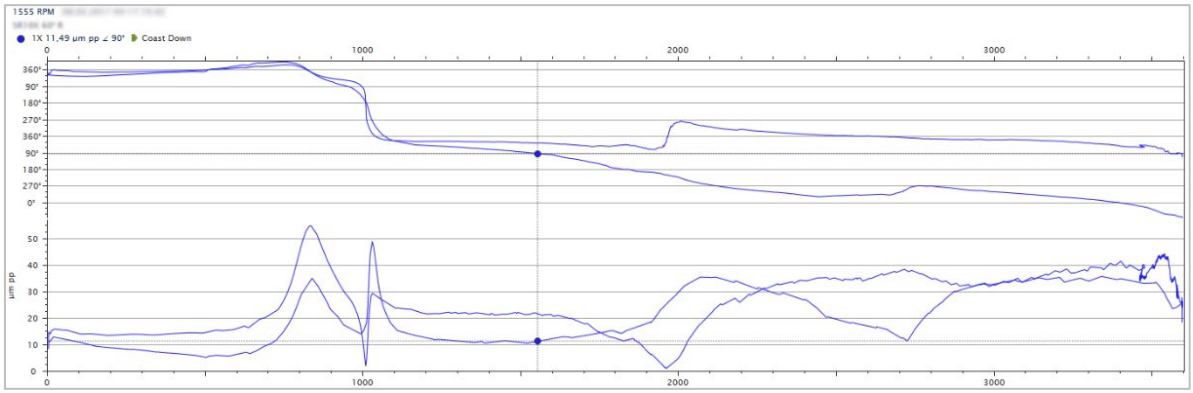
Select **Delete State** to remove a **Manual State**. Note that this operation cannot be undone.

11.3.19.4 Plot Coloring using State Based Display

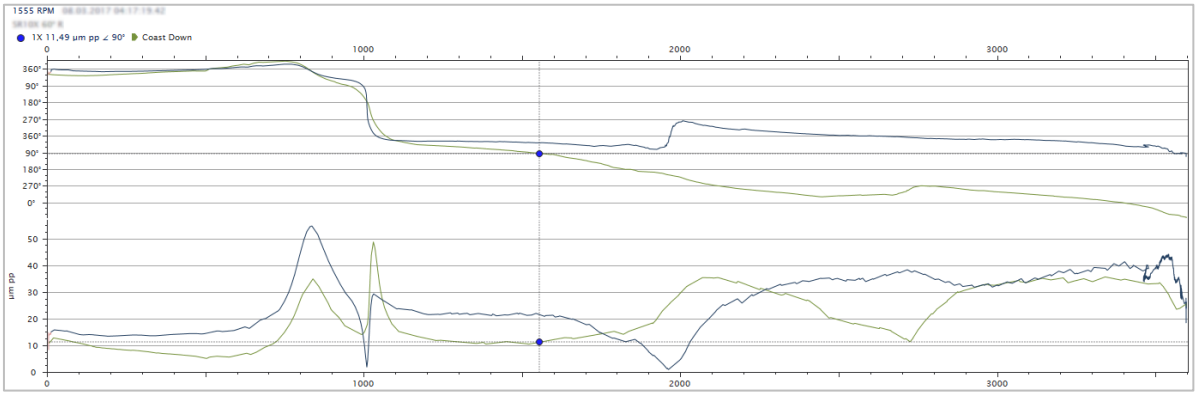
Machine States and **Manual States** can be used to color plot data based on assigned states. This allows vibration data to be displayed in context of the state of the machine state, which simplifies diagnosis.

Activate State Based to activate state-based coloring of plots. This feature is available on Orbit, Timebase, Bode, Polar, Spectrum, Waterfall, and Cascade plots.

Consider the example of a Bode plot that shows data recorded during the startup *and* the coast down phase of machine operation:



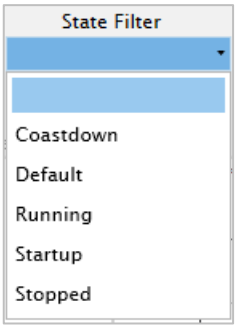
In the above plot, it is difficult to distinguish which part of the data represents which phase. After adding **Manual States** for “Startup” (dark blue) and “Coast Down” (olive green) and activating State Based, on the other hand, the coloring clearly indicates which data belongs to which phase of operation:



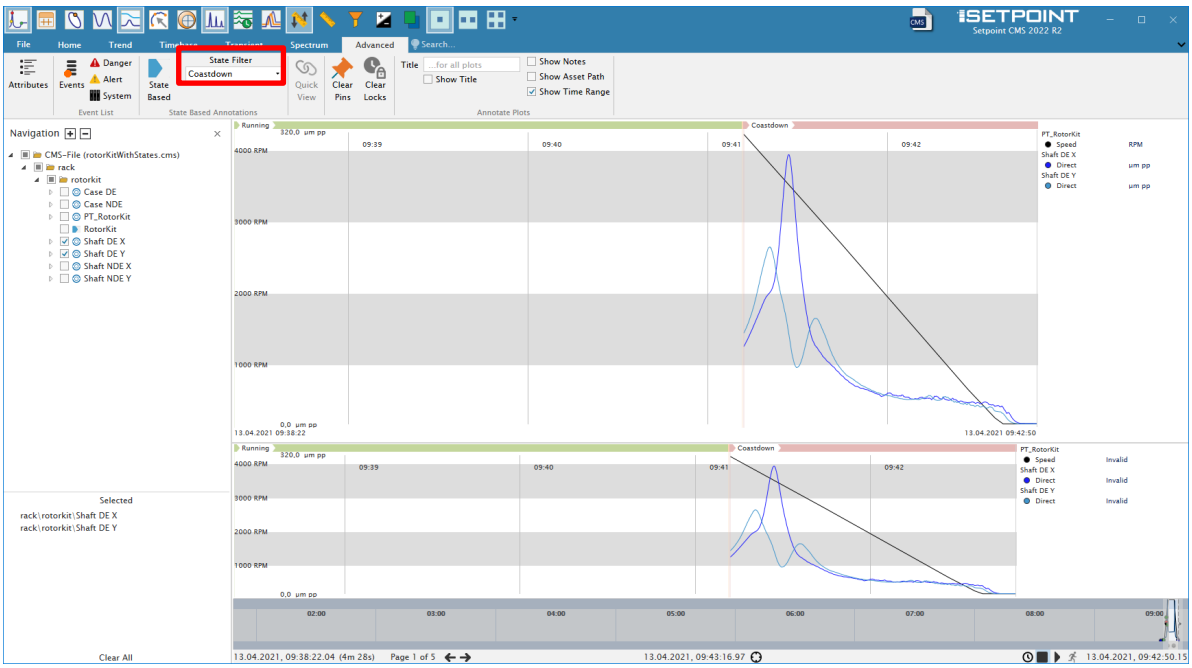
11.3.19.5 State Filtering based on Machine States

Machine (rack-based) states can be used to filter for data being displayed on Small Trend and Large Trend plots. This is useful to observe long term trends in machine behavior in the presence of spurious or misleading data that may have been recorded during non-relevant states of machine operation.

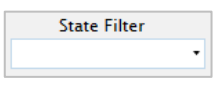
Use the State Filter combo box to activate this feature. It shows a list of all **Machine States** that are present in the currently selected database. Note that this list can thus only contain **Machine States** that have been configured in the VC-8000 rack. Below, an *exemplary* configuration is shown:



Selecting a **Machine State** from the provided list will remove Small Trend and Large Trend plots that is *not* related to the selected state. That is, the presented data will be filtered such that only data from the selected **Machine State** is being displayed. If Auto Scale is active, the plot Y-Axis will be updated accordingly.

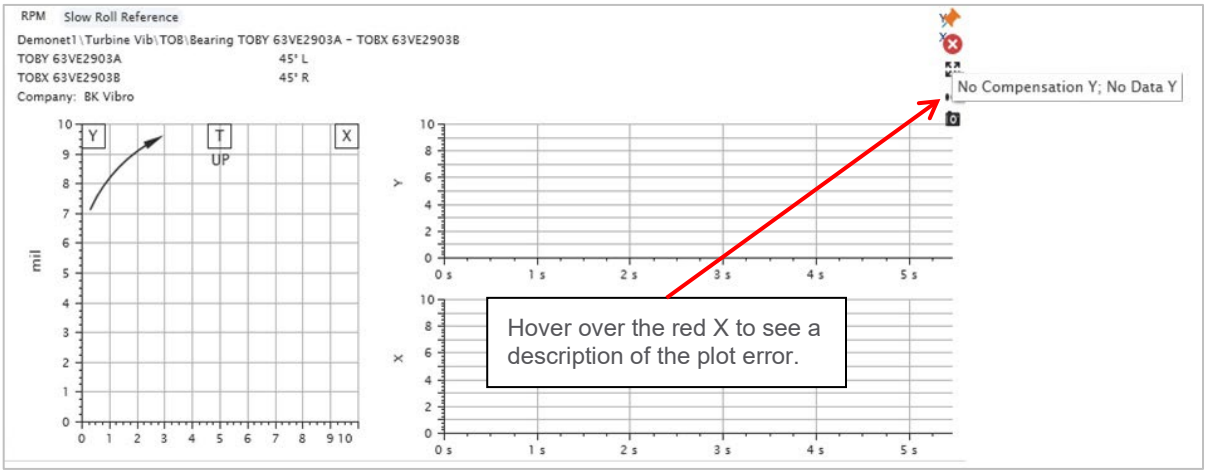


To return to the standard display, select the empty state filter option.



11.3.20 Error Messages

SETPOINT CMS will show a red “X” error indicator if there is a problem presenting a plot. Hover over the “X” to see a description of the problem. In the example below, 2X filtering and compensation were turned on, but no reference sample had been selected for compensation:



The following table lists common error messages and solutions:

Error	Description	Action
No Data	There is no data in the database in the selected time range.	Increase the selected time range.
No Compensation	The plot cannot be compensated because reference data is not set.	Set a reference sample.
	The plot cannot be compensated because the data time and reference time are the same resulting in a null waveform.	Move the dynamic cursor to a time different from the reference sample.
Y and X Probes are not orthogonal	The X and Y probes are not 90 degrees apart (less than 80 degrees or more than 100 degrees)	Adjust the probe orientation if possible. SETPOINT CMS software will automatically adjust the data for non-orthogonal probes. However, errors increase the farther the probes are from 90 degrees.

11.4 Documenting

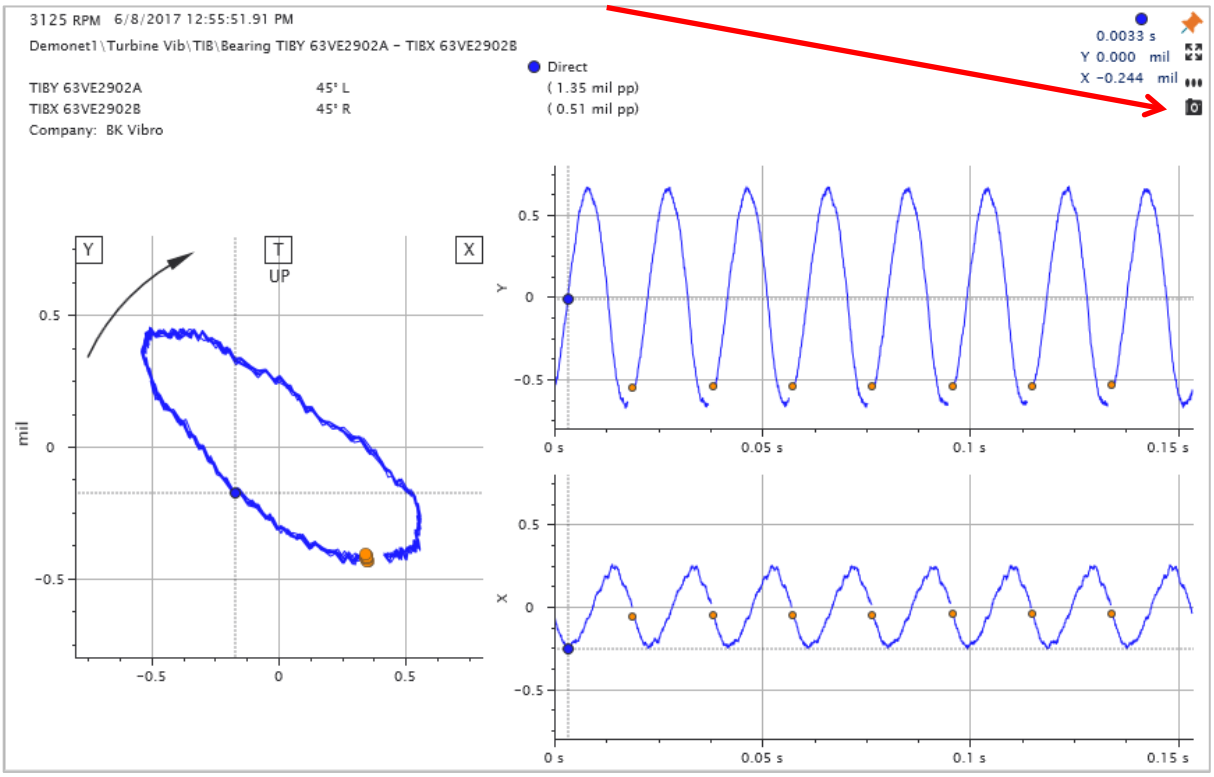
SETPOINT® CMS has several ways to document the results of your analysis:

- Copy and paste plots into another program
- Export Trend data to a CSV file
- Export all plots to a Microsoft Word document

11.4.1 Copying and Pasting Plots

Move the mouse pointer over a plot to activate the three-point symbol ••• in the upper right corner. Click on the symbol to open a selection of further symbols. By clicking on the camera icon, a screenshot of the plot is created and copied to the clipboard. This function can be used, for example, to create reports.

Alternatively, you can right-click anywhere to open the submenu with the selection of icons.

