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Instruction

Setpoint Condition Monitoring Software

Installation and Operations Manual

Intertek

Keep accessible for future reference

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Content

1 System Description

1.1 System Components

The SETPOINT CMS System consists of these components:

- VC-8000 Rack with eSAM, UMM_{CM} and TMM_{CM} Modules
- SETPOINT Setup and Maintenance Software Applications
- SETPOINT CMS Display Application
- SETPOINT-PI Adapter Software
- 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)
- PI Server (2012 or later)
- PI Process Book (Optional)
- PI Vision (Optional)

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

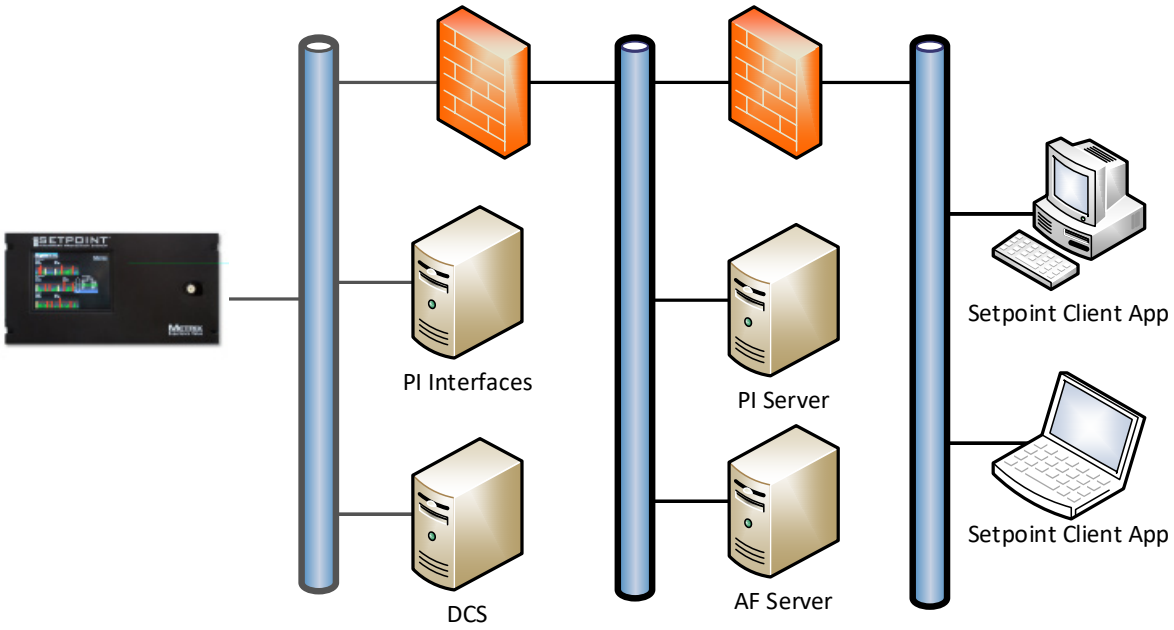


Figure 1: System Components

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. 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.

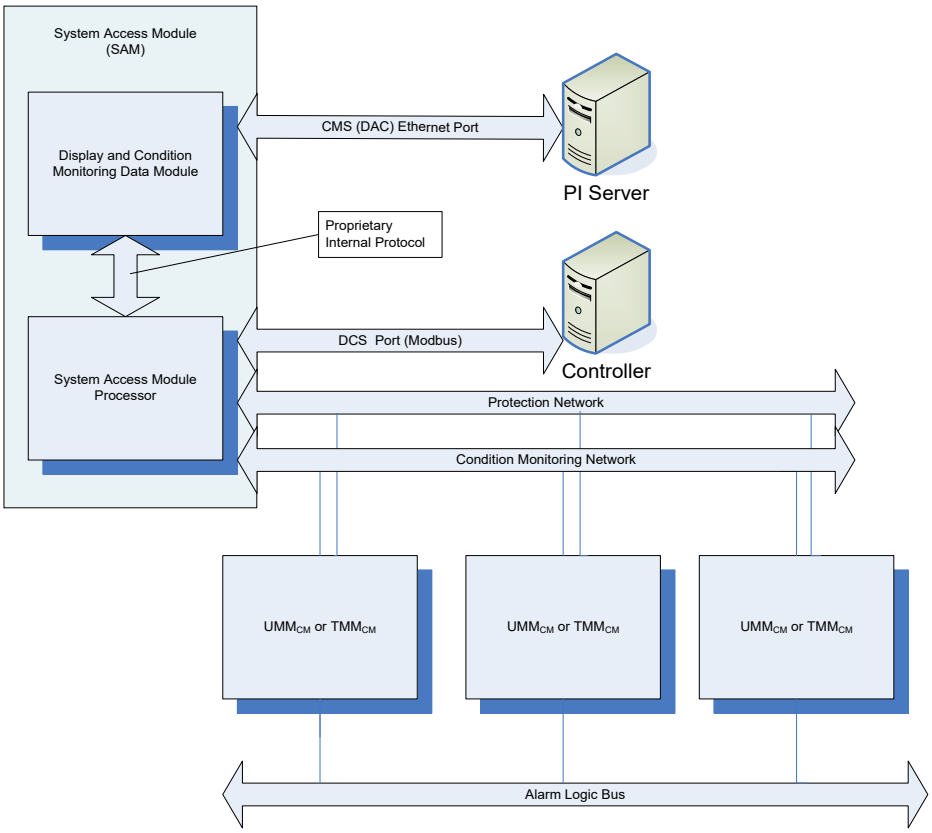


Figure 2: SETPOINT Separation of Protection and Management

1.1.2 OSIsoft PI System Components

SETPOINT CMS is based on the OSIsoft PI System® platform. Brüel & Kjær Vibro has developed methods with OSIsoft 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. This section contains a brief overview of the OSIsoft PI System components. For more detail, refer to the OSIsoft website (www.osisoft.com).

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 OSIsoft have developed interfaces for storing dynamic waveforms and transient machine condition data on the PI Server along with the standard process data.

PI ProcessBook™

PI ProcessBook is the graphical user display interface for the PI System. ProcessBook is an optional component that is highly recommended for all users, allowing you to build machine train diagrams or process mimic diagrams. You can launch the SETPOINT CMS Display Application directly from ProcessBook.

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 similar displays as ProcessBook while also supporting mobile browsers and customized views for small screen devices.

1.1.3 SETPOINT-PI Adapter

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

1.1.4 SETPOINT CMS Display Application

The SETPOINT CMS Display Application is a display package that presents the machinery data stored in the PI System database in standard machinery diagnostic plots. The computer running the SETPOINT CMS Display Application must also have the OSIsoft PI AF Client application installed.

1.1.5 Types of Data

The SETPOINT Universal Monitoring Modules (UMM) collect and send several different types of data that are stored in the PI System database. 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.	Orbit, Timebase, Spectrum, Cascade, and Waterfall (in Orders)
Asynchronously Sampled Waveforms	Data samples are collected at a set sample rate.	Asynchronous Spectrum, Cascade, and Waterfall, Asynchronous Timebase
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

VC-8000 continuously sends static data at an 80 ms rate to the PI Server. The PI System provides change detection that saves more samples while the machine conditions are changing rapidly and fewer samples when the machine is running at steady state. This provides superior data versus a fixed pre-event buffer that may or may not have frozen data while the machine condition was changing.

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

Setpoint System	Description
SD	SD card data storage. The system stores condition monitoring data on an SD card installed in the SAM. 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 adapter 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 SAM 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 www.setpointvibration.com.

- VC-8000 Operation and Maintenance Manual Document #S1079330
- SETPOINT Reciprocating Machine Addendum Document #S1342998

Get more information on the PI System at www.osisoft.com.

- PI Server 2012 Configuring Security

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)
- 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

You can install all OSIsoft 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 OSIsoft specifies. Brüel & Kjær Vibro recommends a computer with a minimum of:

- Windows Server 2008 or Windows Server 2012
- Use SQL Server Express edition or higher
- 16 GB RAM
- 1 TB storage minimum
- Minimum 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 OSIsoft's 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, OSIsoft 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, OSIsoft recommends that you install SQL Server on a different computer from PI Server. OSIsoft 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 4 GB RAM and a 3rd 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-PI Adapter 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 Setpoint 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-PI Adapter 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. Quantity is across all channels but is not allocated per channel (e.g. an interesting channel 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 PI Adapter or loss of data while changing the SD card. 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-PI Adapter. Non-Volatile.	Depends on HD option purchased: 32 GB, 256 GB, or 480 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-PI Adapter. See Section 14. 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-PI Adapter and the PI Server. Recommended when the Setpoint-PI Adapter 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-PI Adapter 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-PI Adapter 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 to the SAM's internal hard drive, SD card drive, and/or a connected OSIsoft 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 SETPOINT Operation & Maintenance Manual S1079330 for additional information on these DCS communication ports.

CM-ENABLED modules can be identified using the Setpoint Maintenance software **Hardware Info** tab as shown in Figure 3 (Refer to VC-8000 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.

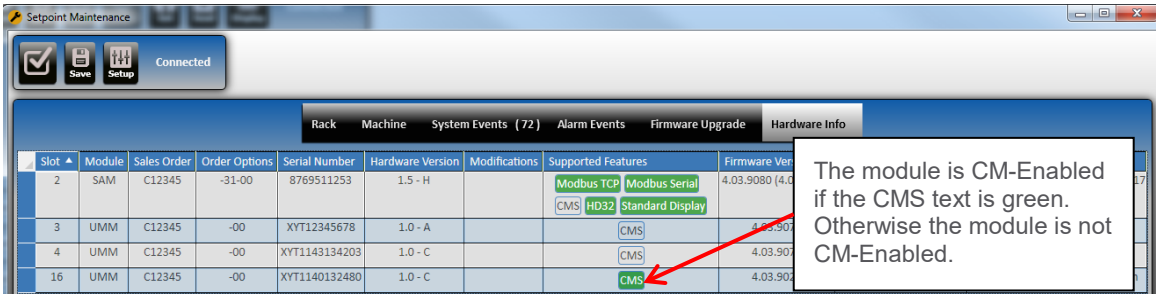


Figure 3: Identifying CM-Enabled Hardware

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.

In addition to CM-ENABLED UMMs and TMMs, the rack must also have a CM-ENABLED SAM. 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.

NOTE!

Even if your eSAM is CM-ENABLED, it must be using revision 3.X firmware or higher. You can check your firmware revision using SETPOINT Maintenance software and apply newer firmware if applicable. Refer to SETPOINT Operation & Maintenance Manual S1079330 for additional information.

3.2 Upgrading SETPOINT 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 SETPOINT Maintenance software:

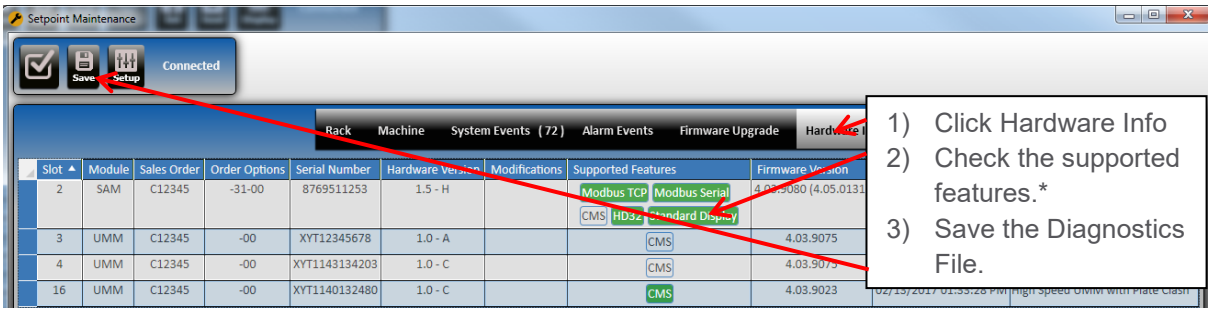


Figure 4: Retrieving the Hardware Information

*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 http://www.setpointvibration.com/downloads/firmware/view.

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 SETPOINT Maintenance software to apply the enabler keys.

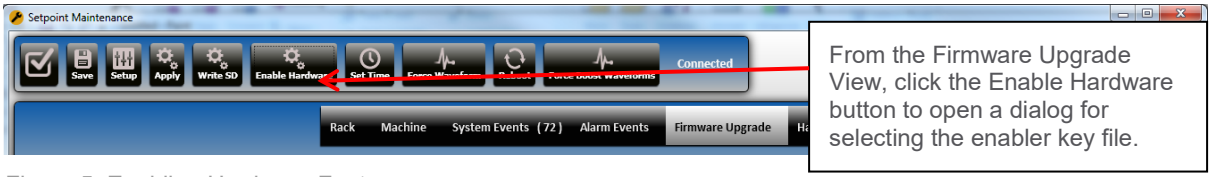


Figure 5: Enabling Hardware Features

Navigate to the .setk file 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 Display software 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-PI Adapter Licensing

The SETPOINT-PI Adapter software converts the data stream from the CMS port on the SAM into a format readable by a PI Server. It functions similar to a PI Interface. This software incurs a charge and cannot be downloaded from our website or freely distributed. It will be provided to you by Brüel & Kjær Vibro via physical media and/or a special download site. Once provided to you, it may be installed on as many computers as required for a single site, but normally only a single instance of this application is required for each PI Server. 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 OSIsoft PI System Licensing

Necessary OSIsoft PI System components for SETPOINT CMS can be obtained directly from OSIsoft, 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 OSIsoft rather than from Brüel & Kjær Vibro, the license agreement is between the end user and OSIsoft, and document 1313253 does not apply. Support for the PI Server and other PI System components in this situation comes from OSIsoft. However, support for the SETPOINT hardware, SETPOINT-PI Adapter software, and SETPOINT CMS Display software 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 SETPOINT racks, except as noted in 3.4.1.2 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 SETPOINT 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 SETPOINT 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 OSIsoft 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 OSIsoft, the license agreement for your PI Server and tags is with OSIsoft. These tags are not restricted in how they may be used, except as governed by your OSIsoft license. They can be used for SETPOINT and non-SETPOINT datastreams, 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 3.4.2.

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 SETPOINT 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
Adapter Service	1	One required per Adapter Service computer
Rack	1	For each rack
Measurement and Status	2	Per measurement
Waveform and Status	2	Per Synchronous or Asynchronous waveform
Waveform Interestingness Index	1	Per channel

Table 6: Tags Required by Channel Type

Universal Monitoring Module							
	PI Tag Consumption			Data Returned			Measurements Available
				Waveform[1]		Non-WF	
Channel Type	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 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-to-PI adapter**
1 tag per adapter

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 Setpoint 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 adapter 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 OSIsoft, including but not limited to PI Interfaces, PI-to-PI Interfaces, ProcessBook, Vision, and DataLink. It is also licensed to connect to SETPOINT CMS Display software and the SETPOINT-PI Adapter 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.

OSIsoft-supplied PI Servers

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

4.3.3 PI Asset Framework (AF) Client License

SETPOINT CMS Display software 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 datastreams.

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, with the features enabled per Section 3.

5 Installation

5.1 Installing the PI System

Refer to the OSIsoft PI System installation manuals when installing the OSIsoft PI System components. The recommended installation order is:

1. SQL Server (for the PI AF Database)
2. PI AF Server 2012 or newer
3. PI Server
4. PI AF Client 2012 or newer
5. Reboot the Server

5.2 Installing the SETPOINT-PI Adapter

Click on the Setpoint_PI_Adapter_Setup.exe to install the SETPOINT-PI Adapter and configuration application. Accept the license agreement and follow the instructions shown on the screen.

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!

The computer running the SETPOINT-PI Adapter must also have the PI AF Client application installed.

During the install process you will be prompted to enter Log On Credentials for the SETPOINT-PI Adapter Service as shown in Figure 6. If the PI Adapter Service is installed on the same computer as the PI Server and PI AF Server, you can select Run service as a 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.

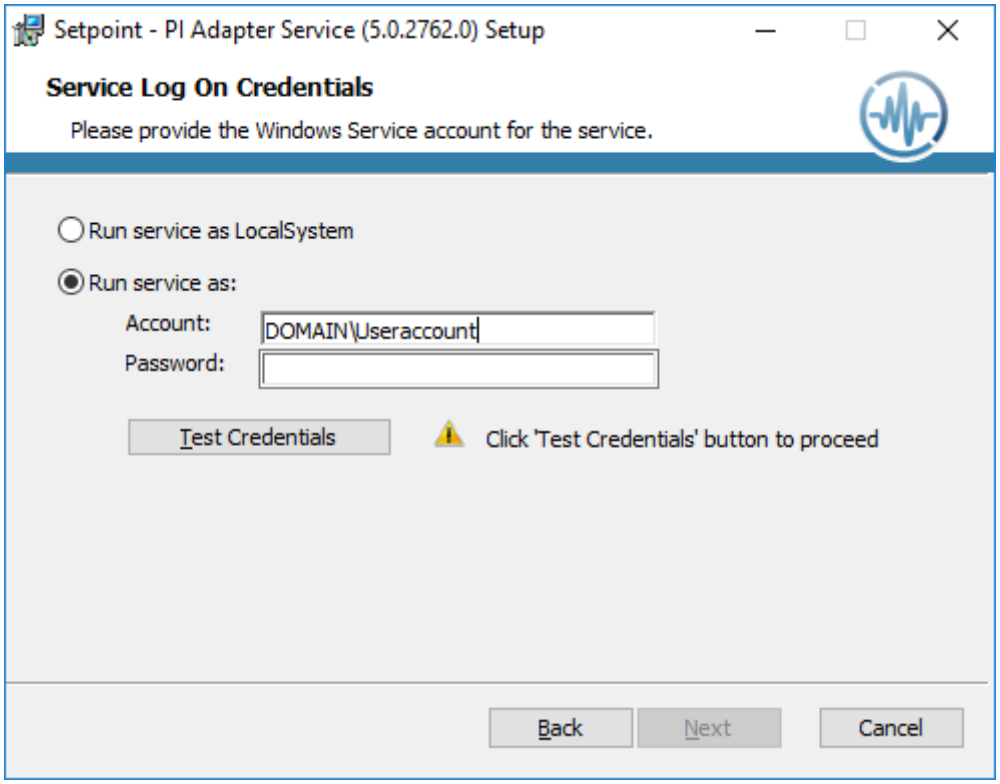
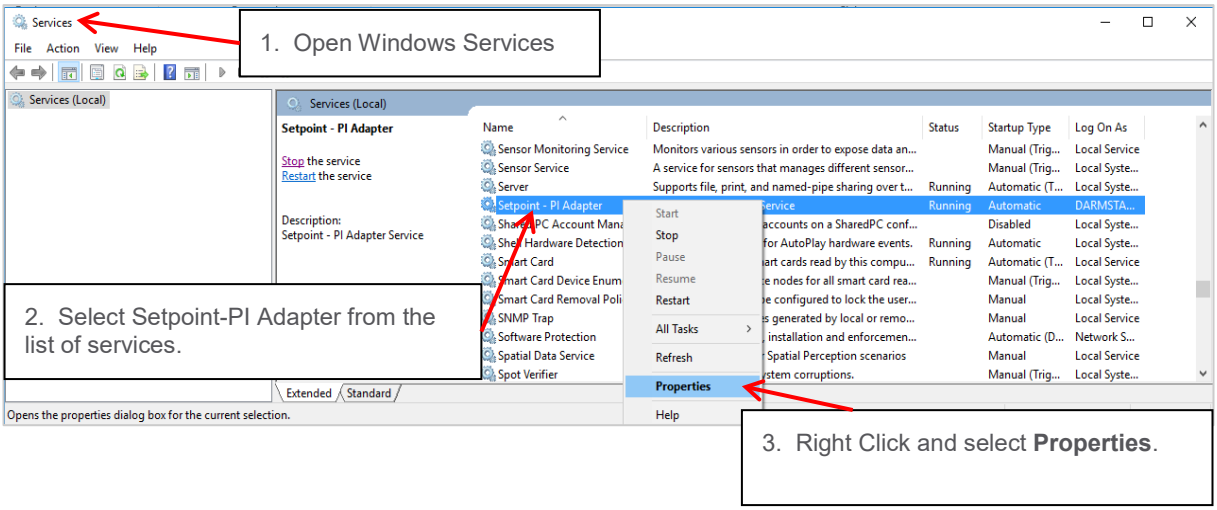
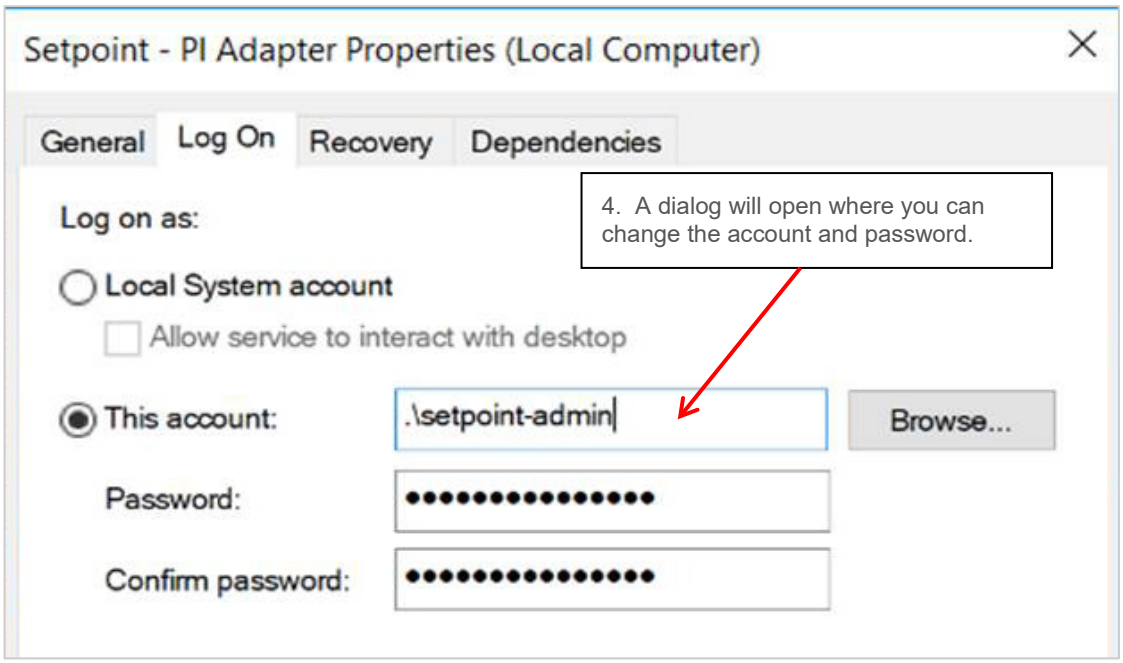


Figure 6: Setting the Adapter Service Log On Credentials

5.2.1 Changing the SETPOINT-PI Adapter 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 PI Adapter 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-PI Adapter service, change the Log On properties of the Setpoint-PI Adapter service.





If the service fails to start, check the Windows Event Log for messages relating to Setpoint-PI Adapter.

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!

The computer running the SETPOINT CMS Display Application must also have the PI AF Client with SP2 (or higher) application installed.

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 OSIsoft 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 OSIsoft procedures. If you have an existing OSIsoft 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
- Store Reference Data
- 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:

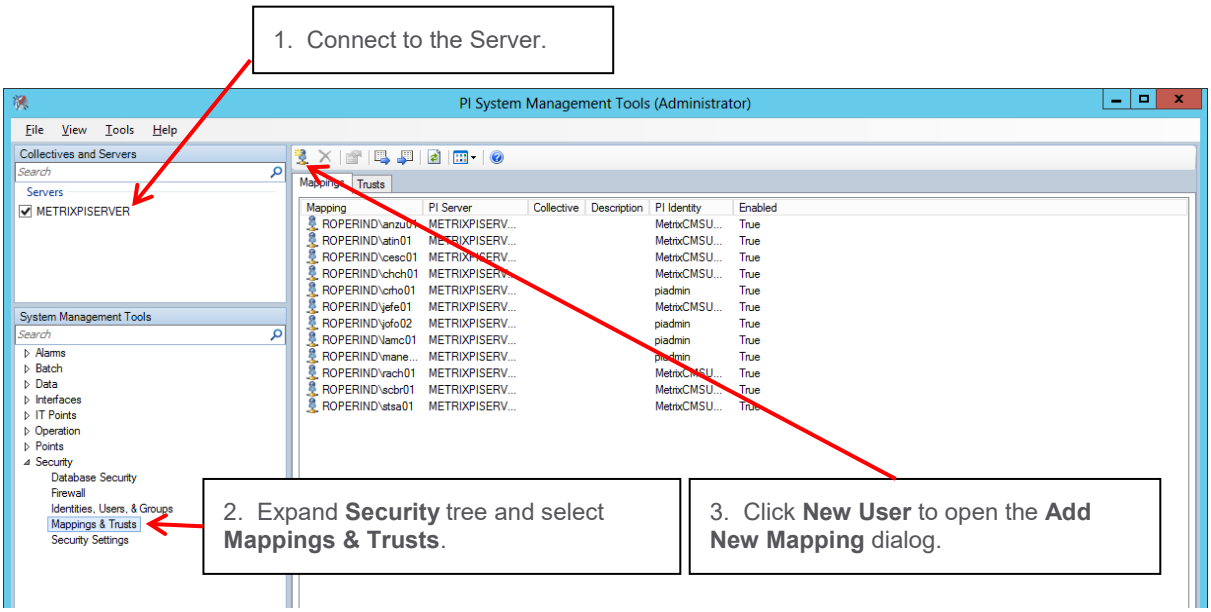


Figure 7: Adding Users

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.

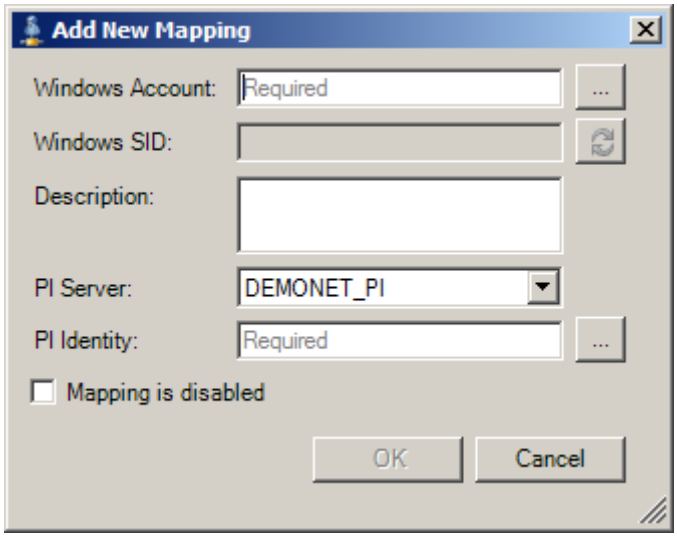


Figure 8: Add New Mapping Dialog

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 the SETPOINT CMS SETPOINT-PI Adapter Service. These ports are required:

Table 7: Communication Ports

Port	Description
8001	Communication and time synchronization between the VC-8000 rack and the SETPOINT-PI Adapter.[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 a VC-8000 Rack. Only required when using MPS-Remote option.
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

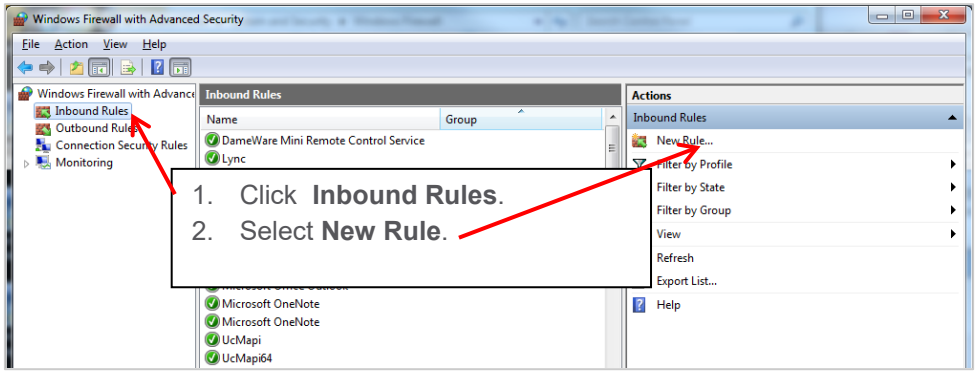


Figure 10: Windows Firewall Advanced Security

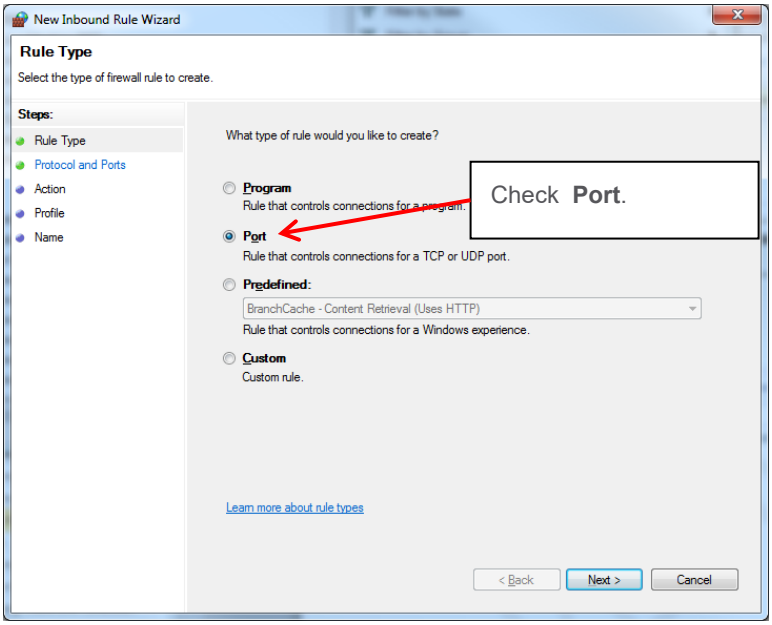


Figure 11: Setting the Rule Type

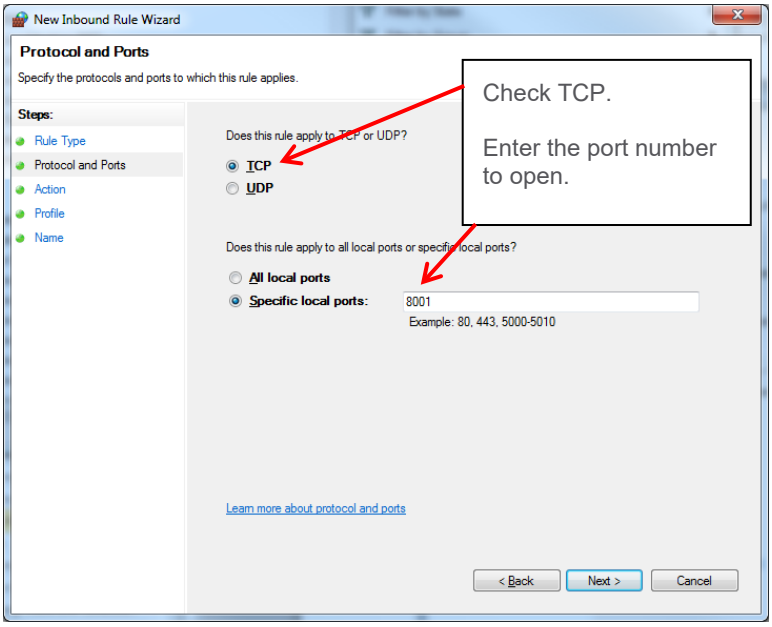


Figure 12: Specify the Port

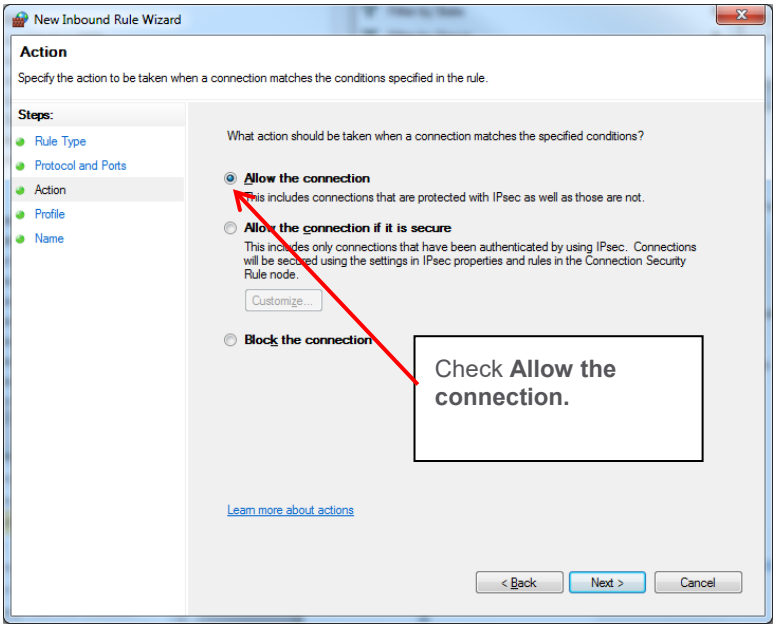


Figure 13: Allow the Connection

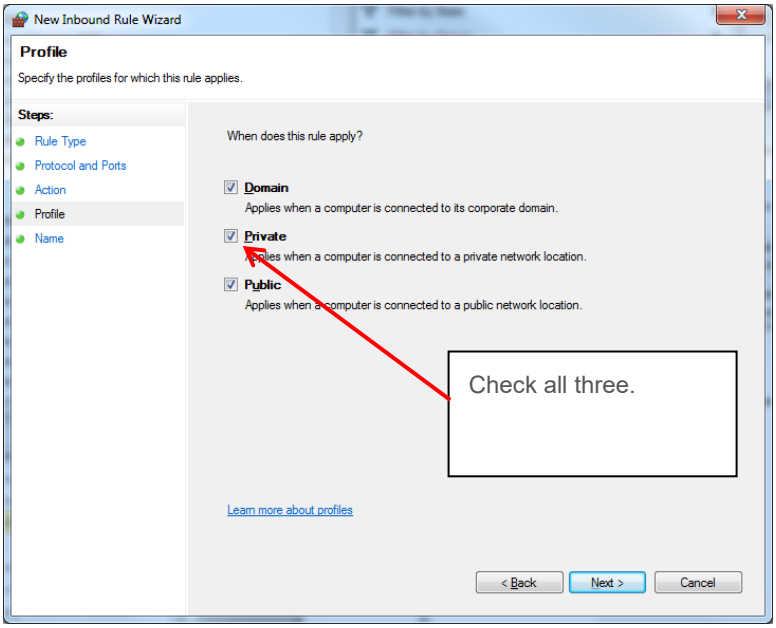


Figure 14: Setting the Rule Application

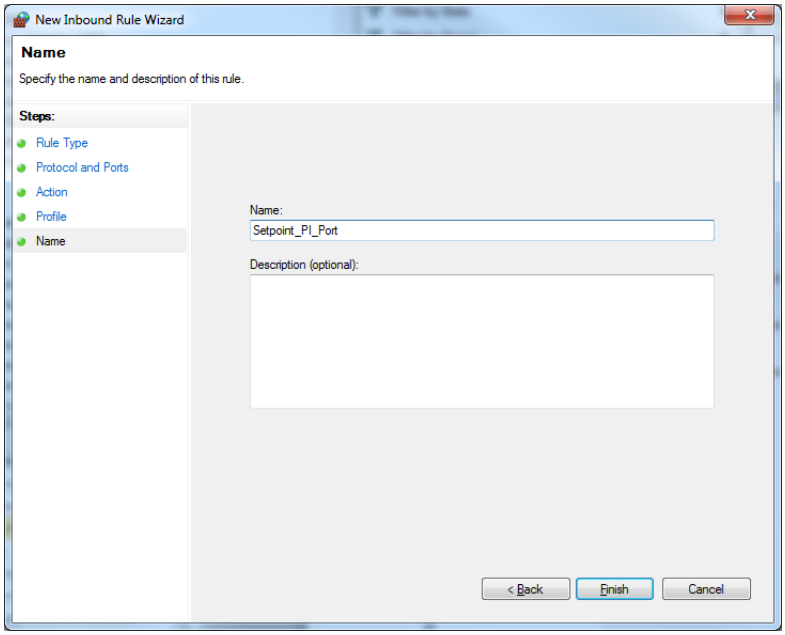


Figure 15: Setting the Port Rule Name

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 Configuration

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

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

7.1 Configuring the SAM

Use the SETPOINT 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 (DAC) 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.

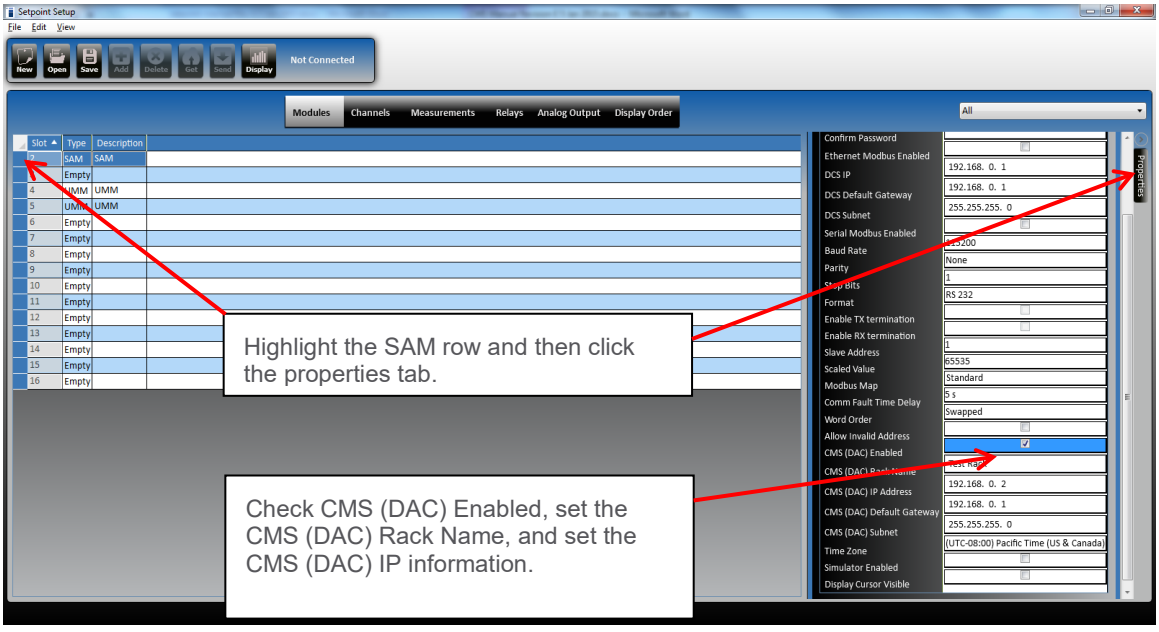


Figure 16: Opening the SAM Properties

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 (DAC) Rack Name

Assign a name to the VC-8000 rack. The SETPOINT-PI Adapter 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-PI Adapter will allocate new PI Tags. Use the Rack Alias (See Section 8.2 and 8.4) setting to avoid creating new tags if you change the rack name.

CMS Enabled

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

CMS-SD Enabled

Check this box to turn on recording to the SDcard. The SAM must be 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 be have been purchased with the SD card 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 (DAC) 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-PI Adapter 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 SAM, 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 OSIsoft 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 SETPOINT Setup software to configure the hierarchy by opening the **Asset Framework View** from the **Channels View** as shown in Figure 17.

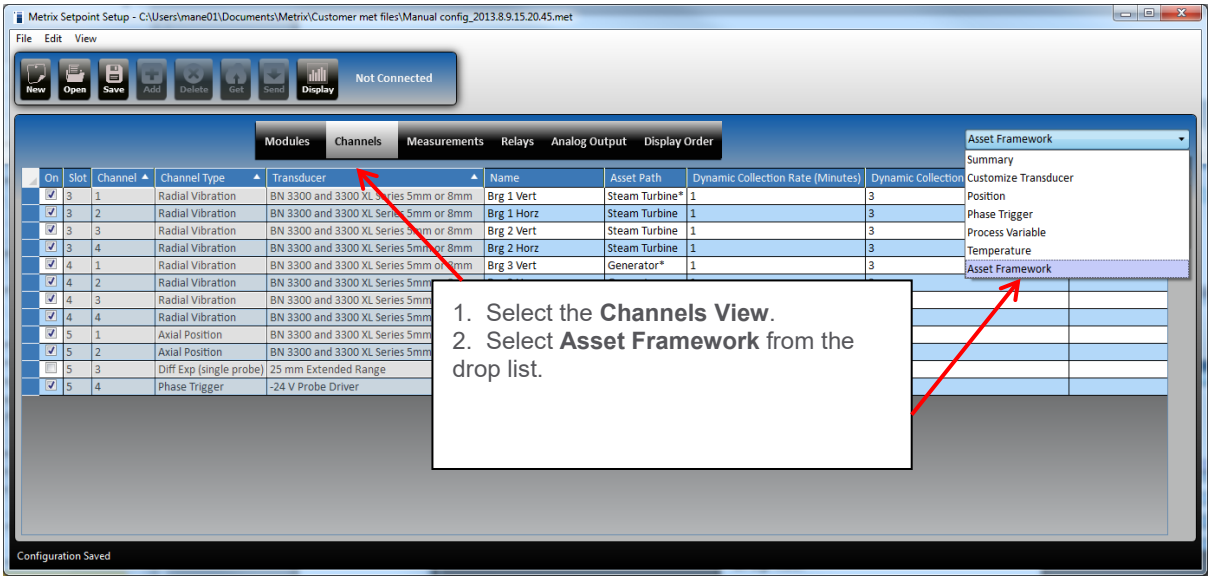


Figure 17: Opening the Asset Framework View

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

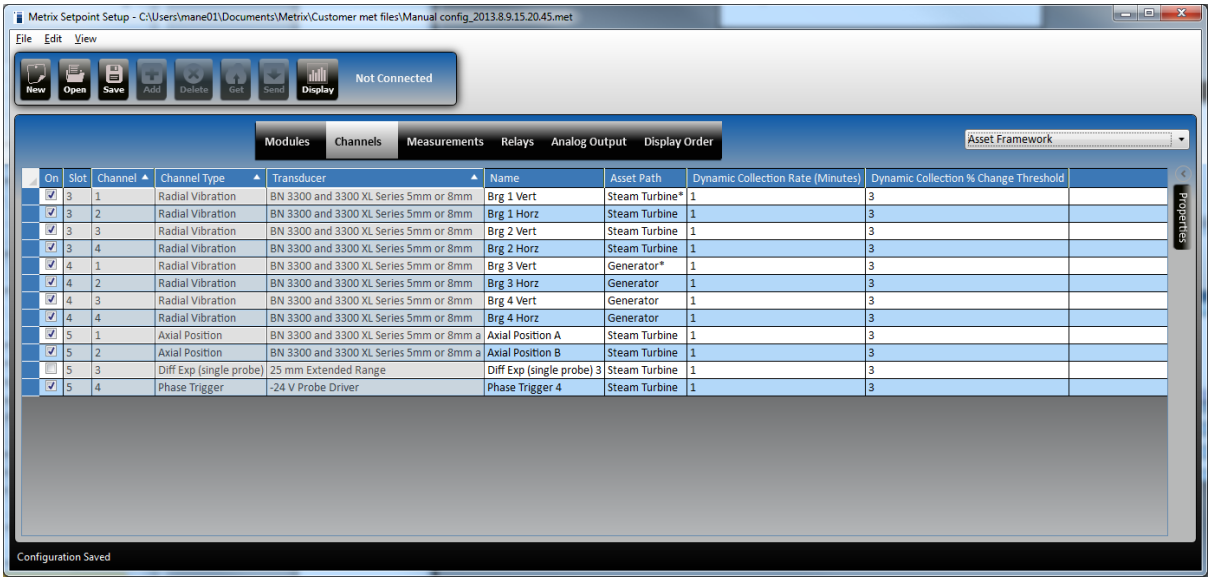


Figure 18: The Asset Framework View

Asset Path

The asset path provides a method for creating an asset hierarchy 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 Asset Path will be truncated when displayed on the home screen.

Example:

An asset 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:

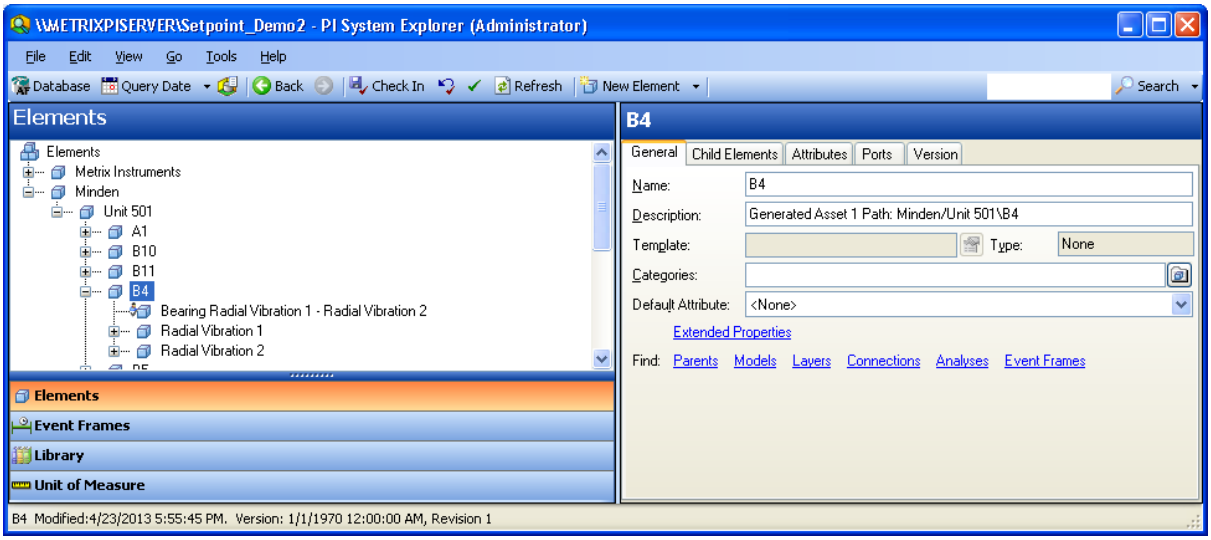


Figure 19: PI System Explorer Hierarchy

In this case the asset path was entered as:

Minden\Unit 501\B4

7.3 Configure Data Collection Rates

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

7.3.1 Dynamic Collection Rate (Minutes)

The dynamic collection rate sets the maximum amount of time that can elapse between storing the most interesting waveform. The dynamic collection rate ensures that waveforms are collected periodically, even when the machine condition is not changing enough to trigger the dynamic collection % change threshold.

Whenever the dynamic collection rate 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 Dynamic Collection Rate.

Setting a short dynamic collection rate 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 dynamic collection rate does not need to be set low to achieve good waveform collection when the machine state is changing.

Table 8: Dynamic Collection Rate Data Storage for 2048 Sample Waveforms

Dynamic Collection Rate	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 point 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 Dynamic Collection % Change Threshold

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 Dynamic Collection % Change Threshold 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 Interestingness

Adaptive interestingness (i-ness) is a tool that learns the machine changes and automatically adjusts the Dynamic Collection % 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 will increase the dynamic collection % change threshold greater than 4% to prevent the system from collecting excessive waveforms. The adaptive 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.

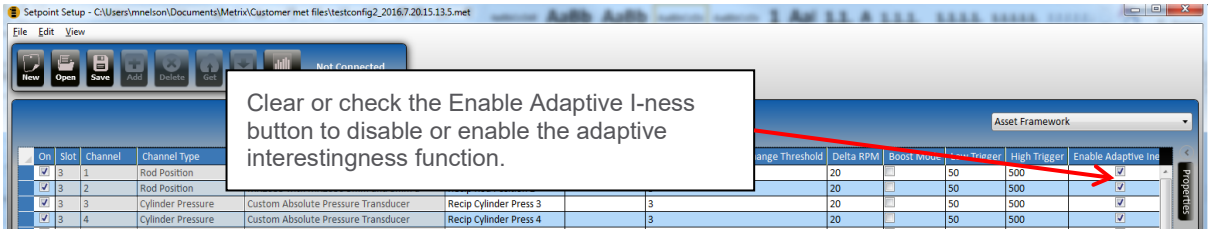


Figure 20: Enabling Adaptive I-ness

Adaptive interestingness is enabled by default on dynamic channels and is recommended for long term data collection.

7.3.4 Dynamic Collection on Speed Change

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 Asset 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.

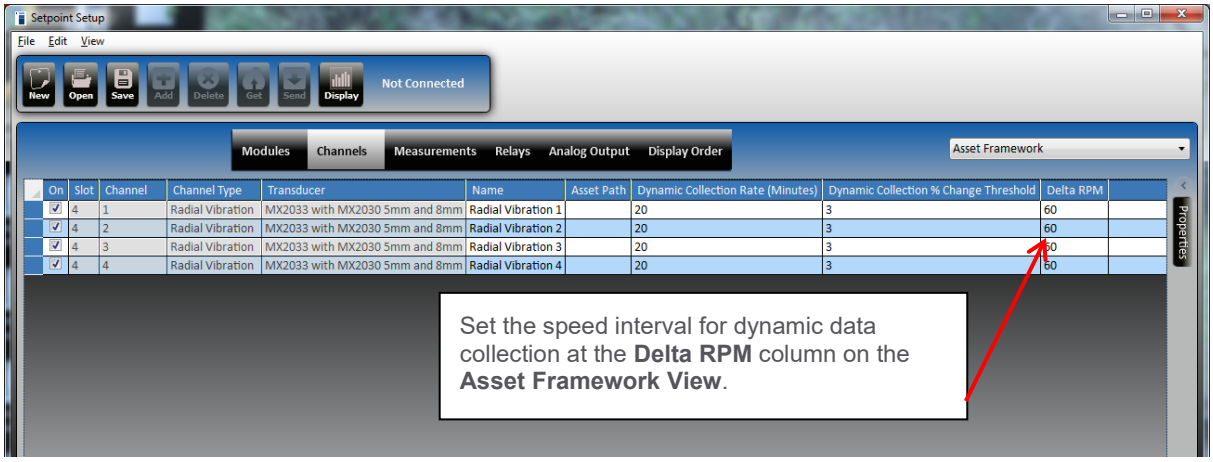


Figure 21: Setting Speed Change for Dynamic Data Collection

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 SETPOINT Setup application when the VC-8000 is configured.

NOTE!

If you created your rack configuration with SETPOINT Setup software older than version 3.0, you will 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 are fixed as channels 1 and 2 or channels 3 and 4 on a UMM. The configured transducer's orientations determine which channel is "X" and which is "Y".

7.4.1.2 Setting sample rates

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

CAUTION!

The SETPOINT 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.

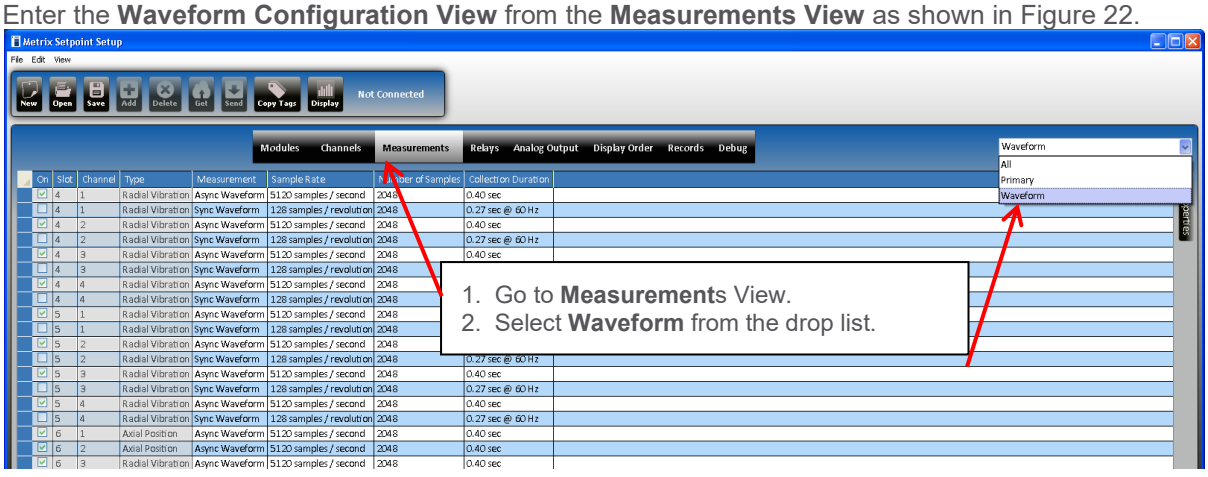


Figure 22: Entering the Waveform Configuration View

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	Collection time at 3600 rpm
128X	12,500 rpm	1024	8	50X, 0.125X	133 ms
		2048	16	50X, 0.0625X	267 ms
64X	25,000 rpm	1024	16	25X, 0.0625X	267 ms
		2048	32	25X, 0.03125X	533 ms
32X	50,000 rpm	1024	32	20X, 0.03125X	533 ms
		2048	64	10X, 0.015625X	1.07 s
16X	100,000 rpm	1024	64	5X, 0.015625X	1.07 s
		2048	128	5X, 0.0078125X	2.13 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	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
512 sps	200 Hz	1024	400	0.5 Hz, 30 cpm	2 s
		2048	800	0.25 Hz, 15 cpm	4 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
2560 sps	1000 Hz	1024	400	2.5 Hz, 150 cpm	400 ms
		2048	800	1.25 Hz, 75 cpm	800 ms
5120 sps	2000 Hz	1024	400	5 Hz, 300 cpm	200 ms
		2048	800	2.5 Hz, 150 cpm	400 ms
12800 sps	5000 Hz	1024	400	12.5 Hz, 750 cpm	80 ms
		2048	800	6.25 Hz, 375 cpm	160 ms
25600 sps	10000 Hz	1024	400	25 Hz, 1500 cpm	40 ms
		2048	800	12.5 Hz, 750 cpm	80 ms
51200 sps	20000 Hz	1024	400	50 Hz, 3000 cpm	20 ms
		2048	800	25 Hz, 1500 cpm	80 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.

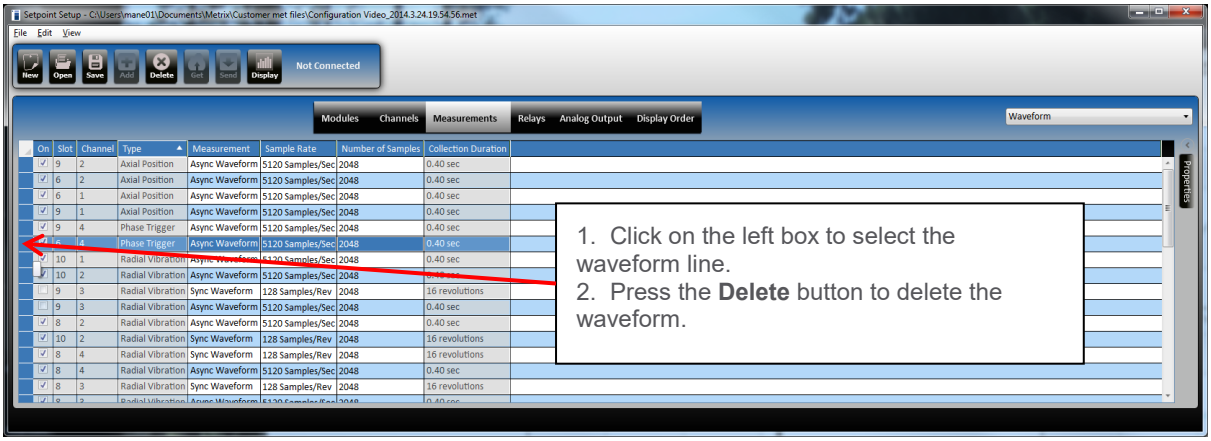


Figure 23: Deleting a Waveform

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, 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

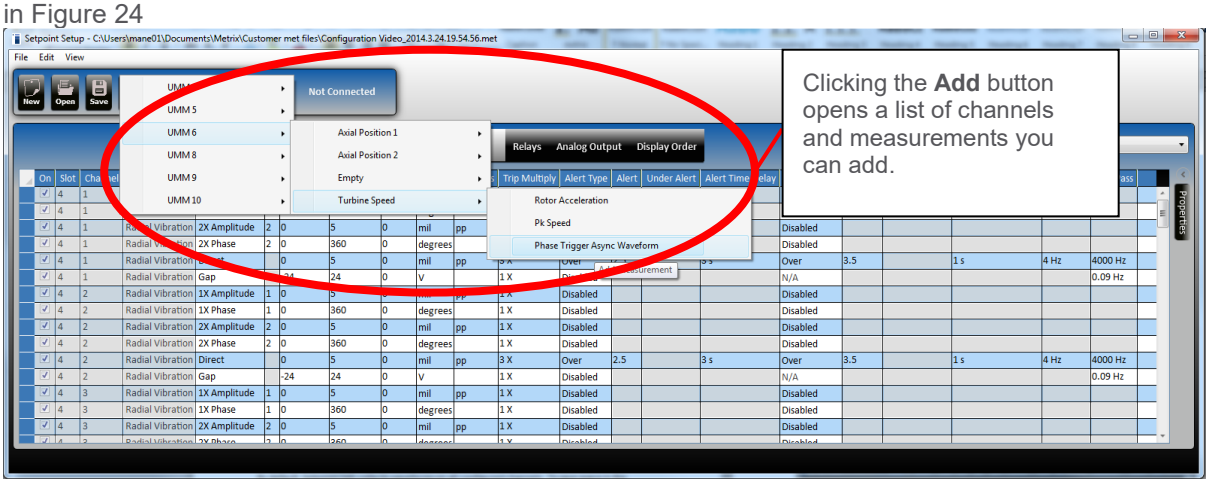


Figure 24: Adding Measurements

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. Uploading 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 **Asset 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.

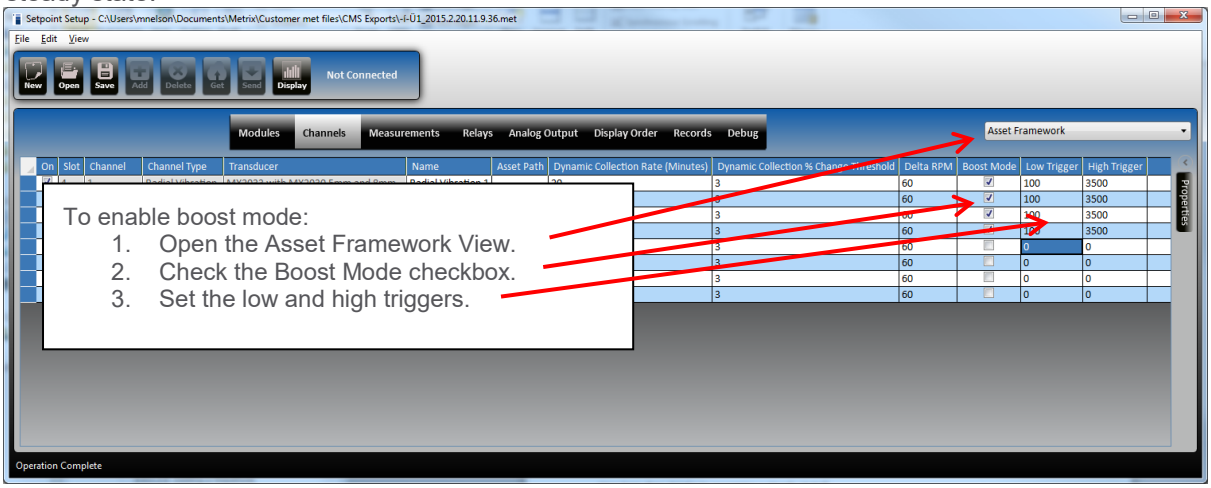


Figure 25: Boost Mode Configuration

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 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 OSIsoft PI database manuals and tutorial videos. This section gives a brief overview of the storage modes and how they impact SETPOINT CMS data collection.

7.6.1 Automatic archive creation

Automatic archive creation is the default with newer versions of the OSIsoft 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 7.6.2).

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 26.

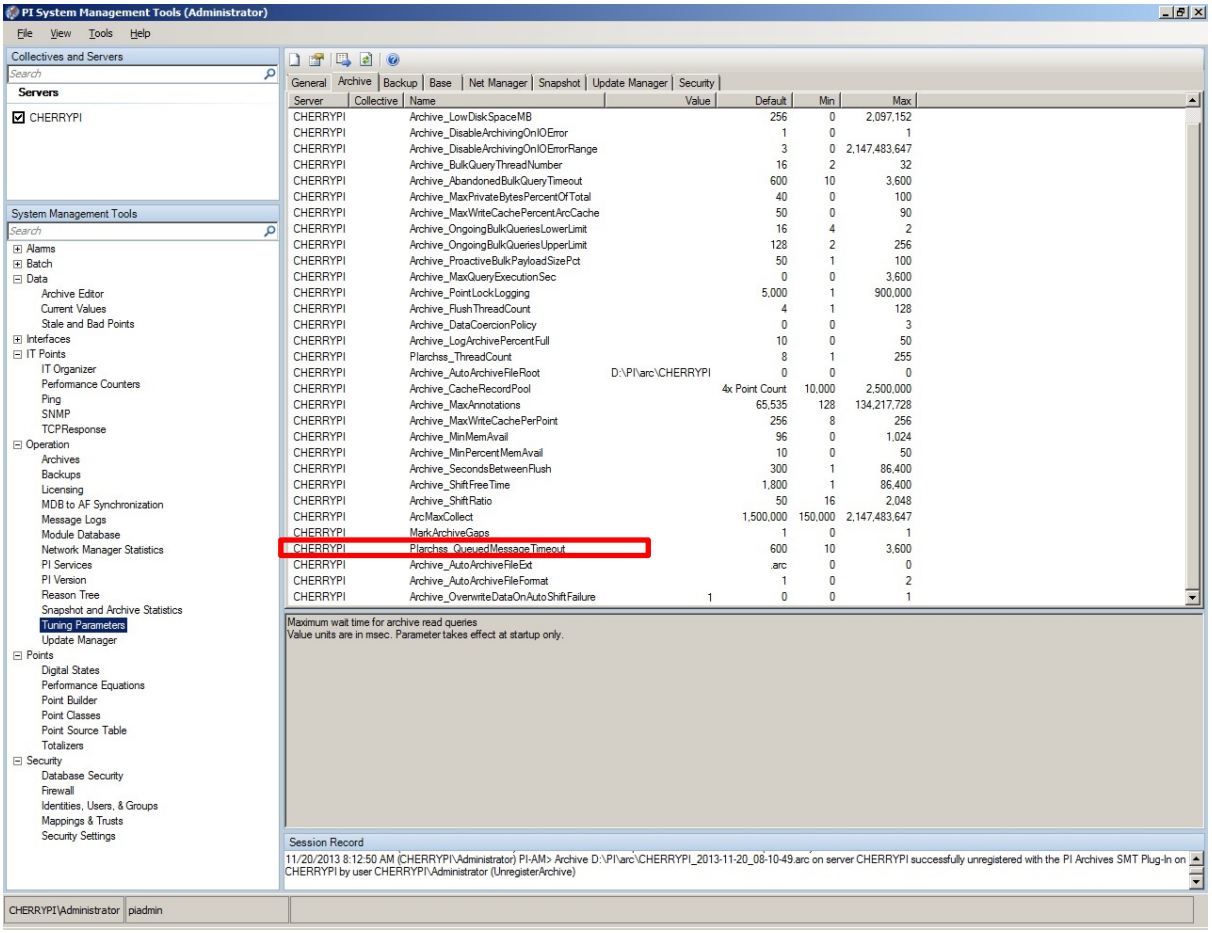


Figure 26: PI Database Tuning Parameters

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.

