



# Welcome to System 1

Version 21.2 [Nov 2021]



**System 1**  
Machinery Management



 **Bently Nevada**  
a Baker Hughes business

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# Welcome

Bently Nevada is pleased to present System 1 version 21.2. This release delivers brand new capabilities to the Hydro Machine Monitoring and OT/IT System Integration use cases.



## Hydro Machine Monitoring

- Air Gap Extractions



## OT/IT System Integration

- Health Status Export through OPC DA
- OPC UA Hydro Waveform Export

Users upgrading to version 21.2 will benefit from the many capability enhancements to System 1's

**Connectivity**, **Analytics**, and **Visualization** pillars, which are summarized below.

<b>Connectivity</b>		<b>Analytics</b>		<b>Visualization</b>	
	<p><b>Bently Devices</b></p> <ul style="list-style-type: none"> <li>• 3500/62 Custom Unit Support</li> <li>• Ranger Pro Device Grouping</li> <li>• 2300 Synchronous Sampling Support</li> </ul> <p><b>Interfaces</b></p> <ul style="list-style-type: none"> <li>• OPC DA           <ul style="list-style-type: none"> <li>○ Health Status Export</li> <li>○ Server Heartbeat</li> </ul> </li> <li>• OPC UA           <ul style="list-style-type: none"> <li>○ Hydro Waveforms Export</li> </ul> </li> </ul> <p><b>Data Management</b></p> <ul style="list-style-type: none"> <li>• Seamless View of Data from Multiple Archives</li> </ul>		<p><b>Core Analytics</b></p> <ul style="list-style-type: none"> <li>• Hydro Air Gap Extractions as Trended Variables</li> <li>• Spectral Band Computation Using Highest Peak</li> </ul> <p><b>Decision Support</b></p> <ul style="list-style-type: none"> <li>• Refer to Decision Support Roadmap</li> </ul>		<p><b>Plots</b></p> <ul style="list-style-type: none"> <li>• Apply User-defined Plot Sets across all Machines</li> <li>• Enhancements           <ul style="list-style-type: none"> <li>○ Add New Plot</li> <li>○ Turn off Phase Roll-over</li> </ul> </li> </ul> <p><b>Events</b></p> <ul style="list-style-type: none"> <li>• Event Filtering           <ul style="list-style-type: none"> <li>○ Time Range</li> <li>○ Event Source</li> <li>○ Activity</li> </ul> </li> </ul>

Bently Nevada remains focused on delivering the world's premier plant-wide machinery management software through bi-annual product releases. For a detailed overview of System 1, please visit the [website](#).

Thank you,

**Tarannum Sarang – System 1 Product Manager**

*On behalf of your System 1 Leadership and Development Teams*

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# 1. SYSTEM 1 V21.2 FEATURE OVERVIEW

**ALL 21.2 FEATURES ARE ONLY SUPPORTED WITH POSTGRESQL AS THE DATA HISTORIAN.**

Table 1: System 1 v21.2 – Connectivity Capabilities

Connectivity		
Bently Devices		
3500/62 Custom Unit Support	Configure custom units for points from 3500/62 Process Monitor.	3.1.1
2300 Synchronous Sampling Support	Import synchronous waveform measurement data from 2300 device.	3.1.2
Ranger Pro Device Groups	Create custom Ranger Pro device groups to aid in device management. <i>**Available with new version of Ranger Pro Plugin. Release to follow System 1 21.2**</i>	3.1.3
Interfaces		
Health Status Export through OPC DA	Export capability through OPC DA to enable health statuses (alarm and point statuses exported as Boolean tags) from System 1.	3.2.1
OPC DA Server Heartbeat	OPC DA server heartbeat export using the Heartbeat tag to indicate steady connection between OPC server and client.	3.2.2
OPC UA Hydro Waveform Export	Export Hydro Waveform data from System 1 to third party OPC UA client through the OPC UA Protocol.	3.2.3
Data Management		
Seamless View of Data from Multiple Archives	Simultaneously join data from multiple audit files and display it in a seamless view, on a single client.	3.3.1

Table 2: System 1 v21.2 – Analytics Capabilities

Analytics		
Core Analytics		
Hydro Machinery Support – Air Gap Extractions	Add a set of Air Gap extractions as Trended Variables.	4.1.1
Spectral Band Computation Using Highest Peak	Add Spectral band based on the computation using either the Highest Peak or Energy. System 1 also allows users to add Overall Spectral measurement.	4.1.2
Decision Support		
Decision Support	Refer to the Decision Support Roadmap for more details.	-

Table 3: System 1 v21.2 – Visualization Capabilities

Visualization		
Plots		
Apply User-defined Plot Sets across all Machines	Apply user-defined plot sets across all machines from the Defined Plot Sets, Save Plot Sets, and Manage Plot Sets dialog box.	5.1.1
Plot Enhancements	Enable plot view customization by providing the Add New Plot option button in the Plot Title Bar to add new plot of the same plot type.  User preference to turn off Phase Roll-Over for vector measurements on Trend and Bode Plot.	5.1.2
Events		
Event Filtering	Filter Events within the Events workspace by Time Range, Activity, and Event Source.	5.2.1

## 2. VERSION SUPPORT & OPERATING SYSTEM COMPATIBILITY

System 1 follows a semi-annual release cadence with targeted releases in May and November of each year. Versions are fully supported for a minimum of two years from the published date of availability (Table 4).

New Versions of System 1 benefit from:

- Compatibility with the latest Microsoft Client & Server Operating Systems
- Client backwards compatibility to previous versions under support (21.2 Client to 20.1 Server DB)
- Database upgrade from previous versions released within last 3 years (19.1→21.2)
- Security patch and update testing for the latest available version
- Bug fixes included in the latest available version
- Standard technical support with escalation to engineering as required

Versions no longer supported:

- Standard support is provided for common FAQ type questions, but users are encouraged to update software to latest version to benefit from new features, OS compatibility, and bug fixes.

Table 4: System 1 Version Support & OS Compatibility Matrix

System 1 Versions & Support			Windows Server OS					Windows Client OS (64bit)		
Version	Available	End of Support	2019	2016	2012 R2	2012	2008 R2	10**	8.1 UI	7 SP1
21.2	Nov 2021	Nov 2023	✓	✓	✓			✓	✓	
21.1	May 2021	May 2023	✓	✓	✓			✓	✓	
20.2	Nov 2020	Nov 2022	✓	✓	✓			✓	✓	
20.1	May 2020	May 2022	✓	✓	✓	✓		✓	✓	
19.2	Nov 2019	Nov 2021	✓	✓	✓	✓	✓	✓	✓	✓
19.1	May 2019	May 2021	✓	✓	✓	✓	✓	✓	✓	✓

\*\*Windows 10 version compatibility will track Microsoft’s published release and support model. System 1 will be tested and supported on all versions of Windows 10 under support at the time of release.

System 1 v21.2 (Windows 10 v21H1, v20H2, 2004)

System 1 v21.1 (Windows 10 v20H2, 2004, 1909)

System 1 v20.2 (Windows 10 v1903, 1909, 2004)

System 1 v20.1 (Windows 10 v1903, 1809, 1803)

System 1 v19.2 (Windows 10 v1903, 1809, 1803)

System 1 v19.1 (Windows 10 v1809, 1803)

# 3. CONNECTIVITY

## 3.1 Bently Devices

### 3.1.1 3500/62 Custom Unit Support

General Enhancement video located in Bently Nevada Tech Support Training Library  
[Valid M&S Agreement Required](#)

Prior to System 1 v21.2, custom units configured for 3500/62 Process Variable Monitor were imported as unknown and read-only.

With System 1 v21.2, users can configure the custom units from System 1 configuration for these Process Variable points (Figure 3-1 and Figure 3-2). Users can also replace these custom units with any standard unit available in System 1. The units configured in System 1 for the Process Variable points will then be exhibited in the Display environment i.e., Status List view, Bar graph, Plots, etc.

