i-ALERT® Remote Monitoring Solution

Zero Unplanned Downtime

Sensor | App | Gateway | Diagnostics | Ai Platform

Application Guide

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Introduction

This guide is designed to assist reliability practitioners in optimizing the performance of their rotating equipment assets using modern condition monitoring technologies.

Traditional condition monitoring techniques and budget constraints force practitioners to make difficult choices as to which pieces of equipment they can focus on while relegating many of the less critical assets to a suboptimal time based maintenance regime or a "fix it when it breaks" mentality. Even in those plants that do perform periodic predictive maintenance (PdM) inspections, the frequency or time between inspections is a month or more, sometimes up to a year. Many failure mechanisms can develop and progress into catastrophic failure well before the next inspection, rendering the PdM program ineffectual for "balance of plant" equipment.

Using the latest Micro-Electromechanical Sensors (MEMS) and Bluetooth® wireless communications technologies ITT has created a tool that better fits the needs of reliability practitioners.

Continuous monitoring of machinery health is an ideal solution to prevent unplanned downtime, but has historically come with a big price tag that couldn't be justified except on the most critical assets. Using the latest Micro-Electromechanical Sensors (MEMS) and Bluetooth® wireless communications technologies ITT has created a tool to better fit the needs of reliability practitioners. The i-ALERT3 Equipment Health Monitor is a low cost alternative that continuously trends key machinery health parameters including overall vibration and temperature and allows users to access that trend data during routine inspections. Leveraging new technology allows the i-ALERT3 condition monitor to offer improved utility and reduced cost compared to a typical "walk-around" monthly vibration program.

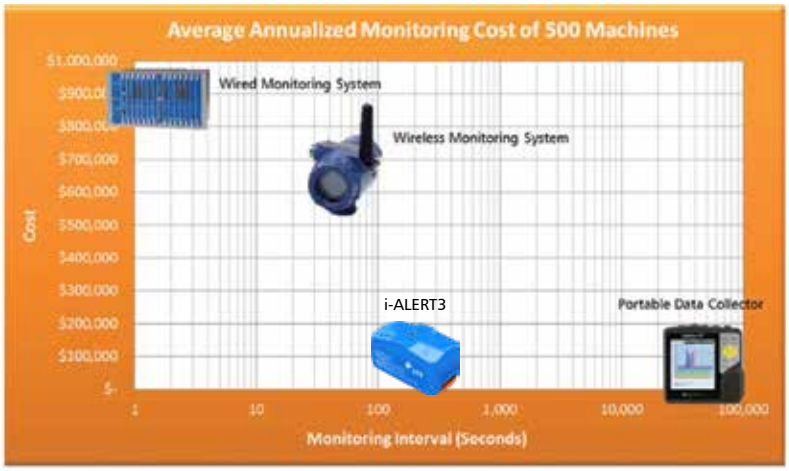


Figure 1: Condition Monitoring Technology Comparison

How i-ALERT3 Monitor Augments a Condition Monitoring Program

Improved Program Effectiveness

- Continuous data collection allows for diagnosis of transient and process related problems which are traditionally very hard if not impossible to spot with monthly or quarterly data collection cycles. Especially effective for batch process equipment.

- Traditional monthly walk around monitoring with a portable data collector requires at least 2 months to generate 2 points or a "trend" upon which a baseline condition can be established. In 2 months, the i-ALERT3 monitor can measure and store 1440 points or more, giving the PdM practitioner a superior level of confidence and understanding of the equipment's behavior.

- Changes in machine state automatically trigger the device to capture spectral and time waveform data. The ability to capture this diagnostic data in conjunction with the trend and timestamp information improves a reliability practitioner's ability to troubleshoot process related problems. These state changes are captured by the sensor itself, and when used in conjunction with a Gateway, that information is quickly sent to the Ai Platform, where a user notification can be sent.

- Trending enhances the traditional overall vibration dataset, yielding more accurate condition assessment than overall RMS vibration alone.

- On-board FFT computation provide greater insight into machine health than just overall RMS measurements.

- Exceptionally accurate motor flux based run-time accumulator (i-ALERT3) delivers information for scheduled maintenance activities, as well as an indication of impending motor failures and faults. Enhanced run speed precision when used on equipment motor or drive end.

Improved Worker Safety

- No need to get close to dangerous rotating equipment hazards to collect the data; addition of a remote Gateway delivers enhanced safety through remote data collection and analysis.

Reliability Overview

Maintenance and Reliability (M&R) practices including condition monitoring are largely governed by the type of assets being maintained and the associated failure patterns of those assets. Numerous studies have been conducted in both the Industrial and Aeronautical / Military markets that show the relative frequency or "probability" of failure of equipment. This data is summarized in Figure 2. What should immediately become apparent is that very few failures are attributable to "wearing out" or what might be termed an "age-related" failure pattern.

The majority of industrial equipment will tend to have a failure probability distribution similar to that of Figure 3, where the risk of failure for equipment is highest upon startup, sometimes termed "infant mortality" and will decrease to some relatively constant probability of failure over time.

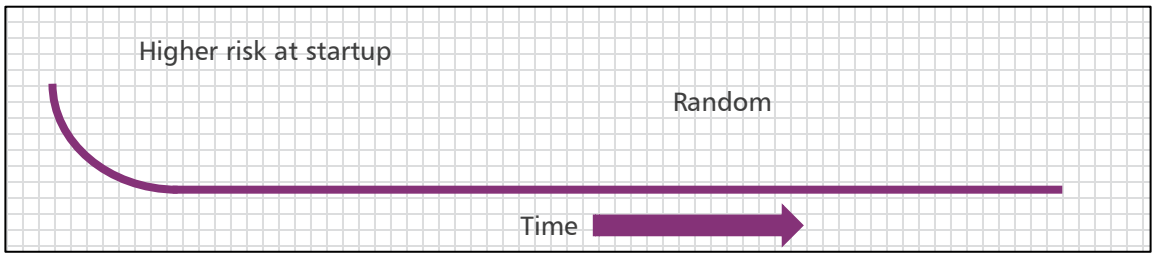


Figure 3: Most common failure probability pattern for industrial equipment

Knowing that most equipment will follow the failure pattern of Figure 3 should guide M&R practitioners to select condition monitoring equipment that can:

1. Quickly identify defects or problems when new equipment is started before they cause severe damage
2. Help establish confidence that a newly commissioned machine is operating within specific limits
3. Maximize the ability to detect randomly occurring failures after a successful startup.

The i-ALERT3 Equipment Health Monitor is designed to provide all of these functions while still maintaining cost effectiveness. Always consider the benefits a new condition monitoring technology will provide against these proven failure curves to ensure it will be effective. Implementing new technology just for the sake of saying you have the latest and greatest technology will lead to a lot of wasted money and effort.

Introduction to Condition Monitoring

CM and PdM tools available today are great enhancements to the traditional visual / audible Inspections and augment regular operators' inspections. Whether performing a simple visual inspection or using the most sophisticated tools available the process is fundamentally the same. There are 4 Steps:

- NOTICE
  - We have to notice or detect that we have a problem with a piece of equipment.
- INVESTIGATE
  - Once detected, we can investigate and analyze the problem to determine the root cause.
- RESOLVE
  - After determining the root cause, we can correct the problem and, if possible, improve the machine by leaving it in a precise state.
- DOCUMENT
  - By documenting our results, we are able to verify that the problem has been solved and communicate our successes to others.

It is important to thoroughly understand each of these steps. Valuable time is often wasted when too much emphasis is placed on any one component.

Step 1. Notice: Detection of Problems

Since analysis of machine problems is a time consuming process and there are many machines in a typical plant, it is important NOT to try to analyze all machines. The first step in an effective condition monitoring program is to identify the problem machines. This is the purpose of the detection phase of the program. Measurements and machines are organized into a series of logical routes and data is collected on them in a routine manner. Automated data collection, route functionality and remote continuous monitoring (when using a Gateway) is a cornerstone of the i-ALERT3 condition monitor's value. One of the strengths of the i-ALERT3 monitor is the ability to broadcast the machine's condition without having to wirelessly connect to it. The alarm settings against data collected are designed to indicate when a change has occurred or when a preset limit has been exceeded. After the data has been collected, it is reviewed, diagnostics are applied and exceptions are noted and reported. When a Gateway is used, alarm level excursions can be used to send an alert to the user.

After identifying machines in need of further analysis using detection, the next step is to determine the root cause of the problem. This is achieved during the INVESTIGATE or ANALYSIS phase.

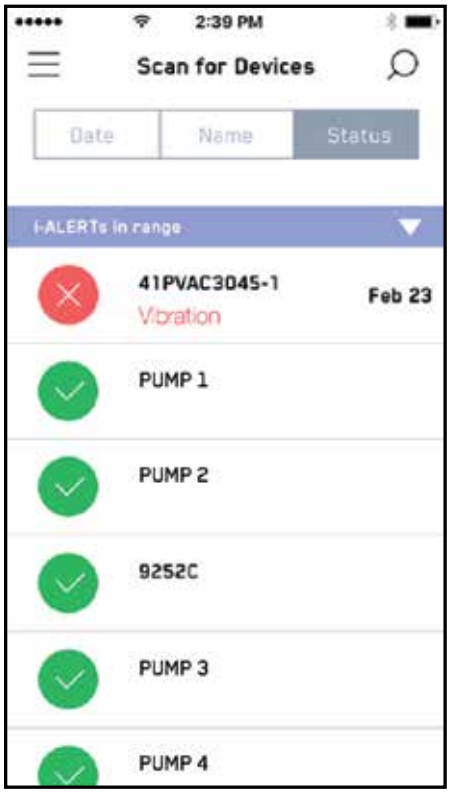


Figure 4: Simultaneously view states of all devices in range

Step 2. Investigate: Analyze the Problem

The analysis phase involves gathering more detailed diagnostic data which can include process conditions, flows, pressures, FFT, TWF, Timestamps and Trend data. Performing such analysis is a time consuming process and should NOT be attempted on all machines, only the ones that have exceeded alarm limits.

If process data is available from the control system it should be overlaid with the vibration/temperature trends of the i-ALERT3 to help determine root cause. Often the root cause of a vibration problem is a process upset.

Figure 5: Process data related to condition monitoring data

Step 3. Resolve: Correction & Improvement

After determining the root cause of the problem, it can be corrected. Cost effective corrective actions will depend on the machine in question and the findings of the failure analysis. In order to maximize the reliability of the machine in question, it is also advisable to improve the vibration levels on the machine to "precision state" levels after it has been repaired. This will extend the life of the machine.

Figure 6: Precision repair at an ITT PRO Service Center

Step 4. Document

After determining the root cause of the problem, correcting the problem and improving the machine, it is important to verify that the correction/improvement has occurred and document the findings. One mechanism for this verification is comparing the vibration levels after restarting the machine with those taken before shutdown and the original baseline data. Other common verification methods include:

- Measuring reduced energy consumption
- Capturing Infrared Thermography Images
- Oil analysis
- Confirming precision alignment

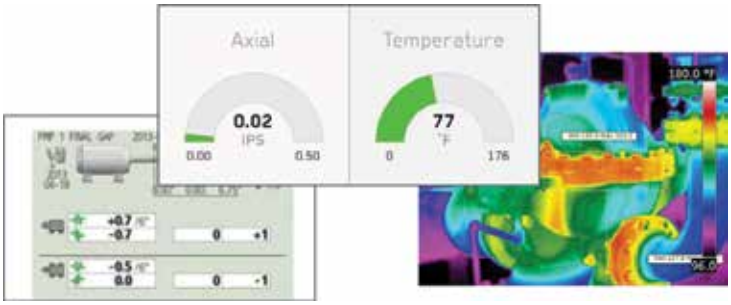


Figure 7: Document results to verify corrective action was effective

System Overview

Device Technology Background

Micro-Electro-Mechanical Systems, or MEMS, is a technology that is best defined as miniaturized mechanical and electro-mechanical elements that are made using the techniques of microfabrication. MEMS represent the next generation of sensing technology. One of the most prevalent uses for MEMS is the construction of miniaturized sensors that convert energy from one form to another, known as transducers. In the case of MEMS sensors, the device typically converts a measured mechanical signal into an electrical signal. MEMS sensors are very robust, and require no calibrations or external temperature compensation.

The latest generation of MEMS includes micro-sensors, micro-actuators and micro-electronics integrated onto a single microchip. This has resulted in the explosive development of smart products which integrate computing intelligence with sensing and control. Because MEMS devices are manufactured using batch fabrication techniques, similar to integrated circuits, high levels of reliability are being achieved at very low costs. The i-ALERT3 monitor leverages recent advancements in MEMS vibration transducers to achieve impressive performance at a minimum cost. The sensors' data gathering capabilities are then mated to another leading technology known as Bluetooth Smart or Bluetooth Low Energy.

Bluetooth is a wireless signal protocol that was first developed in 1994 as a way for computers to communicate to other devices without cables. Bluetooth is an open standard that allows disparate devices to communicate using the same "language". Over the last few decades the technology has been steadily improved to be able to transmit more data faster while simultaneously reducing the amount of power the wireless radios consumed. Bluetooth Smart allows tiny batteries to power wireless radios for years at a time without recharging and is one of the technologies enabling the rapid rise of the Industrial Internet of Things (IIOT). IIOT is a term that describes the reality of hundreds (or thousands) of smart devices communicating hordes of data to enable smarter, more efficient operations.