7.6.2 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.

8 Configure VC-8000 Rack Connections

You need to point the VC-8000 rack to the location where it will be storing the data. The SETPOINT-PI Adapter Setup software provides an interface for:

- Configuring data storage locations
- Adding a new rack
- Deleting a rack
- Viewing connection status
- Starting and stopping data collection
- View system status logsFigure 35: SETPOINT-PI Adapter

NOTE!

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

8.1 The Adapter File Tab

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

- Select PI AF Servers and Databases
- Reset Data Compression Settings and update the PI Units of Measure to Match the Rack
- Configure CMS-XC
- Access Log Files
- View the Adapter Version

8.1.1 PI AF Settings

PI System to configure OSIsoft PI System data collection.

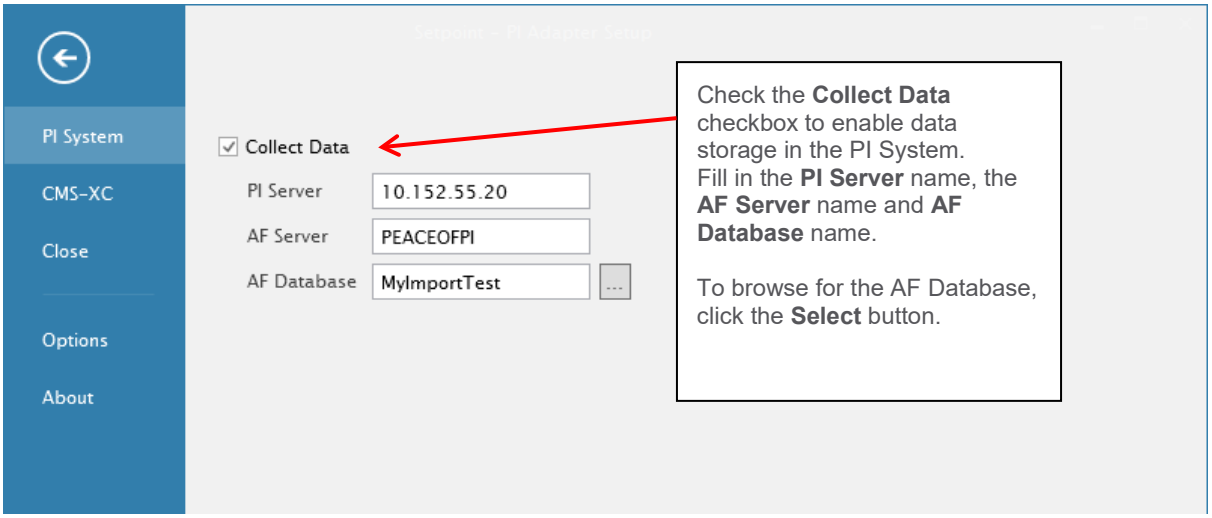


Figure 27: Setpoint-PI Adapter PI System Settings

NOTE!

If the AF Database configured does not exist, the SETPOINT Adapter will automatic create a new database with the configured name.

8.1.2 CMS-XC Settings

CMS-XC stores static and dynamic data from the VC-8000 rack into files on a local computer storage drive. CMS-XC files can be directly accessed from the SETPOINT CMS Display Application 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 12 in this manual for more information on CMS-XC.

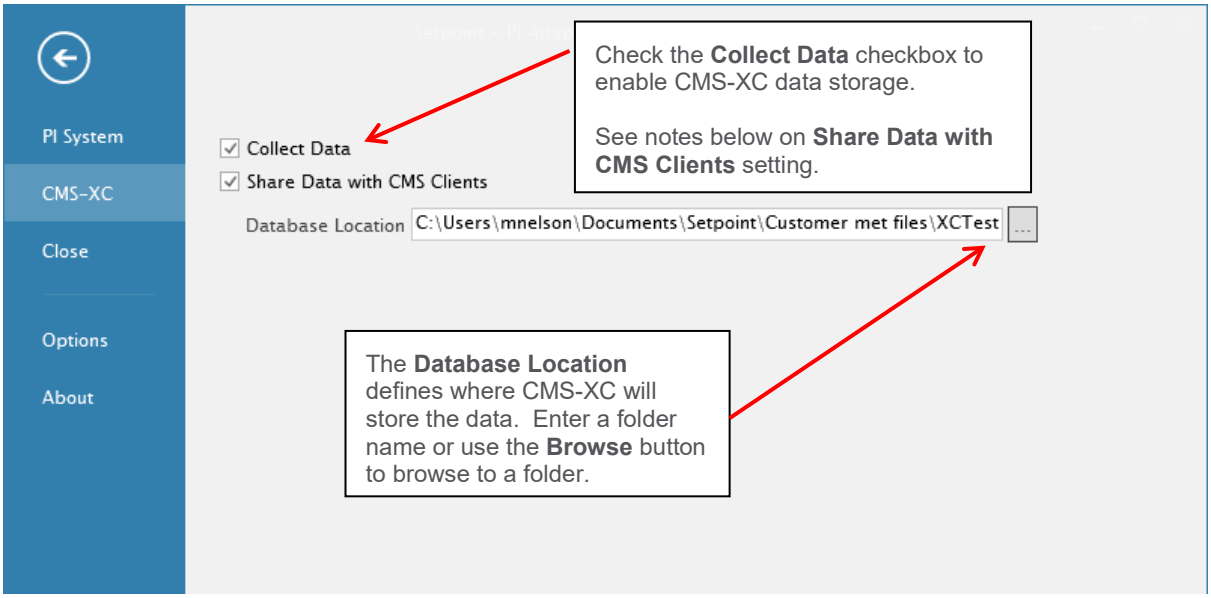


Figure 28: CMS-XC Configuration

The **Share Data** option allows other computers to view live data using the SETPOINT CMS Display software. Clear the **Share Data** checkbox if CMS-XC is only used for backing up data, otherwise check the **Share Data** checkbox to allow viewing live data. When the **Share Data with CMS Clients** 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. 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:

- Open the Log Folder
- Open the Services Dialog
- Update the Units of Measure (UOM)
- Reset Compression
- Upload a CMS database into the PI System
- Suppress Setting the Rack Time
- Enable Test Runs
- Enable Adaptive Exception Deviation

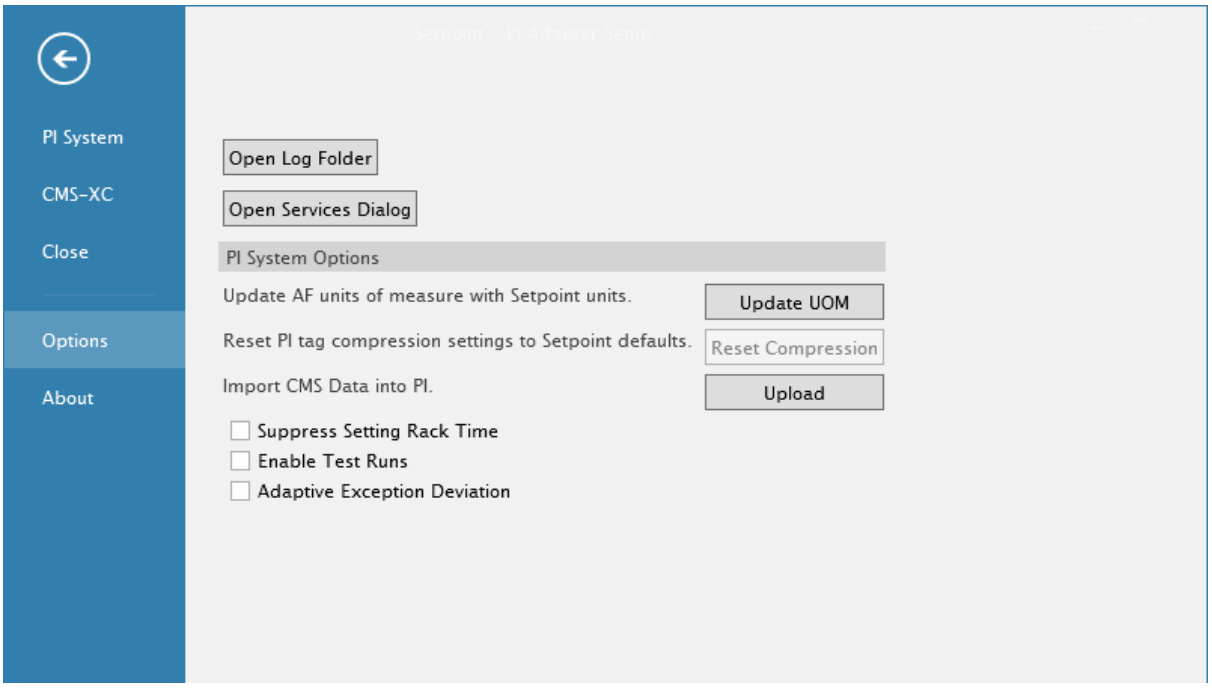


Figure 29: Adapter Options View

8.1.3.1 Open Log Folder

The **Open Log Folder** option opens a Windows folder containing the SETPOINT CMS system logs. Use the feature to find log files to send to Brüel & Kjær Vibro for product improvements.

8.1.3.2 Open Services Dialog

Clicking this button opens the Windows Services dialog. You can change settings made during the Setpoint-PI Adapter installation from the Services dialog such as the log on account by right clicking the Setpoint-PI Adapter service and selecting **Properties**.

NOTE!

Stopping or resetting the Setpont-PI Adapter service from the Windows Services dialog will close the Setpoint-PI Adapter interface and stop data storage.

8.1.3.3 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.

8.1.3.4 Resetting Compression

Under normal operating conditions, the Setpoint-PI Adapter only sets the compression levels when the PI System tags are first created. Later changes to the VC-8000 rack channels do not change the compression so that any changes made in PI System Management Tools to optimize compression are not overwritten. However, when using the Setpoint rack with different machine assets you may need to change compression settings from a previous job. Click the **Reset Compressio**n 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 VC-8000 rack (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.

8.1.3.5 Upload

Use the **Upload** button to import CMS-SD, CMS-HD, or CMS-XC data into the PI System as discussed in Section 14.

8.1.3.6 Suppress Setting Rack Time

For Brüel & Kjær Vibro Service use. Leave this cleared for normal operation.

8.1.3.7 Enable Test Runs

Check Enable Test Runs if you are using the SETPOINT CMS system with one VC-8000 rack for different assets as described in Section 19.3

8.1.3.8 Adaptive Exception Deviation

Adaptive Exception Deviation 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 function.

8.1.4 About

Click About to see the SETPOINT Adapter revision as shown in Figure 30.

Figure 30: Adapter Revision

8.2 Adding a New Rack

Click **Add** to add a rack to the server.

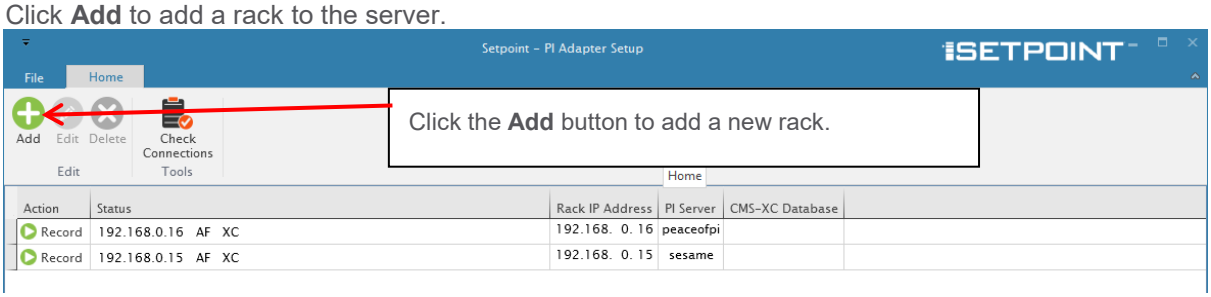


Figure 31: Adding a Rack in the SETPOINT-PI Adapter

Enter the Rack IP Address and PI Server name and Root Path as shown in Figure 32 and Figure 33. See descriptions of these fields in Table 11.

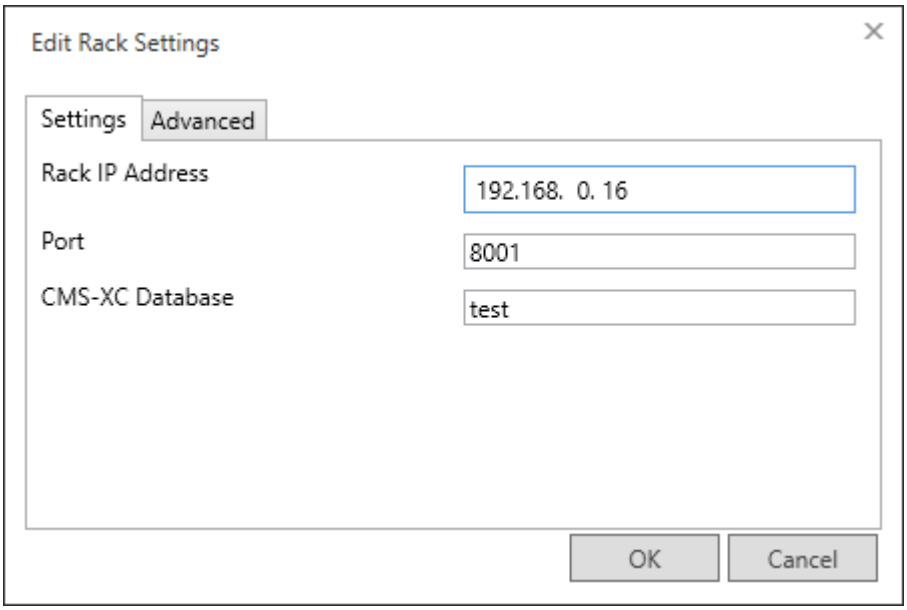


Figure 32: Setpoint-PI Adapter Rack Settings

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 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).

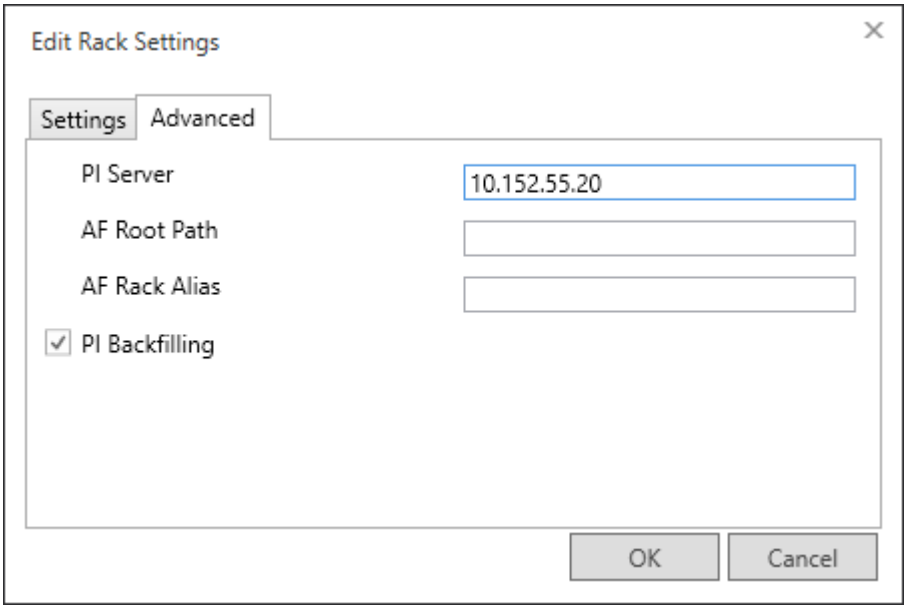


Figure 33: Setpoint-PI Adapter Rack Advanced Settings

The **AF Root Path** sets the PI-AF hierarchy. The Setpoint-PI Adapter appends the asset path set in the rack configuration (See Section 7.2) underneath the AF Root Path the first time data collection starts. Once the rack node has been created in PI-AF, changing the Root Path has no effect. Figure 34 shows the resulting PI-AF element hierarchy for a rack with AF Root Path of SATA_Temp_Test2 and a rack name of MACH1.

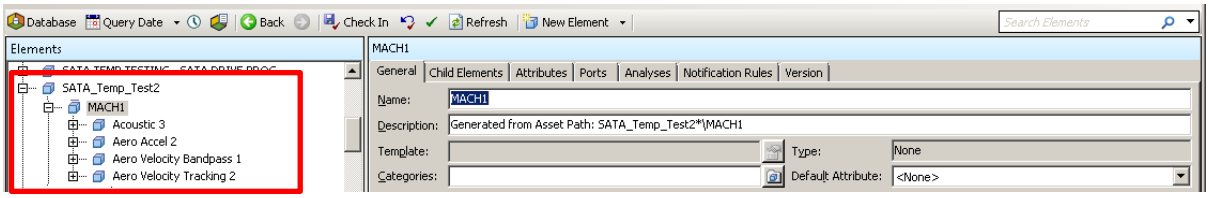


Figure 34: AF Root Path

The **Rack Alias** is used when creating the PI Tags. PI tags are created using: Rack Alias/Slot/Channel. If the Rack Alias is not specified, the Setpoint-PI Adapter will create new tags using the Rack Name. You can use the Rack Alias to change the rack name without creating new PI tags.

Refer to section 13.4 for information on PI Backfilling.

The following table summarizes the settings:

Table 11: Rack Connection Configuration Parameters

Setting	Description
Rack 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-PI Adapter. Normally you will not change this from the default value.
PI Server	The PI Server network name or IP Address. Leave this blank if you are only using CMS-XC.
Root Path	The SETPOINT-PI Adapter appends each channel's asset path to the root path when building the PI AF Hierarchy. Use the Root Path when the same VC-8000 rack is used with different assets such as in test stand or portable diagnostic applications.
XC Database	Specifies the folder name where the Setpoint Adapter will store the XC file data.

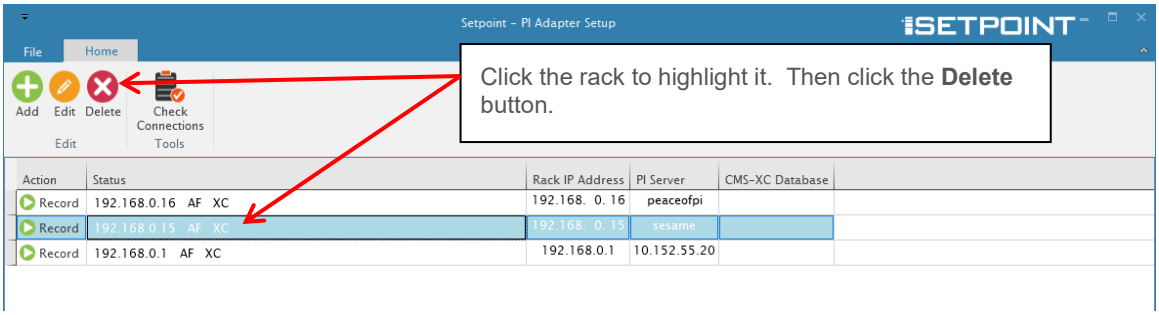
NOTE!

The SETPOINT-PI Adapter 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 the SETPOINT-PI Adapter.

Click **OK** to keep your changes and to build the hierarchy. The SETPOINT software will automatically upload configuration information from the rack and build the PI AF asset hierarchy.

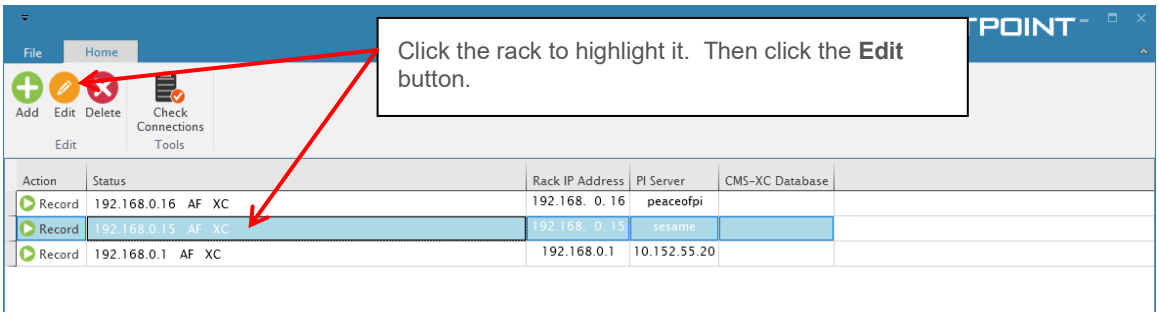
8.3 Deleting a Rack

Follow these steps to delete a rack.



8.4 Editing Rack Information

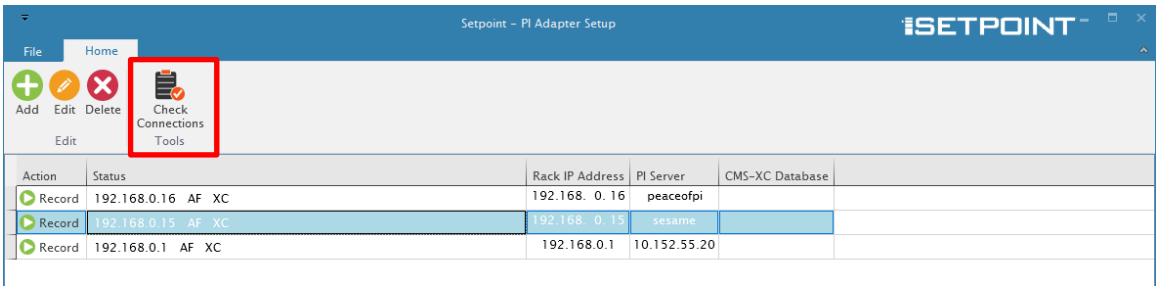
Follow these steps to change rack information.

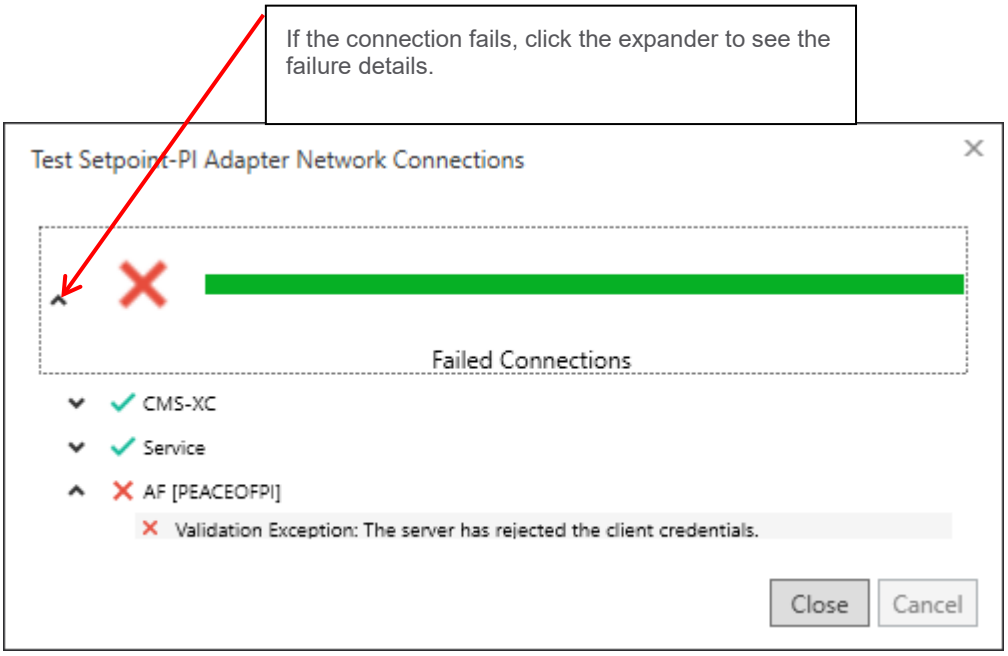


The Edit Rack Settings dialog will open as shown in Figure 32 and Figure 33.

8.5 Checking the Connection

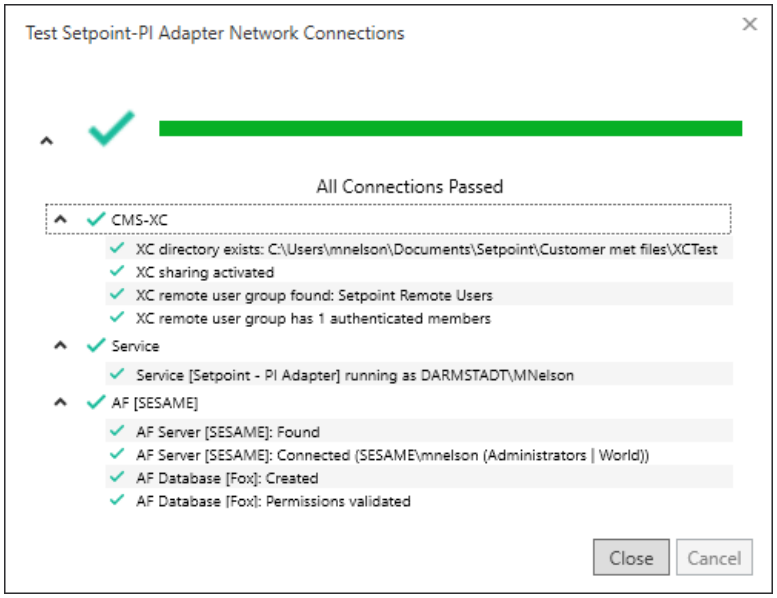
The Setpoint – PI Adapter includes a tool to check the security and network settings.





In the above example, 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.



8.6 Viewing Connection Status

The main SETPOINT-PI Adapter screen shows the configured racks and their connection statuses as shown in Figure 35. The rack name that shows is set in the rack configuration.

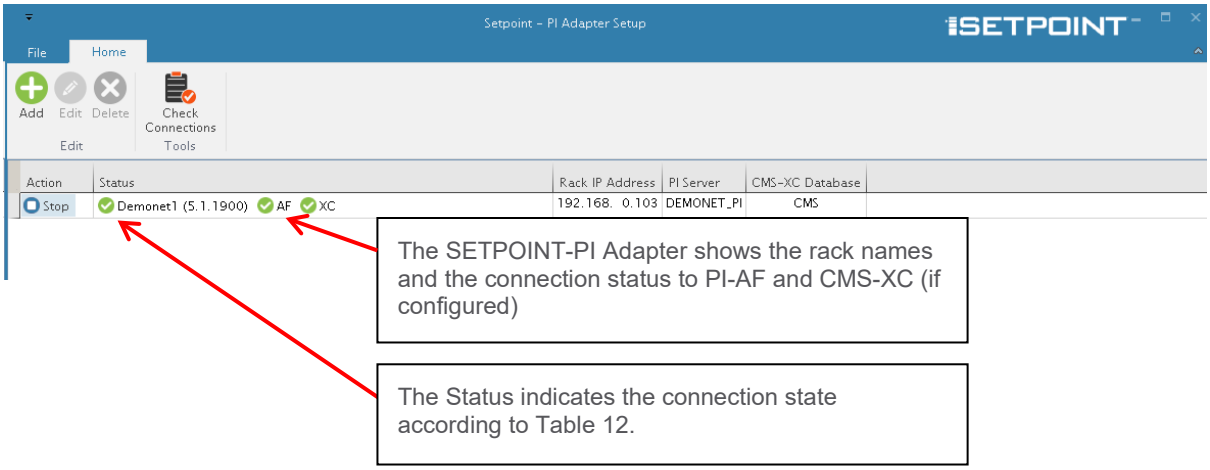


Figure 35: SETPOINT-PI Adapter

Table 12 SETPOINT-PI Adapter Status

Status	Description
Rack Configuration	The service is starting up or checking for VC-8000 rack configuration changes. If the configuration has changed, the service builds the PI AF hierarchy from the VC-8000 rack configuration, allocating tags, and loading the hierarchy into the PI AF Server.
Collecting – Rack Name	The service is running and collecting data from the listed VC-8000 rack.
No Status shown.	The service is stopped and is not collecting data from the listed VC-8000 rack. The Action button will change to the record button.

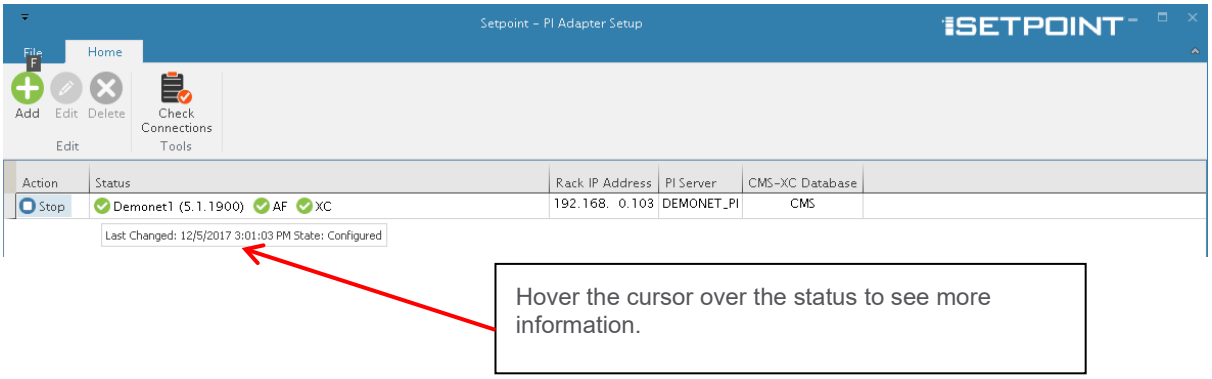


Figure 36: Connection Information

8.7 Starting and Stopping Data Collection

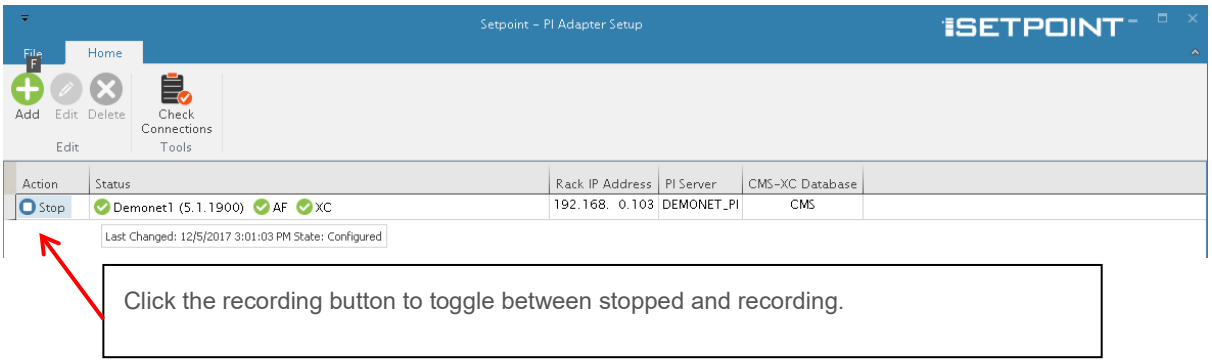


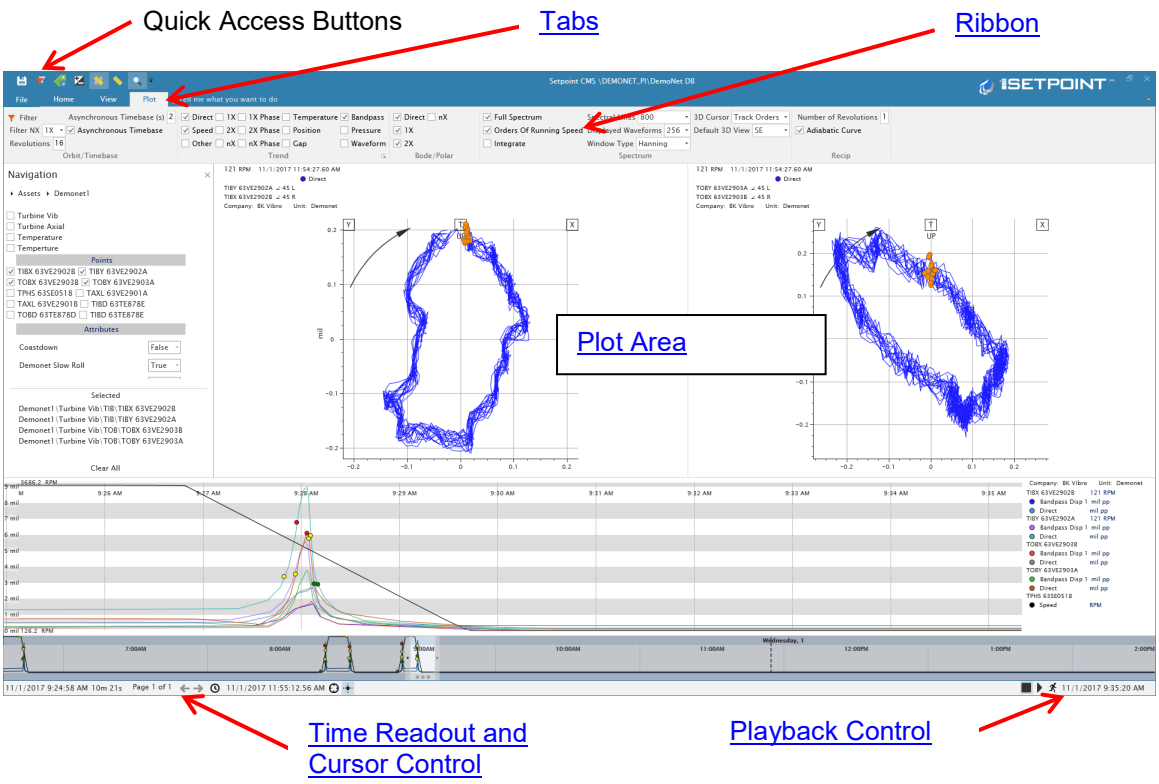
Figure 37: Starting and Stopping Data Collection

Table 13: Adapter Actions

Status	Description
	The rack is not collecting data. Click the record button to start data collection.
	The service is running and collecting data from the listed VC-8000 rack. Click the button to stop data collection.

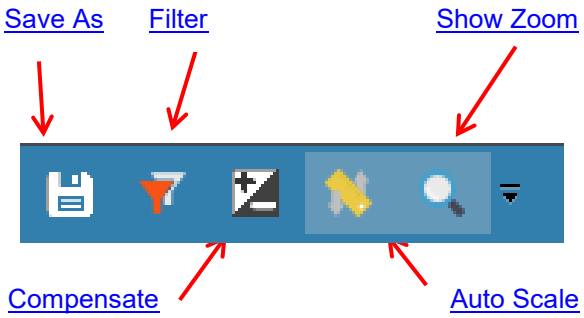
9 CMS Display Software Features

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

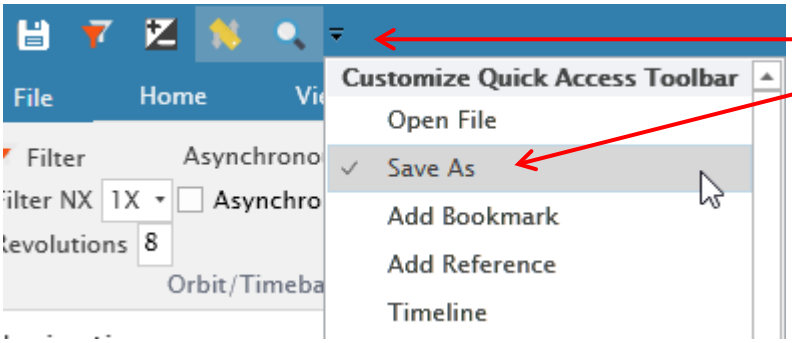


Quick Access Buttons

At the screen top there are buttons for commonly used functions.



You can hide or show buttons using the drop arrow on the right:



Tabs

The CMS Display software has four main tabs:

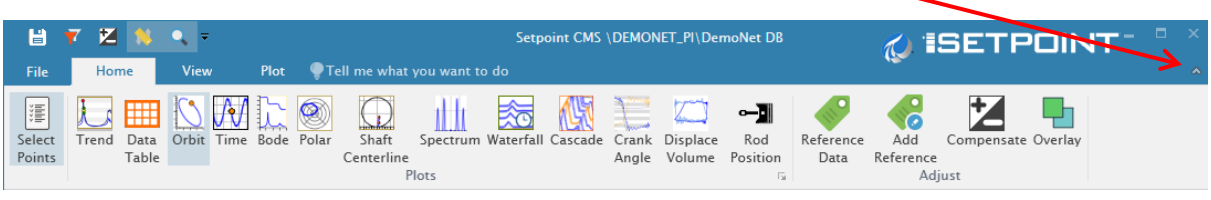
- File Tab
- Home Tab
- View Tab
- Plot Tab

Each tab provides the features commonly used at each step of the data analysis process. Use the links above to find information on each tab function.

Ribbon

Each tab has a ribbon with commonly used functions. The ribbon functions are listed in the sections for each tab. You can hide or show the ribbon to increase the plot area.

The default is to show the ribbons. 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 analysing 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 and dock and undock panes to move them to a more convenient location.

- Navigation Pane
- Events Pane
- Pages Pane
- Reference Data Pane
- Scales Pane
- Plot Settings 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, turn on and synchronize cursors, or turn off all cursors.

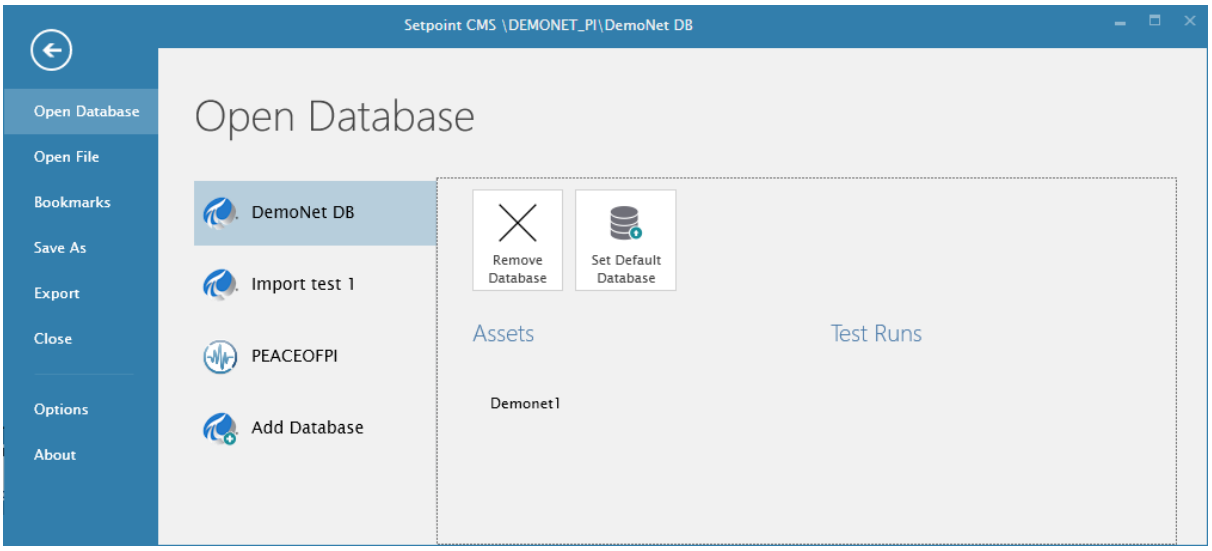
Playback Control

Use the playback controls to replay recorded data or to view live data.

9.1 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
- Open a saved .cms file
- Save a .cms file
- Open a bookmarked dataset
- Set a default database
- Export plots and reports
- Set default units
- Change the screen colors
- View the software revision



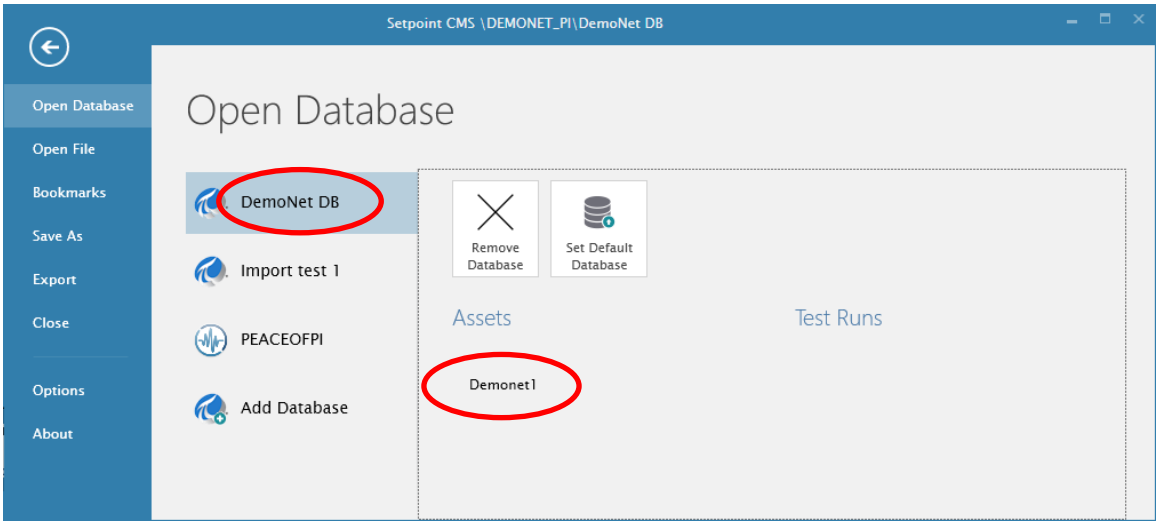
Go to Home Tab

9.1.1 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).

9.1.1.1 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.

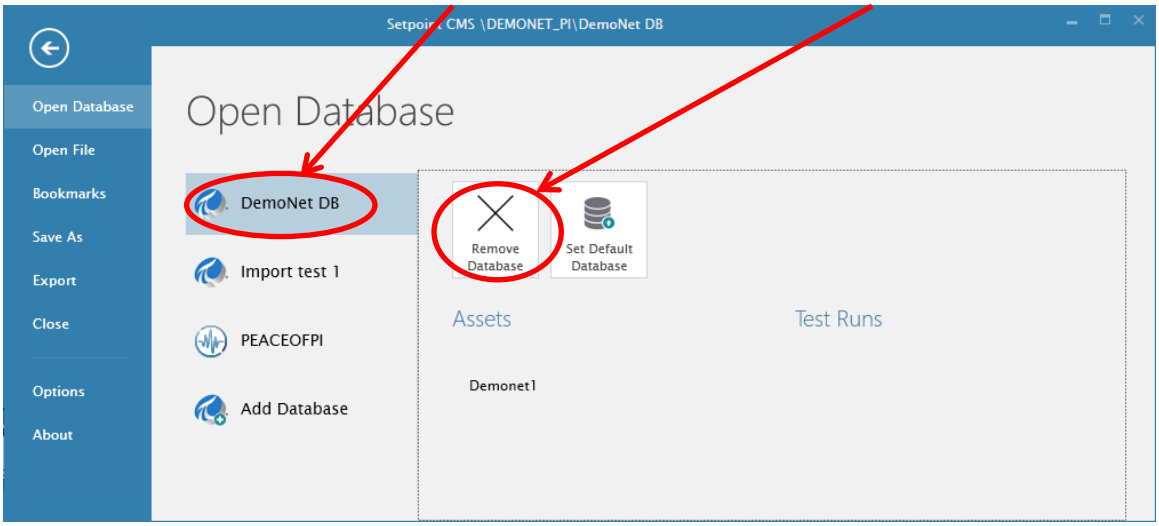


NOTE!

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

9.1.1.2 Removing a Database

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

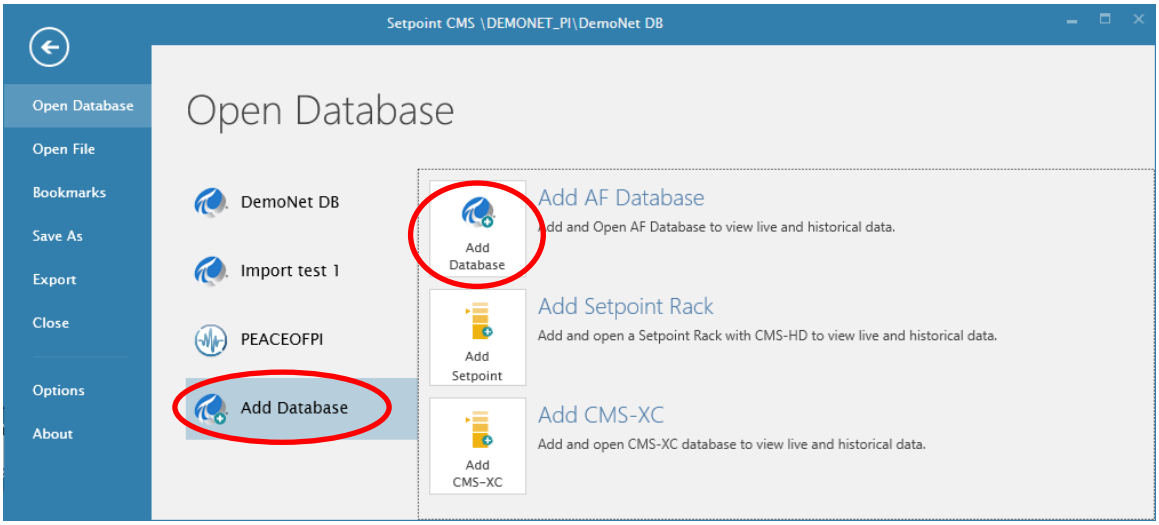


NOTE!

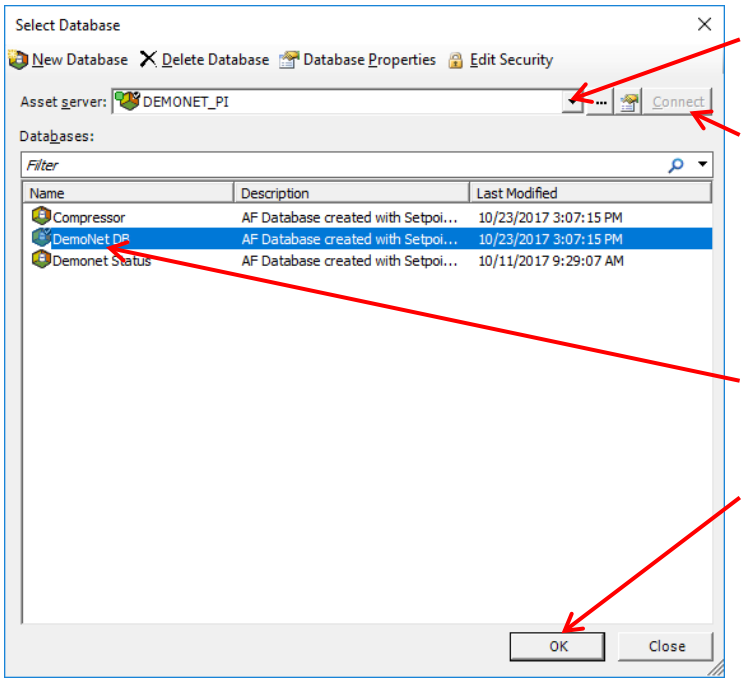
If you delete the currently open database and do not open another database before closing CMS, the next time you open CMS, CMS will restore the deleted database.

9.1.1.3 Connecting to a New PI AF Database

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



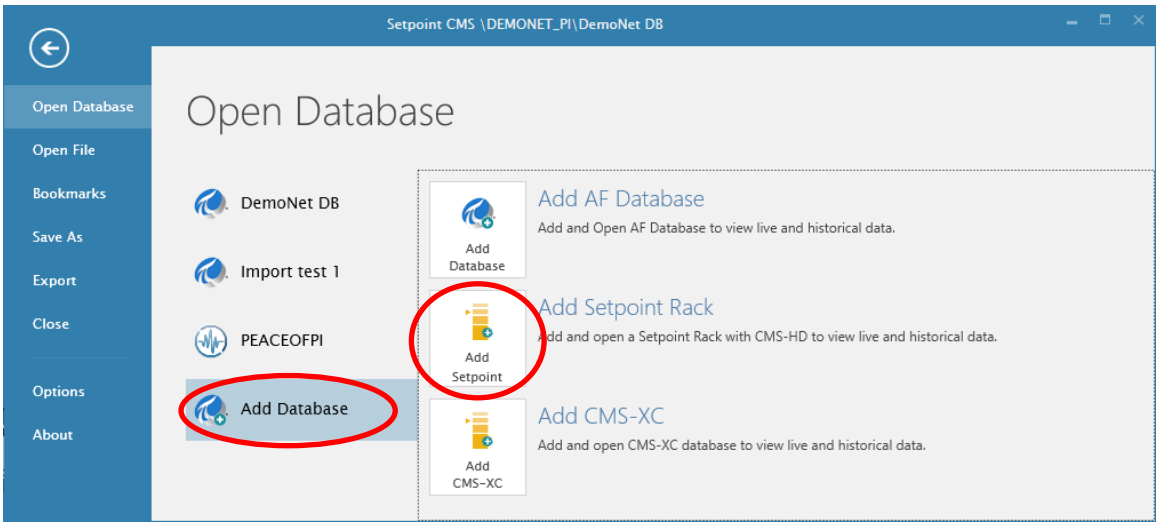
The Select Database window will open:



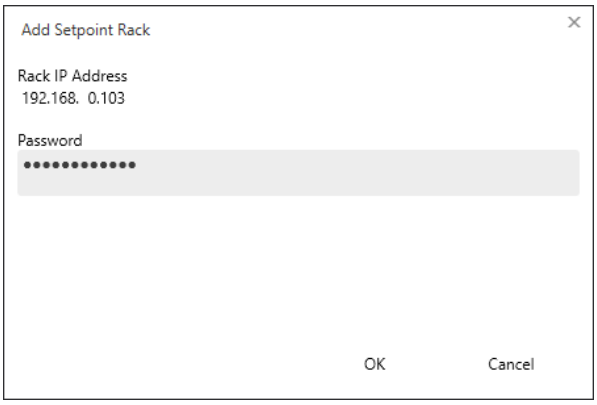
1. Click the arrow to get a drop list of the available PI AF Servers.
2. Click the **Connect** button to establish the connection with the PI AF Server. Note: If you are already connected to that server, the **Connect** button will be disabled.
3. Select your machine database from the list of databases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

9.1.1.4 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** button.



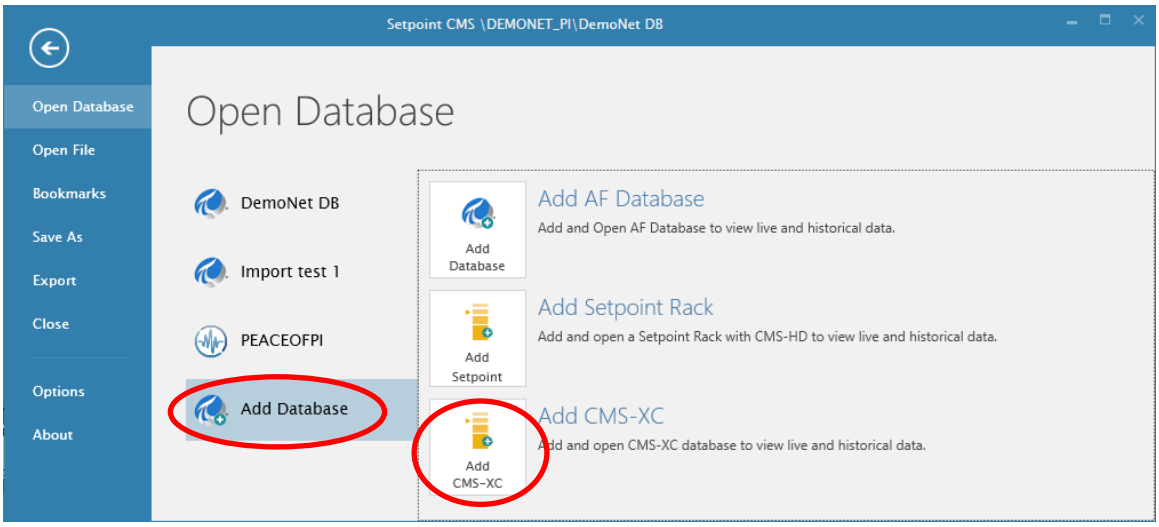
Enter the rack IP Address and password as set in the SAM network configuration.



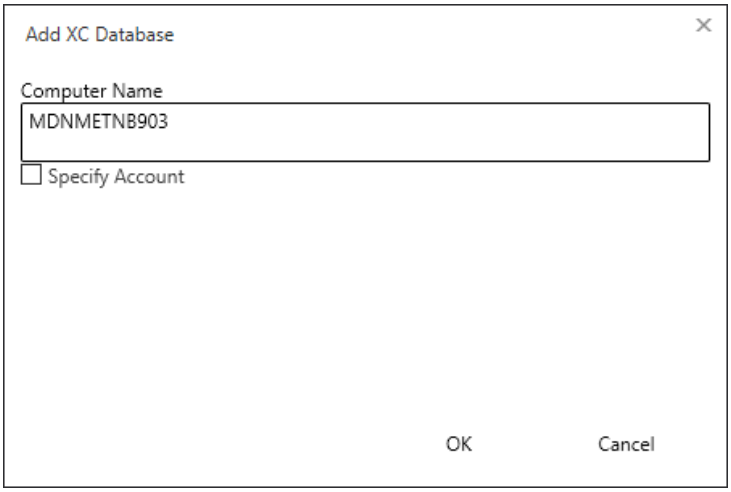
Click **OK** to establish the connection.

9.1.1.5 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.

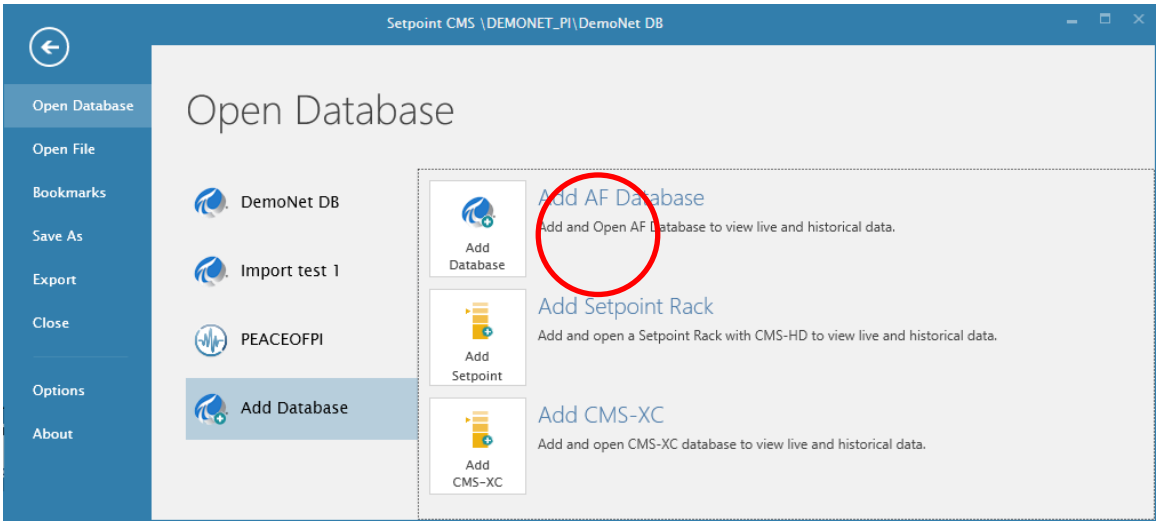


Check the **Specify Account** button if the computer security settings require a specific User Name and password must be specified.
Click **OK** to finish the connection and return to CMS.

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

9.1.1.6 Setting Default Database

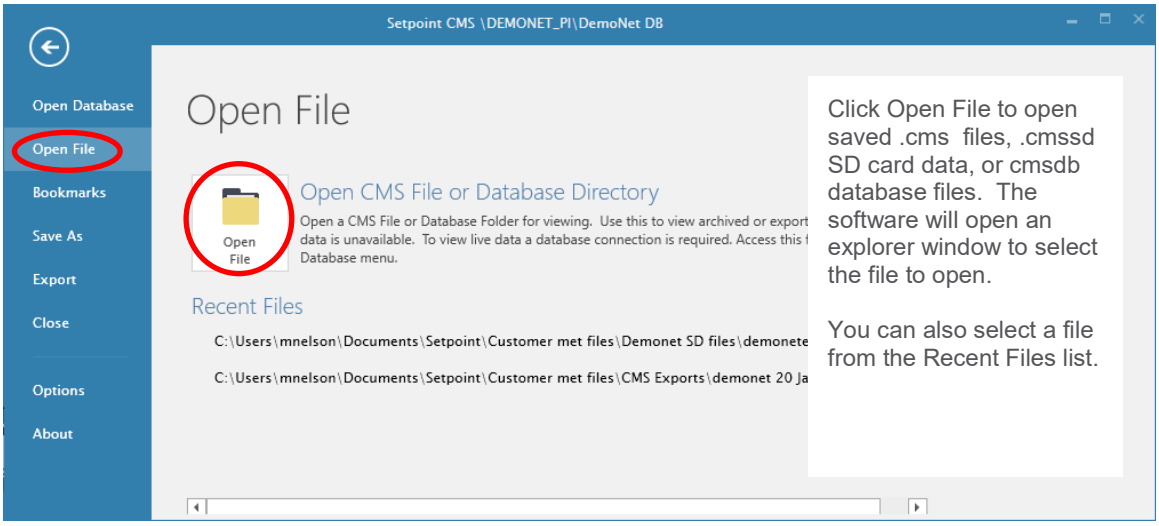
A CMS user can set a global default database so that any user logging onto the CMS computer will default to the global database. To set the default database, click on the recently opened database that you want to set as the default and click the **Set Default Database** button.



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

9.1.1.7 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 Display computer requirements. You do not need the OSIsoft 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.

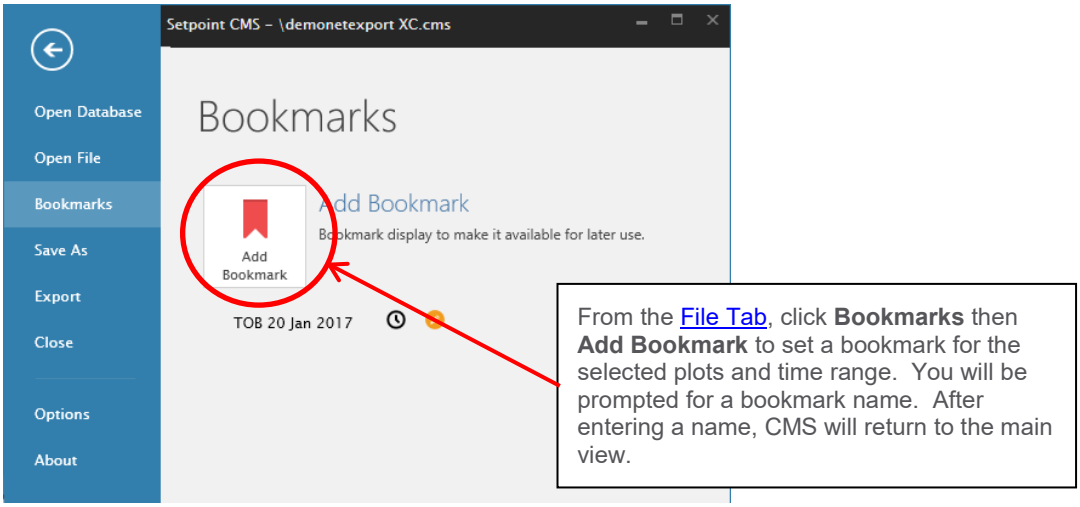
When viewing saved data, all controls are active. Note that the timeline data only shows the data in the time range set at the time the data was saved.

NOTE!