Name	Channel	Channel Type	Measurement	Active	Active in...	Top Scale	Bottom Scale	Unit	Clamp Value
Process Variable Channel	1	Process Variable Channel	Process Variable	✓	✓	20.0 Unknown	4.0 Unknown	Unknown	4.0 Unknown

Figure 3-1: Process Variable Imported with Custom Unit Showing "Unknown"

Name	Channel	Channel Type	Measurement	Active	Active in...	Top Scale	Bottom Scale	Unit	Clamp Value
Process Variable Channel	1	Process Variable Channel	Process Variable	✓	✓	20.0 Unknown	4.0 Unknown	<input type="text"/>	4.0 Unknown

**Add Custom Unit** [?] [X]

Name:

Description:

Figure 3-2: Edit the Custom Unit

Points		Spectrums & Waveforms		Trended Variables		Setpoints			
Name	Channel	Channel Type	Measurement	Active	Active in...	Top Scale	Bottom Scale	Unit	Clamp Value
Process Variable Channel	1	Process Variable Channel	Process Variable	✓	✓	20.0 Pascal	4.0 Pascal	Pascal	4.0 Pascal

Figure 3-3: Custom Units Displayed for Process Variable

### 3.1.2 2300 Synchronous Sampling Support

2300 Enhancements video located in [Bently Nevada Tech Support Training Library](#)

[Valid M&S Agreement Required](#)

System 1 v21.2 now enables users to import Synchronous Waveform measurements data from a 2300 device. Users need to add Synchronous Waveform and nX measurements to the following input channels under the 2300 device (Firmware version 3.3) in the BNMC version 6.6:

- Acceleration channel
- Velocity channel
- Radio Vibration channel

Points		Spectrums & Waveforms		Trended Variables		Setpoints					
Name	C...	...	Measurement	Sampling Type	Unit	Active	Type	Fmax	Sample Rate	Samples per Rev	Num of Rev
Acceleration Channel 1	1	...	Demod Wf(2000Hz)	Async	g	✓	Waveform	2000 Hz	5,120 Hz	-	-
Acceleration Channel 1	1	...	Accl Wf(256X/32revs).Magnetic Pickup Speed Channel	Sync	g	✓	Waveform	100 X	-	256	32

Figure 3-4: Spectrums & Waveforms Tab Showing Sync Measurement

### 3.1.3 Ranger Pro Device Groups

Ranger Pro Enhancement video located in [Bently Nevada Tech Support Training Library](#)

[Valid M&S Agreement Required](#)

*\*\*Available with new version of Ranger Pro Plugin. Release to follow System 1 21.2\*\**

System 1 v21.2 now enables users to create custom device groups within Ranger Pro gateways. Users can add device groups by right clicking a connected gateway and selecting "Add Device Group" (Figure 3-5). Users can then drag and drop Ranger Pro devices from the same gateway into device groups (Figure 3-6). Grouping related devices together helps users to better manage large numbers of devices. Users can group devices that are monitoring the same machine or machine train, which helps to quickly view only the channels and measurements of those devices in System 1. The ability to filter using these groups greatly improves the performance of System 1 workspaces, as less information is loaded to generate the views (Figures 3-7 and 3-8).