Many of the existing condition monitoring hardware manufacturers are aware of the potential for MEMS and Smart sensors however they are reluctant to offer this new technology due to the potential for cannibalization of their existing macro-scale sensor products. ITT is free from this commercial constraint and will continue to utilize the best and latest technology that allows our customers to optimize the reliability of their rotating equipment assets.

Device Overview (i-ALERT3)

The i-ALERT3 Equipment Health Monitor is a compact, battery-operated monitoring device that continuously measures the vibration and temperature of a piece of rotating equipment. The i-ALERT3 Equipment Health Monitor uses blinking red LED and wireless notification to alert operators when the equipment exceeds vibration and temperature limits. This allows the operator to make changes to the process or the equipment before catastrophic failure occurs. The Equipment Health Monitor is also equipped with a single green LED to indicate when it is operational and has sufficient battery life.

The i-ALERT3 Equipment Health Monitor also contains a Bluetooth radio that communicates to certain Bluetooth 5.0 (iA3) equipped devices through a mobile application. Data is shared between the i-ALERT3 Equipment Health Monitor, the mobile application, tablet or phone, Gateway and the data servers.

The i-ALERT3 Equipment Health Monitor will communicate sensor related data (such as vibration, temperature, runtime information, and device statistics) stored in the device to the mobile application. The mobile application will send commands to the device. The i-ALERT3 has expanded capabilities such as lower and higher frequency range as well as a magnetic flux sensor which is geared toward precise equipment speed measurement, an improved run-time accumulator, and early diagnosis of motor faults.

The Mobile application will back up device data as well as app usage information on the data servers. The data servers will send the mobile application equipment technical data. For full details about data storage and rights please review the Privacy Policy.

Alarm mode

The i-ALERT3 Equipment Health Monitor enters alarm mode when either vibration or temperature limits are exceeded over two consecutive readings within a 10 minute period. Alarm mode is indicated with 1 (one) red double flashing LED within 5 (five) second intervals. The "check" interval is adjustable from 1 to 60 minutes, and the "data acquisition" interval is also adjustable from 5 to 60 minutes.

Default Warning and Alarm Values Variable	Limit
Temperature (default)	80°C (176°F)
Vibration Alarm (0.1-1.5 ips)	100% increase over the baseline level
Vibration Warning (0.1-1.5 ips)	75% increase over the baseline level

Table 1: Default Alarm Values

Vibration and Temperature

Sensor Characteristics	i-ALERT 3
Flux Sensing	Yes
Flux Range	.13/1.6mT (auto)
Run speed Measurement	Calculated
Temperature Resolution	0.1C
On-Board FFT Calculation	Yes
On-Board Kurtosis Calculation	Yes
Dynamic Range	20g
Frequency Range (X,Y,Z)	4-5000 Hz
Frequency Resolution	0.5 Hz / 2 Hz
Amplitude Accuracy	+/-10%
Selectable Band Measurements	Yes
Maximum Equipment temperature	183°F

Trending Specifications

- Sensors and onboard memory tracks vibration, temperature, Flux & run-time hours continuously
- Devices checks every five minutes & alarms if equipment is outside normal operating conditions
- Stores data once per hour & on alarm for 170 days
- Stores the weekly average, minimum & maximum up to 5 years

Hardware Specifications

- Rated for most industrial environment. IP68 water/dust resistant. Class 1 Division 1, Zone 0, ATEX Certified
- Intrinsically Safe with a 2-3 year battery life
- The following determines the "normal operating conditions" in which the battery life is determined:
  - Temperature: 18°C (65°F)
  - Dashboard connections (including trend download): Once per day
  - FFT and Time Waveform usage: One tri-axial request per 14 days
  - Operation time in Alarm: 25% of time
- Sync data via Bluetooth Smart enabled smartphones and tablets.
- Wireless Range Approximately 30m (100ft)
- Gateway Range Approximately 75m (250ft)

Communication and Environmental Specifications

Hardware Specifications

Sensor Characteristics	i-ALERT 3
Bluetooth Range	30m (100ft)
Bluetooth Throughput	Up to 50KB/s
Rating	IP68
Hazardous Rating	Class 1, Div 1
Expected Battery Life	2-3
Replaceable Battery	Yes

i-ALERT3 Vibration Data Acquisition Specifications

Standard Vibration FFT Specifications	Low Range	High Range
Number of Samples	8192	8192
Sample Rate	16384	32768
Lines of Resolution	4096	4096
Frequency Resolution (Bin Size)	0.5 Hz	2 Hz
Frequency (Min)	4 Hz	4 Hz
Frequency (Max)[1]	800 Hz	4990 Hz

i-ALERT3 Flux Data Acquisition Specifications

Flux FFT Specifications	
Number of Samples	8192
Sample Rate	32768
Lines of Resolution	4096
Frequency Resolution (Bin Size)	1 Hz
Frequency (Min)	1 Hz
Frequency (Max)[1]	4096 Hz

[1]FIR Filter fc = 3200

i-ALERT3 Run Speed Acquisition Specifications

Run Speed Specifications[1]	Default	High Accuracy
Sample Time	4 seconds	8 seconds
Accuracy	4 rpm	4 rpm

[1]Run speed calculation is only valid when sensor is mounted to a motor

i-ALERT3 Temperature Specifications

Temperature Accuracy[1,2]	i-ALERT 3
Accuracy (Steady State)	2 deg. F
Accuracy (Varaible, <20deg/hour)	4 deg. F

[1]Temperature accuracy is only valid when sensor is mounted directly or using mounting pad
[2]Both i-ALERT3 and i-ALERT3 have a temperature offset field used interactively to compensate for delta_T

Choosing the Correct Measures and Assets

Equipment Criticality

The initial step in building a predictive maintenance program is to identify which systems will be analyzed and prioritizing the order in which the analysis will take place. To get the most return on the time invested, the most logical place to start is with the equipment hierarchy that exists in the Computerized Maintenance Management System (CMMS). This is typically a breakdown of all existing equipment from Plant Level to Business Unit to Operating System to Equipment to Component and to Sub-component, where necessary.

For systems deemed critical, a full Reliability Centered Maintenance (RCM) analysis should be performed. One approach to determine criticality is to use tables similar to those below to assess consequence and probability.

Equipment Hierarchy

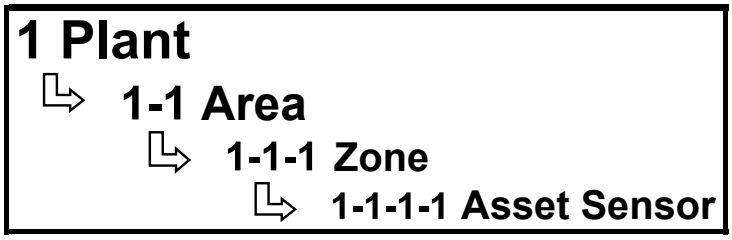


Figure 8: Example Asset Hierarchy for a CMMS

Risk is defined as Probability x Consequence. So by multiplying the assigned values from each table a criticality number can be determined.

The value assigned for equipment will be based on the consequence of the failure of the equipment (called Severity) multiplied by the probability that the failure will occur (called Probability). The asset matrix (list of all assets that have had the business criticality determined) can then be sorted by priority. The equipment with the largest number as figured by Severity x Priority is the most business critical equipment.

Machine Selection Criteria

Just as with every existing condition monitoring system, there are certain applications that best fit the technology being leveraged. The following tables and comments help illustrate the best fits for the i-ALERT3 condition monitoring system.

Some general limitations to keep in mind when selecting machinery are:

- The i-ALERT3 monitor is designed to measure casing vibration, so machines with sleeve/fluid-film bearings are inherently not going to be as good a fit due to attenuation of the shaft vibration via the fluid-film. Now that does not mean i-ALERT3 cannot be used for sleeve bearing machinery, only that the casing vibration measured will not reflect the true shaft vibration amplitudes.
- The upper and lower frequency cutoffs for the i-ALERT3 devices are 5000Hz and 4Hz respectively. Just as with any condition monitoring instrumentation, it is recommended that the machinery shaft speed and primary potential fault frequencies fall within this range. For diagnostic purposes, you want to be able to see more than just the shaft speed and ITT recommends a minimum frequency range of 10x the shaft speed, AKA the first order. This translates to an effective upper limit on shaft speeds of 6,000 RPM. It can be applied on higher speed machinery, but the upper frequency cut off will limit its usefulness in that application.

Equipment Type	Good	Limited
Centrifugal Pumps	V,T	
Positive Displacement Pumps	V,T	
Electric Motors	V,T,F	
Fans / Blowers	V,T	
Paper Machine Bearings	V,T	
Centrifugal Compressor	V,T	
Reciprocating Compressors		Low Speed Limitations
Engines	V,T	
Steam Turbines		Casing Temperature
Gearbox / Reducers		Mesh Frequency

Table 3: Recommended machinery applications for i-ALERT3 (Note: Shaft Speeds must be greater than 300 RPM)

Where to Start?

1 Bad Actors.

Start with the "bad-actors" list. All plants track their worst performing assets to one degree or another. (High maintenance cost and effort, low availability, etc.) The reasons for the poor performance of these assets can be myriad but chances are that one of the reasons they are on the bad actors list is because not enough information is currently available to diagnose and correct the problems. Continuous monitoring of vibration and temperature combined with any available process control data can go a long way towards helping the proactive reliability engineer eliminate the sources of a bad actors poor performance.

2 Machinery that is dangerous or difficult to access for inspections.

We've all seen these poor pumps or motors in the darkened corner of the plant basement. Often leaking, corroded, and installed in poorly lit process areas. Regular inspection routes miss them as their hidden by piping or other equipment. Installing i-ALERT3 devices on these neglected machines helps give them a voice and allows them to communicate potential failures that otherwise would have gone undetected. The same is true of machinery with particularly hazardous operating environments. Collecting data on equipment installed on platforms or in pits can be difficult if not impossible while the equipment is running. Modern machinery guarding can also obscure typical measuring points, and removing it to take a vibration reading typically won't be allowed. The i-ALERT3 wireless communication enables data collection at a safe proximity from the equipment hazards.

3 Equipment that doesn't run Machinery that requires close monitoring .

It is difficult and sometimes nearly impossible to try and collect data on a machine that only runs intermittently or at odd hours a hand-held data collector. Batch processes run at all hours of the day or night. Unless someone is assigned to be in front of the machine ready to collect data 24/7, it's likely you won't have a great deal of data to analyze should a problem arise.

4 Equipment that has no permanent machinery protection/monitoring system.

Critical assets are sometimes "protected" by permanently installed systems that have the ability to shut down the machinery if it exhibits signs of failure. However these systems are generally very expensive and cannot be applied to all assets in a plant. The low cost and ease of installation of the i-ALERT3 monitor make it a perfect device to bridge the gap between machinery protection systems and periodic inspections. In fact, the i-ALERT3 monitor can completely supplant the use of portable data collectors for monthly inspections. The exception report and alarm / trend information generated by the i-ALERT3 monitor will show a user which machines should be prioritized for further vibration analysis. If a machine generates an alarm or alert, the reliability practitioner can initiate a work order for the in house team or bring in a consultant to perform a diagnostic of the equipment using powerful multichannel vibration analyzers and other advanced instrumentation to investigate the root cause.

5 New or Recently Repaired Equipment.

As mentioned earlier in the user guide, the risk of equipment failure due to some defective component or faulty repairs is much more likely to manifest as a failure right at start-up. By installing i-ALERT3 devices on new equipment and recently repaired equipment being commissioned, start-up failures can be reduced, and faulty equipment can be diagnosed right away, protecting the plant from low quality equipment repairs or parts.

Condition Monitoring Measures

Implementing a condition monitoring technology requires the user to first understand the equipment failure modes and what physical parameters are responsive to changes in the equipment's state. Since not one single device can hope to cover all possible machine configurations or physical measures we will instead offer recommendations for utilizing temperature and casing vibration to detect some of the most common failure modes.

Temperature

Monitoring and trending the Temperature of a bearing housing provides insight into many common problems with rotating machinery such as:

- Inadequate lubrication of rolling element bearings
- Damaged rolling element bearings
- Excessive loading of rolling element bearings
- Inadequate cooling flow from housing fins, jacketed cooling systems or cooling fans
- Excessive ambient or process fluid temperatures

Vibration – RMS Velocity

Monitoring and trending RMS velocity of a bearing housing provides an assessment of how much overall energy is contained in the machines vibration. This can be used to indicate changes to both process conditions and machinery health. RMS velocity increases can also corroborate a Temperature increase, which assists the reliability practitioner in narrowing down potential failure modes. RMS velocity is by far the most common vibration parameter utilized to gauge overall machine condition. as it provides an "energy like" parameter by which variations can be inferred to indicate changes to loading, equipment stress or looseness.