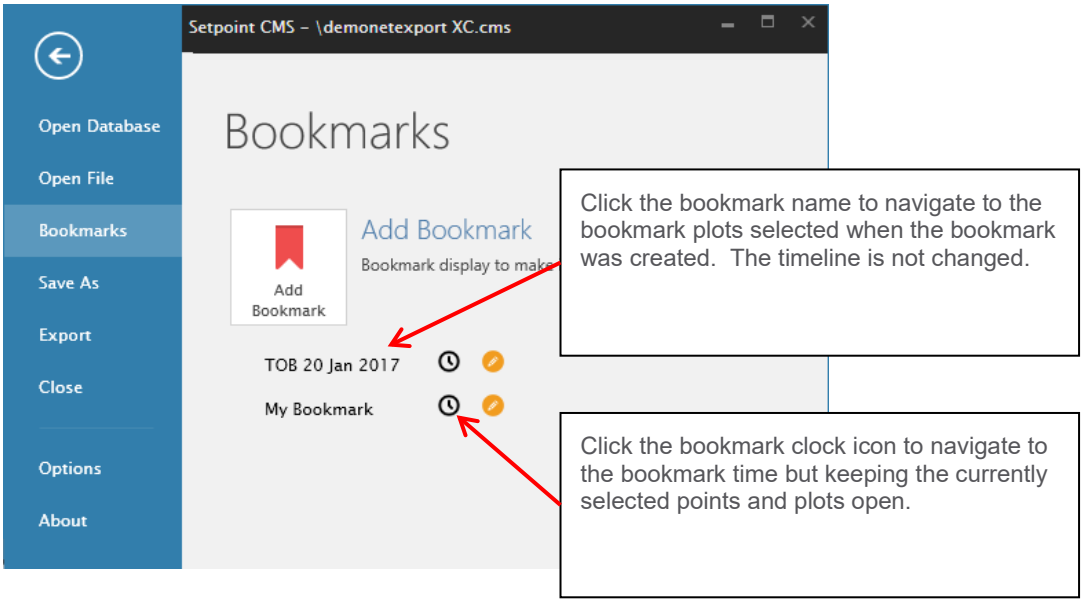
When using Setpoint CMS version 2017 or later you can double click a .cms file to open CMS using that file.

9.1.2 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.

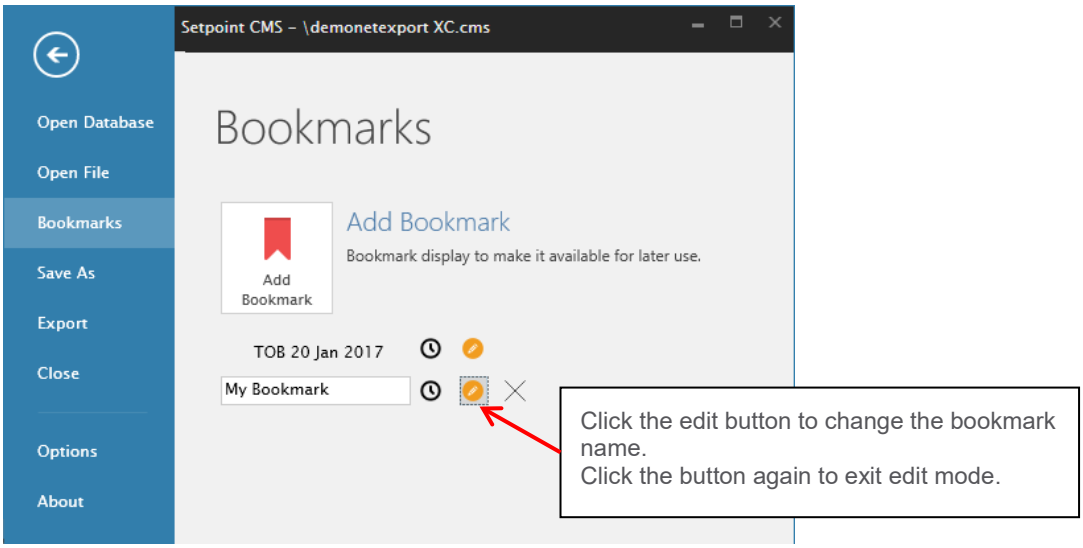


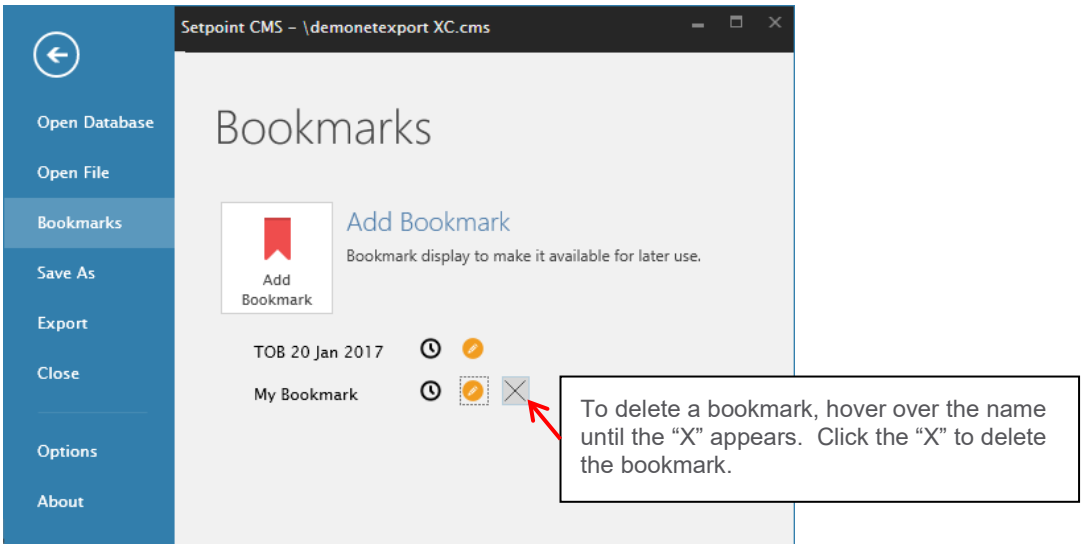
9.1.3 Using Bookmarks



NOTE!

Bookmarks open with the plots pinned. Clear the pins to remove the plots.





9.1.4 Saving a Data File

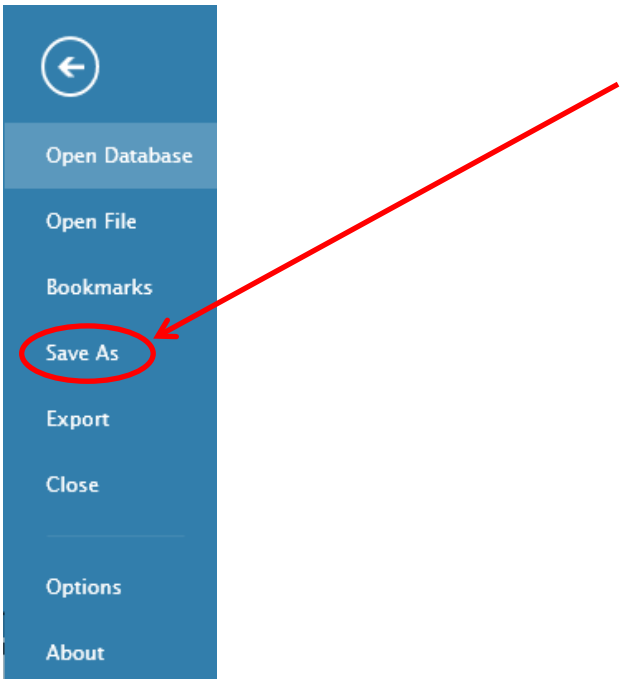
The SETPOINT CMS data file Save/Open functions allows you to save a range of data in a file. You can then open this file directly into SETPOINT CMS for viewing the data on a computer not connected to the PI System database or SD card files.

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,



From the File Tab, Click **Save As**.

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.

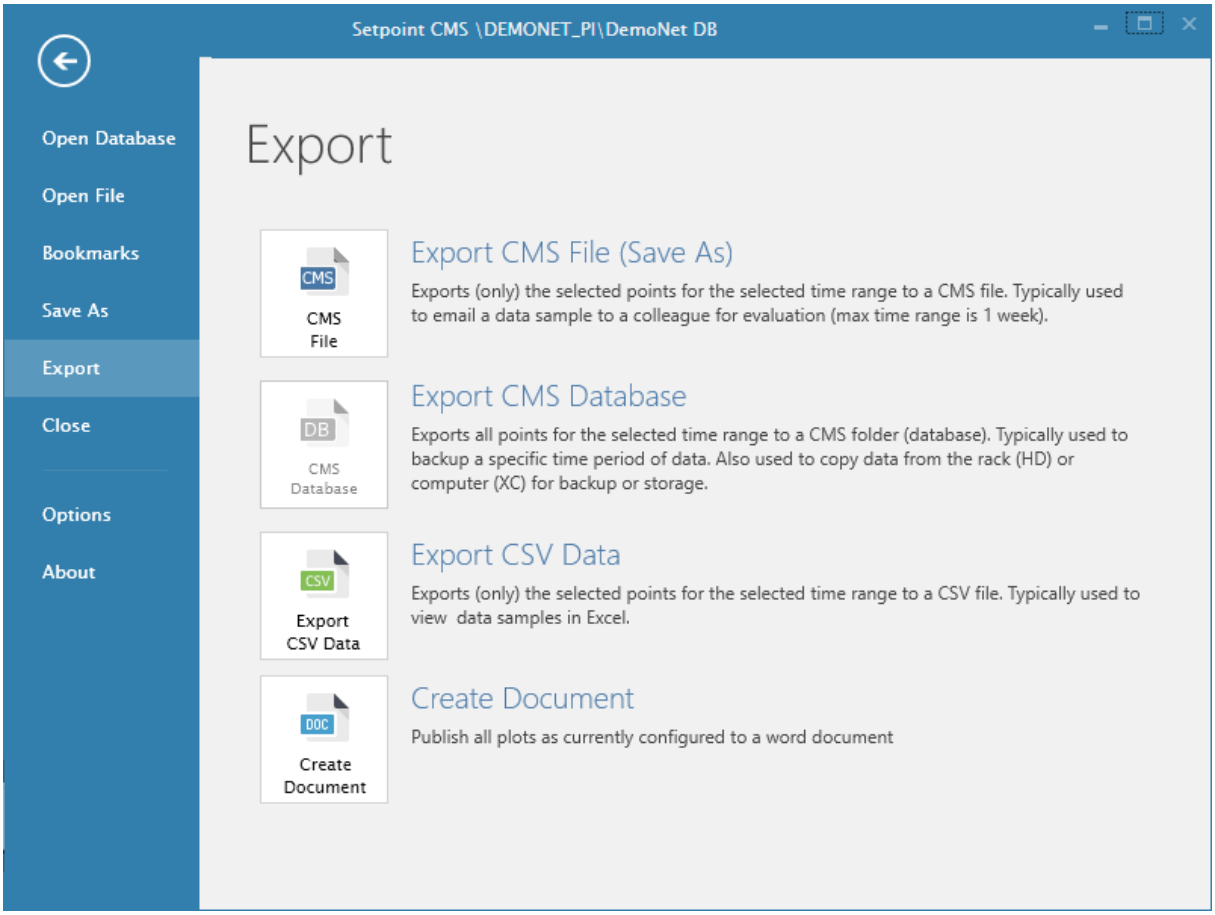
NOTE!

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.

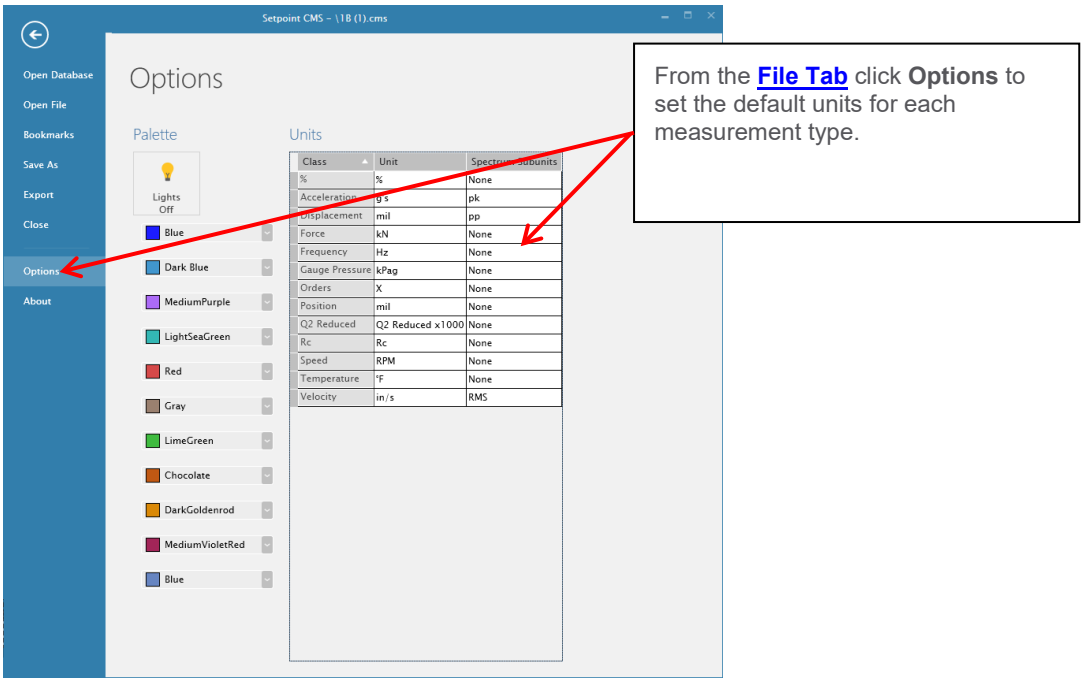
9.1.5 Export

See Section 10.4 Documenting for information on the Export functions. The Export menu provides overviews of the different formats you can export the data as:



9.1.6 Setting Default Units

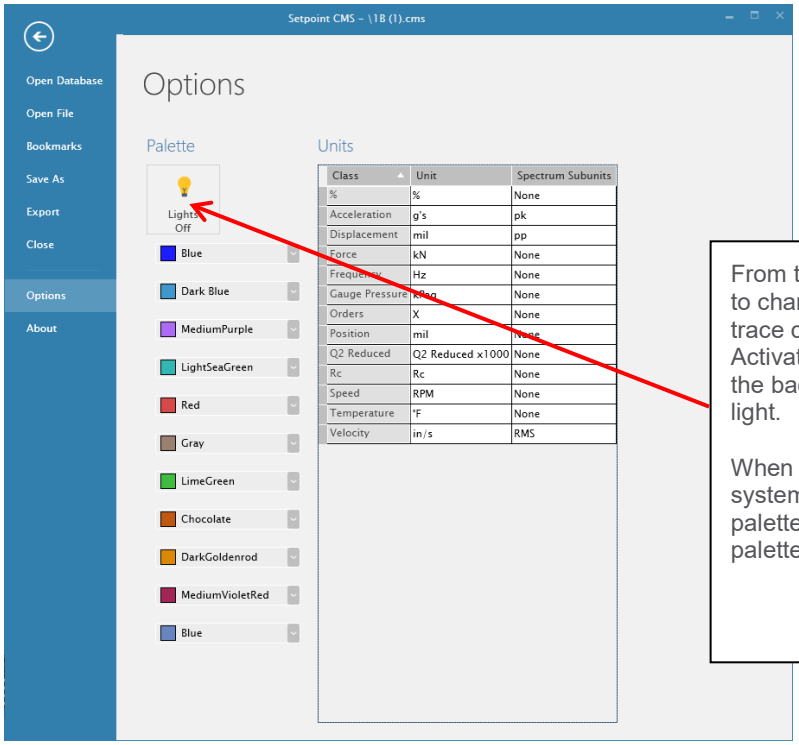
The default units apply to all plots. After changing units, all open plots will redraw using the new units and subunits. New plots will open using the current unit settings.



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

9.1.7 Changing Display and Trace Colors

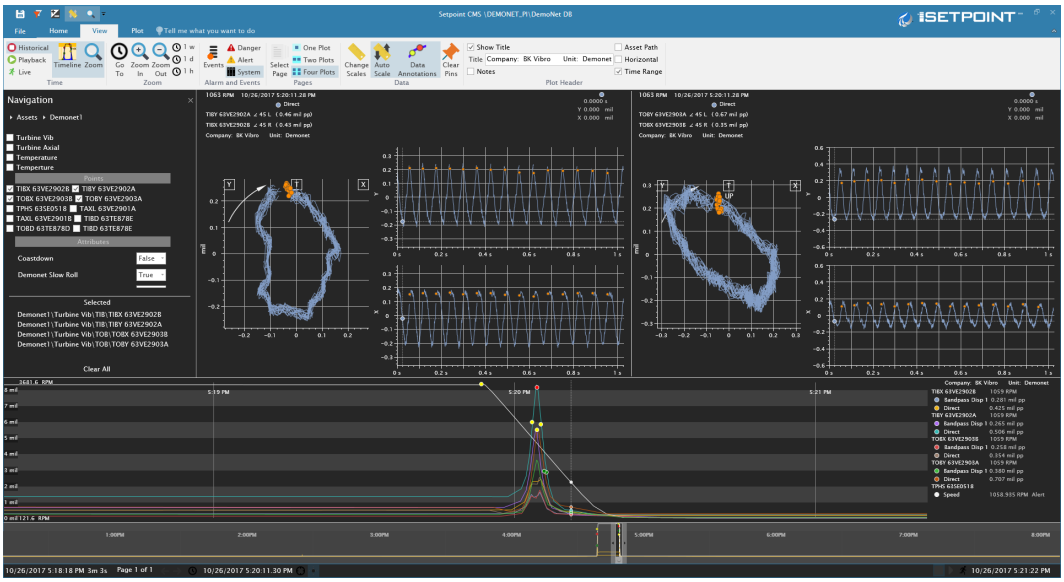
Setpoint CMS has two separate color palettes for use with dark or light backgrounds.



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.

The listed colors apply in order to the channels placed on the plot. With the palette above, the first trace plotted will be goldenrod, the second trace orange, etc. The following figure shows an example of the dark palette:

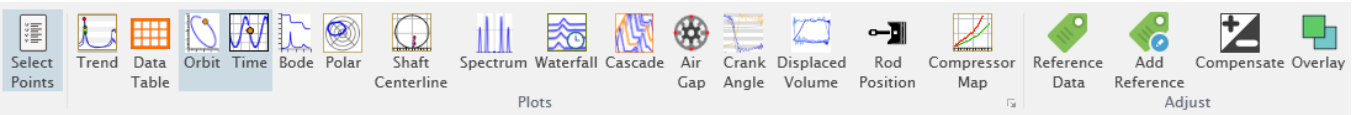


9.1.8 View the Software Revision

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

9.2 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:

- Select points
- Select plots
- Select and add reference data
- Select whether to compensate the data
- Show or hide overlay data

Go to View Tab

9.2.1 Select Points (The Navigation Pane)

Click the Select Points button on the Home Tab to open the Navigation Pane. The Navigation Pane allows you to quickly select and edit which points will show in the plots and Event Pane.

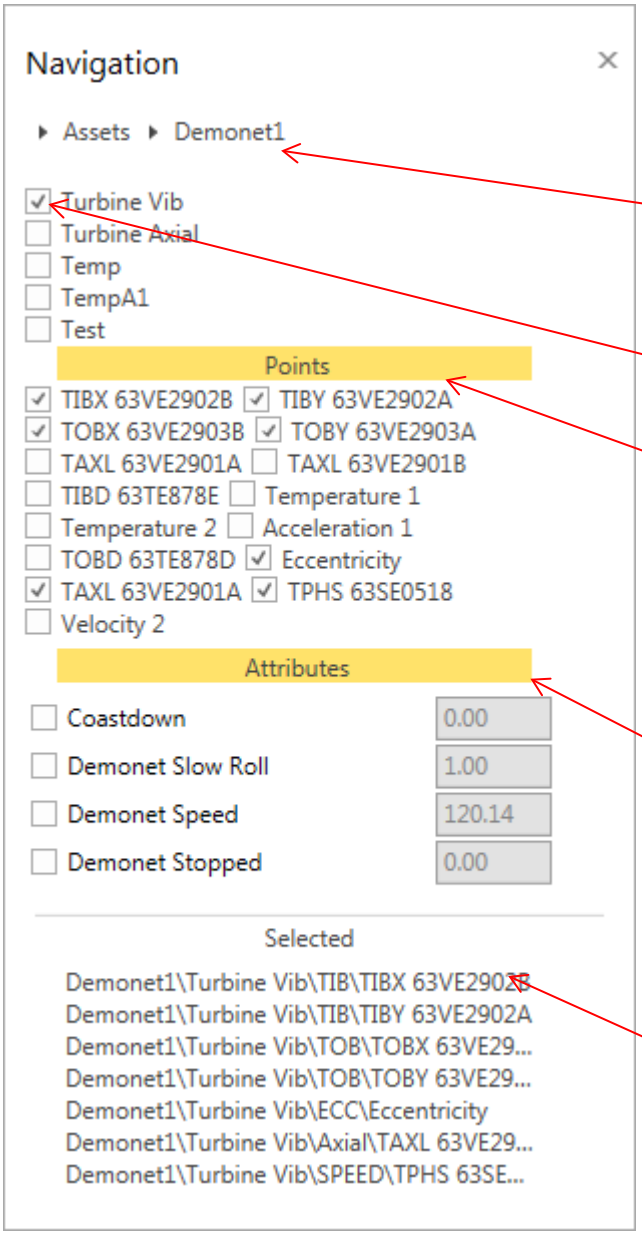
NOTE!

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

The Navigation Pane upper section shows the point or asset has the focus. You can select points under, view attributes, or change configuration for the point or asset with the focus.

In the following example the focus is currently on “Demonet1”. “Demonet1” has 5 sub assets: Turbine Vib, Turbine Axial, Temp, TempA1, and Test. Checking the box in front of Turbine Vib selects all of the Turbine Vib points, shown in the Points view with check marks in front of all of the selected points and also lists the selected points in the list at the bottom.

Demonet1 has several attributes which are rule results set to determine Coastdown, Slow Roll, and Stopped conditions. The machine speed has also been set to show up as an attribute at the Demonet1 asset level.



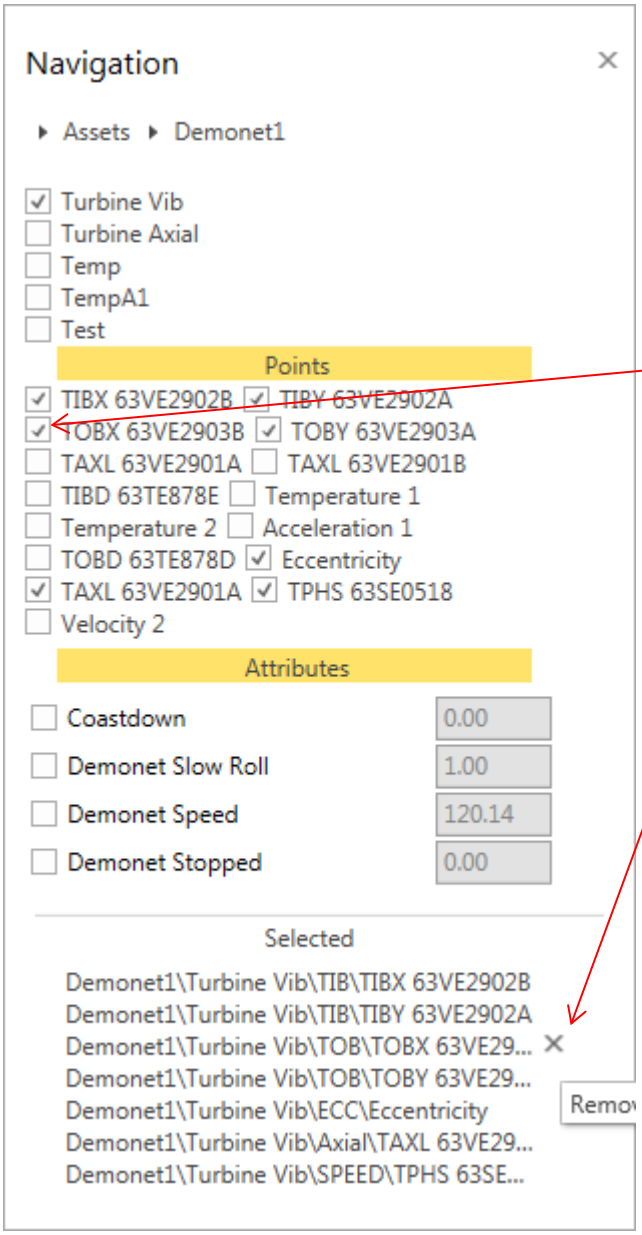
Navigate to any asset level by clicking on the asset name.

Assets under “Demonet1” show here. Check the box to automatically select all points under the asset level.

You can also click the Points bar to show all points under the current asset level. Check the boxes to select individual points.

Click the Attributes bar to show or hide asset attributes.

Selected points show up in the list here. When a plot type is activated, plots will open for all the selected points.

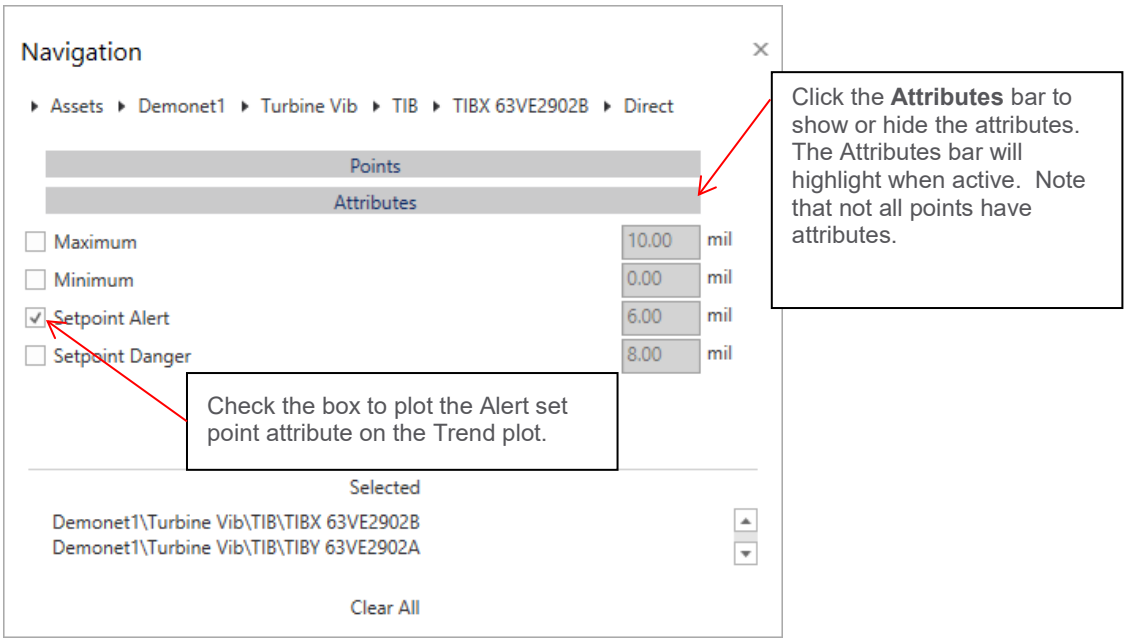


To remove a point from the selected list, clear the check box in the Points view or hover the cursor over the point in the Selected List and click the X on the right.

9.2.1.1 Viewing Attributes

The navigation pane also shows attributes assigned to points in PI AF. Attributes can include configuration values, alarm values, or PI AF analysis results.

You can plot attributes preceded by a check box. Checking the box adds the attribute to the selected list.

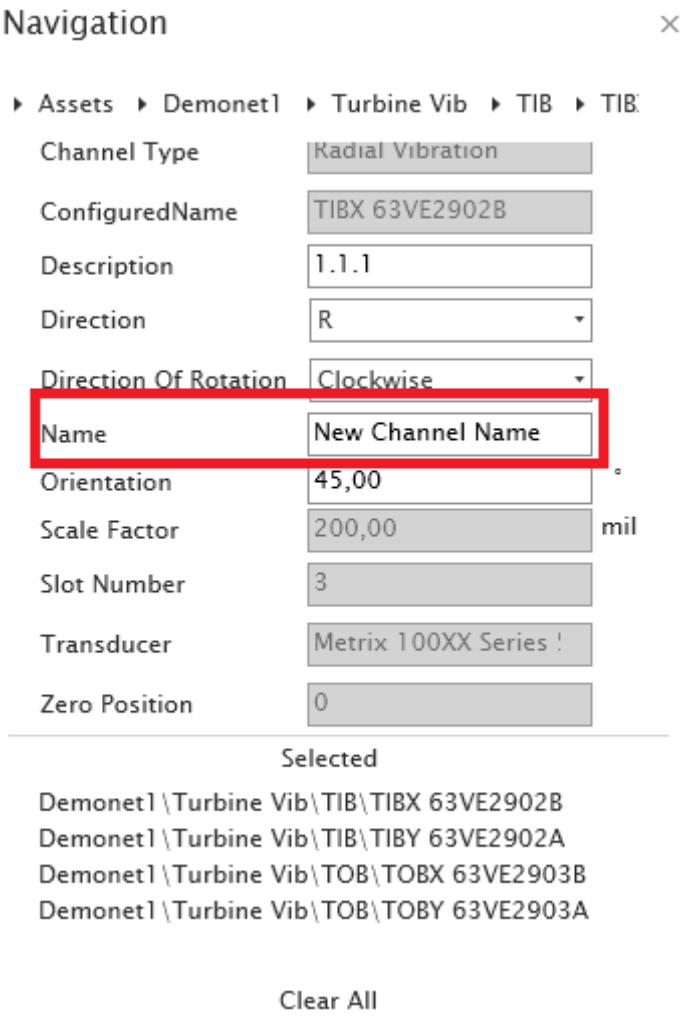


NOTE!

Unless the attribute is associated with a tag, the attribute will plot as a static, unchanging value.

9.2.1.2 Edit Channel Name

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

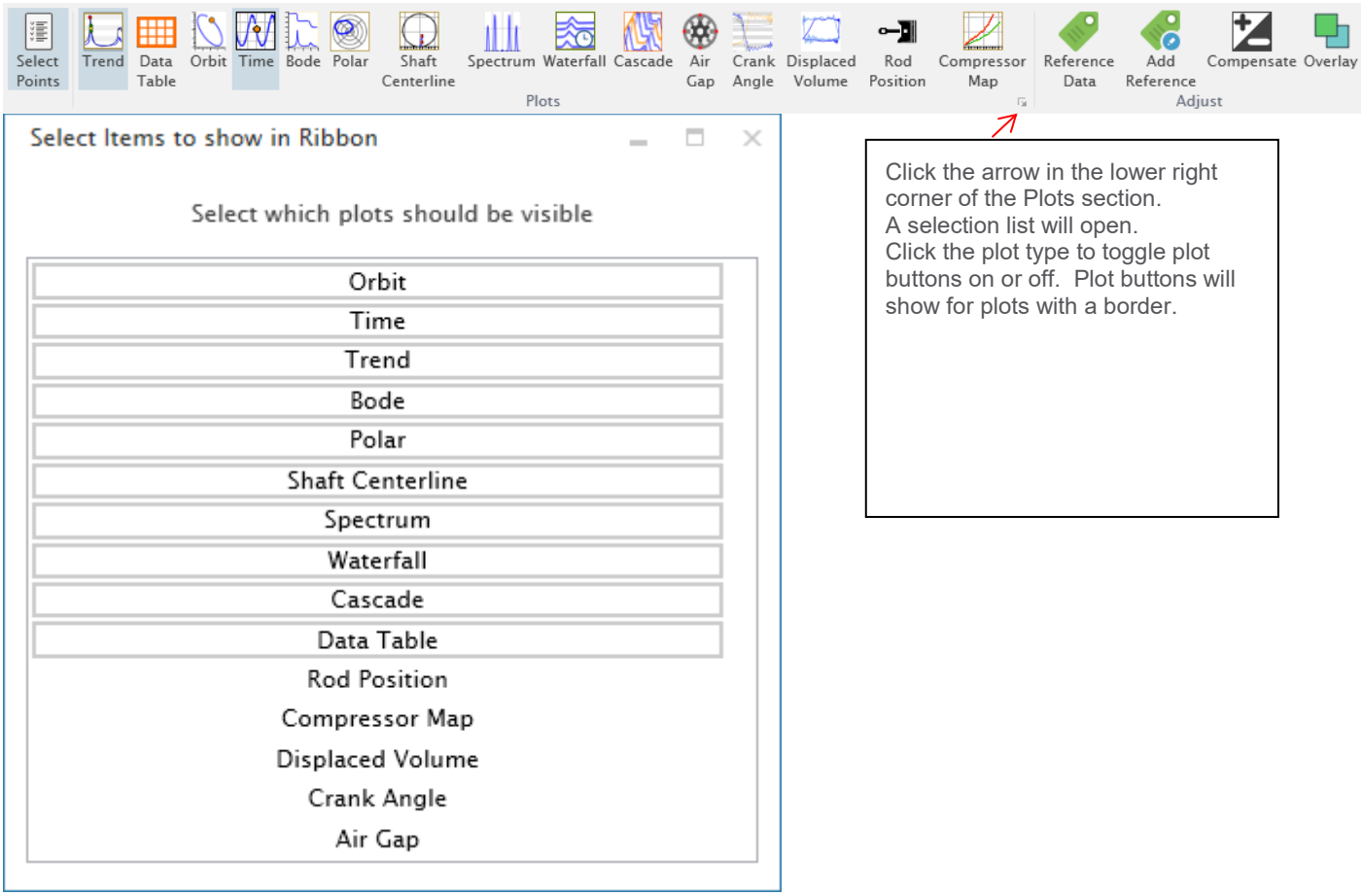


9.2.2 Selecting Plots

Click on a plot icon to open that plot for the selected points. The highlighted icons indicate active plots.

Click on a highlighted plot icon to toggle it off. This will turn the plot type off for all selected points.

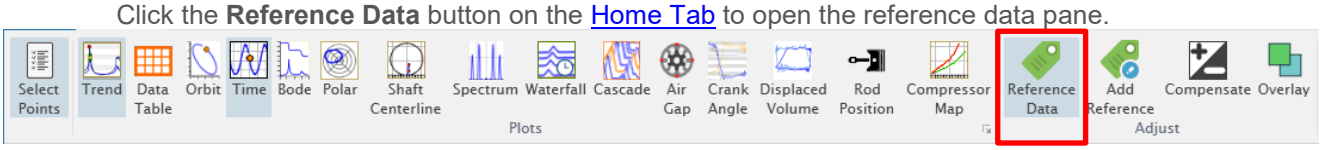
You can change which plot types show on the Home Tab. For example, if you do not have any reciprocating machines you can hide the reciprocating machine plots.



9.2.3 Set Reference Data

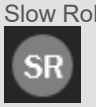
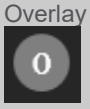
Reference data marks a data set at a specific time for use in compensation or for comparison.

Click the **Reference Data** button on the Home Tab to open the reference data pane.



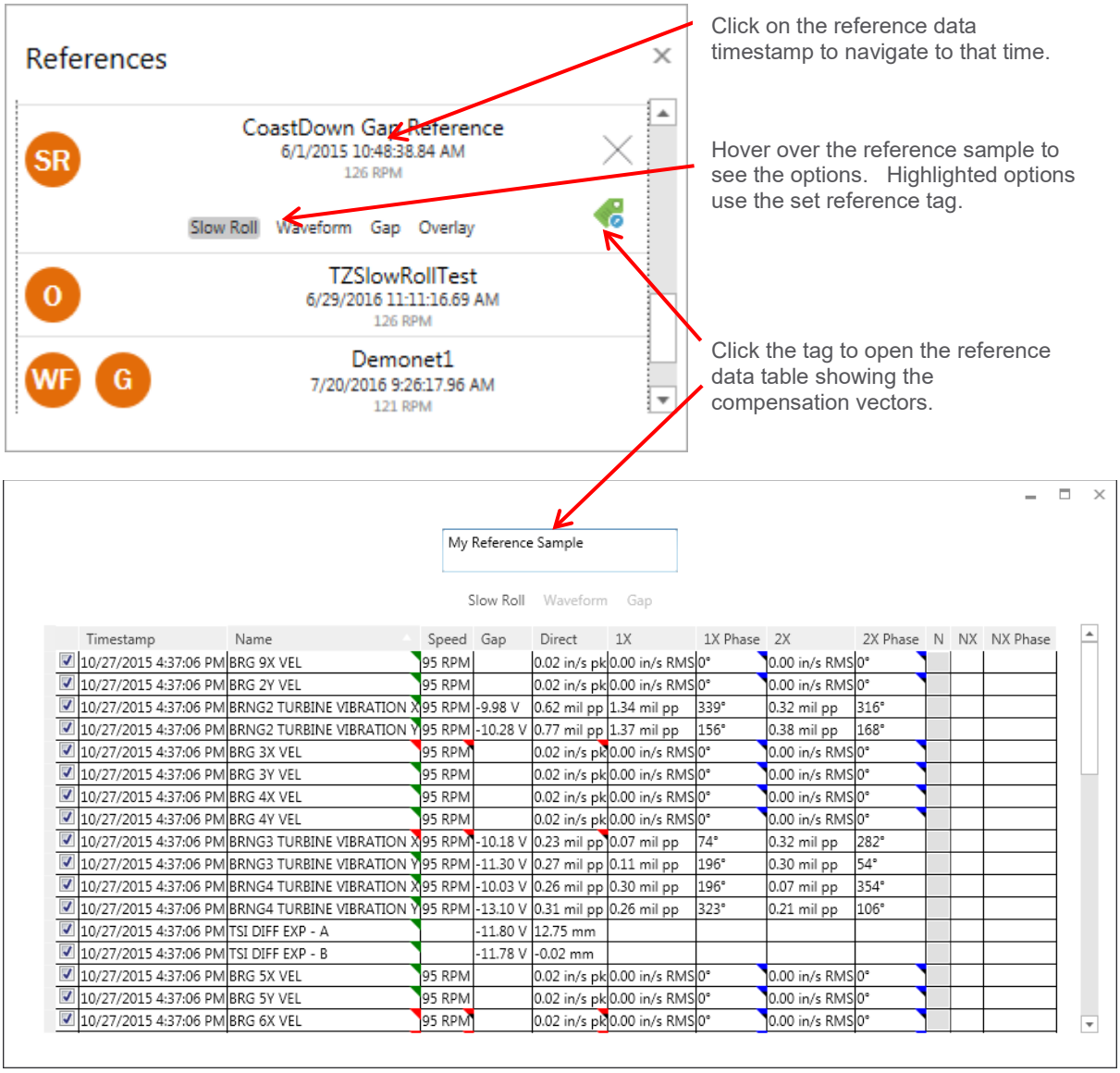
The reference data pane opens on the right side of the screen.

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

Compensation	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 Orbit Unfiltered 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 next picture shows the **References Pane** and various changes you can make from the **References Pane**.



Timestamp	Name	Speed	Gap	Direct	1X	1X Phase	2X	2X Phase	N	NX	NX Phase
10/27/2015 4:37:06 PM	BRG 9X VEL	95 RPM		0.02 in/s pk	0.00 in/s RMS	0°	0.00 in/s RMS	0°			
10/27/2015 4:37:06 PM	BRG 2Y VEL	95 RPM		0.02 in/s pk	0.00 in/s RMS	0°	0.00 in/s RMS	0°			
10/27/2015 4:37:06 PM	BRNG2 TURBINE VIBRATION X	95 RPM	-9.98 V	0.62 mil pp	1.34 mil pp	339°	0.32 mil pp	316°			
10/27/2015 4:37:06 PM	BRNG2 TURBINE VIBRATION Y	95 RPM	-10.28 V	0.77 mil pp	1.37 mil pp	156°	0.38 mil pp	168°			
10/27/2015 4:37:06 PM	BRG 3X VEL	95 RPM		0.02 in/s pk	0.00 in/s RMS	0°	0.00 in/s RMS	0°			
10/27/2015 4:37:06 PM	BRG 3Y VEL	95 RPM		0.02 in/s pk	0.00 in/s RMS	0°	0.00 in/s RMS	0°			
10/27/2015 4:37:06 PM	BRG 4X VEL	95 RPM		0.02 in/s pk	0.00 in/s RMS	0°	0.00 in/s RMS	0°			
10/27/2015 4:37:06 PM	BRG 4Y VEL	95 RPM		0.02 in/s pk	0.00 in/s RMS	0°	0.00 in/s RMS	0°			
10/27/2015 4:37:06 PM	BRNG3 TURBINE VIBRATION X	95 RPM	-10.18 V	0.23 mil pp	0.07 mil pp	74°	0.32 mil pp	282°			
10/27/2015 4:37:06 PM	BRNG3 TURBINE VIBRATION Y	95 RPM	-11.30 V	0.27 mil pp	0.11 mil pp	196°	0.30 mil pp	54°			
10/27/2015 4:37:06 PM	BRNG4 TURBINE VIBRATION X	95 RPM	-10.03 V	0.26 mil pp	0.30 mil pp	196°	0.07 mil pp	354°			
10/27/2015 4:37:06 PM	BRNG4 TURBINE VIBRATION Y	95 RPM	-13.10 V	0.31 mil pp	0.26 mil pp	323°	0.21 mil pp	106°			
10/27/2015 4:37:06 PM	TSI DIFF EXP - A		-11.80 V	12.75 mm							
10/27/2015 4:37:06 PM	TSI DIFF EXP - B		-11.78 V	-0.02 mm							
10/27/2015 4:37:06 PM	BRG 5X VEL	95 RPM		0.02 in/s pk	0.00 in/s RMS	0°	0.00 in/s RMS	0°			
10/27/2015 4:37:06 PM	BRG 5Y VEL	95 RPM		0.02 in/s pk	0.00 in/s RMS	0°	0.00 in/s RMS	0°			
10/27/2015 4:37:06 PM	BRG 6X VEL	95 RPM		0.02 in/s pk	0.00 in/s RMS	0°	0.00 in/s RMS	0°			

NOTE!

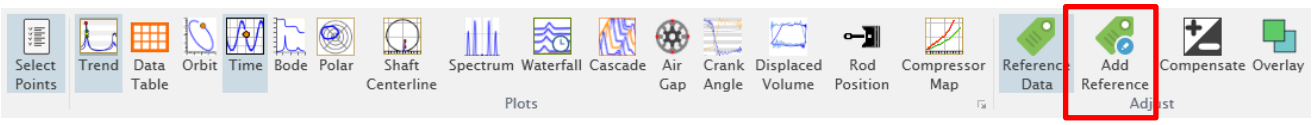
You cannot change reference data when viewing live data.

NOTE!

MS-HD and CMS-SD store reference data at the rack level or root level. When using OSI PI-AF, CMS-XC or CMS File you can store reference data at the asset level.

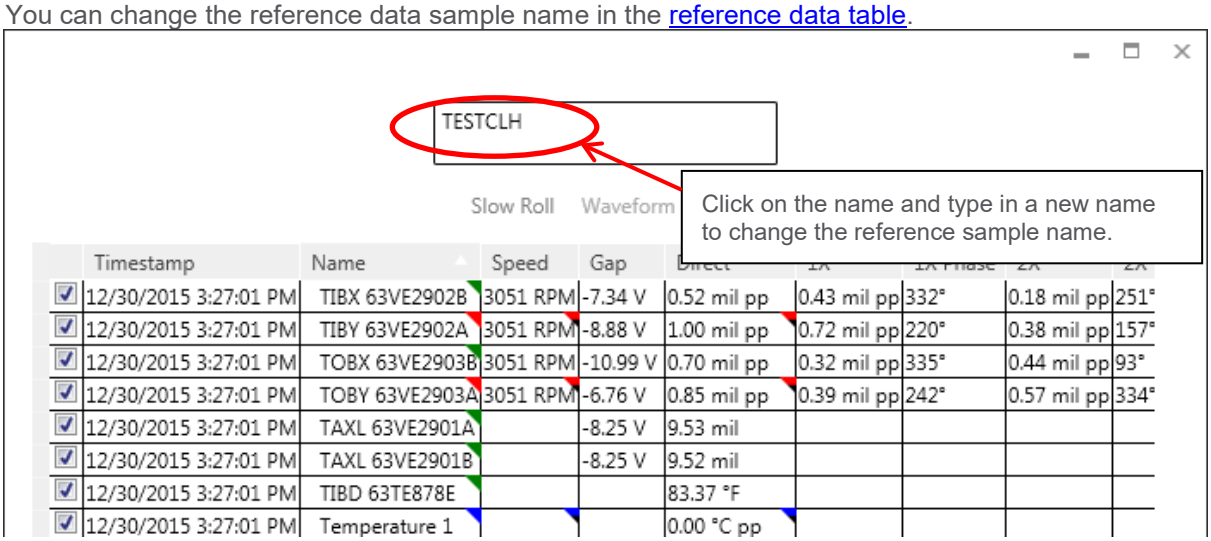
9.2.3.1 Adding a Reference Tag

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



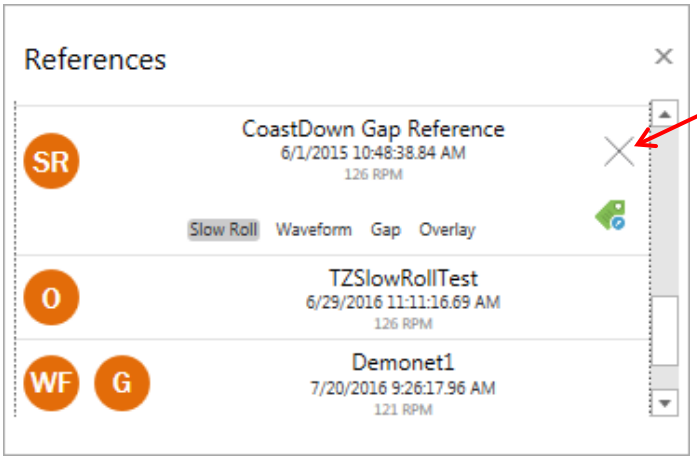
9.2.3.2 Naming a Reference Sample

You can change the reference data sample name in the reference data table.



9.2.3.3 Delete a Reference Sample

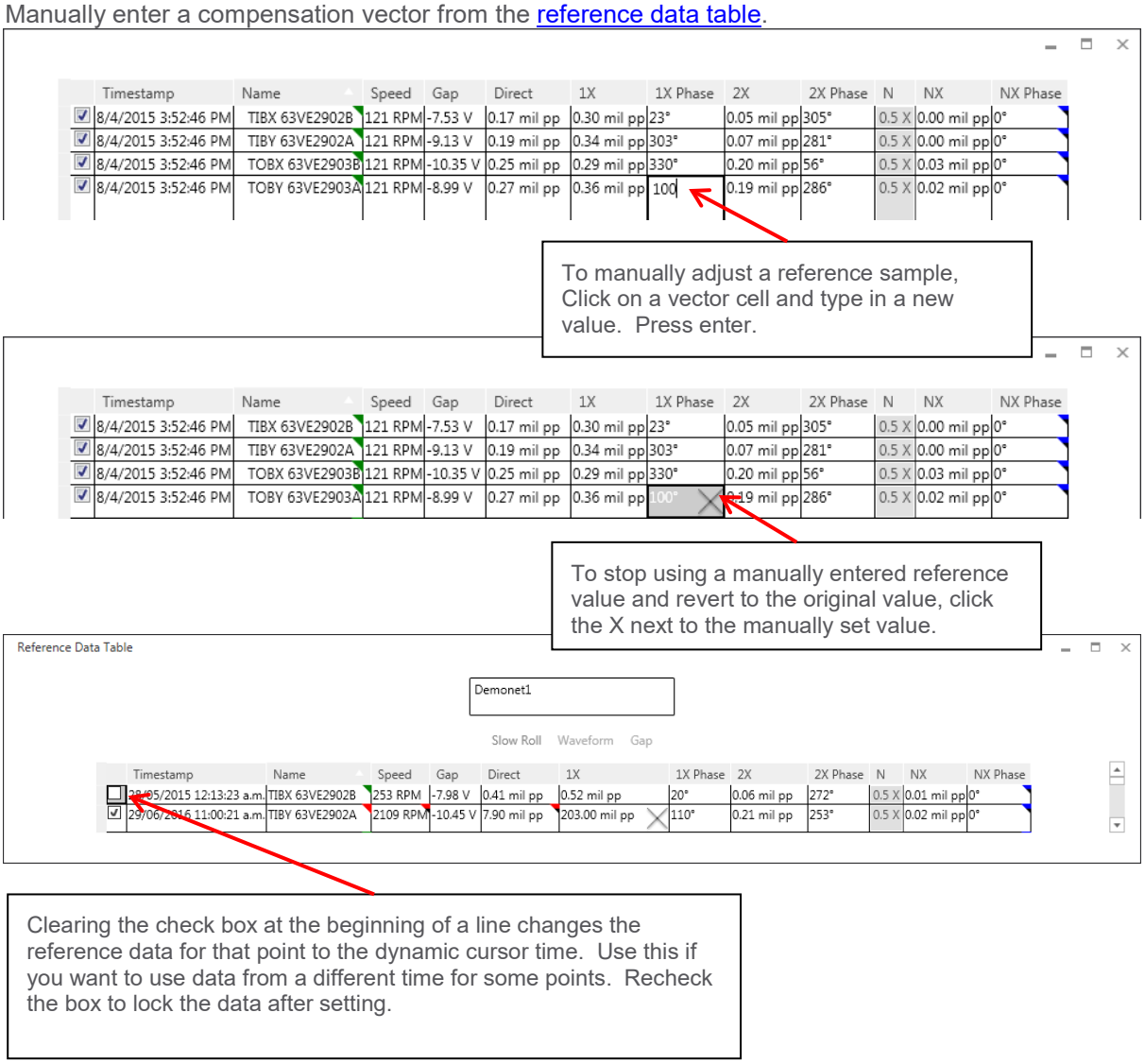
Delete reference data from the reference data pane.



Hovering the cursor over the reference data sample causes an "X" to appear after the sample. Click the "X" at the end of the line to delete a reference sample.

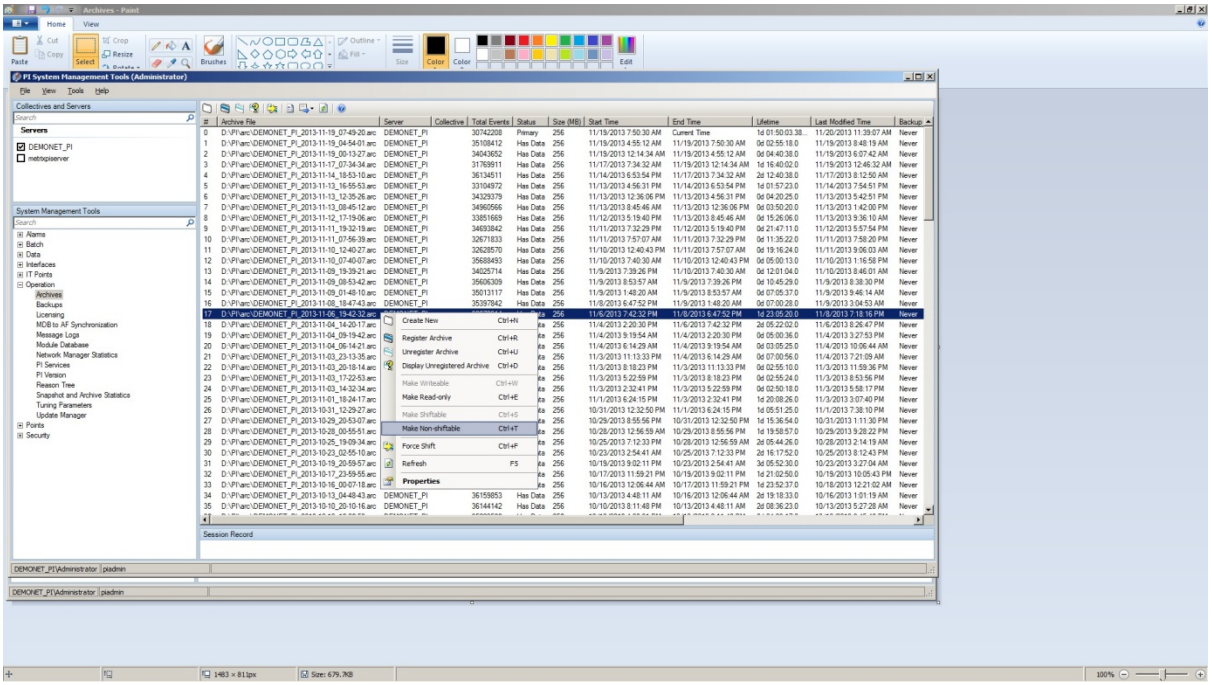
9.2.3.4 Manually Entering a Compensation Vector

Manually enter a compensation vector from the reference data table.



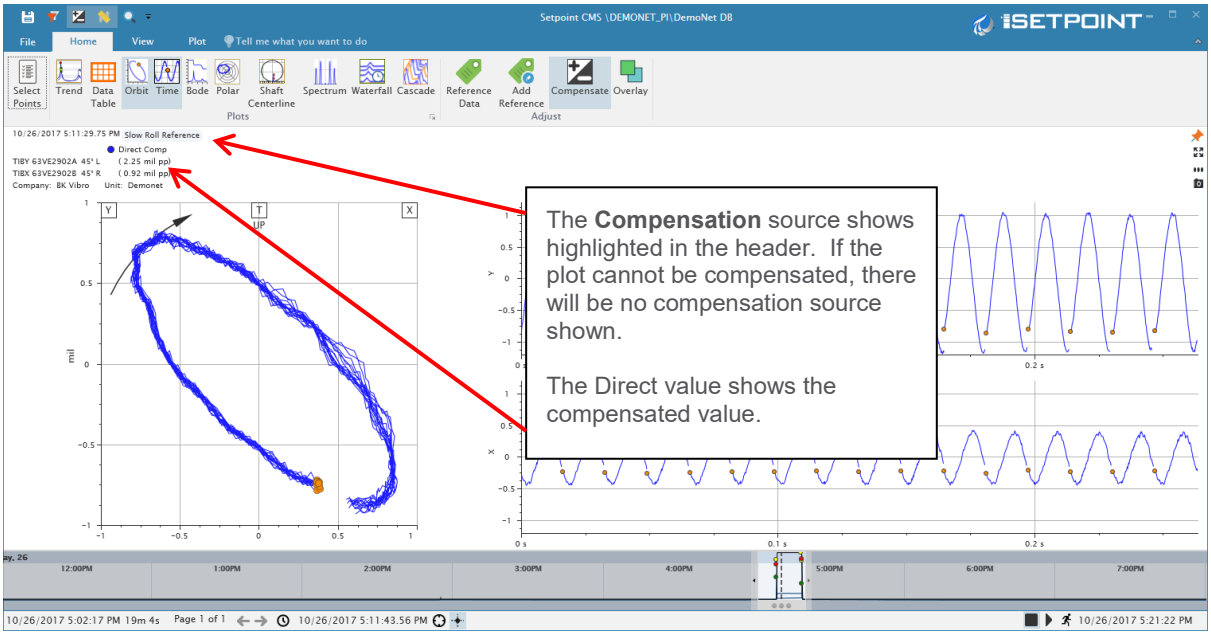
9.2.3.5 Locking a Reference Data Archive

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.



9.2.4 Turning on Compensation

From the Home Tab, click the **Compensate** button to turn on compensation.



NOTE!

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

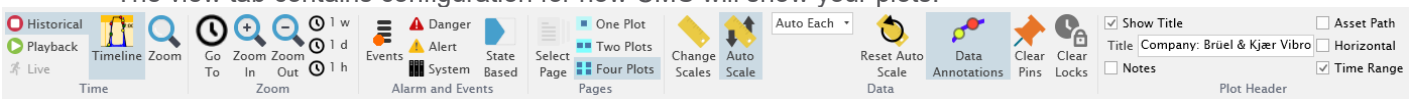
9.2.5 Showing and Hiding Overlays

Refer to Section 10.2.8 for information on using overlays.

Click the Overlay Button on the Home Tab to turn overlays on or off. Overlays follow the plot settings set on the Plot tab for filtering, revolutions, etc.

9.3 The View Tab

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



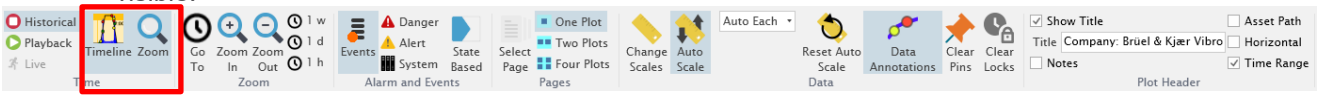
From the View Tab you can:

- Use the Timeline and Zoom Panes used to set the time range.
- Show or hide data annotations
- Manually enter a time
- Zoom the time range in or out
- Set the selected time range size
- Show and filter events
- Open the Pages Pane
- Change the number of plots shown on a page
- Clear Pinned Plots
- Manually scale plots
- Automatically scale plots
- Show or Hide the Trend Legend

Go to Plot Tab

9.3.1 Show or Hide the Timeline and Zoom Panes

The **Timeline Pane** and **Zoom Pane** buttons control visibility of the Timeline Pane and Zoom Pane. Clicking on the button toggles the panes on or off. When the buttons are highlighted, the panes are visible.



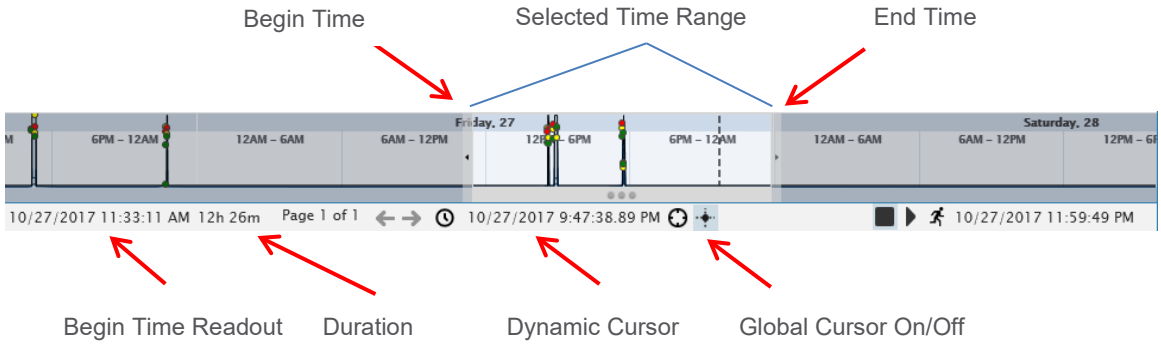
CMS uses two key time parameters for plotting data:

Selected Time Range: Selects a set of data over time. The Selected Time Range sets the data shown in Bode, Trend, Polar, Shaft Centerline, Waterfall, and Cascade plots.

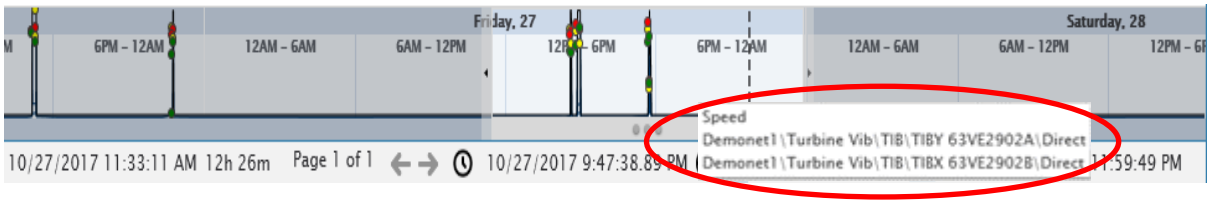
Dynamic Cursor: A specific point in time. CMS uses the cursor time when selecting the dynamic sample to plot for Orbit, Timebase, and Spectrum plots. Navigating to a time from the Events Pane or Reference Data Pane sets the Dynamic Cursor to the event or reference time.

9.3.1.1 Timeline Pane

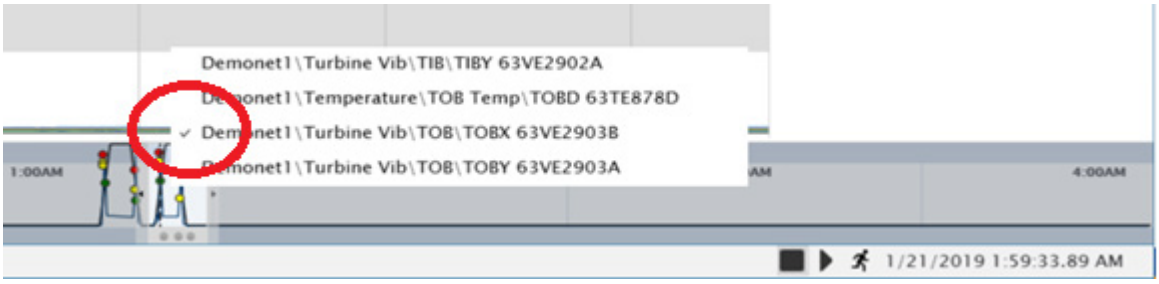
The Timeline Pane provides a way to scroll through the data and select regions for analysis. The Timeline Pane shows trend data for the first several selected points. You can use the Timeline Pane to select the time range of data you want to analysis.



The timeline shows two data points. To see which points show in the timeline, hover over the timeline trace:

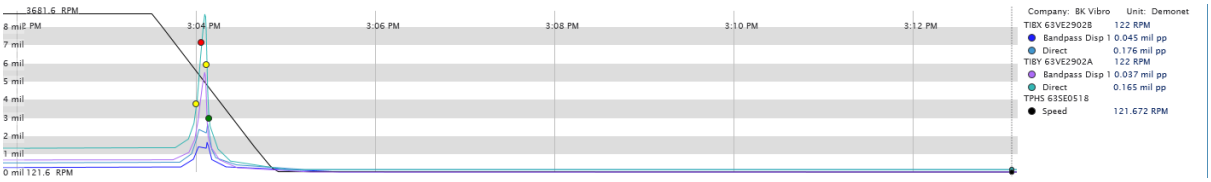


To select the active trace to plot, right click on the timeline.



9.3.1.2 Zoom Pane

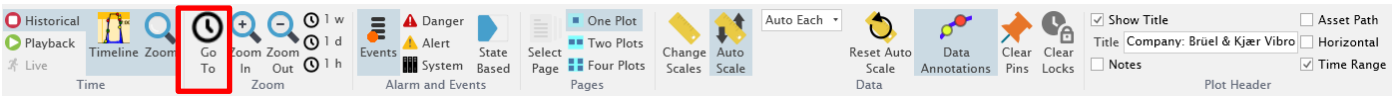
The Zoom Pane is a trend plot that remains visible on any plot page. Use the Zoom Pane to further define your analysis time range.

