

Trio Analyzers – The Inside Story

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VP Technology
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The Trio – A Two Component Analyzer Design

(versus a purpose-built instrument)

Tablet



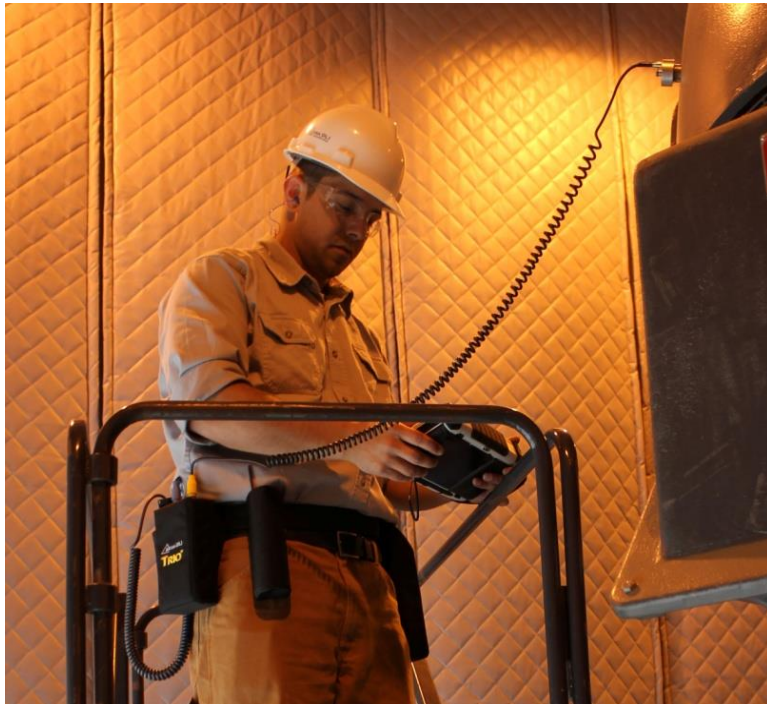
Smartphone

Bluetooth



Two Component Design Advantages

- **Basic packaging has been the same since 1985**
 - Single-unit, monolithic design
- **Two-component design with wireless capabilities delivers benefits over current packaging**



Better suited for humans with one or two arms

Better distribution of weight and lighter handheld controller

Greater safety when cables do not dangle in front of you

Signal processing unit is self-contained, protected, and rugged

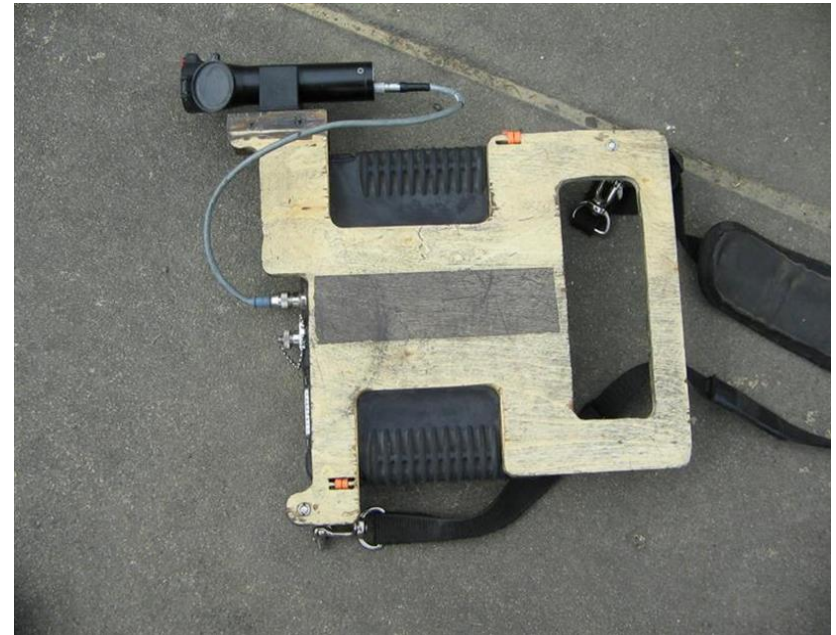
Easily interfaced with a host of low-cost controller options (new instrument lifecycle strategy)

Advantages for our Customers

- Advanced features resulting from all of the developments occurring in tablet computers, PDAs, and Smartphone wave (cameras, communications, GPS, etc.)
- Improved maintainability and lifecycle cost
- Evergreen products with upward compatibility
- Better ergonomic design –problem of carrying all the items needed for a technician to do his job



Users are constantly frustrated by the ergonomics of even market-leading products



Is there any question that there is room for a better mousetrap?

Making Improvements for Users



Trio – You have Choices!



...to have choices

TRIO™ CA6 / CX7

7" lightweight, portable and safest collector on the market



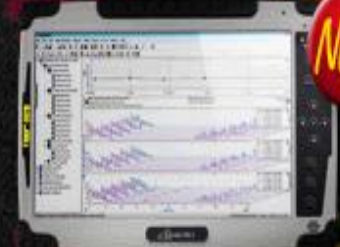
TRIO™ CA8 / CX8

10" thin and durable w/ 2-year accidental damage protection



TRIO™ CA10 / CX10

10" powerful, rugged and ready for your demands



The Trio – Controllers options will change/improve over time but the data processing unit will not need to change to provide high quality data on request...



What We Accomplished with the Trio

Very flexible and expandable product design

Replaces and improves DAQ functionality

Higher frequency range (40kHz)

Four signal processing channels

Dedicated tachometer with integral control

Improved dynamic range (24-bit A/D)

Enhanced measurement modes
(impact demod, order tracked sampling,
new trigger modes, and more to come)



Lightweight

Eight hour battery life with extended batteries

Custom tachometer for measuring speed on route

Faster sensor attachment method



Making Data Collection More Fun



Can triax accelerometers be mounted with one hand?

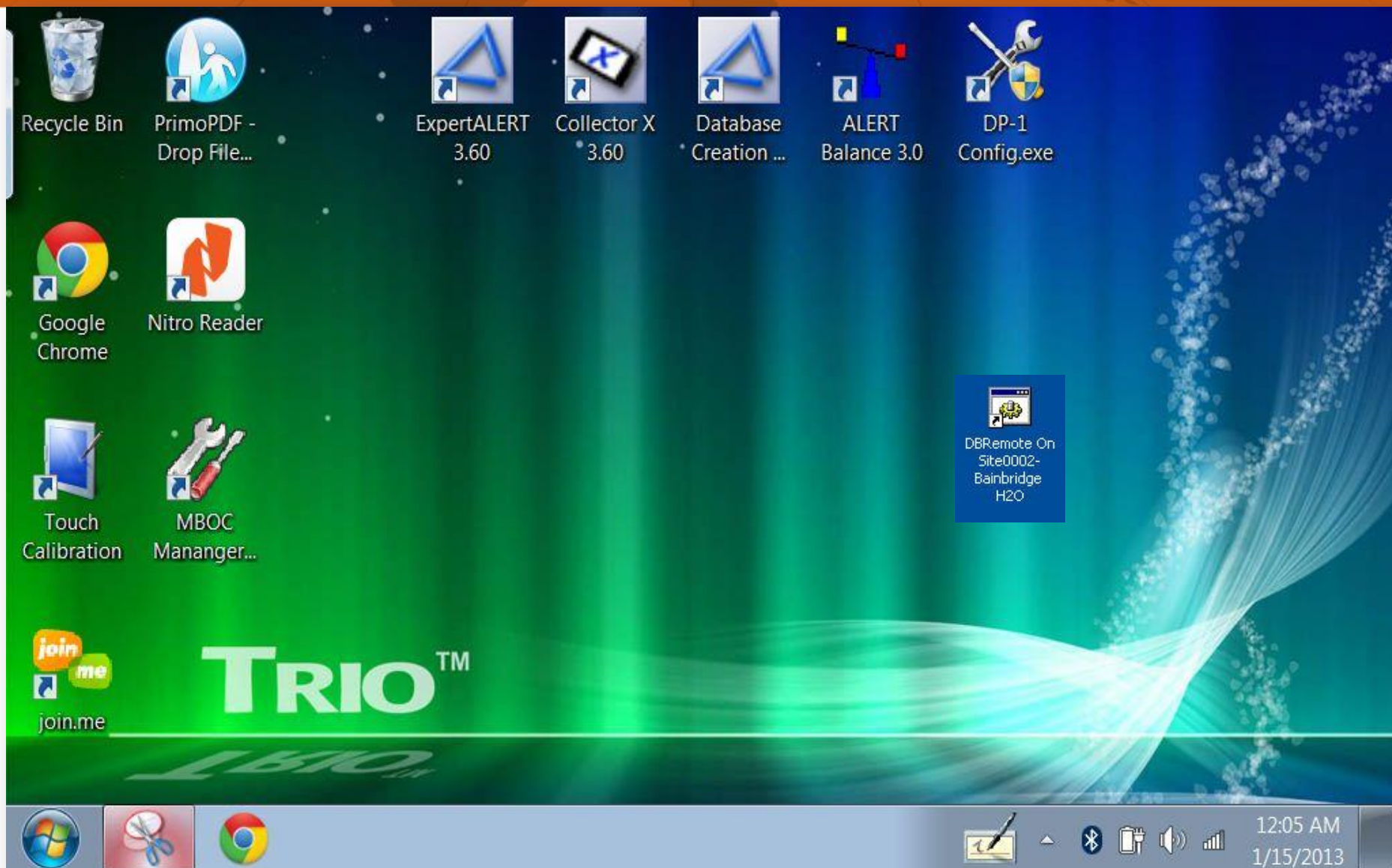


New Impact Demod Technique highlights impact events even in slow speed applications