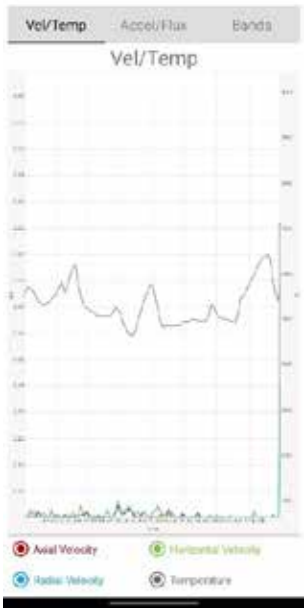


Figure 9: Example weekly trend data

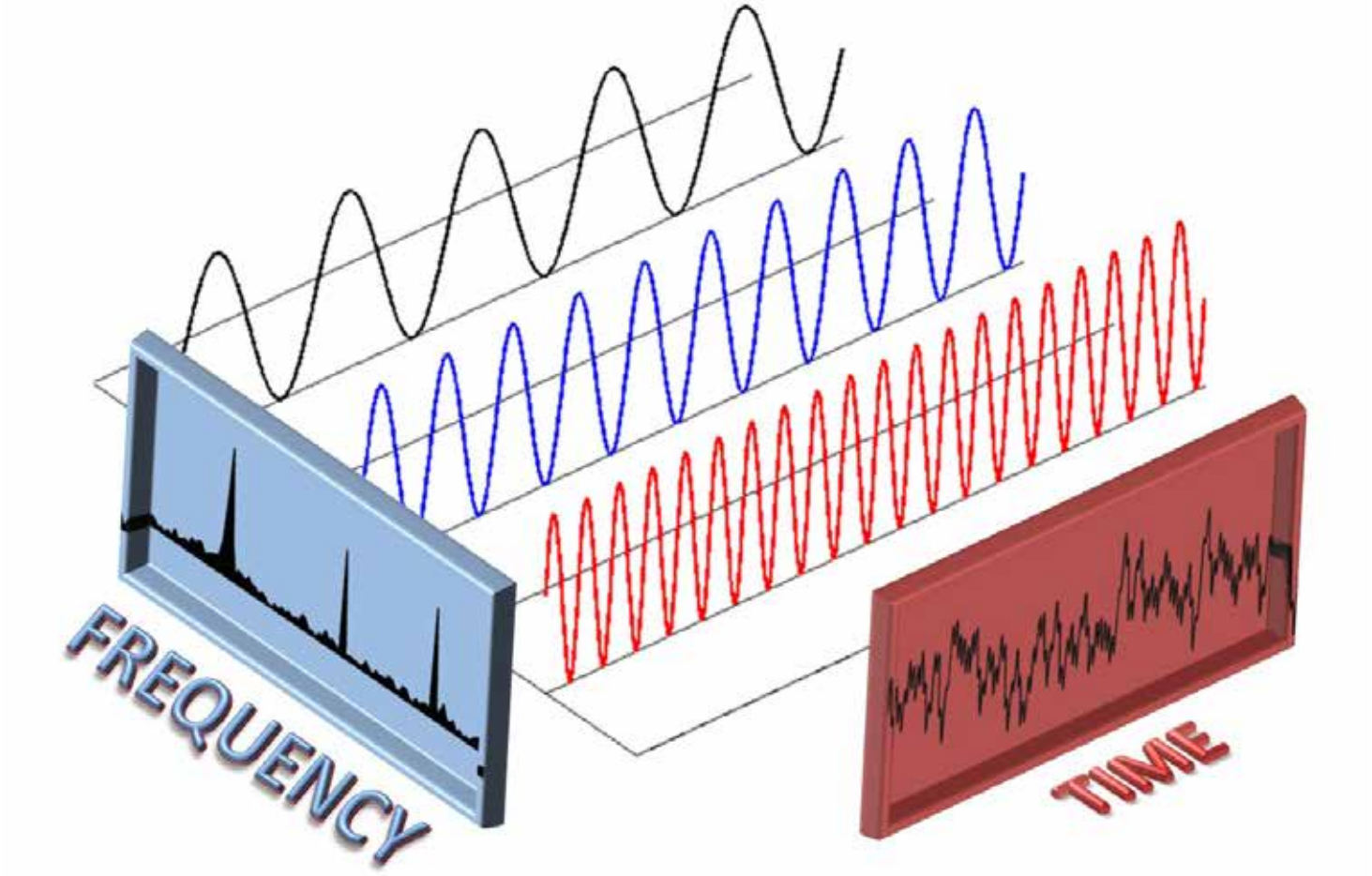
Spectrum Analysis

There are no "absolute" levels of vibration that can be used to indicate if a machine is good or bad. There are too many factors that influence of the overall vibration from one machine to the next. The chart below is provided to assist the user to establishing warning and alarm limits and is taken directly from the ISO 10816 standard. These limits can and should be modified based on the equipment's actual vibration data and user's experience . In some cases machines of a given size may operate outside of the established limits under their normal operating conditions; those machines should have their alarm and warning levels set based on "real-world" VRMS and Temperature values after the behavior has been monitored for some period. During this baseline process, it is also very advantageous to have acquired at least (3) baseline FFT and TWF measurements that can be compared to subsequent measurements. These later FFT's are utilized by the Ai Platform Diagnostic Engine to determine (a) Impending Fault, (b) Fault Severity, and (c) Action. The Diagnostic Engine is described in the FFT section below.

The "Fast Fourier Transform" (FFT) is an important measurement method used in the analysis of machine vibration. It converts a signal into individual spectral components and in so doing provides frequency information about the signal. Computation of the FFT is considered processor intensive, and requires sampling the incoming vibration signal over a period of time, and converting to frequencies of equivalent amplitudes. FFTs are used for spectral analysis, and general condition monitoring of machines or systems.

The i-ALERT Vibration/Temperature Sensor computes the FFT on-board for both vibration and flux, with the result provided to the Ai Platform. In both cases, the resulting measurement result provides the user with frequency based energy content of the particular measurement location, the relevance of which is indicative of energy emitted from various mechanical components within the equipment. Analysis of FFT spectra from equipment is somewhat of a science unto itself, typically requiring vibration expertise to assist with interpretation of the signal. The i-ALERT system employs an advance diagnostic algorithm set coupled with a comprehensive fault library to assist the user in interpretation of the FFT.

Strictly speaking, the FFT is an optimized algorithm for the implementation of the "Discrete Fourier Transformation" (DFT). A signal is sampled over a period of time and divided into its frequency components. These components are single sinusoidal oscillations at distinct frequencies each with their own amplitude and phase. This transformation is illustrated in the following diagram. Over the time period measured, the example signal shown contains 3 distinct dominant frequencies.



Condition Monitoring Measures

VIBRATION SEVERITY PER ISO 10816						
Machine			Class I small machines	Class II medium machines	Class III large rigid foundation	Class IV large soft foundation
in/s		mm/s				
Vibration Velocity Vrms	0.01	0.28				
	0.02	0.45				
	0.03	0.71		GOOD		
	0.04	1.12				
	0.07	1.80				
	0.11	2.80		SATISFACTORY		
	0.18	4.50				
	0.28	7.10		UNSATISFACTORY		
	0.44	11.2				
	0.70	18.0				
	0.71	28.0		UNACCEPTABLE		
	1.10	45.0				

Table 4: Condition based on overall vibration velocity in RMS

While the above ISO Chart is geared toward general rotating equipment, ISO Vibration Standards Exist for a variety of equipment that are applicable for i-ALERT Monitoring. These standards/guidelines are available for purchase from the International Organization for Standardization, www.iso.org. Some of the relevant standards are listed below."

ISO Standard Reference Number	Title	Notes
ISO 10816-1	General Machines	Applicable to general rotating equipment; Class 1: 15kW/20Hp Class 2: 15kW/20Hp to 300kW/400Hp Class 3: Large, rigidly mounted Class 4: Large, relatively soft foundation
ISO 10816-2	Steam Turbine And Generators	Applicable to
ISO 10816-3	Critical Machines	Applicable to
ISO 10816-4	Gas Turbines	Applicable to heavy-duty gas turbine sets used in electrical and mechanical drive applications, with fluid-film bearings, outputs greater than 3 MW and an operating speed range under load between 3,000 rpm and 30,000 rpm.
ISO 10816-5	Hydro Turbines	Machine sets in hydraulic power generating and pumping plants.
ISO 10816-6	Reciprocating Machinery	Large (>100kW) reciprocating machines; mounted either rigidly or resiliently. Examples are engines operating in diesel generator sets, gas compressors, marine propulsion engines, marine auxiliary engines, and diesel locomotives engines.
ISO 10816-7	Rotary Pumps	Applicable to pumps for industrial applications with nominal power above 1 kW.
ISO 10816-8	Reciprocating Compressors	Applicable to reciprocating compressors mounted on rigid foundations with typical rotational speed ratings greater than 120 r/min and up to and including 1800 rpm. Vertical or Horizontal arrangement; constant or variable speed.
ISO 10816-21	Onshore Wind Turbines With Gearbox	Applicable to wind turbines and their components with outputs above 100kW but below 3MW.

Mounting Locations

General Guidelines

In general the ideal place to mount the i-ALERT3 device is as close as possible to the machines bearings in a place where the LEDs can be easily observed. Since the primary function of the i-ALERT3 device is to monitor for changes in condition, it is not critical that the device be placed in the "load zone" of the bearing. Doing so may give a more accurate amplitude reading, but may obscure the LEDs which are used for local status indication.

In general, a standard machine train consisting of a driver and driven piece of equipment can be monitored by 2 i-ALERT3 devices. Up to 4 monitors can be installed per machine train, one at each bearing if necessary.

Machine Type	Non-Drive End Bearing	Drive End Bearing	Drive End Bearing	Non-Drive End Bearing
Driver	Optional	Recommended		
Driven Machine			Recommended	Optional

Figure 11: Recommended monitoring points

i-FRAME Pump

On any ITT Goulds Pumps that come equipped with the i-ALERT3 device, a slot will be machined in the bearing housing to mount the device within close proximity to both bearings. See figure 12.

Figure 12: ITT Goulds Pumps 3196 i-FRAME contains mill slot for mounting the monitor

End Suction Pump

On end-suction (overhung) style pumps where the thrust and radial bearings are contained within the same bearing housing, ITT Goulds Pumps recommends mounting the i-ALERT3 device centrally on the bearing housing in an area where the LEDs can easily be observed.

Figure 13: PD pump, side mounted to frame

Figure 14: Chemical Process pump, side mounted to bearing frame

Mounting Locations

Horizontal Electric Motors

Mount the i-ALERT3 monitor directly over the bearing housing on the drive-end bearing. A second monitor can be mounted over the non-drive end bearing if desired. Never mount a monitor on a fan cover!

Figure 15: Horizontal motor, mounted over drive end bearing housing

Figure 16: Close coupled motor, mounted over drive end bearing housing

Between Bearings Pump

On between bearings pumps, it is recommended to mount i-ALERT3 monitors to both bearing housings. If only one device is to be installed on a pump, then it should be installed on the bearing housing that contains the thrust bearing. Note, that this is not always the drive end bearing housing. Be sure to check the pumps cross sectional drawing to verify location of the thrust bearing.

Figure 17: Between Bearings Pump (BB3), mounted on each bearing housing

Figure 18: Double Suction, Horizontal Split case pump, mounted on thrust bearing housing

Vertical Electric Motors

The best mounting location for the i-ALERT3 device will depend on which class of vertical motor is being monitored. For vertical solid shaft motors with 2 rigid bearings, instrument the upper thrust bearing housing first since this is the primary bearing absorbing thrust loads. The lower bearing can also be instrumented if desired.

Figure 19:

For vertical hollow shaft (VHS) motors it is recommended to mount the i-ALERT3 device adjacent to the thrust bearing at the top of the motor. Most VHS motors do not have lower bearings and therefore there is no need for a second monitor.

Vertical Pump

Vertical pumps can be instrumented with the i-ALERT3 device at the pump discharge head. See image below. Mount the device at the top of the discharge head where the LEDs are clearly visible.

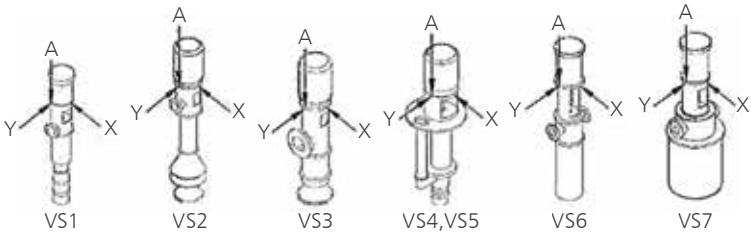


Figure 20: Arrows show recommended mounting location for vertical pumps (On Discharge Head)

Mixers

Mixer configurations can vary widely so ITT does not recommend any single best location. Use good engineering judgment and knowledge of the machine design to appropriately locate the monitor. Nearer to the bearings and sources of potential vibration energy is best.

Vacuum Pumps

ITT recommends monitoring the drive end bearing housing for vacuum pumps.

Figure 21: Vacuum Pump, side mounted to bearing housing

Mounting Methods / Commissioning / Reset the i-ALERT3

Mounting

There are four methods that can be used to mount the i-ALERT3 device to a machine. They are shown in the figure below. On new pumps and pumps repaired through ITT PRO Services, a slot will be milled into an appropriate location on the bearing housing and the device will be secured using a mounting adapter and fastener. Alternatively, a hole can be drilled and tapped and a small adapter plate can then be used to secure the device.

A magnet mount is available to move the sensor from location to location easily. The sensor can only be used with the i-ALERT3 Magnetic mount specified below. Using a non-approved magnetic device can damage the sensor.