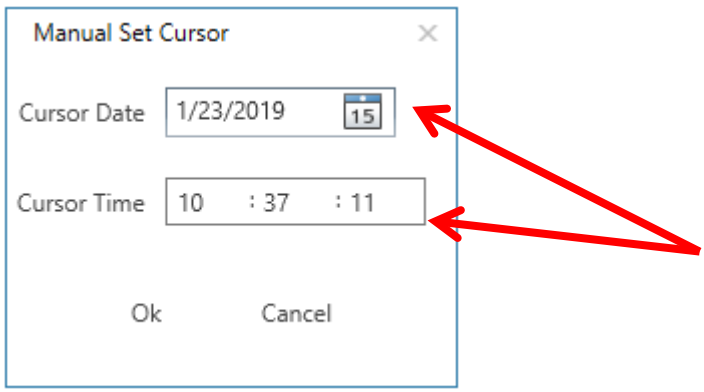


You can show/hide traces and rubber band zoom the selected time region in the Zoom Pane in the same manner as on the Trend plot.

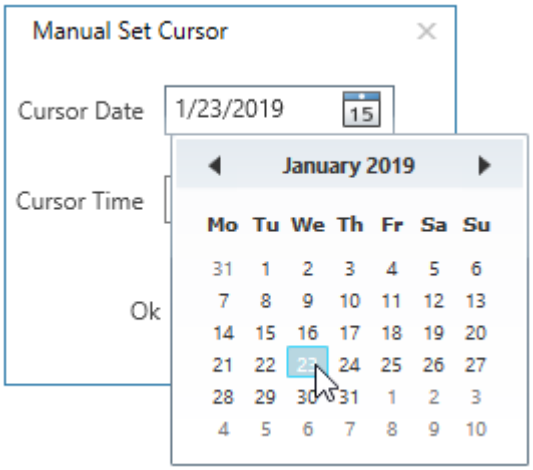
9.3.2 Manually Enter a Time Range

You can quickly navigate to a time range by manually setting the date and time. CMS will set the dynamic cursor time to the set time and center the selected time range on the set time.



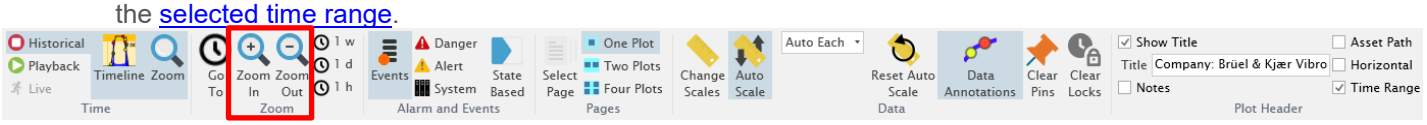


Set the date on the calendar and the cursor time. Then click **OK** to move to the set time.

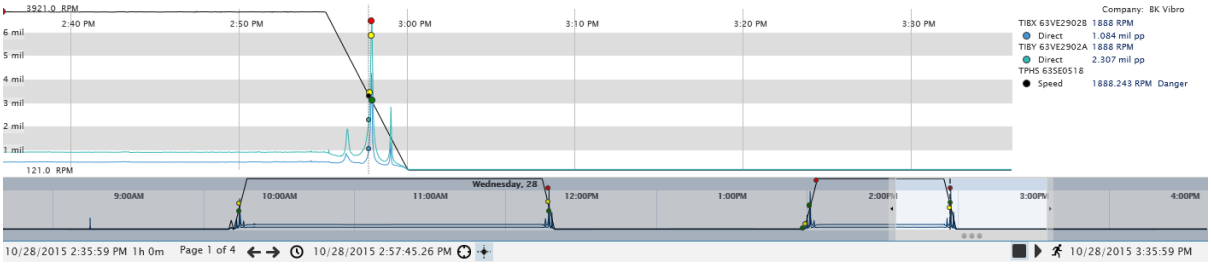


9.3.3 Zoom the Selected Time Range In or Out

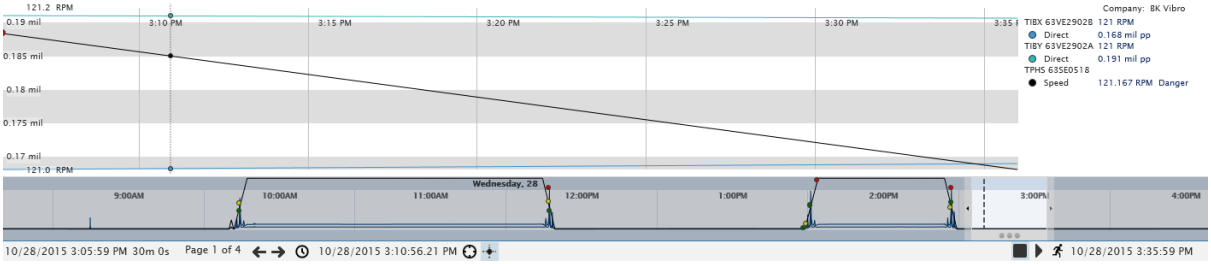
Clicking the **Zoom In** button reduces the selected time range in half. The **Zoom Out** button doubles the selected time range.



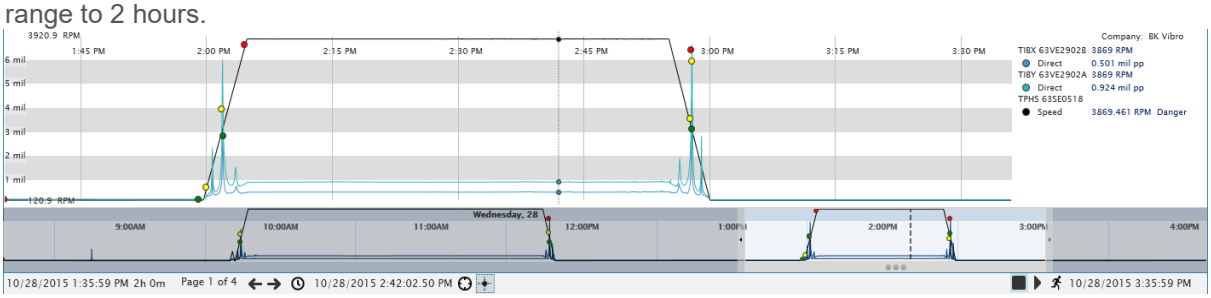
Zoom functions are anchored at the end time range. In the example below the selected time range ends at 03:35:59 PM and the duration is 1 hour, 0 minutes.



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

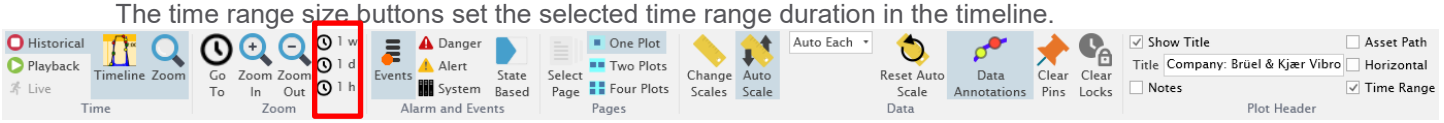


Clicking the Zoom Out button from the original 1 hour selected time range increases the selected time range to 2 hours.



9.3.4 Set the Time Range Size

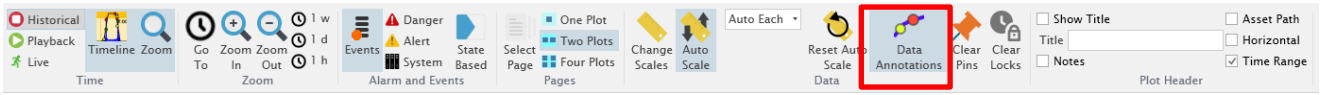
The time range size buttons set the selected time range duration in the timeline.



The end time remains constant. The begin time moves in time to set the duration.

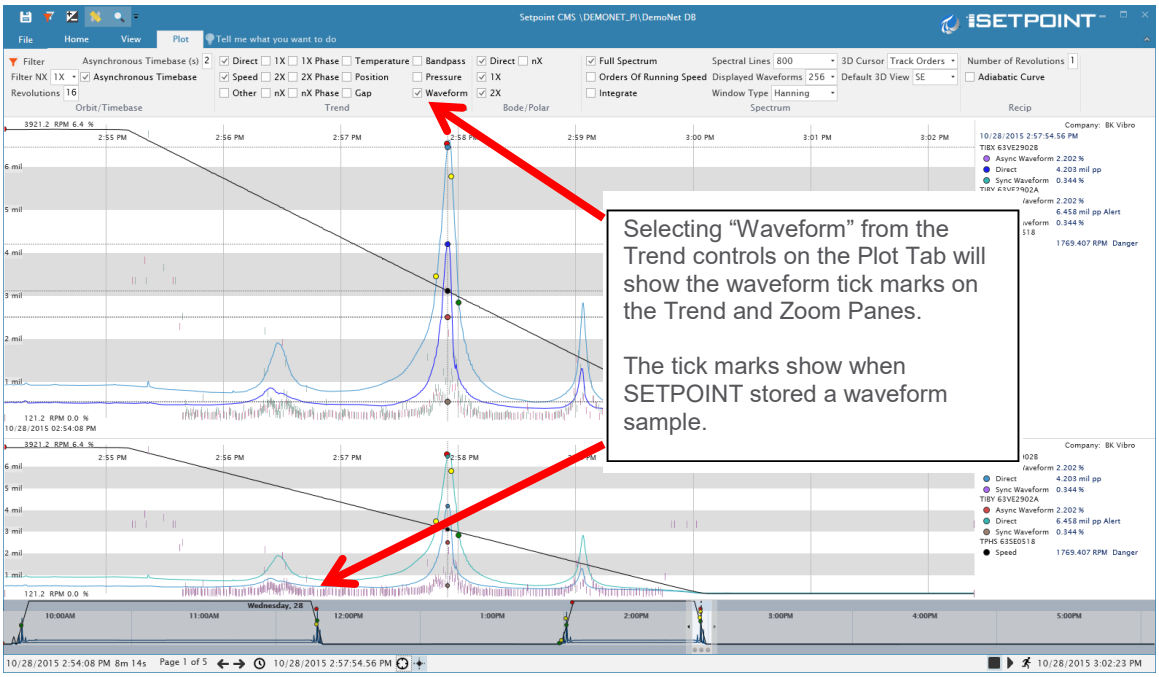
Button	Duration	Timeline Length
1 w	1 week	13 weeks
1 d	1 day	14 days
1 h	1 hour	8 hours

9.3.5 Show or Hide Data Annotations



Show Data Annotations displays the alarm markers, state markers on the Trend Plot and Zoom Pane.

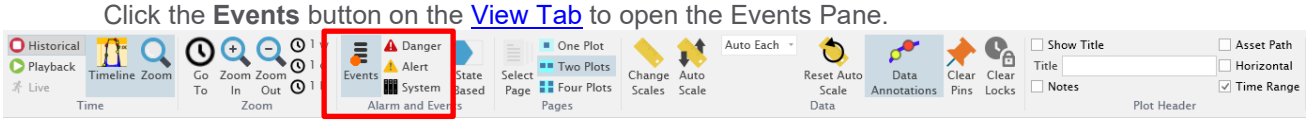
9.3.6 Show or Hide Waveform Tick Marks



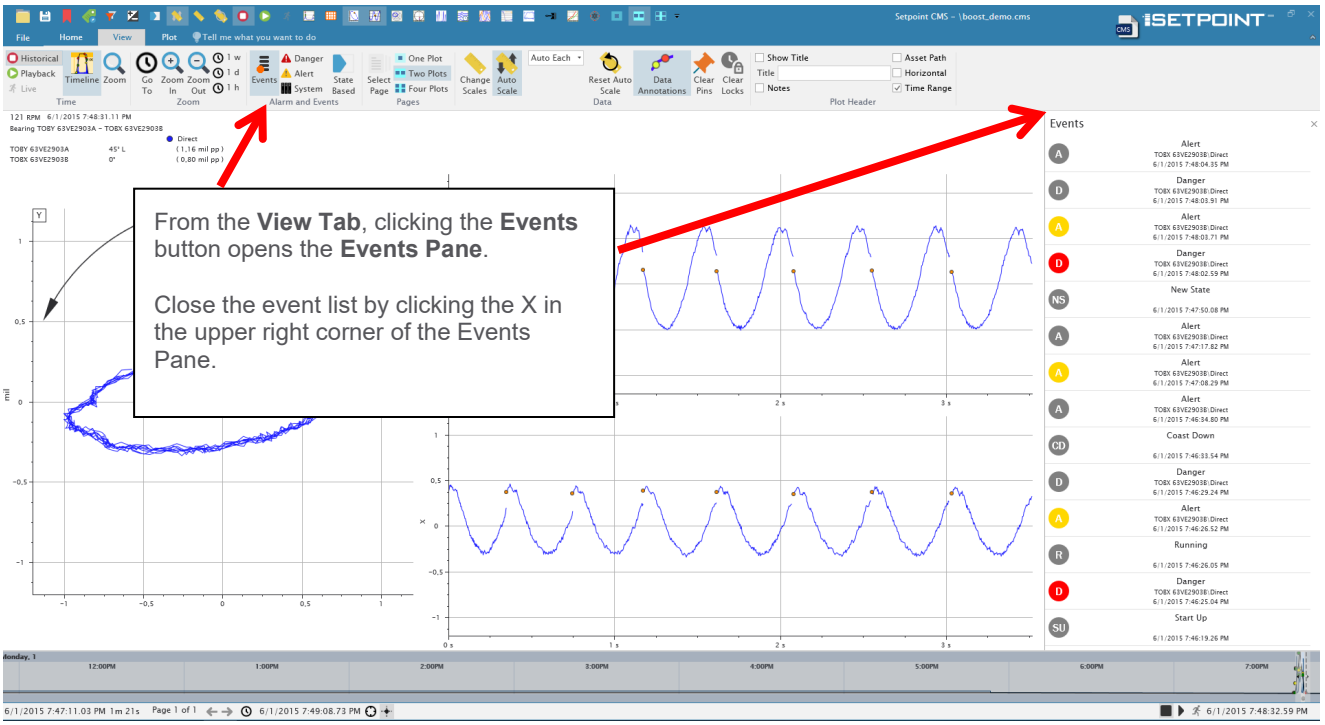
The height of the tick mark above the axis shows how interesting SETPOINT found the data. You can change the axis scale from the % setting in the Units Pane. Setting a larger percentage pushes the tick marks down toward the axis.

9.3.7 Show and Filter Events (The Events Pane)

Click the **Events** button on the View Tab to open the Events Pane.



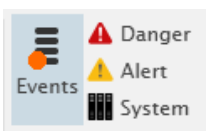
The Events Pane shows alarm, state and system events that occurred in the Timeline Pane whether in the selected time range or not. You can navigate directly to points and time ranges corresponding to the events directly from these lists. CMS defaults to showing the alarm list on the right as shown:



NOTE!

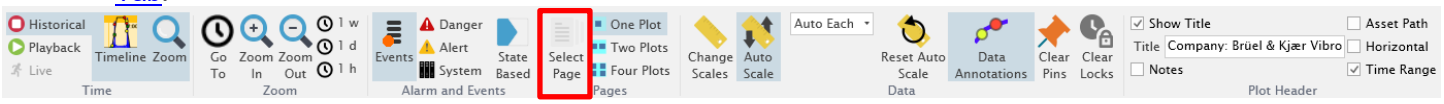
The Events list is filtered to show events for the selected points. The list will also include top level system events.

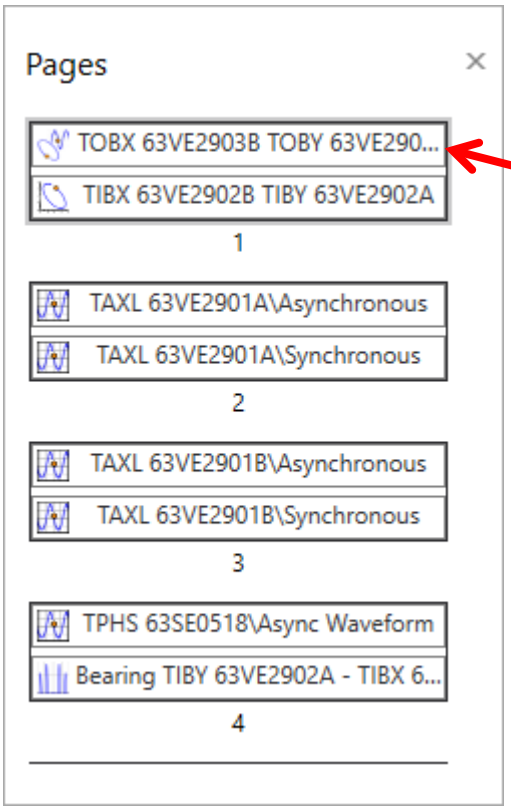
You can filter the event list to only show Danger, Alert, or System events by clicking the buttons shown. All events are shown is no buttons are active. When an event type is active, the type is highlighted:



9.3.8 Opening the Pages Pane

Open the Pages Pane for selecting the plots shown by clicking the **Select Page** button on the View Tab.

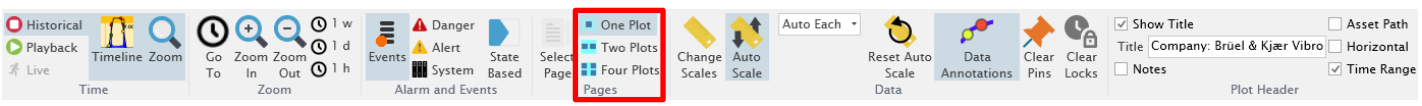




The Pages Pane groups the plots by the selected number of plots per page. The current page is highlighted.

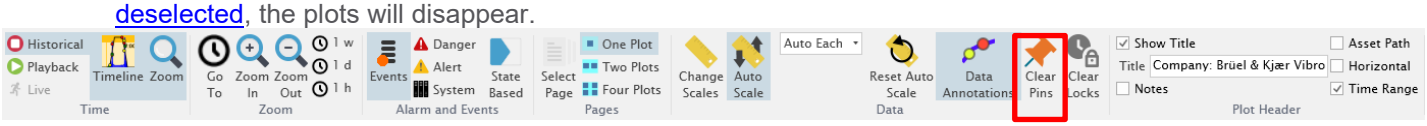
9.3.9 Change the Number of Plots Shown on a Page

Click the buttons to select one, two, or four plots per page.



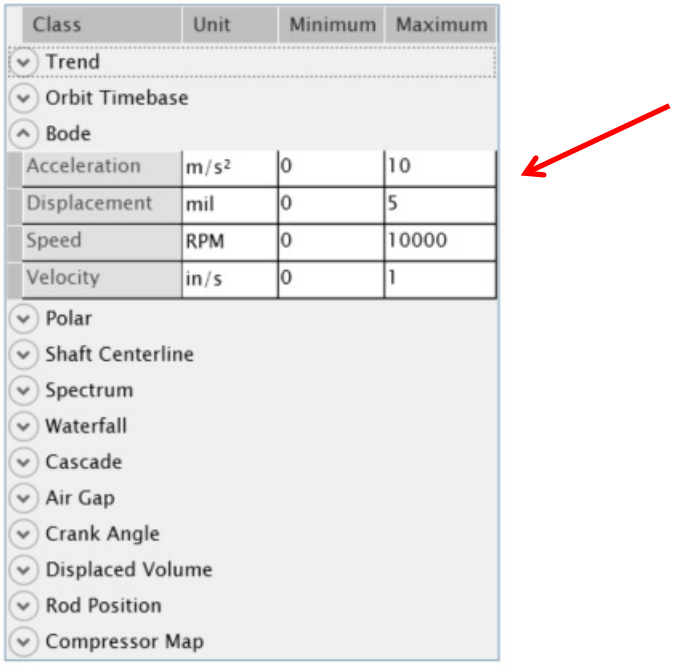
9.3.10 Clear Pins

The clear pins button un-pins any plots currently pinned. If the pinned plot types have been deselected, the plots will disappear.



9.3.11 Change Scales (Manual Scale)

From the View Tab, click the **Change Scales** button to open the Scales Pane. Use the Scales Pane to manually scale plots to the set value.



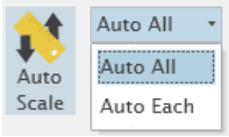
Set the full scale range for each unit. When Auto Scale is turned off, plots using the given unit will scale to the set value.

Minimum values are used only on the Trend and Reciprocating Compressor plots.

9.3.12 Auto Scaling

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

When scaling in **Auto All** mode the scale will automatically adjust to the size of the largest values viewed in the plot. As data grows smaller the scale will stay at the largest values seen.

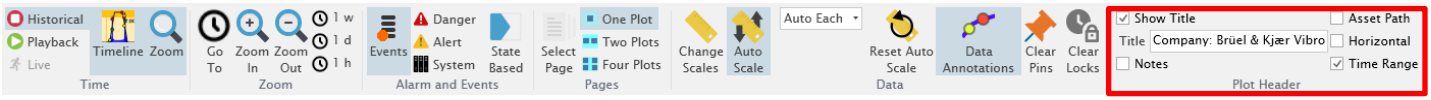


To reset the scale in **Auto All** mode use the **Reset Auto Scale** button on the View Tab.

Toggle the **Auto Scale** button off to return the plots to the configured scale.

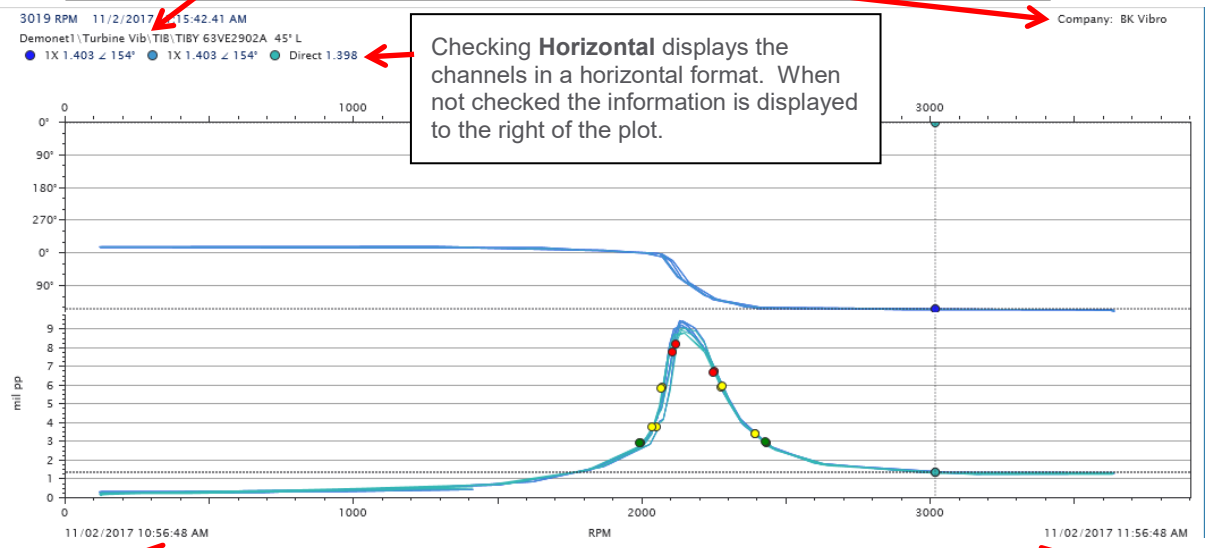
9.3.13 Show or Hide the Plot Header Information

The Plot header controls allow you to show or hide plot header information. Plot header information is useful for annotating plots in reports, but you may want to hide the information to maximize the plot area when analysing the data.



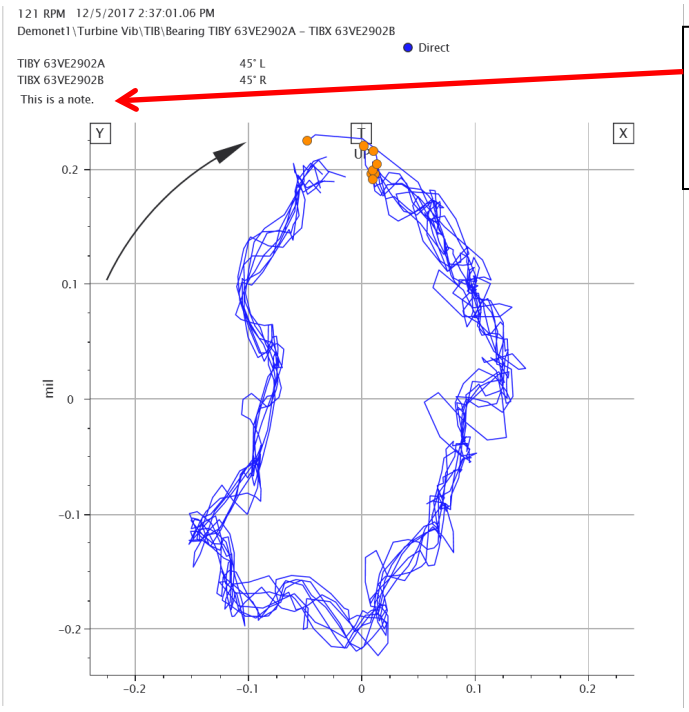
Checking **Asset Path** checkbox shows the full asset path in the header.

Show Title shows the set Title.



Checking **Horizontal** displays the channels in a horizontal format. When not checked the information is displayed to the right of the plot.

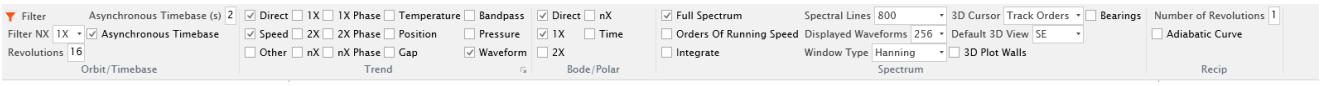
Checking **Time Range** displays the plot time range.



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

9.4 The Plot Tab

The Plot Tab includes commonly used controls for analyzing plots.



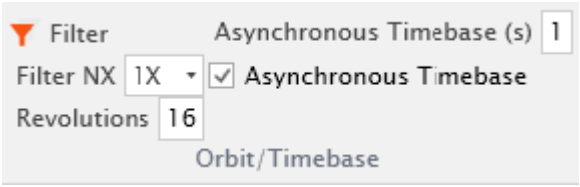
The Plot Tab is broken into sections for:

- Orbit/Timebase plot control,
- Trend plot control,
- Bode/Polar plot control,
- Spectrum plot control, and
- Reciprocating Compressor plot controls.

Cascade and Waterfall plots are controlled using the Spectrum settings.

9.4.1 Orbit/Timebase Controls

The Orbit/Timebase Controls apply to the Orbit, Timebase, and Orbit/Timebase plots.



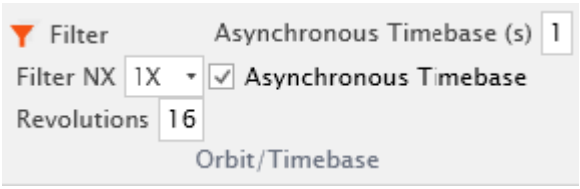
9.4.1.1 Turn on Filtering

Filtering applies to the Orbit, Timebase, and Orbit/Timebase plots.

You can filter the plots to show only the 1X, 2X, or nX vector components.

To filter an Orbit or Timebase to a specific component:

1. Open the Plot Tab.
2. Click the Filter button.
3. Select the vector harmonic to filter to.



NOTE!

To show filtered data, the UMM must be configured to measure the 1X, 2X, or nX vector.

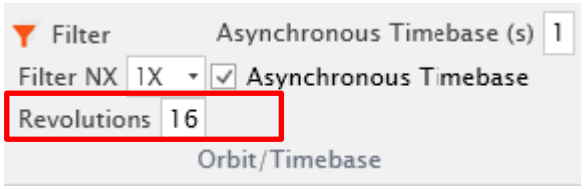
NOTE!

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

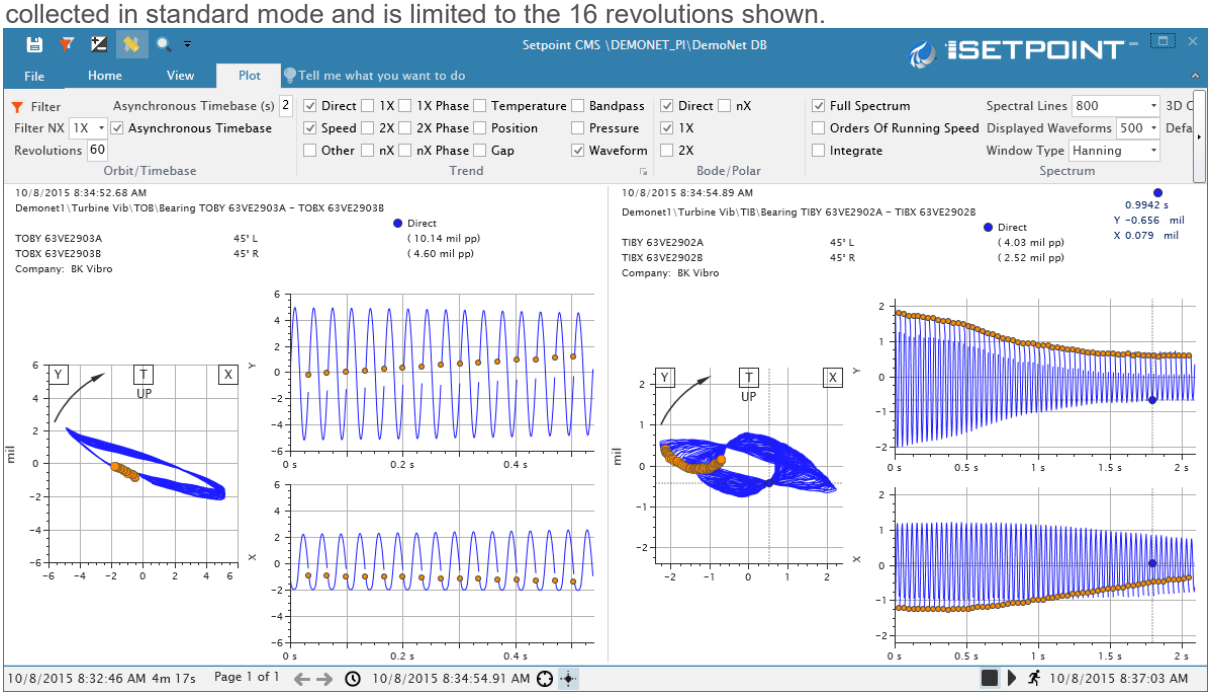
After you have set the filter harmonic, you can use the quick access filter button to toggle filtering on and off.

9.4.1.2 Adjusting the Number of Revolutions

You can change the number of shaft revolutions shown on the Orbit or Timebase plots from the default value of 8 revolutions. For example, changing Orbit 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 figure shows two Orbit/Timebase plots. The plot on the right was collected in boost mode and shows the full 60 revolutions. The plot on the left was collected in standard mode and is limited to the 16 revolutions shown.



The following table shows the number of revolutions collected when not in boost mode for the configured sample rate. 1024X and 512X sample rates are only available for reciprocating compressor channel types.

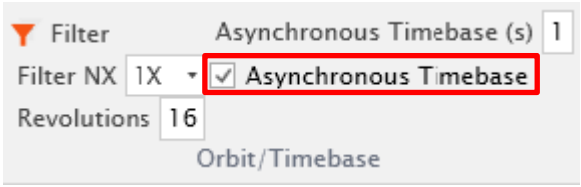
Sample Rate	Revolutions
1024X	2
512X	4
128X	16
64X	32
32X	64
16X	128

9.4.1.3 View the Asynchronous Timebase

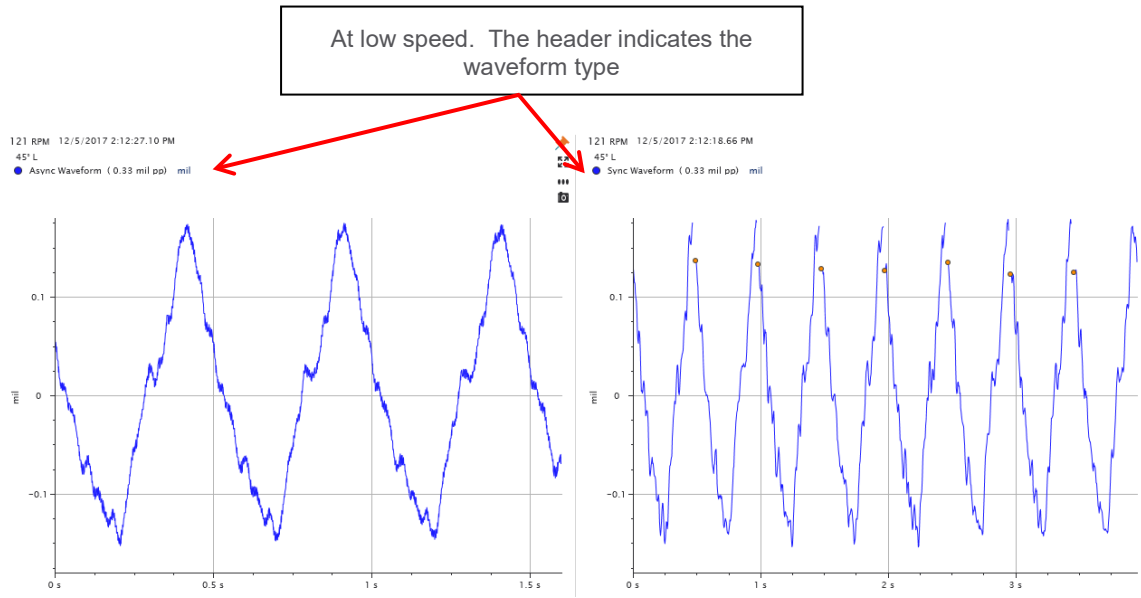
By default, the timebase plot will show the synchronously sampled waveform. You can also plot the asynchronously sampled waveform. To view the asynchronous timebase:

1. Select the timebase plot on the Home tab. Turn Orbit off.

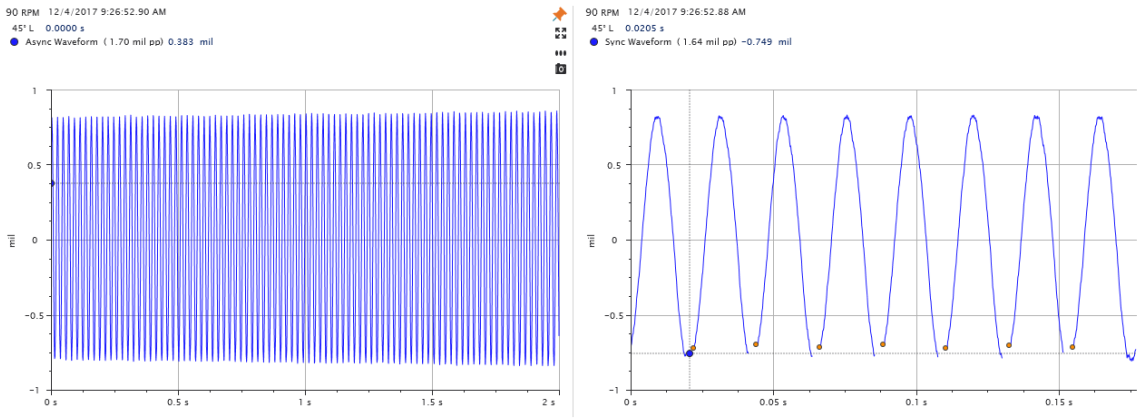
2. On the Plot Tab, click the **Asynchronous Timebase** checkbox:



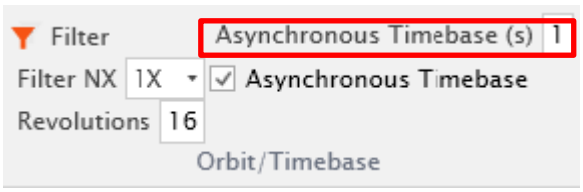
The asynchronous waveform will not have phase trigger marks and cannot be filtered or compensated. The synchronous waveform always shows the number of configured shaft revolutions. The asynchronous waveform will show fewer revolutions at low speed and more at higher speeds as shown by the following figures:



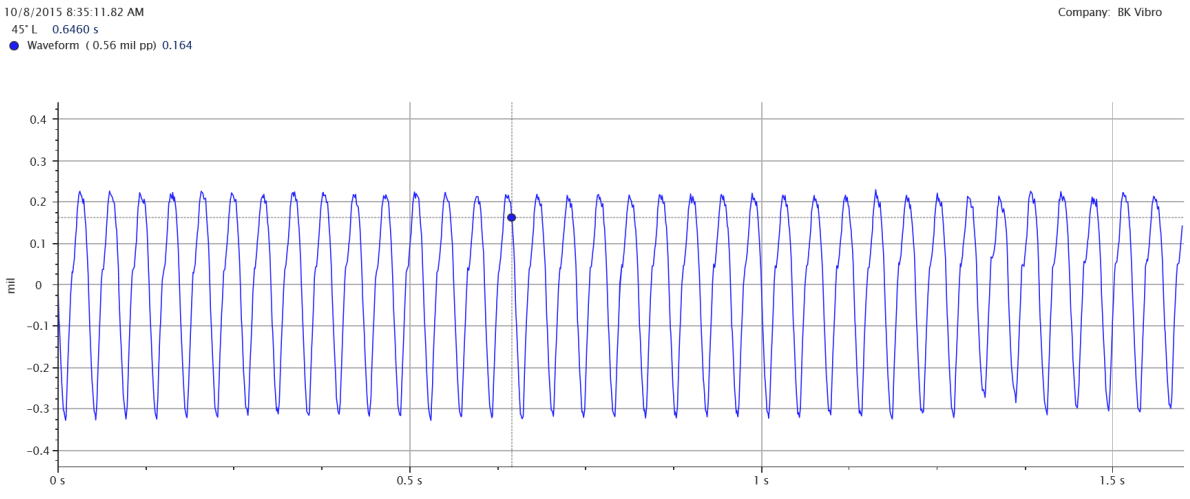
At high speed. Asynchronous waveform on the left, synchronous on the right:



Data collected in boost mode supports long, continuous waveforms. You can configure the Asynchronous Timebase to set the amount of asynchronous timebase data plotted.



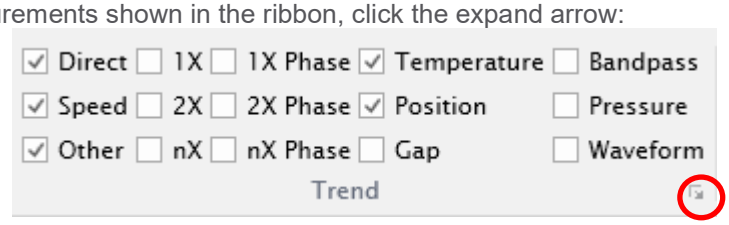
Boost mode data can show continuous waveforms much longer than a typical 2048 point waveform.



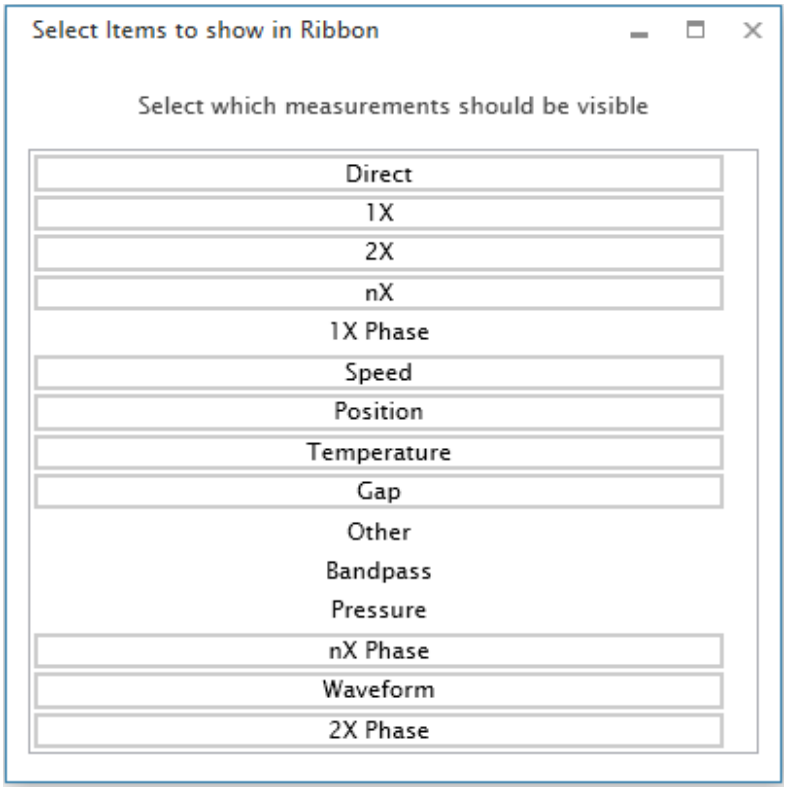
9.4.2 Trend Controls

You can filter the data shown to only include set types of measurements. For example, if you want to only see 1X vector measurements on your Trend, check the 1X box and clear all the others.

To change the measurements shown in the ribbon, click the expand arrow:



The dialog shown below opens. Click the measurements you want visible or hidden. After selection, the visible measurements will be boxed as shown below.



When finished, click the X to close the window.

The following tables show the association of the measurements to the Trend Controls.

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

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

Channel Type	Measurements	Trend Group
Discrete Input	Digital State	Direct
Dynamic Pressure	Direct	Direct
	Bias	Gap
	Pressure Band-pass 1	Bandpass
	Pressure Band-pass 2	Bandpass
	Pressure Band-pass 3	Bandpass
Eccentricity	PP Eccentricity	Direct
	Gap	Gap
	Min	Position
	Max	Position
	Ecc Position	Position
Enveloped Acceleration	Direct	Direct
	Bias	Gap
	Cage	Bandpass
	IRBP	Bandpass
	ORBP	Bandpass
	Ball Spin	Bandpass
	2X Ball Spin	Bandpass
Hydro Radial Vibration	Direct	Direct
	Gap	Gap
	1X Amplitude	1X Amplitude
	2X Amplitude	2X Amplitude
	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
	Bias	Gap
	1X Amplitude	1X Amplitude
	2X Amplitude	2X Amplitude
	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
	Bandpass	Bandpass
	Bias	Gap
Low Frequency Velocity	Direct	Direct
	Bias	Gap
Phase Trigger	Speed	Speed
	Gap	Gap
	Rotor Acceleration	Speed
	Peak Speed	Speed
Process Variable	Direct	Direct
	Bias	Gap
Radial Vibration	Direct	Direct
	Gap	Gap
	1X amplitude and phase	1X Amplitude, 1X Phase
	2X amplitude and phase	2X Amplitude, 2X Phase
	nX	nX Amplitude, nX Phase
	Band-pass 1	Bandpass
	Band-pass 2	Bandpass

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

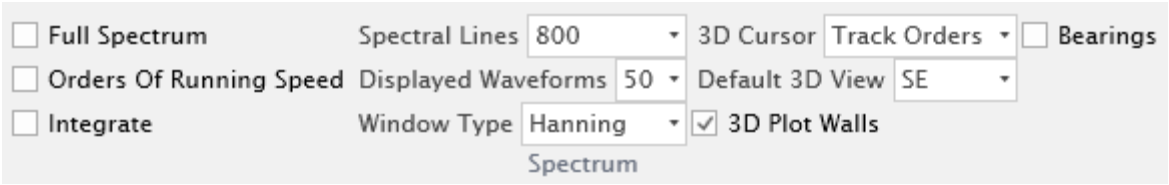
Channel Type	Measurements	Trend Group
Recip Cylinder Pressure	Compression Ratio	Pressure
	Discharge Pressure	Pressure
	Maximum Pressure	Pressure
	Minimum Pressure	Pressure
	Peak Rod Compression	Pressure
	Peak Rod Tension	Pressure
	Rod Reversal Degrees	Pressure
	Suction Pressure	Pressure
Recip Rod Drop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

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

Channel Type	Measurements	Trend Group
Valve Position	Direct	Direct
	Bias	Gap
Velocity	Direct	Direct
	Bias	Gap
	1X amplitude and phase	1X Amplitude, 1X Phase
	2X amplitude and phase	2X Amplitude, 2X Phase
	Band-pass	Bandpass
	nX amplitude and phase	nX Amplitude, nX Phase
Zero Speed	Zero Speed	Speed
	Speed	Speed
	Gap	Gap
	Peak Speed	Speed

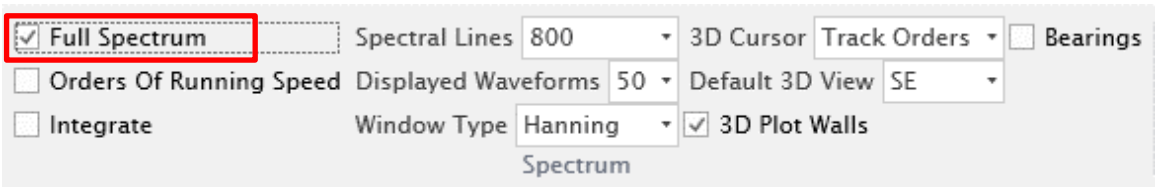
9.4.3 Spectrum Controls

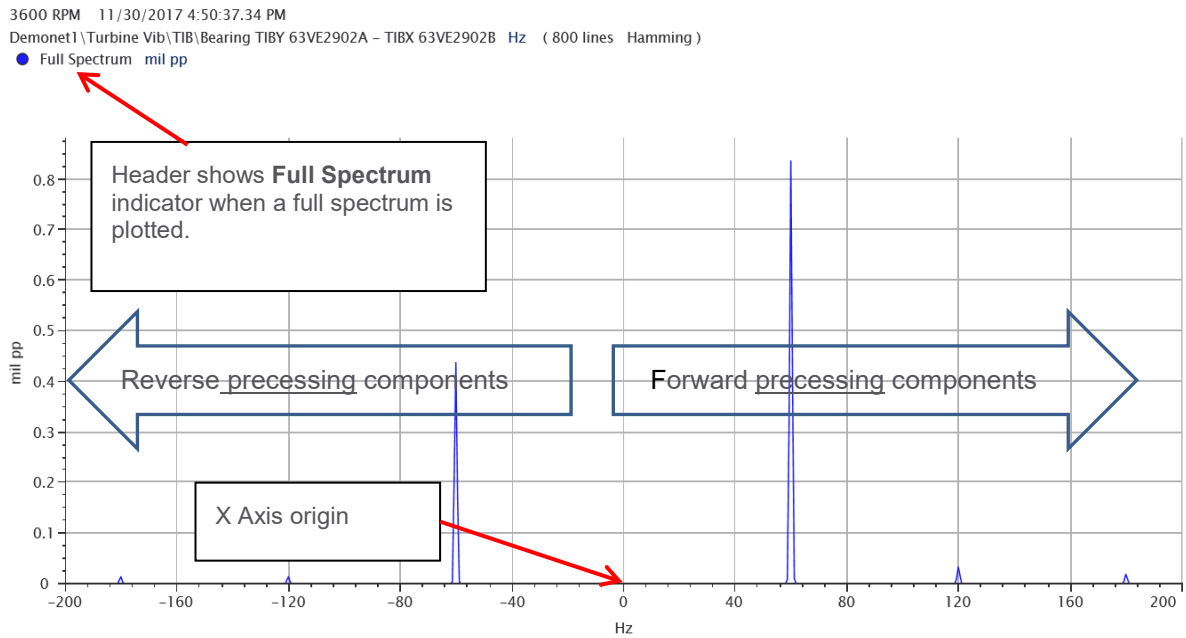
The spectrum controls apply to the Spectrum, Waterfall, and Cascade plots.



9.4.3.1 Viewing the Full Spectrum

SETPOINT CMS generates the full spectrum from an XY probe pair. The resulting full spectrum is the spectrum of the orbit with forward and reverse vectors that define the orbit.

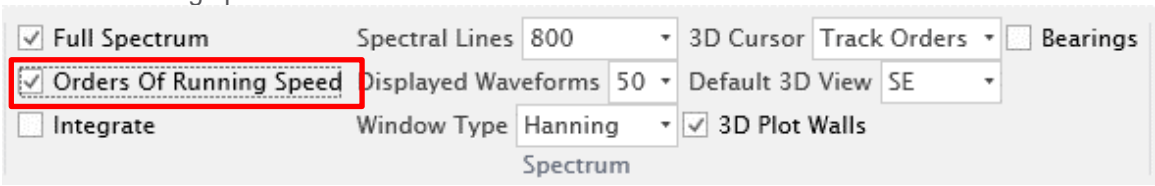




Full spectrum plot cursors show both the forward and reverse precessing values for the selected frequency or order.

9.4.3.2 Show Order of Running Speed:

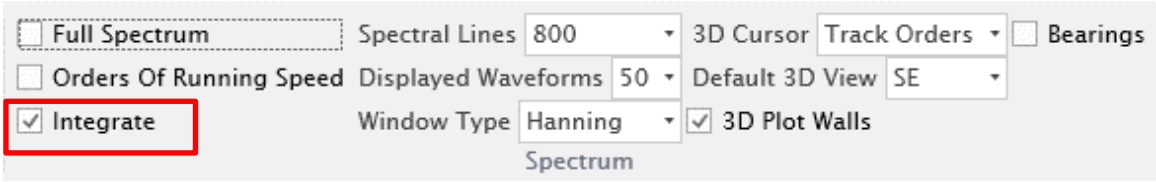
Select this option to generate the spectrum data from the synchronous sampled data and display in orders of running speed.



Set the X maximum scale on the Scales Pane. The X scale does not autoscale.

9.4.3.3 Integrating Spectrums

Click the **Integration** button to integrate spectrums, cascade spectrums, or waterfall spectrums from acceleration units to velocity units or from velocity units to displacement units as set in the default units. On the integrated spectrum, the spectral components below 10 Hz may have errors caused by high integration gain at low frequencies.



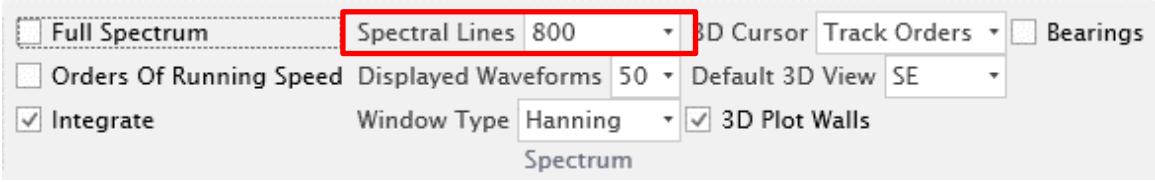
Click the **Integration** button again to return to non-integrated units.

NOTE!

Integration is only available on spectrum plots. Orbits and Timebase plots are not integrated.

9.4.3.4 Number of Spectral Lines:

Allows you to adjust the spectrum resolution. If the number of spectral lines exceeds the maximum for the sampling configuration, CMS will interpolate the data to provide a smoother plot.

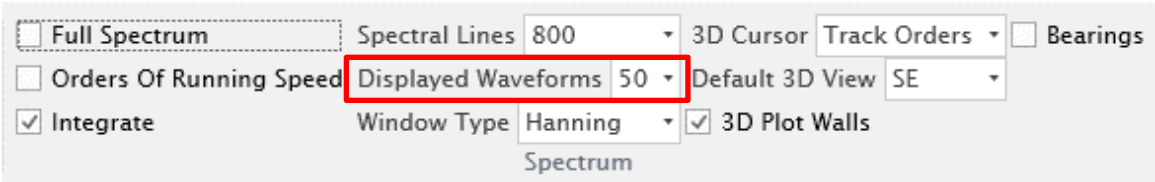


NOTE!

Interpolation does not improve resolution beyond what is supported by the sample rate. When combined with windowing, the interpolation only provides a smoother data presentation. Without windowing, the interpolation can increase side lobes.

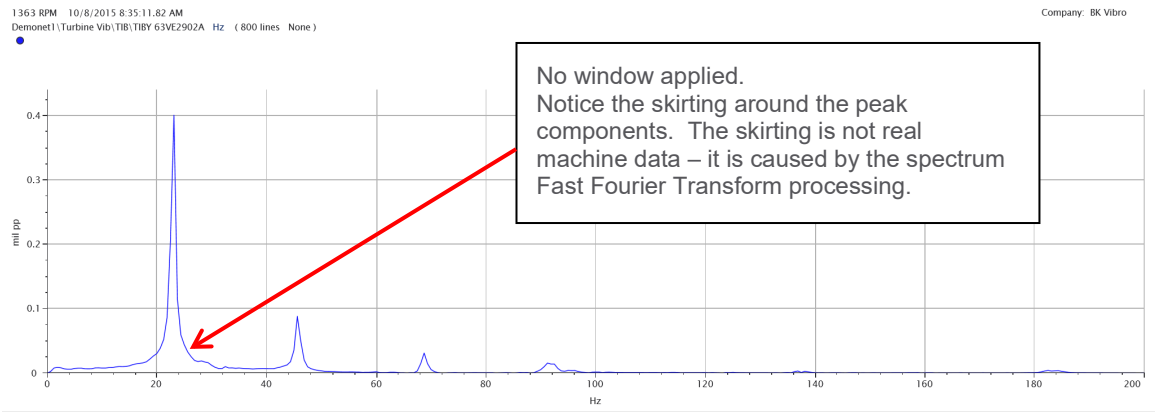
9.4.3.5 Displayed Waveforms:

Spectral Display Limit applies only to Cascade and Waterfall plots. This is the maximum number of spectrums that CMS will display on these plots. A large spectral display limit provides more detail but takes longer to plot.

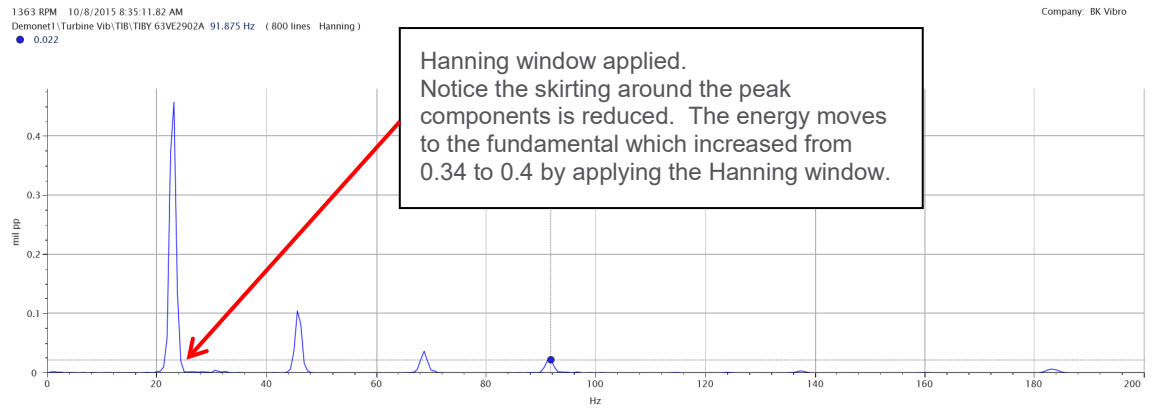


9.4.3.6 Spectrum Window Type

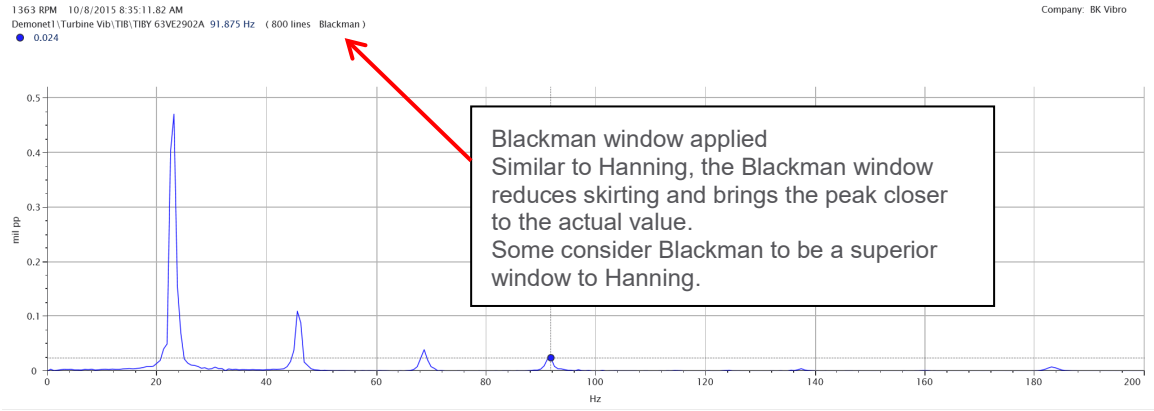
Windowing can enhance the spectrum display for amplitude and frequency accuracy. The Window type applies to all open spectrum plots. Window choices are: No Window, Blackman, Hamming, and Hanning. The following figures show the effects of the various window types.



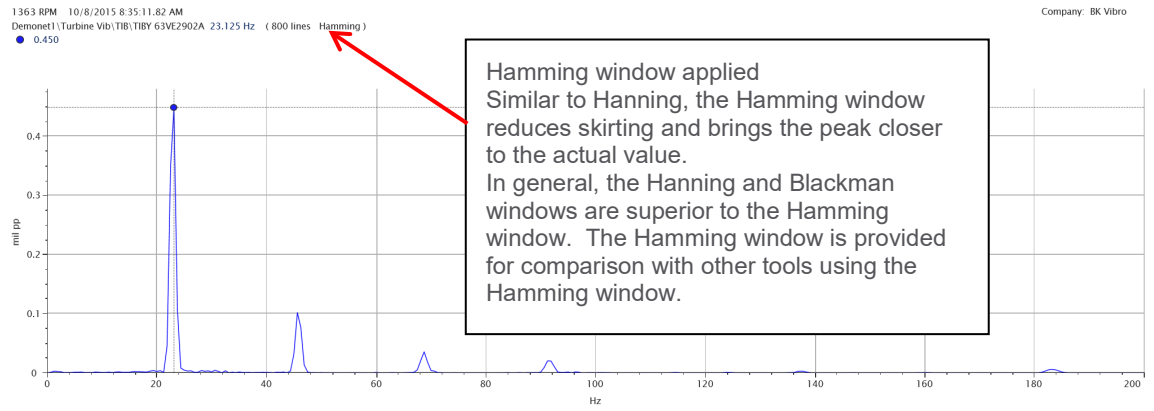
Hanning:



Blackman:

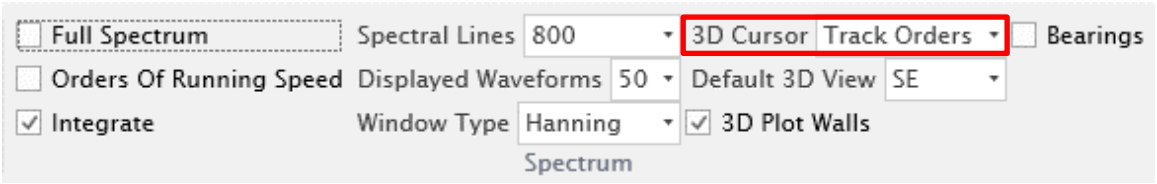


Hamming:



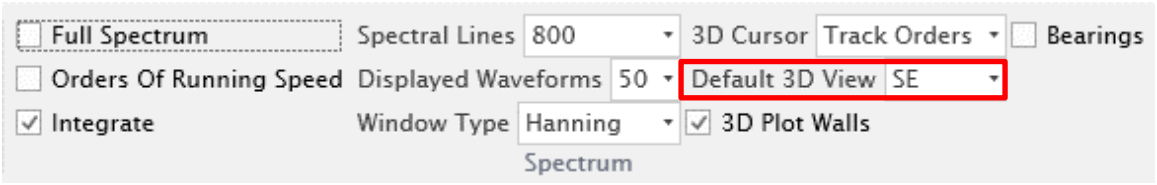
9.4.3.7 3D Cursor

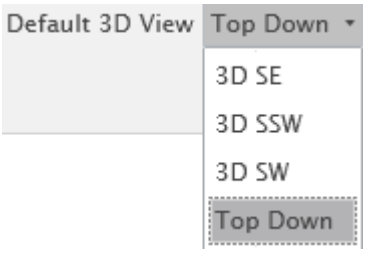
The 3D Cursor control applies only to Cascade and Waterfall plots. Standard mode causes the cursors to track the X-Axis point when using the Up/Down arrow keys to move between spectrums. Track Orders causes the cursor to follow the current order. For example, if you click on the 1X harmonic component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



9.4.3.8 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.

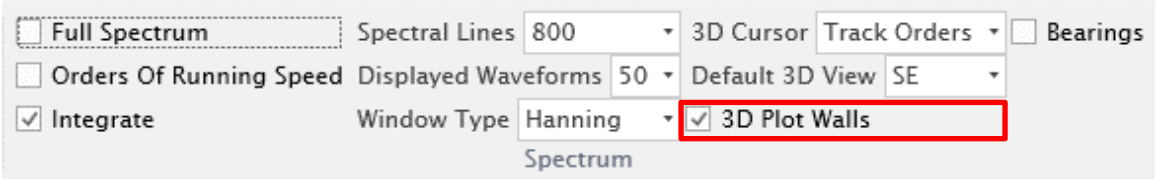


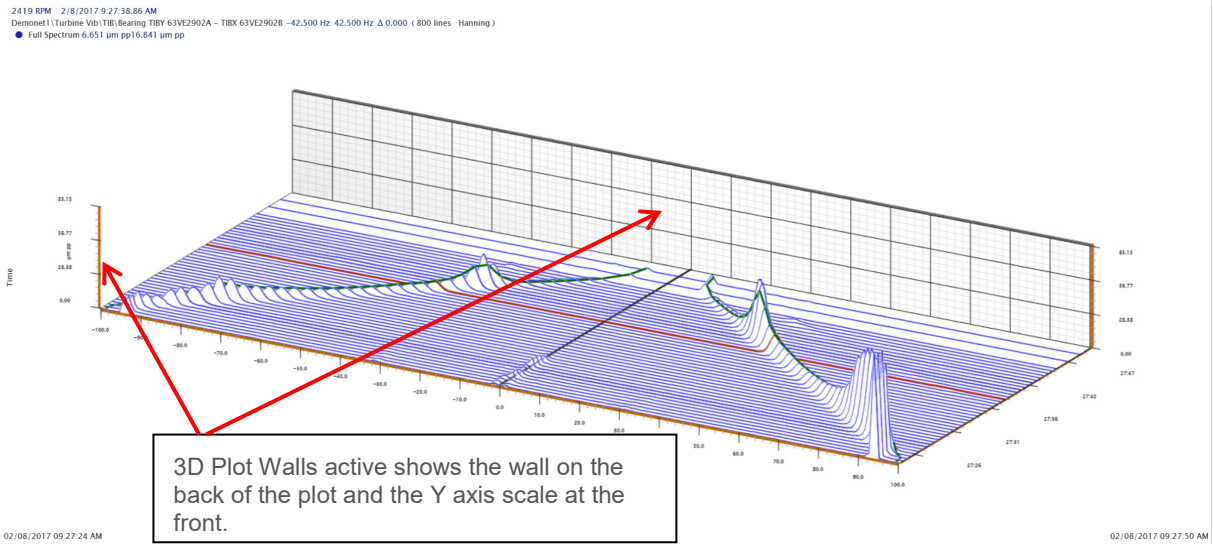


The views are listed as compass coordinates.