- Equivalent capability to similar impact detection techniques offer by CSI, SKF, SPM, etc.
- Enhances ability to detect impact events over traditional demodulation
- Very effective bearing or gear fault detection even in slow speed applications
- Peak value of impact demod waveform is more trendable as an indication of fault severity

Trio Analyzer - Desktop



Trio 3.60 Navigation Layout



Start ID Tag New Note New Speed More Data Voice Options Analysis Unload Help Exit

Aeration Blower #1 **1780 RPM**
(Nominal)
Last tested 9/20/2012 2:52 PM

Machine List **Status** Picture Test Setup Details

Bainbridge Water Authority Demo Plant

- Day Road Main Facility
 - Aeration Blower #1**
 - Motor Drive End**
 - Blower Drive End
 - Blower Free End
 - Downtown Service Pump #1
 - Main Service Pump #1
 - Main Service Pump #3
 - Service Pump #1
 - Service Pump #2
- Example Setup Plant
- Ken Piety Plant
 - Test Area #123
 - Machine A1

POS: 2 RAT ID: 23

Previous Machine Next Machine

Previous Location Next Location

Stop Test **Start Test**

View Data

Stored Notes

11/29/2012 1:15 AM

CollectorX 3.60 Features



Better indications of machine status in the field

The screenshot displays the CollectorX 3.60 software interface. At the top, a toolbar contains icons for Start Test, ID Tag, New Note, New RPM, More Data, Voice, Options, Analysis, Unload, Help, and Exit. The main window title is "Downtown Service Pump #1" with "RPM=1775 (Nominal)" on the right. Below the title is a tabbed interface with "Machine List", "Status", "Picture", "Test Setup", and "Details". The "Status" tab is active, showing "Unreviewed Diagnostic Results:" with the following data:

Date Acquired:	7/27/2010	12:45 PM (GMT-05:00)
Report generated:	7/21/2011	8:29 AM (UTC-08:00)
Figure of merit:	735	MID: 9 Averages: 3
Maximum level:	113 (+12)	VdB at 1.00x on Pump Drive End
Machine Speed:	1778 RPM	

Below the data are sections for "RECOMMENDATIONS:" and "DIAGNOSTICS:". The recommendations include "MANDATORY: REPLACE MOTOR BEARINGS" and "IMPORTANT: REPLACE PUMP FREE END BEARING". The diagnostics list several issues, including "EXTREME: MOTOR FREE END BEARING LOOSENESS", "EXTREME: MOTOR DRIVE END BEARING LOOSENESS", "SERIOUS: MOTOR THRUST BEARING PROBLEM", "SERIOUS: MOTOR DRIVE END BEARING WEAR", and "SERIOUS: PUMP FREE END BALL BEARING WEAR".

On the right side of the interface, there are buttons for "Previous Location", "Next Location", "Previous Machine", and "Next Machine". There are also "Start Test" and "Stop Test" buttons. At the bottom, there are "Run Expert System", "OK", "ID Machine", and "ID Location" buttons. The status bar at the bottom right shows the date and time: "10/21/2011 | 12:33 AM".

CollectorX 3.60 Features



Easier access to machine configuration information

The screenshot displays the CollectorX 3.60 software interface. At the top, a toolbar contains icons for Start Test, ID Tag, New Note, New RPM, More Data, Voice, Options, Analysis, Unload, Help, and Exit. Below the toolbar, the machine name 'AC Motor Pump A IPS VHA' is shown on the left, and 'RPM=1785 (Nominal)' is shown on the right. A navigation bar below the machine name has tabs for Machine List, Status (with a '2' icon), Test Setup, and Details (which is selected). The main area is divided into two panes: 'Machine Design Tree' on the left and 'Schematic' on the right. The Machine Design Tree shows a hierarchical view of the machine components:

- AC Motor & Centrifugal Pump
 - Motor
 - AC Motor with 54 motor bars
 - Rolling element bearings and no cooling fan
 - Flexible Coupling
 - Centrifugal Pump
 - Supported rotor with rolling element main and thrust bearings
 - 5 first stage vanes and 0 second stage vanes

On the right side of the interface, there are several control buttons: Previous Location, Next Location, Previous Machine, Next Machine, Start Test (with a play icon), Stop Test (with a close icon), ID Machine, and ID Location. At the bottom right, a status bar shows the date and time: 10/21/2011 | 12:31 AM.

CollectorX 3.60 Features



Integrated Voice Control and Audible Feedback Options

The screenshot shows the CollectorX 3.60 software interface. At the top, there is a menu bar with icons for Start Test, ID Tag, New Note, New RPM, More Data, Cancel, and Options. On the right side of the menu bar are icons for Analysis, Unload, Help, and Exit. Below the menu bar, the main window displays the following information:

- AC Motor Pump A IPS VHA
- Motor Free End Brg 1
- RPM=1785 (Nominal)
- Location not tested.

The 'Voice Options' dialog box is open, indicated by a blue arrow pointing to the title bar. The dialog box contains the following settings:

- Enable Speech Recognition
- Activate Voice Commands
- Input Device: SigmaTel Audio
- Enable Auditory Feedback
- Computer Voice: Microsoft Mary
- Audio Output Device: SigmaTel Audio
- Buttons: Check Microphone Level, Train Speech Recognition
- Volume: A slider control.
- Buttons: OK (with a green play icon), Cancel (with a red X icon)

The status bar at the bottom right of the window shows the date and time: 10/21/2011 12:20 AM.

CollectorX 3.60 Features



Better support for measuring machine speed during routine testing

The screenshot shows the CollectorX 3.60 software interface. At the top, there is a toolbar with icons for Start Test, ID Tag, New Note, Cancel, More Data, Voice, Options, Analysis, Unload, Help, and Exit. Below the toolbar, the main window displays test parameters: "AC Motor Pump A IPS VHA" and "Motor Free End Brg 1" on the left, and "RPM=1785 (Nominal)" and "Location not tested." on the right. A blue arrow points to the "Enter or Measure Machine Speed" dialog box. This dialog box contains a numeric input field with the value "4780", a numeric keypad (0-9, .), and buttons for "Measure", "Backspace", and "Clear". To the right of the keypad, there is a "Speed Units" section with radio buttons for "RPM" (selected) and "RPS". Below this is a checked checkbox for "Divide Tach" with a "by:" field containing the value "4". At the bottom of the dialog, the "Resultant RPM:" is displayed as "1195". There are "Save" and "Cancel" buttons at the bottom of the dialog. The bottom right corner of the software window shows the date and time: "10/21/2011 | 12:17 AM".