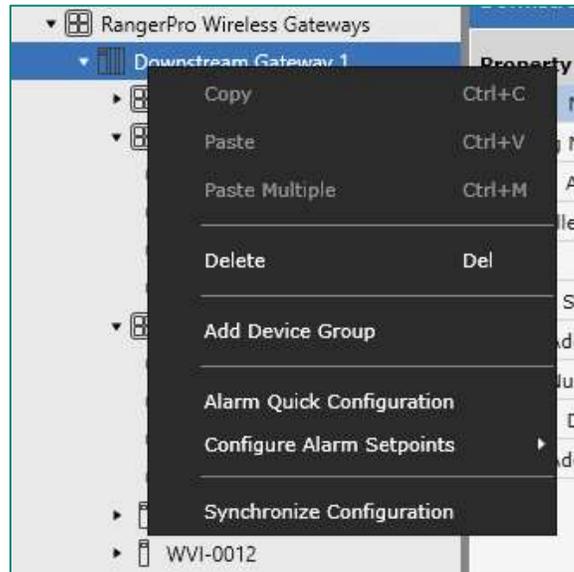


Figure 3-5: New "Add Device Group" Context-Menu Option for Ranger Pro Gateways

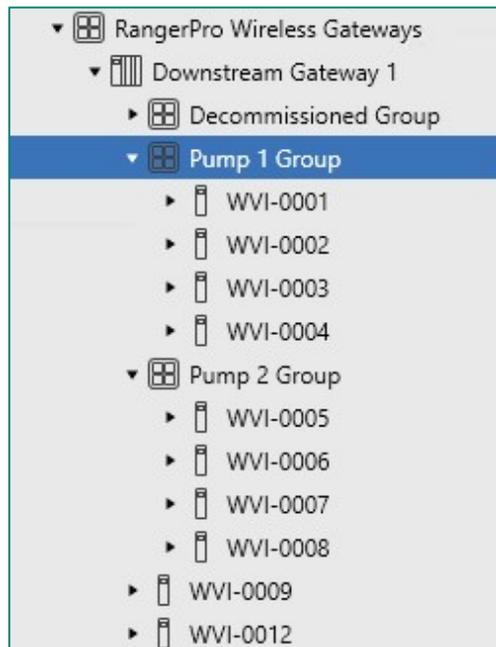


Figure 3-6: Ranger Pro Devices Nested Under Device Groups

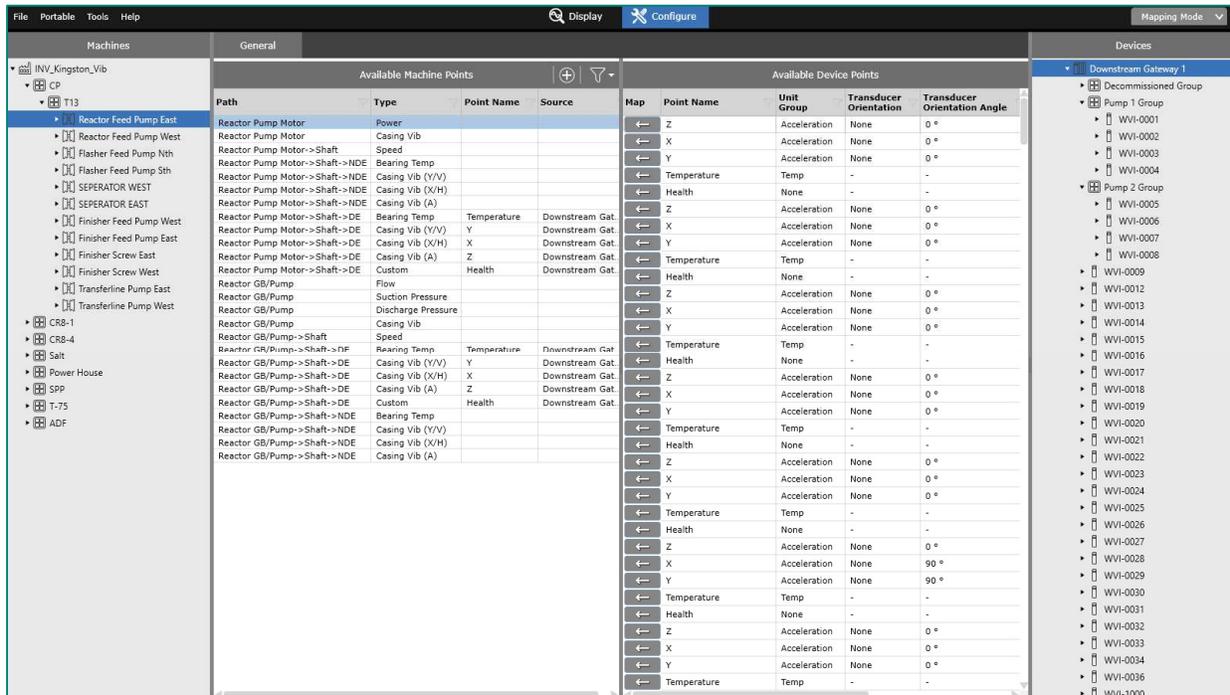


Figure 3-7: System 1 Mapping Mode with Gateway Selection

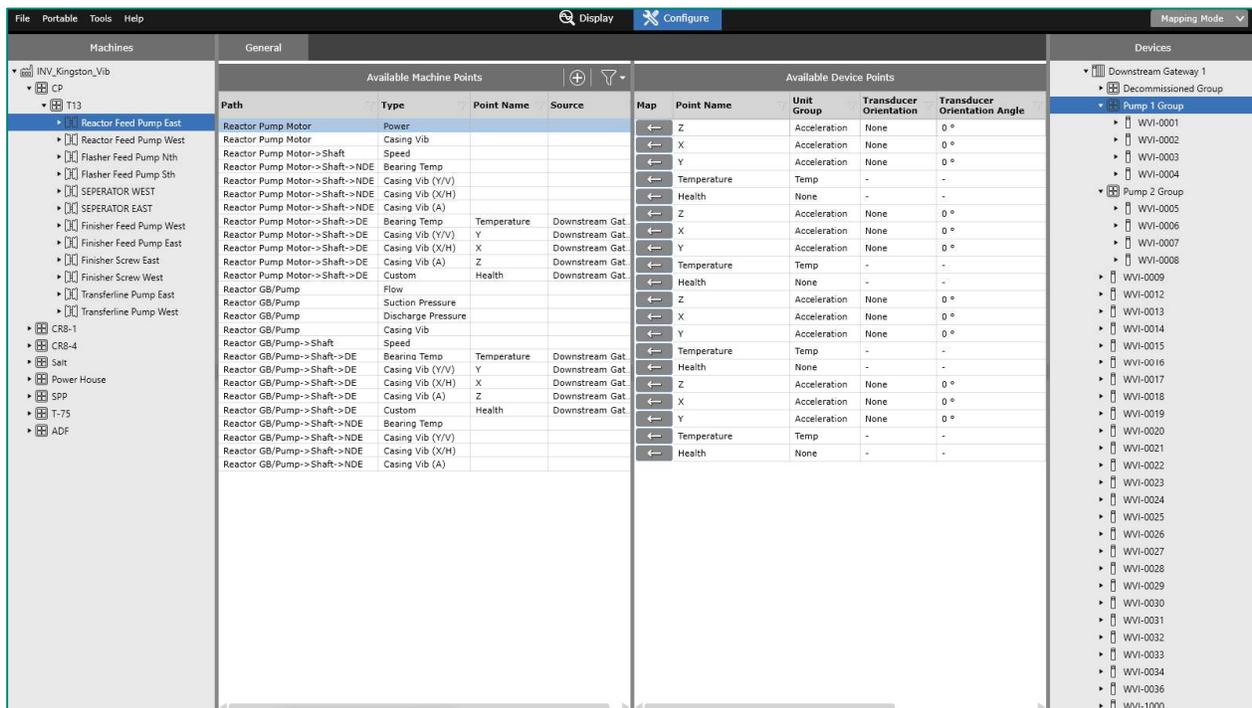


Figure 3-8: System 1 Mapping Mode with Device Group Selection

## 3.2 Interfaces

### 3.2.1 Health Status Export through OPC DA

Data Export Enhancements video located in Bently Nevada Tech Support Training Library  
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System 1 now extends the export capability through OPC DA to enable export of Health Statuses. These Health Statuses include alarm and point statuses exported as Boolean tags.

This Health Status information exported through OPC DA can be further fed to the DCS system. The figure below (Figure 3-9) shows the list of health statuses that System 1 exports.

Health Status Name	Health Status Type
Inactive	Alarm Status
Condition Monitoring Alarm	Alarm Status
New Alarm Status	Alarm Status
New Condition Monitoring Alarm	Alarm Status
New Protection Alarm	Alarm Status
No Data	Alarm Status
Not Ok	Alarm Status
Alarm Ok	Alarm Status
Protection Alert Alarm	Alarm Status
Protection Danger Alarm	Alarm Status
Alarm Latch	Alarm Status
Transient Mode	Point Status
Trip Multiply	Point Status
Alert Bypass	Point Status
Bypass	Point Status
Danger Bypass	Point Status
New Point Status	Point Status
Drive Rack Not OK Relay - Key switch change	Miscellaneous Status
Program Mode Enabled	Miscellaneous Status

Figure 3-9: Health Status Tags Exported over OPC DA Server

Item ID	Data Type	Value	Timestamp	Quality
Generic Refinery(1)/Train 401 A1/RV11_X/0.08 X - 1.2 X/Status(10714)/Inactive(529)	Float	1	17:31:16.594	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/Alarm Latch(754)	Float	0	16:49:34.843	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/Alarm Ok(544)	Float	0	19:07:33.391	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/Condition Monitoring Alarm(533)	Float	1	19:07:33.391	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/Inactive(529)	Float	0	16:49:34.843	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/New Alarm Status(664)	Float	0	19:09:11.839	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/New Condition Monitoring Alarm(662)	Float	0	19:08:50.793	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/New Protection Alarm(663)	Float	0	19:09:11.839	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/No Data(528)	Float	1	23:55:36.002	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/Not OK(530)	Float	0	17:01:46.747	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/Protection Alert Alarm(531)	Float	1	19:07:36.407	Good
Generic Refinery(1)/Train 401 A1/RV11_X/Direct/Status(4560)/Protection Danger Alarm(532)	Float	1	19:07:36.407	Good

Figure 3-10: Health Status Tags in OPC DA Client

### 3.2.2 OPC DA Server Heartbeat

System 1 OPC DA Server supports the export of OPC DA Server Heartbeat, which indicates steady OPC connection between OPC server and client using the Heartbeat tag. The OPC Heartbeat tag is a simple counter that goes from value 1 to 10 in steps of 1 per second, then resets back to value 1.

Users need to monitor this tag in the OPC client to detect failure of OPC connection between the OPC server and client.

Item ID	Data Type	Value	Timestamp	Quality
Z84-37_win2016(10.5.153.180)/Heartbeat	Float	1	00:15:21.656	Good

Figure 3-11: Heartbeat Tag in OPC DA Client

### 3.2.3 OPC UA Hydro Waveform Export

System 1 v21.2 now supports export of Hydro Air Gap and Multimode Hydro Air Gap waveforms from a 3500/46M device mapped to a Hydro Machinery through System 1 OPC UA Protocol.

After the OPC UA server configuration is complete, System 1 begins exporting waveforms at 10-minute intervals or the device storage rate intervals (NOTE: Each OPC UA client can further regulate the dynamic data subscription rate). The data is exported with a set of data properties, such as Unit, Data Status, Node Status, and RPM (Figure 3-12) that can be utilized to define the dynamic sample in external systems.

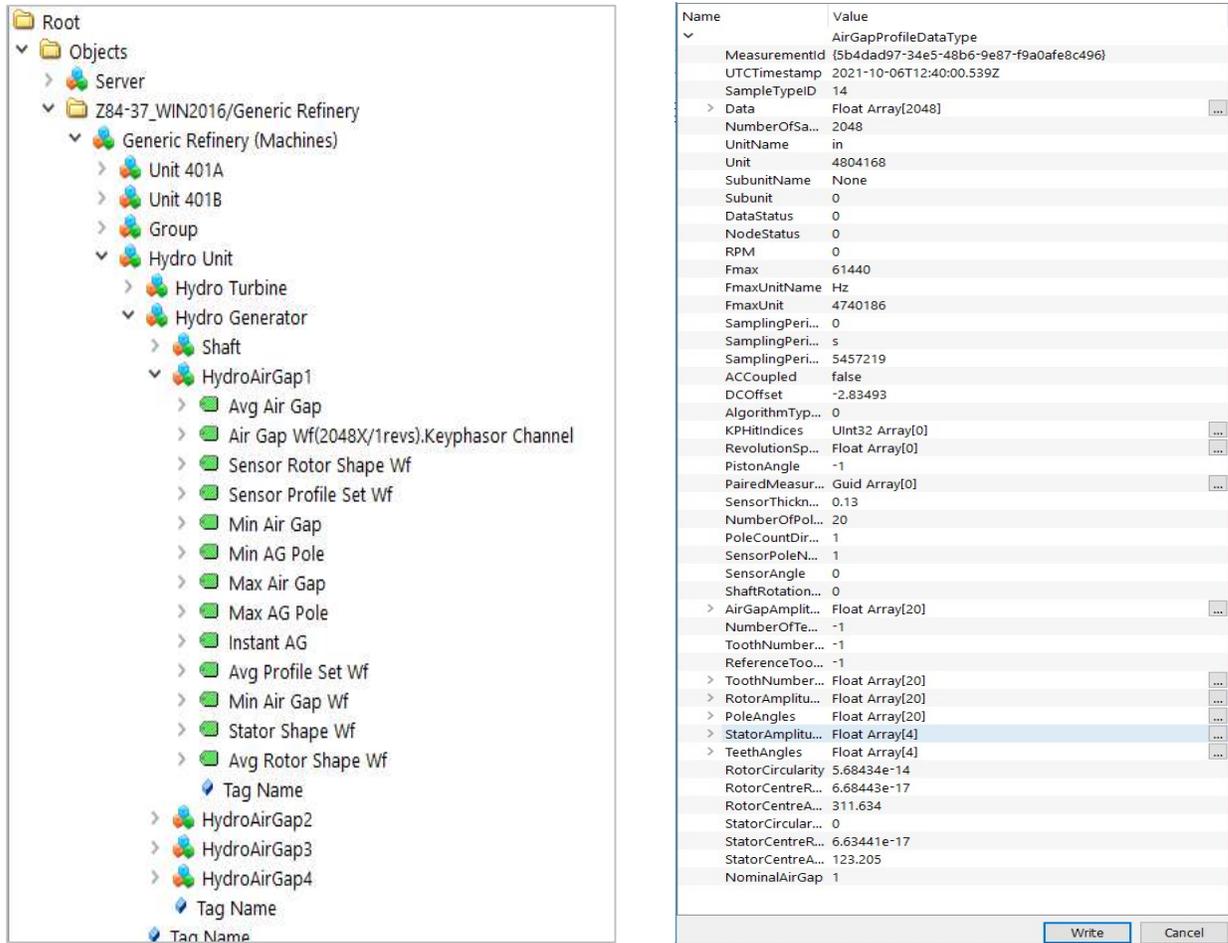


Figure 3-12: OPC UA Client Hierarchy & Data Sample after Subscription

The format of the exported waveforms and its derived extractions is described in the figure below (Figure 3-13):