Lastly, the device can be epoxied directly the machine via the mounting plate. Make sure to use a good quality, rigid epoxy. Do not use RTV or Silicon to mount the device.

Commissioning

Steps to activate the i-ALERT3 Equipment Health Monitor:

1. Remove the battery pack (top portion of sensor, with script "I" insignia) from package.

2. Press the battery module over the top of the sensor body, taking care to insure that the battery module is not twisted Incorrect power pin alignment will damage the i-ALERT3!

3. Once powered, LEDs will begin flashing to indicate that the unit is powered on.

4. Connect to the sensor using the i-ALERT Mobile App, and follow the sensor registration steps.

5. When sequence is completed the green LED will flash every 5 sec under normal operating conditions .

i-ALERT3

K21911A

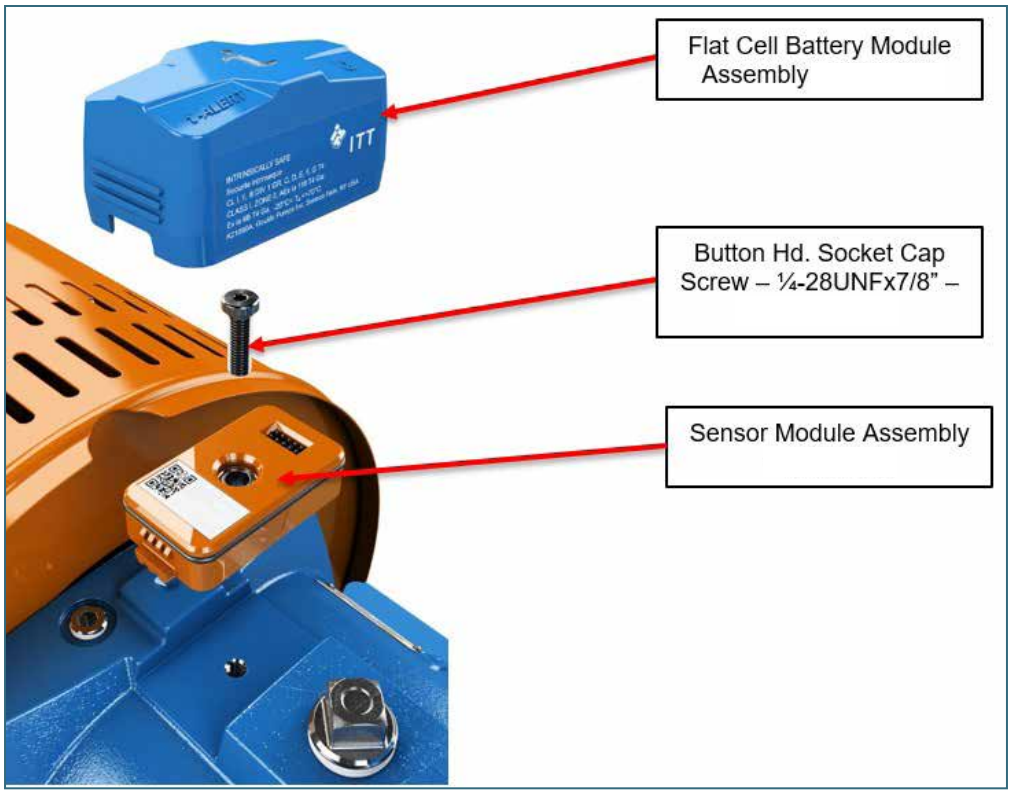
Stainless Steel Mounting Adapter

K25394A

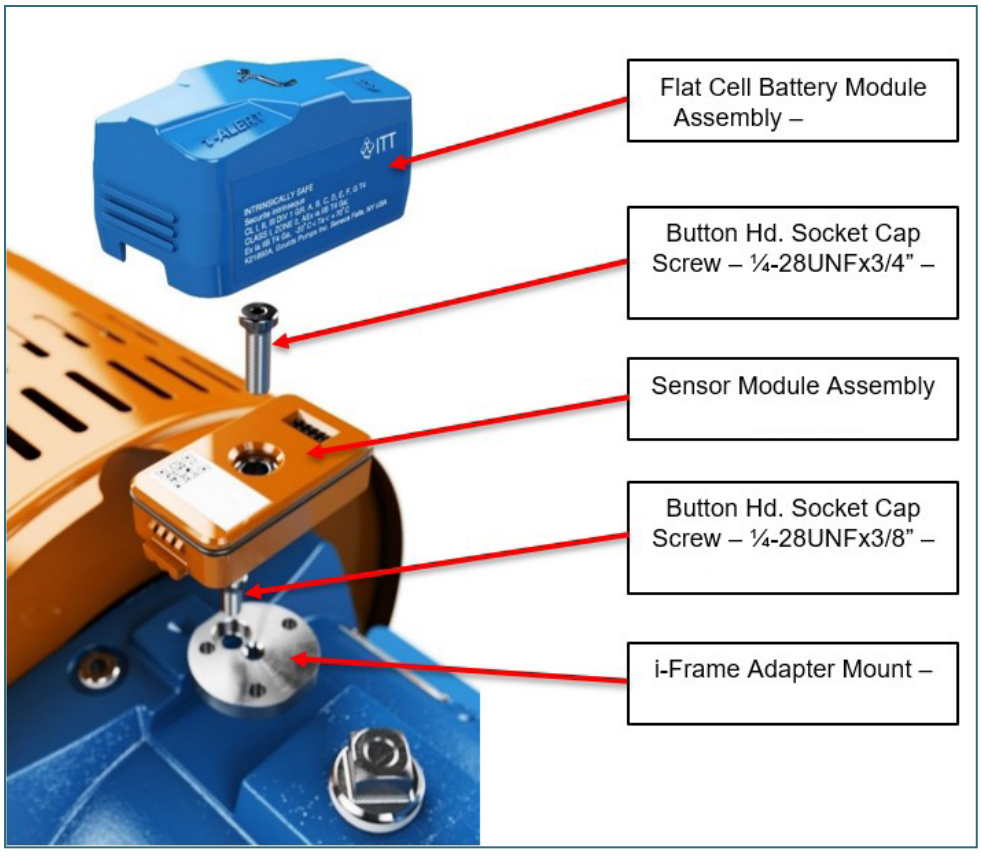
Magnetic Mounting Adapter

K21913A

Mounting Methods Cont.

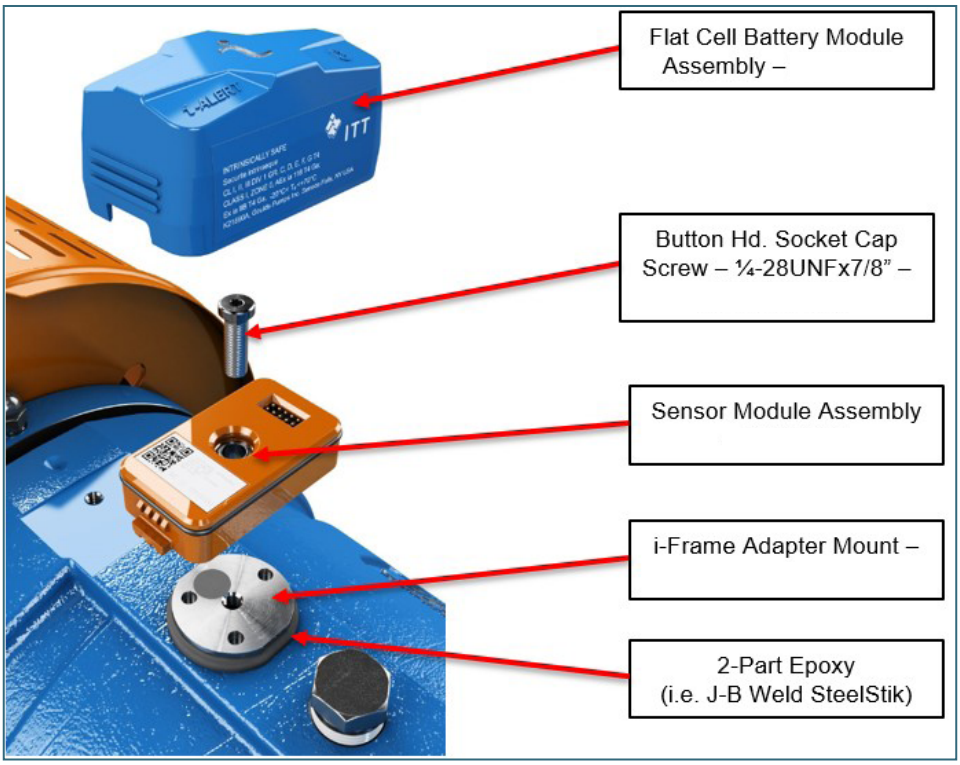


i-ALERT3 Mounting to i-Frame with Center Mount Hole

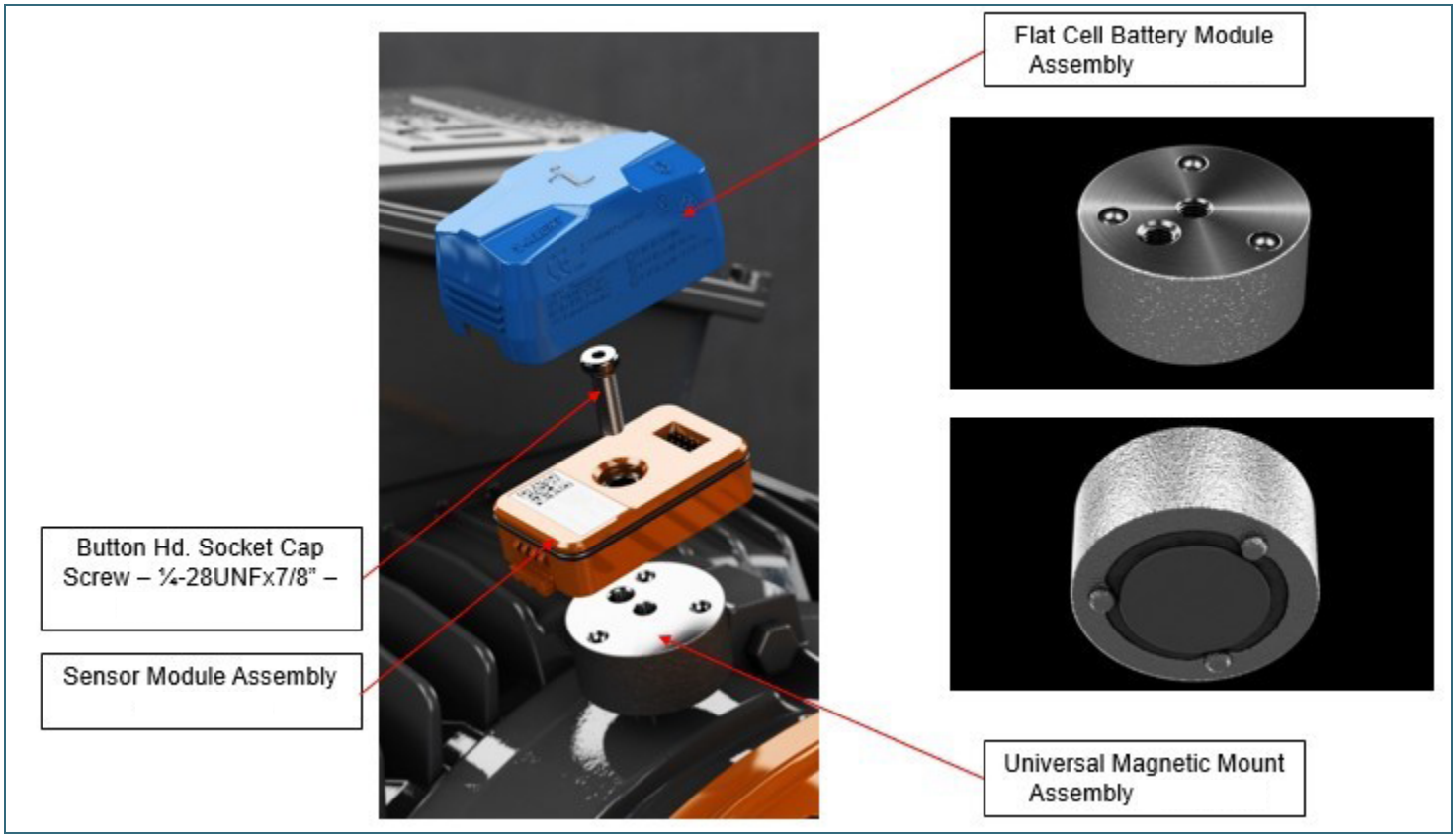


i-Frame Mount with Adapter Mount

Mounting Methods Cont.