Predefined Field Notes by Categories

Start **ID Tag** **New Note** **New Speed** **More Data** **Voice** **Options** **Analysis** **Unload** **Help** **Exit**

AC Motor Pump A IPS RAT **1785 RPM**

Enter New Notes

Categories

- 1 Status/safety issues
- 2 As-Is State
- 3 Structural Conditions
- 4 Bearing-Belt-Blade-Motor-Shaft
- 5 Filter-Leaks-Fluid
- 6 Overheating
- 7 Pressure-Load
- 8 Sounds
- 9 Modify Database

Predefined Notes

- 601 Temperature Exceeds Safe Levels
- 602 Arcing/Sparks Being Generated
- 603 Burned/Discolored Surfaces
- 604 Burning Smell
- 605 Hot Bearing
- 606 Hot Casing
- 607 Melted Materials/Components
- 608 Insulation - Cracked/Missing

Component

Location

Voice Note

Photo Note

Free Text

Selected Notes

- 406 Belts - Flapping/Resonating
- 605 Hot Bearing

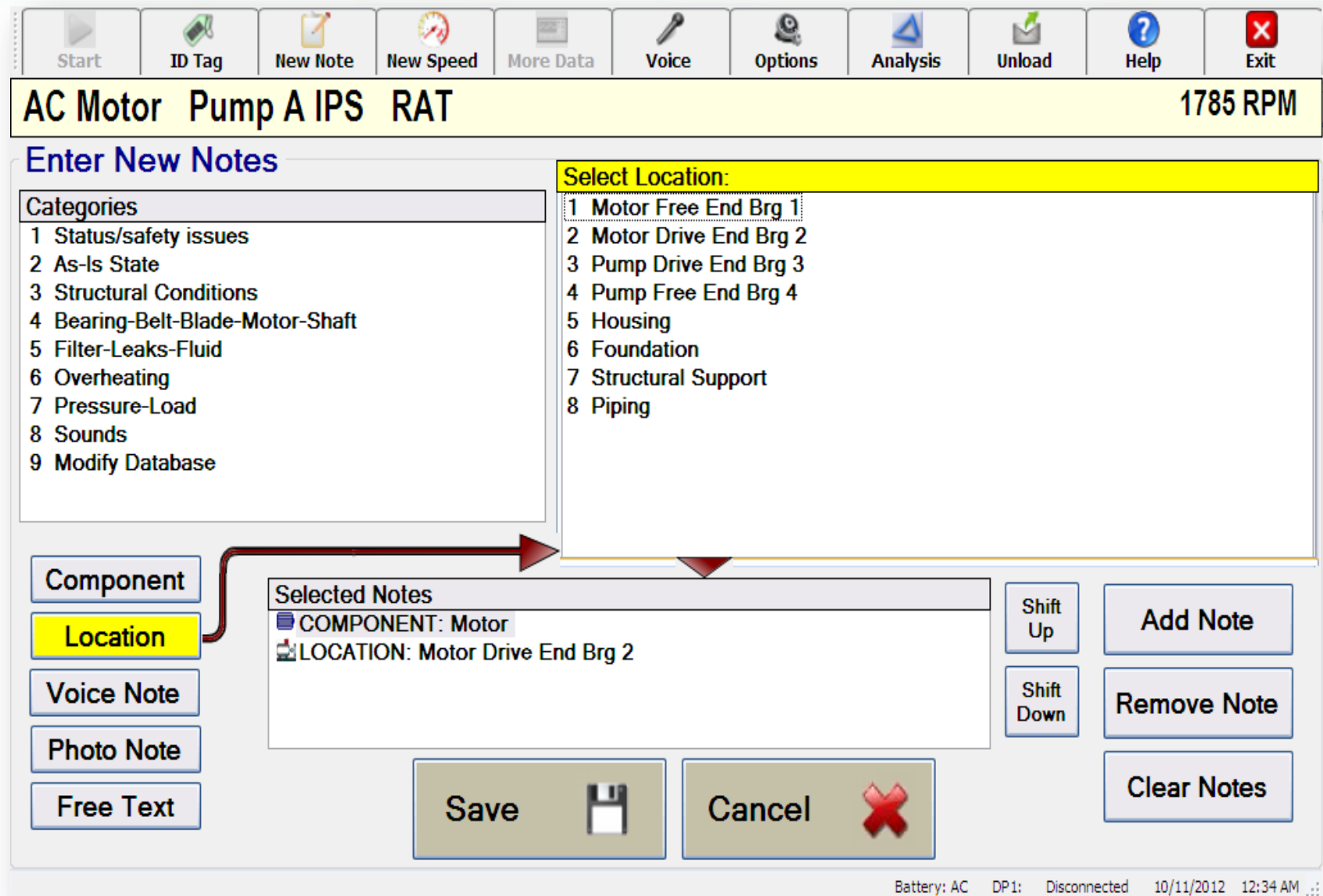
Shift Up **Add Note**

Shift Down **Remove Note**

Save **Cancel** **Clear Notes**

Battery: AC DP1: Disconnected 10/11/2012 12:30 AM

Define the Component and Location



The screenshot shows a handheld device interface with a top toolbar containing icons for Start, ID Tag, New Note, New Speed, More Data, Voice, Options, Analysis, Unload, Help, and Exit. Below the toolbar, the header displays "AC Motor Pump A IPS RAT" and "1785 RPM".

The main area is titled "Enter New Notes" and is divided into two sections:

- Categories:** A list of note categories: 1 Status/safety issues, 2 As-Is State, 3 Structural Conditions, 4 Bearing-Belt-Blade-Motor-Shaft, 5 Filter-Leaks-Fluid, 6 Overheating, 7 Pressure-Load, 8 Sounds, 9 Modify Database.
- Select Location:** A list of location options: 1 Motor Free End Brg 1, 2 Motor Drive End Brg 2, 3 Pump Drive End Brg 3, 4 Pump Free End Brg 4, 5 Housing, 6 Foundation, 7 Structural Support, 8 Piping.

Below these sections is a "Selected Notes" area containing:

- COMPONENT: Motor
- LOCATION: Motor Drive End Brg 2

On the left side, there are buttons for "Component", "Location" (highlighted in yellow), "Voice Note", "Photo Note", and "Free Text". A red arrow points from the "Location" button to the "Selected Notes" area.

On the right side, there are buttons for "Shift Up", "Add Note", "Shift Down", "Remove Note", and "Clear Notes".

At the bottom, there are "Save" and "Cancel" buttons. The "Save" button has a floppy disk icon, and the "Cancel" button has a red 'X' icon.

The status bar at the bottom right shows: Battery: AC DP1: Disconnected 10/11/2012 12:34 AM

Free-form Text Entry Notes



The screenshot shows a software interface with a menu bar at the top containing icons for 'More Data', '**Voice', '**Options', '**Analysis', '**Unload', '**Help', and '**Exit'. Below the menu bar, the text 'Rotational Speed RPM 1500 on All' is displayed on the left, and '1500 **RPM' is on the right. A yellow header bar reads '**Enter Free Text'. Below this, a text entry area contains the text 'This is a free text note.' To the left of the text entry area is a list of categories under the heading '**Enter New Notes':

- **Categories
- 1 **Status/safety issues
- 2 **As-Is State
- 3 **Structural Conditions
- 4 **Bearing-Belt-Blade-Motor-Shaft
- 5 **Filter-Leaks-Fluid
- 6 **Overheating
- 7 **Pressure-Load
- 8 **Sounds
- 9 **Modify Database

At the bottom left, there is a vertical stack of buttons: '**Compone', '**Location', '**Voice', '**Photo', and '**Free Text'. The '**Free Text' button is highlighted in yellow. A red arrow points from this button to the text entry area. An 'On-Screen Keyboard' window is overlaid at the bottom, showing a full QWERTY keyboard layout with various function keys like Esc, Tab, Caps, Shift, Ctrl, Alt, and Fn.

Sound Recordings



Start ID Tag New Note New Speed More Data Voice Options Analysis Unload Help Exit

AC Motor Pump A IPS RAT 1785 RPM

Enter New Notes

Categories

- 1 Status/safety issues
- 2 As-Is State
- 3 Structural Conditions
- 4 Bearing-Belt-Blade-Motor-Shaft
- 5 Filter-Leaks-Fluid
- 6 Overheating
- 7 Pressure-Load
- 8 Sounds
- 9 Modify Database

Record Voice Note

Record Play Stop Erase

Component
Location
Voice Note
Photo Note
Free Text

Selected Notes

Save Cancel

Shift Up Add Note
Shift Down Remove Note
Clear Notes

Battery: AC DP1: Disconnected 10/11/2012 12:36 AM

Picture Field Notes



Start ID Tag New Note New Speed More Data Voice Options Analysis Unload Help Exit


Downtown Service Pump #1 1775 RPM

Enter New Notes

Categories

- 1 Status/safety issues
- 2 As-Is State
- 3 Structural Conditions
- 4 Bearing-Belt-Blade-Motor-Shaft
- 5 Filter-Leaks-Fluid
- 6 Overheating
- 7 Pressure-Load
- 8 Sounds
- 9 Modify Database

Press "Snapshot" to Take Photo





Component
Location
Voice Note
Photo Note
Free Text

Selected Notes


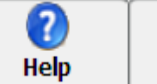

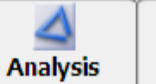
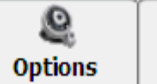
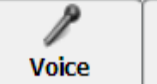
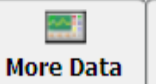
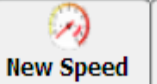
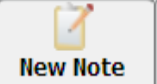
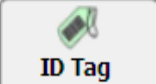

Snapshot

Shift Up **Add Note**
Shift Down **Remove Note**
Clear Notes

Save  **Cancel** 

Battery: AC DP1: Disconnected 10/18/2012 2:48 PM

Analyzer - Special Test Measurements



Downtown Service Pump #1 **1784.9 RPM**
(Latest)
Motor Free End Last tested 7/27/2010 12:40 PM

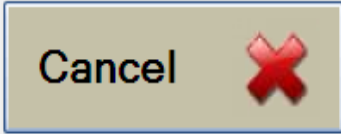
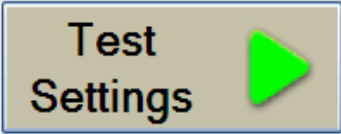


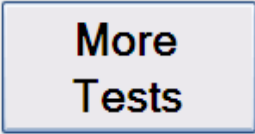
Take Additional Test Data at This Location

Advanced Tests

- 1 **Custom Setup**
- 2 High Frequency
- 3 High Resolution
- 4 Demodulation
- 5 Low Frequency
- 6 Order Tracking
- 7 Time Synchronous Average
- 8 Bump Test (Equipment ON)
- 9 Bump Test (Equipment OFF)
- 10 Runup/Coastdown (Waterfall)
- 11 Runup/Coastdown (Bode)
- 12 Runup/Coastdown (Peak-Hold)
- 13 Long Time Capture

Goal: To allow the user to define any test setup within the capability of the data acquisition hardware.