Property	Description
MeasurementId	Unique ID for the measurement (System 1 GUID)
UTCTimestamp	Spectrum/waveform time stamp in UTC format
Data	Raw data samples from Device
NumberOfSamples	Total number of waveform samples (e.g., 1024, 2048)
Fmax	FMax for the spectrum or waveform
RPM	Speed for the spectrum or waveform
SampleTypeID	Synchronous or Asynchronous
UnitName	Name of the spectrum/waveform Unit (e.g., mil, um)
Unit	OPC UA code for the Unit (OPC Foundation code)
SubunitName	Name of the spectrum Subunit (pk, rms, pp)

Subunit	OPC UA code for Subunit (OPC Foundation code)
Samplingperiod Unit	Delta time between two data values in a waveform
ACCCoupled	Waveform AC Coupled (True or False)
DC Offset	DC Offset value
DataStatus	OPC UA code for the Data Status (OPC Foundation code)
NodeStatus	OPC UA code for the Node Status (OPC Foundation code)
AlgorithmTypeID	[Future] Applied algorithm type (e.g., Enveloping, Averaging)
KPHitIndices	Sample on which KPH hits occurred
RevolutionSpeeds	Speed in rpm for each revolution
PistonAngle	Piston angle for reciprocating compressor waveforms
PairedMeasurementIDs	Paired channel ID -X or Y (System 1 GUID)
NumberOfPoles	Number of Poles on the Rotor
PoleCountDirection	Ascending or Descending as the number of poles pass a reference point
SensorPoleNumber	Pole that is directly in front of the air gap probe
SensorAngle	Angle at which sensors are mounted with respect to reference plane
ShaftRotationDirection	Angular rotation direction of the Shaft for Hydro Units
AirGapAmplitudes	Air Gap Amplitude data values
NumberOfTeeth	Number of Teeth on the Stator
ToothNumberingDirection	Direction that the tooth numbering increases around the Stator
ReferenceToothNumber	Tooth on the Stator that is aligned in the same direction as the reference point
ToothNumberForPoles	Tooth on the Stator that is aligned in the same direction as the reference point
Nominal Air Gap	Designed Air Gap
RotorAmplitudes	Rotor Amplitude data samples
PoleAngles	Calculated Pole angle values
StatorAmplitudes	Stator Amplitude data samples
TeethAngles	Calculated Tooth angle values
RotorCircularity	Calculated value of ellipticity or out-of-roundness of the rotor
RotorConcentricityAmp	Calculated distance between the current location and defined location of the rotor center
RotorConcentricityAngle	Calculated angle between the current location and defined location of the rotor center
StatorCircularity	Calculated value of ellipticity or Out-of-roundness of the stator

StatorConcentricityAmp	Calculated distance between the current location and defined location of the stator center
StatorConcentricityAngle	Calculated angle between the current location and defined location of the stator center
RotorStatorCircularity	Calculated value of ellipticity or Out-of-roundness of the rotor or the stator
RotorStatorConcentricityAmp	Calculated distance between the current location and defined location of the rotor or the stator center
RotorStatorConcentricityAngle	Calculated angle between the current location and defined location of the rotor or the stator center
AirGapShapeAmplitudes	Air Gap Shape Amplitude data samples
AirGapShapeAngles	Air Gap Shape Angle corresponding to the Amplitude data samples

Figure 3-13: OPC UA Data Properties for Hydro Waveform

## 3.3 Database Management

### 3.3.1 Seamless View of Data from Multiple Archives

[Audit Files Enhancement video located in Bently Nevada Tech Support Training Library](#)  
[Valid M&S Agreement Required](#)

System 1 v21.2 allows users to join data from multiple audit files and display it in a seamless view, on a single client. The audit files must belong to the same database. Users can choose to attach audit files to the database or another audit file. To create a seamless view, users need to follow the below steps:

1. Select the Display workspace
2. In the Machines or Devices hierarchy pane, select and right-click the Database node
3. Choose Data Management > Attach Audit File (Figure 3-14)

The Windows Open dialog box is displayed.

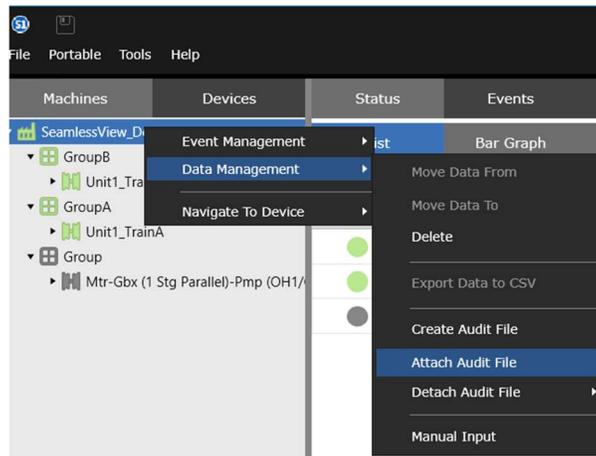


Figure 3-14: Attach Audit File

Navigate to the directory where the machine audit file is stored and select the file to attach it either to a database or an audit file.

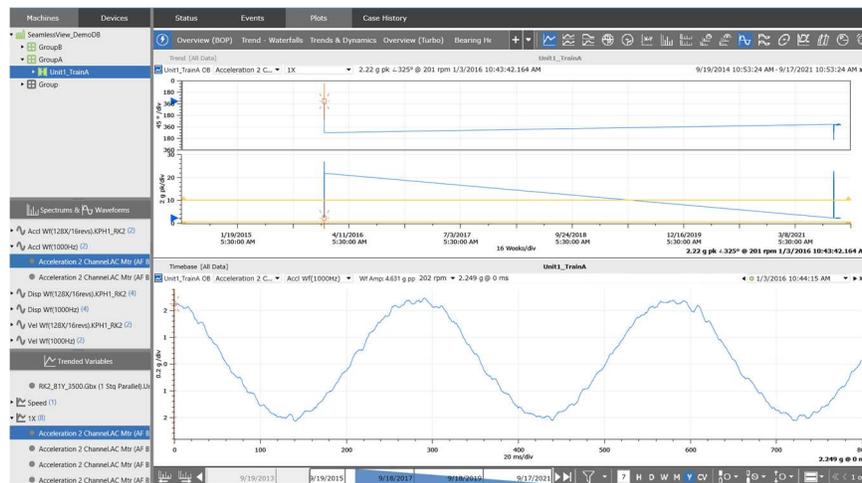


Figure 3-15: Data from Older Audit File is Stitched with Existing Database Data on Plots Seamlessly

If users no longer want to view data from attached audit file(s), they can detach an audit file using below steps:

1. Select the Display workspace
2. In the Machines or Devices hierarchy pane, select and right-click on Database node
3. Choose Data Management > Detach Audit File
4. Choose an audit file to detach (Figure 3-16)