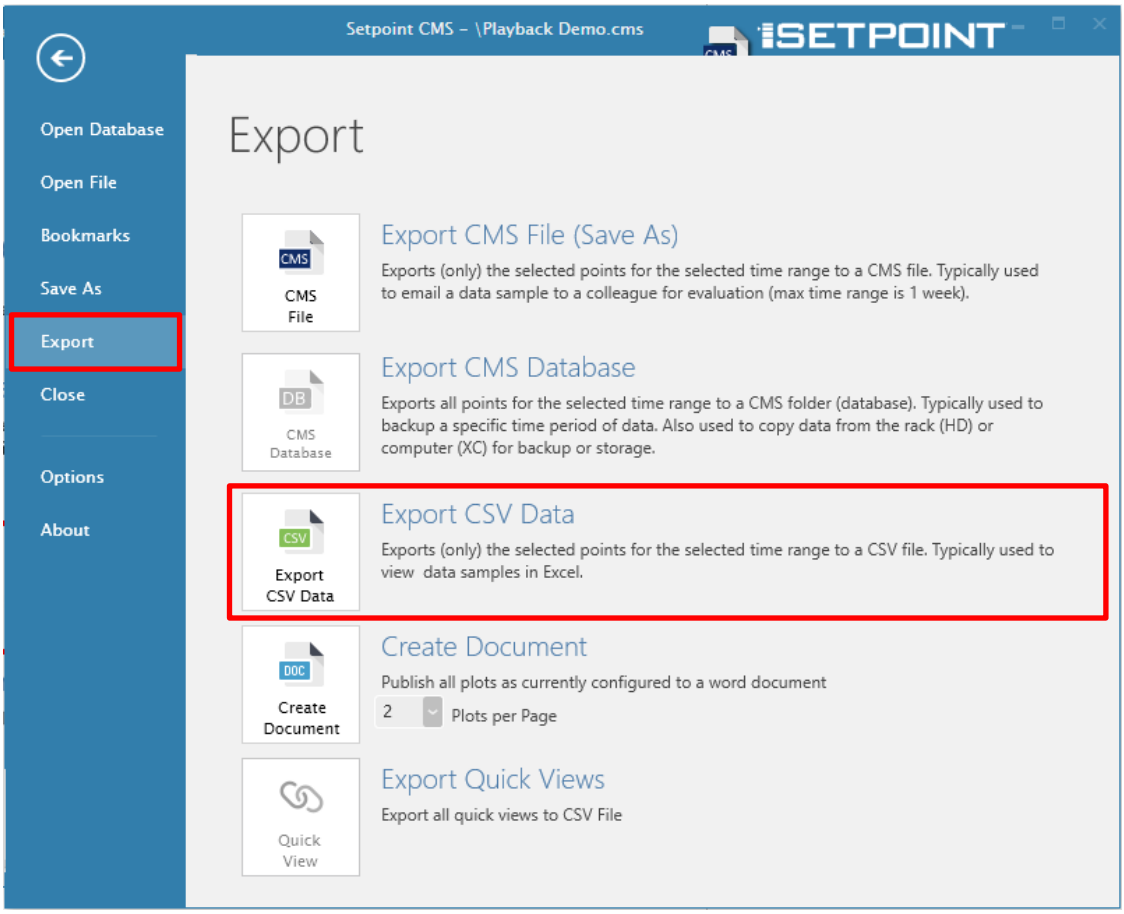


Use the paste command (Ctrl-V) to paste the plot into another document.

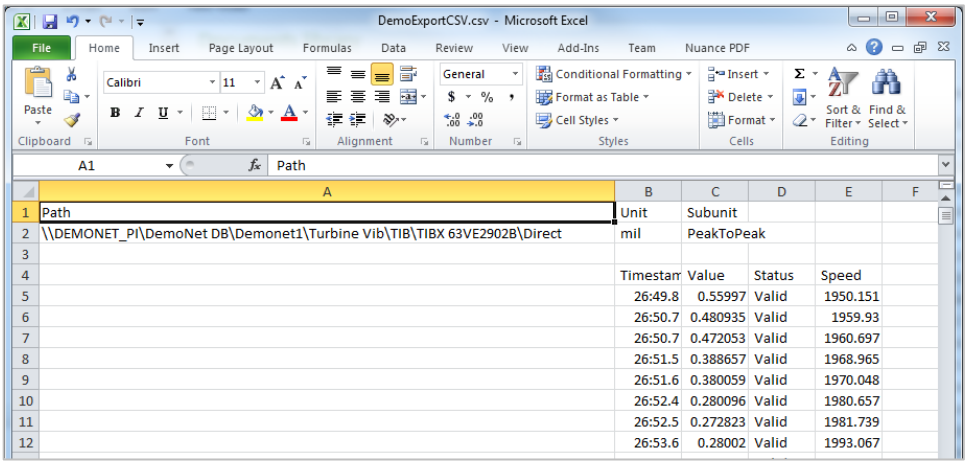
11.4.2 Export Trend Data to .CSV File

You can quickly export the trend data for the selected points and selected time range to a comma separated file for further processing or sharing using a program such as Microsoft Excel.

From the **File Tab**, click **Export** and **Export CSV Data**:



When opened in Microsoft Excel, the path lists the point name. The timestamps, data values, data status, and speed values for each sample are shown in the following columns.



	A	B	C	D	E	F
1	Path	Unit	Subunit			
2	\\DEMONET_PI\DemoNet DB\Demonet1\Turbine Vib\TIB\TIBX 63VE2902B\Direct	mil	PeakToPeak			
3						
4		Timestam	Value	Status	Speed	
5		26:49.8	0.55997	Valid	1950.151	
6		26:50.7	0.480935	Valid	1959.93	
7		26:50.7	0.472053	Valid	1960.697	
8		26:51.5	0.388657	Valid	1968.965	
9		26:51.6	0.380059	Valid	1970.048	
10		26:52.4	0.280096	Valid	1980.657	
11		26:52.5	0.272823	Valid	1981.739	
12		26:53.6	0.28002	Valid	1993.067	

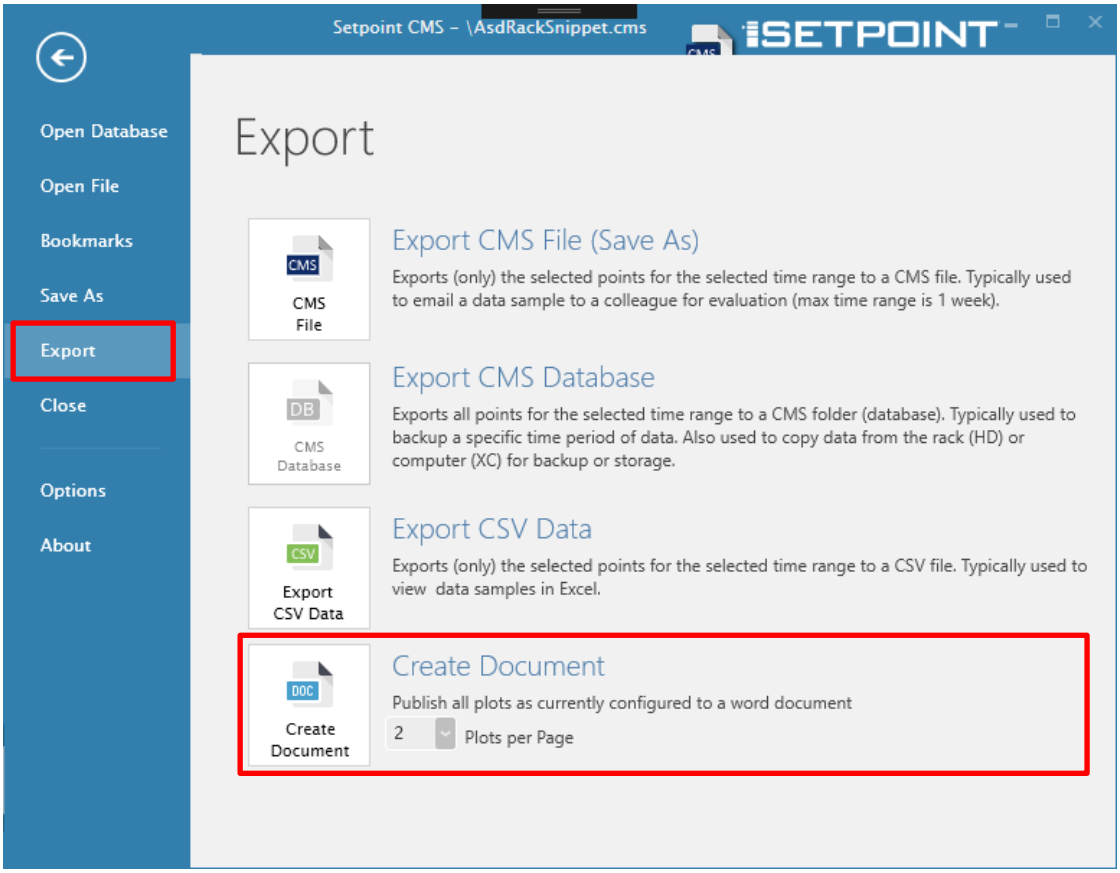
NOTE!

The default Excel time formatting does not show the hour. Click on the cell to see the full date/time or change the Excel cell format to “time”.

11.4.3 Exporting all Plots to Microsoft Word

You can export all the currently open plots to Microsoft Word in one quick process. You can choose between one plot per page (landscape orientation) or two plots per page (portrait orientation).

From the **File Tab**, select **Export** and **Create Document**:



Set the document type to Word Document (.docx) and type in a file name. SETPOINT CMS will create the document with all the currently open plots.

NOTE!

If the export lists that errors occurred during the export, check your plots in SETPOINT CMS for error indications.

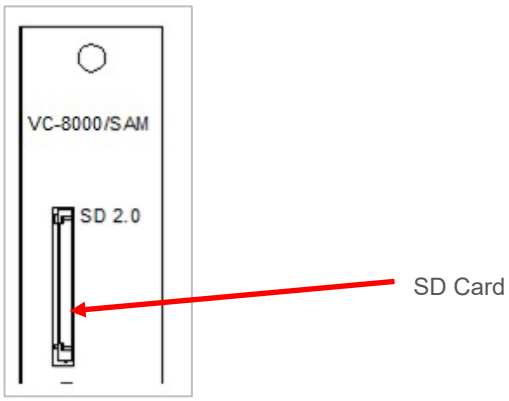
NOTE!

Limit the Large Trend plot to less than 10 traces for best export presentation.

12 Using the Removable SD card Media (VC-8000)

When enabled, the eSAM can collect steady-state (static and dynamic) and transient data and store the data in files on the SAM SD card. You can open the .cmssd file and view the data using the SETPOINT® CMS display software without any networks or servers.

The SD card is located at the top of the SAM module installed in slot 2 as shown below:



IMPORTANT!

To use the SD card functionality, the SAM must be enabled for the SD card, UMMs and TMMs must be CMS enabled, and the SD card function enabled in the VC-8000 configuration. Refer to the VC-8000 Operation and Maintenance manual for information on enabling the SAM SD card functionality.

12.1 Card Types and Sizes

SD 2.0 suitable to 32 GB. SETPOINT® recommend using 32 GB cards.

Class 10 Speed rating, 10 MB/s or higher

The SD card should be rated to the VC-8000 environmental ratings. SD cards should be Industrial Temperature Rated for -20 to +85 °C unless your rack is in a climate-controlled environment.

IMPORTANT!

Scan the card for viruses before inserting into the SAM.

Industrial temperature SD cards are available in both SLC (Single Level Cell) and MLC (Multiple Level Cell) technology. SLC technology cards support more erase/write cycles than MLC cards but are considerably more expensive. For most applications, MLC cards will work fine. However, if you configure the rack to save waveforms at a high rate during steady state conditions then you should consider upgrading to SLC cards.

12.2 Data Storage

The amount of data stored and the time duration before the card fills and starts over-writing (FIFO) depends on several key factors:

- The number of channels
- Dynamic channels vs. position and temperature channels
- The number of transient events
- Boost mode

While data storage can vary, the system will adapt (i-Factor®) to the machine operating conditions to optimize the amount of stored data.

12.2.1 Data Organization

Data is stored in 50 MB blocks (before compression) in intervals no longer than 5 minutes. If the system records 50 MB of data in less than 5 minutes, the files will be closer together.

12.2.2 Compression

There are multiple levels of compression used to maximize the data storage on the SD card.

12.2.2.1 Static Data Compression

Using patented techniques, Setpoint adjusts compression levels according to the how the machine operation is changing and how much data has previously been stored under similar operating conditions.

12.2.2.2 Dynamic Data Compression

Dynamic Data is compressed using the various techniques listed in this section.

i-Factor

If the UMM detects that the signal has not changed since the last waveform sample stored it will discard the waveform. Waveforms are stored based on a calculated “interestingness” in comparison to the last stored waveform. CMS will automatically adjust the i-Factor data collection rate during steady state conditions to optimize the data storage.

Boost Mode

Boost mode data is collected and stored continuously and is not compressed. Boost mode should be limited to infrequent, short transient intervals such as fast startups and coast downs. If the speed stops changing while still in the transient range the UMM will exit boost mode until it begins changing again. If the buffer in the UMM fills up it will exit boost mode and resume normal collection until the data are transferred to the SAM and a certain percent of the buffer empties out.

Delta RPM

For machines that startup or coast down slowly, delta rpm waveform sampling allows a waveform to be published at set speed changes. If no other waveforms (> I-ness) have been published during the configured periodic interval, the most interesting waveform (to the defined speed changes) for that interval is published.

Delta Time

The Delta Time set in the UMM configuration sets a maximum amount of time that expires between saving waveforms. If no other waveforms have been saved during the configured periodic interval, the most interesting waveform for that interval is saved. Note that since the most interesting waveform is saved, the interval between saved waveforms can be double the configured interval if the first waveform of one interval is saved and the last waveform of the next interval is saved. Set the Delta Time to a longer time to extend the SD card storage time.

12.2.3 Overwriting

When the SD card fills the system will overwrite the data (FIFO), overwriting the oldest data first in 50 MB blocks. The SAM OK LED will blink green on/off when the card is full. Only cms files are overwritten. The system will not overwrite other files stored on the card.

NOTE!

To maximize data storage, remove any non-CMS files stored on the card. These files will not be overwritten and will reduce the available storage.

12.3 Enabling

The SD card data collection and storage requires CMS enabled UMMs or TMMs to collect the data and an SD card enabled SAM. Order enabler keys at the time of purchase or contact Brüel & Kjær Vibro Services to upgrade existing racks.

12.4 SD card Status

You can verify correct SD card operation from the front panel display, from the SAM LEDs, or from Modbus status registers.

12.4.1 SD card Status on Display and LEDs

The SD card status is shown using the SAM OK LED. You can use the LED indications to see the SD card status if your system does not have a display. The display indication and OK LED patterns below will only occur when the SAM is enabled for SD card data storage.

Display Indication	OK LED Color Pattern	Indication
SD OK	Solid Green	The card is installed, the system is correctly collecting data, and the card is currently not being written to. It is safe to remove the card.
SD Full	Blinking Green	The card is installed, the system is correctly collecting data, but the card is full, and the oldest data is being overwritten. The card is currently not being written to. It is safe to remove the card.
SD Busy	Blinking Green/Amber	The card is installed, the system is correctly collecting data, the card is currently being written to. Wait until the blink pattern returns to solid or blinking green before ejecting the card. The LED will also blink this pattern when the UMMs have buffered Boost Mode data and is spooling this data to the SAM for writing to the SD card. The SD Busy indication on the display shows a progress bar for data moving from the UMM to the SD card. If the background is showing partially blue, there is data still in the UMMs waiting to be written to the card.
No SD	Solid Amber	There is no card installed or the system is rebooting, and the system cannot detect the card. Wait for the system to finish booting and verify a card is inserted.
SD Fail	Blinking Red	The system cannot write to the SD card. This may be because the SD card is corrupted, unformatted, or has write-protection on. Replace the card with a valid card. The LED will also blink red if a front panel firmware upgrade from the SD card fails. Remove the card and replace with a card with a good firmware file or no firmware file to abort the upgrade.
N/A	Solid Red	They system has failed and is not collecting or storing data.