This setup will default to the setup that was defined on the last selection of this test. If the test that is desired is a slight variant of one of the other test selections, then it will likely be easier to select that predefined test but use the Custom Setup button available when the default test settings are displayed. Regardless of which path is taken to the Custom Setup options, any changes to the test settings can be saved and named using the Save Settings button. These user-defined tests are added to the list of tests and can be recalled to provide convenient access to measurements that are likely to be repeated in the future.



Special Test Measurements Notes



Start ID Tag New Note New Speed More Data Voice Options Analysis Unload Help Exit

AC Motor Pump A IPS VHA + Ovr **29.87 RPS**
Motor Free End Brg 1 (Latest)
Last tested 10/17/2012 1:43 AM

Stored Notes

10/17/2012 1:25:44 AM	Administrator
10/12/2012 1:12:33 AM	Administrator

- High Frequency test collected from Motor Drive End.
- Custom settings test collected from Motor Free End Brg
- Waterfall test collected from Motor Free End Brg

Note saved by: Administrator
10/17/2012 1:25:44 AM

Edit Note Delete Note OK

Analyzer - Requested Action



Start ID Tag New Note New Speed More Data Voice Options Analysis Unload Help Exit

AC Motor Pump A IPS VHA + Ovr **29.87 RPS**
(Latest)
Last tested 10/17/2012 1:43 AM

Motor Free End Brg 1

Machine List	Status	Picture	Test Setup	Details
AC Motor Pump A IPS RAT			POS: 1	VHA ID: 45
AC Motor Pump A IPS VHA #3 No Ovr			Previous Machine	Previous Location
AC Motor Pump A IPS VHA #4 RPS All			Next Machine	Next Location
AC Motor Pump A IPS VHA #5			Stop Test	Start Test
AC Motor Pump A IPS VHA #9 wLS630fpm			View Data	
AC Motor Pump A IPS VHA + Ovr			Stored Notes	Requested Action
Motor Free End Brg 1				
Motor Drive End Brg 2				
Pump Drive End Brg 3				
Pump Free End Brg 4				
AC Motor Pump A IPS VHA RPM1st				
AC Motor Pump A IPS-1xOv VHA				
AC Motor Pump B VdB RAT				
AC Motor Pump B VdB VHA				
Circulating Fan A				
C Common Setup Example				

Battery: AC DP1: Disconnected 10/18/2012 2:09 PM

Analyzer - Requested Actions Review

Start ID Tag New Note New Speed More Data Voice Options Analysis Unload Help Exit

AC Motor Pump A IPS VHA + Ovr 29.56 RPS (Nominal)

Machine List	Status	Picture	Test Setup	Details
AC Motor Pump A IPS	RAT			
AC Motor Pump A IPS	VHA #3 No Overlap			
AC Motor Pump A IPS	VHA #4 RPS All			
AC Motor Pump A IPS	VHA #5			
AC Motor Pump A IPS	VHA #9 wLS630fpm			
Motor Free End Brg 1				
Motor Drive End Brg 2				
Pump Drive End Brg 3				
Pump Free End Brg 4				
AC Motor Pump A IPS	VHA RPM1st			
AC Motor Pump A IPS-1xOv	VHA			
AC Motor Pump B VdB	RAT			
AC Motor Pump B VdB	VHA			
Circulating Fan A				
Co-Current Setup Example				

Perform Bump Test-Machine On for motor bearings.
Any repairs been done since last survey?
Take photo of motor nameplate.

Note saved by: Administrator
10/12/2012 1:12:33

Don't show again

OK

Battery: AC DP1: Disconnected 10/18/2012 1:48 PM

Analyzer - Expert System Results



Start ID Tag New Note New Speed More Data Voice Options Analysis Unload Help Exit

AC Motor Pump A IPS-1x0v VHA 2240.5 RPM

Expert System Results

MID: 8 Averages: 0 Rulebase: 20120525
Date Acquired: 1/5/2013 9:07 PM Report Generated: 1/5/2013 9:22 PM

Machine Speed: 1792 RPM Figure of merit: 214
Maximum Level: 2.6 (1873%) in/s at 1.05x on Pump Drive End Brg 3 Axial
ANALYST ALERT: CHECK SPECTRA MANUALLY, MAX LEVEL MAY INDICATE A PROBLEM

RECOMMENDATIONS:

- <1> MANDATORY: CHECK SHAFT ALIGNMENT; IF SAT, INSPECT COUPLING AND CHECK FO
- <2> IMPORTANT: CHECK PUMP END FOR MOUNTING INTEGRITY AND PROPER ALIGNMEN
- <3> DESIRABLE: INSPECT PUMP FOR PROPER INTERNAL FIT AND ALIGNMENT

DIAGNOSTICS:

- <1> EXTREME INDICATION OF POSSIBLE MISALIGNMENT
- <2> SERIOUS INDICATION OF POSSIBLE PUMP MOUNTING WEAKNESS
- <3> MODERATE PUMP BEARING OR ROTOR MISALIGNMENT
- <4> SLIGHT INDICATION OF POSSIBLE COUPLING WEAR OR LOOSENESS
- <4> SLIGHT MOTOR FREE END BALL BEARING DEMOD
- <4> SLIGHT PUMP FREE END BEARING DEMOD
- <4> SLIGHT PUMP DRIVE END BEARING DEMOD

Attention Required!

View Data

Next Report

Previous Report

OK

Attempting connection 1/15/2013 12:10 AM

12:10 AM
1/15/2013

Trio 3.60 More Data Tests



Start ID Tag New Note New Speed More Data Voice Options Analysis Unload Help Exit

Aeration Blower #1 **1780 RPM**
(Nominal)
Last tested 9/20/2012 2:52 PM

Motor Drive End

Take Additional Test Data at This Location

Advanced Tests

- 1 Custom Setup
- 2 High Frequency
- 3 High Resolution
- 4 Demodulation
- 5 Low Frequency
- 6 Order Tracking
- 7 Time Synchronous Average
- 8 Bump Test (Equipment ON)
- 9 Bump Test (Equipment OFF)
- 10 Runup/Coastdown (Waterfall)
- 11 Runup/Coastdown (Bode)
- 12 Runup/Coastdown (Peak-Hold)
- 13 Long Time Capture

Goal: To allow the user to define any test setup within the capability of the data acquisition hardware.

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More Tests ↑ ↓ Test Settings Return to Machines

11/29/2012 1:16 AM

CollectorX 3.60 Features



Addition of alternate demodulation technique - Impact Demod

Start Test ID Tag New Note New RPM Cancel Voice Options Analysis Unload Help Exit

AC Motor Pump B VdB RAT RPM=1785
Pump Drive End Brg 3 (Nominal)
Location not tested.