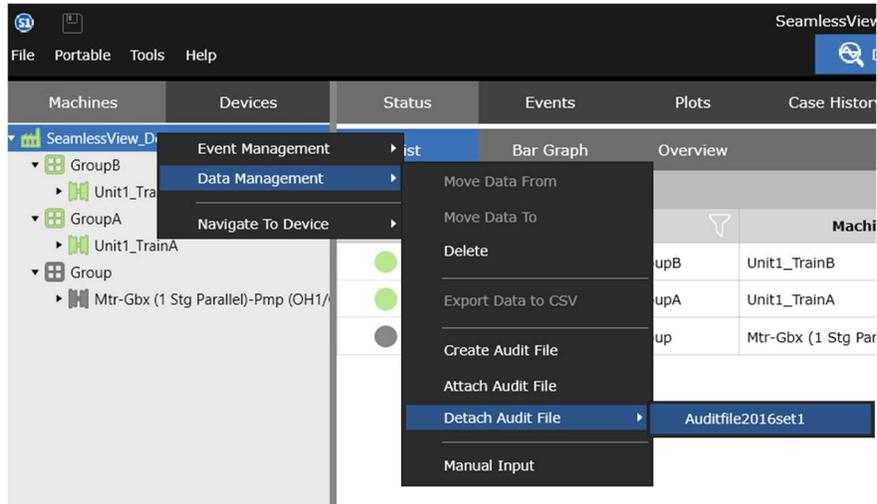


Figure 3-16: Detach Audit File

# 4. ANALYTICS

## 4.1 Core Analytics

### 4.1.1 Hydro Machinery Support – Air Gap Extractions

Hydro Machinery Support video located in Bently Nevada Tech Support Training Library  
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System 1 provides the ability to add a set of Air Gap extractions as Trended Variables (Figure 4-1). The extractions are derived from the Average Air Gap Waveform and calculated in accordance with CEATI International guidelines. User can configure these Air Gap extractions for both upper and lower planes of the hydro generator to monitor changes in Air Gap, including Rotor and Stator Circularity and Concentricity. These Trended Variables are historized and available for trend plots, software alarms, and reports in System 1. They can also be exported through standard OPC protocols for analytical purposes, including rule development in Decision Support.

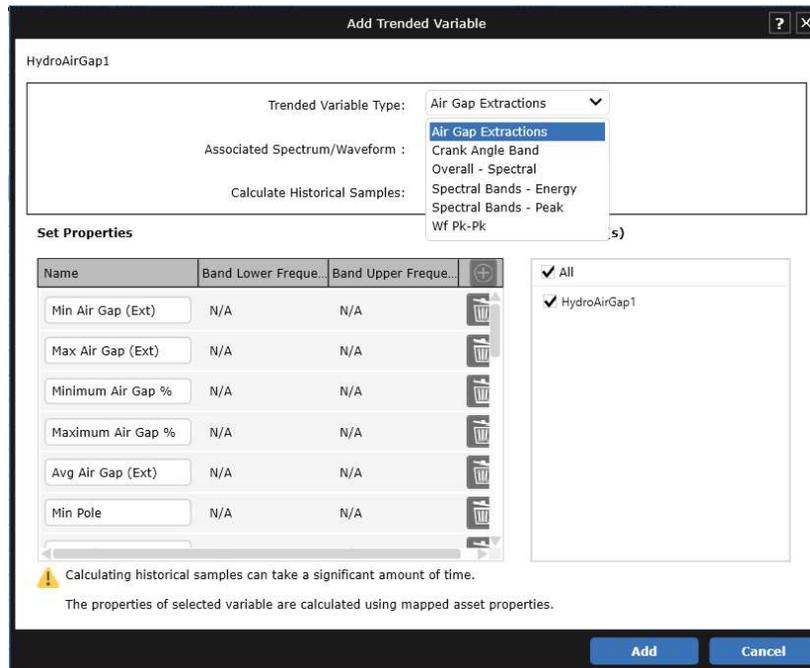


Figure 4-1: Air Gap Extractions as Trended Variables

Machine Name	Name	Channel	Channel Type	Measurement	Active	Active In...	Top Scale	Bottom Scale	Unit	Clamp Value	Associated Wf/Spec
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Avg Air Gap	✓	✓	2.0 in	0.0 in	in	0.0 in	-
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Min Air Gap	✓	✓	2.0 in	0.0 in	in	0.0 in	-
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Min AC Pole	✓	✓	20.0 Poles	1.0 Poles	Poles	1.0 Poles	-
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Max Air Gap	✓	✓	2.0 in	0.0 in	in	0.0 in	-
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Max AC Pole	✓	✓	20.0 Poles	1.0 Poles	Poles	1.0 Poles	-
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Instant AG	✓	✓	2.0 in	0.0 in	in	0.0 in	-
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Min Air Gap (Ext)	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Max Air Gap (Ext)	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Minimum Air Gap %	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Maximum Air Gap %	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Avg Air Gap (Ext)	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Min Pole	✓	✓	20.0 Poles	1.0 Poles	Poles	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Max Pole	✓	✓	20.0 Poles	1.0 Poles	Poles	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Min Tooth	✓	✓	1.0 Teeth	1.0 Teeth	Teeth	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Max Tooth	✓	✓	1.0 Teeth	1.0 Teeth	Teeth	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Stator Circularity	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Stator Circularity %	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Rotor Circularity	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Rotor Circularity %	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Stator Circularity (Avg of Both Planes)	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Stator Circularity % (Avg of Both Planes)	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Rotor Circularity (Avg of Both Planes)	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Rotor Circularity % (Avg of Both Planes)	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Stator Concentricity	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Stator Concentricity %	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Rotor Concentricity	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Rotor Concentricity %	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Stator Concentricity (Avg of Both Planes)	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Stator Concentricity % (Avg of Both Planes)	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Rotor Concentricity (Avg of Both Planes)	✓	✓	2.0 in	0.0 in	in	-	Avg Profile Set Wf
Hydro Generator	HydroAirGap1	1	Hydro Air Gap Channel	Rotor Concentricity % (Avg of Both Planes)	✓	✓	100.0 %	0.0 %	%	-	Avg Profile Set Wf

Figure 4-2: List of Air Gap Extractions

### 4.1.2 Spectral Band Computation Using Highest Peak

Peak Band Extraction video located in Bently Nevada Tech Support Training Library  
[Valid M&S Agreement Required](#)

System 1 v21.2 now enables users to add trended variable types, Overall – Spectral and Spectral Bands – Peak, in addition to the existing variable type, Spectral Bands – Energy (earlier known as Spectral Bands). These trended variable types are available on all devices.

1. Overall – Spectral: Spectrum Overall displays the root mean square (RMS) value for FFT calculation

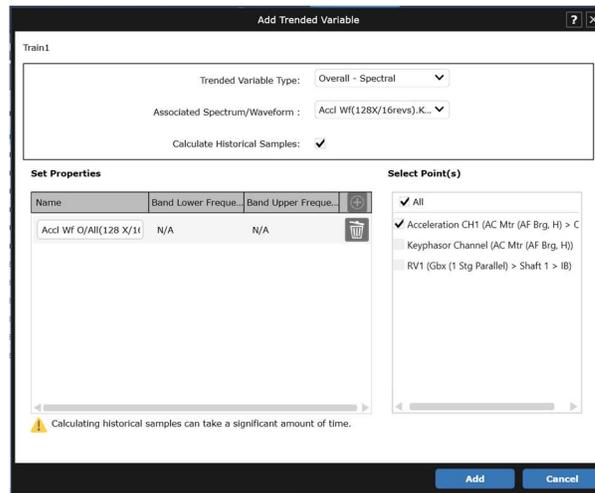


Figure 4-3: Add Overall – Energy from Add Trended Variable Dialog

2. Spectral Bands - Peak: Users need to choose the spectrum/waveform measurement that they want associated with the trended variable. Then, configure the band lower and upper frequencies for the range that is needed for calculating spectral band using highest peak.

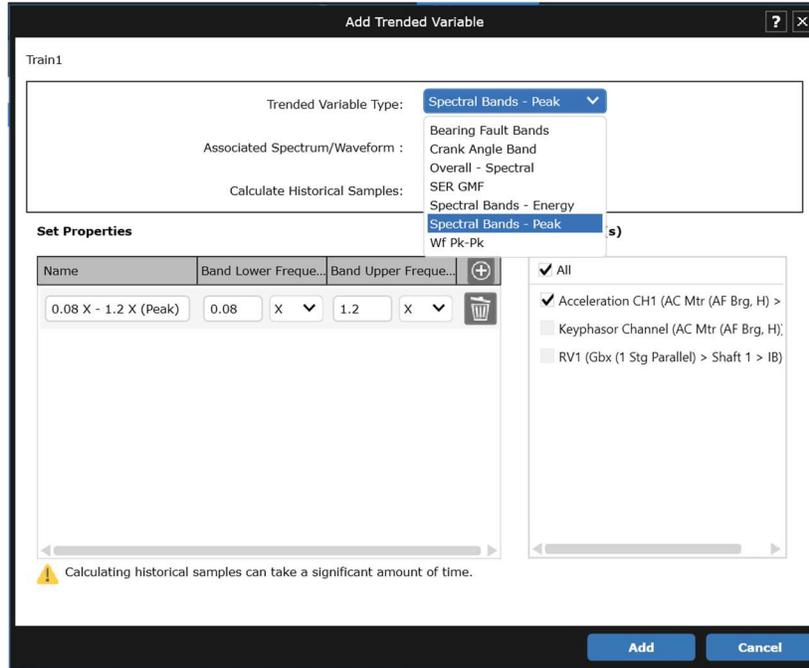


Figure 4-4: Add Spectral Bands – Peak from Add Trended Variable Dialog

System 1 v21.2 shows a Band Computation column in the Trended Variables tab, which shows whether Spectral band computation is performed using Energy or Highest Peak.