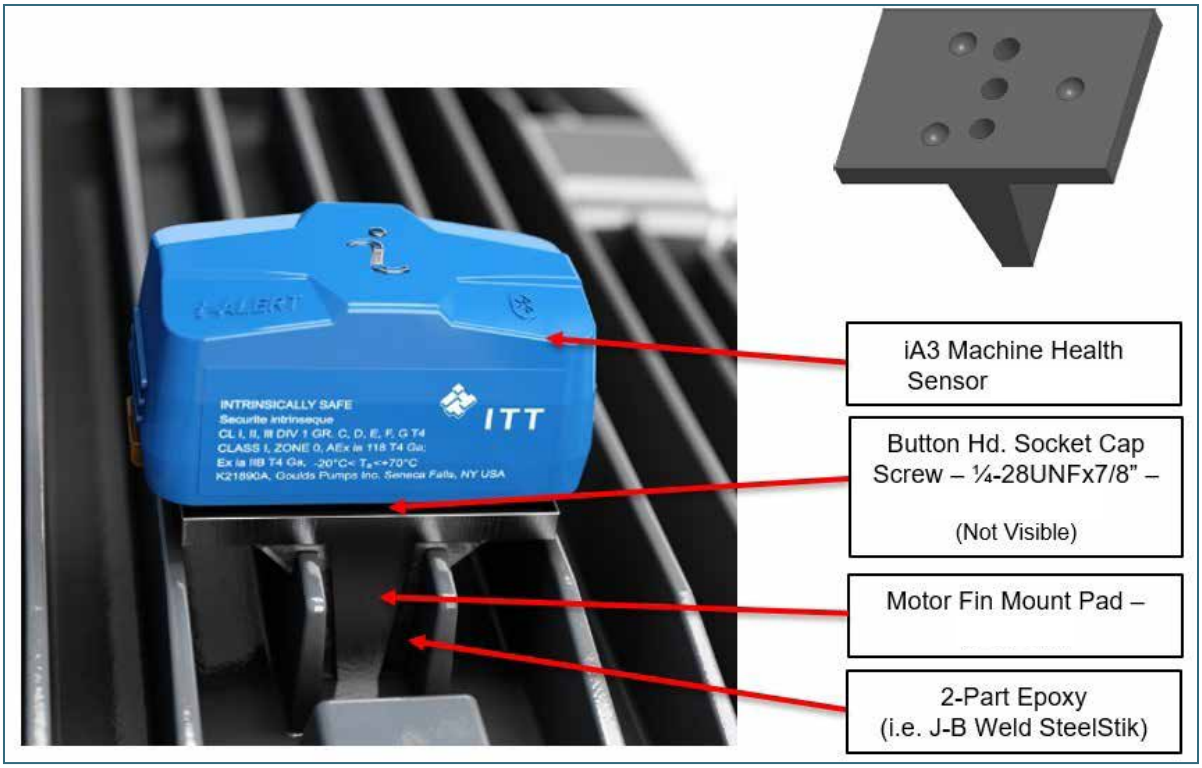


i-ALERT3 Mounting to Non-i-Frame Equipment Surface with i-Frame Adapter Mt. & Epoxy



Universal Magnetic Mount

Mounting Methods Cont.



i-ALERT3 Mounting to Motor using Motor Fin Mount Pad

Mounting Scenario	Screw Size	Packaging (Fasteners)
Mounting iA3 directly to Piece of Equipment	1/4-28UNF x 7/8" lg.	Included within iA3 Monitor Single Pack (K21911A)
Mounting iA3 to i-Frame Adapter Mount (K25394A)	1/4-28UNF x 3/4" lg.	Included within iA3 Monitor Bulk Pack (K25399A) & i-Frame Adapter Mount Single Pack (K25394A)
Mounting iA3 to iA3 Magnetic Mount Assembly (K21913A)	1/4-28UNF x 7/8" lg.	Included within iA3 Monitor Single Pack (K21911A)
Mounting i-Frame Adapter Mount (K25394A) to i-Frame Mount Area	1/4-28UNF x 3/8" lg.	Included within iA3 Monitor Bulk Pack (K25399A) & i-Frame Adapter Mount Single Pack (K25394A)
Mounting iA3 to Motor Fin Mount Pad (K22757A)	1/4-28UNF x 7/8" lg.	Included within iA3 Monitor Single Pack (K21911A)

Battery Replacement

The i-ALERT3 Battery is designed to be field replaceable, and utilizes a power pin design that allows the removal and replacement to be accomplished in the environment where the sensor is rated to be used. Replacement of the battery does not alter or delete any of the stored data or settings on the sensor. Steps to replace the battery in the i-ALERT3 Equipment Health Monitor are below:

1. Remove the battery pack (top portion of sensor, with script "I" insignia) from the sensor using a flat blade screwdriver inserted under the edge of the battery pack as shown. Twist the screwdriver gently to release the plastic clasp.

2. Open the replacement battery pack and install the supplied O-ring into the grove (if not already installed), onto the sensor module.

3. Press the new battery module over the top of the sensor body, taking care to insure that the battery module is not twisted and that the power pins are aligned with the mating portion. Incorrect power pin alignment can damage the i-ALERT3.

4. Once powered, LEDs will begin flashing to indicate that the unit is powered on.

5. The user should open the app (not necessary if there's a gateway operating in range) to activate the sensor. The purple LED will mean the sensor is not recording measurements. Green flashing LED means it is recording and operating properly.

6. The Sensor is now ready for use. Please recycle the expired battery as you would for any other batteries, or devices containing rechargeable Li batteries. Always follow local laws and guidance for recycling.

To Reset the i-ALERT3:

Action	LED	Action performed
Remove and re-install battery pack	LED's active	Resets Sensor; no loss of data

Routine Operation / Troubleshooting

i-ALERT3 Equipment Health Monitor Routine Operation

Measurement interval

The measurement interval for the condition monitor during normal and alarm operation is 5 minutes. When the monitor measures a reading beyond the specified temperature and vibration limits, the appropriate red LED flashes (after 2 consecutive readings). After the process or pump condition that causes the alarm is corrected, the condition monitor returns to normal mode after one normal-level measurement. The measurement interval is adjustable (from the 5 min default) within the range of 1-60 minutes. Please note that speeding the data collection rate will shorten battery life.

Alarm mode

The condition monitor's alarm mode is activated after two consecutive readings. When the alarm mode is on, you should investigate the cause of the condition and make necessary corrections in a timely manner.

Wireless Integration

A Bluetooth Low Energy Radio is utilized to communicate condition monitoring information to a mobile Smart device that the operator can easily view and react to abnormal readings. The use of a Gateway, allows for truly remote monitoring from any location worldwide where an internet connection is available.

LED Status Chart:

LED	Status	Meaning
Green	Flashing	Sensor is taking data and functioning normally
Blue	Flashing	Sensor is not recording measurements. It is in standby mode.
Red	Flashing	Sensor is currently in Alarm due to vibration or temperature or battery
Yellow	Flashing	Sensor is in Warning due to vibration or temperature
None	N/A	Sensor battery is dead, or Sensor failed

i-ALERT3 Equipment Health Monitor Troubleshooting

Symptom	Cause	Remedy
There are no red, green, or blue flashing LED	The battery is dead.	Replace the sensor battery.
	The unit is in sleep mode.	Insure that the battery is installed properly.
	The unit is malfunctioning.	Contact your ITT Representative.
The red LED is flashing, but the temperature and vibration are at acceptable levels.	The baseline is too low.	Check and adjust baseline alarm levels.
	The unit requires a firmware update.	Contact your ITT Representative.
	The unit is malfunctioning.	Contact your ITT Representative.

Figure 24: Troubleshooting

If you are unable to resolve an issue with a sensor using this guide, please reach out to us by email or phone - we will gladly assist:

email: support@i-alert.ai
phone: +1 315-568-7290

i-ALERT Mobile App Operation

Installing the APP

To download the app to your mobile device you must navigate to the Apple App Store or Google Play application on your mobile device and search for "i-ALERT3". The App icon should match the one shown below. Note that your device must be compliant with Bluetooth Smart / 4.0 for the App to function properly.

Google Play: https://play.google.com/store/apps/details?id=com.gouldspumps.iAlert&hl=en
Apple Store: https://itunes.apple.com/us/app/i-alert-2-condition-monitor/id1013078652?mt=8

Once you have downloaded and installed the app, you will need to register with a valid email address in order to log in. Many helpful videos are also available at;
https://www.i-alert.com/support/

To sign up using the Mobile App if you are a new user, choose "Sign Up", and enter the information into the fields shown below.

Figure 25: Click Sign Up on the Sign in screen

Figure 26: Fill out form and scroll if needed

Figure 27: Agree to Terms of Service and Click Sign Up

Once the form is created you will receive a verification email. Please use this link to confirm your email address.

If you are already a valid user, use the "Sign In" link.

Sensor Registration

Overview

This section will cover:

- Associating (registering) a sensor to an account
- Configuring the sensor's installation details
- Creating an asset
- Defining the asset's location within a company

Getting Started

Unregistered sensors can be identified on "Scan for Devices" screen by ⊕ symbol to the right side of the sensor name.

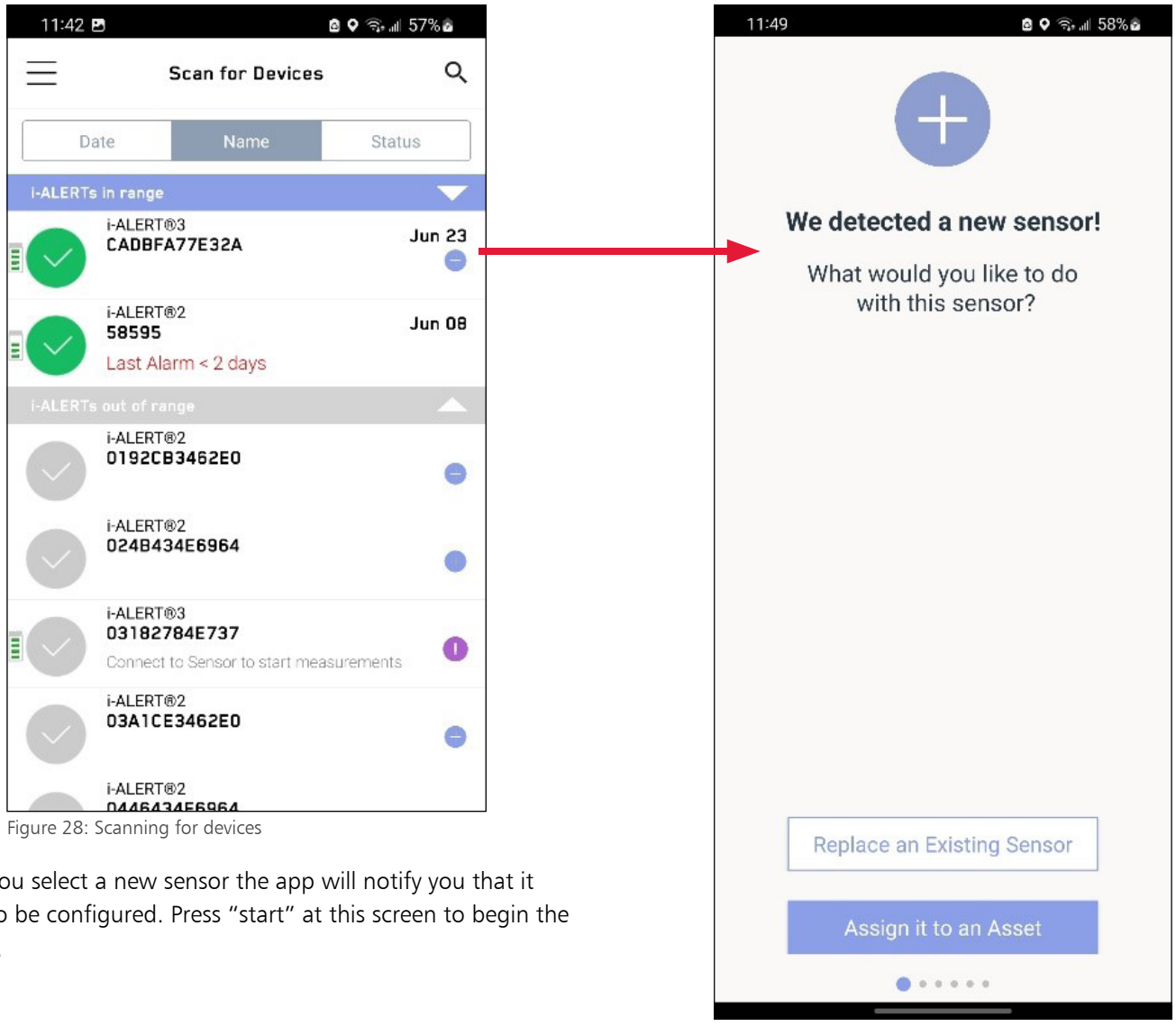


Figure 28: Scanning for devices

When you select a new sensor the app will notify you that it needs to be configured. Press "start" at this screen to begin the process.

Sensor Registration

Claiming Ownership

The next screen will appear, asking for the legal owner of the sensor to select the AI Platform account you would like it to be associated with. If you are not the device owner, select "Not now" and proceed; otherwise choose "Register".

Please read and affirm the Claiming ownership Statement:

"The parties to this service are the Site Owner and you. If you are not acting on behalf of yourself as an individual, then "you" "your" and "yourself" means your company or organization of person that you are representing. All references to "we" "us", "our" "this website" "this Service" or "this site" shall be construed to mean the i-alert.ai website business and the Site Owner."

"By clicking "I Agree", you are hereby stating that you are the owner of this sensor and have legally purchased the device or represent the company that has purchased the sensor."

In the event we find a user falsely claiming ownership, we may directly step in and take what we determine to be appropriate action (including, but not limited to, disabling that user's account."