9.4.3.9 3D Plot Walls

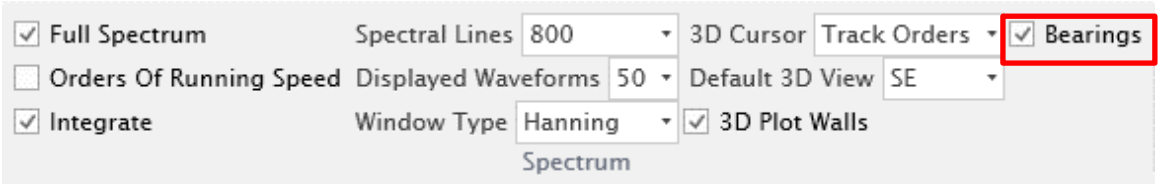
You can display or hide the Y axis scales and back wall on the Cascade and Waterfall plots.



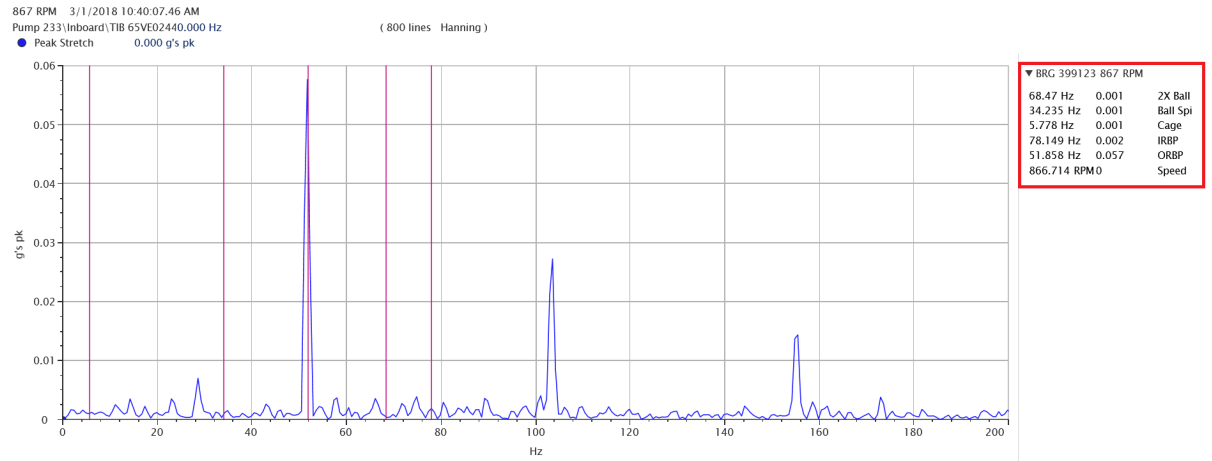


9.4.3.10 Enable Bearing Cursors

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.

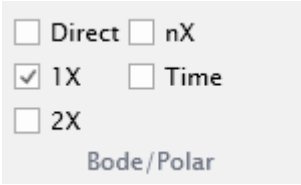


9.4.4 Bode and Polar Plot Controls

Choose which vector data values to plot on the Bode and Polar plots.

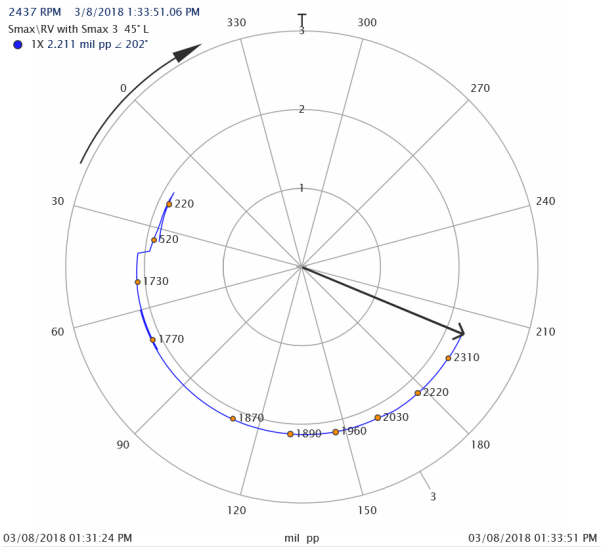
NOTE!

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

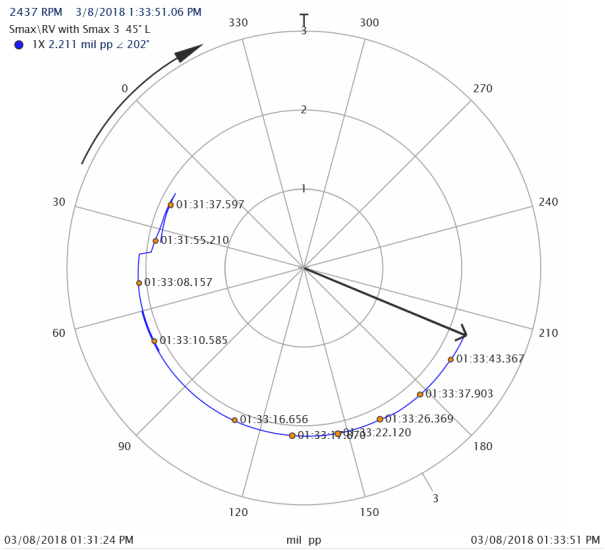


You can also plot the Direct value on the Bode. All selected Direct and vectors plot on the same Bode plot to allow you to quickly determine which vector is influencing the Direct value. Different vectors open separate Polar plots.

The **Time** checkbox labels the Polar and Shaft Centerline plot points with the sample time. When the **Time** checkbox is cleared the points are labelled with the speed.



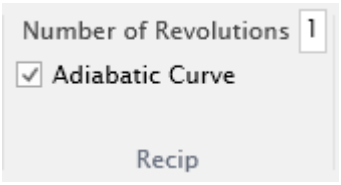
Points labelled with speed



Points labelled with time

9.4.5 Reciprocating Compressor Controls

Reciprocating compressor controls apply to the Pressure-Volume Diagrams, Rod Load Diagrams, and Rod Position plots used to analyze Reciprocating Compressors.



See Pressure-Volume Diagram for information on the adiabatic curve.

9.4.5.1 Changing the Recip Number of Revolutions

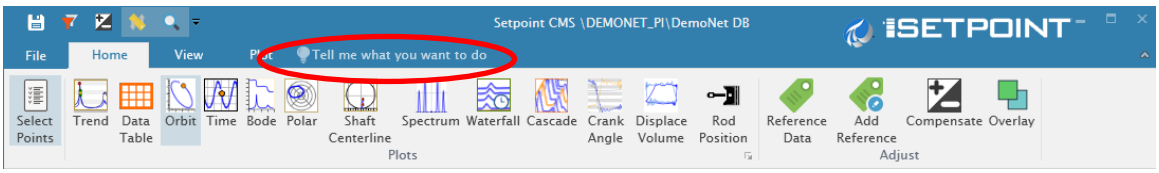
Change the number of revolutions to see a data samples plotted over more or fewer revolutions on the Rod Position plot.

9.5 Tell Me What You Want to Do

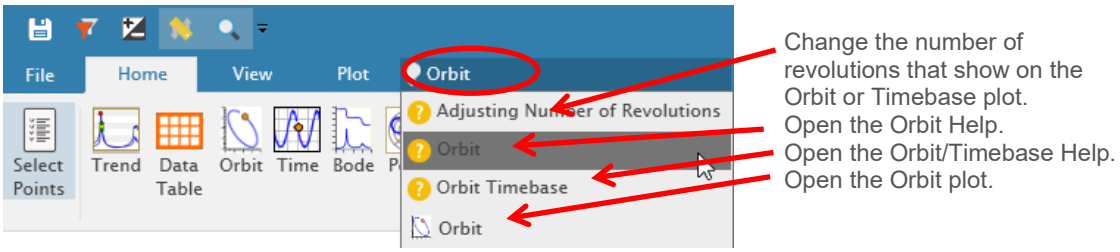
The “Tell me what you want to do” input line is a combination help, search, and control line.

Entering a key word such as “Bode” will show options for opening the Bode plot or viewing the Bode plot help information.

Entering a point name will open the navigation pane at that point level.



For example, typing in the word Orbit lists several options:



10 Using the CMS Display Software

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

The basic flow consists of:

- Setting Default Units
- Opening a data source
- Selecting the assets and points you want to analyze
- Configuring the plots
- Selecting the data time range
- Analyzing the data
- Create a report

10.1 Setting the Time Range

Setting the time range sets the data for plotting Trend, Bode, Polar, Waterfall, and Cascade plots.

By default, plots open with the time range set to the time range from the last session.

Set the time range to:

- Move to the Current Time
- View Data From a Specific Time Range
- View Data Around an Event
- Zoom in on Selected Data

10.1.1 Move to the Current Time

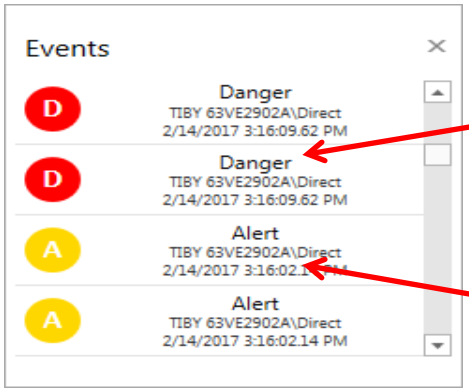
Click the clock icon to move the selected time range to end at the current time.

10.1.2 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 View Tab to navigate directly to that time.

10.1.3 View Data around an Event

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

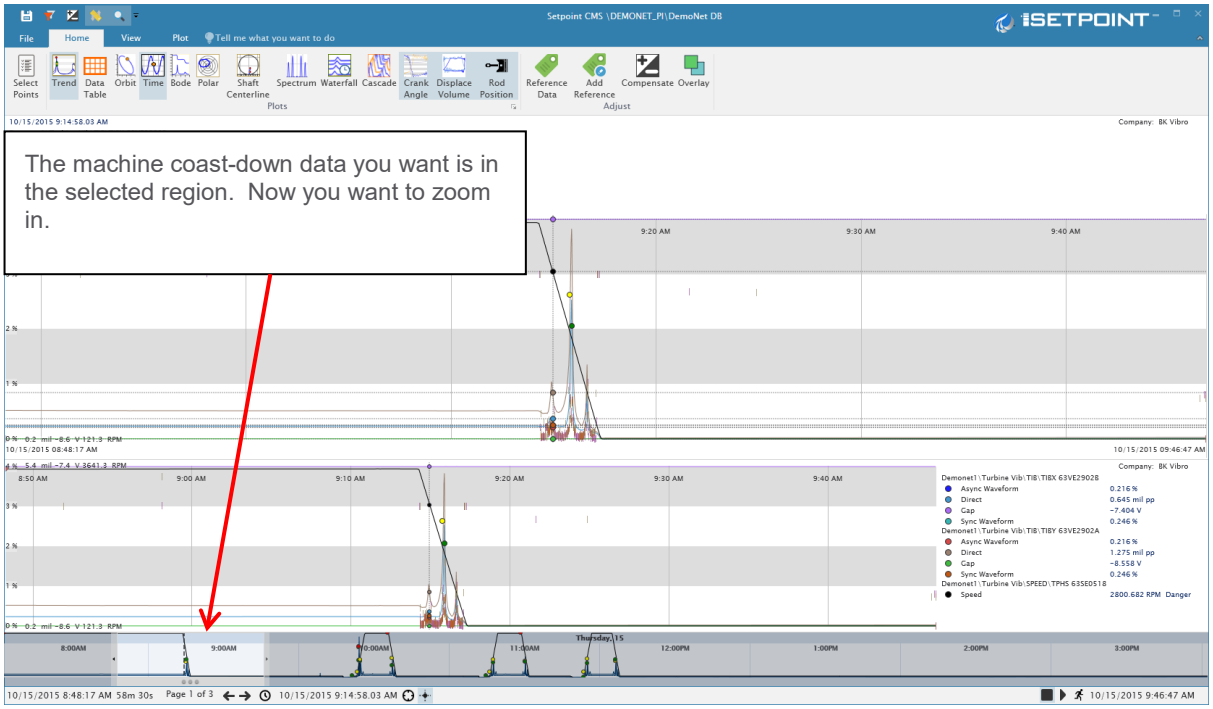


Clicking on the point name in the event will change to that point in the Navigation Pane.

Clicking on the event time centers the selected time range on the event time.

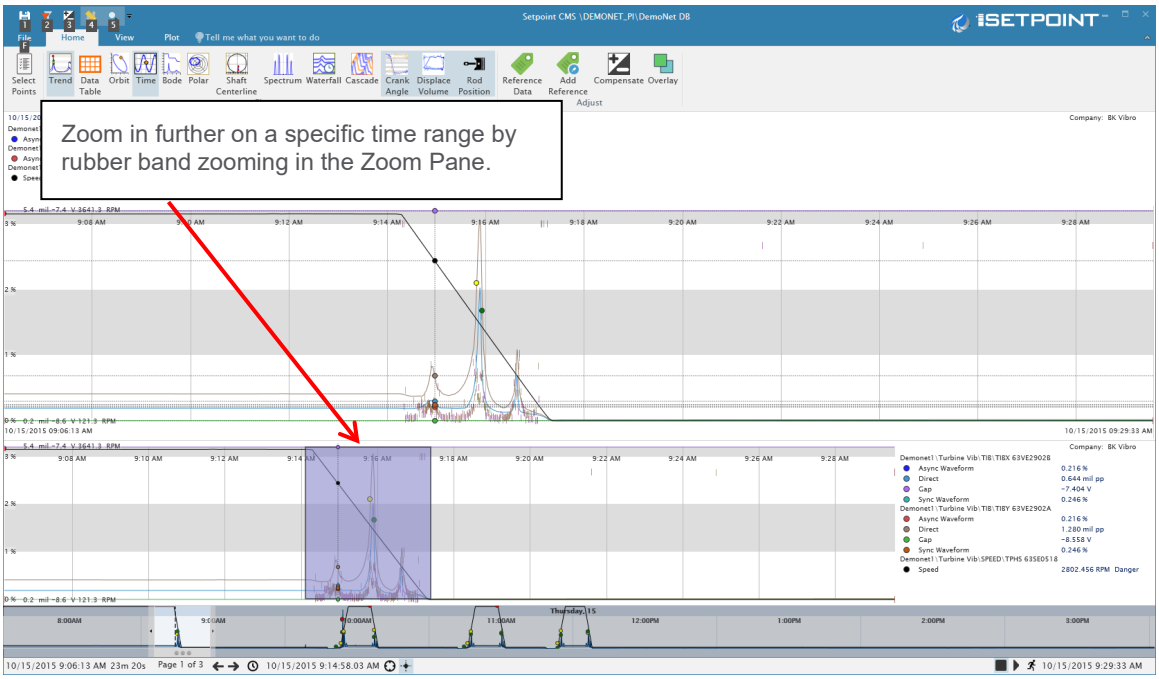
10.1.4 Zoom in on Selected Data

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.



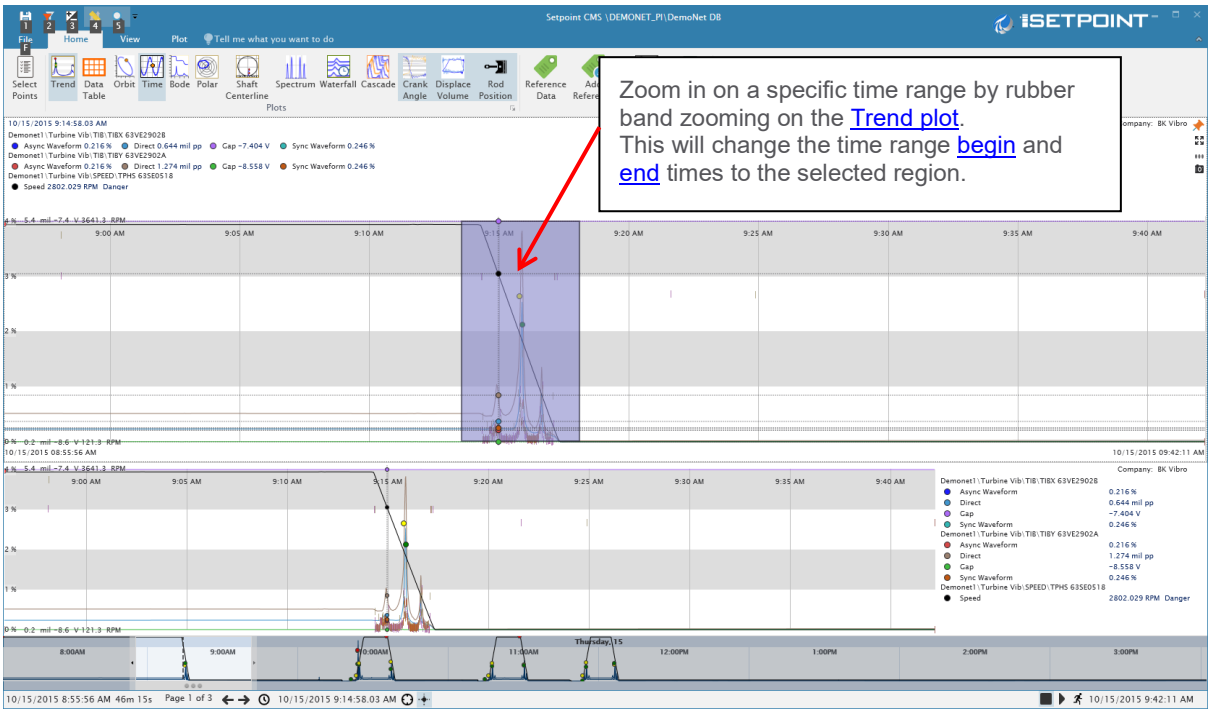
10.1.4.1 Zoom in the Zoom Pane

Open the Zoom Pane from the View Tab. Drag the mouse across the Zoom Pane to rubber-band zoom on a section of data.



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

10.1.4.2 Zoom on the Trend Plot

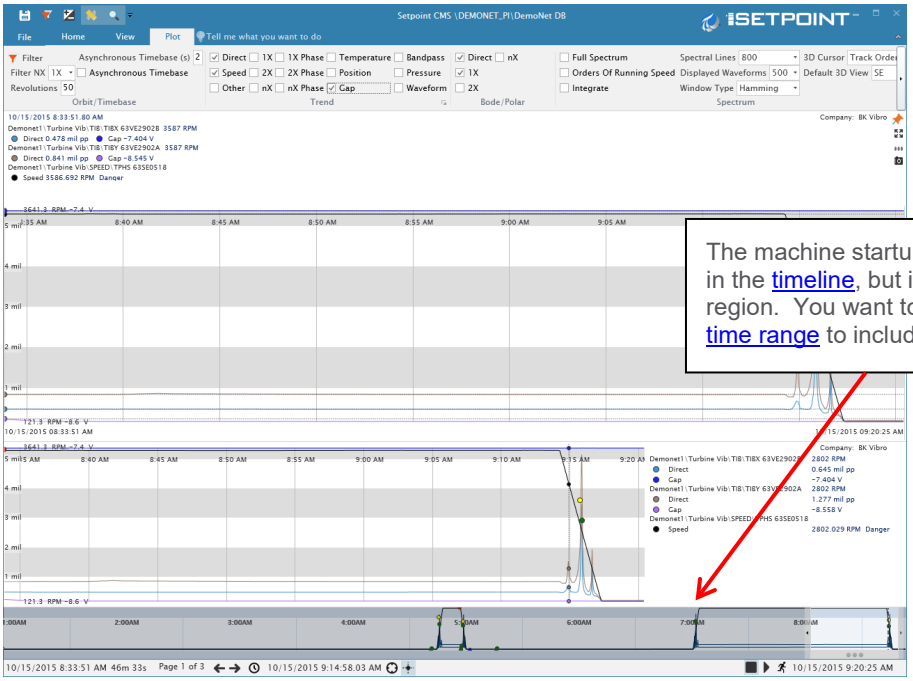


You can also use the Zoom In and Zoom Out buttons to reduce the time range.

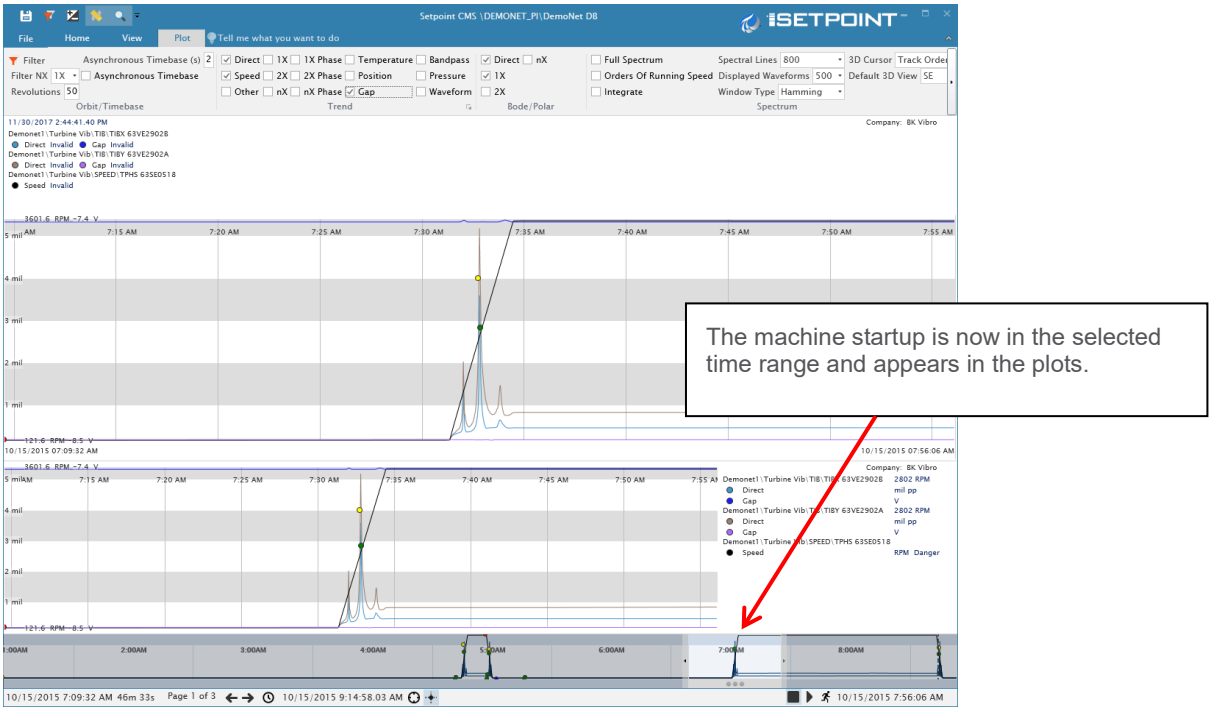
10.1.4.3 Move the Timeline Handles

Click either the begin time or end time and drag to adjust the selected time.

10.1.5 Data of Interest is Shown in the Timeline, but not Selected



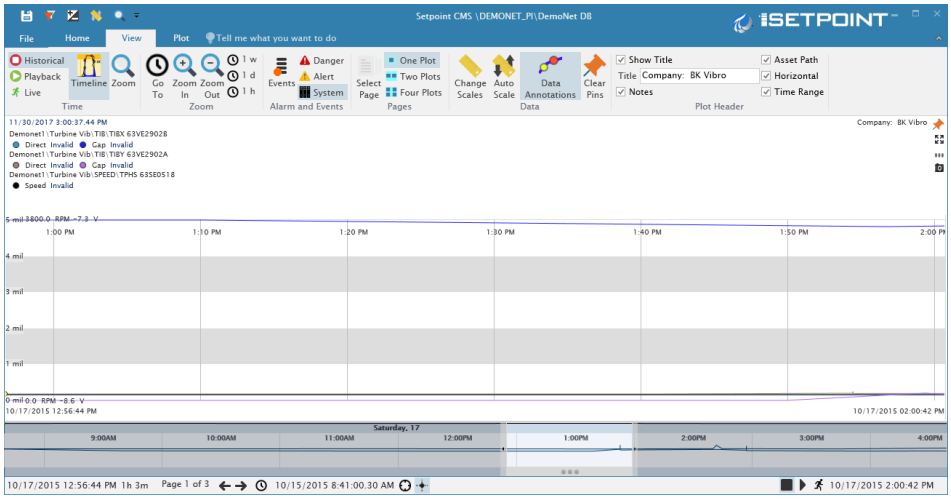
Click on the selected time range slider control and drag the selected time window to the left. This changes the begin time but keeps the duration the same.



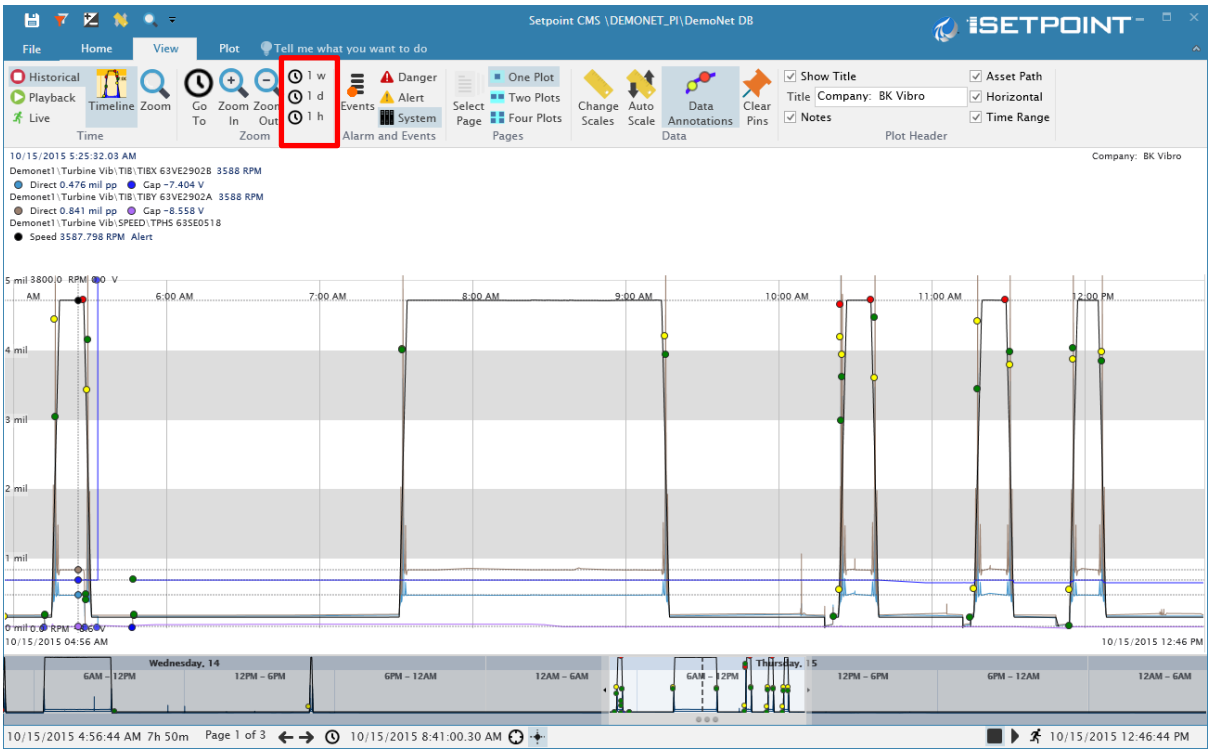
Alternatively, you can increase the selected time range by zooming out, moving the timeline handles or changing the time range size buttons.

10.1.6 Data is 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:



Slide the range all the way to the left end to see the previous time period or to the right to see more current data.

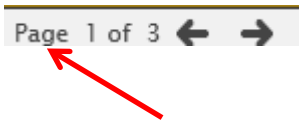
10.2 Analyzing the Data

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

- Paging through plots
- Changing the number of plots shown on a page
- Zooming in on a plot
- Expand a plot to full screen
- Automatically scale the data
- Manually scale the data
- Compensate the data
- Maximizing the plot area
- Using cursors
- Viewing live data
- Playing back recorded data

10.2.1 Paging Plots

This section describes the ways to page through the plots. Open the Pages Pane from the View Tab. You can also page plots or open the view tab using the controls at the lower left of the screen as shown below.

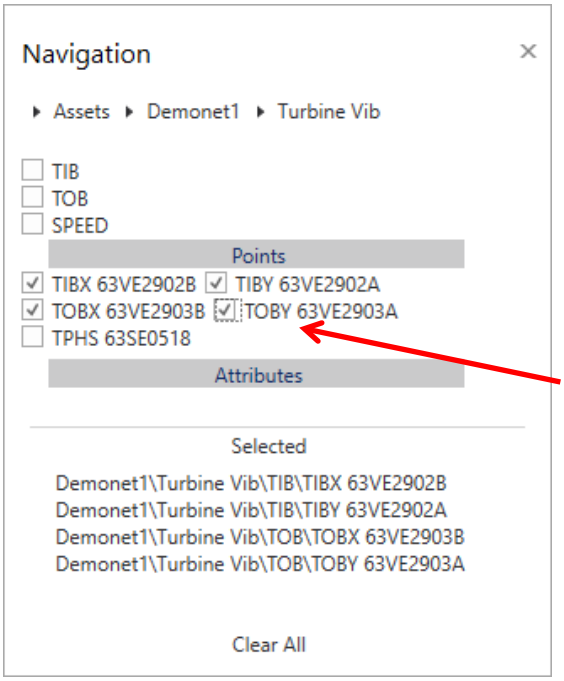


Click on the right or left arrows at the bottom of the screen to page to the next or previous plot. The arrows are not active if there is only one plot page. You can also use the Alt key and the left and right arrow keys to page plots.

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.

10.2.1.1 Paging through Plot Types for a Group of Channels

Follow these instructions when you want to view the same plot type on 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.

10.2.1.2 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) Turn on the desired plots.
3) Use the Pages Pane or the page arrows to page through the plots.

10.2.1.3 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:

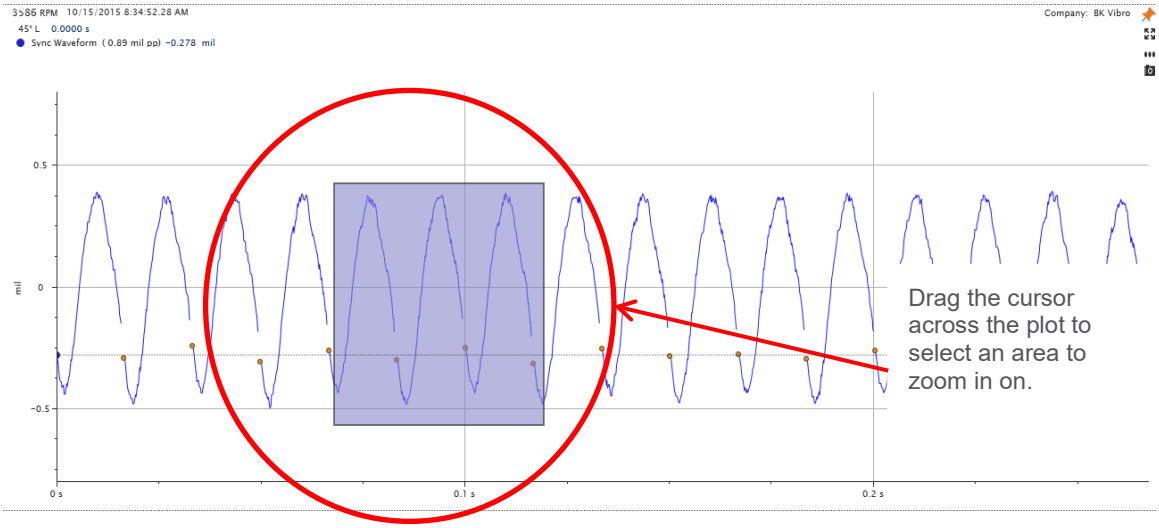
1) Use the Navigation Pane to select the desired channels and remove other points from the selected data list.
2) Select two plots per page.
3) Turn on the plot type you want and turn the others off.

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.

10.2.2 Zooming in on a Plot

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



You can also use the mouse scroll wheel to zoom in or out on the Timebase plot.

10.2.3 Increasing the Plot Area

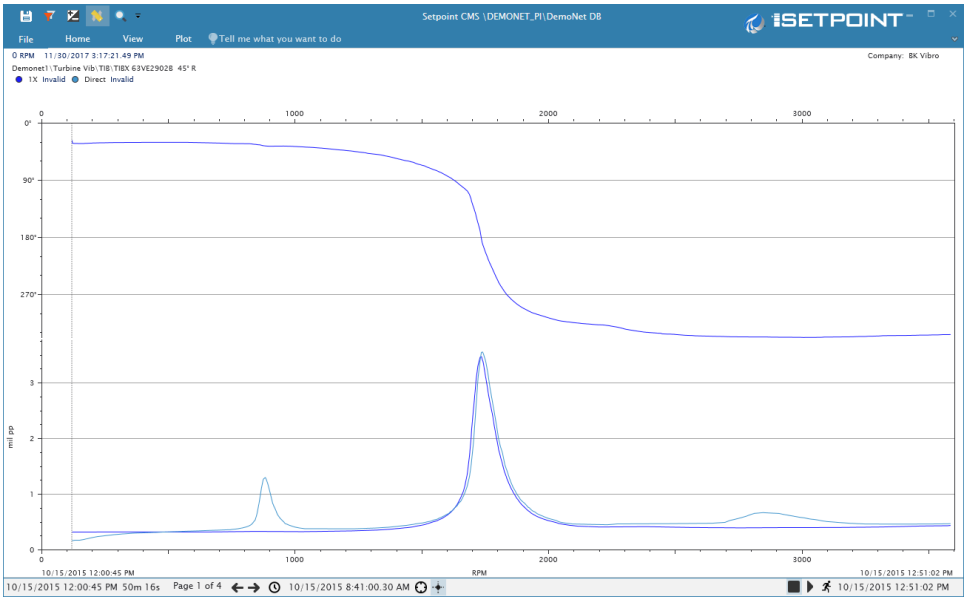
You can increase the area available for viewing plots by:

Collapsing the ribbon

Closing the Timeline

Undocking panes and moving them out of the plot area

The following figure shows the plot area maximized.



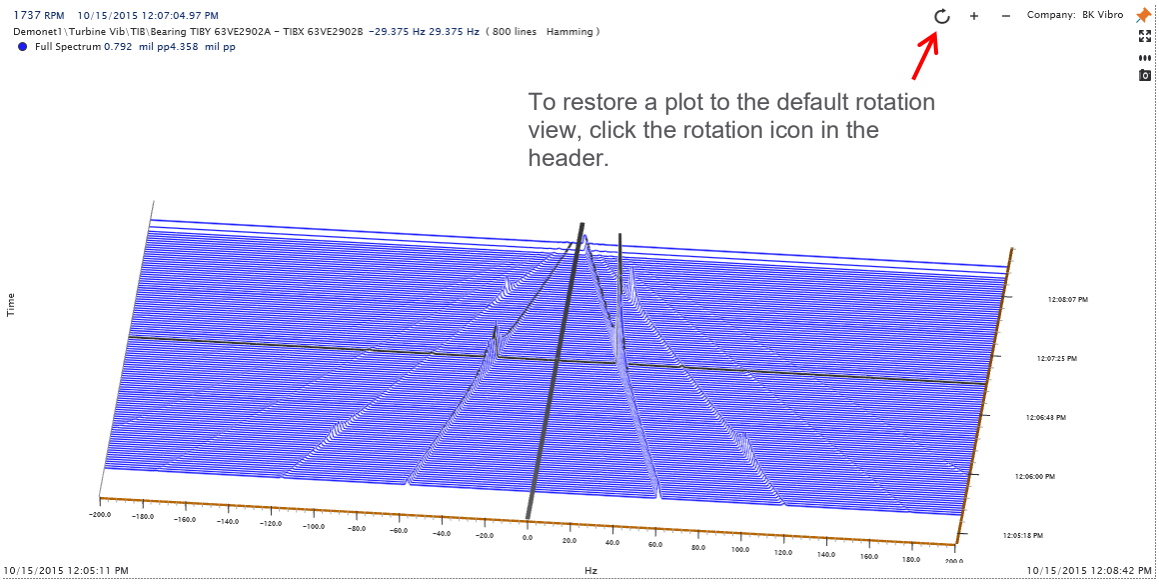
10.2.4 Full Screen a Plot

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. Select the full screen button as shown:

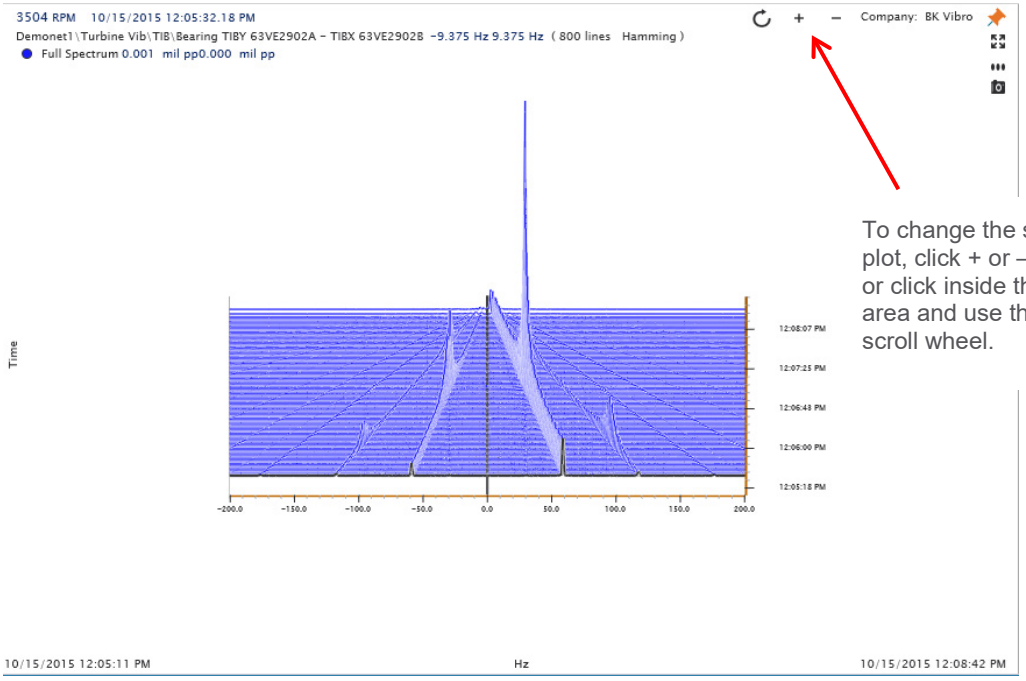
Press the Escape (ESC) key to exit full screen mode.

10.2.5 Rotating and Sizing Waterfall and Cascade Plots

You can rotate and size the Waterfall and Cascade 3-dimensional plots differently than the default view.



10.2.5.1 Sizing a Waterfall or Cascade Plot

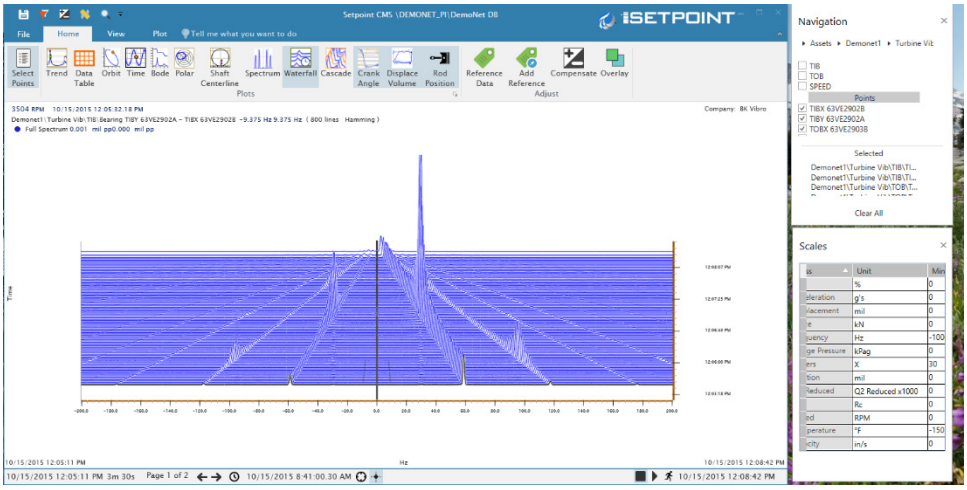


10.2.6 Docking and Undocking Panes

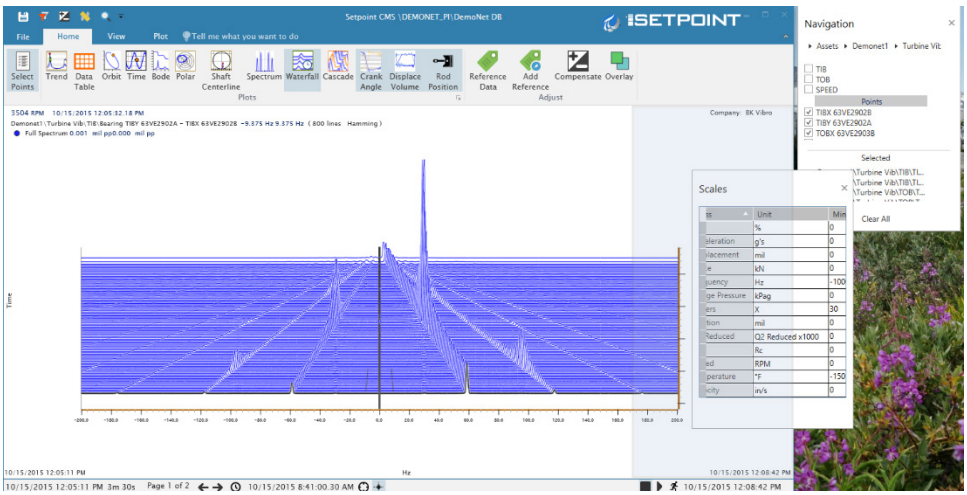
Any panes opened can be freely moved around the plot area.

To undock a pane, hover over the title until the cursor turns into the pan icon:

Click and drag the pane across the screen. The plot area will resize and the pane can be freely moved around the screen. The pane does not need to be located in the plot area.



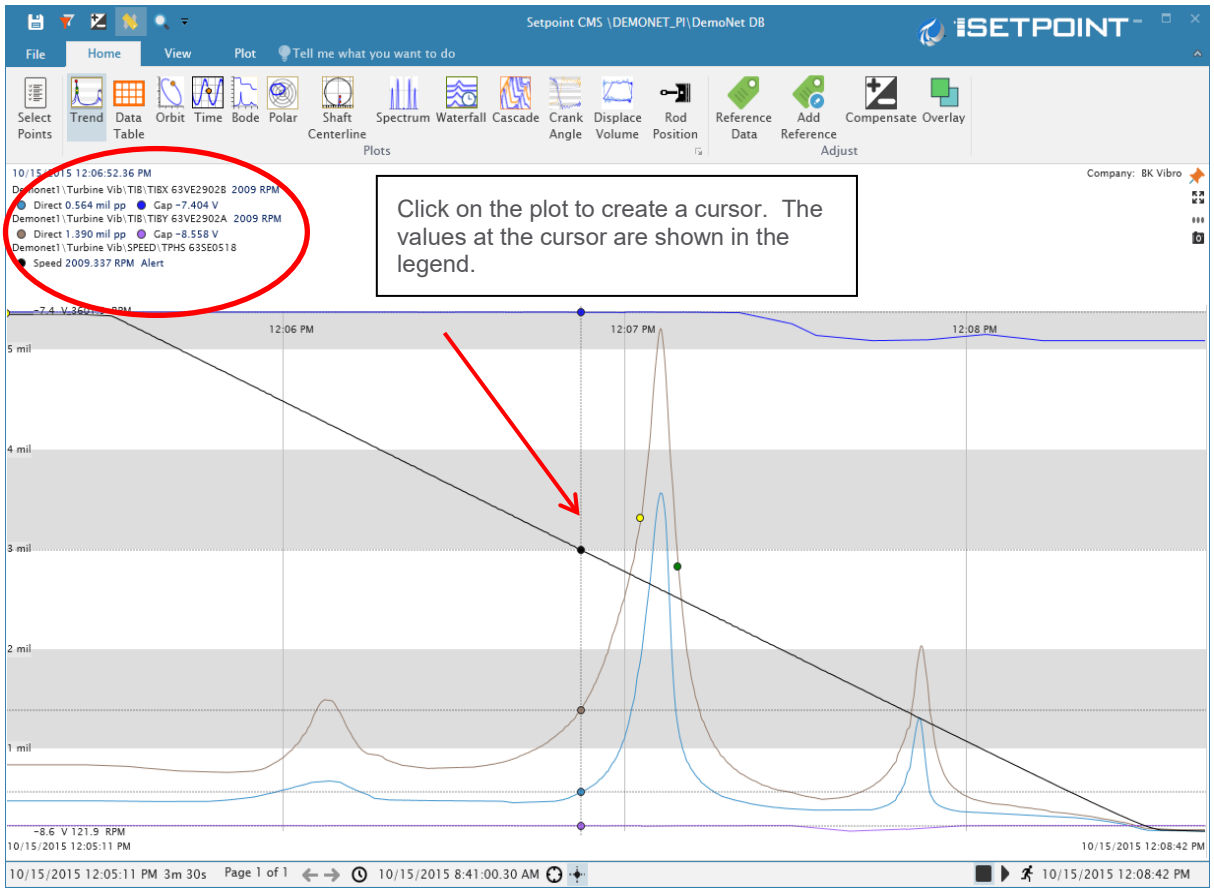
To dock the pane on the right or left, drag the pane so it overlaps the right or left side of the plot area. The dock area will highlight. Release the mouse button to doc the plot.



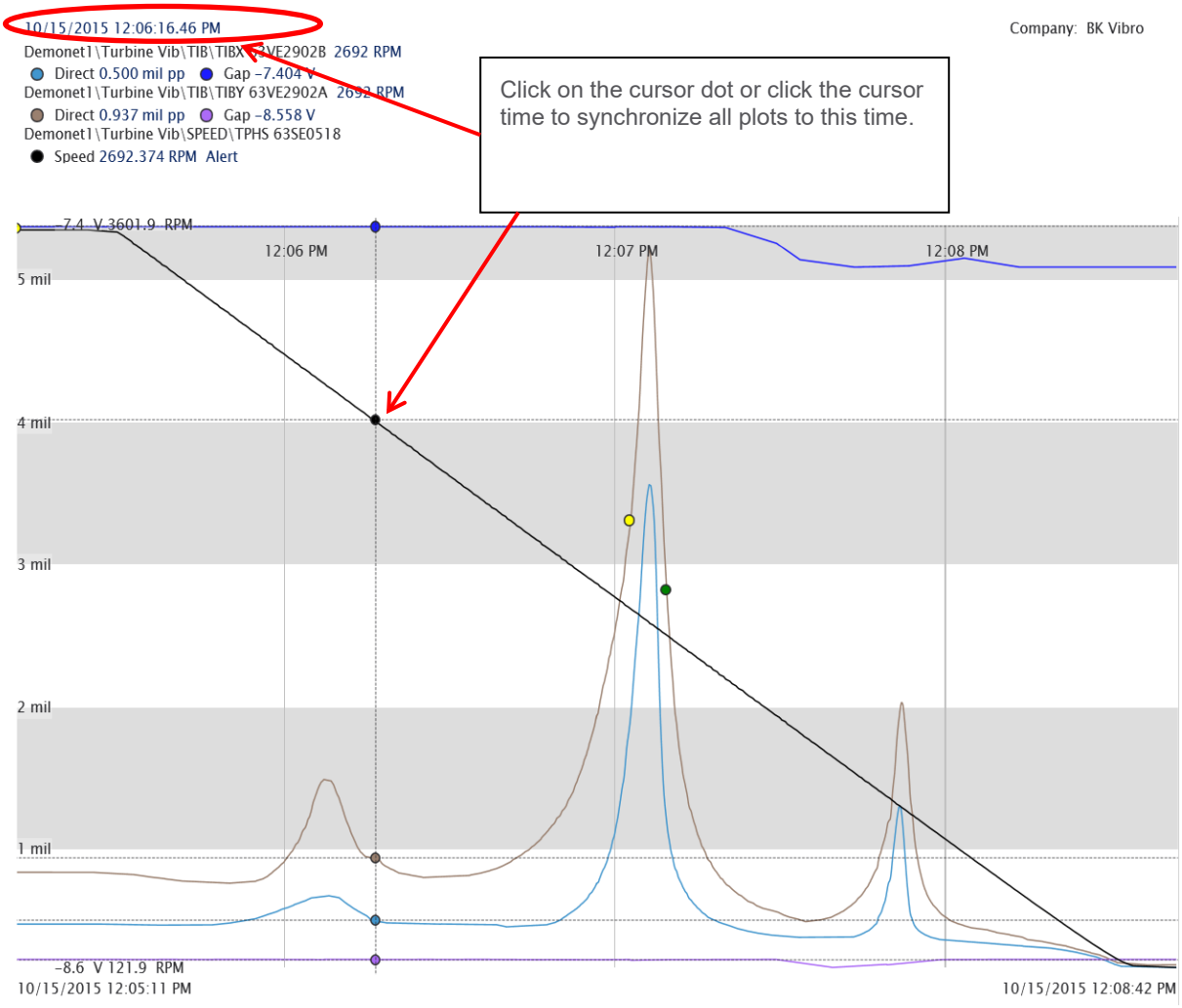
10.2.7 Using Cursors

Cursors provide you with a numerical readout of the value at a specific point on the plot.

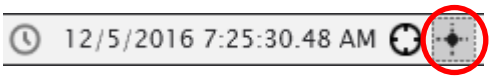
Click on plot to activate a single cursors. Use the right/left arrow keys to move the cursors to the right or left. Hold down the arrow key to move the cursor faster. You can create separate cursors on separate plots each showing the cursor time and the data values at that time.



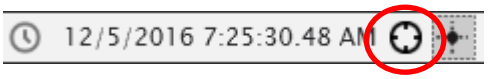
You can synchronize the cursor time with other plots:



Overall cursor controls are shown at the bottom of the screen. To enable cursors on all plots, click the cursor button to highlight it as shown below. To hide all cursors, click the cursor button again to clear.

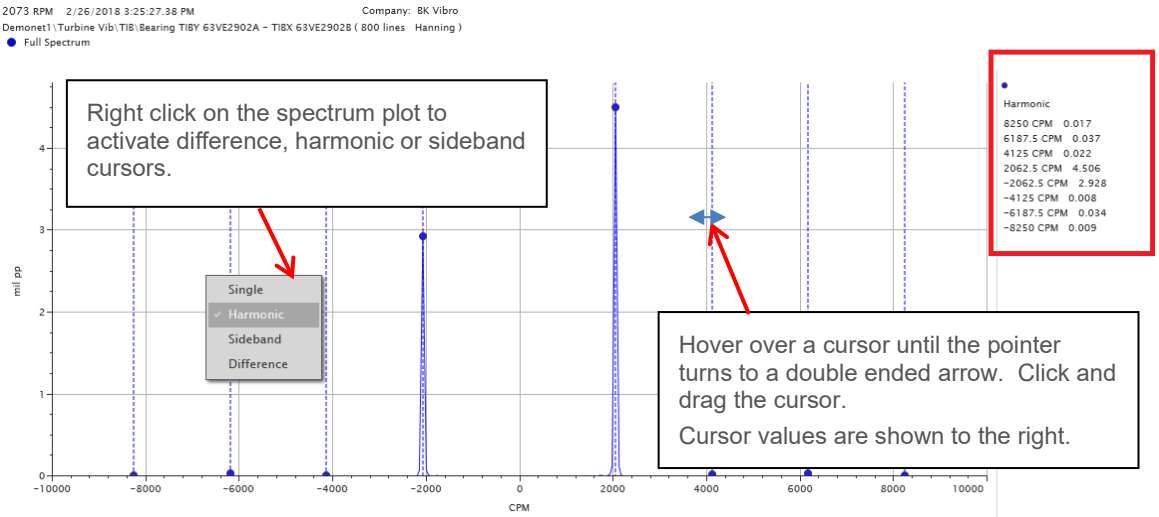


Clicking the **Set Cursors** button next to the timestamp will set all cursors to the time shown.



10.2.7.1 Difference, Harmonic and Sideband Cursors

The spectrum plot supports single, difference, harmonic, and sideband cursors. The Trend and Timebase plots support single and difference cursors. Follow these instructions to activate these cursors:

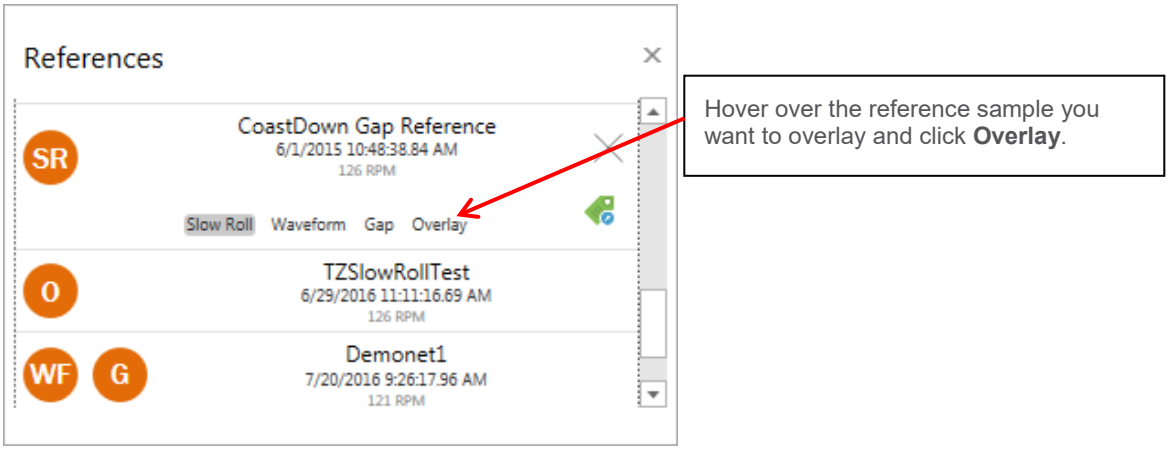


If overlays are active, there will be a data column for the overlay.

10.2.8 Using Overlays

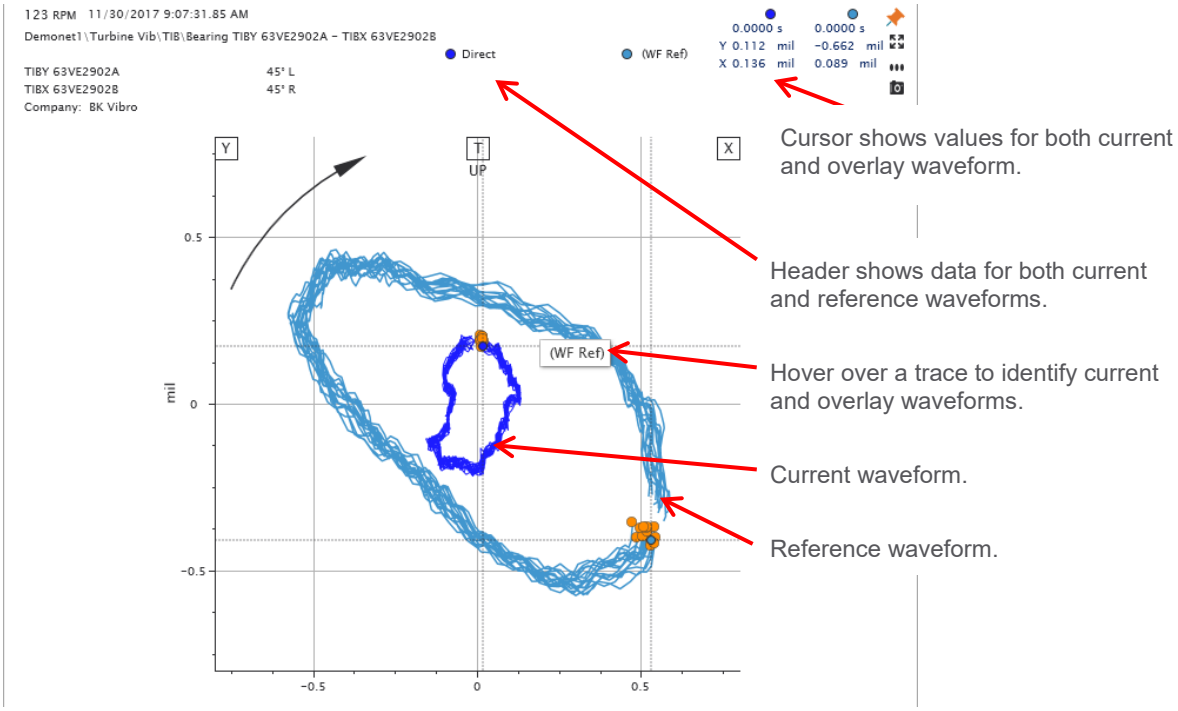
You can overlay a selected data set on the plot along with the currently selected data. The overlay function uses reference data samples. To overlay data:

1. Set a reference data sample for the data you wish to overlay. (See section 9.2.3)
2. Select the reference data sample you want to overlay. From the Home Tab, click the Reference Data button to show the Reference Data Pane.
3. Select the reference sample to overlay.

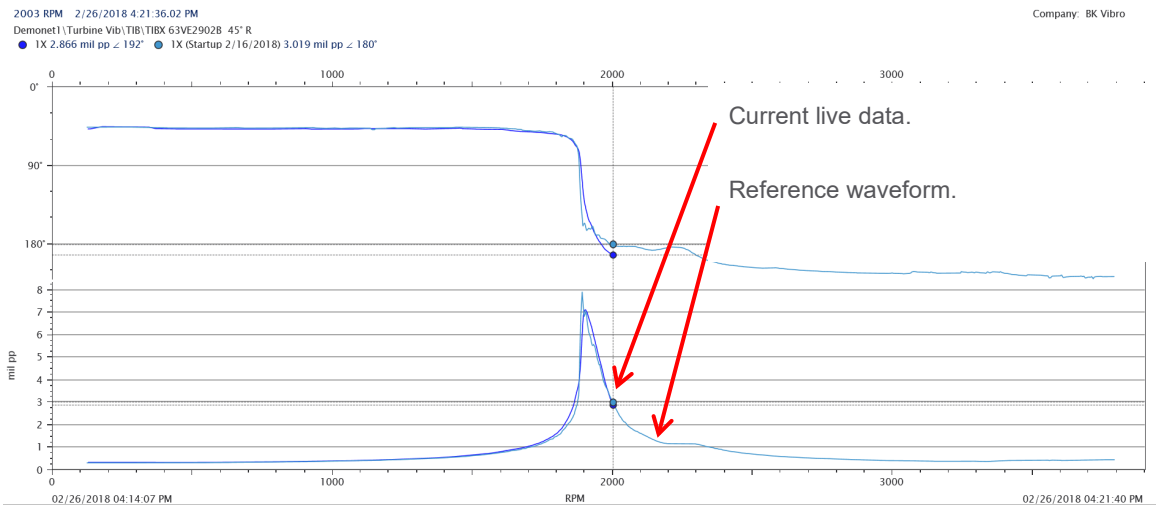


Click the Overlay Button on the Home Tab to turn overlays on or off. Overlays follow the plot settings set on the Plot tab for filtering, revolutions, etc.

When the overlay button 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:



10.2.9 Viewing Live Data

Clicking the **Running Man** button causes all of the plots to update automatically as new data is loaded into the PI database.

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

NOTE!

When viewing live data, the 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, the 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 to resume updates.

10.2.10 Playback Function

In playback mode, the software takes the selected time range and plays the data back from dynamic cursor time to end time.

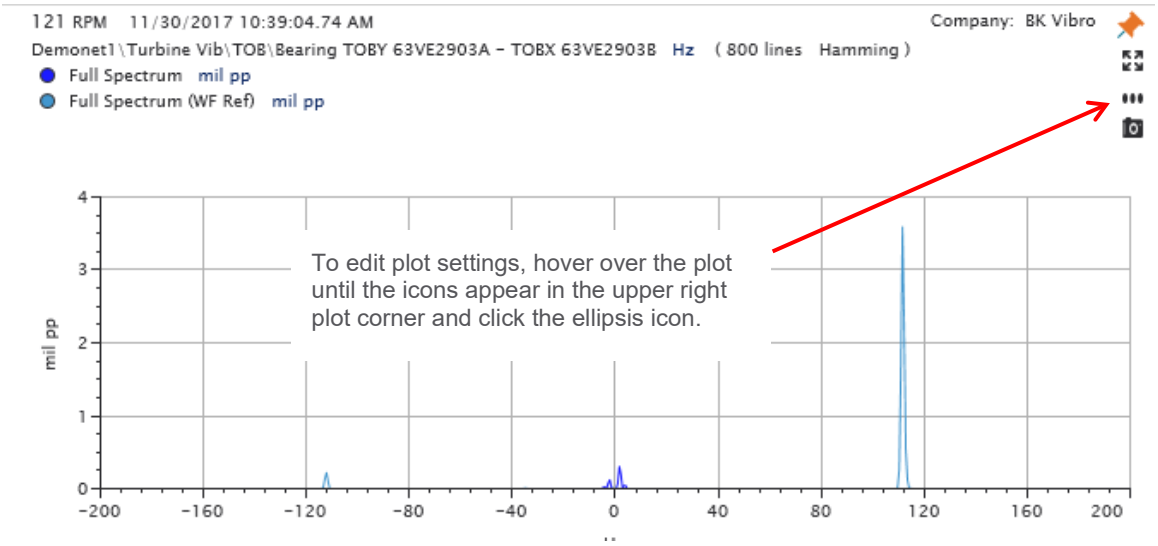
You can speed up the playback by repetitively clicking the playback button. The playback button changes to indicate the playback rate:

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.