Machine Name	Name	Channel	Channel Type	Measurement	Active	Active in...	Integrated	Band Lower...	Band Upper...	Band Com...
AC Mtr (AF Brg, H)	Acceleration CH1	3	Acceleration Channel	0.08 X - 1.2 X (Peak)	✓	-	-	0.08 X	1.2 X	Peak
Gbx (1 Stg Parallel)	RV1	1	Radial Vibration Channel	0.08 X - 1.2 X (Peak)	✓	-	-	0.08 X	1.2 X	Peak
AC Mtr (AF Brg, H)	Acceleration CH1	3	Acceleration Channel	120 Hz - 600 Hz (Peak)	✓	-	-	120.0 Hz	600.0 Hz	Peak
Gbx (1 Stg Parallel)	RV1	1	Radial Vibration Channel	1X	✓	✓	-	-	-	-
AC Mtr (AF Brg, H)	Acceleration CH1	3	Acceleration Channel	2 X - 3 X (Peak)	✓	-	-	2.0 X	3.0 X	Peak
AC Mtr (AF Brg, H)	Acceleration CH1	3	Acceleration Channel	2 X - 3 X (Peak)	✓	-	-	2.0 X	3.0 X	Peak
Gbx (1 Stg Parallel)	RV1	1	Radial Vibration Channel	2X	✓	✓	-	-	-	-
AC Mtr (AF Brg, H)	Acceleration CH1	3	Acceleration Channel	5 X - 10 X	✓	-	-	5.0 X	10.0 X	Energy
AC Mtr (AF Brg, H)	Acceleration CH1	3	Acceleration Channel	Accl Wf O/All(1000 Hz)	✓	-	-	-	-	-
AC Mtr (AF Brg, H)	Acceleration CH1	3	Acceleration Channel	Accl Wf O/All(128 X/16 revs)	✓	-	-	-	-	-

Figure 4-5: Band Computation Column in Trended Variables Tab

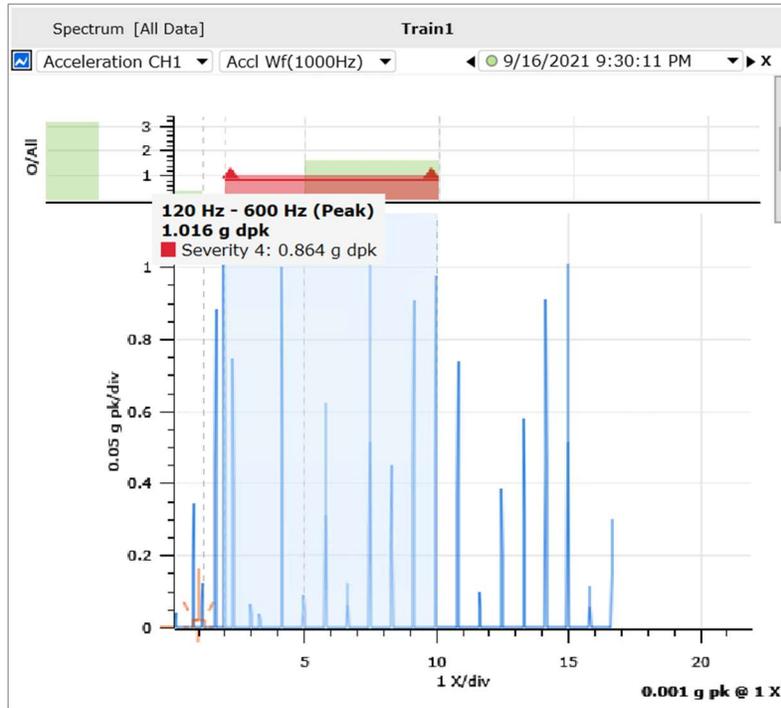


Figure 4-6: Spectral Bands and Overall Displays in Spectrum Plot

## 5. VISUALIZATION

### 5.1 Plots

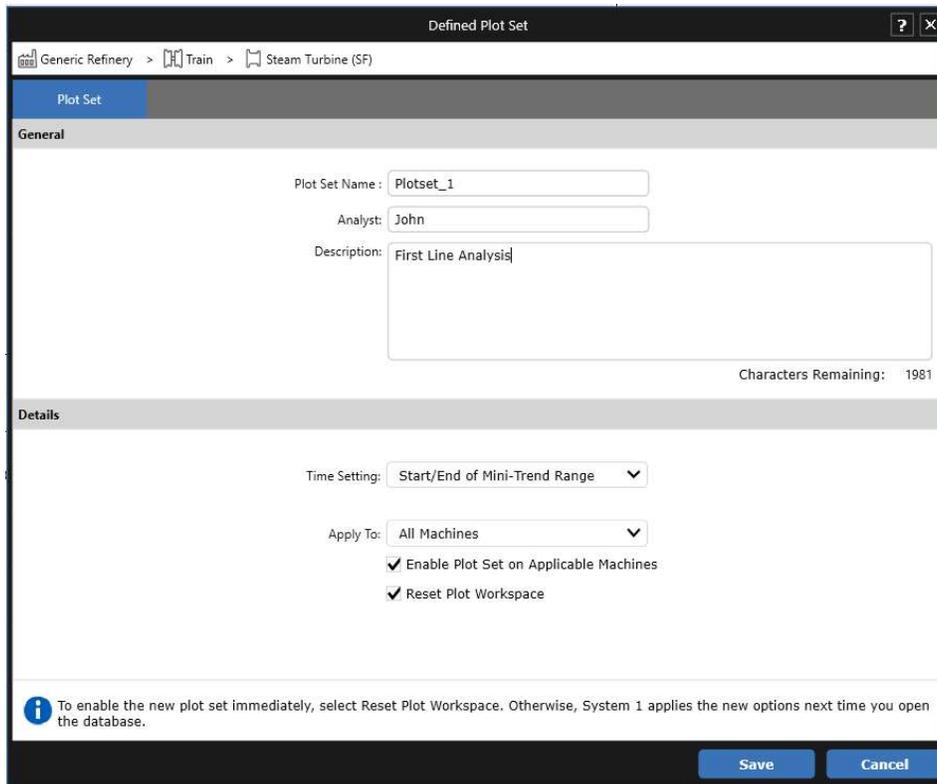
Plot Enhancements video located in Bently Nevada Tech Support Training Library

[Valid M&S Agreement Required](#)

#### 5.1.1 Apply User-defined Plot Sets across all Machines

System 1 now enables users to apply user-defined plot sets across all machines from the Defined Plot Sets, Save Plot Sets, and Manage Plot Sets dialog box.

This capability allows users to create global database-level plot sets and then apply them across all machines using the "Apply to All Machines" option (Figure 5-1). This option is helpful if the machines within the database are not created from same templates but rather individually configured.



Generic Refinery > Train > Steam Turbine (SF)

Plot Set

**General**

Plot Set Name: Plotset\_1

Analyst: John

Description: First Line Analysis

Characters Remaining: 1981

**Details**

Time Setting: Start/End of Mini-Trend Range

Apply To: All Machines

- Enable Plot Set on Applicable Machines
- Reset Plot Workspace

To enable the new plot set immediately, select Reset Plot Workspace. Otherwise, System 1 applies the new options next time you open the database.

Save Cancel

Figure 5-1: Define Plot Sets for All Machines

From the Manage Plot Sessions dialog box (Figure 5-2), users can rearrange the user-defined Plot Sets and choose to "Apply to All Machines", which creates the same Plot Set order for all machines within the database.

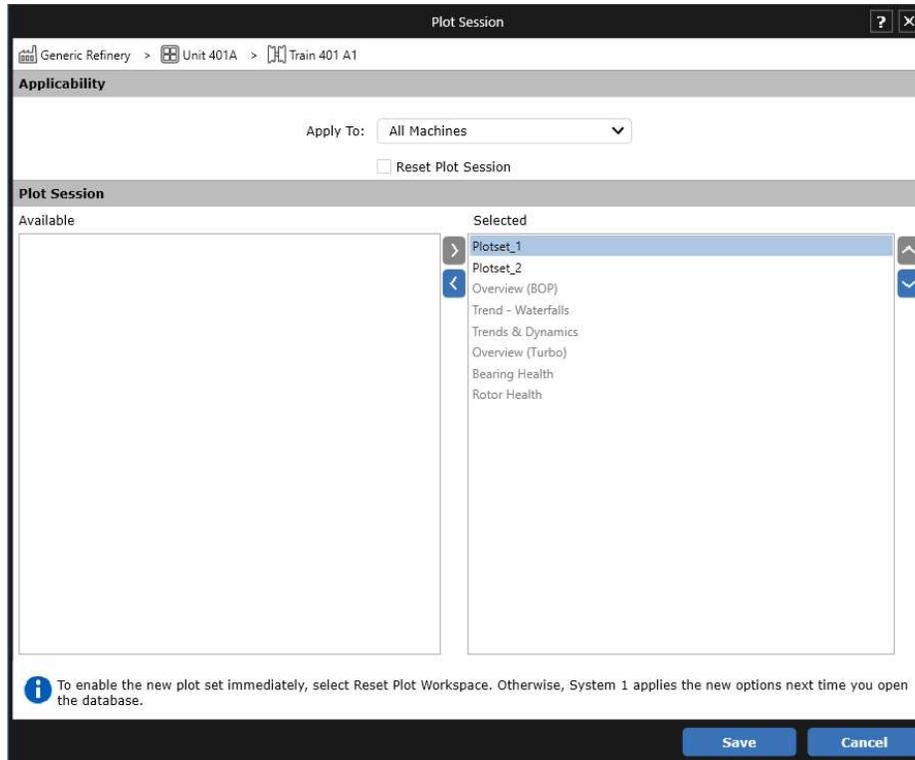


Figure 5-2: Manage Plots Sets for All Machines

## 5.1.2 Plot Enhancements

### 5.1.2.1 Add New Plot

System 1 now supports plot view customization by providing the Add New Plot button in the Plot Title Bar (Figure 5-3). This button generates a new Plot of the same Plot type and users can add measurements to that Plot from the Add Measurement dialog.

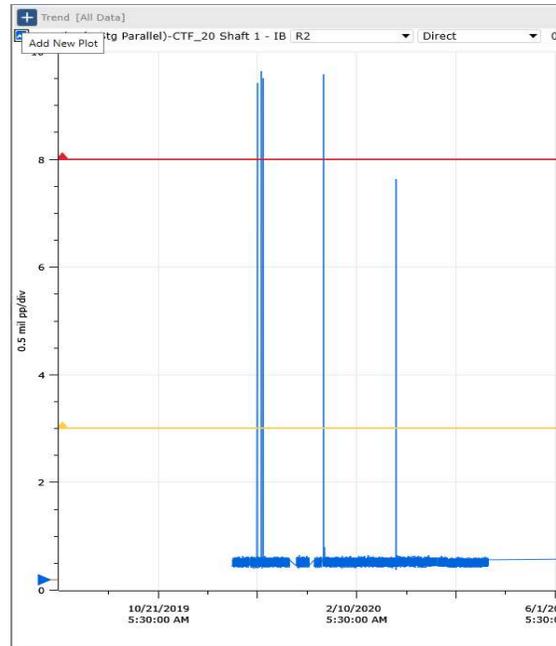


Figure 5-3: Add New Plot

### 5.1.2.2 Turn off Phase Roll-Over

System 1 now allows users to disable Phase Roll-Over on the Trend and Bode Plots from the Preferences window. This helps to lock the Phase scale at 0-359 when analyzing two ends of rotor to find mode shape (Figure 5-4).

Phase Roll-Over is turned on by default. When turned on, Phase is displayed continuously in an unwrapped form (Figure 5-5).

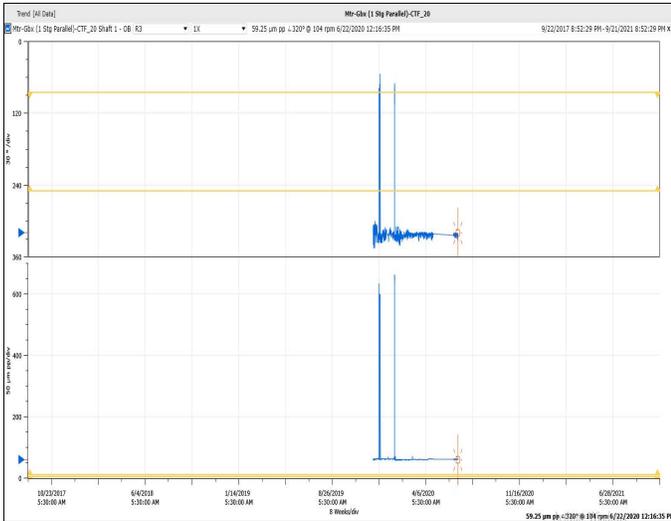


Figure 5-4: Phase Roll-Over Turned Off

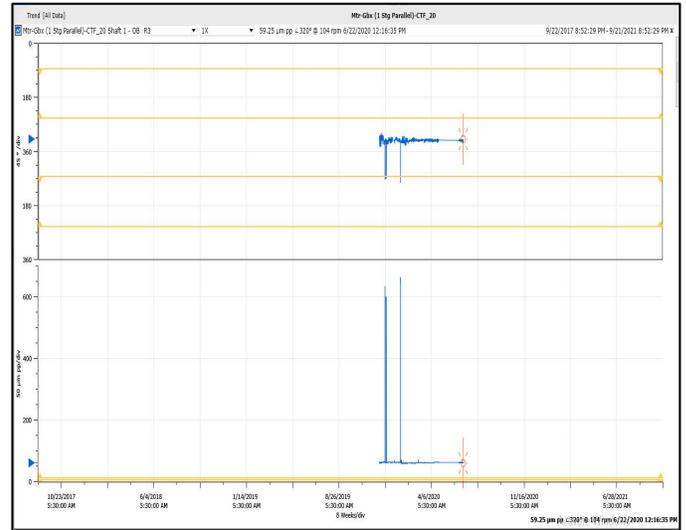


Figure 5-5: Phase Roll-Over Turned On

Users can turn off Phase Roll-Over from Plot Preference > General Tab (Figure 5-6), which applies to all Trend and Bode Plots in the Plot workspace or the individual plot through context menu.

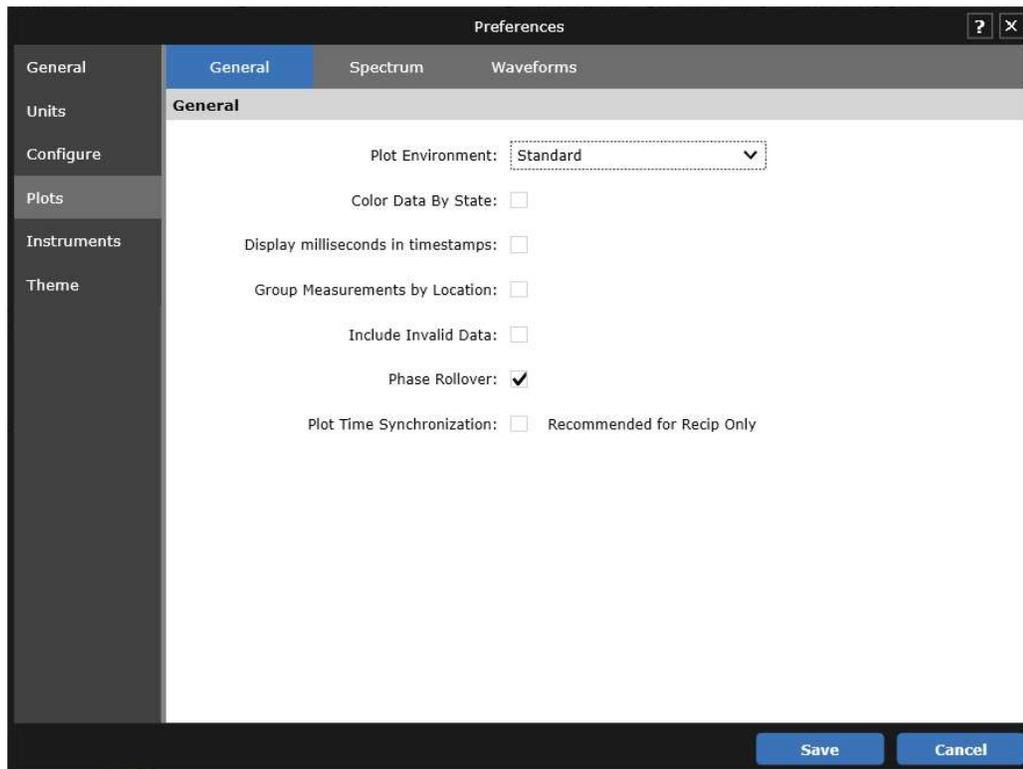


Figure 5-6: Phase Displayed Continuously in Unwrapped Form

## 5.2 Events

### 5.2.1 Event Filtering

Event Filtering video located in Bently Nevada Tech Support Training Library

[Valid M&S Agreement Required](#)

System 1 v21.2 supports filtering of Events within the Events workspace. The different filtering options are:

1. Filter by Time Range
2. Filter by Activity
3. Filter by Event Source

These filtering options apply to both Alarm and System Health Tabs.