12.4.2 SD Card Status via Modbus

The SD card statuses are located in the Modbus Map at registers 12445 and 112445. Refer to the VC-8000 Operation and Maintenance Manual S1079330 for more information on Modbus.

In addition to the statuses shown on the display, Modbus also provides a SD Card Locked status which indicates if the card write enable switch is on or off.

12.5 Removing the Card

The SAM processor periodically writes data to the SD card. Removing the card while the processor is writing data can cause loss of the 50 MB (five minute) file currently being written. The write cycle typically lasts 20 seconds. When writing, the display shows the SD card as “SD Busy” and the SAM OK LED will be alternately blinking green and amber. When the write cycle is complete the display will show “SD OK” or “SD Full” and the SAM OK LED will return to either solid green or blinking green on/off.
You can install an SD card at any time.

IMPORTANT!

Removing the SD card while the system is writing data can cause loss of the last 50 MB or 5 minutes of data. Wait until the SD card is not busy before ejecting.

WARNING!

In hazardous locations do not eject or insert the SD Card unless the environment has first been proven safe.

12.6 Copying Card Data

You can copy the files and folders from the SD card directly to a computer hard drive. There will be a file named <RACK NAME>.cmssd and a folder <RACK NAME>. Copy both of these. Log files or other information on the card is not required. You can merge new data into the same folders with data previously collected on the same rack as long as the rack configuration has not changed.

NOTE!

If the rack configuration has changed, copy new data into a different location. Do not merge the data folders.

NOTE!

Depending on your computer and the amount of data on the SD card, it can take a long time to copy to a computer. Best practice is to replace the card when it is removed so that data collection continues.

12.7 Viewing Card Data

To view the data on the SD card, insert the card into a computer. You can view the files directly from the SD card or copy the files to a local folder. When opening the files, the CMS Display will automatically find and concatenate all of the 50 MB (5 minute) .cms files in the folder. You can use CMS to analyze the full range of time saved.

Open the SD card data from the **File Tab**, Open File, with the file type CMSSD.

The file will open with the selected time range set to the last hour on the card.

12.8 Configuration Changes

The SD card data only supports one configuration. If you are changing your VC-8000 configuration, eject the SD card and copy all the files before changing the configuration. Insert an empty SD card after downloading the configuration changes to the VC-8000 rack.

12.9 Using the SD card for Data Collection Redundancy

When enabled, the SAM can store data to the SD card simultaneously while spooling the data to a PI Server. This provides a level of redundancy in the event of a network failure in that critical data is still available on the SD card.

12.10 Backfilling SD Card Data into a PI Server

Refer to **Section 15** for information on backfilling data stored on an SD card into a PI Server.

13 CMS-XC Data Storage on a Local Computer

The SETPOINT® CMS-XC option spools CMS data files to the storage drive on a computer without requiring a local PI Server. This feature is useful for:

- Applications where a local PI Server is not practical.
- Backing up the data sent to the PI Server.
- Portable or temporary data acquisition.

Figure 48 shows a CMS-XC installation where a PI Server local to the machine is not practical. The CMS-XC computer provides a large data storage drive and the necessary security software required for connection to the Wide Area Network (WAN).

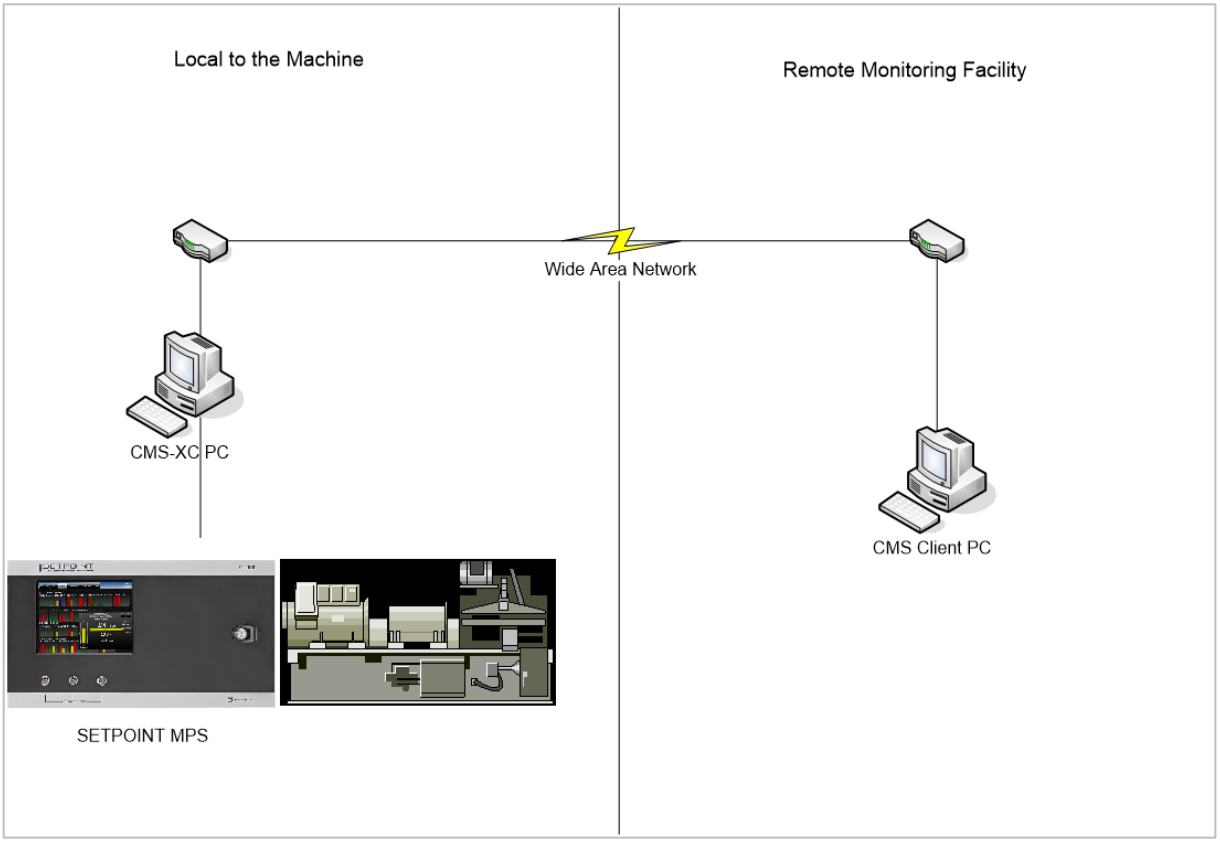


Figure 48: CMS XC on a WAN

The CMS Display can connect to the CMX-XC computer and view the data files in the same way as connecting to a PI Server.

Figure 49 shows a CMS-XC computer serving as a backup to the local PI Server. CMS-XC stores all data from the VC-8000 rack on a local drive. If there is a fault on the either the Local PI Server or a remote Main PI Server, the CMS Display PC can still view the SETPOINT® data stored on the CMS-XC computer.

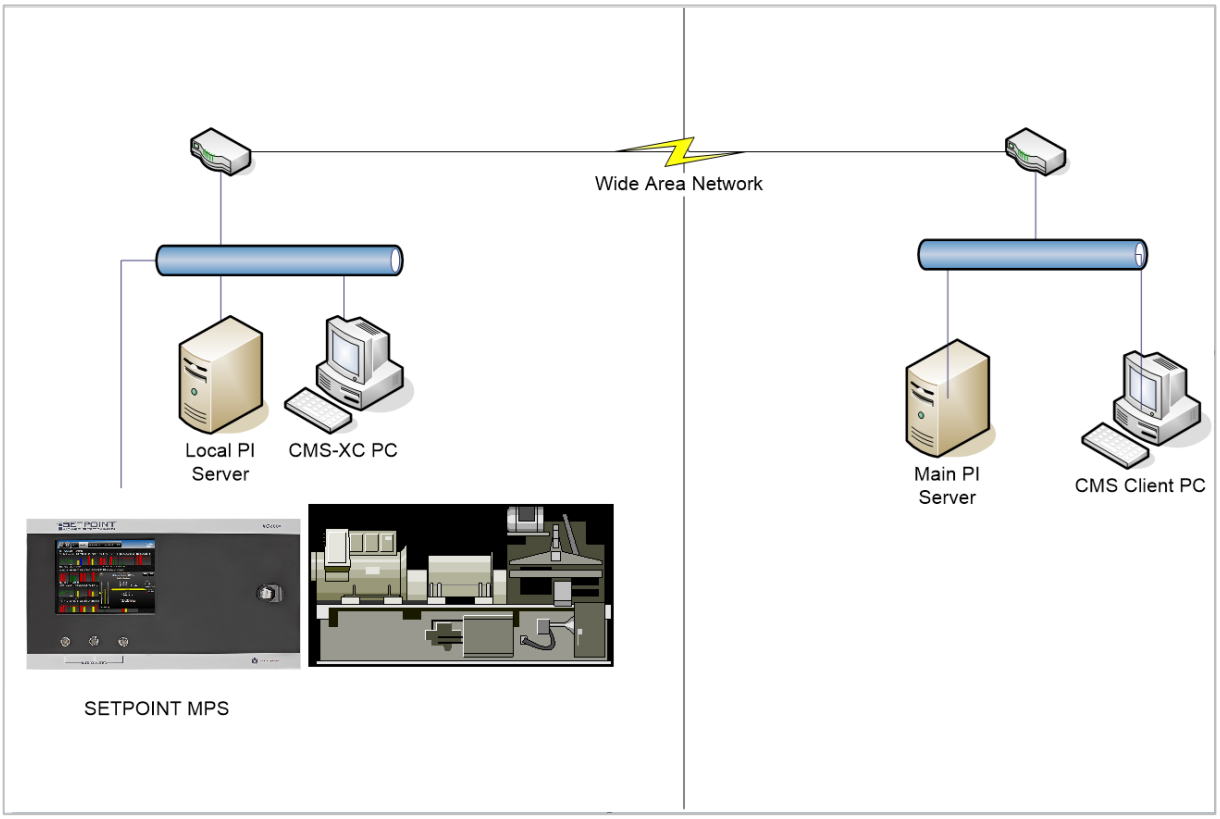


Figure 49: CMS-XC Backing up a PI Server

NOTE!

CMS-XC only backs up data collected by the VC-8000 racks and does not back up process data in the PI Server collected from other instrumentation.

13.1 Configuring a CMS-XC Computer

Configure the CMS-XC computer using the SETPOINT® Connector Setup software.
See **Section 8.1.2** for information on configuring the XC computer storage locations and folder names.

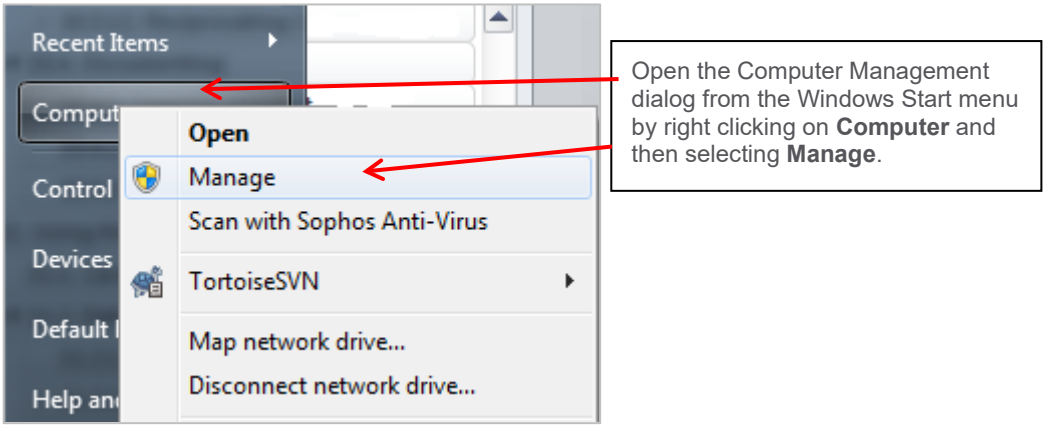
13.2 Configure Windows Remote User Access

You must give remote users Windows security access to the CMS-XC data. Follow the instructions in this section to configure CMS-XC access for individuals or groups of users.

NOTE!

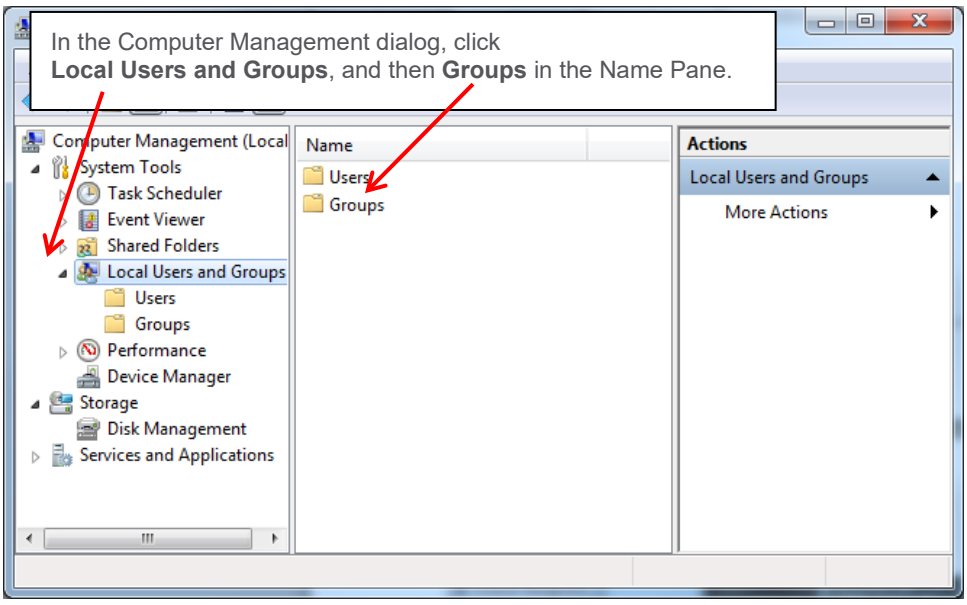
Install SETPOINT® Connector before performing this step. SETPOINT® Connector will automatically create the “Setpoint Remote Users” group.