[NOT NOW] *[I AGREE]*

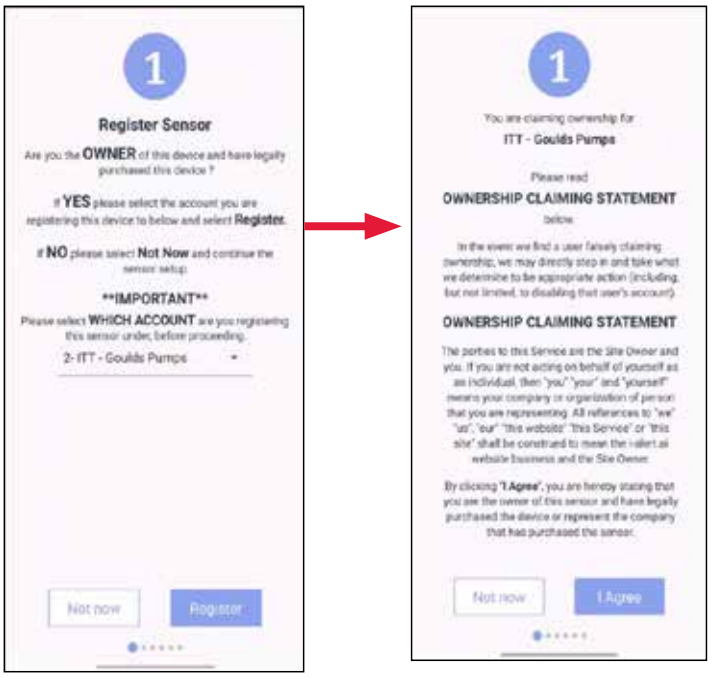


Figure 29: Registering the sensor

Installation: Sensor Name

The registration process requires the sensor be named. Typically the name is the name of the piece of equipment that the sensor is attached to. This is typically a functional equipment name, such as "Boiler Feed Pump". The name cannot exceed 12 characters in length. The default name is the unique radio ID of the sensor. If you skip this step by choosing "not now", the name will be defaulted to current name; new sensors by default the radio ID. The sensor name can be changed at a later time.

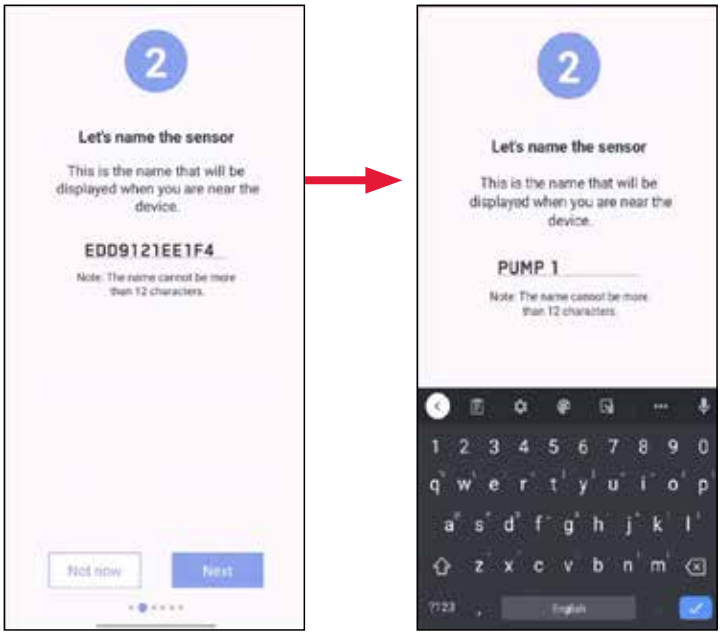


Figure 30: Name the sensor

Sensor Registration

Installation: Position

Once the sensor has been named, it is necessary to describe where on the equipment the sensor is located.

The locations for each i-ALERT3 on a typical motor driven pump system are as shown in the diagram below. Note from the image of the vertical pump, that only (3) i-ALERT3 Sensors are used. The sensors cannot be submerged.

The locations are selected from the dropdown box on the following screen.

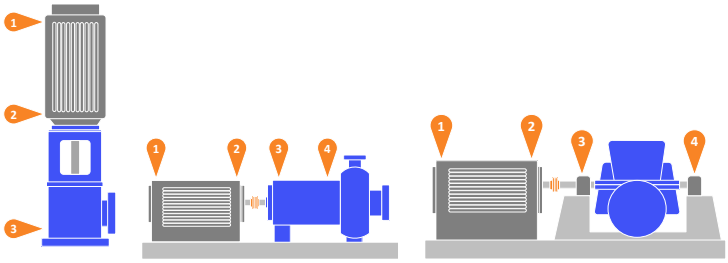


Figure 31:

Labels

1- Motor Non-Drive End	2- Motor, Drive End
3- Pump Drive End	4- Pump Non-Drive End

Figure 32: Identifying the sensor location on the equipment

Installation: Orientation

Depending on how the sensor is oriented, the user can elect to choose different axes names to describe the orientation by choosing the drop down arrow next to the default axis name.

The default orientation is shown in the left panel below.

Figure 33: Setting sensor orientation

Sensor Registration

Installation Details: Alarms & Warnings

The next step is to set the sensor alarm levels. As discussed earlier in this guide, the user has several choices:

Alarm Preference	Action
Manually Set Alarms	Set the alarm levels right now with the app
Run New Baseline	If "Run new baseline" is selected, the sensor automatically sets alarms based on average over 25 hours of machine run time.
Use Existing Alarms	No changes

If "Manually Set Alarms" is chosen, the user is taken to the screen where the alarms for the sensor can be configured:

Figure 34: Choosing alarm configuration

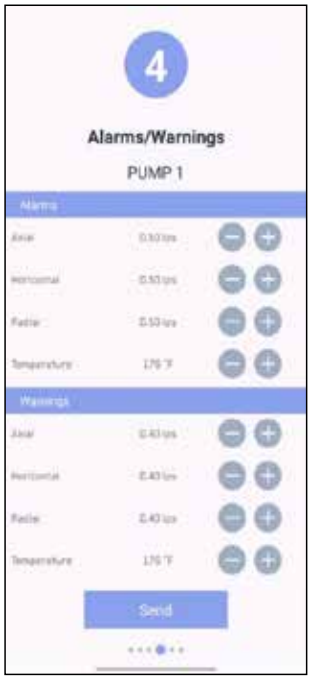


Figure 35: Setting manual alarm

Figure 36: Sending command for alarms

Figure 37: Successful setting of alarm settings

Creating an Asset Train:

To create a new Asset Train, follow the following steps:

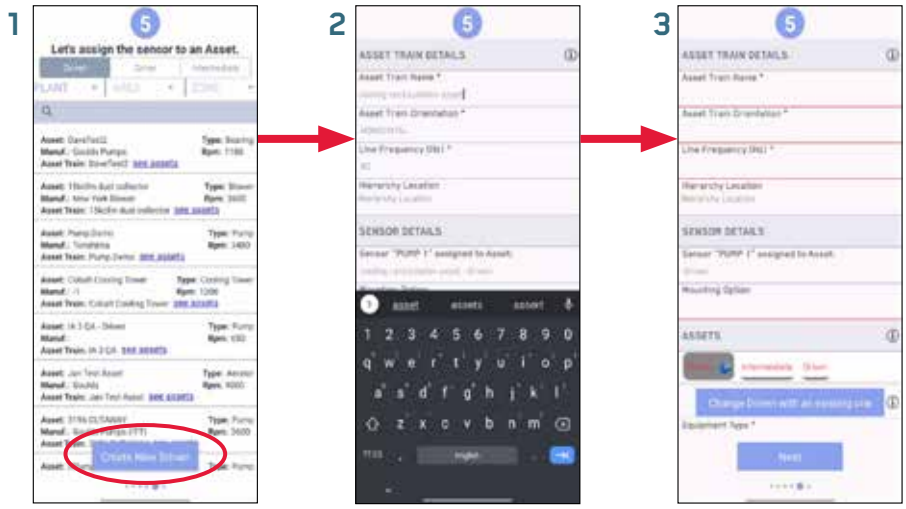


Figure 38: Steps 1-3 for creating an asset

Step 1:
The user needs to click on the create new driven to create an "Asset Train"

Step 2/3:

- The Asset Train Name is what you call the entire asset which includes the Driver(Motor, Turbine etc), Intermediate (Coupling, Gearbox etc) and Driven (Pump, Fan etc.)
- The Line Frequency is the frequency of the AC voltage driving your Asset. (60Hz for USA)
- The hierarchy location is where it is in your plant
- Mounting option must be defined from the options of Epoxy, Drill and Tap and Magnetic Mount

Sensor Registration

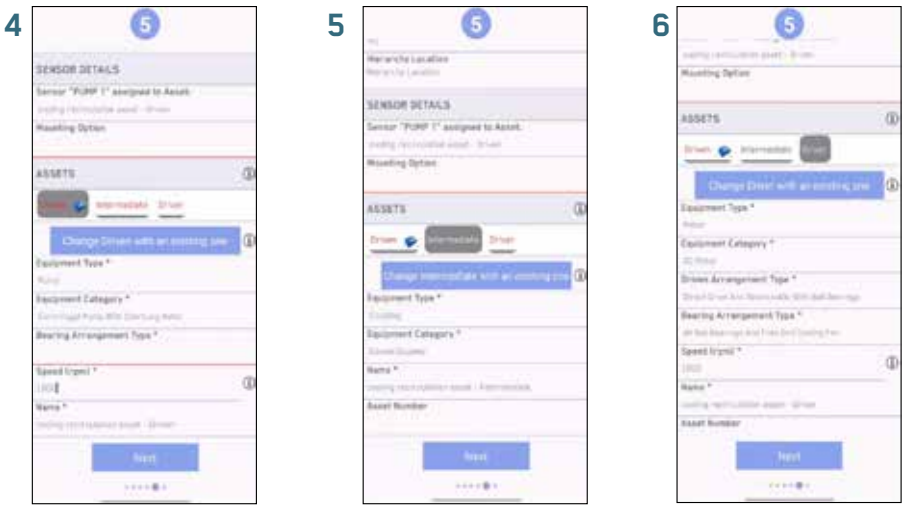


Figure 39: Steps 4-6 shows usual configuration for Driven, Intermediate and Driver

Step 4/5/6:

- Shows the fields that need to be filled out for each Driven, Intermediate and Driver respectively
- The fields with an asterisk are required fields
- All 3 sections need to be filled out to complete the process
- For the best results fill all the fields
- For help with this part please reach out to support@i-alert.ai

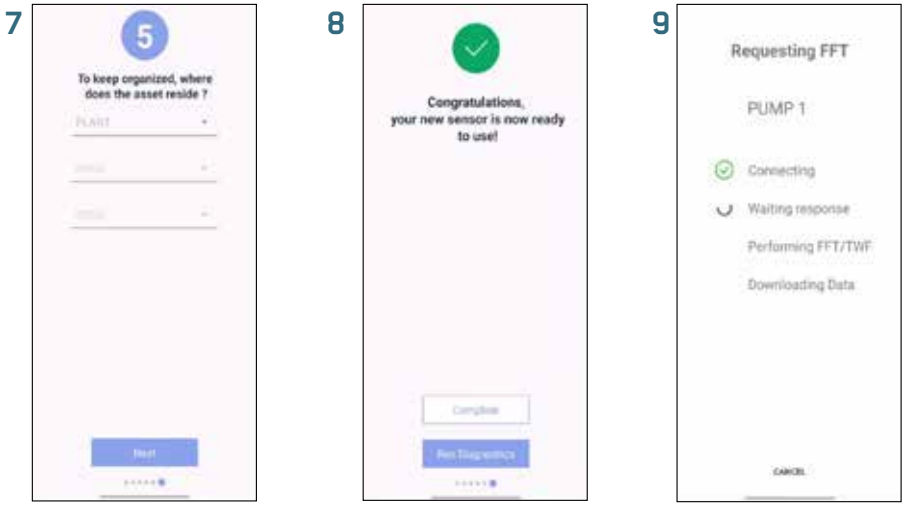


Figure 39: Steps 7-9 shows how to set the location and run a diagnostic basleline

Step 7/8/9:

- Shows the fields that need to be filled out to define the location of the asset
- Once the location is set, the Asset train is created and the sensor is linked to the Asset train
- The user then can click "Complete" to go to the Dashboard or Run Diagnostic to get a baseline spectrum (recommended)

Assigning to an asset:

If the asset is already created in the respective account then search for the respective asset and select it to assign the sensor to it. The user can filter the search based on Plant, Area and Zone.