Time Range filter (Figure 5-7) allows users to view Events generated during the selected time period.

Level	Asset Path	Device Path	Point	Measurement	State	Type	Value	Setpoint	Source	Activity	Entered	Exited	Acknowledged
3	...F>OB	...ic Monitor	RV11_X	Direct	-	Over	16.9983 mil pp	15.0000 mil pp	SW Alarm	Active	10/4/2021 4:16:21 PM		
3	...SF>OB	...mic Monitor	RV11_X	Direct	-	Over	-	16.0000 mil pp	HW Alarm	Cleared	9/27/2021 7:07:34 PM	10/4/2021 4:14:16 PM	Z84-37_WIN201
4	...SF>OB	...mic Monitor	RV11_X	Direct	-	Over	-	16.0000 mil pp	SW Alarm	Latched	9/27/2021 7:07:32 PM		Z84-37_WIN201
4	...SF>OB	...mic Monitor	RV11_X	Direct	-	Over	-	16.0000 mil pp	HW Alarm	Cleared	9/27/2021 7:07:32 PM	10/4/2021 4:14:16 PM	Z84-37_WIN201
2	...F>OB	...ic Monitor	RV11_X						Instrumentation	Cleared	9/27/2021 5:01:35 PM	9/27/2021 5:01:55 PM	
4	...B>OB	S/N: 43963	COB_A	Vel Spec O/All(10					2 in/s rms	SW Alarm	Active	3/27/2021 5:30:22 AM	
4	...B>OB	S/N: 43963	COB_V	Vel Spec O/All(10					2 in/s rms	SW Alarm	Active	3/27/2021 5:30:20 AM	
4	...B>OB	S/N: 43963	COB_H	Vel Spec O/All(10					2 in/s rms	SW Alarm	Active	3/27/2021 5:30:18 AM	
4	...B>IB	S/N: 43963	CIB_A	Vel Spec O/All(1000 Hz/800 lines)	-	Over	8.6379 in/s rms	0.1772 in/s rms	SW Alarm	Active	3/27/2021 5:30:16 AM		
4	...B>IB	S/N: 43963	CIB_V	Vel Spec O/All(1000 Hz/800 lines)	-	Over	8.6379 in/s rms	0.1772 in/s rms	SW Alarm	Active	3/27/2021 5:30:14 AM		
4	...B>IB	S/N: 43963	CIB_H	Vel Spec O/All(1000 Hz/800 lines)	-	Over	8.6379 in/s rms	0.1772 in/s rms	SW Alarm	Active	3/27/2021 5:30:12 AM		
4	...H>IB	S/N: 43963	MIB_A	Vel Spec O/All(1000 Hz/800 lines)	-	Over	8.6379 in/s rms	0.1772 in/s rms	SW Alarm	Active	3/27/2021 5:30:10 AM		

Figure 5-7: Filter by Time Range

Activity filter (Figure 5-8) allows users to view Events based on activity of the Events such as Active, Cleared, Latched, and Shelved.

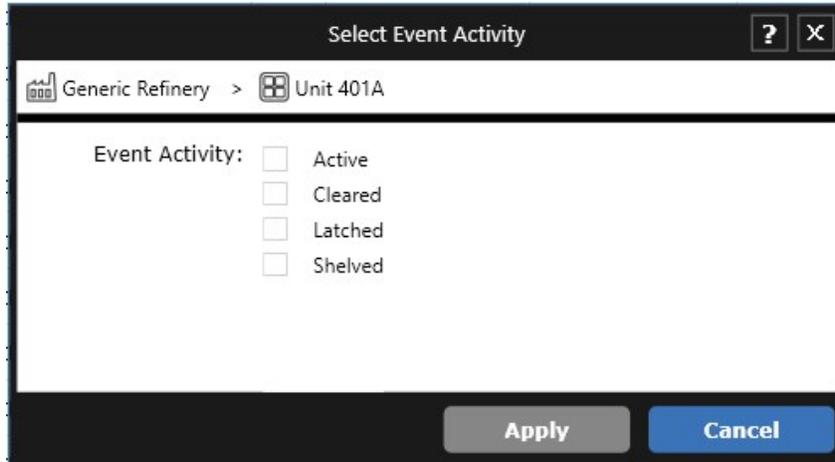


Figure 5-8: Filter by Event Activity

Event Source filter (Figure 5-9) allows users to view Events based on the following criteria:

1. HW Alarm
2. SW Alarm
3. External Alarm
4. Instrumentation
5. System Health
6. User Initiated
7. Transient

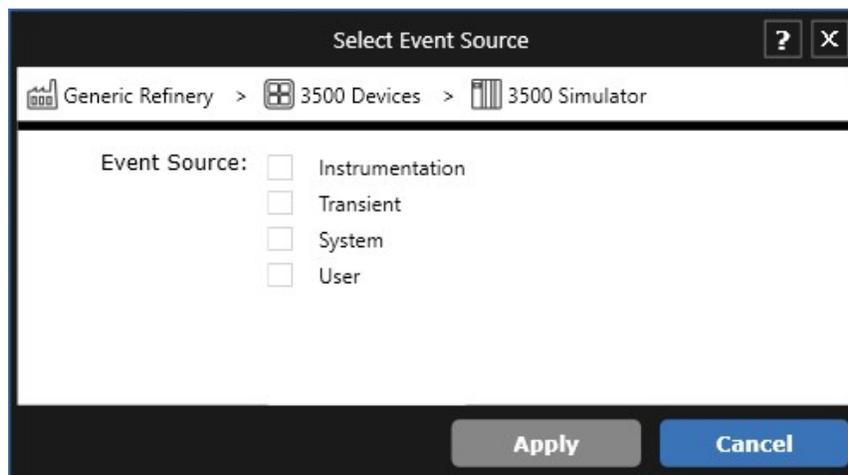


Figure 5-9: Filter by Event Source

## ONLY APPLICABLE WHEN UPGRADING FROM VERSIONS PRIOR TO 20.2

### Installation

Before installing System 1 21.2, users must uninstall any System 1 versions below 20.2.

#### ! Change to Program ID impacting OPC Data Collection

As part of the Baker Hughes separation from General Electric (GE), OPC DA import settings have been renamed. To maintain data collection from OPC connections, please take the following actions:

Property	Prior Versions	Versions 20.2 & Up	Required Action
Program ID	GE.BentlyNevada.SysIOPCServer.2	SystemIOPCServer.1	Change Program ID in client to "SystemIOPCserver.1"
DCOM Config Name	System 1 OPC Server	System 1 OPC DA Service	<p><b>Before uninstalling System 1:</b></p> <p>Take a screenshot of DCOM setting for "System 1 OPC Server" for the following tabs:</p> <ul style="list-style-type: none"> <li>— General</li> <li>— Security (Launch and Activation / Access / Config Permissions)</li> <li>— Identity</li> </ul> <p><b>After installing System 1 v20.2 and above:</b></p> <p>Reapply the DCOM settings to "System 1 OPC DA Service"</p>

For Bently Performance (BP) installations, open the BP template key and change the Program ID from "Input OPC Server" to "SystemIOPCServer.1" (as shown in below image).

Bently Performance	Performance 0.6.0
Input OPC Server	SystemIOPCServer.1
Auto Start	TRUE
Cycle Time	30000
Status	Ok
Input Cell Range	A10:A200
Output Cell Range	V11:V200

For more details, please refer to System 1 Help.

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