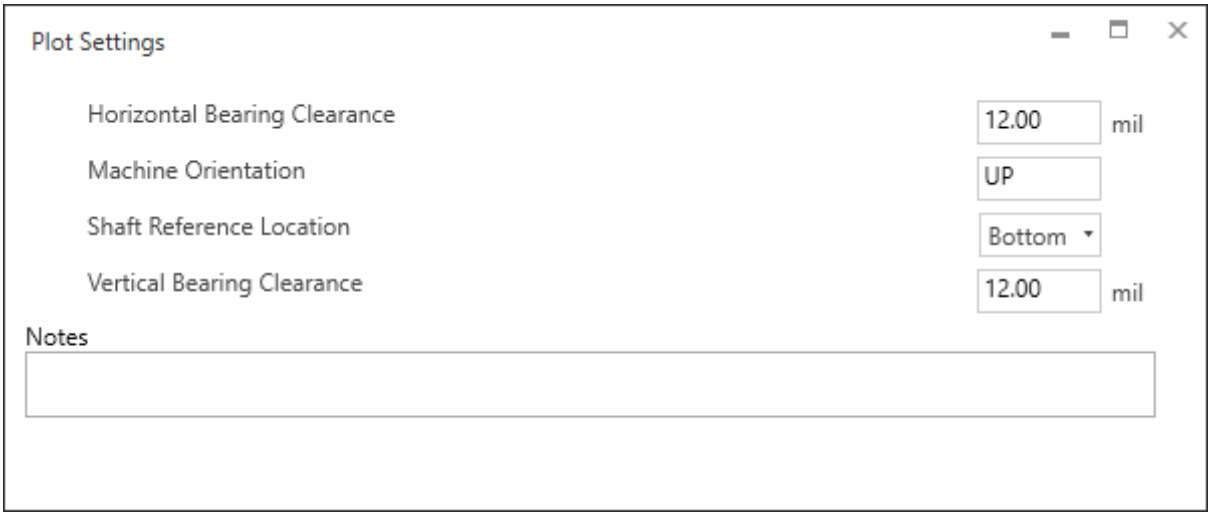
Playback starts from the dynamic cursor location. Click the square **Stop** button to stop playback mode.

10.2.11 Changing Plot Settings

CMS requires various pieces of point information to correctly plot and annotate data plots. For example, the shaft absolute plot requires bearing clearances in order to place them on the plot. CMS stores this information in PI AF. The ellipsis icon is grayed out if there are no configurable settings for the plot.



The Plot Settings Pane will open:



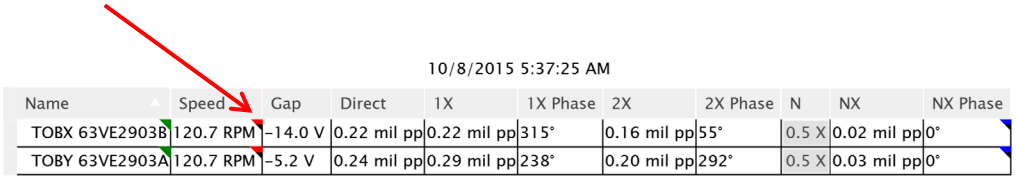
You can set these values from the Plot Setting Pane:

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

10.2.12 Viewing Alarms Markers

You can view measurement alarm status using markers on the Trend plot or using the data table.

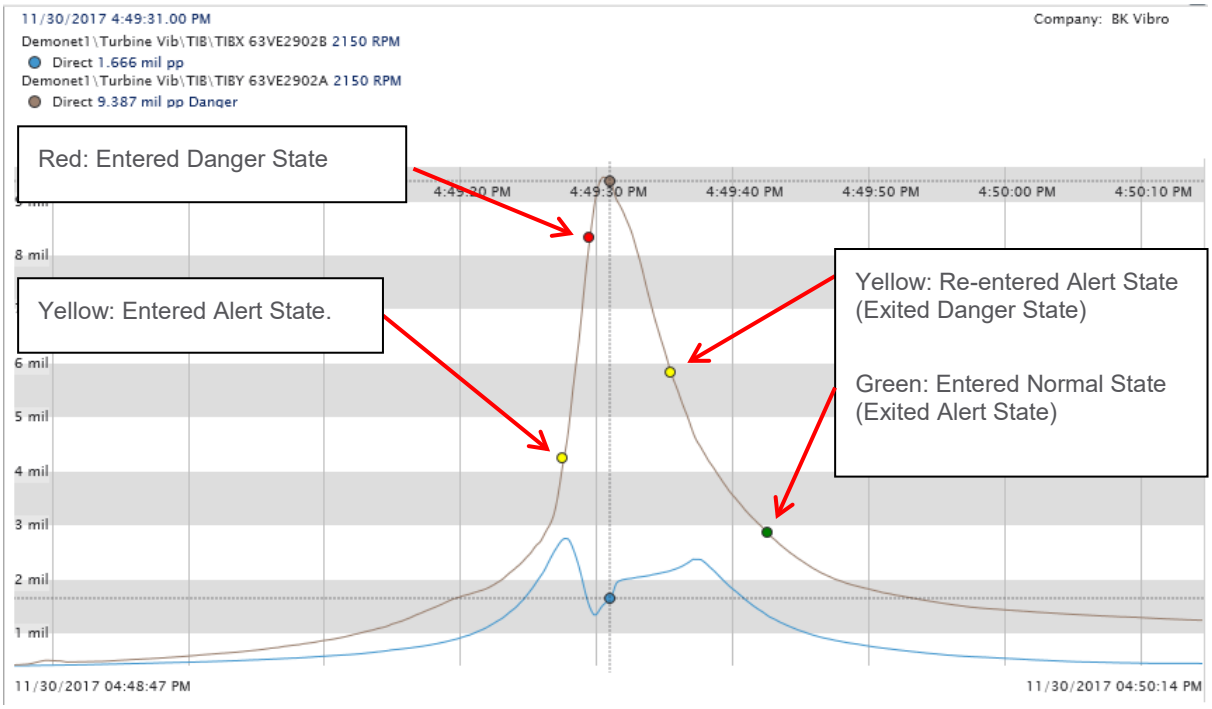
Markers in the data table cells indicate the alarm status.



10/8/2015 5:37:25 AM

Name	Speed	Gap	Direct	1X	1X Phase	2X	2X Phase	N	NX	NX Phase
TOBX 63VE2903B	120.7 RPM	-14.0 V	0.22 mil pp	0.22 mil pp	315°	0.16 mil pp	55°	0.5 X	0.02 mil pp	0°
TOBY 63VE2903A	120.7 RPM	-5.2 V	0.24 mil pp	0.29 mil pp	238°	0.20 mil pp	292°	0.5 X	0.03 mil pp	0°

Turn on Data Annotations to show markers on the Trend plot 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 Show Data Annotations is on. 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 highest status is shown.

NOTE!

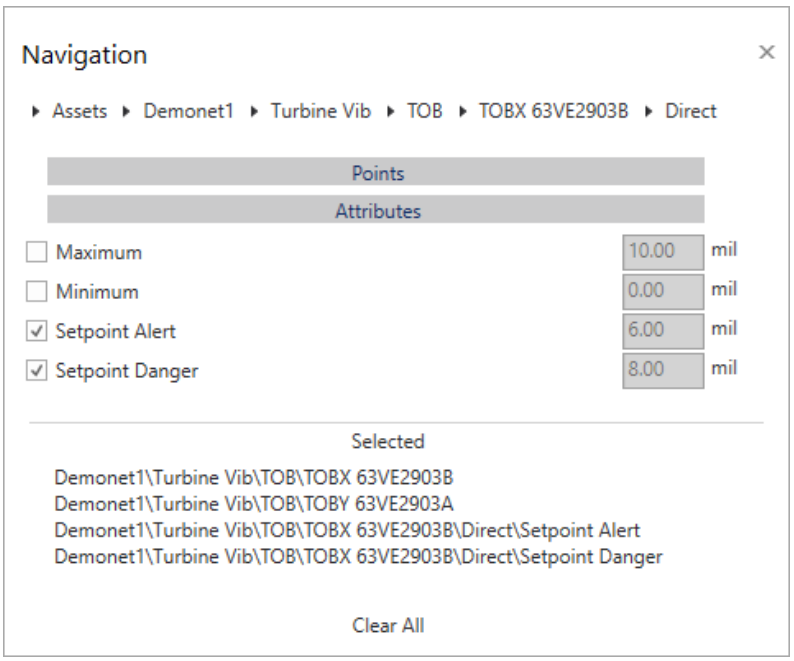
Alarm markers include the configured alarm time delay. If a machine transitions rapidly from no alarm through both alert and danger levels, danger may be indicated before alert if alert has a longer configured time delay.

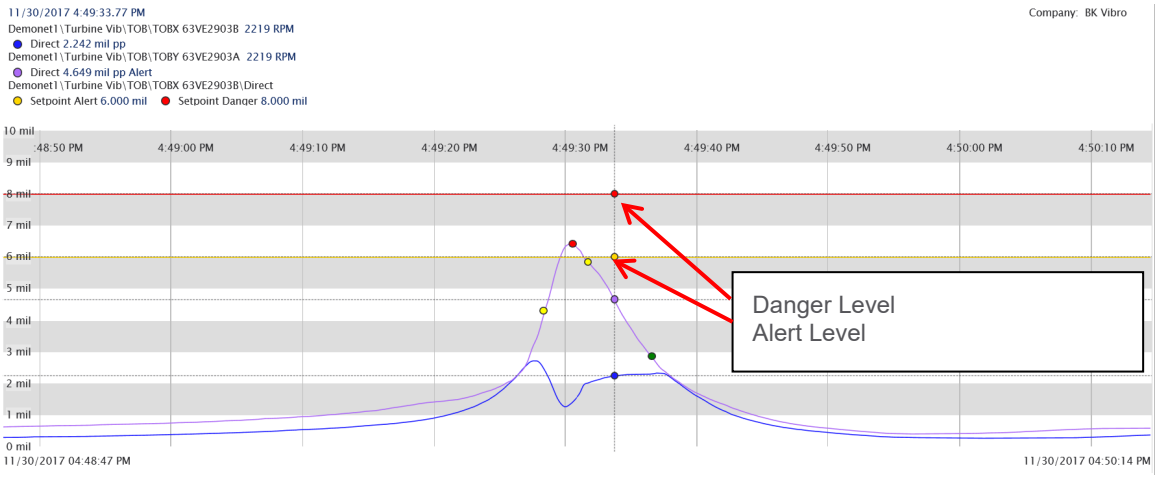
You can turn on and off the alarm markers using the Show Data Annotations button on the View Tab.

10.2.13 Plot Alarm Levels on Trend

You can plot alarm limits on the trend plots. To add an alarm level to a plot, open 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 two following figures show the Navigation Pane and Trend Plot with the Over (Alert) and Over (Danger) alarm levels added to the plot.





10.2.14 Channel Ordering

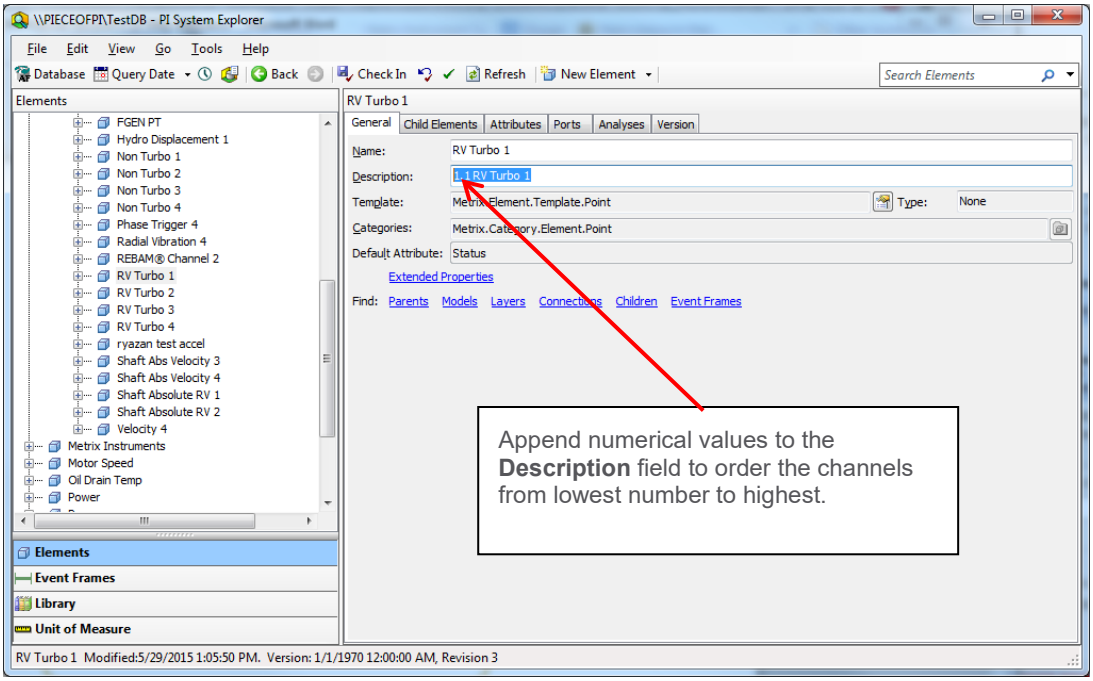
SETPOINT CMS orders the channels alphabetically using the PI AF **Description** field. By default, CMS loads the **Description** field with the channel name so the default channel order is alphabetical by channel name. You can change the channel order by appending a numerical value at the beginning of 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 close and reopen the SETPOINT CMS Display program to see the channel ordering change.

10.2.15 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 view of the dynamic shaft information. This section discusses the types of compensation the VC-8000 system performs and the steps to configure and use compensation.

SETPOINT CMS performs three types of compensation: Vector, Waveform, and Gap compensation.

The basic steps to using compensation are:

- Tag a data sample as reference
- Select the sample to use for compensation
- Turn on/off compensation

10.2.15.1 Vector Compensation

Compensation applied to filtered timebase and orbit, polar, and bode plots uses vector compensation. Vector compensation subtracts the selected compensation vector from the vibration vector and plots the waveform of resulting vector difference.

10.2.15.2 Waveform Compensation

You can apply waveform compensation to any dynamic data plot collected synchronously. This includes orbit and timebase. It also includes spectrum, cascade, and waterfall plots when displayed in orders of running speed. Waveform compensation subtracts the slow roll compensation 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!

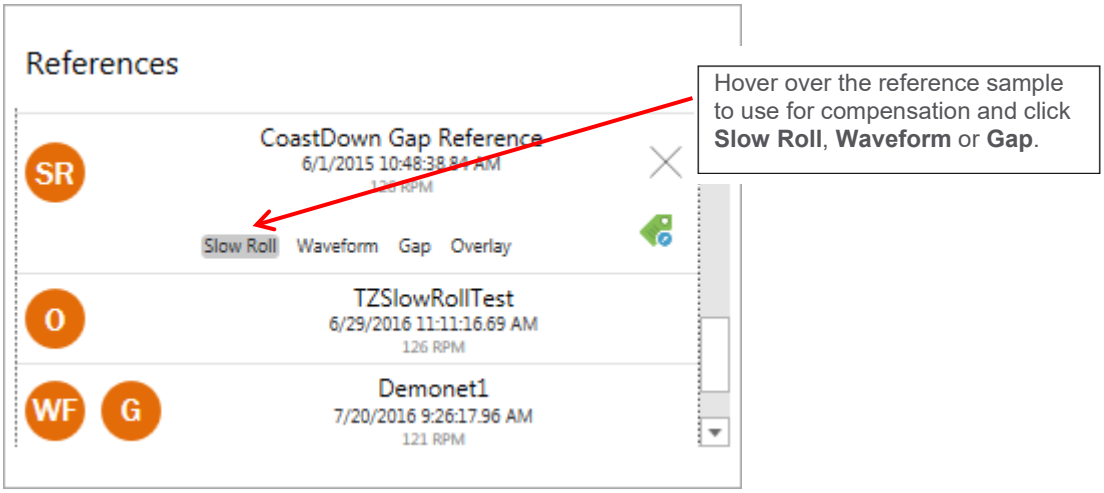
Waveform compensation requires a Phase Trigger association.

10.2.15.3 Gap Compensation

Gap compensation subtracts the selected reference gap value from the gap value readings before plotting. Gap compensation is used primarily with the shaft centerline plot.

10.2.16 Select Compensation Sample

Select the reference sample for compensation from the reference data pane. You can use different reference data samples for slow roll vector compensation, waveform compensation, and gap compensation.



View the compensation vector measurements in the reference data table.

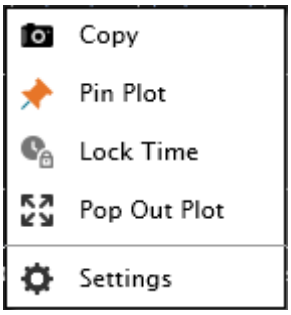
10.2.17 Pinning Plots

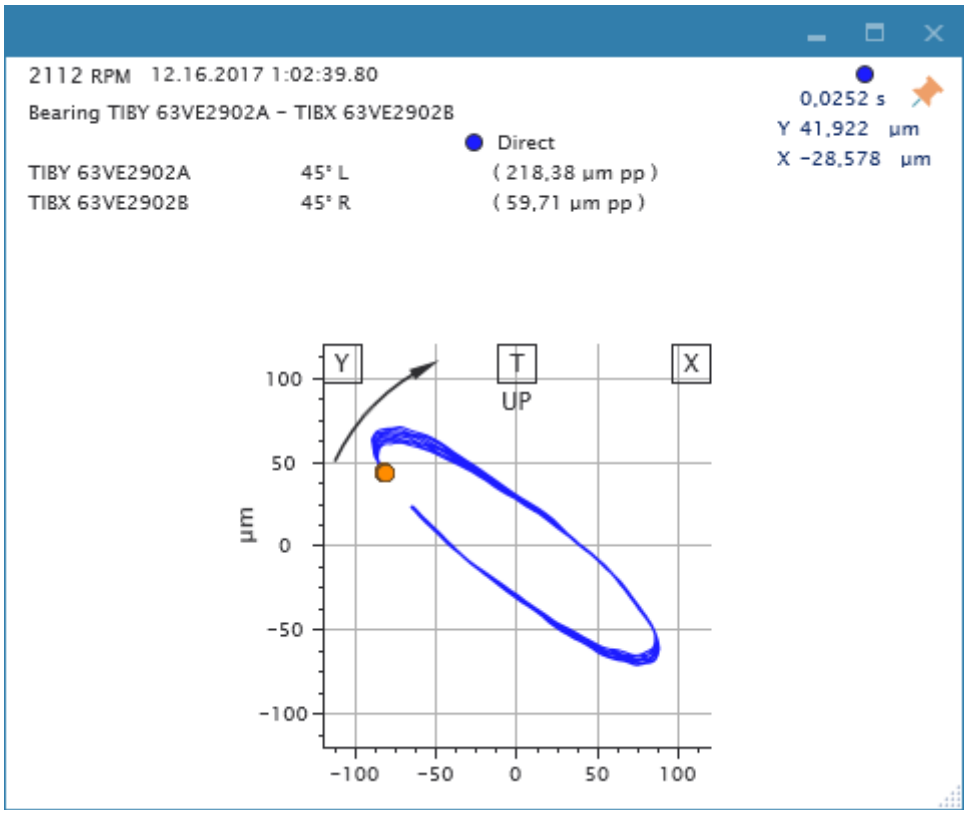
Pinning a plot causes the plot to display regardless of plot settings. Plot pinning is useful when you want to compare several specific plots or for selecting plots for reporting. Pin plots will change time range or time as the selected time or dynamic cursor are changed. Pinned plots retain compensation and filtering set when the plot was pinned.

To pin a plot, click the pin icon  in the upper right corner of the plot. Then turn off the plots and only the pinned plots will remain displayed.

10.2.18 Pop Out Plot

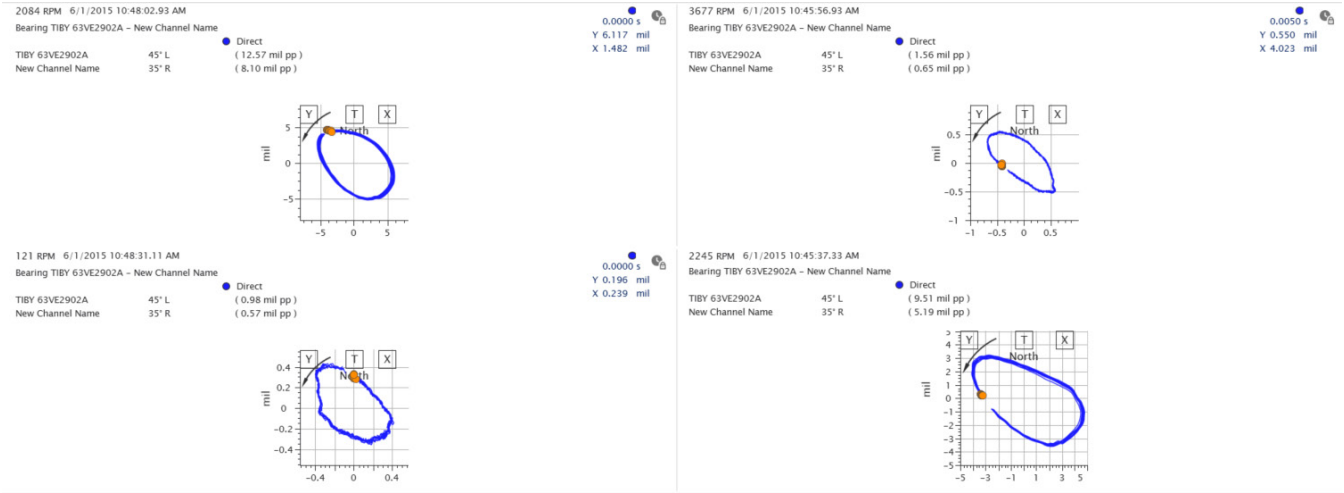
Any plot can be moved to a second window by right clicking on the plot and selecting Pop Out Plot.





10.2.19 Time Lock

Right click and select lock time to freeze time for a given plot so that multiple plots can be reviewed over a range of time.

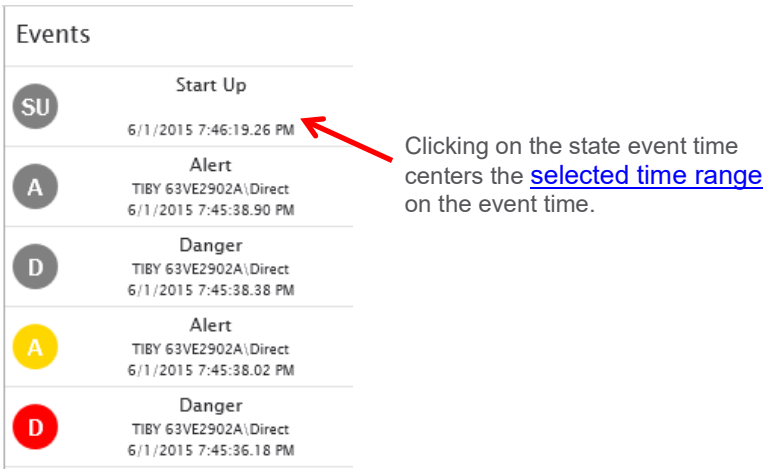


10.2.20 State Marker

10.2.20.1 Add State Marker

State markers may be added on zoom trend with context menu **Add State** to annotate when machine state changes occur. The created state is shown as bar with a flag on zoom pane.

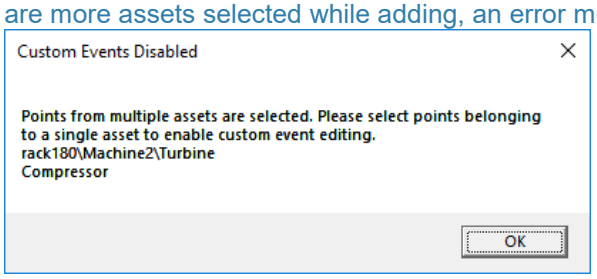
The added states are also displayed as events in the Events Pane.



NOTE!

The state markers are only visible on zoom pane if Data Annotations from the View Tab is activated and only the states of the selected assets can be displayed.

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 of the other assets and try adding state again.

If there is no asset path defined in the hierarchy, the state will be added under root node by default.

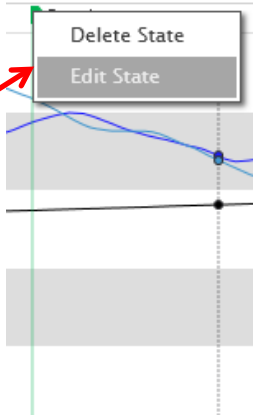
10.2.20.2 Edit / Delete State Marker

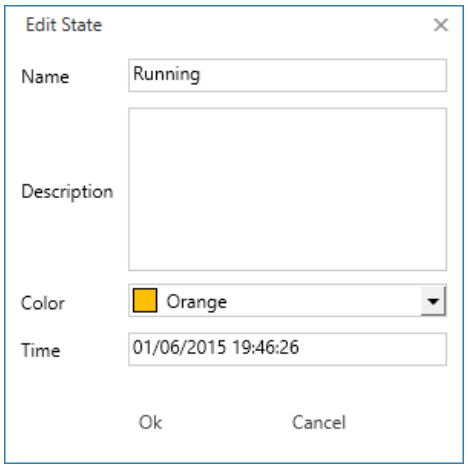
An existing state marker can be edited or removed with by right-clicking on the marker and selecting form the menu options. The color and texts are editable, but time cannot be changed.

Moving mouse near to a state bar or flag area, a context menu is shown.

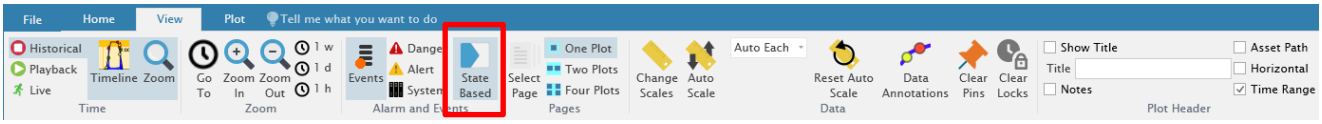
Clicking **Delete State** will remove the state from the system.

Clicking **Edit State**, a dialog box appears.

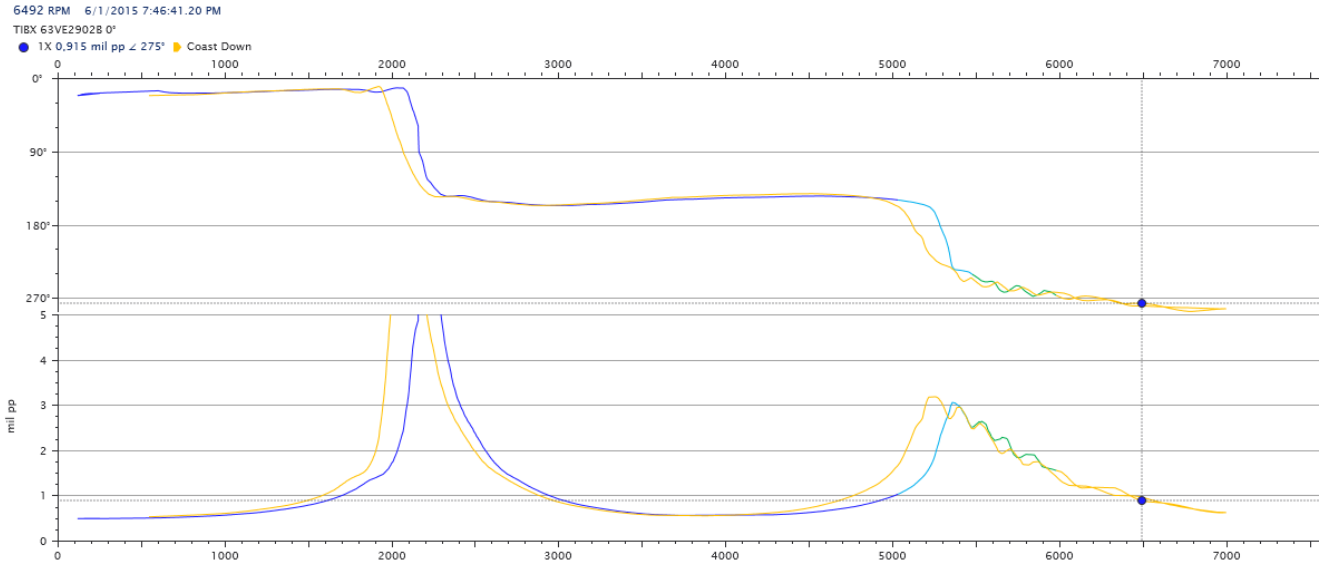




10.2.20.3 State Based Display

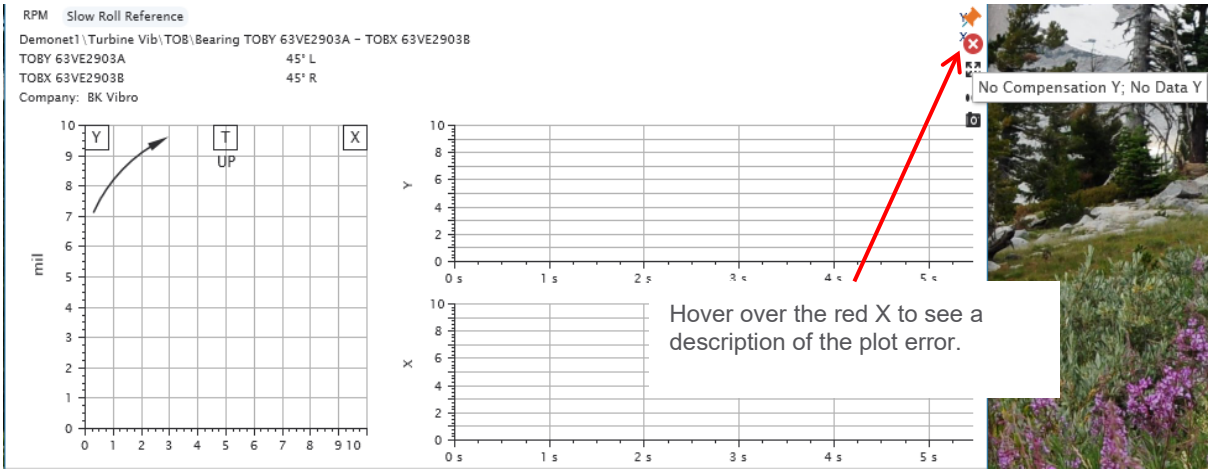


States can be used to color plot data based on assigned states if **State Based** button is toggled on. This allows vibration data to be taken in context of state so that it is not incorrectly diagnosed. For example a bode plot can visually show what data is in startup and what is in coastdown. If **State Based** button is toggled off, the plot is drawn with trace colors.



10.2.21 Error Messages

CMS will show a red X error indicator if there is a problem presenting the 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:

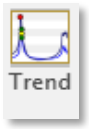


Error	Description	Action
No Data	There is no data in the database in the selected time range.	Increase the selected time range.
No Compensation	The plot cannot be compensated because reference data is not set.	Set a reference sample.
	The plot cannot be compensated because the data time and reference time are the same resulting in a null waveform.	Move 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.

10.3 Plots

After navigating to a point, clicking the plot buttons on the Home Tab will open that plot type for the selected points.

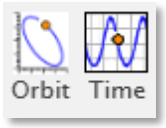
The plot buttons are shown below followed by descriptions of each available plot type.



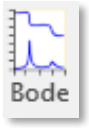
The Trend plot shows static values as a function of time.

The Data Table shows the numeric values of the measurements.

The Orbit plot is a two dimensional path of shaft centerline motion as viewed from an orthogonal transducer pair (XY).



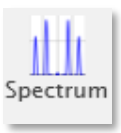
Selecting both the Orbit and Time buttons allows visualization of orbit and timebase waveforms side by side.



The Bode plot allows you to view the 1X, 2X, or nX forward vector amplitude and phase as a function of shaft rotational speed.

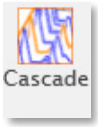
The Polar plot shows vector amplitude and phase data plotted on polar coordinates.

The Shaft Centerline plot shows the movement of the shaft average centerline position over time.



The Spectrum Plot allows you to view the vibration amplitude as a function of frequency in either half or full spectrum formats.

The Waterfall plot shows spectrums collected over a period of time.



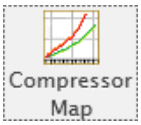
The Cascade plot shows spectrums collected as a function of speed.

The Air Gap button plots present the rotor profile waveforms of multiple air gap channels.

The Crank Angle button plots reciprocating compressor measurements as a function of the compressor crank angle position.

The Displaced Volume button plots reciprocating compressor measurements as a function of the compressor cylinder displaced volume.

The Rod Position plot shows reciprocating compressor X-Y rod position.

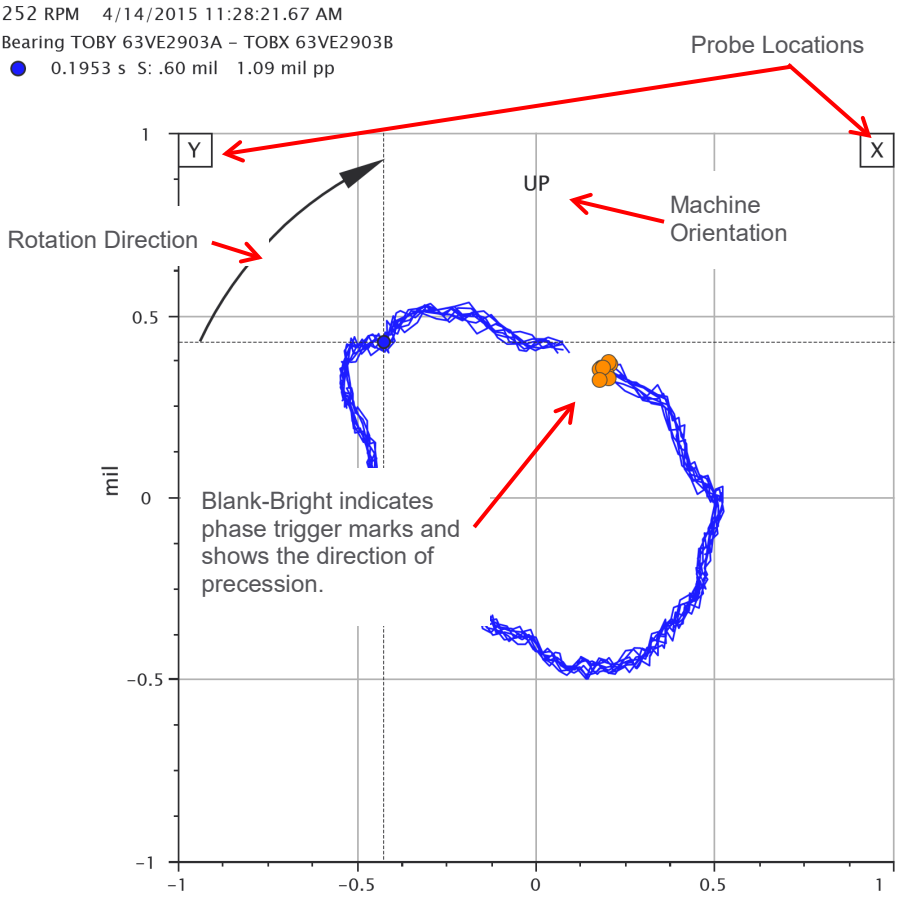


The Compressor Map plot shows the operating point, surge control line, and surge limit line for a centrifugal or axial compressor.

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.

10.3.1 Orbit Plot

The Orbit Plot shows the dynamic shaft motion 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
- Manual Scale
- Auto Scale
- Change the Machine Orientation
- Overlay Data

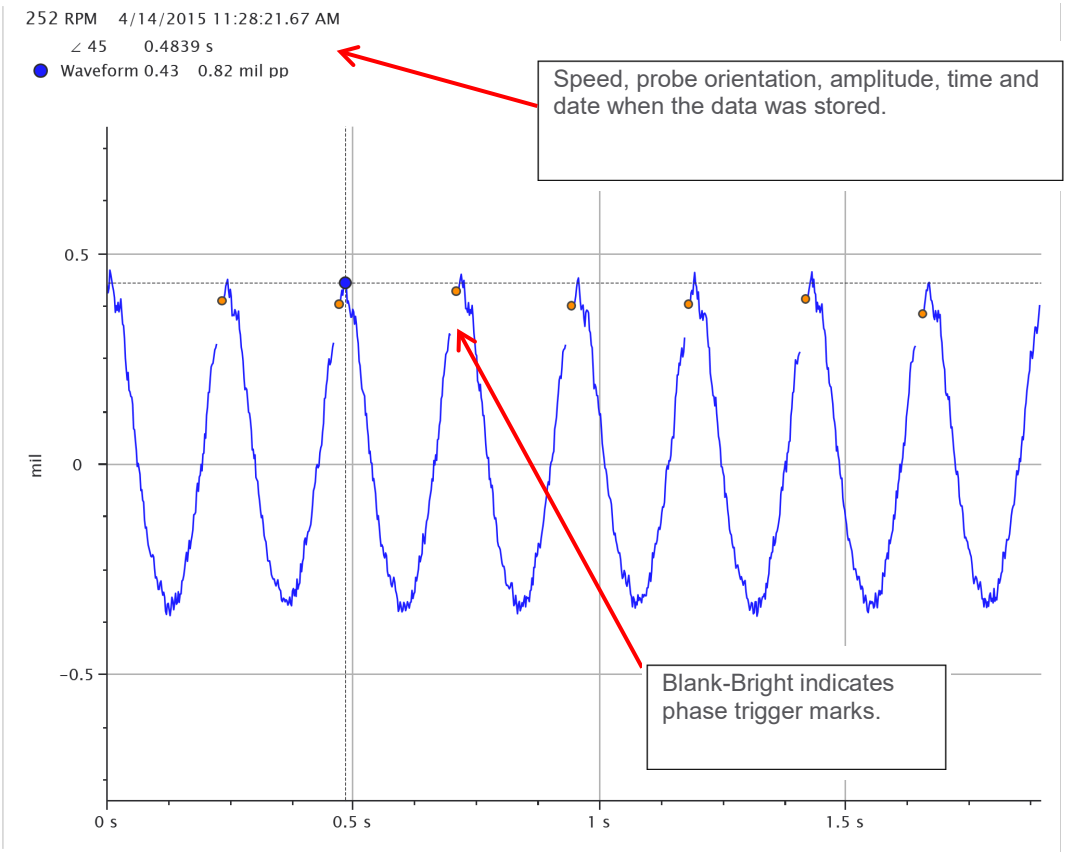
Go to Plots overview

NOTE!

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

10.3.2 Timebase Plot

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



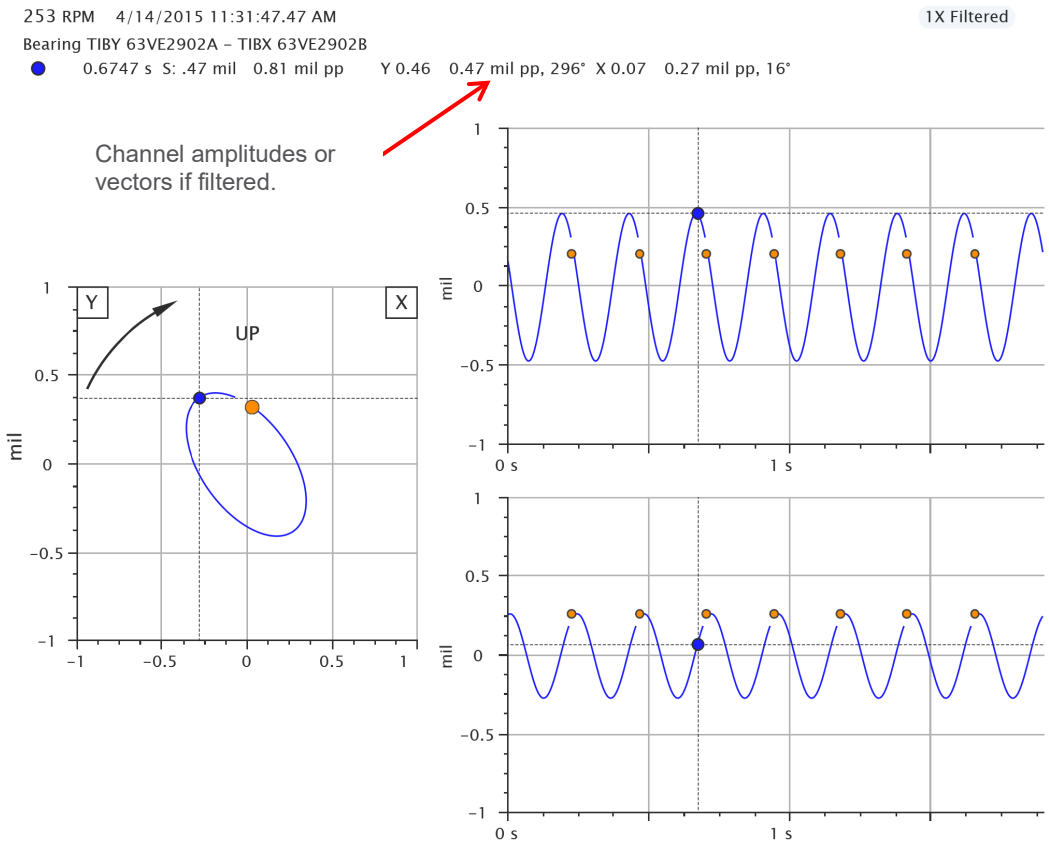
You can adjust your Timebase plot using these options:

- Filtering to 1X, 2X or nX components
- Compensate
- Adjusting the number of Revolutions shown
- Manual Scale
- Auto Scale
- Zoom in on a section of the plot
- Overlay Data
- Show Asynchronous Timebase

Go to Plots overview

10.3.3 Orbit/Timebase Plot

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



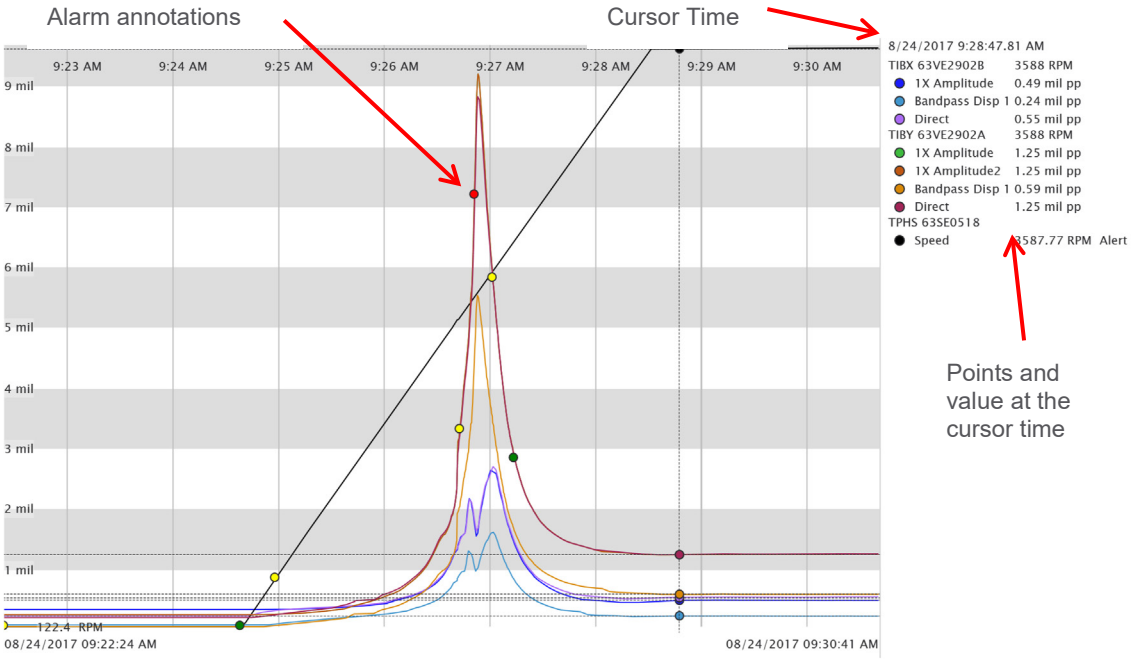
You can adjust your Orbit/Timebase plot using these options:

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

Go to Plots overview

10.3.4 Trend Plot

The Trend plot shows static values plotted against 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

Data

- Change which channels show
- Change which measurements show
- Plot alarm set points on the trend

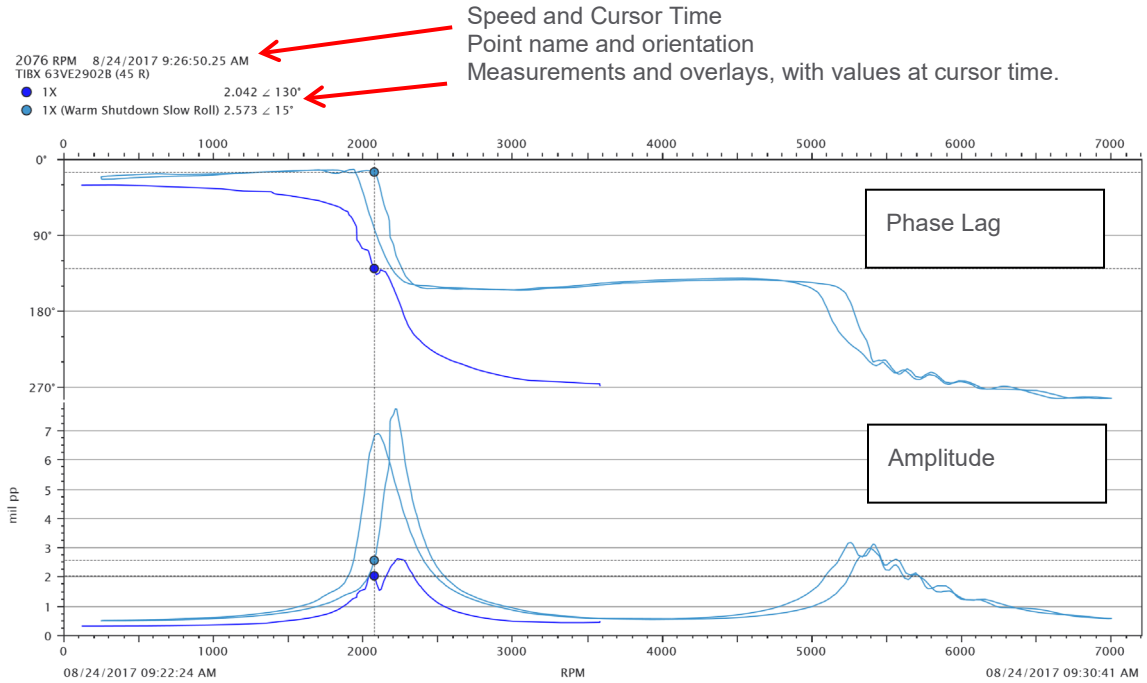
NOTE!

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

10.3.5 Bode Plot

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



When analyzing a Bode Plot, you can:

- Show Direct, 1X, 2X, or nX data
- Compensate
- Autoscale the speed and amplitude axis
- Manually set the speed and amplitude axis
- Apply cursors
- Overlay Data

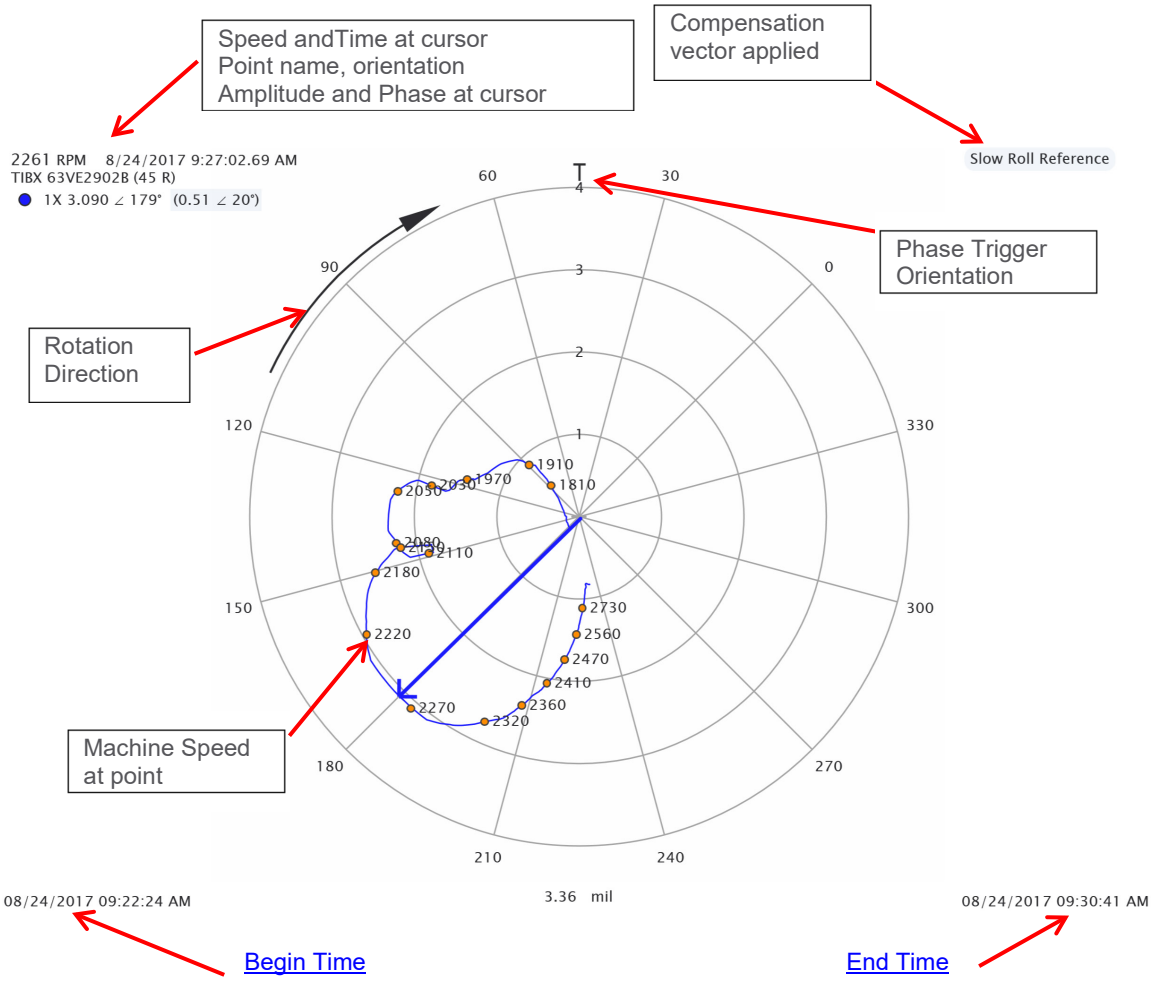
NOTE!

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.

Go to Plots overview

10.3.6 Polar Plot

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



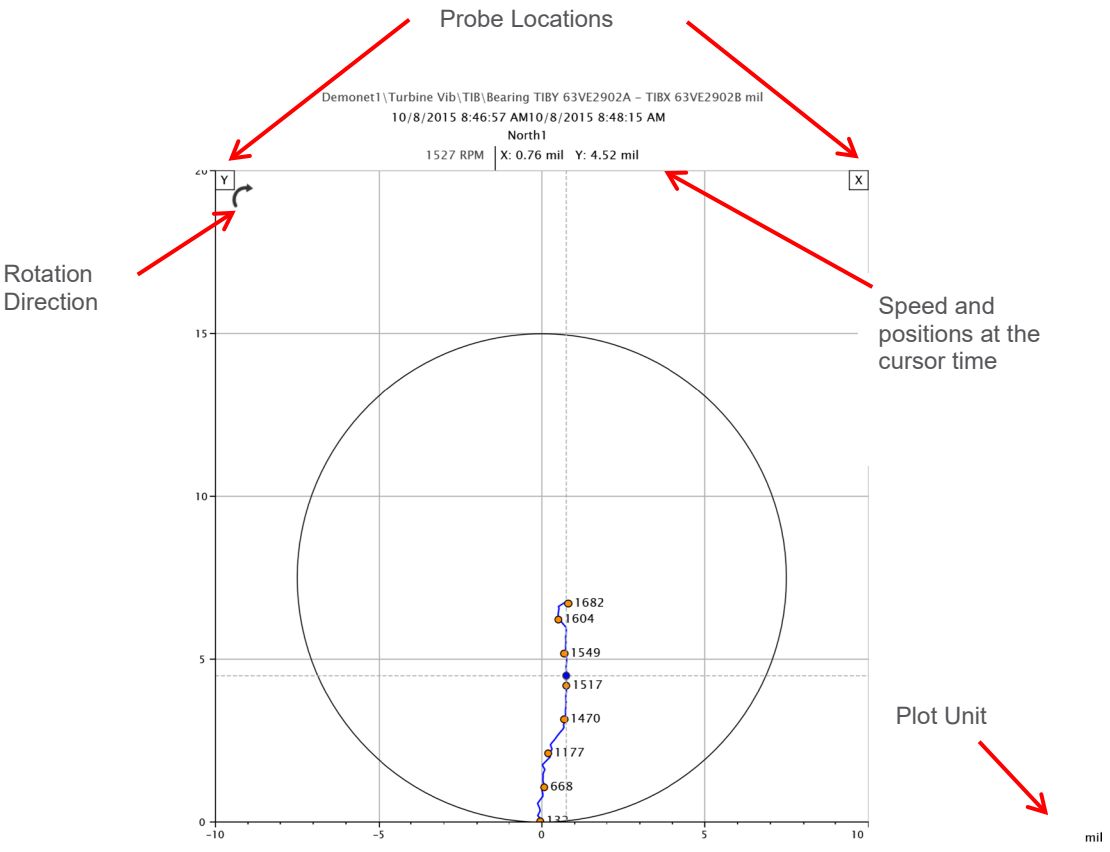
When analysing polar plots, you can:

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

Go to Plots overview

10.3.7 Shaft Centerline Plot

The Shaft Centerline plot shows the movement of the shaft average 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

- Plot Start Point
- Clearance Boundary
- Start Reference
- Machine Orientation
- Overlay Data
- Label points with speed or time

Go to Plots overview

10.3.7.1 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:

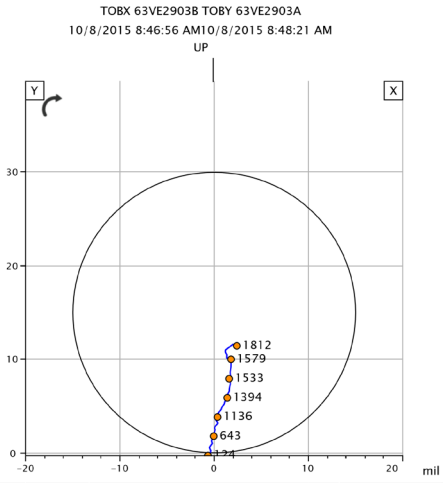
1. Set a reference sample for the dataset.
2. Choose the reference sample as the “gap” reference.
3. CMS will draw the shaft absolute plot starting at the gap value of the selected reference sample.

10.3.7.2 Setting the Start Position

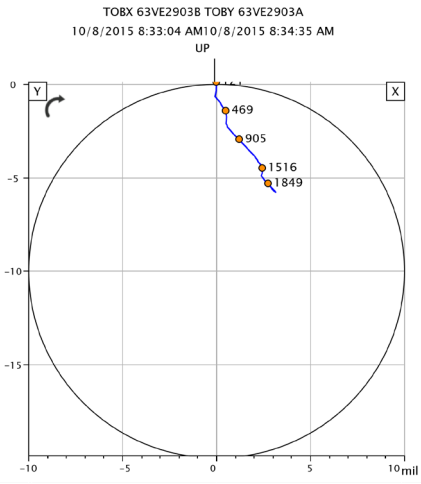
The start position sets where to begin plotting the shaft centerline movement and represents the plot origin (0,0). Set the start position from the Plot Settings Pane.

Machine Orientation	Typical Start Position
Horizontal	Bottom
Vertical	Center
Overhung Rotor	Top

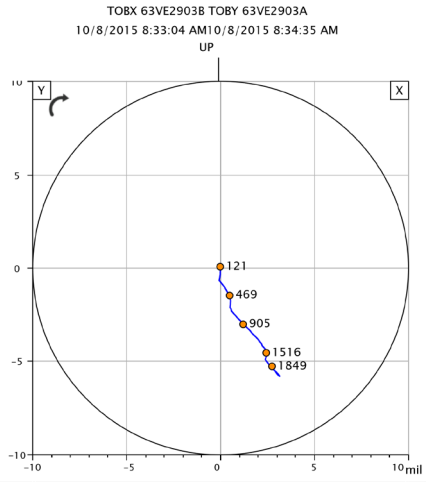
Bottom:



Top:



Center:

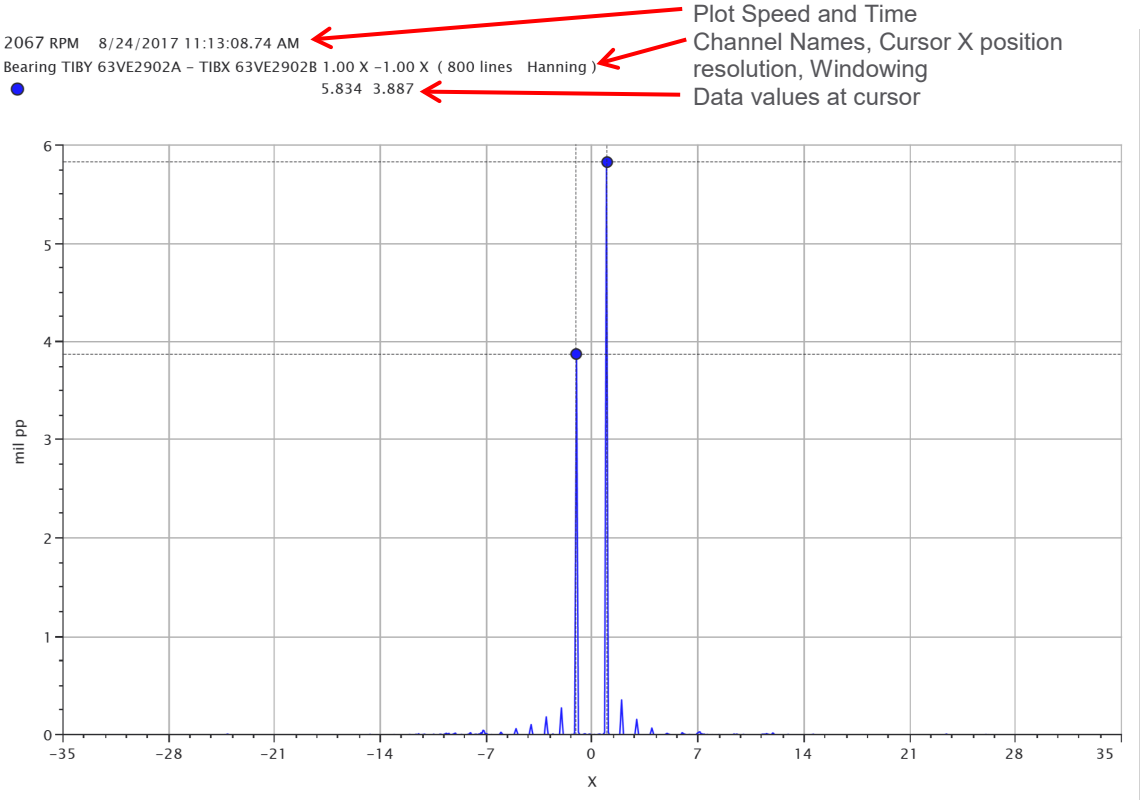


NOTE!

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

10.3.8 Spectrum

This screen allows you to view the vibration amplitude as a function of frequency in either half or full spectrum formats.



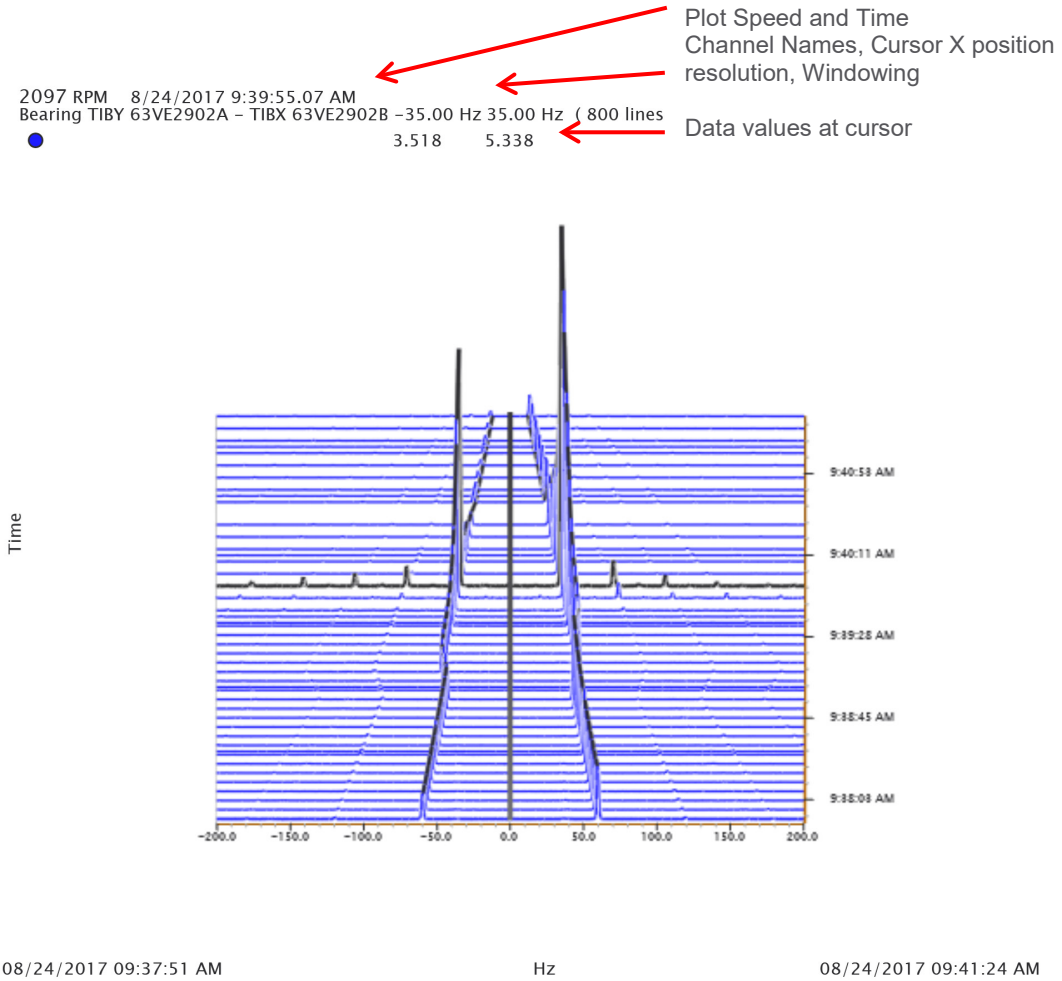
- Change the number of spectral lines shown
- Change the windowing
- Show data in orders of running speed or frequency
- Show the full spectrum
- Integrate velocity or acceleration spectra
- Overlay Data
- Show Bearing Cursors

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

Go to Plots overview

10.3.9 Waterfall

The waterfall plot shows spectrums collected over a period of time.