Advanced Test: Demodulation

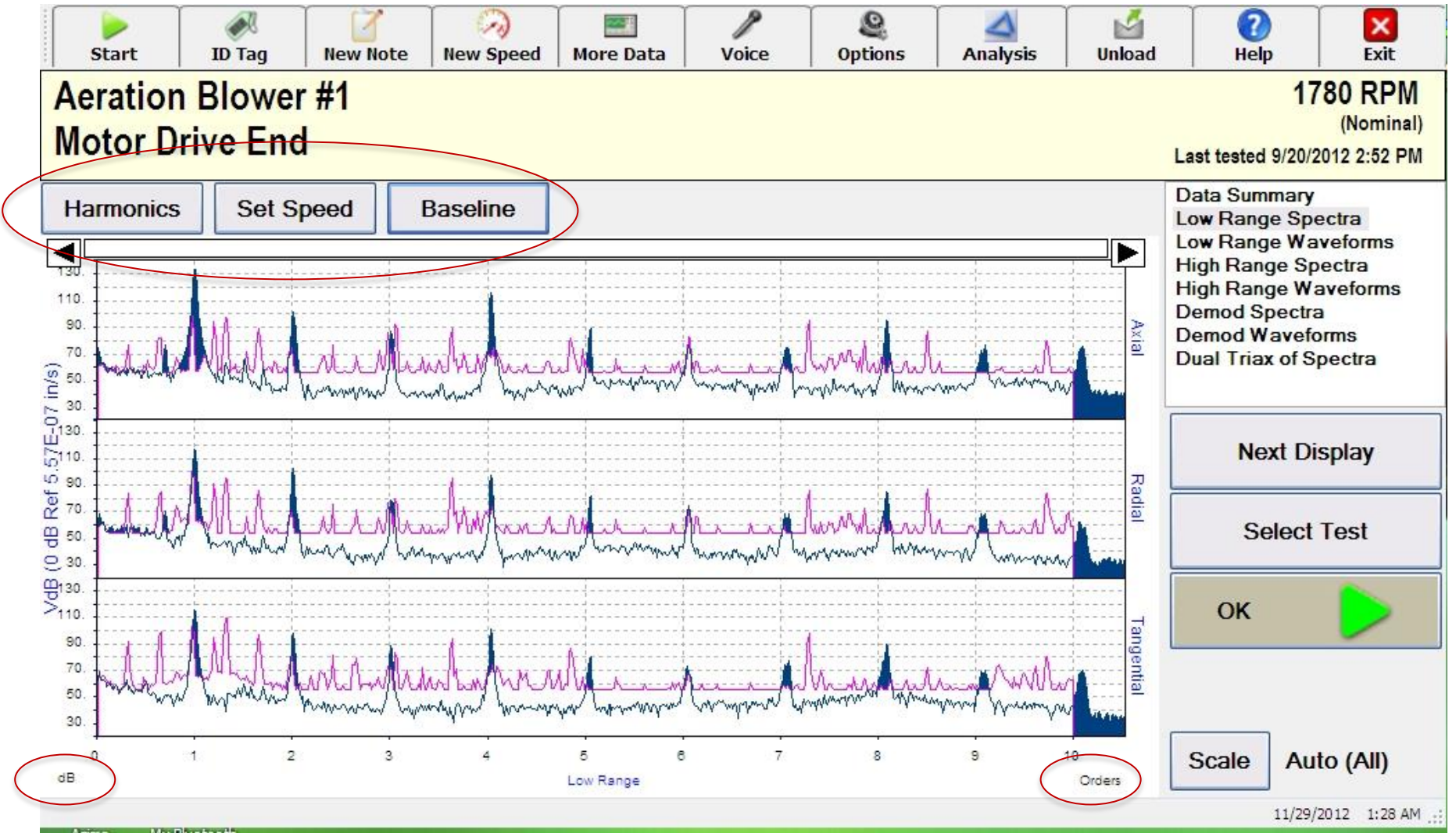
This test acquires demodulated spectra and waveforms. Tightly connect the sensor to a clean location to ensure a good frequency response.

Frequency Range 1000 Hz
Resolution 1600 Lines
Number of Averages 2
Filter Band HPF 1000 Hz Impact Demod Method
Orientation RAT

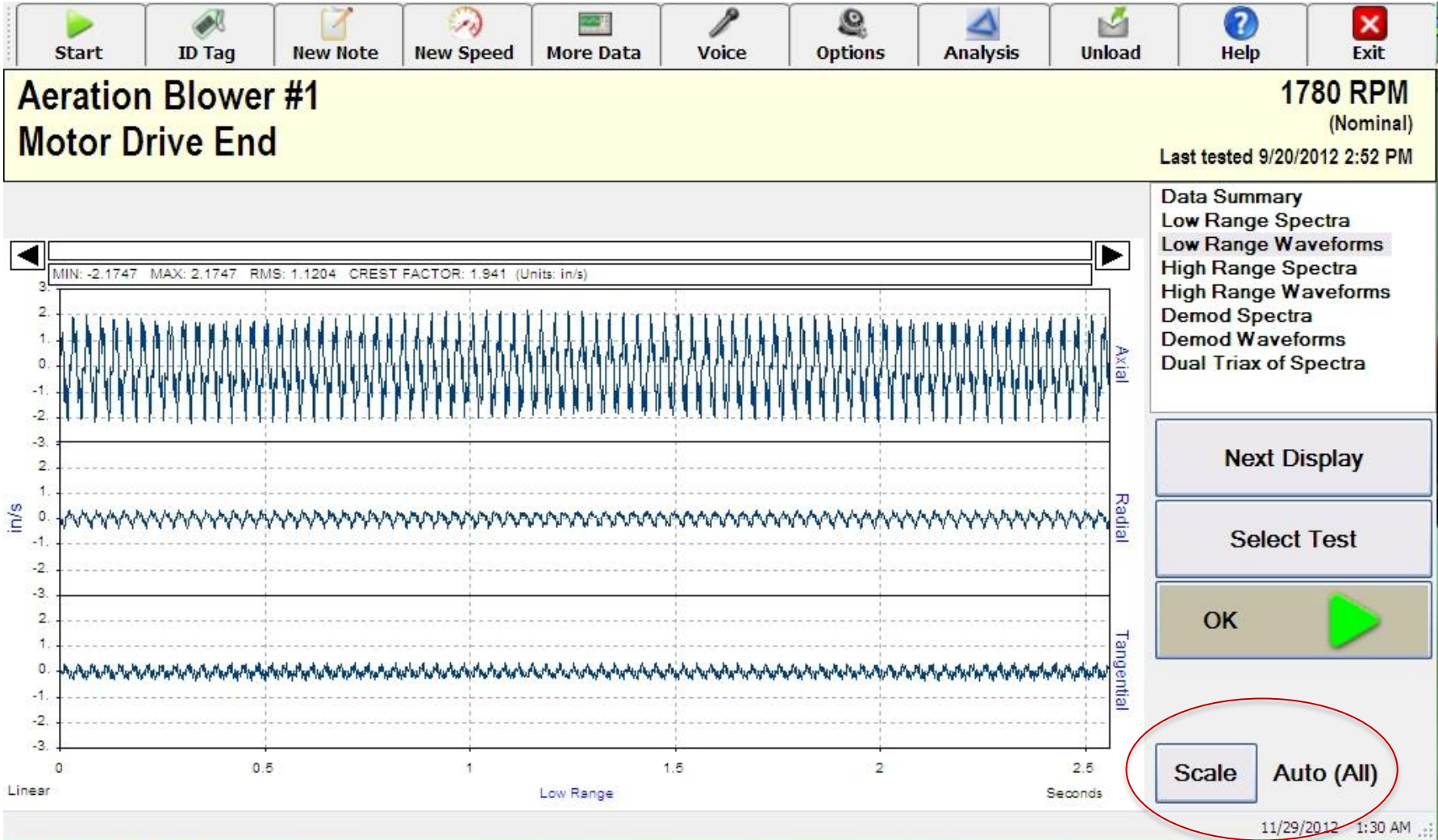
Custom Setup Start Test Cancel Return to list of tests

10/26/2011 12:27 AM

Trio 3.60 New Plot Options



Trio 3.60 New Plot Options



Trio 3.60 New Plot Options



Start ID Tag **New Note** New Speed More Data Voice Options Analysis Unload Help Exit

Aeration Blower #1 **Motor Drive End** **1780 RPM**
(Nominal)
Last tested 9/20/2012 2:52 PM

MIN: -2.2488 MAX: 2.2488 RMS: 1.1894 CREST FACTOR: 1.923 (Units: in/s)

3
2
1
0
-1
-2
-3
in/s

Axial

2
1
0
-1
-2
-3
Radial

2
1
0
-1
-2
-3
Tangential

0 0.5 1 1.5 2 2.5
Seconds

Linear Low Range

9/20/2012 2:52:24 PM	Routine Test
9/12/2012 4:33:41 PM	Routine Test
9/12/2012 4:15:34 PM	Routine Test
7/6/2012 5:19:14 PM	Routine Test
7/6/2012 5:18:32 PM	Custom Setup
7/26/2010 5:18:57 PM	Routine Test
4/13/2010 3:31:21 PM	Routine Test
1/13/2010 2:30:34 PM	Routine Test
10/7/2009 3:24:24 PM	Routine Test
7/17/2009 1:49:28 PM	Routine Test
4/22/2009 4:56:21 PM	Routine Test

Data Summary
Low Range Spectra
Low Range Waveforms
High Range Spectra
High Range Waveforms
Demod Spectra
Demod Waveforms
Dual Triax of Spectra

Next Display

Hide Test Dates

OK

Scale Auto (All)

11/29/2012 1:30 AM

ALERT Software - Diagnostic Report

The screenshot displays the ExpertALERT software interface. The left sidebar shows a tree view of the 'Bainbridge Water Authority Demo Plant' with 'Downtown Service Pump #1' selected. The main window shows the 'Expert System Results' for this pump, including machine speed, rulebase, and maximum level. Below this, there are sections for 'RECOMMENDATIONS' and 'DIAGNOSTICS' with severity levels and descriptions.