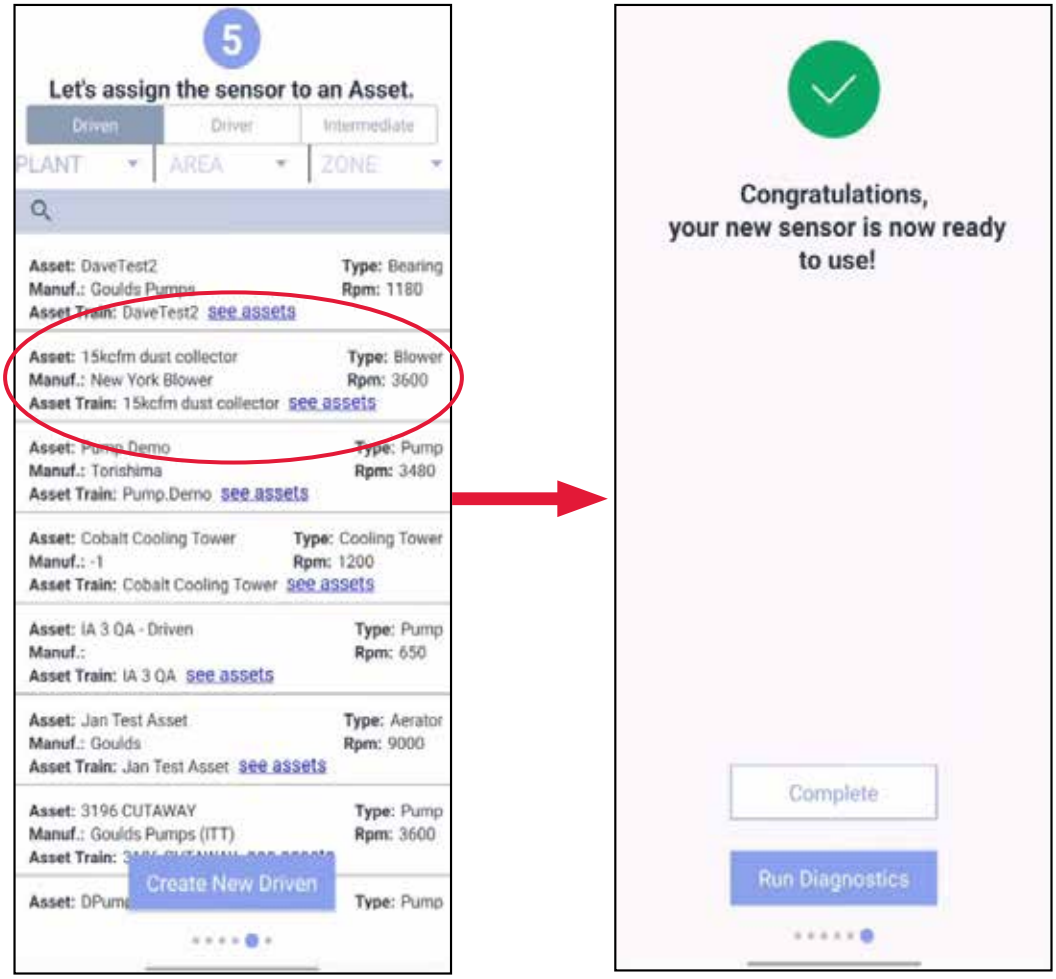


Figure 40: Successful assigning of sensor to created asset

Connecting to i-ALERT3 Devices

Upon gaining access to the app you will be brought to the "Scan for Devices" page, see Figure 41 below. This page will display any i-ALERT devices within range of your mobile device. Devices that are in range will have a status icon to the left of them. Click on the devices name to connect to it. (You can reach the scan for devices option at any time by tapping icon in the upper left hand corner to bring up the main menu options. Devices that are no longer in range will have a grey icon next to their names.

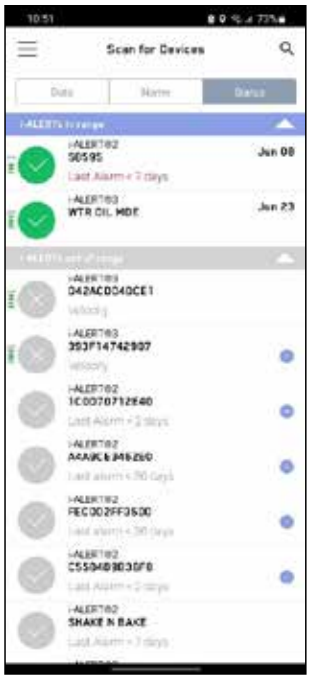


Figure 41: Scan for devices page

The Dashboard shows characteristics of the sensor such as:

- Battery life indicator which is located to the left of the status symbol
- The status of the sensor which can be **Good**, **Warning** and **Alarm**
- What type of sensor:
  - i-ALERT 2
  - i-ALERT3
  - i-ALERT Pressure
- The Sensor name
- If the sensor was in Alarm state in the last 2days, 7 days and 14 days
- When the sensor was last connected to which is located to the right of the sensor name

After clicking on the device's name, the screen shown in figure 42 will come up as the phone and i-ALERT2 device begin to communicate. Once all 4 steps are completed and green checkmarks are shown you will be taken to the device dashboard showing the latest data.

Figure 42: sensor connection page

Dashboard

Once the sensor is selected in the "Scan for Devices" page, the user will be taken to the sensor's Dashboard page. This page consists of real time measurements of the sensor. The Dashboard consists of the following measurements:

1. Velocity RMS (Radial, Horizontal and Axial), Temperature, Runtime Hours and Run Speed
2. Acceleration RMS (Radial, Horizontal and Axial), Flux Measurement, Runtime Hours and Run Speed
3. Velocity Band RMS (Radial, Horizontal and Axial) and Acceleration Band RMS (Radial)

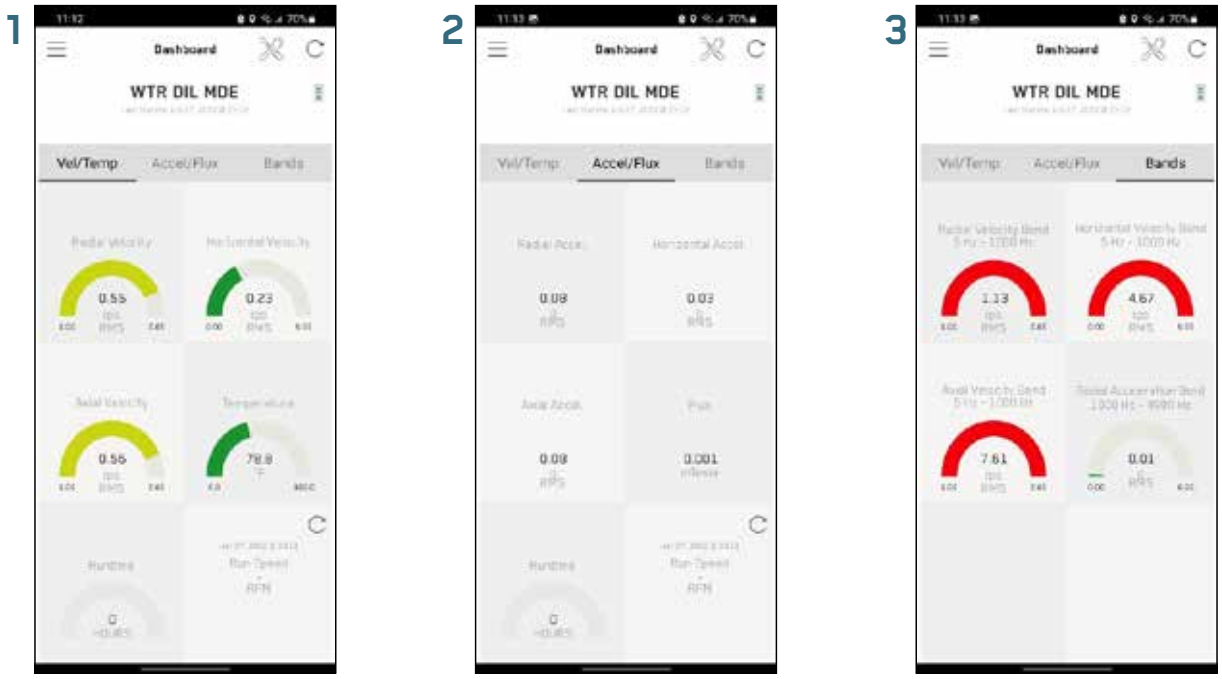


Figure 43: sensor Dashboard page

The Dashboard page can be refreshed by clicking the refresh button on the top right of the page.

Application Menu:

To access the different pages for the sensor and the application, the user can click the menu button on the top left. See Figure 44.

Figure 44: Application Menu panel

Trending

Tap on any of the individual measurement icons on the Dashboard page to bring up the Trend page. Alternatively, you can tap the application menu symbol and select "Trending" from the list. The Trend page shows the historical values of each individual measurement. You can overlay or remove measurement trends by clicking the radio buttons on the bottom of the screen. To view the numerical values instead of the graphical trend, tap the icon that looks like an arrow pointing up next to the devices name. If you would like to export the numerical data click on the up arrow icon at the bottom left of the page. (Note: the upload icon may not always be at the bottom left, in some cases it is at the upper right. Regardless of location the function remains the same.). You will have a choice to print it directly to a local printer, or attach it to an email in the CSV file format. CSV files are universal and can be imported to plant historians or opened with a spreadsheet processing program.

Figure 45: Trending page and uploading data

For i-ALERT3 the user has 3 trending pages:

- Velocity and Temperature Trends
- Acceleration and Flux Trends
- Velocity and Acceleration Band Trends

The different trending pages can be accessed by clicking the respective page header on top of the graph.

Diagnostics Page

This page is where the user can request and see stored spectrum and time wave forms to the respective sensors. This page also consists of the asset details to which this sensor is assigned to. On this page the user can use the Automated Diagnostic feature to get the Fault, Recommendation and Severity for the respective spectrums.

Spectrums and Time Wave Forms:

The user has two primary options when it comes to spectrums and time wave forms:

- Request new spectrum and time wave forms
- Download stored Alarm spectrums and time wave forms

The user can view the new Spectrum or the Alarm Spectrum by selecting "See FFT/TWF" option. In the spectrum viewer page, the user can select from the three axis and also select between velocity and acceleration for each axis. For each axis the user can select between Low Frequency and High Frequency for the Time Wave Form for each axis. Like the Trend page the user can upload the data by clicking the up arrow symbol to the top right of the page. The user can select the desired spectrum as a baseline spectrum by selecting "Mark as Normal Operation" on this page.

Once the data is downloaded the user can access the data by navigating to this page from the offline sensors in the "Scan for devices" page.

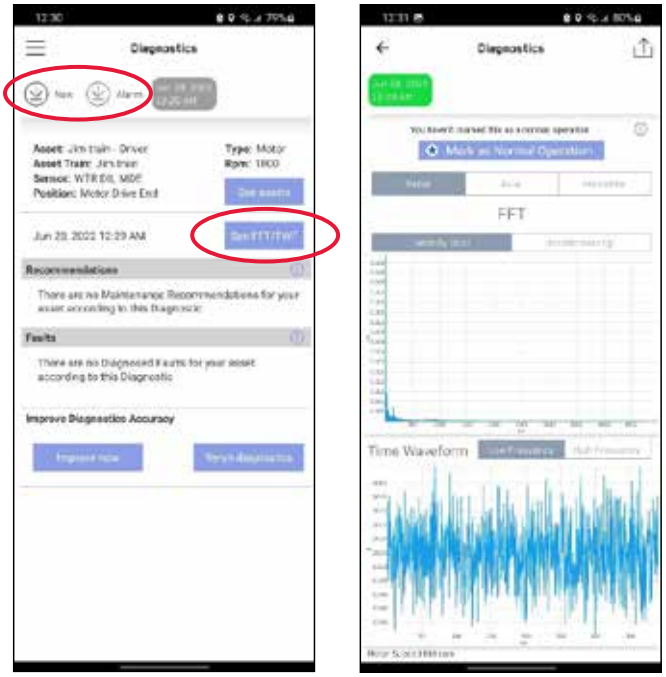


Figure 46: Spectrum and TWF viewing options

Automated Diagnostics:

If the account has access to Automated Diagnostics, every time a new spectrum or an Alarm spectrum is downloaded the respective spectrum(s) will be run against the rules engine and will displayed on the page

To improve the accuracy of the diagnostics the user has 2 options:

- Under 'See Assets", make sure all fields are filled for the asset train
- Under the "Improve Now" option see what is recommended and do as follows.

Figure 47: Automated Diagnostics

Equipment Information: Sensor Settings

Equipment Information

One of the most useful features of the i-ALERT2/3 mobile app is the ability to instantly access equipment details. The "Equipment Information" page also includes functionality that allows a user to adjust alarm and warning limits as well as send various commands to the respective sensor.

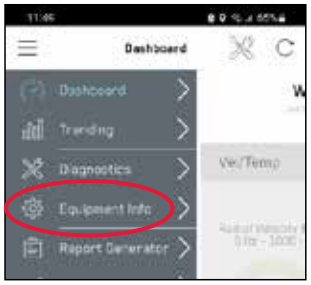


Figure 48: Equipment Information location

Sensor Settings

This is a group of settings pertaining to the respective sensor. If the sensor is tied to a certain account the user can only access these settings if they are part of the account or select the respective account under the user settings page.

Figure 49: List of sensor setting

Alarms / Warnings

The user will be prompted to select whether to issue a "Run new Baseline" or "Manually set alarms". If the user selects the "Manually set alarms" option they will see the different options as seen in Figure 50. From here a user can adjust the overall vibration amplitudes, band alarms, asset runtime configuration and temperatures that cause the device to go into alarm or warning modes. Tap the " + " or " – " icons at the right hand side to adjust values. After updating the alarm or warning settings, they must then be sent down to the i-ALERT device in order to be programmed in. To do this, tap the "Send" button at the bottom.

Change Sensor Name

This setting changes the sensor name on the scan screen as well as reports.

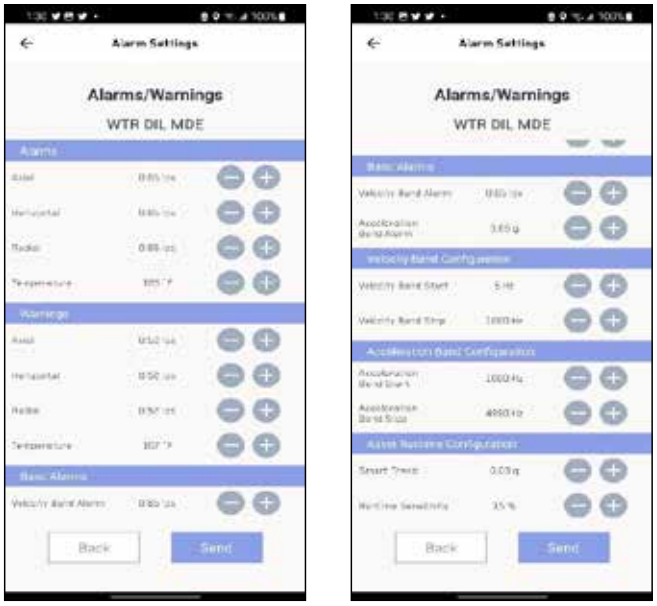


Figure 50: Alarm and warning settings

Equipment Information: Sensor Settings

Temperature Offset

This setting allows a temperature offset to be applied to the sensor readings to compensate for sensor ambient cooling and heat transfer losses in the heat path from the equipment surface to the sensor. Alarm and warning settings include this offset. Figure 51.

Figure 51: Temperature Offset page

Acquisition Rate

If "Alarm Check Rate" is pressed, a screen with a slider bar appears that allow settings in the range of 1-60 minutes. The expected life (new unit) calculation is based on the current alarm check and acquisition rate setting, and assumes one download connection per week, and temperatures less than 76C / 170F.

Changes to the acquisition rate (as opposed to the alarm check rate) have a much greater effect on expected battery life. Battery life range varies from 9 months to 5 years and is primarily dependent on the acquisition rate. Please be aware that when using higher acquisition rates the device lifespan will be reduced.

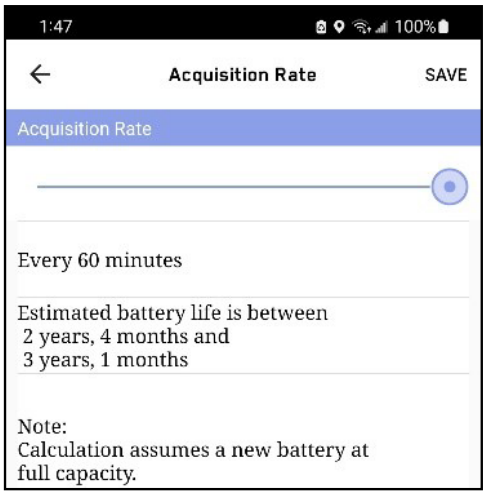


Figure 52: Acquisition Rate page

Alarm Check Rate

If "Alarm Check Rate" is pressed, a screen with a slider bar appears that allow settings in the range of 1-5 minutes. The text displayed shows the expected life calculation based on the selected settings. The projections are based on life for a new unit; it does not show remaining life.

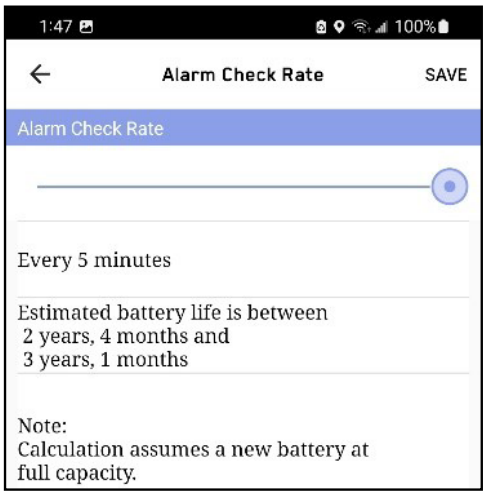


Figure 53: Alarm Check Rate page

Equipment Information: Asset Settings/Product information

Asset Settings

The Asset Settings section in the Equipment Information page consists of:

Assign sensor to another asset

This selection will let the user choose to link the sensor to another asset within the account similar to the assign to the asset part in the registration process. Figure 40.

Edit Asset Details

This selection will let the user edit the respective asset similar to the create the asset train part in the registration process. Figure 38 and 39.

Product Information

The Product Information section in the Equipment Information page consists of:

Parts List/BOM

The "Parts List / BOM" is not user editable and only applies to ITT Goulds Pumps products. If a valid ITT Goulds Pumps S/N is entered into the Equipment Details page the user should be able to view all the parts on the bill of material. The user can also choose to send part information via email to their purchasing department or local ITT Goulds Pumps sales representative. To Send parts information via email (Email must be configured on the mobile device), simply tap each part that you need and then tap the upwards arrow icon in the upper right portion of the screen. This will open your mobile devices email application and insert the requested parts as text in the body of an email.

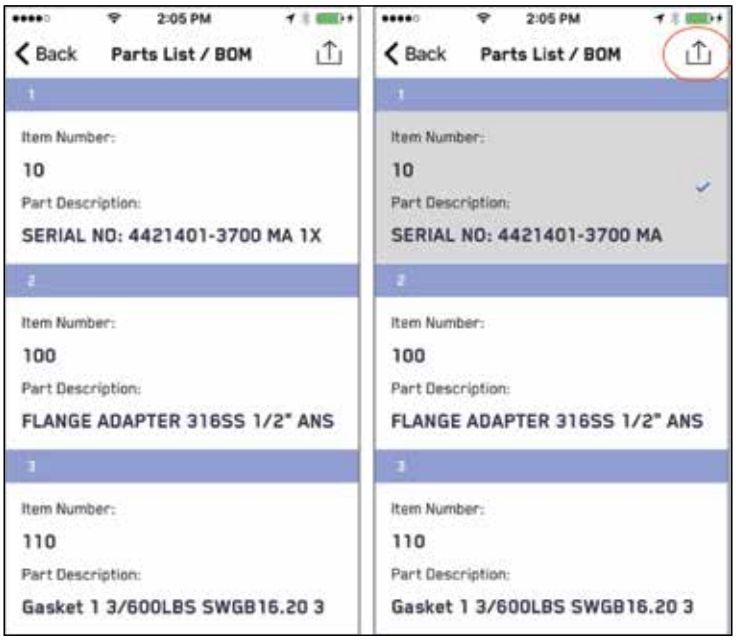


Figure 54: Item 10 information selected for email

Equipment Information: Asset Settings/Product information

Pump Curve

The "Pump Curve" page allows users to easily download, view and save/send a PDF version of the pumps performance curve. This feature is only available for valid ITT Goulds Pumps S/Ns. To view the curve, simply select "Pump Curve" under the Product Information Heading. Once the curve loads you can zoom in and out using standard touchscreen commands or you can save/send the file by tapping the upwards arrow in the upper right hand corner.

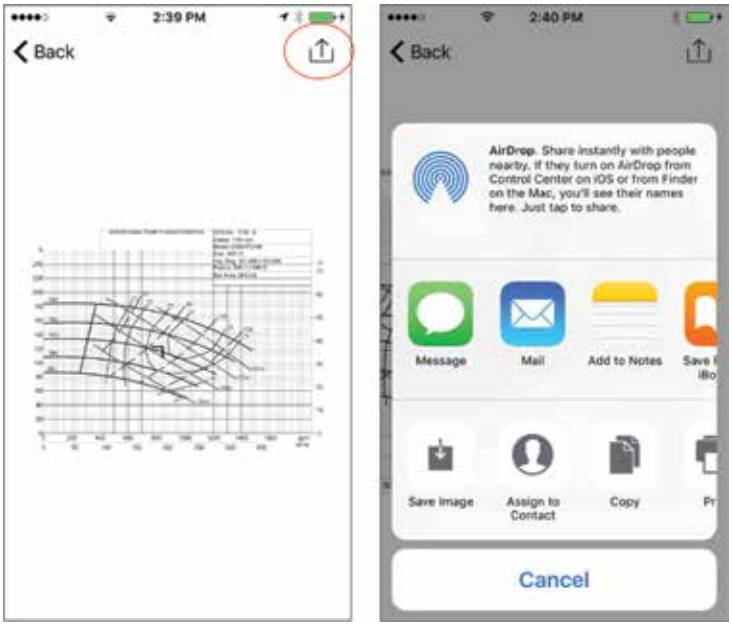


Figure 55: Pump Curve can be saved or sent like standard image file export

Equipment Information: Commands

Commands Settings

The Command Settings section in the Equipment Information page consists of:

Start New Baseline
This selection will let the user have the sensor automatically set the Alarm and Warning thresholds by taking the average of 25 running measurements and applying a multiplier (Alarm :2x, Warning: 1.75x).

Set Runtime Hours to 0
This selection will let the user reset the runtime hours.

Enable Smart Trend
This selection will let the user to enable smart trend. This will allow sensor to get trend only when the asset is ON every 8 hours.

Disable Flux Measurements
This selection will let the user disable using the flux sensor. This is meant if the sensor is far from the motor and the
readings are not applicable

Factory Reset
This selection will let the user to restore the sensor to its factory settings

Clear All Alarms
This selection will let the user reset all the alarms back to default.

Help/FAQ /Service Locator

Help/FAQ

The Help/FAQ section provides useful tools In the event you encounter a problem or need additional assistance with the i-ALERT sensor or mobile application. Within the Help/FAQ menu you can access the FAQ or Troubleshooting documentation for the product. (Internet connection is required). You also access ITT's website, contact

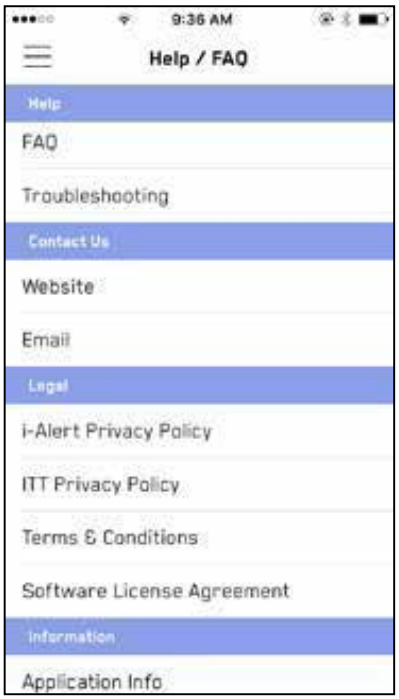


Figure 56: Help/FAQ menu

Service Locator

ITT makes it easy to get in touch with local resources that can assist with equipment repairs, spare parts, and field service. Upon tapping the "Service Locator" tag in the main menu, you will be prompted to allow access to you location in order for the application to locate the nearest service center or sales office. Tap the pin with the wrench icon to bring up the service center contact information.

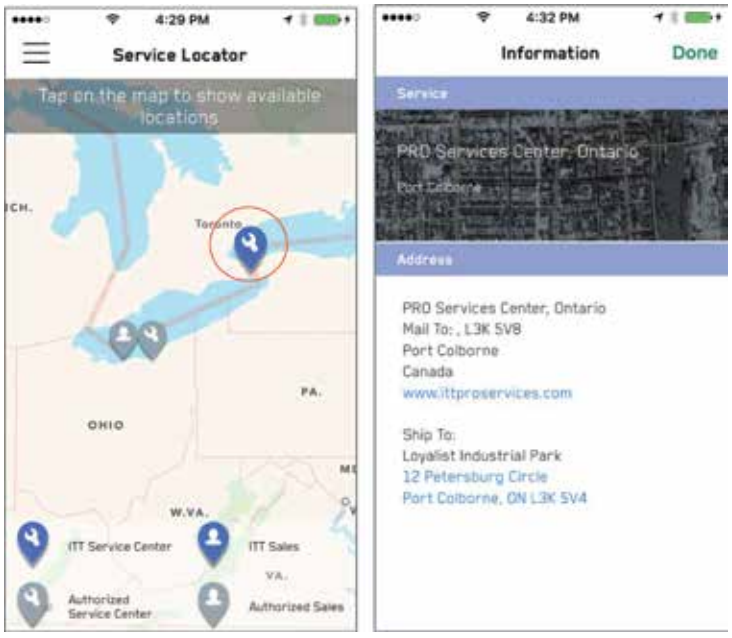


Figure 57: Service Locator to help identify nearby ITT PRO shop

User Settings

Edit Account Details

To edit account details, select it, and edit user information. Note that "Last Name" is a required field.

Select Accounts

In this section the user will be able to navigate between accounts. If the user is not able to change or view any of the sensor settings, make sure the right account is selected in this section.

Units

The user can switch between English and Metric as the units of measurements.

FFT options

In this section the user will be able to switch the spectrum with respect to Frequency (Hz), Cycles per Minute (CPM) and Orders.

LOGOUT

In this section the user will be able to Log out of the app.

Figure 58: User setting page

Notes

Notes

Notes

For More Details:

visit: https://www.i-alert.com

contact: support@i-alert.ai

call: 1.315.568.7290

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