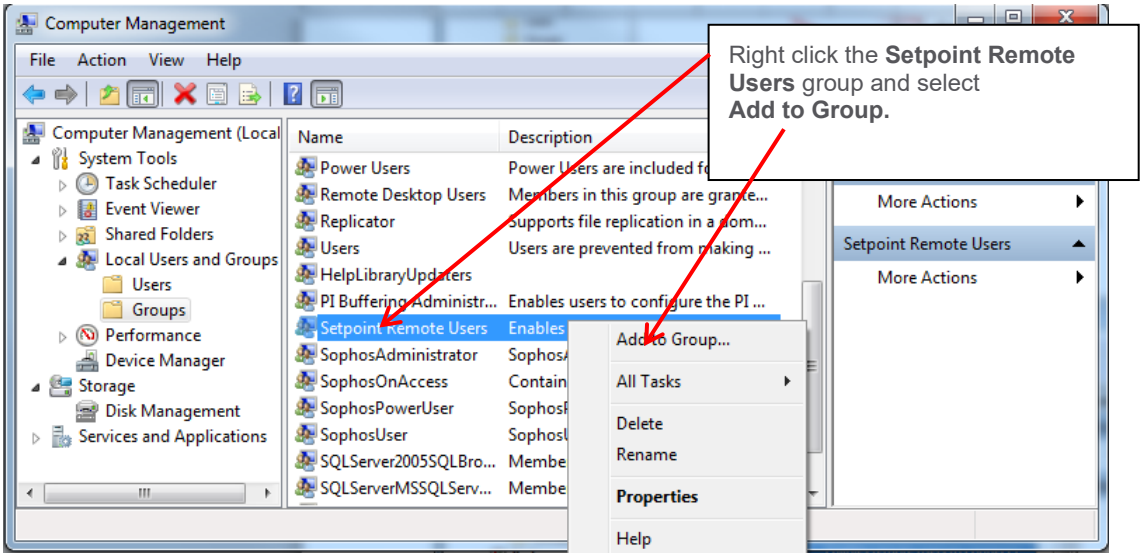
Configure the users from the Windows Computer Management.



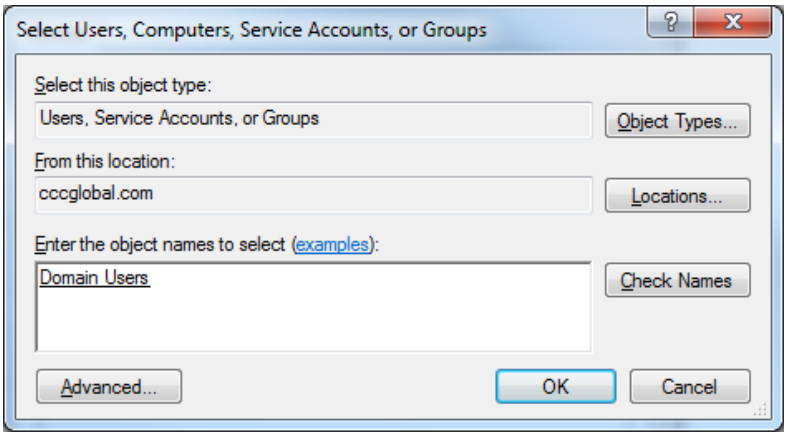
Alternatively, you can open the Computer Management dialog from **Control Panel** by selecting **Administrative Tools** and then **Computer Management**.

The Computer Management dialog will open:





Add user names under object names and click OK. You will need to enter each user that will access the XC database. Alternatively, you can give access to all domain users for a specific location using the **Domain Users** object as shown in the following picture:



13.3 Configuring the Network Firewall for CMS-XC

To allow remote access to the CMS-XC data (see **Figure 48** and **Figure 49**), you will need to have Firewall ports 8001 and 8002 open.

13.4 Backing Up CMS-XC Data

Brüel & Kjær Vibro recommends backing up CMS-XC data folders. There are many ways to do this. Contact your Information Technology department or Brüel & Kjær Vibro Services for backup solutions.

13.5 Viewing Old CMS-XC Data Files

When you connect to a computer running CMS-XC the open database view will only show racks that are currently configured in SETPOINT® Connector. If you have changed the rack name or removed a rack from SETPOINT® Connector, you can still view the data in the CMS Display. CMS-XC data uses the same format as CMS-SD data, and you can open the cmssd files from the **File Tab**.

14 CMS-HD Data Storage in the Rack

CMS-HD uses an internal solid-state drive (SSD) to store static and dynamic data. Depending on the SSD size purchased and the configured data collection rate the SSD can store months or even years of data.

You can connect a computer Ethernet cable directly to the CMS port on the front of the SAM module or you can access the HD data via a network as shown in **Figure 50**.

When connecting a computer directly, you do not need a crossover cable or switch. The SAM will automatically detect the cable and adjust accordingly. You will need to verify that your computer IP Address is configured for the same subnet as the CMS port.

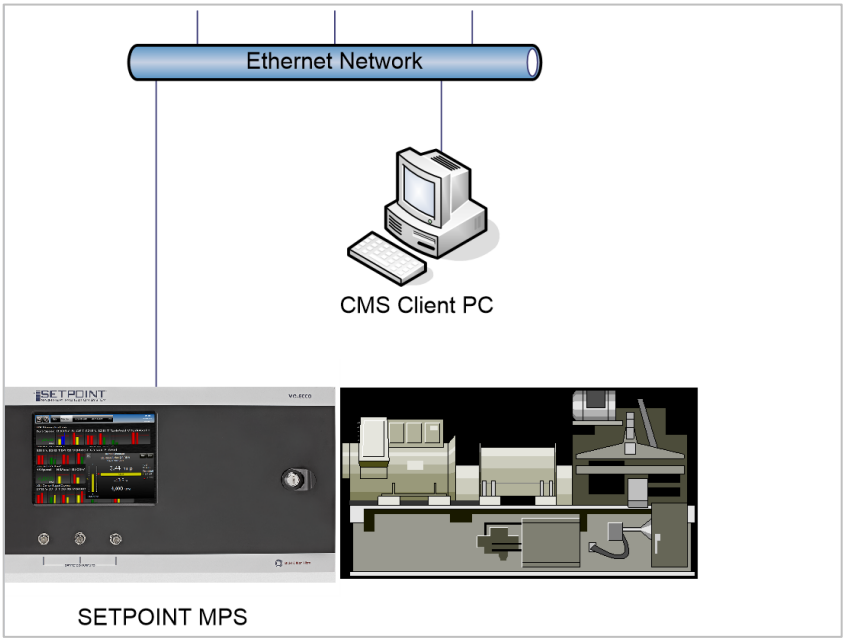


Figure 50: CMS HD Network

IMPORTANT!

The SETPOINT® rack CMS port is not designed to be placed on an exposed network. If the network is accessible externally use the CMS-XC solution.

NOTE!

The CMS HD feature requires the SAM to have a password configured. Refer to the VC-8000 Operation and Maintenance Manual S1079330.

IMPORTANT!

The CMS-HD storage drive will overwrite old data when it is full. Periodically copy the HD database to a computer or save important reference data in a .cms file.

14.1 Configuring HD Storage

SETPOINT® HD does not require configuration. HD enabled hardware will automatically store condition monitoring data from CMS enabled monitoring modules.

14.2 Monitoring HD Storage

The SETPOINT® CMS system can create a very large amount of data. Eventually the HD storage will fill and automatically begin to overwrite the old data (FIFO). To prevent loss of important data, periodically save the HD database on a further storage medium or view and save important data from SETPOINT® CMS.

The SETPOINT® control panel display on the rack (or the Software Setpoint Maintenance) provides basic information on the HD storage which you can use to determine when to upload and save data.

Refer to **Section 16.5** for information on verifying data storage rates.

14.3 Copying HD database to a Local Drive

Refer to **Section 15.2**.

14.4 Automatically Backfilling HD Data into a PI Server

You can configure SETPOINT® Connector to automatically backfill data from SETPOINT® HD into your PI Server in the event of network communication failure (see **Section 8.2** to enable or disable).

When the backfilling option is active, SETPOINT® Connector checks for SETPOINT® HD data not already in the PI Server when:

- The SETPOINT® Connector Service is first started
- When communication to the VC-8000 rack is restored after being lost.

NOTE!

Backfilling does not apply PI Compression for points that already contain data in the PI database. Backfilled data may store more samples than when online.

IMPORTANT!

Backfilling large amounts of data can severely stress a PI Server. If your PI Server also performs critical plant operations that cannot be interrupted, consider disabling the backfilling option and backfill manually (See **Section 15**) at a convenient time.

NOTE!

Backfilling does not import data prior to when the rack was added in the SETPOINT® Connector. Follow the instructions for importing a dataset (See **Section 15**) for migrating SETPOINT® HD data stored in the rack prior to connection to a PI Server.

15 Uploading SD, XC, or HD Data into the PI System

You can upload machine data stored on the SD card, stored in an XC database, or stored on the internal solid-state drive into a PI System. This feature is useful for:

- Racks that cannot be connected to the network.
- Data collection from portable racks
- Racks collecting data before the PI System was installed.
- Data stored during network outages

SETPOINT® Connector will automatically create any points that exist in the SD, XC, or HD database but do not already exist in the PI database and allocate PI Tags as required.

NOTE!

If the rack name already exists in the PI-AF database, SETPOINT® Connector will merge the uploaded points under the existing rack. Set a unique rack name for each SD, XC, or HD rack if you need the data separated.

Uploading data to the PI System involves these steps:

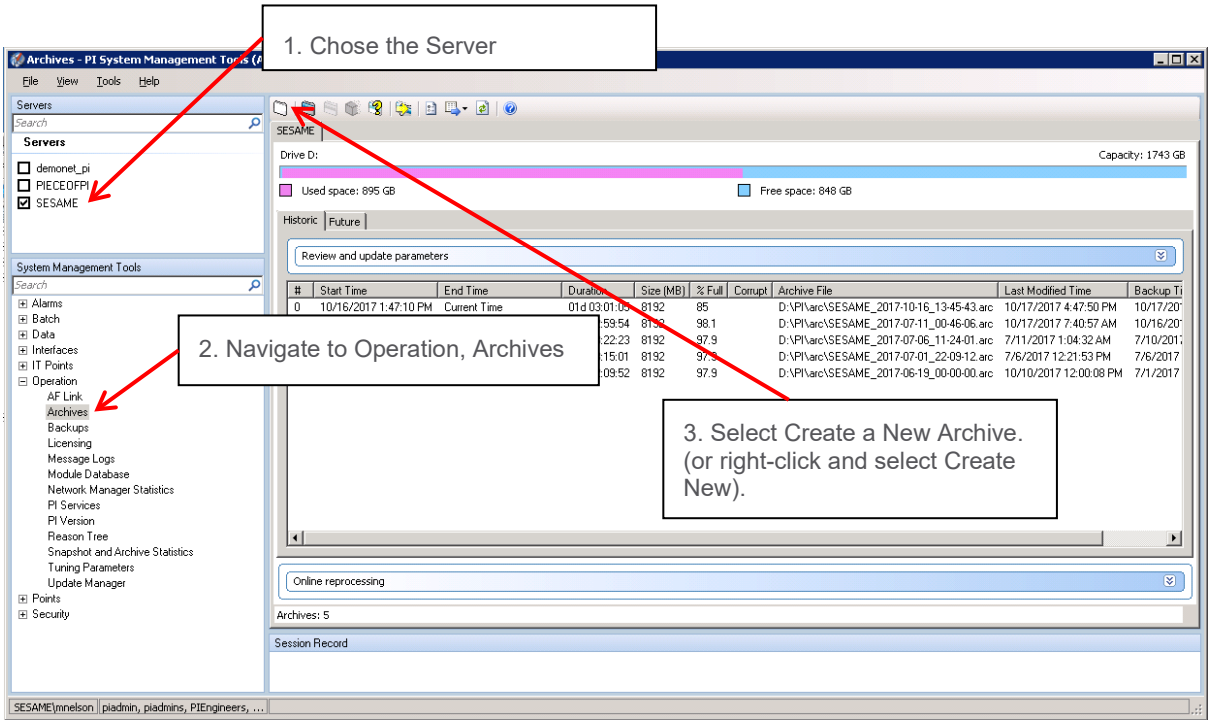
1. Create new PI Archives (if required)
2. Export XC or HD data to be uploaded to a local drive.
3. Upload the data into the PI System.

15.1 Creating PI Archives

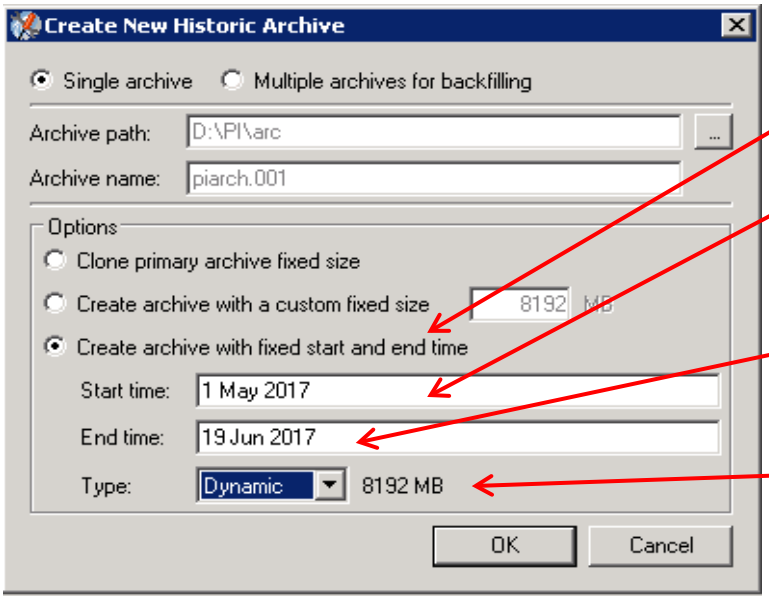
If the data stored on the SD card, XC database, or HD database predates the PI System, you will need to create PI archives in which to store the data. Follow the steps in this section to create PI archives.

To create an archive:

In PI System Management Tools, open the Archives plug-in.



The Create New Historic Archive dialog will open:



Select **Create archive with fixed start and end time**.

For **Start Time,** enter a time equal to or earlier than the oldest timestamp for data to be backfilled.

For **End Time,** enter the start time of the oldest current archive.

Select **Dynamic** as the archive type.

Click **OK** to create and register the archive.