Expert System Results

Downtown Service Pump #1

MID: 9
Averages: 3
Report Generated: 7/21/2011 11:29:58 AM (GMT-05:00)
Date Acquired: 7/27/2010 12:45:03 PM (GMT-05:00)

Machine Speed: 1778 RPM
Rulebase: 3.5.001
Figure of merit: 735
Maximum level: 113 (+12) VdB at 1.00x on Pump Drive End Tangential

RECOMMENDATIONS:

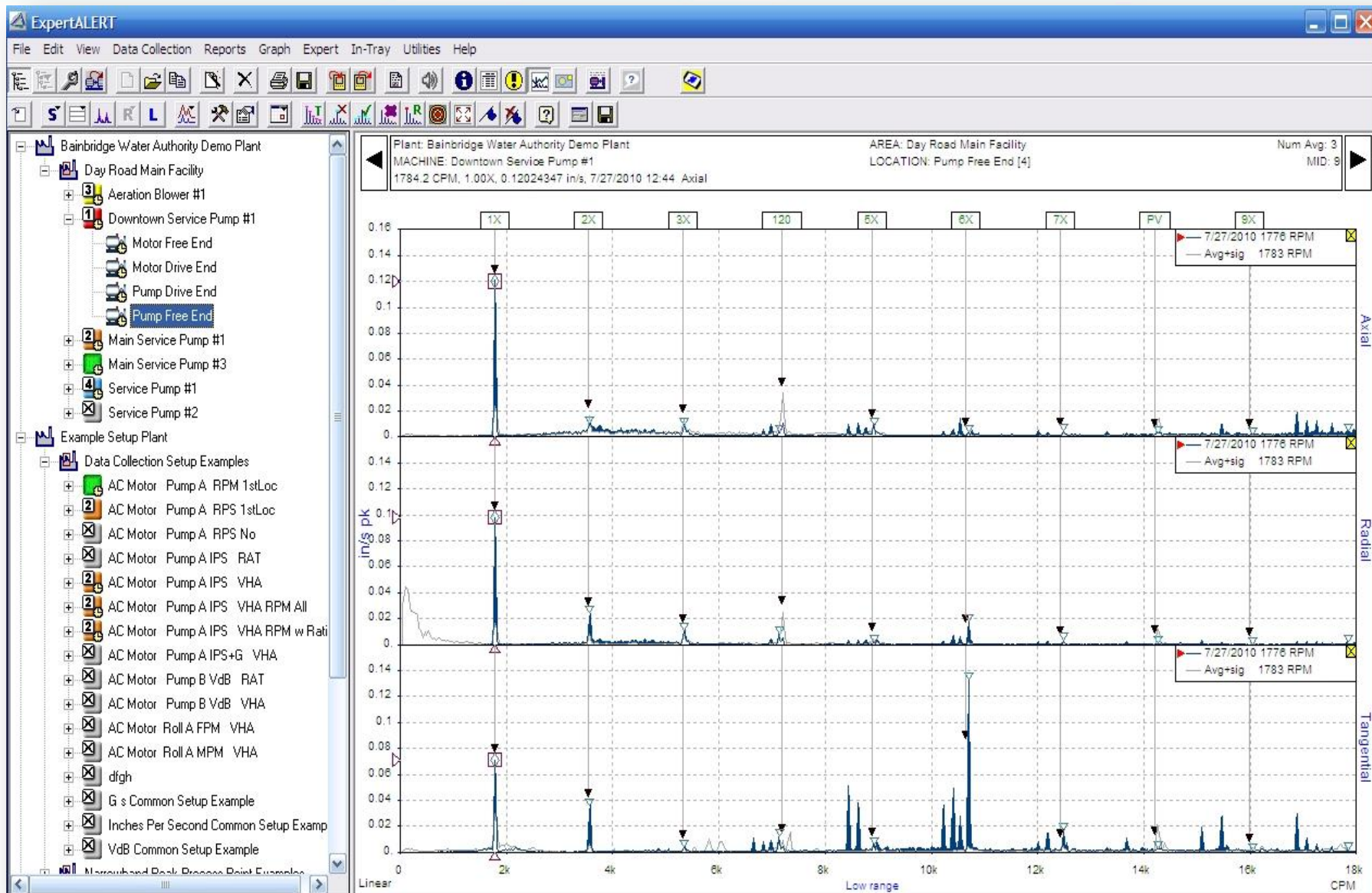
- <1> MANDATORY: REPLACE MOTOR BEARINGS
- <2> IMPORTANT: REPLACE PUMP FREE END BEARING

DIAGNOSTICS:

- <1> EXTREME MOTOR FREE END BEARING LOOSENESS
- <1> EXTREME MOTOR DRIVE END BEARING LOOSENESS
- <2> SERIOUS MOTOR THRUST BEARING PROBLEM
- <2> SERIOUS MOTOR DRIVE END BEARING WEAR
- <2> SERIOUS PUMP FREE END BALL BEARING WEAR
- <3> MODERATE PUMP DRIVE END BALL BEARING WEAR
- <3> MODERATE MOTOR FREE END BEARING WEAR
- <3> MODERATE PUMP DRIVE END LOOSENESS OR BEARING CLEARANCE PROBLEM

Date	Type
7/27/2010 12:45:03 PM	Expert system results
1/14/2010 10:51:33 AM	Analyst reviewed results
1/14/2010 10:51:33 AM	Expert system results
10/7/2009 9:08:42 PM	Analyst reviewed results
10/7/2009 9:08:42 PM	Expert system results
7/17/2009 6:32:25 PM	Analyst reviewed results
7/17/2009 6:32:25 PM	Expert system results
4/22/2009 11:42:52 AM	Analyst reviewed results
4/22/2009 11:42:52 AM	Expert system results

ALERT - Data Review



Az AZIMA DLI hivatalos magyarországi képviseletét a Delta-3N Kft. látja el.

ALERT - Report Editor



ExpertALERT

File Edit View Data Collection Reports Expert In-Tray Utilities Help

Report Trend Screening Sheet **Report Editor** Event Tracker Comments

Downtown Service Pump #1

Add new summary/reviewed record

Priority	Recommendation
Mandatory	REPLACE MOTOR BEARINGS
Important	REPLACE PUMP FREE END BEARING
*	

Severity	Fault
EXTREME	MOTOR FREE END BEARING LOOSENESS
EXTREME	MOTOR DRIVE END BEARING LOOSENESS
SERIOUS	MOTOR THRUST BEARING PROBLEM
SERIOUS	MOTOR DRIVE END BEARING WEAR
SERIOUS	PUMP FREE END BALL BEARING WEAR

Maximum Level
113 (+12) VdB [3T] at 1.00x

Cited peaks

106 (+21) VdB [1A] at 1.00xM
104 (+10) VdB [1T] at 1.00xM
103 (+36) VdB [1A] at 5.00xM
100 (+ 9) VdB [1R] at 1.00xM
98 (+21) VdB [1T] at 2.00xM
95 (+16) VdB [1A] at 4.00xM
95 (+23) VdB [1A] at 3.00xM
94 (+13) VdB [1A] at 2.00xM
94 (+ 9) VdB [1R] at 2.00xM
92 (+25) VdB [1T] at 5.00xM
91 (+20) VdB [1R] at 3.00xM
91 (+28) VdB [1T] at 3.00xM
90 (+13) VdB [1T] at 6.00xM
88 (+26) VdB [1T] at 7.00xM
86 (+20) VdB [1A] at 6.00xM
85 (+18) VdB [1R] at 5.00xM
82 (+25) VdB [1R] at 7.00xM
77 (+18) VdB [1A] at 7.00xM
76 (+11) VdB [1R] at 6.00xM