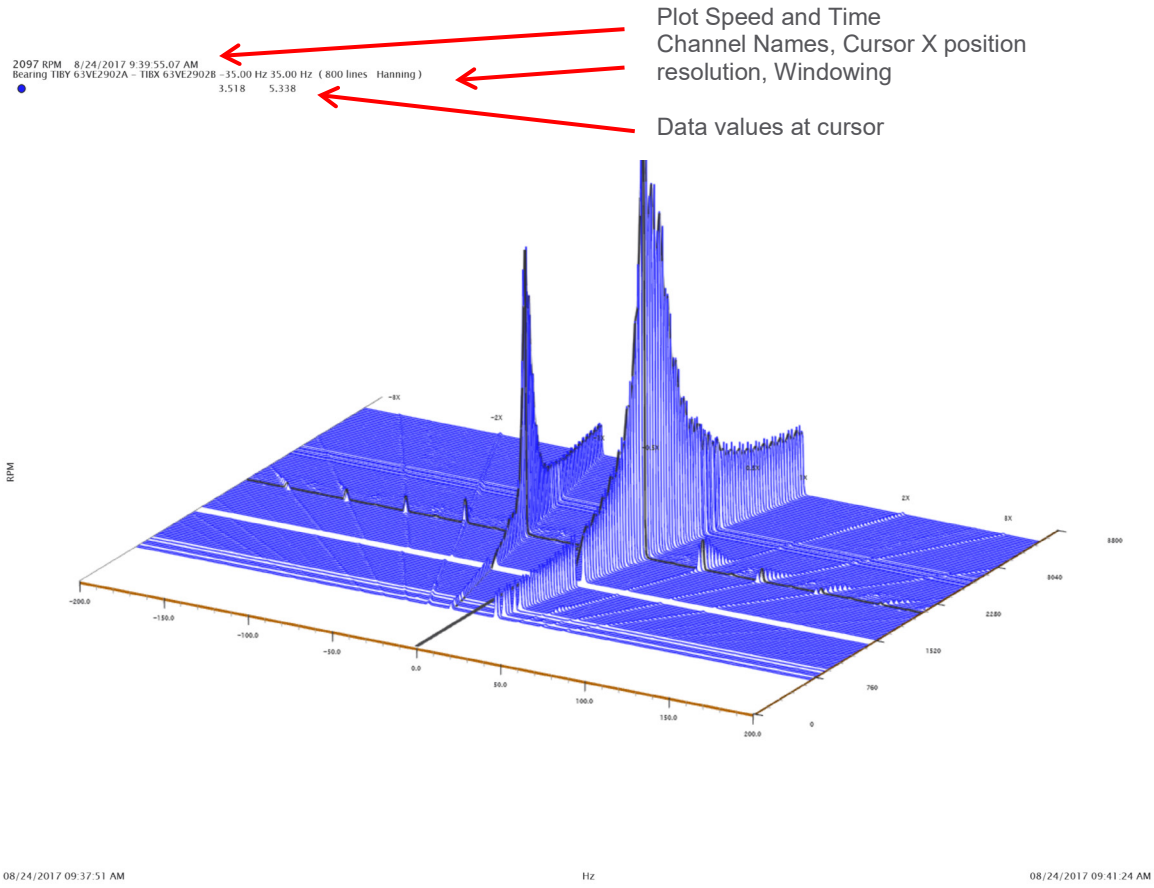
When analysing waterfall plots, you can:

- 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
- Apply cursors

Go to Plots overview

10.3.10 Cascade

The cascade plot shows spectrums collected over changes in speed.



When analysing 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
- Apply cursors

Go to Plots overview

10.3.11 Data Table

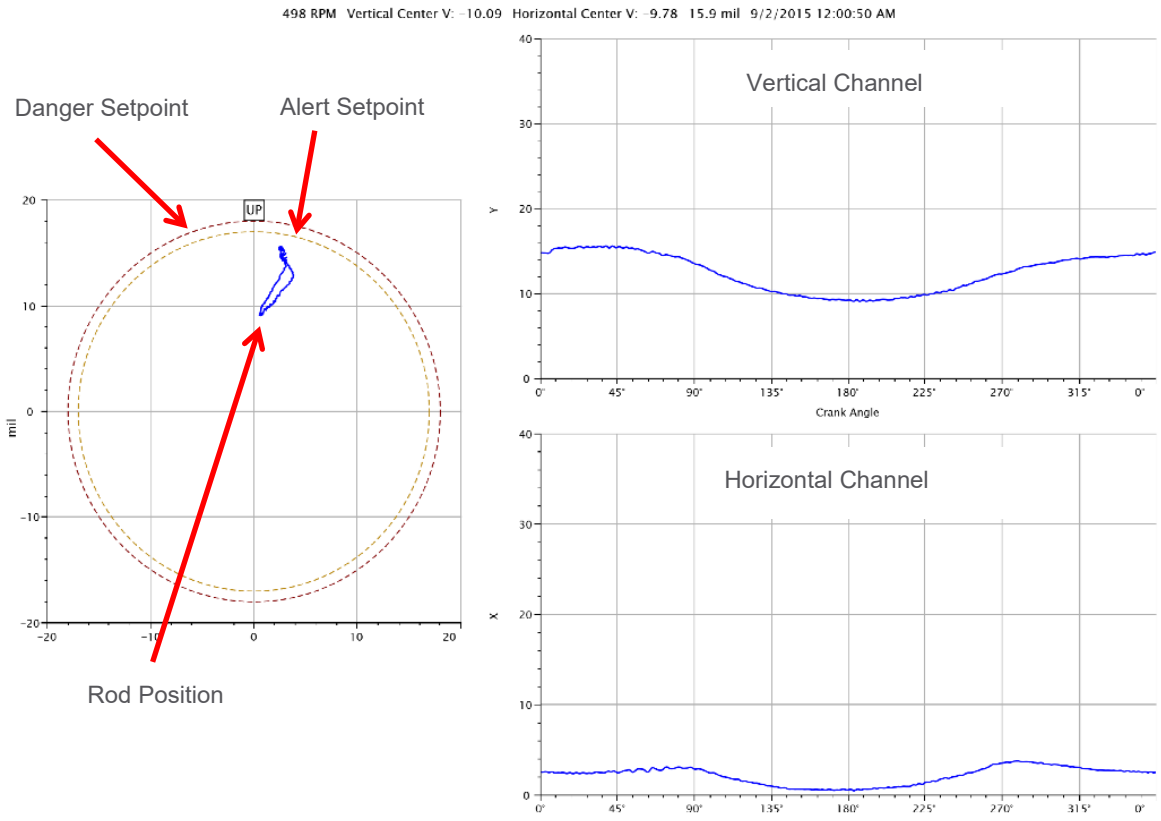
The data table shows the measurement numerical values for the selected points.

Go to Plots overview

10.3.12 Reciprocating Compressor Plots

The reciprocating compressor plots include the Rod Position plot and the ability to plot various measurements against the crank angle and displaced volume.

10.3.12.1 Rod Position Plot



With the Rod Position plot you can:

- Adjusting the number of Revolutions shown
- Show Alarm Limits
- Manual Scale
- Auto Scale
- Overlay Data
- Go to Plots overview

10.3.12.2 Associating Channels with a Throw

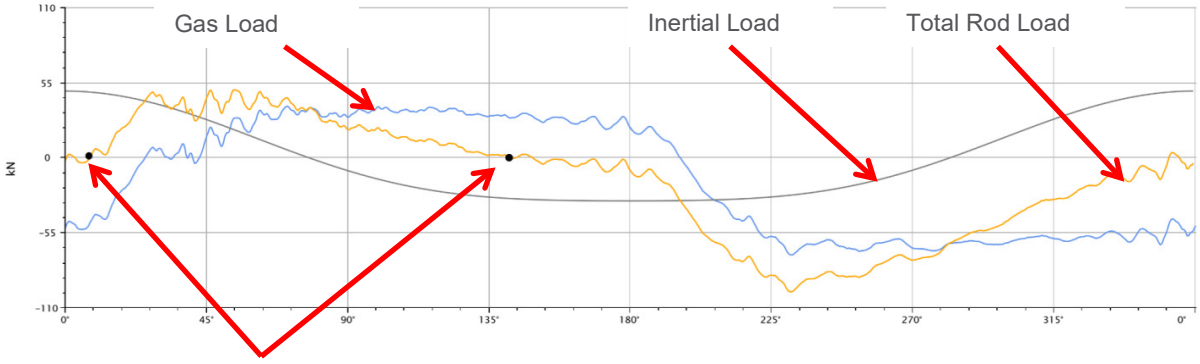
In order to plot dynamic measurements as a function of the reciprocating compressor crank angle or displaced volume, you must associate the channel with a throw. Rod Position and Cylinder Pressure channels are automatically associated to a throw in the reciprocating compressor configuration. Associate vibration and other dynamic measurements to the reciprocating compressor using the Asset Path on the SETPOINT Setup Software Asset Framework configuration view. The following configuration example shows the Recip Crankcase Velocity 1 and Crosshead acceleration channels associated with the Comp A123 Throw 1. When these points are selected in CMS along with the throw, CMS can plot these vibration measurements as a function of crank angle or displaced volume.

On	Slot	Channel	Channel Type	Transducer	Name	Asset Path
☑	4	1	Temperature	100 Ω Platinum (0.392) RTD	Suction Temp Head	Comp A123\Throw1
☑	4	2	Temperature	100 Ω Platinum (0.392) RTD	Discharge Temp Head	Comp A123\Throw1
☑	4	3	Temperature	Type J Thermocouple	Suction Temp Crank	Comp A123\Throw1
☑	4	4	Temperature	Type J Thermocouple	Discharge Temp Crank	Comp A123\Throw1
☐	4	5	Process Variable TMM	Process Variable 4 to 20 mA through 68 ohms	Flow Head	
☐	4	6	Process Variable TMM	Process Variable 4 to 20 mA through 68 ohms	Flow Crank	
☑	5	1	Velocity	SV6300 Piezoelectric Velocity Sensor	Recip Crankcase Velocity 1	Comp A123\Throw1
☑	5	2	Acceleration	SA6200A General Purpose Accelerometer	Crosshead accleration	Comp A123\Throw1
☐	5	3	Discrete Input	+3.3V or +5V Logic	Discrete Input 3	
☑	5	4	Phase Trigger	-24 V Probe Driver	Speed	Comp A123\Throw1
☑	7	1	Rod Position	MX2033 with MX2030 5mm and 8mm a	RP Vert	Comp A123\Throw1
☑	7	2	Rod Position	MX2033 with MX2030 5mm and 8mm a	RP Horz	Comp A123\Throw1
☑	7	3	Cylinder Pressure	Custom Absolute Pressure Transducer	Head Pressure	Comp A123\Throw1
☑	7	4	Cylinder Pressure	Custom Absolute Pressure Transducer	Crank Pressure	Comp A123\Throw1

10.3.12.3 Plotting vs. Crank Angle

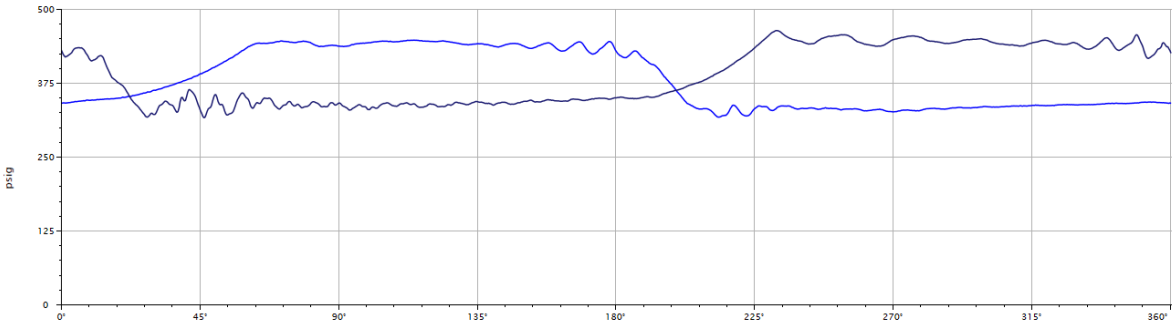
You can plot any dynamic measurement associated with the reciprocating machine as a function of the shaft crank angle.

Rod Load Diagram

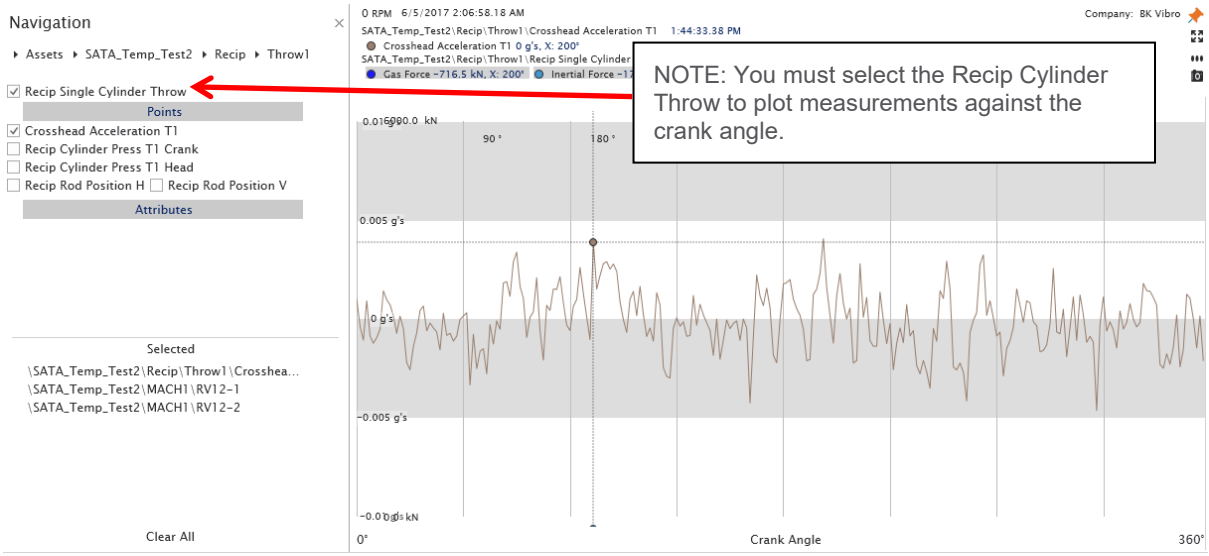


Load Reversal Points

Pressure vs. Crank Angle



Acceleration vs. Crank Angle

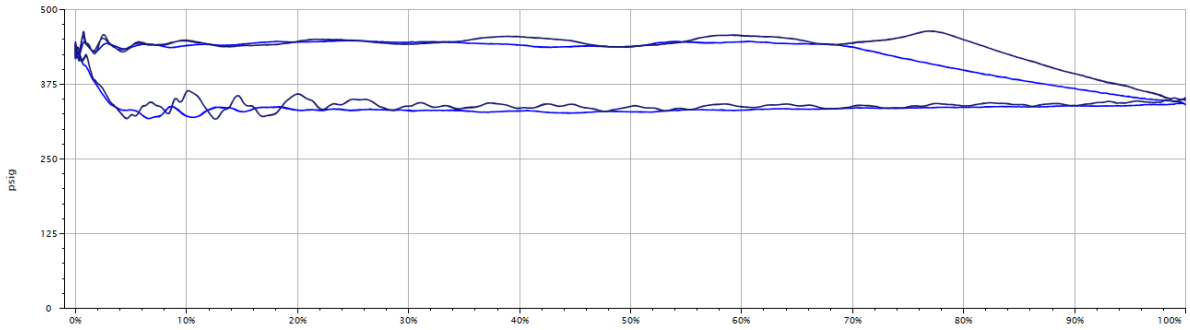


10.3.12.4 Plotting vs. Displaced (Swept) Volume

You can plot any dynamic measurement associated with the reciprocating machine as a function of the cylinder displaced volume.

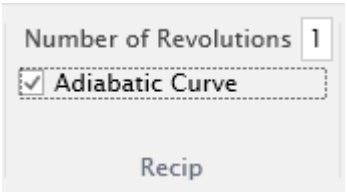
Pressure-Volume Diagram

The pressure-volume diagram shows the cylinder pressure as a function of displaced volume (0% to 100%)

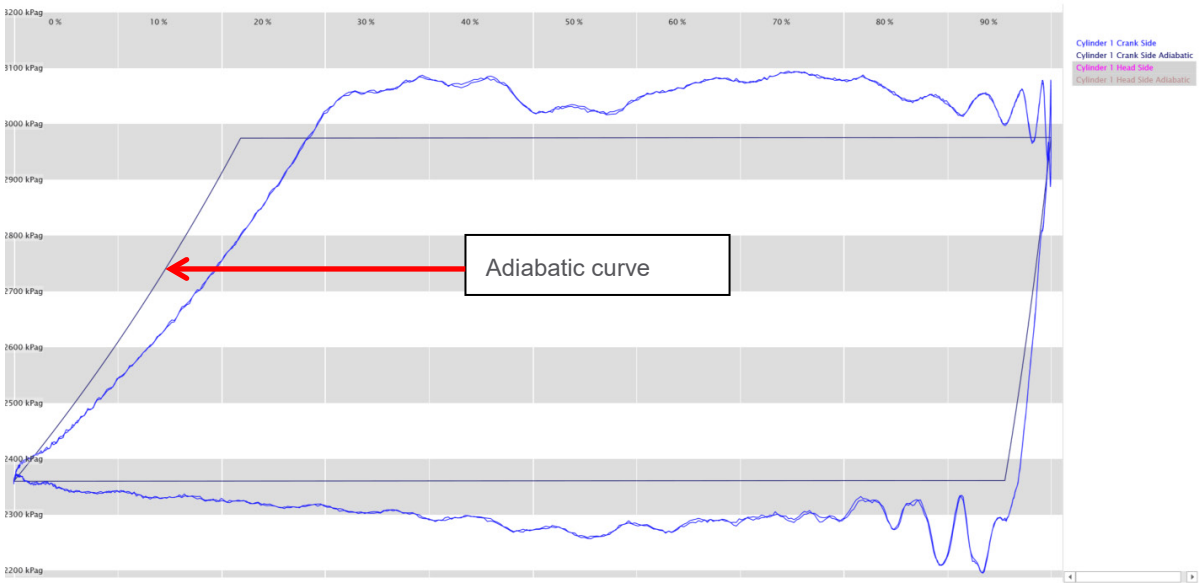


Showing the Adiabatic Theoretical Curve

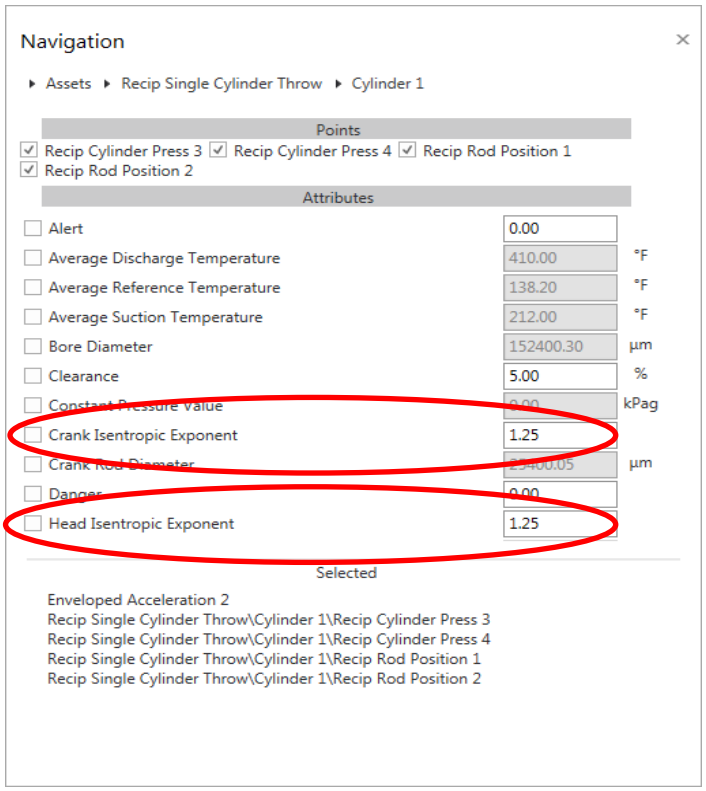
You can show the theoretical adiabatic curve on the pressure volume diagram when plotted as a function of displaced volume. The theoretical curve is a useful tool when diagnosing compressor faults.



On the Plot Tab, under **Recip**, check the Adiabatic Curve box to show the theoretical curve.

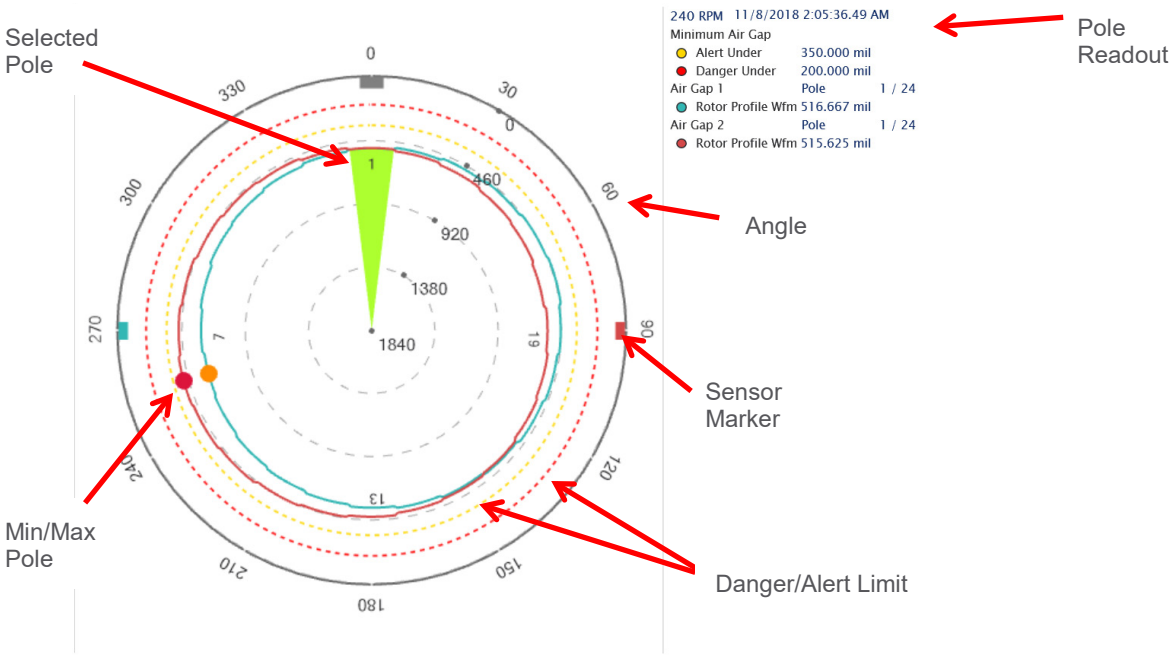


In order to plot the adiabatic curve you must enter the isentropic exponent for the compressed gas mixture. Use an Equation of State solver (purchased or available on the Internet) to calculate the isentropic exponent. Enter the isentropic exponent under the cylinder attributes for the head and crank chambers:



10.3.13 Air Gap Plot

The Air Gap plots present the space between the rotor and stator. It indicates the rotor profile waveforms of multiple hydro air gap channels. The minimum and maximum poles which should be monitored are shown around the rotor profiles. The sensor locations are marked around the outside to orientate the data. There are also tooltips available for each sensor marker and minimum / maximum pole if you move the mouse near these locations. According to the angle axis and pole numbers shown on the plot you can find out the rotation direction and pole numbering direction. The following example shows that the rotation is clockwise and the pole numbering is counter clockwise.

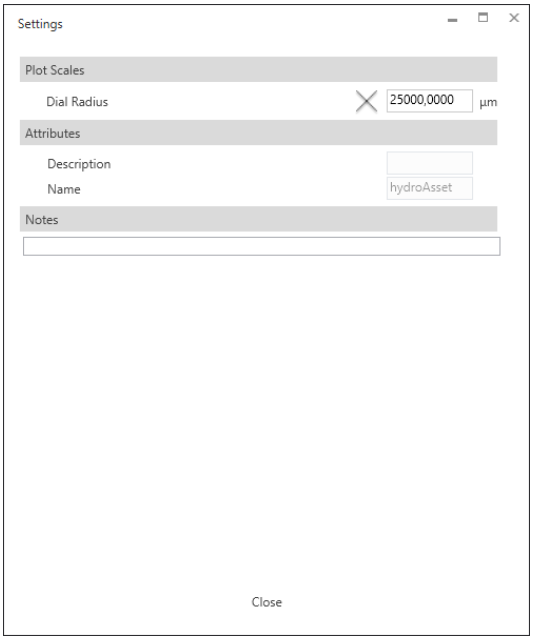


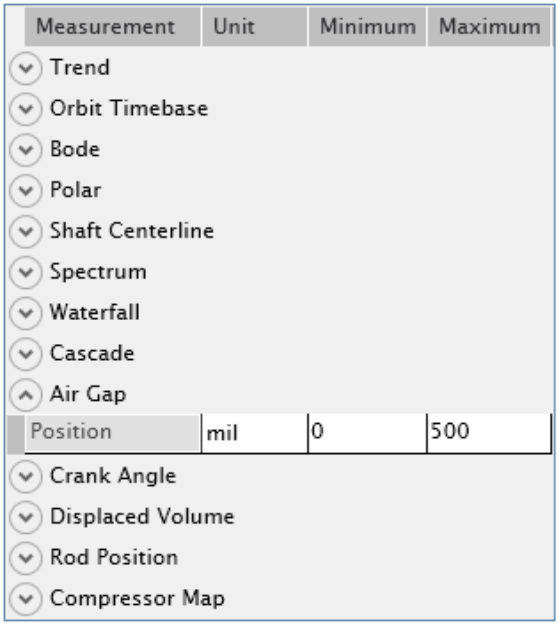
Alert and danger limits are drawn on the plot to visually track how close a pole is to a setpoint.

While moving the mouse from pole to pole, each area is highlighted. If clicking at one location, one pole is selected and 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
- 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

To scale the Air Gap plot you can activate Auto Scale or change it manually with **Settings** dialog of each plot or **Change Scales** button to edit the maximum radius.





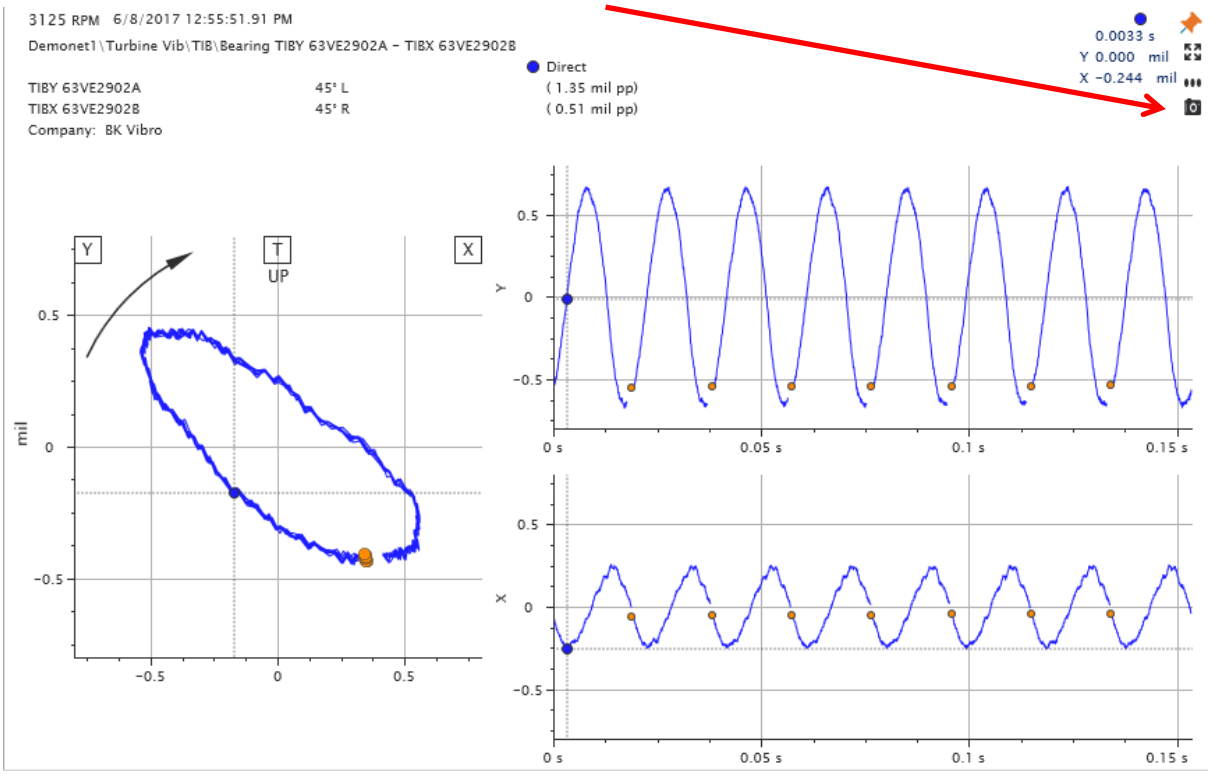
10.4 Documenting

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

10.4.1 Copying and Pasting Plots

Hovering over a plot will enable a camera icon in the upper right hand corner. Clicking the camera icon copies the plot to the clipboard for pasting into reports.

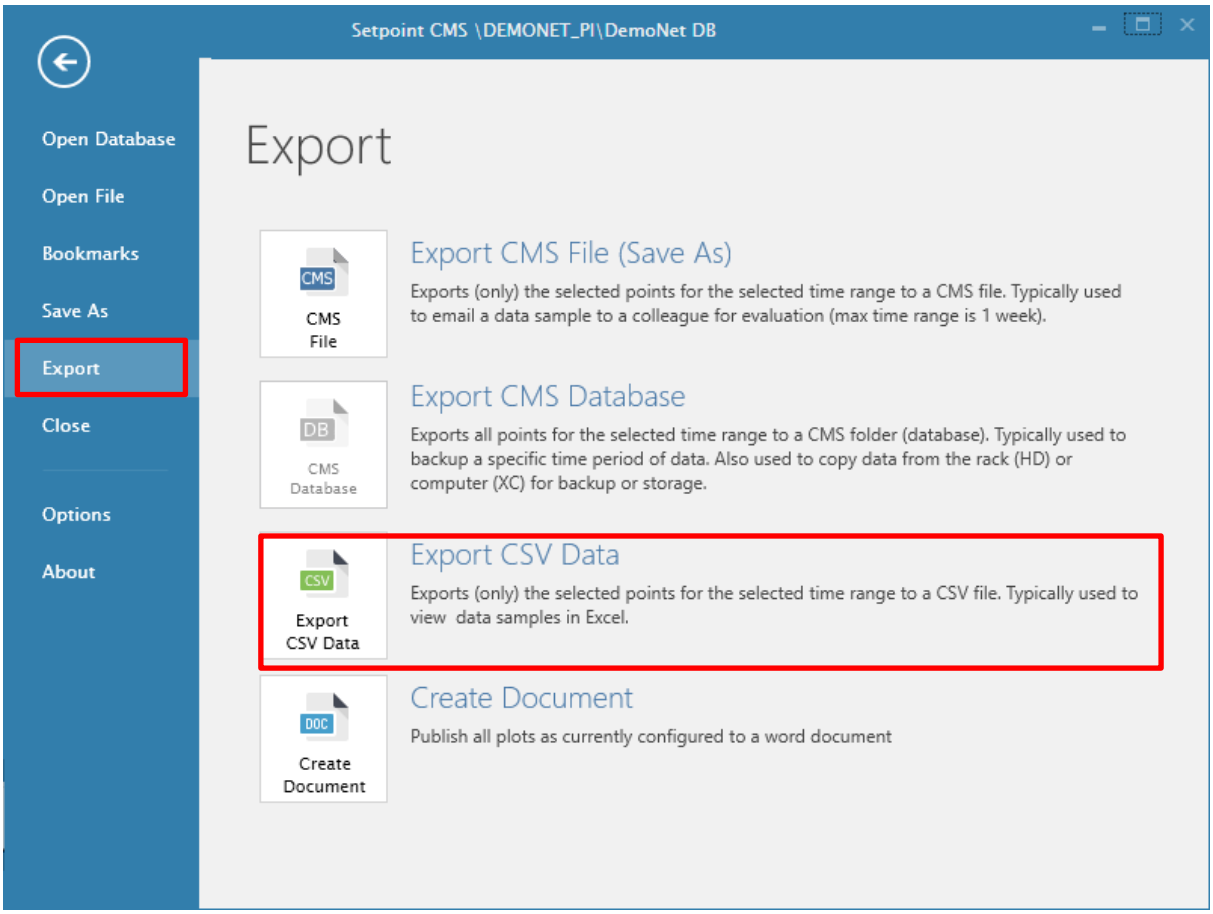


Use the paste command (cntl-V) to paste the plot into another document.

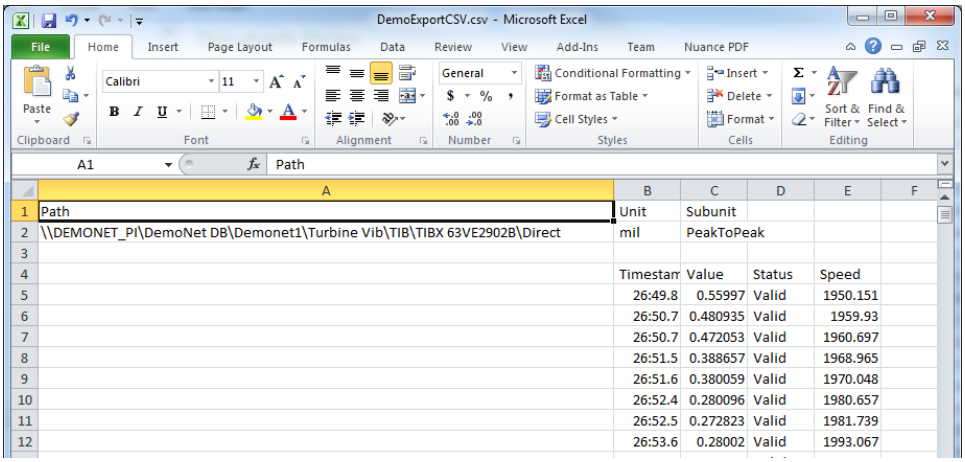
10.4.2 Export Trend Data to .CSV File

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	

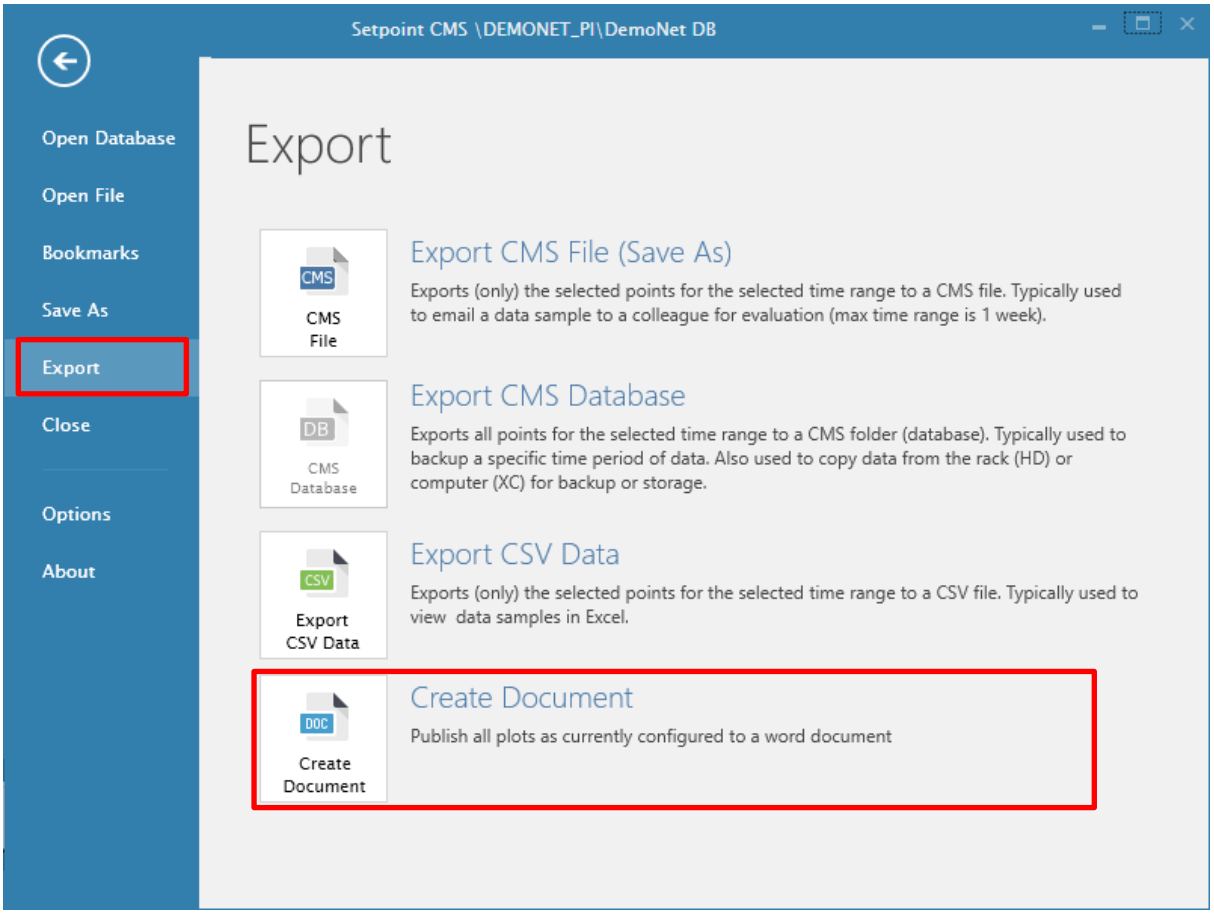
NOTE!

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”.

10.4.3 Exporting all Plots to Microsoft Word

You can export all the currently open plots to Microsoft Word in one quick process.

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 CMS for error indications.

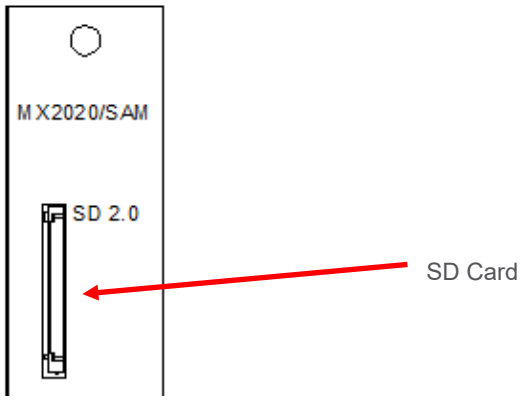
NOTE!

Limit the Trend plot to less than 10 traces for best export presentation.

11 Using the Removable SD card Media

When enabled, the SAM can collect steady-state 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.

11.1 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.

11.2 Data Storage

The amount of data stored and the time duration before the card fills and starts over-writing 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 to the machine operating conditions to optimize the amount of stored data.

11.2.1 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.

11.2.2 Compression

There are multiple levels of compression used to maximize the data storage on the SD card.

11.2.2.1 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.

11.2.2.2 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 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 have been published during the configured periodic interval the most interesting waveform for that interval is then published.

Dynamic Collection Rate

The Dynamic Collection Rate 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 then 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 dynamic collection rate to a longer time to extend the SD card storage time.

11.2.3 Overwriting

When the SD card fills the system will overwrite the data, 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.

11.3 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.

11.4 SD card Status

You can verify correct SD card operation from the front panel display, from the SAM LEDs, or from Modbus status registers.

11.4.1 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.

11.4.2 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.

11.5 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.

11.6 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.

11.7 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.

11.8 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.

11.9 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.

11.10 Backfilling SD Card Data into a PI Server

Refer to Section 14 for information on backfilling data stored on an SD card into a PI Server.

12 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 38 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).

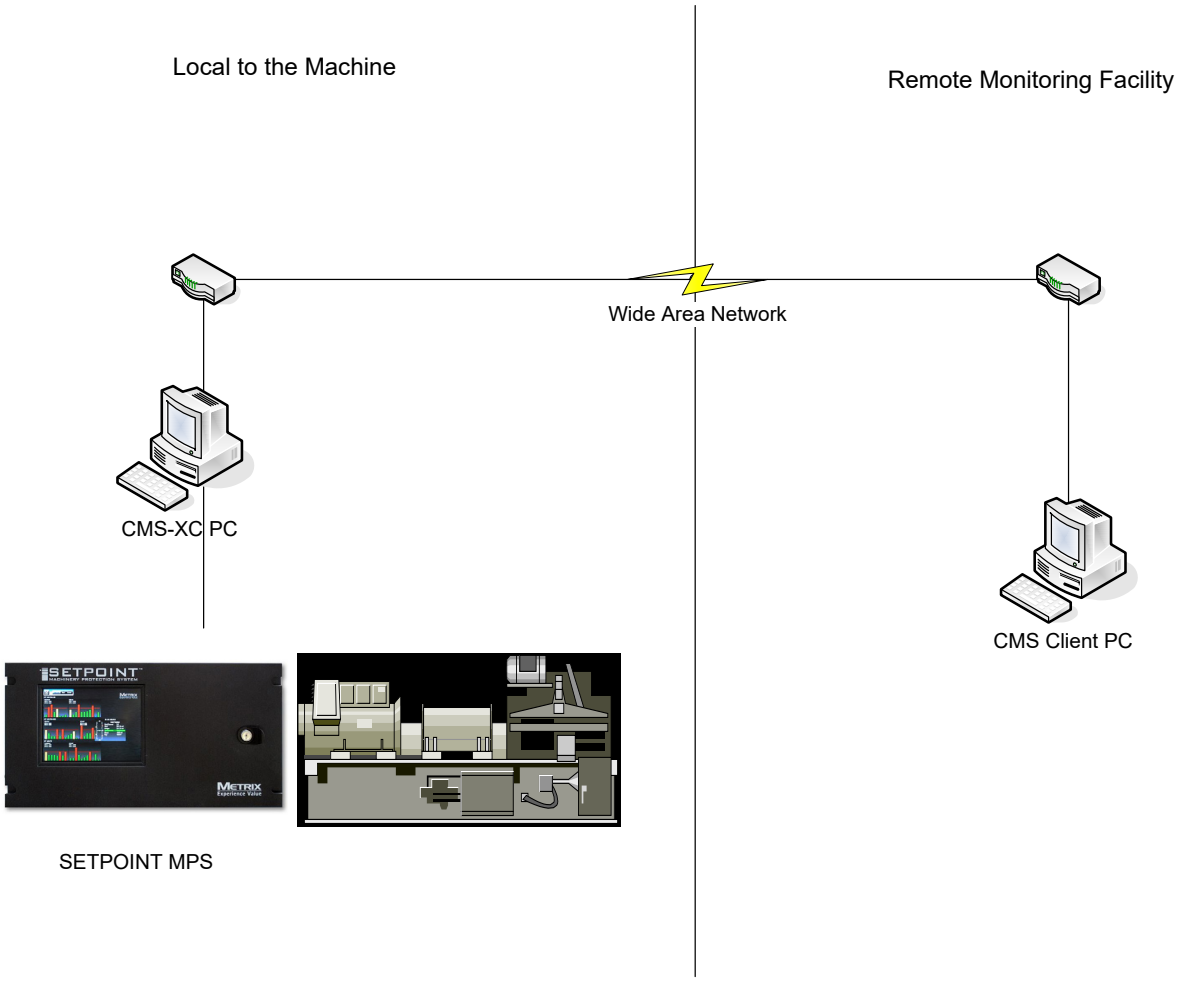


Figure 38: CMS XC on a WAN

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 39 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.

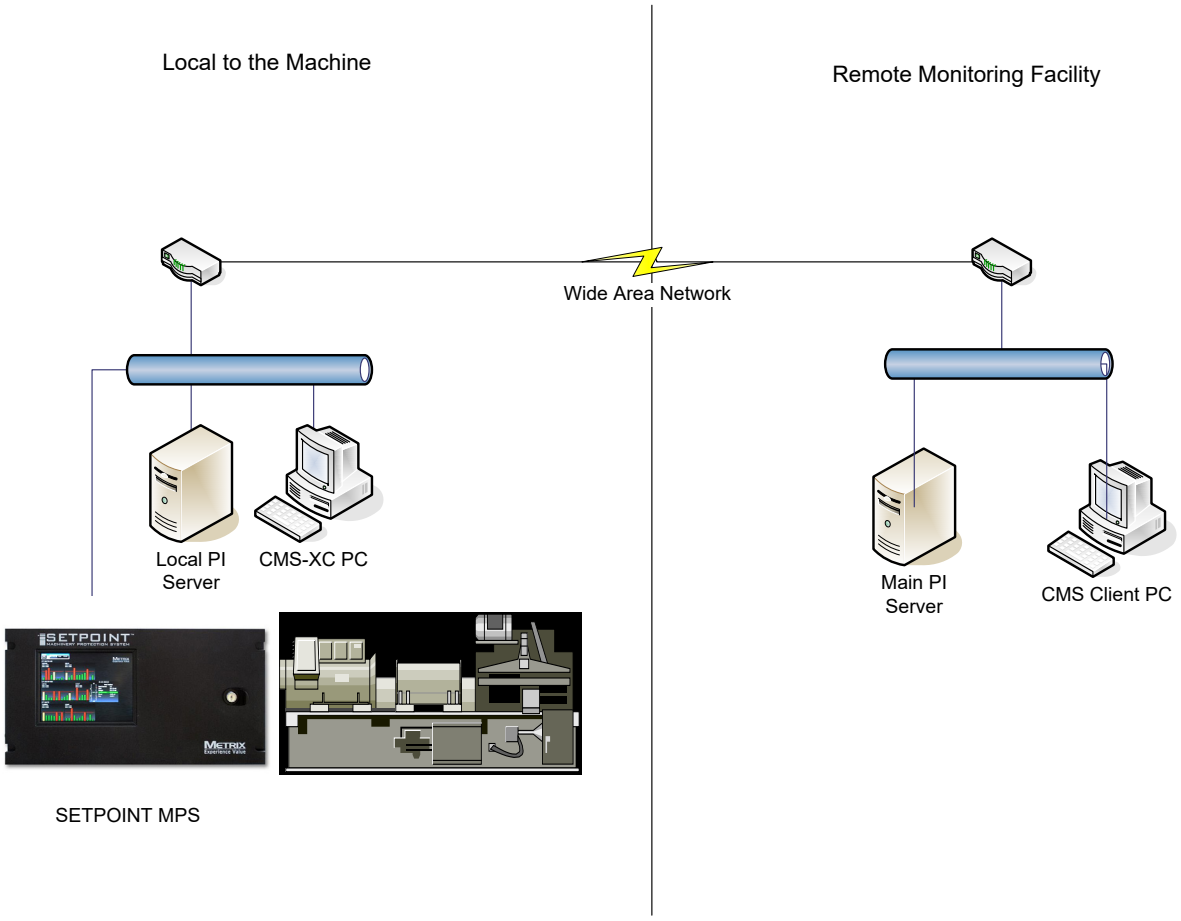


Figure 39: CMS-XC Backing up a PI Server

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.

12.1 Configuring a CMS-XC Computer

Configure the CMS-XC computer using the SETPOINT-PI Adapter Setup software. See Section 8.1.2 for information on configuring the XC computer storage locations and folder names.

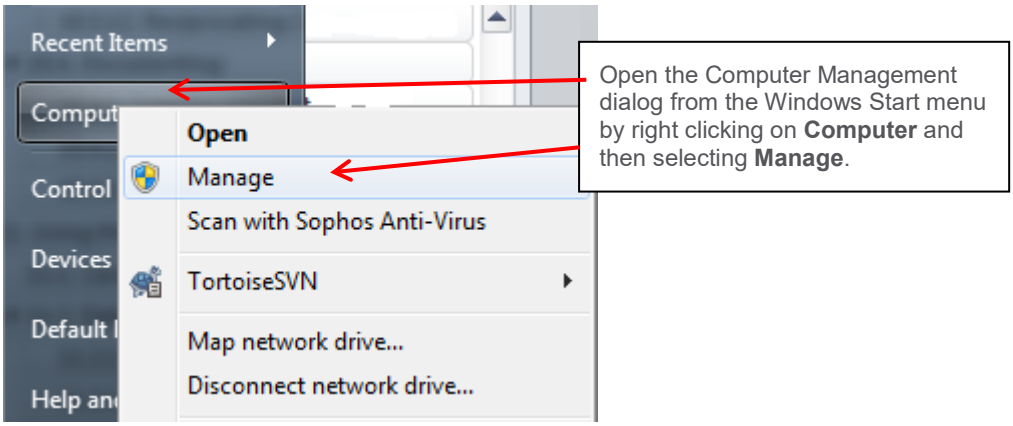
12.2 Configure Windows Remote User Access

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!

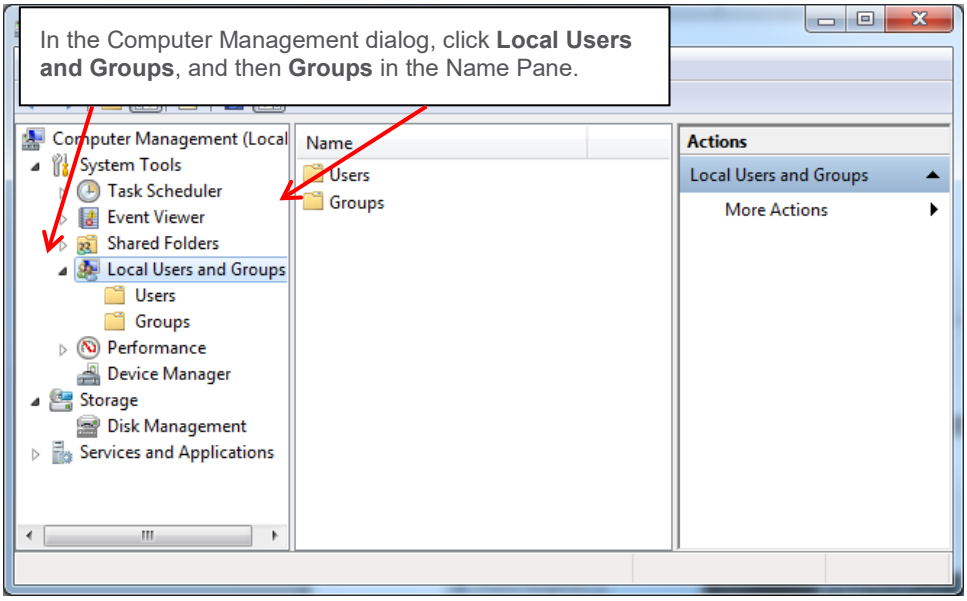
Install the Setpoint Adapter before performing this step. The Setpoint Adapter will automatically create the Setpoint Remote Users group.

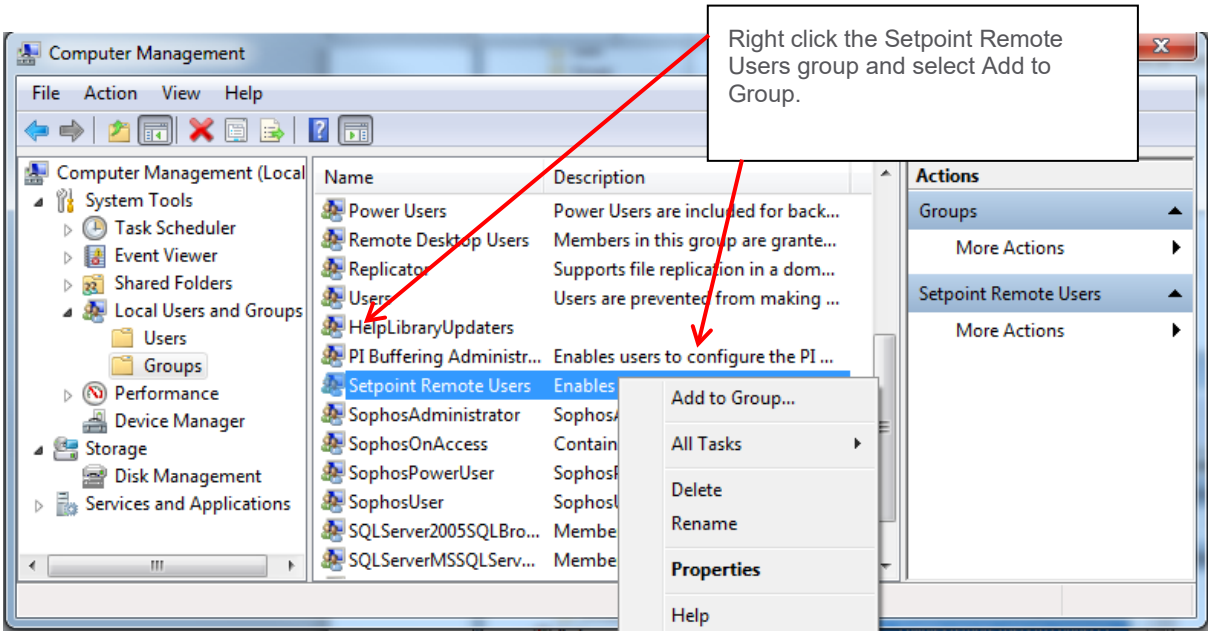
Configure the users from the Windows Computer Management.



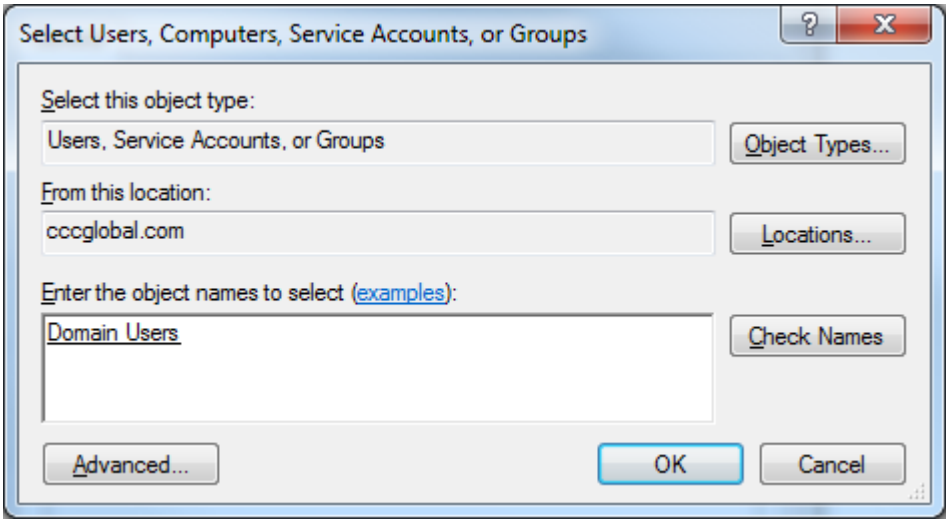
Alternatively, you can open the Computer Management dialog from **Control Panel** by selecting **Adminstrative Tools** and then **Computer Management**.

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:



12.3 Configuring the Network Firewall for CMS-XC

To allow remote access to the CMS-XC data (see Figure 38 and Figure 39), you will need to have Firewall ports 8001 and 8002 open.

12.4 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.

12.5 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 the Setpoint Adapter. If you have changed the rack name or removed a rack from the adapter 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**.

13 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 40.

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.

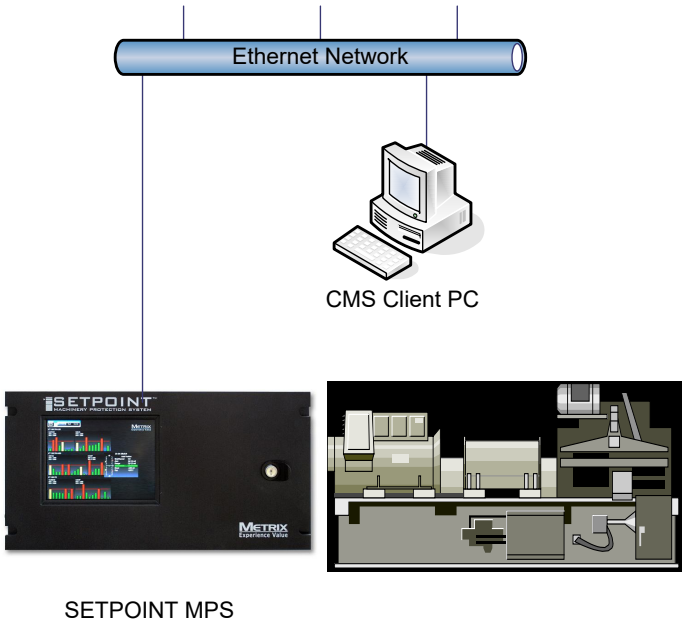


Figure 40: CMS HD Network

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 manual S1079330.

IMPORTANT!

The CMS-HD storage drive will overwrite when full. Periodically copy the HD database to a computer or save important reference data in a .cms file.

13.1 Configuring HD Storage

Setpoint HD does not require configuration. HD enabled hardware will automatically store condition monitoring data from CMS enabled monitoring modules.

13.2 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. To prevent loss of important data, periodically import the HD database or view and save important data from Setpoint CMS.

The Setpoint display provides basic information on the HD storage which you can use to determine when to upload and save data.

Refer to Section 15.5 for information on verifying data storage rates.

13.3 Copying HD database to a Local Drive

Refer to Section 14.2.

13.4 Automatically Backfilling HD Data into a PI Server

You can configure the Setpoint-PI Adapter 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, the Setpoint-PI Adapter checks for Setpoint HD data not already in the PI Server when:

- The Setpoint-PI Adapter Service is first started
- When communication to the Setpoint 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 on line.

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 14) at a convenient time.

NOTE!

Backfilling does not import data prior to when the rack was added in the Setpoint PI Adapter. Follow the instructions for importing a dataset (See Section 14) for migrating Setpoint HD data stored in the rack prior to connection to a PI Server.

14 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

The Setpoint-PI Adapter 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 the Setpoint-PI Adapter 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:

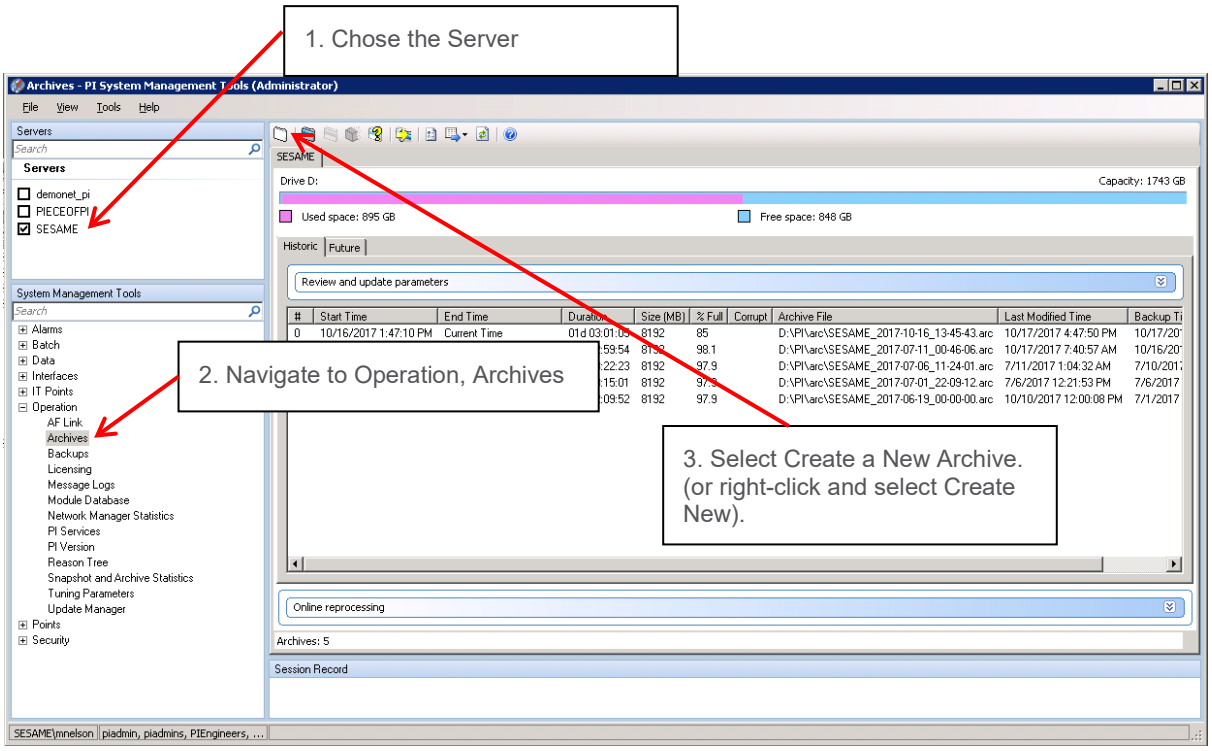
1. Create new PI Archives (if required)
2. Export XC or HD data to be uploaded to a local drive.
3. Upload the data into the PI System.