15.2 Exporting an HD or XC CMS Database

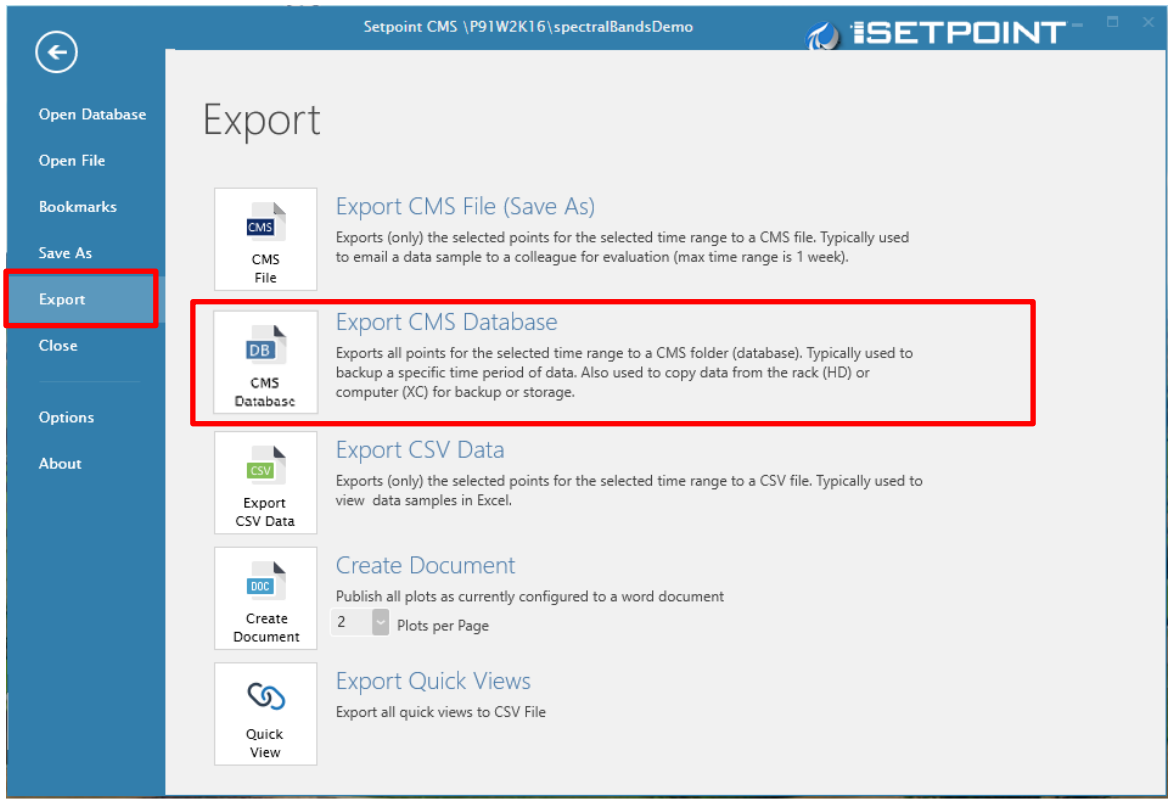
If the data is stored in CMS-XC or CMS-HD files, you need to export the data to a local database file before uploading into the PI System.

NOTE!

The Export CMS Database option will only be active if you are currently connected to a CMS HD or CMS XC database.

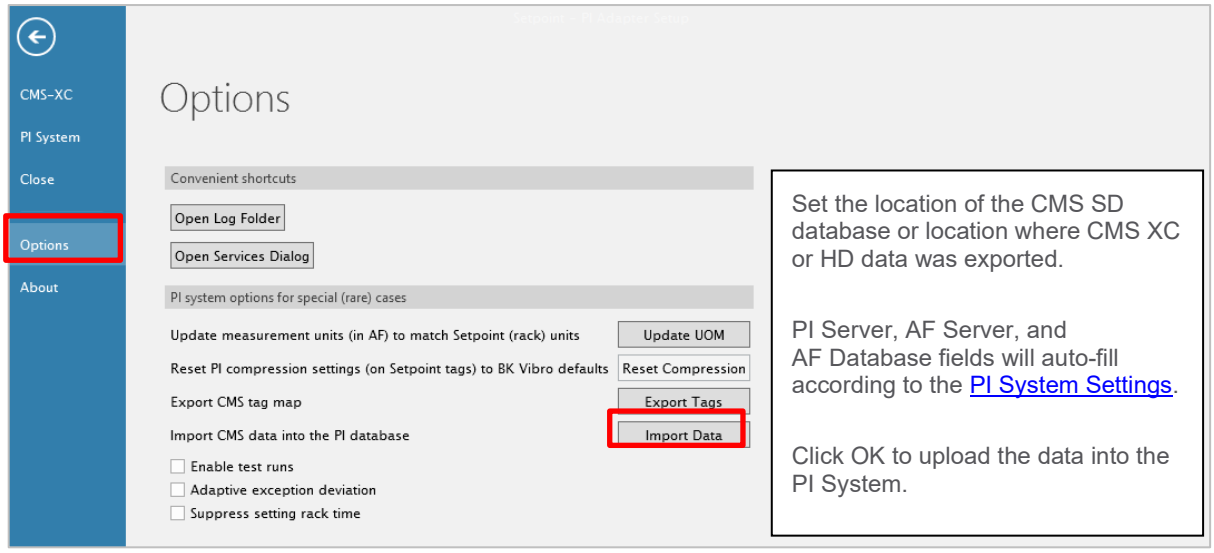
NOTE!

The Export CMS Database option will export data only for the currently selected points and time range. Be sure to select the points and set the time range before exporting.



The export process will require you to specify a location to store the database.

15.3 Uploading XC or HD data in the PI System



Set the location of the CMS SD database or location where CMS XC or HD data was exported.

PI Server, AF Server, and AF Database fields will auto-fill according to the PI System Settings.

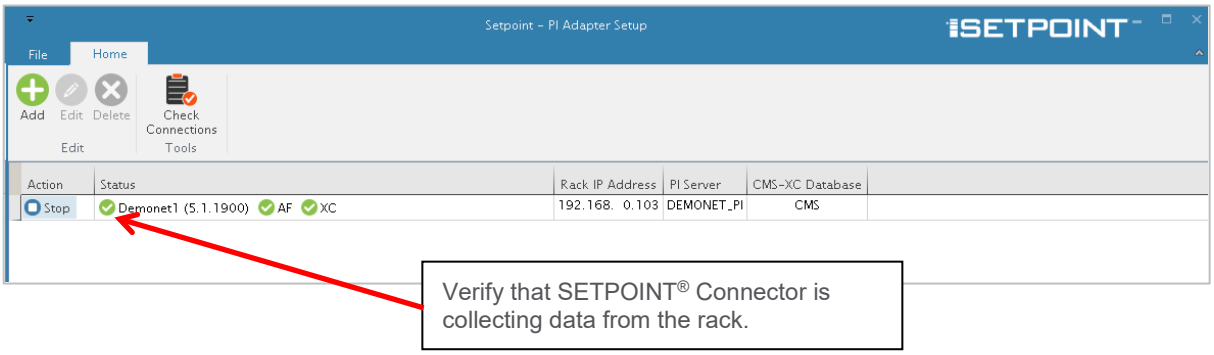
Click OK to upload the data into the PI System.

16 Verification

This section lists ways to verify the data flow between the VC-8000 rack and the database (PI System, XC, SD, or HD).

16.1 Verifying Connection to SETPOINT® Connector

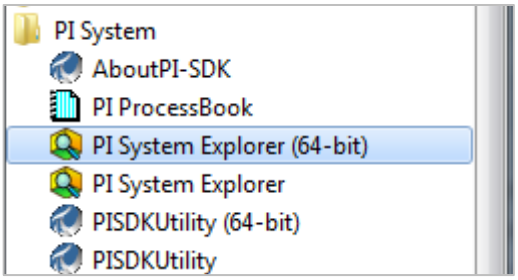
To verify that the VC-8000 rack is properly connected to SETPOINT® Connector and the system is collecting data, open the SETPOINT® Connector Setup program and verify that the rack status is “Collecting”.

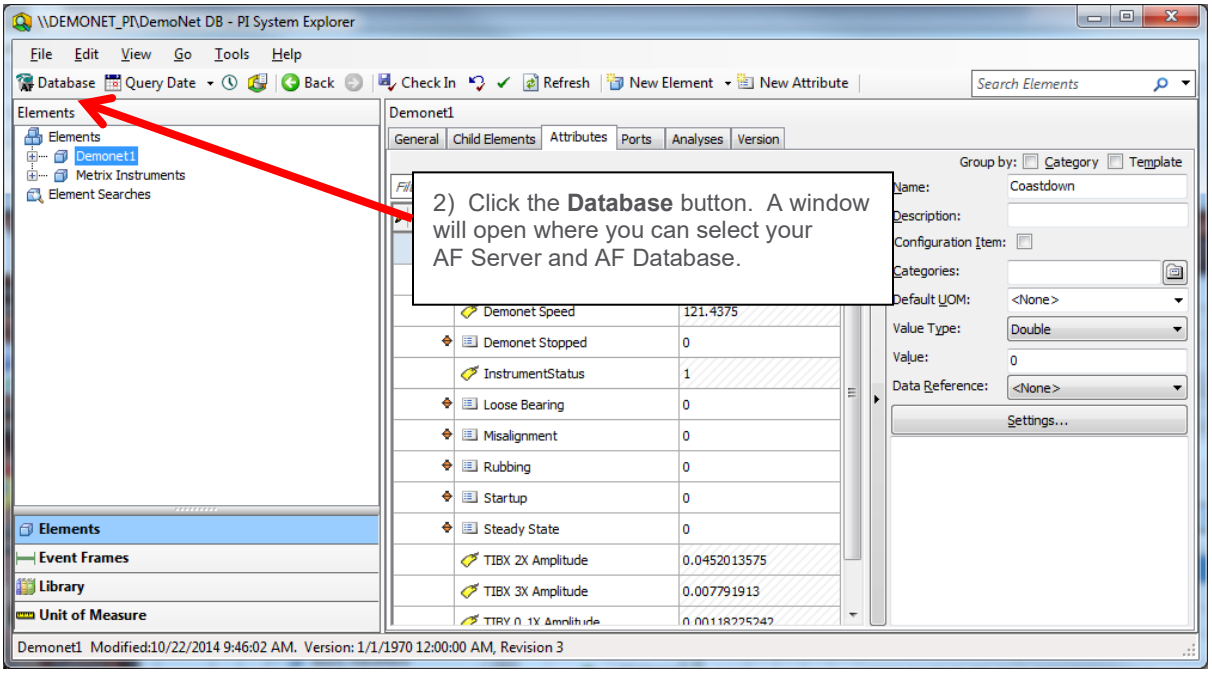


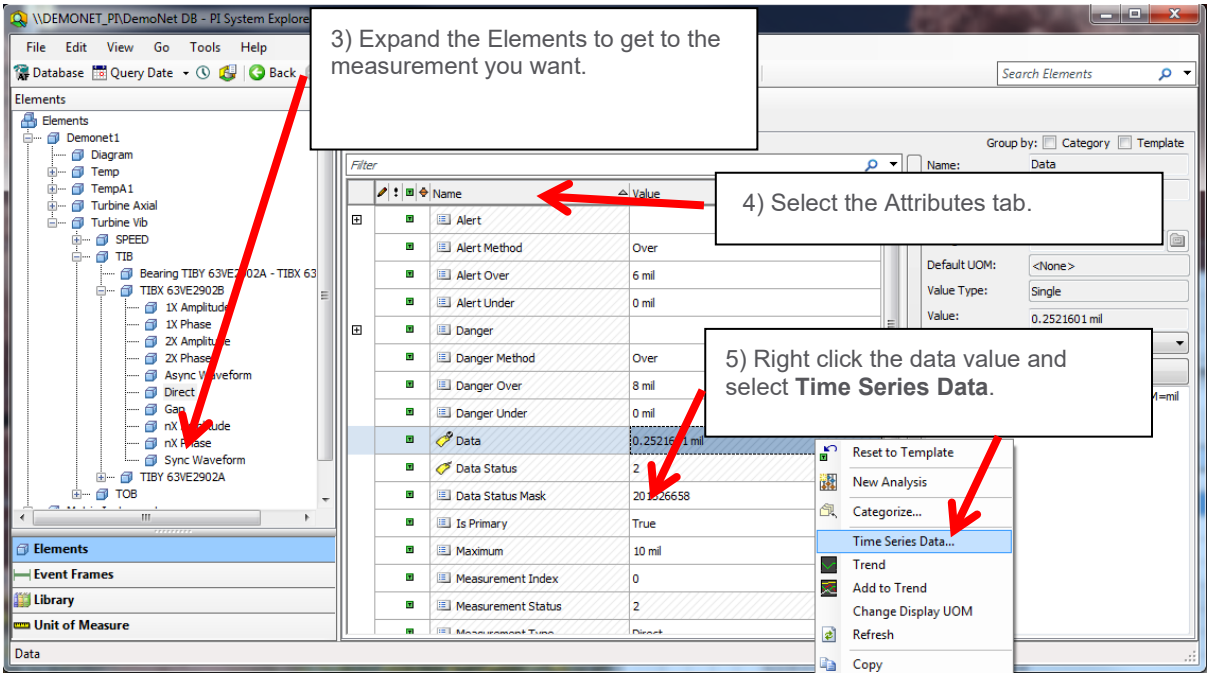
16.2 Verifying Data in the PI System Database

PI System Explorer provides tools for verifying the data stored in the PI System Database. Follow these steps to verify SETPOINT® data in the PI System Database.

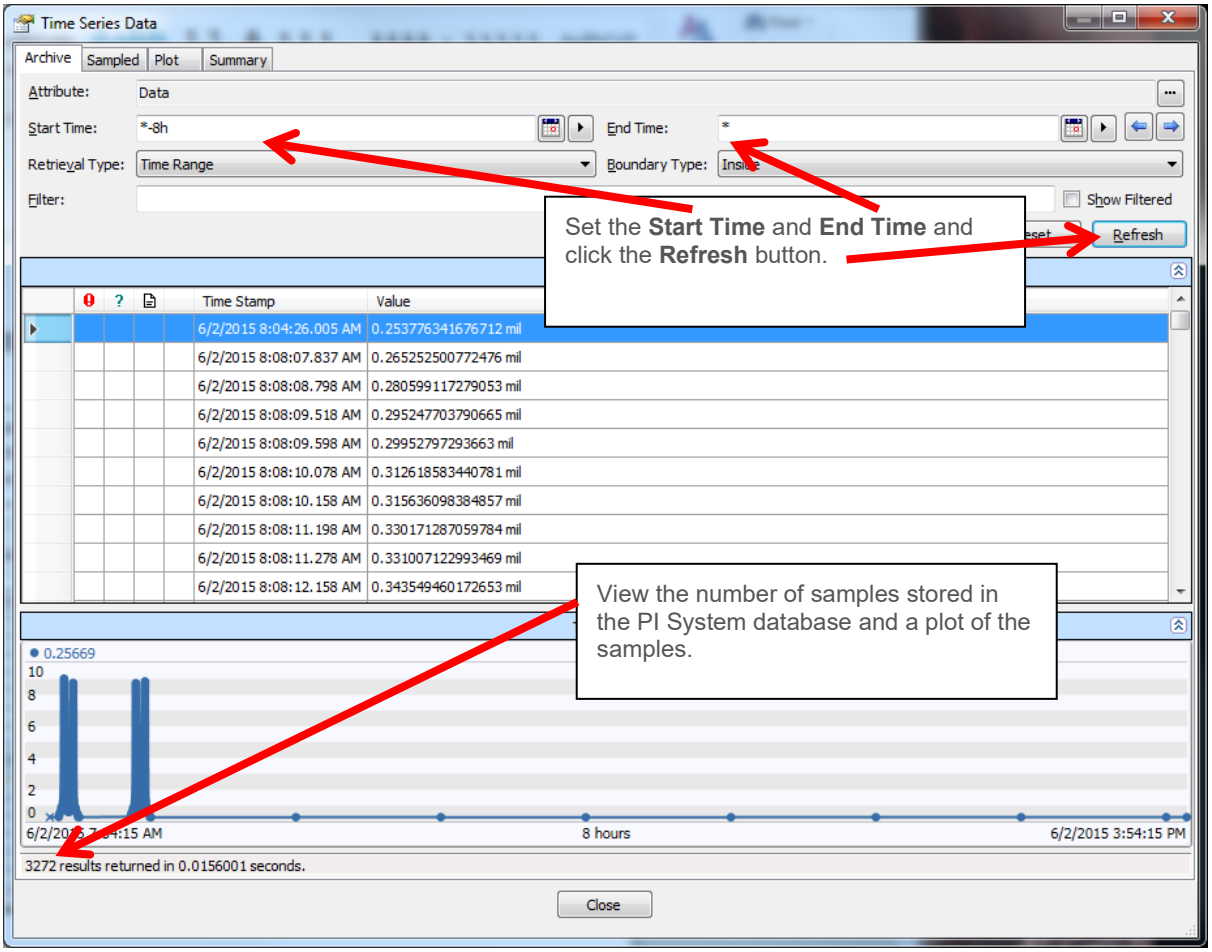
Open PI System Explorer. PI System Explorer will be listed under the PI System folder:







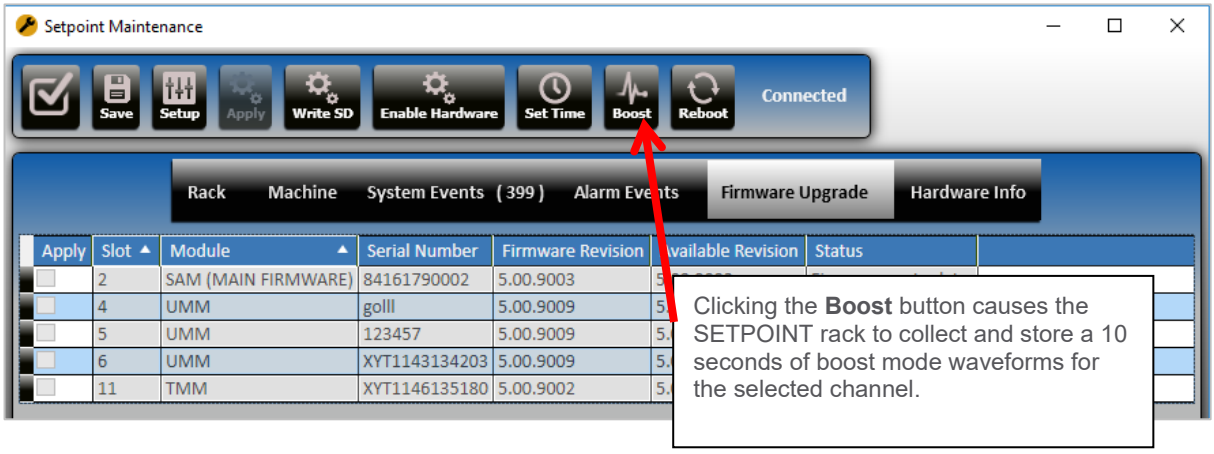
The **Time Series Data** window will open. Setting the **End Time** to "*" causes the time range to end at the current time. Setting the **Start Time** to "*-8h" sets the range to start 8 hours earlier than the current time. Click the **Refresh** button. The **Time Series Data** window shows the number of samples stored in the PI System in the time range and a plot of the data values.



16.3 Forcing a Waveform Sample

Under normal operating conditions, SETPOINT® will automatically collect waveforms on detected changes in machine state. There may be times, such as when you are verifying system operation, when you need to force the system to record a waveform and store it in the database for immediate viewing.

To force a waveform, open the VC-8000 Maintenance application and navigate to the **Firmware Upgrade** view (see Manual S1079330 VC-8000 Operation and Maintenance Manual). In the **Firmware Upgrade** view, click the **Boost** button as shown.

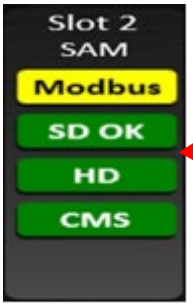


16.4 Data Annotations

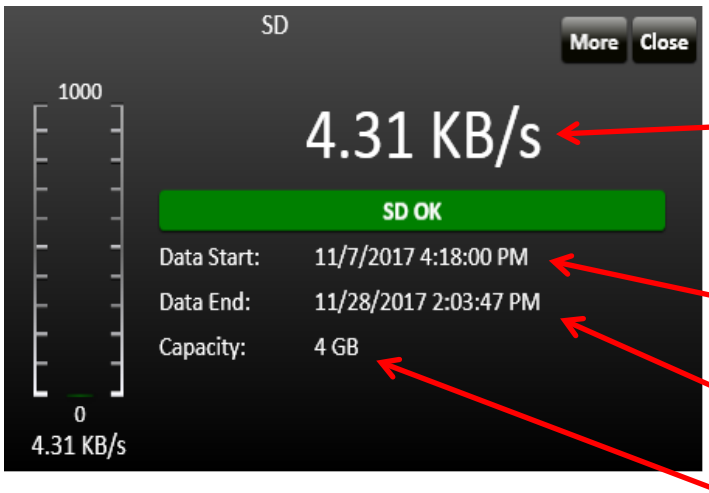
The Data Annotation function provides information about when SETPOINT® collected waveforms and how interesting the machine data is. Data Annotations are useful when troubleshooting waveform collection. Activate Data Annotations from the View Tab.

16.5 Verifying Data Storage Rates (VC-8000)

You can verify the rate at which the system is currently sending data to the database.



From the front panel display or the Setpoint Maintenance software open the rack view. Click the SD, HD, or CMS buttons on the SAM to see information on data collection rates and storage.



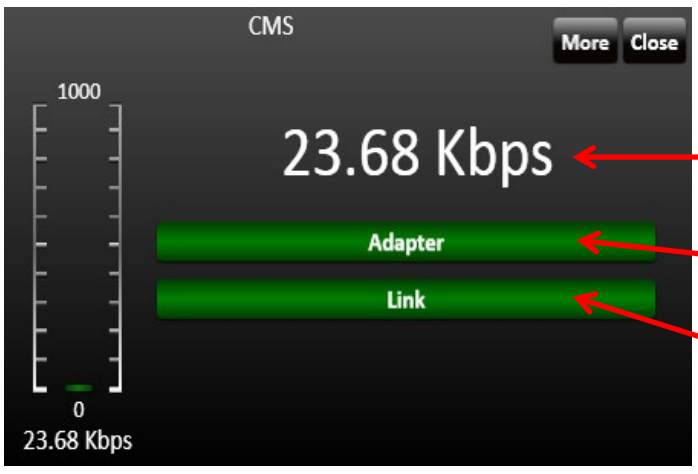
For SD and HD, the details view shows this information:

Storage write rate. This is the amount of data being written to the storage device per second and is also displayed on the bar graph.

The Data Start is the oldest data stored since the last export.

The Data End is date of the most recent data stored.

Capacity: The installed storage device size.



For networked connections to a PI System or Setpoint-XC view the CMS details.

Data rate indicates the network data bandwidth usage.

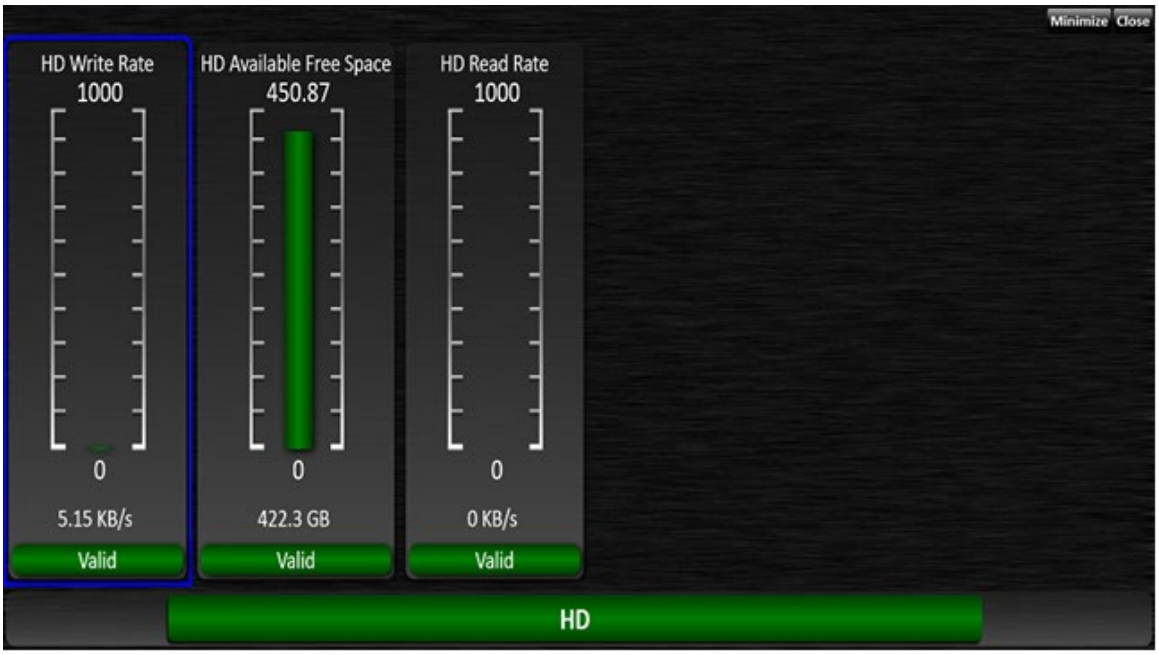
Adapter shows the status of the SETPOINT® Connector.

Link shows green if there is a valid Ethernet connection to a SETPOINT® Connector.

IMPORTANT!

Data storage rates will vary greatly depending on whether the machine is in steady-state or transient conditions.

Click the More button on the details view to see more storage statistics. For SD and HD, the view below will show:



These values show:

HD Write Rate: The rate at which data is being written to the HD storage device.

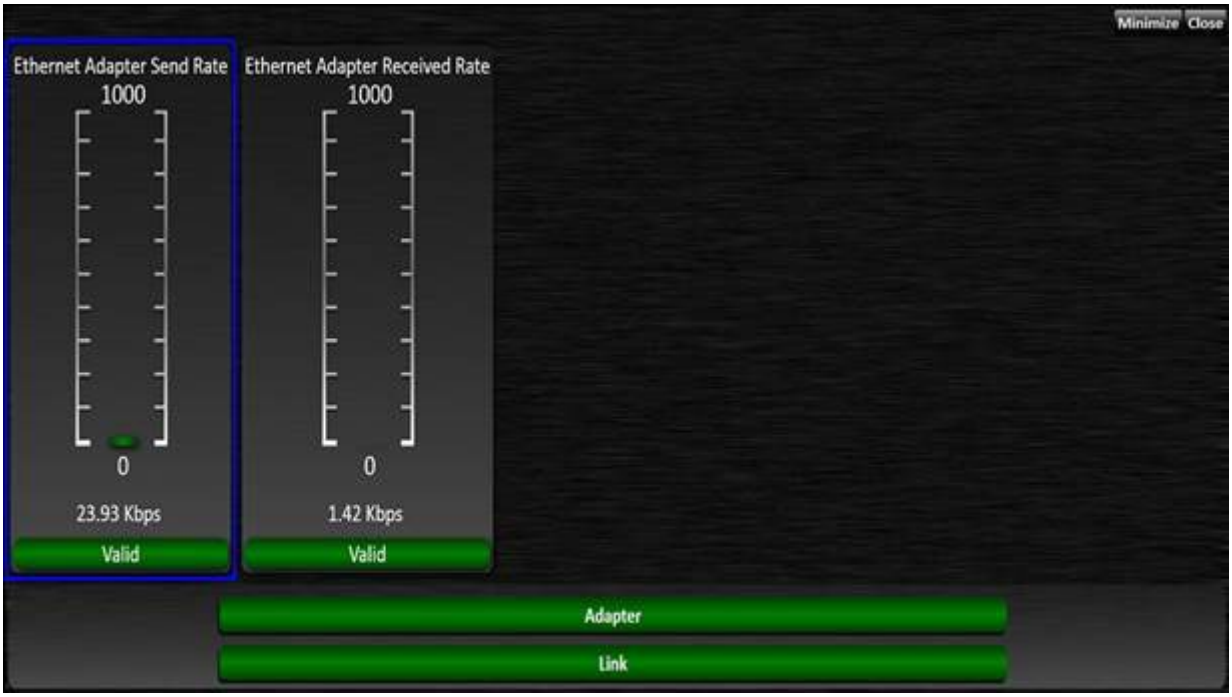
HD Available Free Space: The unused space on the HD storage device.

NOTE!

The HD storage device is not erased when data is exported. Old data will remain on the HD storage device until it is filled at which time the old data will be overwritten. When the HD Available Free Space is 0, new data is still being stored but old data not previously exported is being lost.

HD Read Rate: The rate that data is being read from the HD storage device. In most cases this will be very low unless a user is connected to the HD device with the SETPOINT® CMS display software.

For CMS connections to a PI System or CMS-XC system the following view will show:



These values show:

Ethernet Send Rate: This value indicates the amount of network bandwidth being consumed by outgoing messages. Since this value is measured before data compression done by the PI System it is not necessarily indicative of the amount of data being stored on the PI Server.

Ethernet Received Rate. This value indicates the amount of network bandwidth being consumed by incoming messages. The Ethernet Received Rate will increase when a user is requesting data from the HD through the SETPOINT® CMS software.

Adapter Status: The overall SETPOINT® Connector status. When green, SETPOINT® Connector is operating correctly. If yellow, one or more SETPOINT® Connector connections (PI System or CMS-XC) have failed.

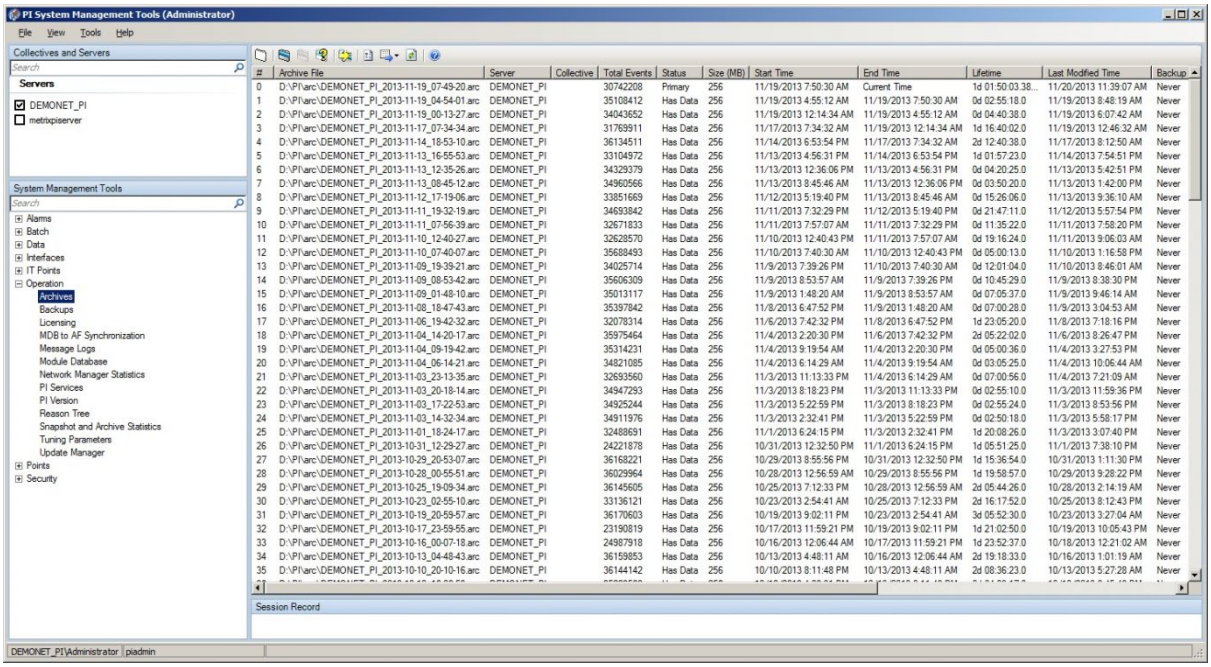
Link Status: When green the rack is correctly communicating with the SETPOINT® Connector. When yellow, the rack cannot communicate with SETPOINT® Connector. This may be due to physical network problems or problems with the SETPOINT® Connector.

17 Maintenance

In general, SETPOINT® CMS database maintenance is similar to maintaining any other AVEVA™ PI database. Refer to AVEVA™ PI System™ manuals and videos. This section lists maintenance specific to SETPOINT® CMS.

17.1 Monitoring the Database Size

Use PI System Management Tools for viewing and managing the database. Go to Operation, Archives to see a list of the archive files the PI system created.



From the list, you can see that from October 19th 2013, to November 19th 2013 server DEMONET_PI stored 31 archive files of 256 MB each. Total storage rate for this system is approximately 8 GB per month. Since this system has 1.74 TB of available storage, under similar operating conditions this system would take approximately 18 years to fill the hard drive. In this case, no action is required.

NOTE!

SETPOINT® CMS collects much more data during transient machine conditions than steady state. Monitor your database more often when machines are changing states.

17.2 Archive Backup

Refer to AVEVA™ documentation for best practices on backing up your data archives.

17.3 Adjusting Compression

You can adjust the PI Server data compression to increase or decrease the amount of stored data. The default compression settings are set to the typical noise floor of the sensor type and resolution of the signal processing.

If your machine frequently changes operational conditions with a process that results in frequent starts and stops, you may want to increase the compression levels to avoid collecting excessive data.

CMS automatically reduces compression during transient speed conditions. AVEVA™ has several excellent videos on the Internet explaining how to adjust the compression settings and how PI data compression works.

Brüel & Kjær Vibro Services also can help with adjusting compression settings.

18 Troubleshooting

18.1 Plot Messages

SETPOINT® CMS will print a message across the plot if there are problems with the data. The following table gives a description of the problem and suggested corrective action.

Table 15: Plot Error Messages

Error Message	Description	Corrective Action
No Data	Data necessary for the plot type does not exist in the selected time range.	Change the time range to include data.
Invalid Data	The data is invalid. This may be caused by a range check error, a speed error, or the speed or amplitude are too large or small to calculate the value.	Verify that the synchronous sample rates were set according to **Table 9**. Check transducer wiring.
Y and X probes are non-orthogonal	The probe orientations are not configured with X following Y by 90 degrees in a clockwise direction.	Fix the probe orientation configuration so that the probes are 90 degrees apart.
No Compensation	Compensation is active but no valid compensation vector or waveform is set for the point. Note that for plots using waveform data, the compensation waveform must not be identical to the compensated waveform.	Select a reference data sample for compensation.
Too many waveforms in range	Waveform ticks are activated and the currently selected time range contains more than 500 collected waveforms (per channel and per waveform type). The number of displayed ticks has been limited because extremely large numbers of waveform ticks can significantly affect performance.	Deactivate waveform ticks during regular operation. Only activate waveform ticks for diagnostic purposes.

18.2 Data Collection Problems

There are a variety of installation and configuration problems that can affect data collection. This section lists some of the most common problems and solutions. Contact Brüel & Kjær Vibro Service for additional troubleshooting information.

Table 16: Troubleshooting Data Collection Problems

Problem	Possible Causes	Actions
SETPOINT® Connector fails to connect to rack	Ethernet Wiring Problem	Verify the link and activity lights at the rack and server.
	Incorrect Firmware Revisions	Verify that all firmware revisions are new enough to support CMS. See **Table 4:** SAM Firmware Revision for Function.
	Network IP Address Incorrect	Verify that the SAM IP Address is on the same subnet as the computer running SETPOINT® Connector (see **Section 7.1**). Use Ping command to verify communication.
SETPOINT® Connector does not show "PI System" tab	AVEVA™ AF Client is not installed.	Verify that PI AF Client is installed with version at least PI AF Client 2012 (2.5.0). Recommended version is latest release from AVEVA™.
SETPOINT® Connector does not show option to backfill data	AVEVA™ AF Client is not supported	Verify that PI AF Client version is at least PI AF Client 2017 R2 (2.9.2). Recommended version is latest release from AVEVA™.
SETPOINT® Connector does not show option to enable Spectral Bands	AVEVA™ AF Client is not supported	Verify that PI AF Client version is at least PI AF Client 2018 R2 (2.10.5). Recommended version is latest release from AVEVA™.
SETPOINT® Connector cannot connect to PI server	Server not running	Restart the PI server.
SETPOINT® Connector fails to build AF hierarchy	Not enough PI Tag licenses available	Verify that you have enough PI Tag licenses (Refer to AVEVA™ documentation).
No PI Tags allocated	Asset Path not filled in	Assign asset paths to the channels.
	Channels are not on.	Verify the channels are turned on.
No data collected	SETPOINT® Connector service not running	Verify SETPOINT® Connector service is running and collecting.
	Module is not enabled.	Verify that the monitor module is CM-Enabled. See **Section 3**
	Incorrect Rack Time	Verify the rack time and time zone are set correctly (see Manual S1079330). If the rack time is incorrect, the rack may be trying to store data in the future or distant past in relation to the set server time.
Cannot connect to server from the CMS Display software	Server not connected to network	Verify that the server computer is connected to the same network as the client computers and configured with a valid network IP address.

Problem	Possible Causes	Actions
No Orbit, Time-base, or Spectrum data in selected time range	Machine is not changing, or Delta Time set too long.	Adjust the Delta Time.
	Machine is running very slow.	Wait for the waveform collection to finish. A waveform at 3 rpm can take over 5 minutes to collect.
No Spectrum Data	Spectrum set for Full Spectrum, but a single channel selected.	Change to half spectrum or ensure that the selected level includes channel pairs.
No Orbit or Time-base Data	Phase Trigger not assigned Phase Trigger not triggering	Verify the phase trigger configuration.
No new data collected	The client is connected to an old database.	Verify SETPOINT® Connector and the Client are using the same PI Database. See **Sections 10.1.1** and **8.1** Verify the system is time synchronized.
Cannot save reference data.	Insufficient permissions to the database.	See **Section 6** for information on setting database permissions.
Excessive data collected	Loose sensor wire or failing sensor.	Fix the sensor or temporarily Increase measurement I-Factor %. (See **Section 7.3.2**) until the sensor is fixed. Turn on Adaptive I-Factor.
	Machine continually changing measurement levels	Increase measurement I-Factor %. See **Section 7.3.2**. Turn on Adaptive I-Factor

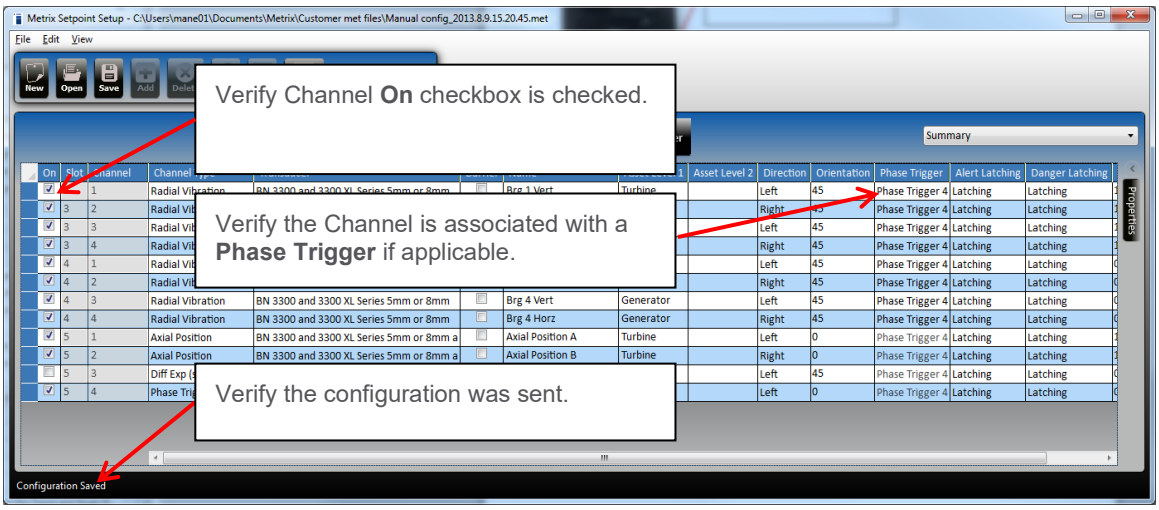


Figure 51: Verifying Channel is Active

18.3 Display Problems

Table 17: Troubleshooting Display Problems

Problem	Possible Causes	Actions
3-D Plots display as black rectangles	Computer graphics card does not support the 3-D graphics.	Upgrade graphics card. Contact Brüel & Kjær Vibro Services for information.
Add Database is grayed out on the Open Database screen.	PI AF Client software is not installed.	Install a compatible version of AVEVA™ PI AF Client software.
Data sources are missing after a software upgrade.	Preferences not migrated from legacy “Metrix” folder to “Setpoint” folder.	Copy files from C:\Users\<User Name>\AppData\Roaming\Metrix\ Setpoint\CMS to C:\Users\<UserName> \AppData\Roaming\Setpoint\CMS
Plots take a long time to display	Insufficient memory available.	Close other applications that may be using large amounts of memory.
	Very large number of waveforms is slowing the system when showing data annotations.	Turn off Data Annotations and Waveform Tick marks.
Cannot set reference data.	User does not have proper database permissions.	Assign permissions per **Section 6**.
Spectrum plot is (not) displayed in orders of running speed	Spectrum set for Orders of Running Speed but no synchronous waveform configured, or vice versa.	Add synchronous waveform or add asynchronous waveform to channel configuration.
Plot appears blank	Manual scaling set too small or large.	Try auto-scale, if plot appears, adjust the manual scale.
All plots are blank	Bookmark opened for a server you are not connected to.	Return to the Home screen and log into the server which has the bookmarked data.

19 Additional Functions

AVEVA™ PI supports many additional functions such as:

- Notification
- Rules
- ERP
- CMMS
- Exporting
- OPC

Contact AVEVA™ for more information.

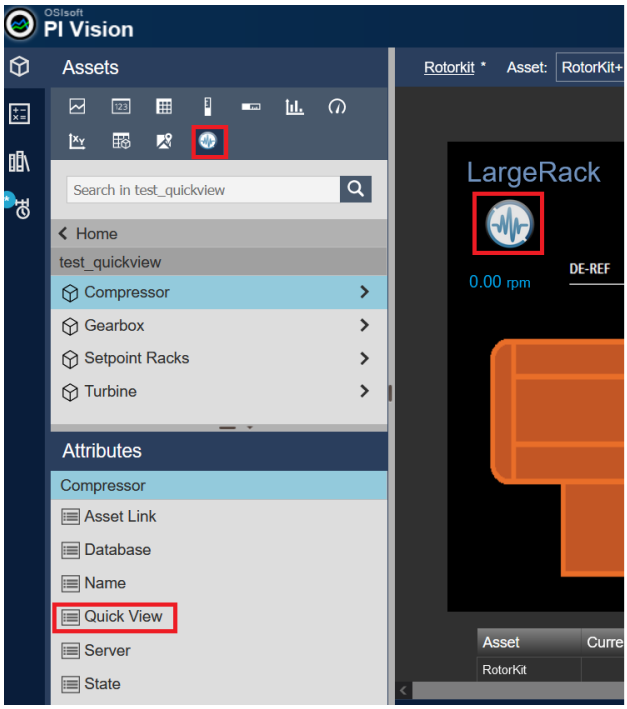
20 Appendix

20.1 PI Vision Integration

20.1.1 Launching SETPOINT CMS Display from PI Vision

You can add a symbol to your PI Vision to launch the SETPOINT CMS Display Application and open with data for the selected and specific plots.

- (CMS-Button is missing – See here to install)
- Go to a PI Vision display.
- Open the Asset-Toolbar and select the corresponding plant.
- Navigation to an Asset and <Quick View> Attribute is presented under <Attributes> section.
- Set the Component to the usage of CMS-Button.
- Then drag the Attribute <Quick View> to the Display and drop the CMS-Button.



Now when the link is selected it will navigate to the previously created CMS quick view display.

20.2 Using SETPOINT CMS in Parallel with an Existing Rack

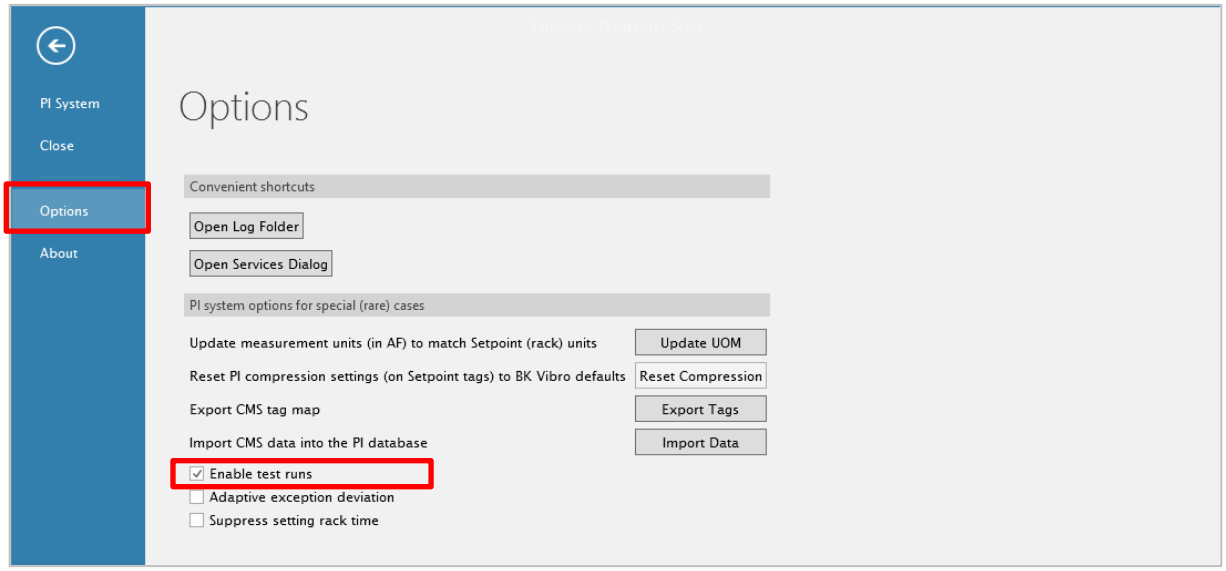
You can use the VC-8000 rack in parallel with an existing rack in order to collect condition monitoring data into SETPOINT® CMS while leaving the existing machine protection system in place. Refer to the VC-8000 Operation and Maintenance Manual (S1079330) for information on how to set the channel inputs for connection to buffered outputs from another rack.

20.3 Using CMS with one VC-8000 Rack and Different Assets

Test stand and portable diagnostic applications may require using the same VC-8000 rack for data collection on different machine assets. SETPOINT® CMS has tools for managing your data and racks when collecting data for test runs on different assets or for different jobs. When using test runs, CMS starts and stops multiple VC-8000 racks synchronous and also allows you to assign security permissions to the various test run datasets to control access.

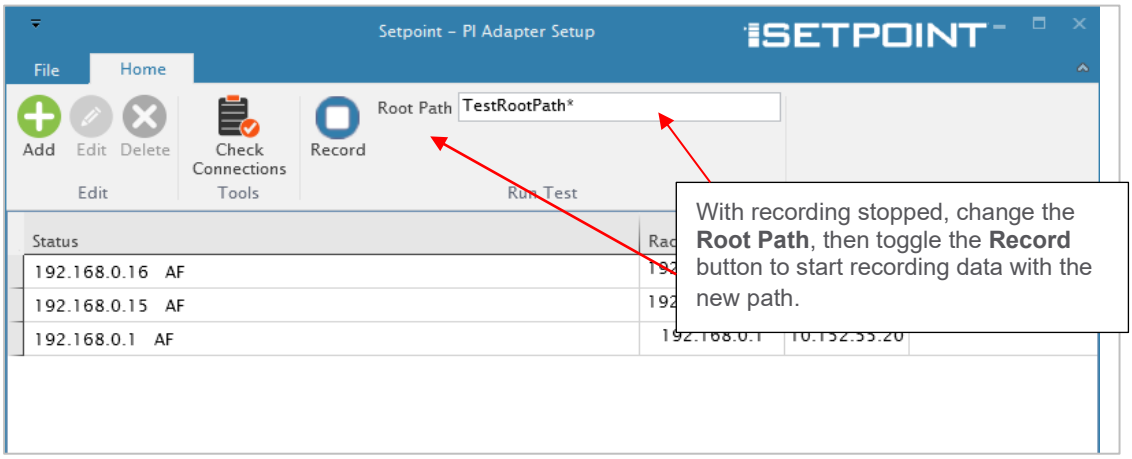
20.3.1 Enabling Test Runs

Open the SETPOINT® Connector Setup utility. From the **File** menu, select **Options** and check **Enable Test Runs** to enable test run data collection. The play and pause buttons will move to the header and apply to all racks.



20.3.2 Set the Root Path

CMS prefixes the machine asset hierarchy with the Root Path providing an easy way to find data collected for a specific machine using the same rack. For example, you can categorize data by customer name or machine serial number by changing the root name.



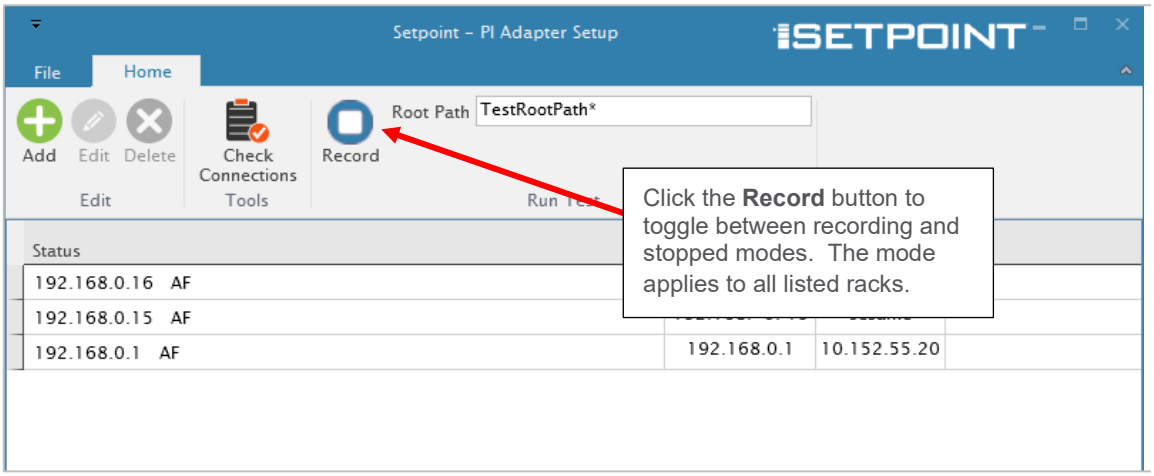
The syntax is the same as for the machine asset hierarchy.

NOTE!

It is easier to find test runs if the name appears on the CMS home screen. When configuring the machine asset hierarchy, it is generally better not to place an asterisk in the VC-8000 hierarchy. Instead, place an asterisk in the Root Path node.

20.3.3 Starting and Stopping the Data Collection

Each time you start data collection, CMS will record a new test run event.



NOTE!

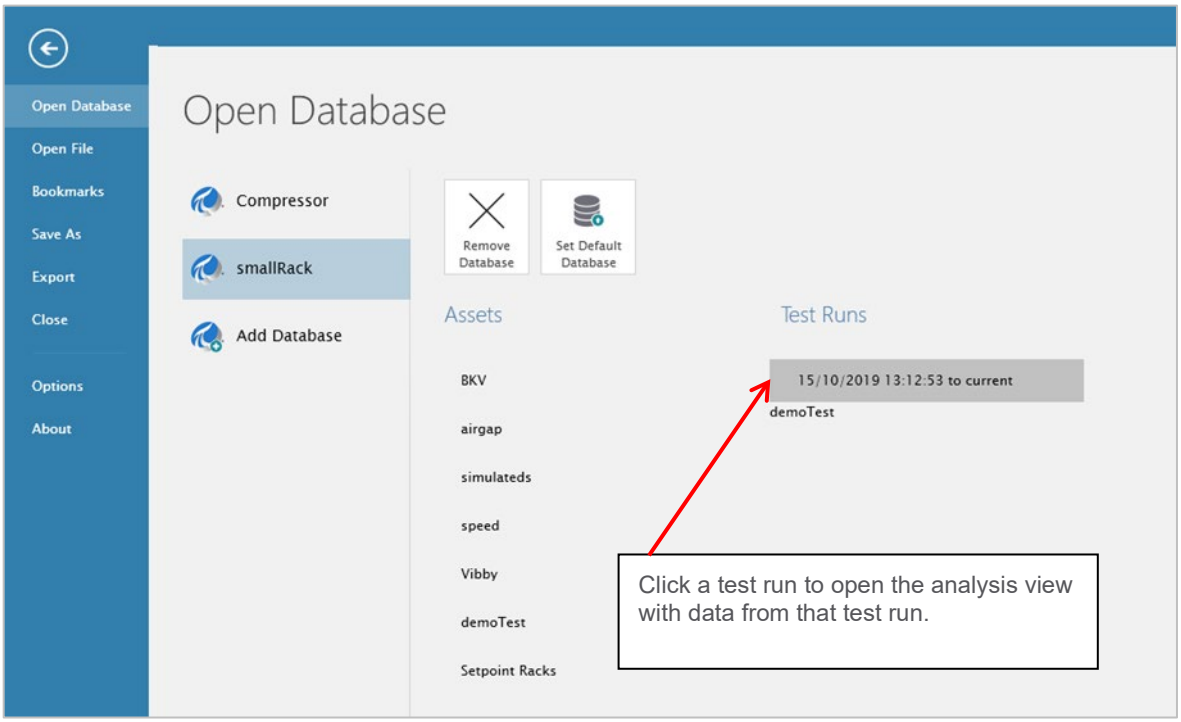
You must place an asterisk in the Root Path name and start data collection for the new Root Path to show up on the CMS home screen.

NOTE!

If you are already collecting data and change the Root Path, CMS will immediately start collecting data under the new name after you click Record.

20.3.4 Navigating to Test Run Data

You can navigate to test runs from the File Tab. If test runs are enabled and there are test runs completed, the Open Database view will show a test run column. Click on the test run icon to open data for that test run.



20.4 File Extensions

Table 18: SETPOINT® File Extensions

File extension	Description
.set	SETPOINT® *VC-8000 Configuration + diagnostic in a single file type but can be opened by either VC-8000 maintenance or VC-8000 setup SW. If you open a file containing only configuration information, the maintenance software will indicate that no diagnostic information is available, such as when creating a configuration on your laptop before connecting to a physical rack – or a legacy configuration file where diagnostic information was not saved.*
.setk	SETPOINT® KEY *VC-8000 CM-Enabler key(s)*
.cms	Condition Monitoring Software *A single file containing CMS-formatted data. Cannot contain more than 7 days. Saves data only for the selected channels or assets.*
.cmssd	CMS Storage Directory *Used with CMS-SD, CMS-HD, and CMS-XC to point to directory containing unformatted CMS data. Individual unformatted files use a variety of extensions and cannot be opened and read by CMS Display directly. They are meant to be opened as groups of files via the .cmssd extension. Unlike 7-day limit on .cms files, .cmssd has no limit on number of days spanned.*
.cmsdb	CMS Data Base *Same as .cmssd. The extension was changed to show that these files are not limited to CMS-SD but are also used for CMS-HD and CMS-XC. Cmsdb files include all channels and assets in the database regardless of the currently selected channels or assets.*
.met	METRIX *Tied to Metrix heritage. This same .met extension was used for configuration and diagnostic files. Configuration files can only be opened using the VC-8000 Setup software, diagnostic files can only be opened from the VC-8000 maintenance software.*

21 Glossary

Term	Definition
Asset Path	The hierarchy from the point up though the asset tree. For example: PLANT\TRAIN\CASE\BEARING\CHANNEL Configure the asset path in the VC-8000 Setup software.
Asynchronous Waveform	Dynamic waveforms samples collected at a fixed sample rate regardless of machine speed.
Attribute	An attribute is a PI AF component that describes a property of the parent element. For example, a measurement may have a danger set point attribute. Attributes can be assigned to any level in the asset path hierarchy. Attributes are not trended by the PI System unless they are mapped to tags so will only show the current value when they are read. SETPOINT® CMS reads the attributes when opened. If attributes are changed in PI AF, you must close and reopen SETPOINT® CMS.
Boost Mode	An operational mode which causes CMS to collect data continuously during transient events. Enable or Disable Boost mode from the VC-8000 Setup software.
Dynamic Data	Dynamic data includes synchronously and asynchronously sampled data streams used for plotting Orbit, Timebase, and Spectrum plots.
Full Spectrum	Plots the complex spectrum using signals from a pair of orthogonal transducers. The full spectrum shows the signal amplitudes of the forward and reverse precessing components as a function of frequency and is essentially the spectrum of an orbit.
Half Spectrum	Plots the signal amplitude as a function of frequency from a single transducer.
Precession	Precession is a change in the orientation of the rotational axis of a rotating body. For machinery, this is the motion of the rotor geometric center in the plane perpendicular to the rotor axis. Precession can be in the direction or rotation (forward precession) or against the direction of rotation (reverse precession).
Static Data	Static data includes filtered and processed samples used for Trend, Bode, Polar, Shaft Centerline, and Data Table plots.
Synchronous Waveform	A dynamic waveform sample collected in fixed intervals of phase over each machine revolution. For example, a synchronous waveform collected at 128 samples/rev will take a sample every 2.8125 degrees of rotation.
Vector	A machine vibration component having both a magnitude and a phase angle. The phase angle is the measured phase lag from a Phase Trigger event to the magnitude peak. Vectors are typically described in relation to the machine running speed: 1X = synchronous to the machine running speed, 2X = synchronous to twice the machine running speed, nX where n is a variable value. Vector data is used to for Bode, Polar, Filtered Orbits and Timebase plots.
XY Pair	Two transducers mounted 90 degrees apart (orthogonal) at the same machine location measuring the vibration in two planes. SETPOINT® will treat UMM channels 1, 2 and 3, 4 as channel pairs for Orbit, Full Spectrum, and Shaft Centerline plots when they are both configured as Radial Vibration.

Contact Us

Brüel & Kjær Vibro GmbH
Wittichstrasse 6
64295 Darmstadt
Germany

Phone: +49 6151 428 0
Fax: +49 6151 428 1000

Corporate E-mail:
info@bkvibro.com

Brüel & Kjær Vibro A/S
Lyngby Hovedgade 94, 5 sal
2800 Lyngby
Denmark

Phone: +45 69 89 03 00
Fax: +45 69 89 03 01

Homepage:
www.bkvibro.com

BK Vibro America Inc.
1100 Mark Circle
Gardnerville NV 89410
USA

Phone: +1 (775) 552 3110

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