Discussion by Analyst

Analyst Review
 Final Review
 Revised

Bainbridge Water Authority Demo Plant

- Day Road Main Facility
 - Aeration Blower #1
 - Downtown Service Pump #1
 - Motor Free End
 - Motor Drive End
 - Pump Drive End
 - Pump Free End
 - Main Service Pump #1
 - Main Service Pump #3
 - Service Pump #1
 - Service Pump #2
- Example Setup Plant
 - Data Collection Setup Examples
 - AC Motor Pump A RPM 1stLoc
 - AC Motor Pump A RPS 1stLoc
 - AC Motor Pump A RPS No
 - AC Motor Pump A IPS RAT
 - AC Motor Pump A IPS VHA
 - AC Motor Pump A IPS VHA RPM All

Date	Type
7/27/2010 12:45:03 PM	Expert system results
1/14/2010 10:51:33 AM	Analyst reviewed results
1/14/2010 10:51:33 AM	Expert system results
10/7/2009 9:08:42 PM	Analyst reviewed results
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7/17/2009 6:32:25 PM	Analyst reviewed results
7/17/2009 6:32:25 PM	Expert system results
4/22/2009 11:42:52 AM	Analyst reviewed results
4/22/2009 11:42:52 AM	Expert system results

ALERT - Event Tracker



ExpertALERT

File Edit View Data Collection Reports Expert In-Tray Utilities Help

Report Trend Screening Sheet Report Editor Event Tracker Comments

Bainbridge Water Authority Demo Plant

- Day Road Main Facility
 - Aeration Blower #1
 - Downtown Service Pump #1**
 - Main Service Pump #1
 - Main Service Pump #3
 - Service Pump #1
 - Service Pump #2
- Example Setup Plant
 - Data Collection Setup Examples
 - AC Motor Pump A RPM 1stLoc
 - AC Motor Pump A RPS 1stLoc
 - AC Motor Pump A RPS No
 - AC Motor Pump A IPS RAT
 - AC Motor Pump A IPS VHA
 - AC Motor Pump A IPS VHA RPM All
 - AC Motor Pump A IPS VHA RPM w Rati
 - AC Motor Pump A IPS+G VHA
 - AC Motor Pump B VdB RAT
 - AC Motor Pump B VdB VHA

Latest Priority	Latest Date	Insert Priority	Insert Date	Machine Name	Recommended Action	Work Order Number	Work Order Status	Status Date
Important	1/14/2010 10:51:33 AM	Important	1/14/2010 10:51:33 AM	Downtown Service Pump #1	REPLACE ALL BEARINGS, INSPECT COUPLING AND ALIGN UNIT		Open	7/6/201 3:04:26 AM
Desirable	10/7/2009 9:08:42 PM	Desirable	10/7/2009 9:08:42 PM	Downtown Service Pump #1	REPLACE PUMP BEARINGS AND INSPECT PUMP FOR PROPER INTERNAL FIT AND ALIGNMENT		Analyst Closed	1/14/201 10:51:33 AM
Desirable	7/17/2009 6:32:25 PM	Desirable	7/17/2009 6:32:25 PM	Downtown Service Pump #1	MONITOR PUMP DRIVE END BEARING FOR INCREASED VIBRATION		Analyst Closed	10/7/200 9:08:42 PM
Desirable	4/22/2009 11:42:52 AM	Desirable	4/22/2009 11:42:52 AM	Downtown Service Pump #1	REPLACE PUMP BEARINGS		Analyst Closed	7/17/200 6:32:25 PM

Date Type


- 7/27/2010 12:45:03 PM Expert system results
- 1/14/2010 10:51:33 AM Analyst reviewed results
- 1/14/2010 10:51:33 AM Expert system results
- 10/7/2009 9:08:42 PM Analyst reviewed results
- 10/7/2009 9:08:42 PM Expert system results
- 7/17/2009 6:32:25 PM Analyst reviewed results
- 7/17/2009 6:32:25 PM Expert system results
- 4/22/2009 11:42:52 AM Analyst reviewed results
- 4/22/2009 11:42:52 AM Expert system results

Administrator, Welcome to ExpertALERT ©2012 Azima DLI. Version 3.60.0.32 Trial expires on: 3/15/2013 (GMT-05:00) Eastern Time (US & Canada) 2/24/2013 11:36 PM

Reliability Portal-Dashboard



demo350



kpiety

[Plant View](#)

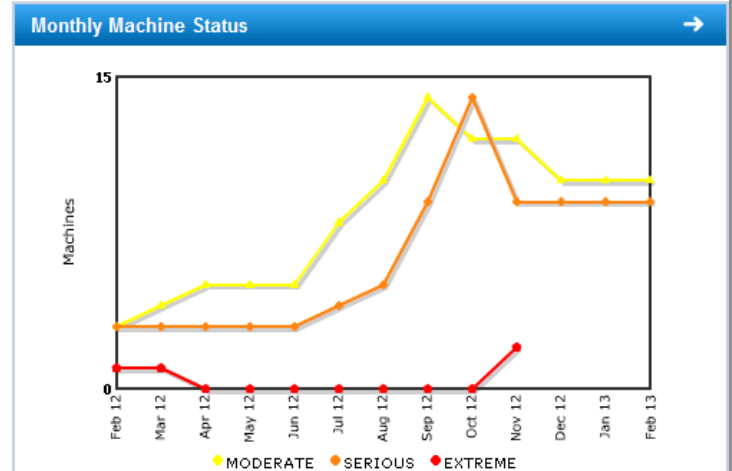
[Machines by Severity](#)

[Recent Analysis Results](#)


Manual Collection →




Extreme	0
Serious	9
Moderate	10
Slight	4
OK	151
Never Tested	33
Total Machines	207



My Watch List +

 **Aux Boiler Feed Pump A** (10QH11AP001) 🔗

Power Station
Balance of Plant

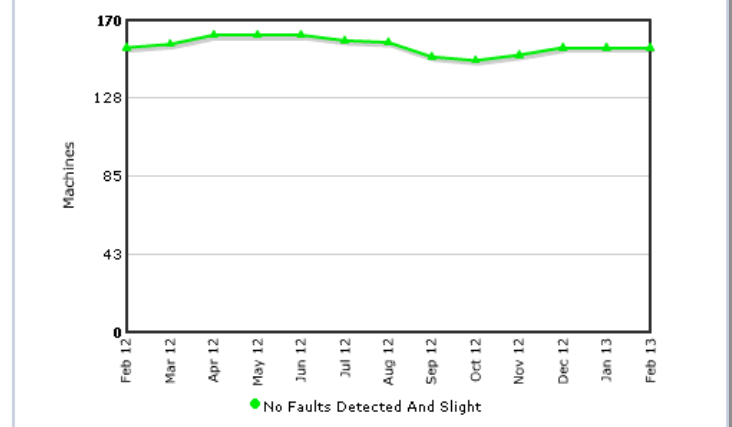
 **Status: SERIOUS**
Date: 7/31/2012 1:44 PM

Online Collection →

No machines are monitored online

Data Collection →

0	0	0	174
On Schedule	Overdue	>15 Days OD	>30 Days OD



Portal - Plant Summary View



WATCHMAN Reliability | Portal 2

View ▶ Preferences ▶ Create Custom Report User-Defined Points ▶ Utilities ▶ Help ▶ Print Screen Log Out

Welcome, kpiety!
You are connected to demo350 in Eastern Standard Time

Plants

Select the Area:

- AQCS
- Ash Silo
- Balance of Plant
- Boiler Building
- Coal Handling
- Turbine Hall

Plant View - Power Station - Analyst Reviewed Result Status

View Analyst Reviewed Result Status View Current Machine Status

Sort Alphabetically

Area Name	Extreme	Serious	Moderate	Slight	No Faults Detected	Never Tested	Needs Review	Total Machines
Turbine Hall	0	5	1	1	20	11	0	38
Balance of Plant	0	2	2	1	30	13	0	48
AQCS	0	1	5	1	37	4	0	48
Boiler Building	0	1	1	0	49	0	0	51
Ash Silo	0	0	0	0	7	3	0	10
Coal Handling	0	0	0	0	10	2	0	12

Available Reports

View all reports in this plant:

View Reports

Reports

- Recent Reports in Plant
- Machines in Plant by Severity
- Analyst Review Required in Plant
- Overdue Machines in Plant
- Event Tracker in Plant

Portal - Reports



Plants

Select the Area:

- AQCS
- Ash Silo
- Balance of Plant
- Boiler Building
- Coal Handling
- Turbine Hall

Recent Reports (Last 20) Filter By : All Types ?