14.1 Creating PI Archives

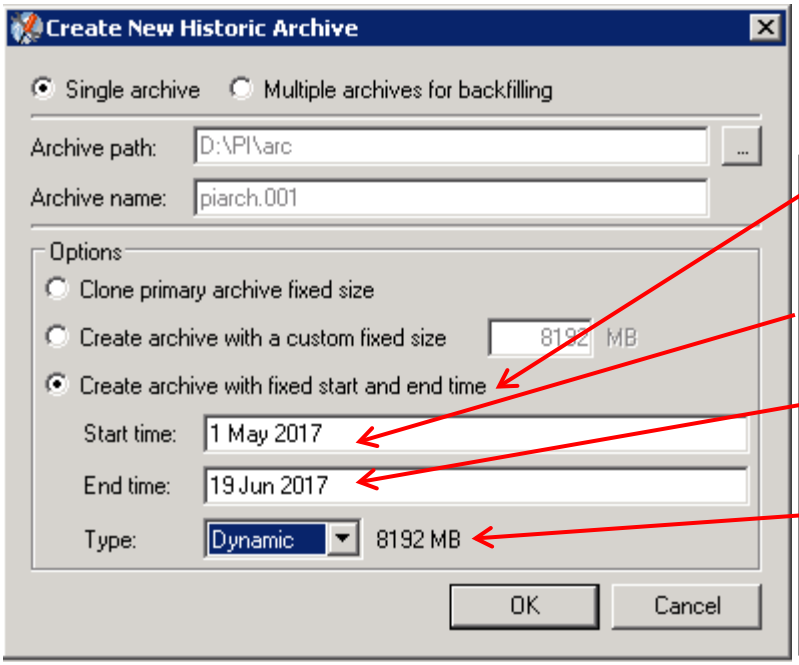
If the data stored on the SD card, XC database, or HD database predates the PI System, you will need to create PI archives in which to store the data. Follow the steps in this section to create PI archives.

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.

14.2 Exporting an HD or XC CMS Database

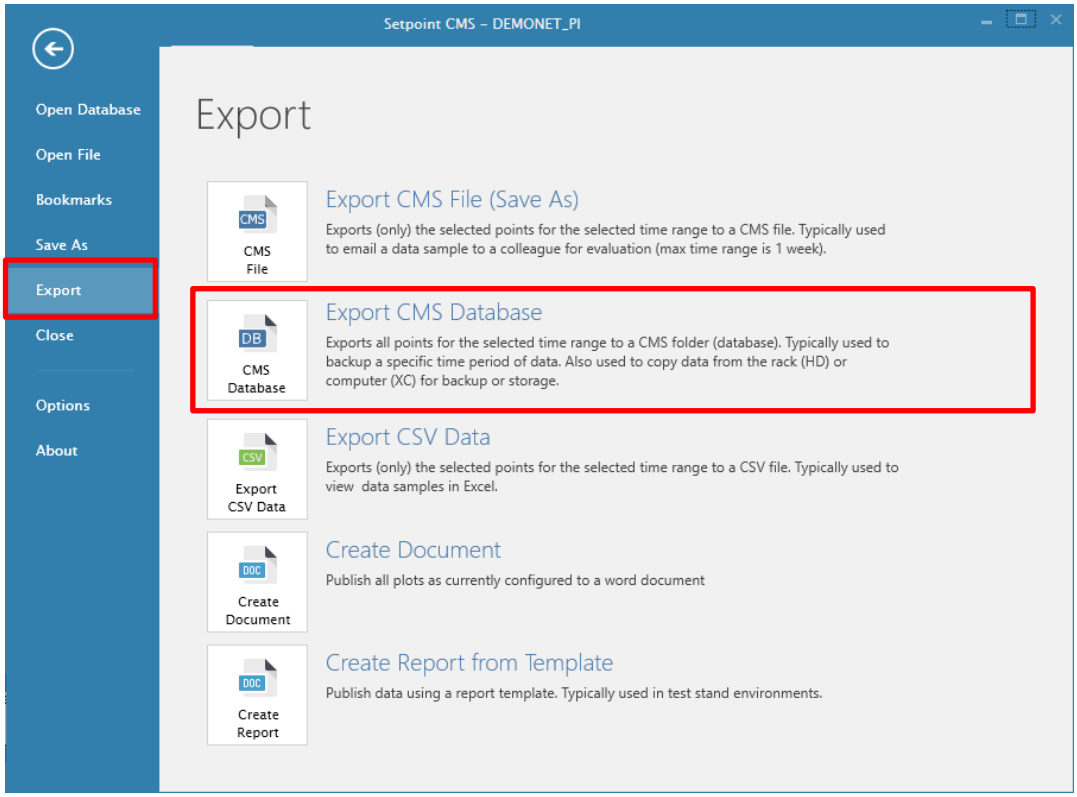
If the data is stored in CMS-XC or CMS-HD files, you need to export the data to a local database file before uploading into the PI System.

NOTE!

The Export CMS Database option will only be active if you are currently connected to a CMS HD or CMS XC database.

NOTE!

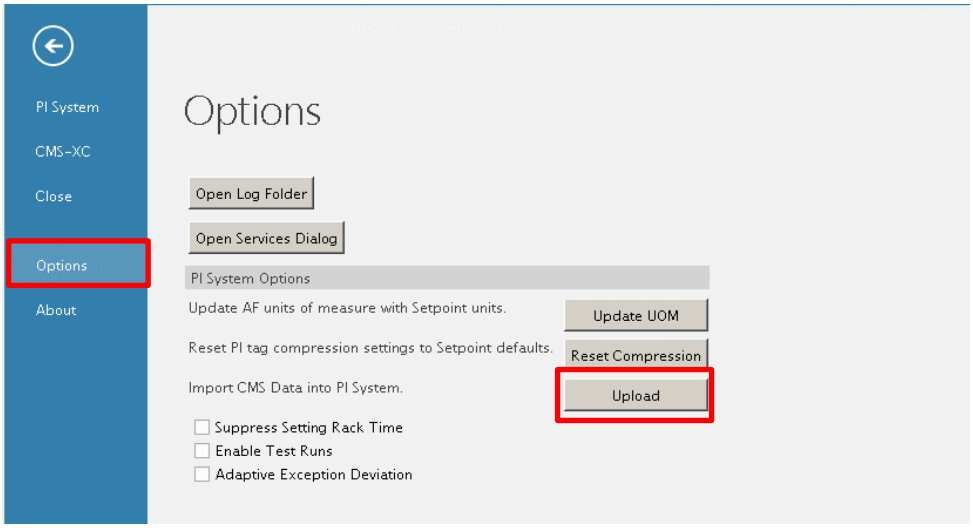
The Export CMS Database option will export data only for the currently selected points and time range. Be sure to select the points and set the time range before exporting.

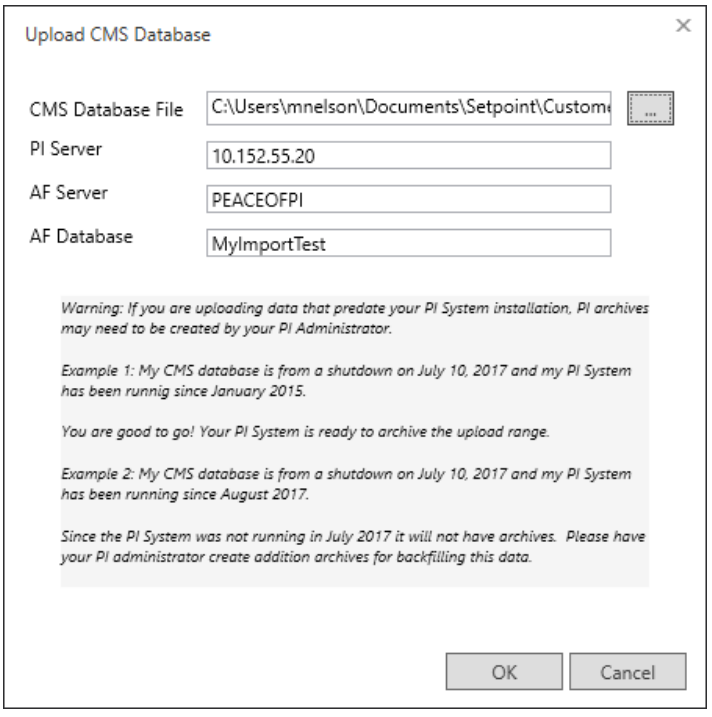


The export process will require you to specify a location to store the database.

14.3 Uploading XC or HD data in the PI System

From the Setpoint-PI Adapter, select **Options** and then **Upload**.





Set the location of the CMS SD database or location where CMS XC or HD data was exported.

The PI Server, AF Server, and AF Database fields will auto-fill according to the PI System Settings.

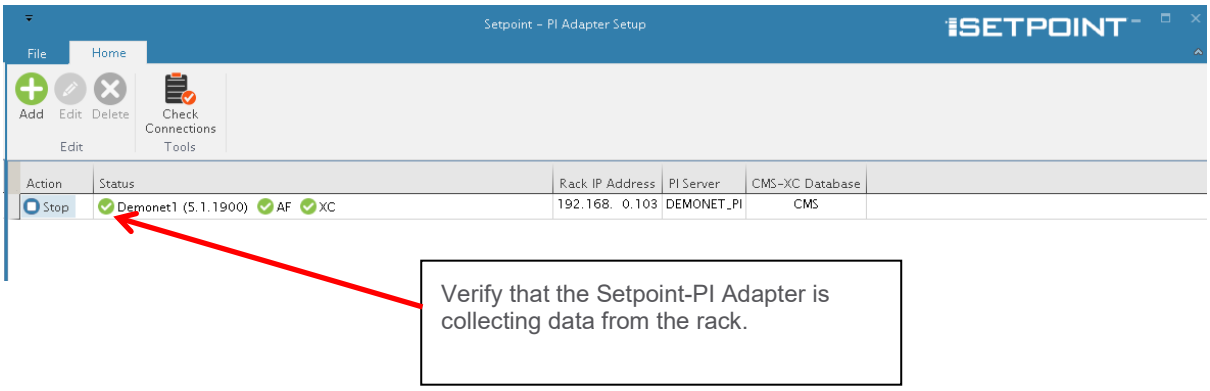
Click OK to upload the data into the PI System.

15 Verification

This section lists ways to verify the data flow between the SETPOINT rack and the database (PI System, XC, SD, or HD.)

15.1 Verifying Connection to the Setpoint-PI Adapter

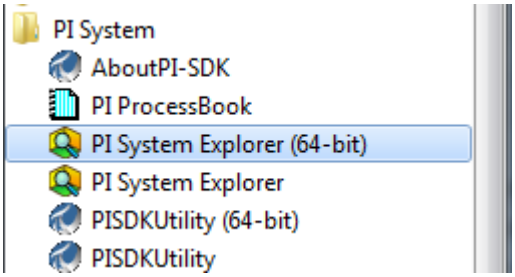
To verify that the SETPOINT rack is properly connected to the Setpoint-PI Adapter and the system is collecting data, open the Setpoint-PI Adapter Setup program and verify that the rack status is “Collecting”.

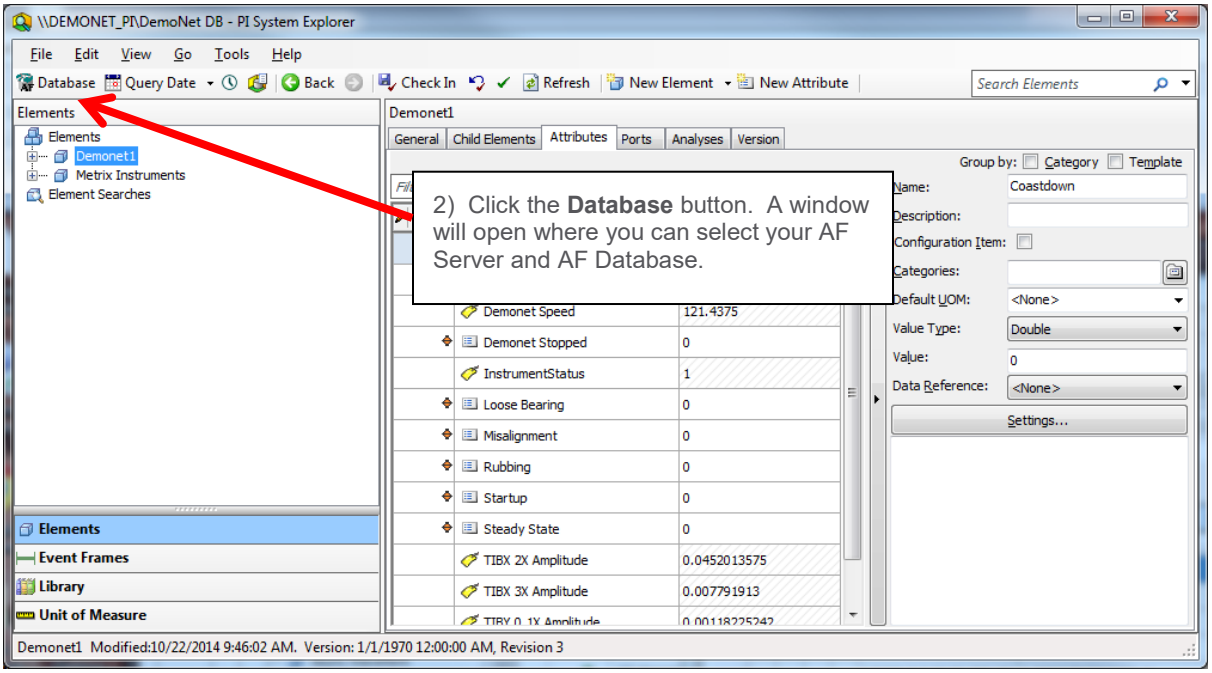


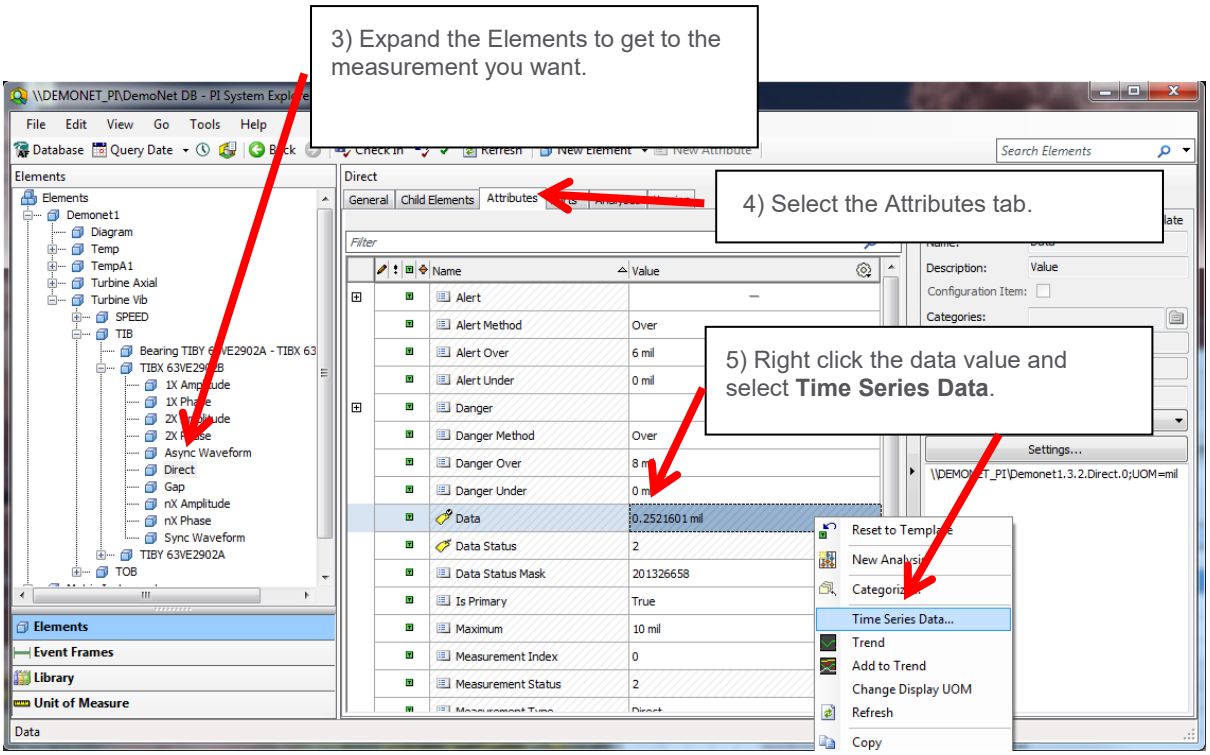
15.2 Verifying Data in the PI System Database

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.

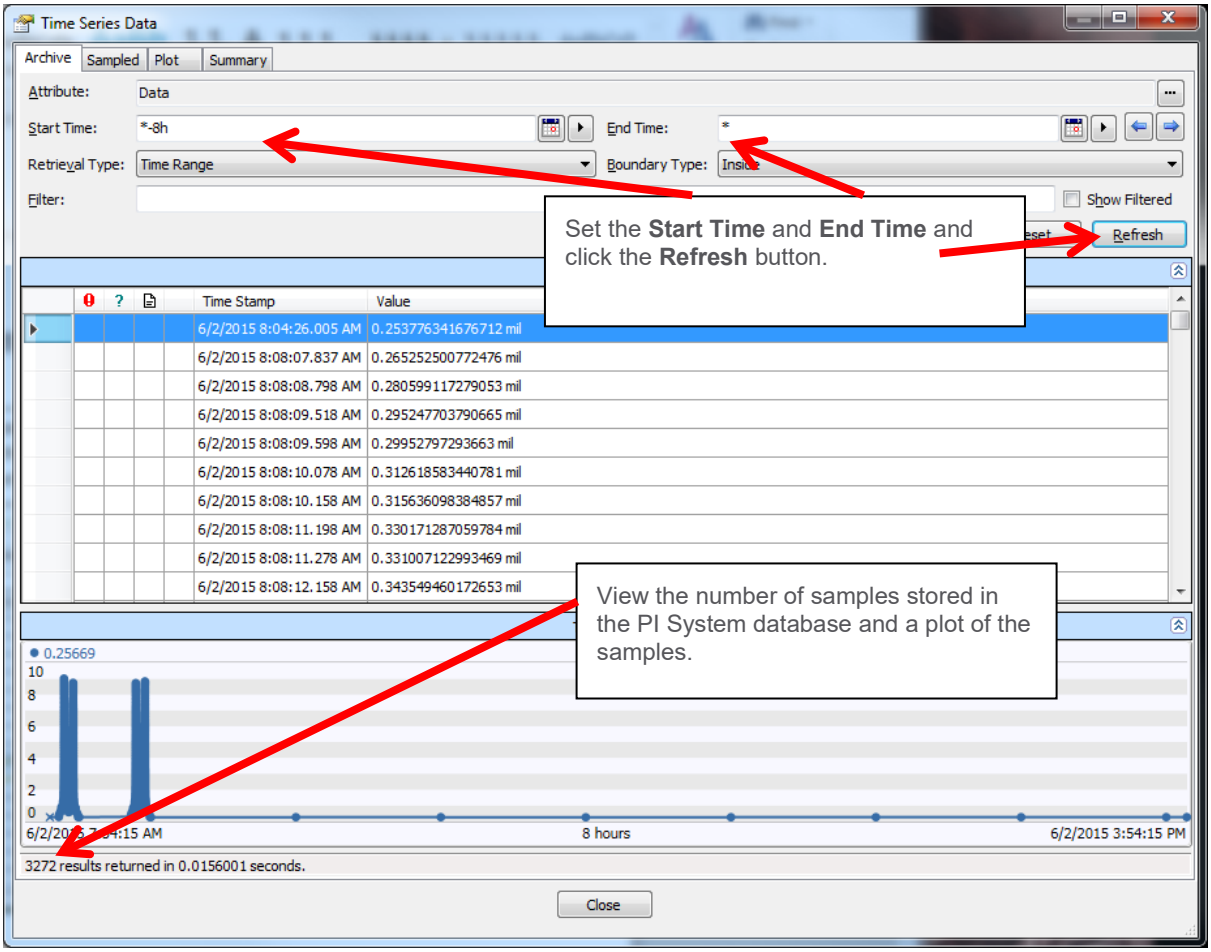
Open PI System Explorer. PI System Explorer will be listed under the PI System folder:







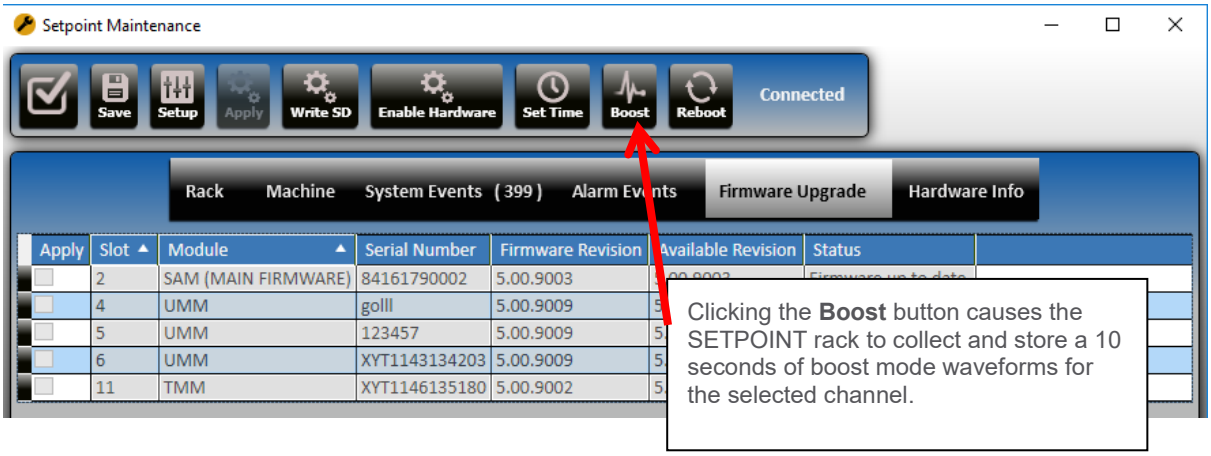
The **Time Series Data** window will open. Setting the **End Time** to "*" causes the time range to end at the current time. Setting the **Start Time** to "*-8h" sets the range to start 8 hours earlier than the current time. Click the **Refresh** button. The **Time Series Data** window shows the number of samples stored in the PI System in the time range and a plot of the data values.


Time Series Data
Archive
Sampled
Plot
Summary
Attribute:
Data
Start Time:
*-8h
End Time:
*
Retrieval Type:
Time Range
Boundary Type:
Inside
Filter:
Show Filtered
Refresh
Time Stamp
Value
6/2/2015 8:04:26.005 AM 0.253776341676712 mil
6/2/2015 8:08:07.837 AM 0.265252500772476 mil
6/2/2015 8:08:08.798 AM 0.280599117279053 mil
6/2/2015 8:08:09.518 AM 0.295247703790665 mil
6/2/2015 8:08:09.598 AM 0.29952797293663 mil
6/2/2015 8:08:10.078 AM 0.312618583440781 mil
6/2/2015 8:08:10.158 AM 0.315636098384857 mil
6/2/2015 8:08:11.198 AM 0.330171287059784 mil
6/2/2015 8:08:11.278 AM 0.331007122993469 mil
6/2/2015 8:08:12.158 AM 0.343549460172653 mil
0.25669
10
8
6
4
2
0
8 hours
6/2/2015 3:54:15 PM
3272 results returned in 0.0156001 seconds.
Close
Set the Start Time and End Time and click the Refresh button.
View the number of samples stored in the PI System database and a plot of the samples.

15.3 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 SETPOINT 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.

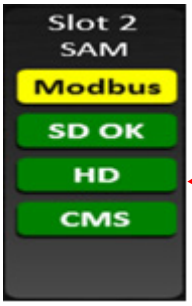


15.4 Data Annotations

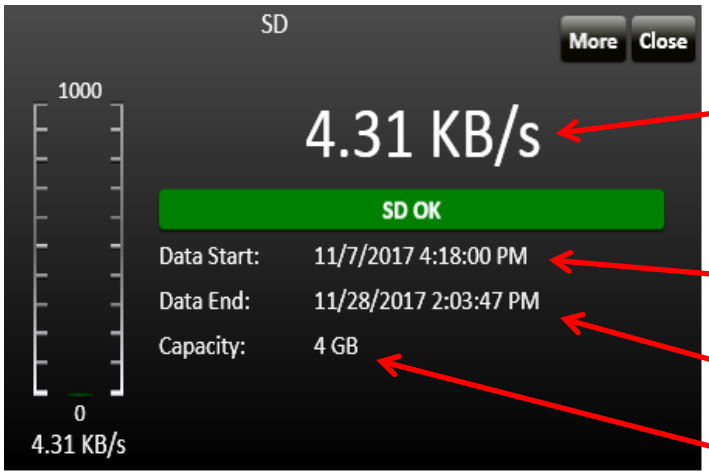
The Data Annotation function provides information about when SETPOINT collected waveforms and how interesting the machine data is. Data Annotations are useful when troubleshooting waveform collection. Activate Data Annotations from the View Tab.

15.5 Verifying Data Storage Rates

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.



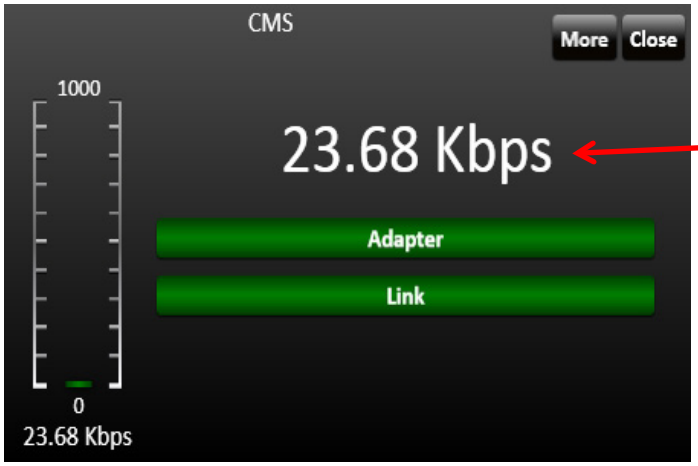
For SD and HD, the details view shows this information:

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.

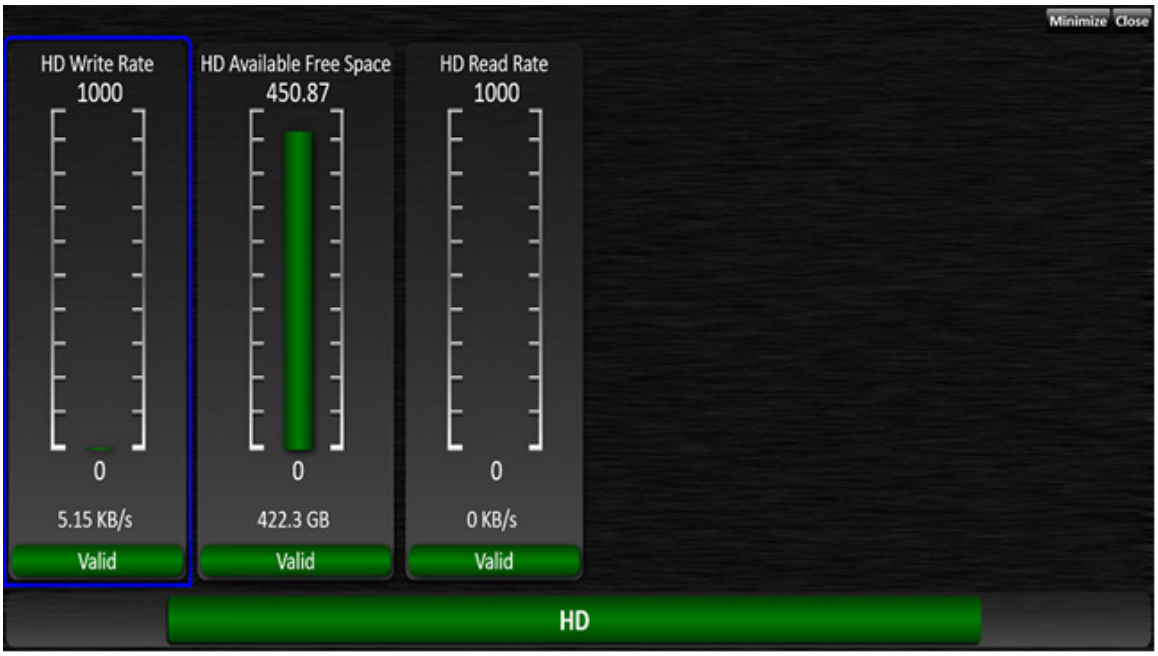
Adapter shows the status of the Setpoint-PI Adapter.

Link shows if green if there is a valid Ethernet connection to a Setpoint-PI Adapter.

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.

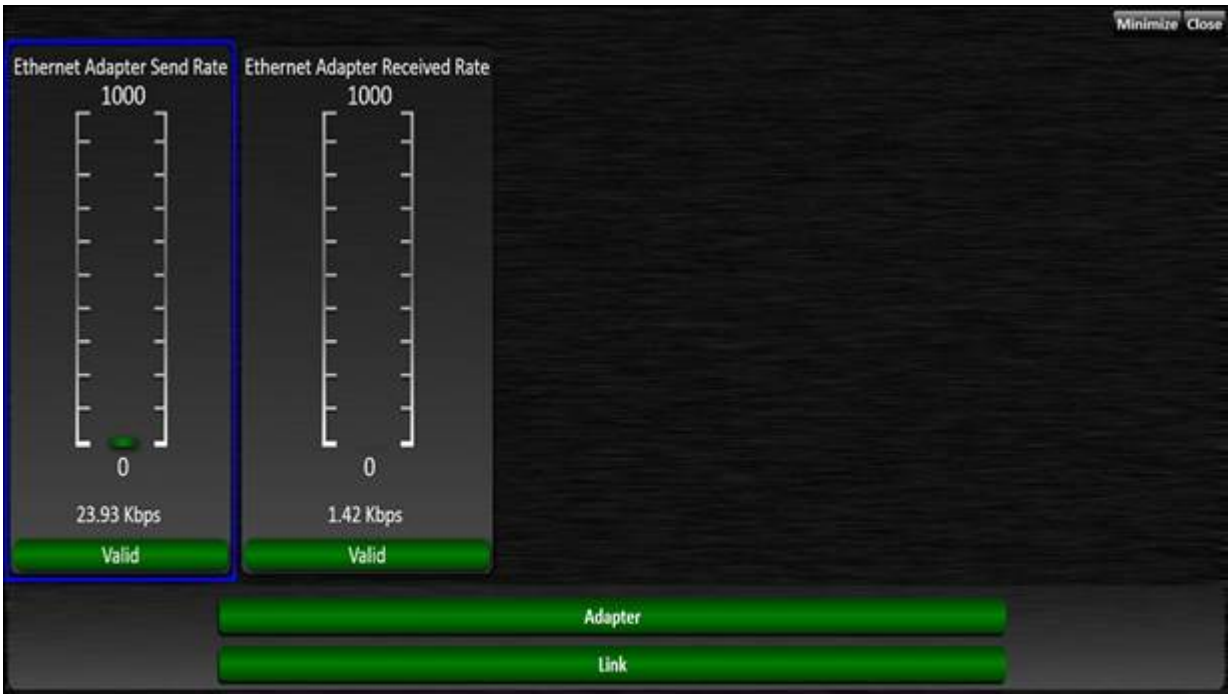
HD Available Free Space: The unused space on the HD storage device.

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-PI Adapter status. When green the adapter is operating correctly. If yellow, one or more adapter connections (PI System or CMS-XC) have failed.

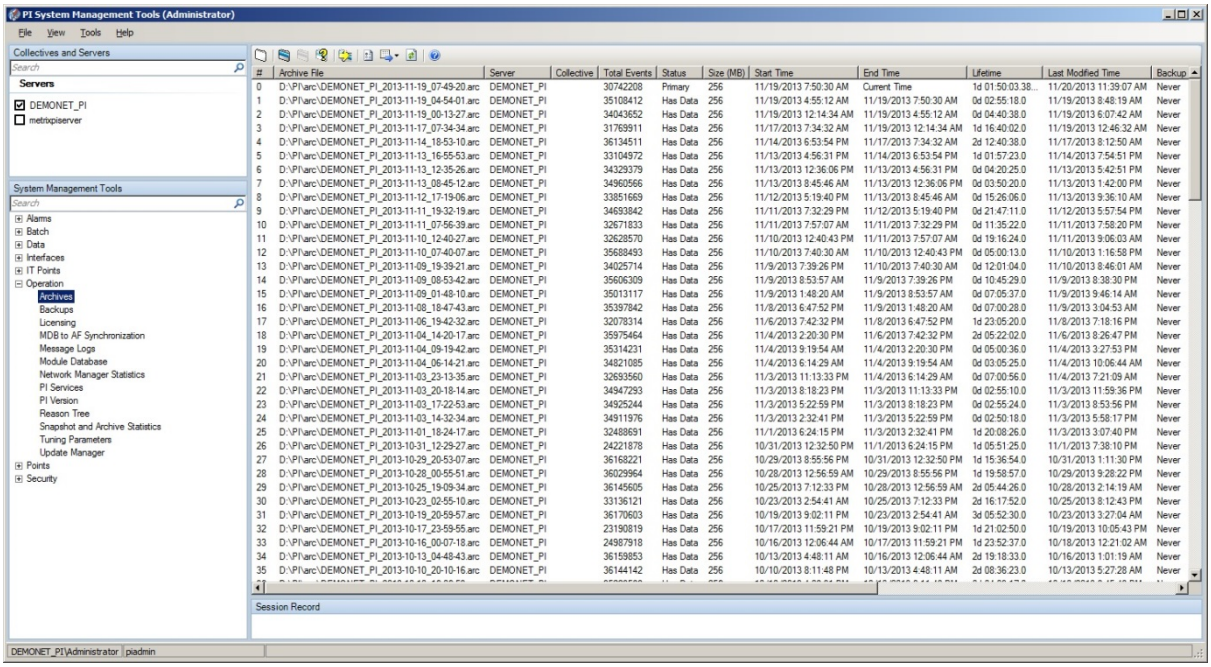
Link Status: When green the rack is correctly communicating with the Setpoint-PI Adapter. When yellow, the rack cannot communicate with the adapter. This may be due to physical network problems or problems with the adapter.

16 Maintenance

In general, SETPOINT CMS database maintenance is similar to maintaining any other OSIsoft PI database. Refer to OSIsoft PI system manuals and videos. This section lists maintenance specific to SETPOINT CMS.

16.1 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.

16.2 Archive Backup

Refer to OSIsoft documentation for best practices on backing up your data archives.

16.3 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, you may want to increase the compression levels to avoid collecting excessive data. CMS automatically reduces compression during transient speed conditions. OSIsoft 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.

17 Troubleshooting

17.1 Plot Messages

The SETPOINT CMS Display Application 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 14: 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 compensation vector or waveform is set for the point.	Select a reference data sample for compensation.

17.2 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 15: Troubleshooting Data Collection Problems

Problem	Possible Causes	Actions
Adapter 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 the SETPOINT-PI Adapter (See Sections 7.1 and 0.) Use Ping command to verify communication.
Adapter fails to connect to PI Server	Server not running	Restart the PI server.
Adapter fails to build AF hierarchy	Not enough PI Tag licenses available	Verify that you have enough PI Tag licenses (Refer to OSIsoft 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	Adapter service not running	Verify the SETPOINT-PI Adapter 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.
	Machine is not changing or Dynamic Collection Rate set too long.	Adjust the Dynamic Collection Rate.

No Orbit, Time-base, or Spectrum data in selected time range	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 the Adapter and the Client are using the same PI Database. See Sections 9.1.1 and 8.1.1. 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 Dynamic Collection % Change Threshold. (See Section 7.3.2) until the sensor is fixed. Turn on Adaptive Interestingness.
	Machine continually changing measurement levels	Increase measurement Dynamic Collection % Change Threshold. See Section 7.3.2. Turn on Adaptive Interestingness

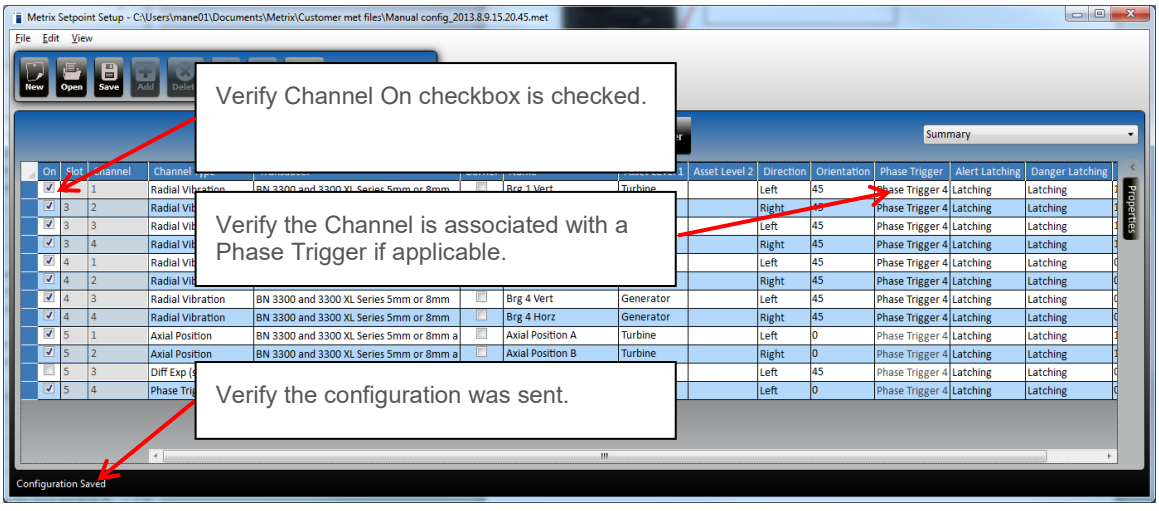


Figure 41: Verifying Channel is Active

17.3 Display Problems

Table 16: 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 OSIsoft 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.
Plot appears blank	Manual scaling set too small or large.	Try auto-scale, if Orbit 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.

18 Additional Functions

OSIsoft PI supports many additional functions such as:

- Notification
- Rules
- ERP
- CMMS
- Exporting
- OPC

Contact OSIsoft for more information.

19 Appendix

19.1 PI ProcessBook Integration

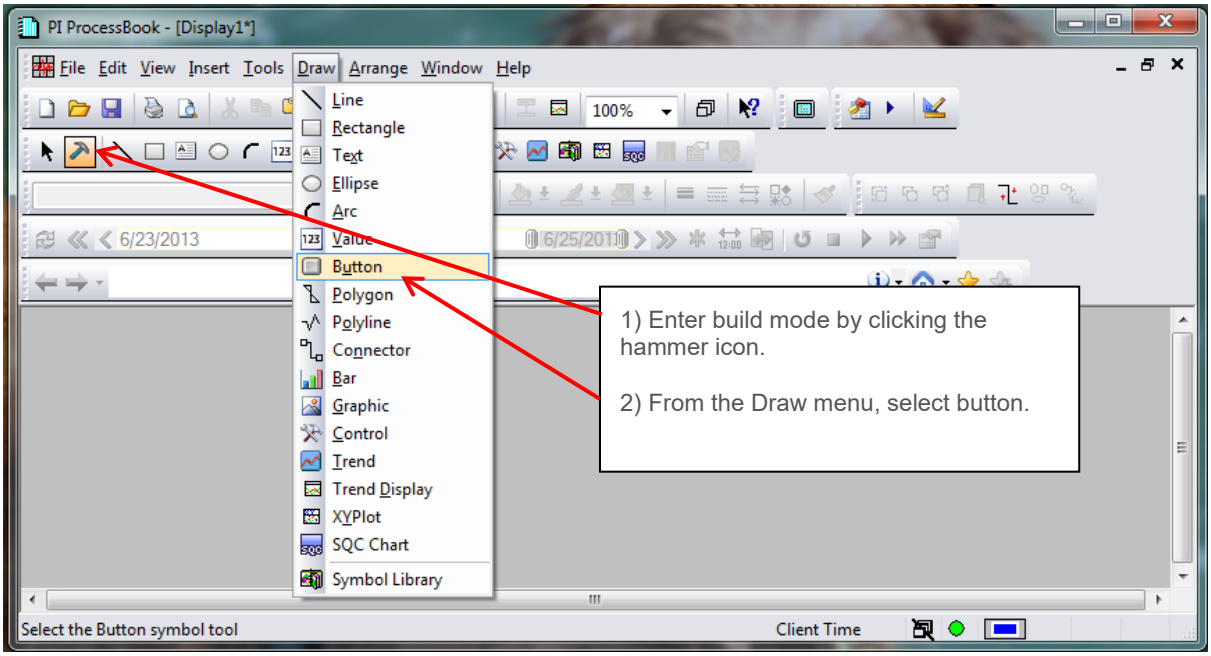
19.1.1 Launching SETPOINT CMS Display from PI Process Book

You can easily add a button to your PI Process Book to launch the SETPOINT CMS Display Application and open with data for the selected asset and specific plots.

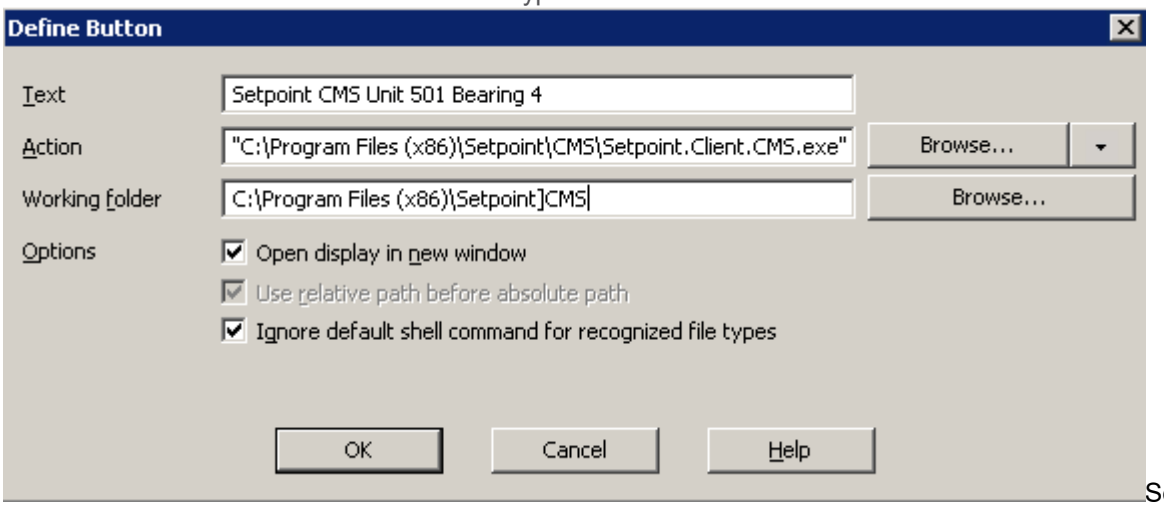
The section below provides a brief overview on how to create a button in ProcessBook. OSIsoft has many videos on the Internet showing how to create views in ProcessBook. Please refer to these for more detail.

Follow these steps to create a button that launches the CMS Display from PI ProcessBook:

Open the PI display you will be adding the button to.



1) Size the button on the display by dragging out the size. PI will open a dialog box to define the button as shown below. Type a name for the button in the Text field.



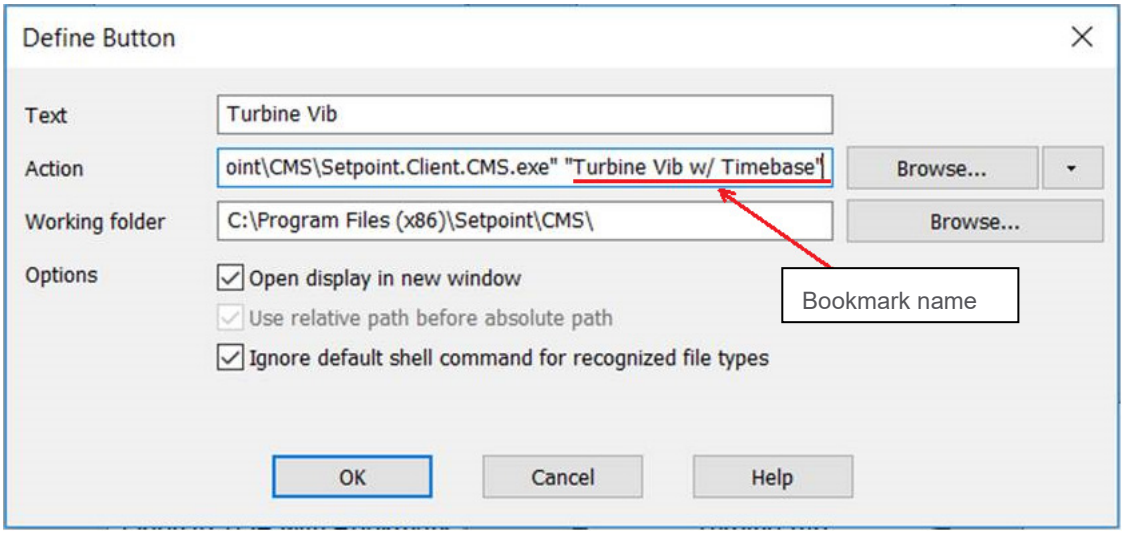
Se”C”

2) For the Action, browse to the SETPOINT CMS application. If installed in the default folder, the path is as shown in the figure above.

3) Set the Working folder to the folder where the CMS application is located.

4) Save the process book. Clicking on the button will launch the CMS application.

The CMS Display by default will open with the default database. To open the CMS Display with a specific database and asset, create and name a bookmark in CMS. Then append the bookmark at the end of the command line.



Where the syntax is:

“C:\Program Files (x86)\Setpoint\CMS\Setpoint.Client.CMS.exe” “<bookmark>”

NOTE!

ProcessBook requires the quotation marks around the call and path. Be sure to include the quotation marks as shown in the example.

19.1.2 Command Line Controls CMS 2.5

You can further control the views by turning on and off plots and defaulting to auto-scale. To do this, add a plot command following the path. Table 17 shows the supported plot commands.

Table 17: Plot Command Line Controls

Command	Description	Action
Plots.ShowOrbit	Orbit plot control for the set machine path.	True: Opens Orbit Plot False: Closes Orbit Plot
Plots.ShowTrend	Trend plot control for the set machine path.	True: Opens Trend Plot False: Closes Trend Plot
Plots.ShowShaftCenterline	Shaft Centerline plot control for the set machine path.	True: Opens Shaft Centerline Plot False: Closes Shaft Centerline Plot
Plots.ShowSpectrum	Spectrum plot control for the set machine path.	True: Opens Spectrum Plot False: Closes Spectrum Plot.
Plots.ShowBode	Bode plot control for the set machine path.	True: Opens Bode Plot False: Closes Bode Plot.
Plots.ShowTime	Timebase plot control for the set machine path.	True: Opens Timebase Plot False: Closes Timebase Plot.
Plots.DefaultAutoScale	Turns on or off the autoscale function.	True: Turns Autoscale on False: Turns Autoscale off

Example

"C:\Program Files (x86)\Setpoint\CMS\Setpoint.Client.CMS.exe" "\\PISERVER\Setpoint_Demo2\Minden\Unit 501\B4" Plots.ShowSpectrum=True Plots.ShowOrbit=False

This example navigates to Bearing 4 on Minden Unit 501 in database Setpoint_Demo2 on AF Server PISERVER. The analysis screen will open with the default Orbit plot turned off and the Spectrum plot turned on.

You can also set the time range from the ProcessBook command line.

Table 18: Time Command Line Controls

Command	Description
“Time.StartRange=MM/DD/YYYY HH:MM:SS PM”	Sets the beginning time to the listed date and time.
“Time.EndRange=MM/DD/YYYY HH:MM:SS PM”	Sets the end time to the listed date and time.
“Time.DynamicTime=MM/DD/YYYY HH:MM:SS PM”	Sets the dynamic time cursor to the listed date and time.

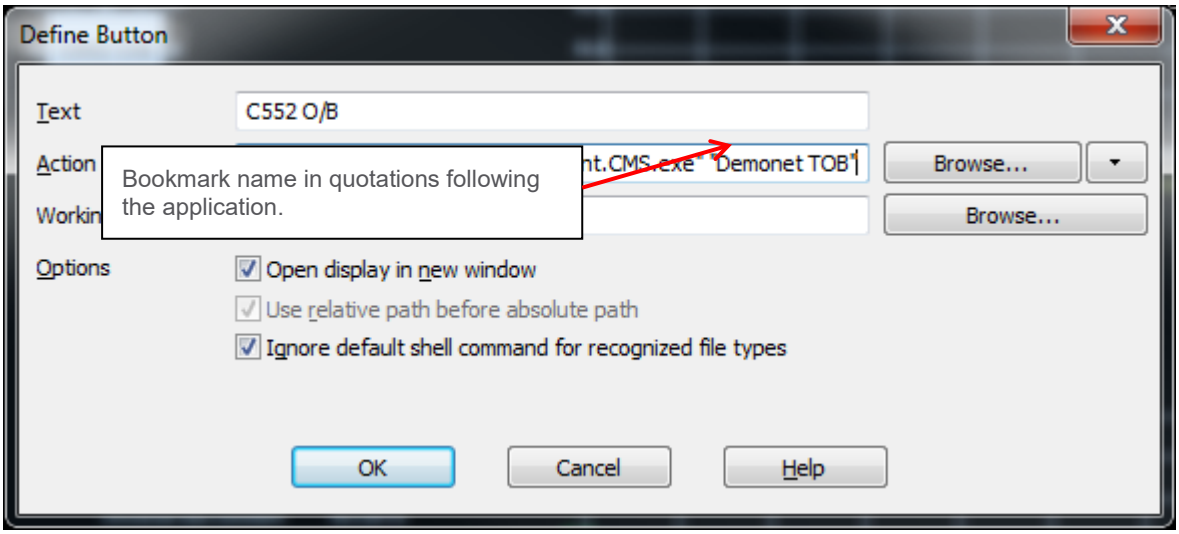
Example:

“C:\Program Files (x86)\Setpoint\CMS\Setpoint.Client.CMS.exe””\\PISERVER\Setpoint_Demo2\Minden\Unit 501\B4” “Time.StartRange=05/23/2013 12:18:16 PM” “Time.DynamicTime=05/25/2013 3:10:05 PM” “Time.EndRange=05/28/2012 2:19:42 PM”

This example navigates to Bearing 4 on Minden Unit 501 in database Setpoint_Demo2 on AF Server PISERVER. The begin time is set to 12:18:16 PM on May 23 2013, the end time is set to 2:19:42 PM on May 28 2013 and the dynamic cursor is set to 3:10:05 PM on May 25 2013.

19.1.3 Command Line Controls CMS 3.0

CMS 3.0 discontinued use of the command line controls used by CMS 2.5 and uses bookmarks instead. Creating bookmarks is much simpler than defining plots in the command line.



When you create the bookmark in CMS, navigate to the hierarchy level of the asset or points you want shown when launching CMS from the button. Open the plots you want shown and then create the bookmark. Set the bookmark name in CMS and use the same bookmark name in quotation marks when defining the button in PI ProcessBook.

19.2 Using SETPOINT CMS in Parallel with an Existing Rack

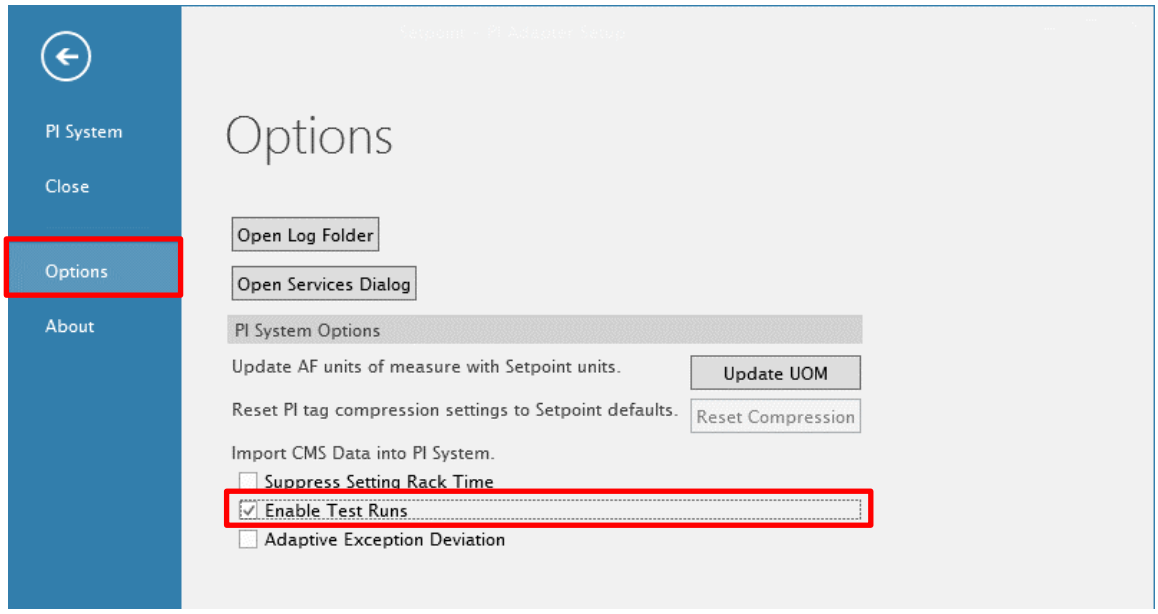
You can use the VC-8000 rack in parallel with an existing rack in order to collect condition monitoring data into SETPOINT CMS while leaving the existing machine protection system in place. Refer to the SETPOINT Machinery Protection System Operation and Maintenance manual (Document #S1079330) for information on how to set the channel inputs for connection to buffered outputs from another rack.

19.3 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 together and also allows you to assign security permissions to the various test run datasets to control access.

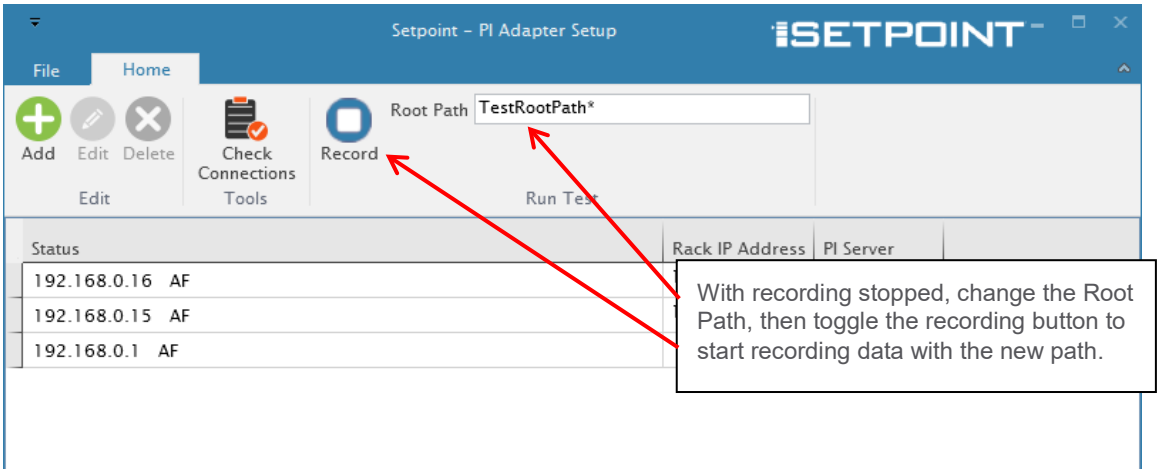
19.3.1 Enabling Test Runs

Open the SETPOINT-PI Adapter 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.



19.3.2 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.



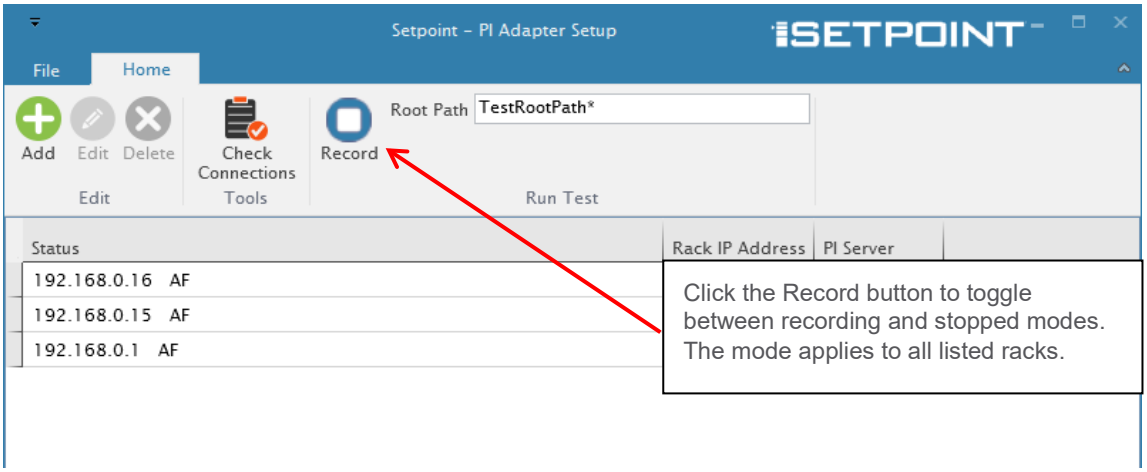
The syntax is the same as for the machine asset hierarchy.

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.

19.3.3 Starting and Stopping the Data Collection

Each time you start data collection, CMS will record a new test run event.



NOTE!

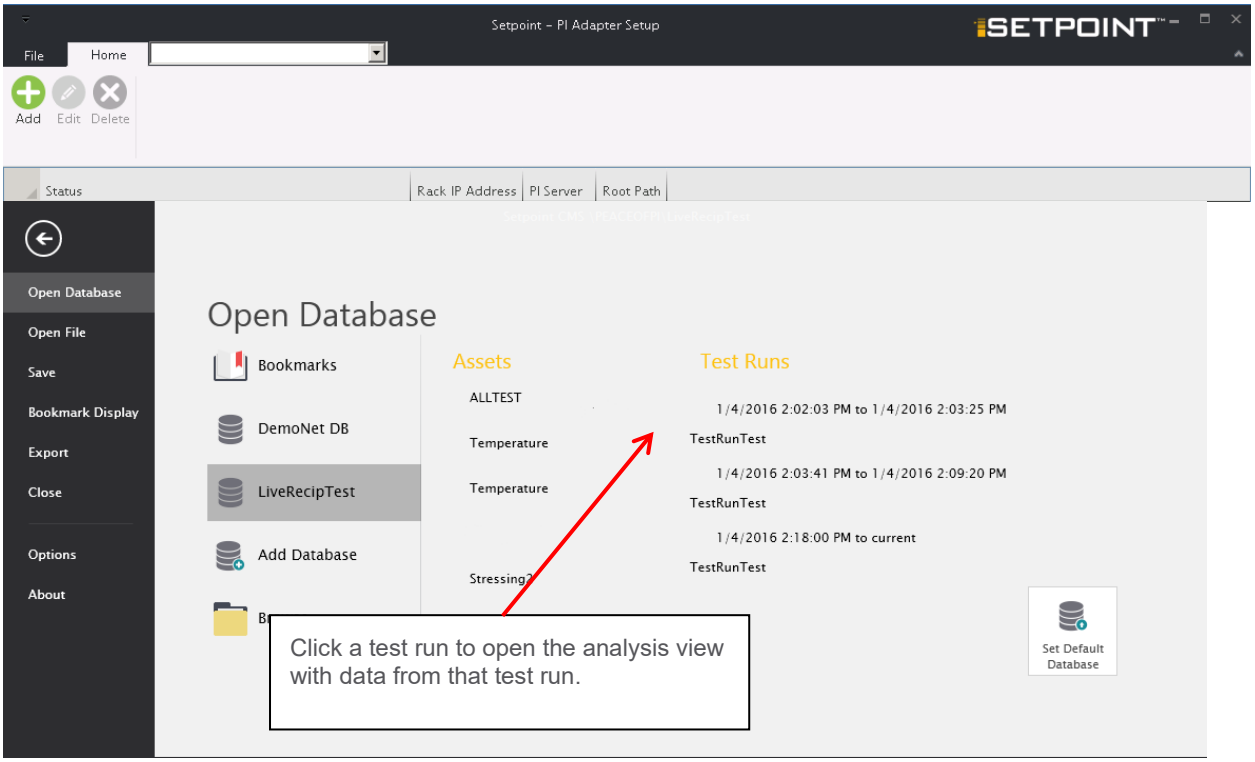
You must place an asterisk in the Root Path name and start data collection for the new Root Path to show up on the CMS home screen.

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 Send.

19.3.4 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.


Setpoint – PI Adapter Setup
SETPOINT
File
Home
Add
Edit
Delete
Status
Rack IP Address
PI Server
Root Path
Open Database
Open File
Save
Bookmark Display
Export
Close
Options
About
Open Database
Bookmarks
DemoNet DB
LiveRecipTest
Add Database
Assets
ALLTEST
Temperature
Temperature
Stressing2
Test Runs
1/4/2016 2:02:03 PM to 1/4/2016 2:03:25 PM
TestRunTest
1/4/2016 2:03:41 PM to 1/4/2016 2:09:20 PM
TestRunTest
1/4/2016 2:18:00 PM to current
TestRunTest
Set Default Database
Click a test run to open the analysis view with data from that test run.

19.4 File Extensions

Table 19: SETPOINT File Extensions

File extension	Description
.set	SETPOINT *VC-8000 Configuration + diagnostic in a single file type but can be opened by either SETPOINT maintenance or SETPOINT 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. Can span no 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 SETPOINT Setup software, diagnostic files can only be opened from the SETPOINT maintenance software.*

20 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 SETPOINT 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 SETPOINT 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 forward and reverse precessing values 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.

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Setpoint Condition Monitoring Software

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