View All Reports

Plant: Power Station

Point Name	Report Description	Date Added	Plant Name Area, Machine Or Survey Name
Vibration Reports	December 2012 Longview Power Vibration Report	12/3/2012 11:28:16 AM	Power Station
Infrared Inspection Reports	September 2012 Longview Power Vibration Report	9/16/2012 10:45:46 PM	Power Station
Vibration Reports	Longview Power Monthly Vibration Report August 2012	8/15/2012 10:29:32 AM	Power Station
Infrared Inspection Reports	Longview	8/12/2012 4:32:43 PM	Power Station
Vibration Reports	Longview Power Monthly Vibration Report June 2012	6/13/2012 11:10:55 AM	Power Station
Motor Testing Reports	Longview Power - Motor Analysis Report - March 2012	6/6/2012 4:42:47 PM	Power Station
Infrared Inspection Reports	Longview Power Infrared Report March 2012	6/6/2012 4:29:02 PM	Power Station
Vibration Reports	Longview Power Monthly Vibration Report April 2012	4/25/2012 12:10:20 AM	Power Station
Vibration Reports	Longview Power Monthly Vibration Report March 2012	3/26/2012 9:36:08 PM	Power Station
Vibration Reports	Longview Power Monthly Vibration Report February 2012	2/22/2012 4:38:28 PM	Power Station

Reports

- Recent Reports in Plant
- Machines in Plant by Severity
- Analyst Review Required in Plant
- Overdue Machines in Plant
- Event Tracker in Plant

Portal - Severity List



Plants

Select the Area:

- AQCS
- Ash Silo
- Balance of Plant
- Boiler Building
- Coal Handling
- Turbine Hall

Reports

- Recent Reports in Plant
- Machines in Plant by Severity
- Analyst Review Required in Plant
- Overdue Machines in Plant
- Event Tracker in Plant

Machines in Plant By Severity - Analyst Reviewed Result Status

Filter By :

- View Analyst Reviewed Result Status View Current Machine Status



Plant:Power Station- Area:Balance of Plant
Aux Boiler Feed Pump A (10QHG11AP001)

Analysts Reviewed Results Data Acquired: 7/31/2012 1:44 PM

MANDATORY: INSPECT COUPLING AND CHECK SHAFT ALIGNMENT
IMPORTANT: CHECK PUMP FREE AND DRIVE END BEARING FIT



Plant:Power Station- Area:Turbine Hall
Condensate Pump 2 (10LCB12AP001)

Analysts Reviewed Results Data Acquired: 11/30/2012 4:53 PM

IMPORTANT: INSPECT SYSTEM FOR FLOW ISSUES / INSPECT IMPELLER FOR SIGNS OF DAMAGE



Plant:Power Station- Area:AQCS
Mill 2 Product Pump A

Analysts Reviewed Results Data Acquired: 6/28/2012 12:04 PM

MANDATORY: INSPECT PUMP DRIVE END BEARING FOR PROPER LUBRICATION



Plant:Power Station- Area:Boiler Building
SCAH Condensate Pump B

Analysts Reviewed Results Data Acquired: 9/10/2012 2:09 PM

IMPORTANT: CHECK FOUNDATION FOR FLEXING AND / OR LOOSENESS

Portal - Machine Status View



Plants **Areas**

Select the Machine:


- Condensate Pump 1 (10LCB11AP001)
- Condensate Pump 2 (10LCB12AP001)
- Stator Cooling Water Pump 1
- Stator Cooling Water Pump 2
- Turbine Generator
- Condensate Pump 3 (10LCB13AP001)
- Seal Oil Pump 2
- Aux Circulating Water Pump 1 (10PAB51AP001)
- Aux Circulating Water Pump 2 (10PAB52AP001)
- Boiler Feed Pump 1 (10LAC11AP001)
- Boiler Feed Pump 2 (10LAC12AP001)
- Boiler Feed Pump 3 (10LAC13AP001)

Reports

- Recent Reports in Area
- Machines in Area by Severity
- Analyst Review Required in Area
- Overdue Machines in Area
- Event Tracker for Machine

Plant: Power Station - Area: Turbine Hall

Condensate Pump 1 (10LCB11AP001)

 **Status: SERIOUS**

Analysts Reviewed Results **Data Acquired: 11/30/2012 4:52 PM**
(by Brandon Schaner)


Last Monthly Test
Nov11 Jan12 Feb12 Apr12 Aug12 Nov12

Maximum Severity Test
Nov11 Jan12 Feb12 Apr12 Aug12 Nov12

Recommended Actions
IMPORTANT: INSPECT SYSTEM FOR FLOW ISSUES / INSPECT IMPELLER FOR DAMAGE

Identified Problems
SERIOUS PUMP CAVITATION OR AIR INGESTION

Analyst Comments
DIAGNOSIS:
Elevated levels of cavitation are noted by the obvious raised noise floor in the high-range spectral data. When viewed in Acceleration format, the levels are reaching 0.3 G's. Additionally, waveform data reveals random impacting at moderate levels, indicated by pump cavitation noise as opposed to bearing defects or other mechanical events.
RECOMMENDATION:
Unit should first receive inspection for any obvious flow issues; i.e. flow restrictions, improperly operating valves / controllers, uneven system pressure, etc. Assuming no flow issues are present, then physical impeller inspection should be done to check for any issues leading to the cavitation issues currently being experienced.



Portal - Event Tracker List View



Plants **Areas**

Select the **Machine**:

- Condensate Pump 1 (10LCB11AP001)
- Condensate Pump 2 (10LCB12AP001)
- Stator Cooling Water Pump 1
- Stator Cooling Water Pump 2
- Turbine Generator
- Condensate Pump 3 (10LCB13AP001)
- Seal Oil Pump 2
- Aux Circulating Water Pump 1 (10PAB51AP001)
- Aux Circulating Water Pump 2 (10PAB52AP001)
- Boiler Feed Pump 1 (10LAC11AP001)
- Boiler Feed Pump 2 (10LAC12AP001)
- Boiler Feed Pump 3 (10LAC13AP001)

Reports

- Recent Reports in Area
- Machines in Area by Severity
- Analyst Review Required in Area
- Overdue Machines in Area
- Event Tracker in Area

Event Tracker Filter By: Pending

Plant: Power Station - Area: Turbine Hall

	Latest Priority	Latest Date	Insert Priority	Insert Date	Machine Name	Recommended Actions	Work Order No.	WO Status	Status Date	Days WO Open	Findings Confirmed
Edit Reject		30-Nov-2012		06-Nov-2012	Condensate Pump 2 (10LCB12AP001)	Inspect System For Flow Issues / Inspect Impeller For Signs Of Damage		Open	02-Dec-2012	0	
Edit Reject		30-Nov-2012		30-Nov-2012	Condensate Pump 1 (10LCB11AP001)	Inspect System For Flow Issues / Inspect Impeller For Damage		Open	02-Dec-2012	0	
Edit Reject		30-Nov-2012		06-Nov-2012	Stator Cooling Water Pump 2	Correct Soft Foot Issue		Open	02-Dec-2012	0	
Edit Reject		30-Nov-2012		06-Nov-2012	Stator Cooling Water Pump 2	Monitor All Pump Bearings For Increased Vibration		Open	15-Nov-2012	0	
Edit Reject		29-Nov-2012		29-Nov-2012	Turbine Generator	Ensure No Shaft Rubs Present On Generator Lead End		Open	02-Dec-2012	0	
Edit Reject		02-Oct-2012		11-Sep-2012	Stator Cooling Water Pump 1	Check Motor Rotor/Stator Air Gap And Mounts. Verify Soft-Foot Condition Not Present And Base Stability		Open	07-Oct-2012	0	
Edit Reject		02-Oct-2012		02-Oct-2012	Circulation Oil Pump 1	Replace Motor Bearings		Open	07-Oct-2012	0	

Portal - Recommended Action | Event Details

Plants **Areas**

Select the **Machine**:

- Condensate Pump 1 (10LCB11AP001)
- Condensate Pump 2 (10LCB12AP001)
- Stator Cooling Water Pump 1
- Stator Cooling Water Pump 2
- Turbine Generator
- Condensate Pump 3 (10LCB13AP001)
- Seal Oil Pump 2
- Aux Circulating Water Pump 1 (10PAB51AP001)
- Aux Circulating Water Pump 2 (10PAB52AP001)
- Boiler Feed Pump 1 (10LAC11AP001)
- Boiler Feed Pump 2 (10LAC12AP001)
- Boiler Feed Pump 3 (10LAC13AP001)

Reports

- Recent Reports in Area
- Machines in Area by Severity
- Analyst Review Required in Area
- Overdue Machines in Area
- Event Tracker in Area

Plant: Power Station
Area: Turbine Hall
Machine: Condensate Pump 2

First Reported: **06-Nov-2012** Latest Priority: **30-Nov-2012**

Edit Event **Attached Files**

Edit Event

Work Order Status: Status Date:

Work Order Number: Findings Confirmed:

Event Description: Root Cause Performed:

Root Cause Finding:

Financial Impact: \$

Recommended Actions:

Inspect System For Flow Issues / Inspect Impeller For Signs Of Damage

Additional Findings: