BESTOBELLSTEAM

3170 Wasson Road • Cincinnati, OH 45209 USA
Phone 513-533-5600 • Fax 513-871-0105
steam@richardsind.com • www.bestobellsteamtraps.com

Steam Tector 2 Series

Installation & Maintenance Instructions for Bestobell Steam Tector 2

Warning: Bestobell Steam products must only be used, installed and repaired in accordance with these Installation & Maintenance Instructions. Observe all applicable public and company codes and regulations. In the event of leakage or other malfunction, call a qualified service person; continued operation may cause system failure or a general hazard. Prior to servicing equipment, disconnect, shut off, drain and/or bypass all pressurized fluids.

Please Read These Instructions

The Bestobell Steam Tector 2 Series will provide you with long, trouble-free service if it is correctly installed and maintained. A few minutes of your time spent reading these instructions may save hours of trouble and downtime later.

Battery Installation

There is a sliding battery door located on the back of the Steam Tector 2.

Turn the unit over so that the controls are facing the floor, and the sensor is facing away from your body.

At the opposite end from the sensors (the end closest to you) there is a sliding panel.

Apply minimal pressure to the center of the panel and slide it towards you exposing the battery compartment.

Install a new 9 volt battery noting the (+) and (-) positions which are indicated on the inner label.

Getting Started

Note: This will give you a basic understanding of the unit's operation and function; however, we **STRONGLY** recommend that you read the complete manual.

Leak Detection...
Use the airborne sensor for detecting pressurized gas leaks and vacuum leaks. Remember, leaks must be turbulent to detect ultrasonically.

1. Insert the headset jack into the plug on the side of the instrument (I.), and push the power button (D.).
2. Depress the mode select button (F.) until the alphanumeric display (A.N.D.) reads "AIR", then press the "▲" or "▼" to activate the airborne sensor (A.). You will begin to hear a translation of any ultrasonic sound present in the test area, and the LED bargraph meter will display the strength of the corresponding signal. The highest LED will hold its place for 5 seconds before resetting its position. This will help guide you toward the leak, where the sound is most intense. The instrument always resets itself so that sensitivity is the active mode. If the LED bargraph meter is at maximum, reduce the sensitivity by simply pressing "▼" until it reads "10" or less, then continue. The A.N.D. will show the sensitivity as a digit between 0 and 255 prefixed by the letter "A" which identifies the airborne sensor being adjusted.
3. To adjust the volume, press the mode button once. The A.N.D reads "VOL". Then use the "▲" and "▼" buttons to make the adjustment. The alphanumeric display will read "V 000". Volume, as with all numerical values, has a range of 0 to 255.
4. Listen for the leak. A gas leak will sound like a harsh rushing noise, or high intensity hiss. This sound will increase as the instrument is drawn toward the leak point, and will clearly disappear as the sensor is turned away.

Touchprobe applications...

Use the touchprobe to detect internally generated ultrasound. These applications include... steam traps, valves, and bearings.

1. Insert the metal touchprobe into its port (B.) on the nose of the Steam Tector 2. The probe should be snug so it can not rattle, however, do not overtighten. Depress the mode select button (F.) until the display reads "Prob", then press the "▲" or "▼" to activate the touchprobe sensor.
2. Making a firm contact, touch the tip of the probe to the item being tested. Apply just enough pressure to make a good contact. You will hear a clear translation of the internally generated ultrasonic sound.
3. Listen for fluid leaks in valves, continuous flow or non-cycling in steam traps, and knocking or scraping in bearings.
4. The Steam Tector 2 always defaults back to Sensitivity as the active mode, therefore if your readings are off the scale simply press the "▼" to reduce the reading to within the range of the instrument. The A.N.D. will display the active sensor and current sensitivity setting before it begins to make the adjustments.
5. To adjust the volume, press the mode button once. The A.N.D. reads "VOL". Then use the "▲" and "▼" buttons to make the adjustment. The alphanumeric display (A.N.D.) will read "V000". Volume, as with all numerical values, has a range of 0 to 255.
6. When testing bearings or machinery vibration, record your sensitivity setting, and use the reading on the A.N.D. as a baseline for future readings. Now you can compare the wear patterns to future tests, and other similar equipment.

WARNING: **To insure a good contact, and accurate readings the touchprobe is sharp! Be careful not to injure yourself or others.**

Principle of Operation

The principle of operation of the Steam Tector 2 is based on the turbulent flow of fluids and gasses. Turbulent flow has a high content of ultrasound. This is sound which is above the human hearing range, but can be heard with the Steam Tector 2, and traced to its source.

Imagine air leaking from a tire. Because this is such a **large** leak, your ear **can** detect this sound, however your ear hears only about 1/3 of the actual spectrum of sound which exists. The sound of small leaks is mostly ultrasonic which your ear can not detect.

It is important to remember this example... A piece of straight tubing connected to a gas supply and left free to exhaust into the atmosphere will not generate sound if the volume of gas through it is such that turbulence does not take place. Yet for that same flow, an opening as small as 0.005 of an inch could generate enough sound to be heard several feet away.

For a leak to happen there must be an opening in the system that carries a gas or fluid. Normally, these openings are not clean smooth holes, but passages through cracks with many jagged edges and internal chambers. Fluid or gas escaping through an "orifice" like this, is forced into turbulence, random circular-like motions. Inside a tube where a gas may be flowing, the flow is normally laminar which means that a given layer of gas does not mix with layers above it or below it. This condition happens in a straight long tube when the velocity of the fluid is not high. A gas leaking out of a straight and long tube will not generate as much sound as if it were leaking out of a small crack because the flow is not turbulent.

The intensity of sound generated at a leak is a very complex function of the viscosity, the temperature, the speed the fluid is moving, the Raynolds number, the pressure differential across the leak, and the physical dimensions and characteristics of the orifice. This is why it is possible for a smaller leak to generate more sound than a larger one.

What this all means...

The Steam Tector 2 detects ultrasound NOT refrigerant or the presence of a specific gas. It is NOT a sniffer. Because of this fact, the Steam Tector 2 can function in areas where heavy wind or a concentration of fumes renders other detectors useless.

Because of the unique touchprobe system in the Steam Tector 2, it can also be used to detect turbulent internal flow in situations such as leaks in valves, steam traps, and pump cavitation.

WARNING
Ultrasonic detectors will not indicate a leak if there is no turbulent flow producing sound when you check it. If you suspect a **toxic gas, natural gas***, or other* **combustible gas leak***, and do not detect it with the Steam Tector 2, do not assume that it does not exist as it may not be turbulent. Use another method as verification that there is no leaking gas present.*

Operation

To use the system, plug the headphones into the jack on the right side of the instrument (I).

Depress the "on/off" button (D.) once to turn the unit on (depress it again to turn the unit off).

Depending on whether you are in contact or airborne mode, you will immediately begin to hear the translated ultrasonic signal from either the airborne sensor (A.), or the touchprobe sensor (B.).

Using the modes...
The Steam Tector 2 uses a simple method of **select and adjust.** Press the "Mode" button to select the parameter you wish to change, then use the Up and Down arrows (G. & H.) to make the adjustment. The Steam Tector 2 offers modes in the following order...

Volume ⇛ Display ⇛ Air ⇛ Probe ⇛ Oper.
("▲" and "▼") (Continuous, Peak Hold, or Off) ("▲" or "▼" to active)

Setting the Sensitivity:
The Steam Tector 2 always defaults back to sensitivity as the active mode. This means that after any other adjustment has been made, it will hold the setting in memory, and reset itself so that "▲" and "▼" adjust sensitivity.
Pressing the "▲" and "▼" arrows will adjust the sensitivity while in either the Airborne or Touchprobe mode. The prefix on the A.N.D. indicates the active mode being changed. For example, the display will read "A 000" to show that you are adjusting the airborne sensor's sensitivity, or "P 000" to indicate that you are adjusting the sensitivity of the touchprobe sensor.

Setting the Volume:
While using either the Airborne or Touchprobe mode, pressing the "MODE" button once will put the Steam Tector 2 in the Volume Adjust Mode. The alphanumeric display will read "Vol" as long as the MODE button is pressed. When released it will show "V000" indicating the current volume setting. Use the "▲" and "▼" buttons to make the adjustment. You will hear the volume change as the display changes from "V 000" to "V 255" (the "V" prefix indicates that volume is the current mode being adjusted).

Note: *Volume and sensitivity are not the same.* **Volume** *adjusts the loudness of the signal in the headset.* **Sensitivity** *adjusts the meters reaction to the incoming signal.*

Selecting the Sensor:
Press the "MODE" button three times. The alphanumeric display will read "Air". The instrument will wait 3 seconds after releasing the MODE button for you to press the "▲" or "▼" button which locks in the sensor selection. If you press the "MODE" button again, the alphanumeric display will read "Prb", and wait 3 seconds for you to press the "▲" or "▼" button to lock in Probe as your sensor selection.

Adjusting the Display:
The alphanumeric display offers three viewing options. Continuous, Peak, and Off. Press the "MODE" button twice. The display will read "Disp". Then by pressing the "▲" or "▼" buttons it will scroll through the display options which are as follows... "**Cont**"

= Continuous, the A.N.D. will show the level of the signal in real time. "**Peak**" = Peak Hold, the A.N.D. will hold the highest reading for 5 seconds. "**Off**" = Turns the alphanumeric display off (with the exception of the "-"). Since this display is not necessary for most airborne applications, turning it off can save a substantial amount of battery.
NOTE: The adjustments you have just made are now in memory, and will remain there until they are changed or if the battery is removed.

"Hidden" MODE Options
There are other features that the "MODE" button can be used for.

1. **Checking the serial #...** While the unit is powered OFF, hold down the "MODE" button. Now turn the unit on while holding down the "MODE" button. The Steam Tector 2 will show its serial number in the alphanumeric display.
2. **Calibration...** The instrument is field calibratable when a calibrator is purchased. There is detailed operational information available by pressing certain combinations of buttons.

Applications Overview

1. Airborne Applications (External sounds)

The Airborne sensor (A.) is used to detect soundwaves which travel to the Steam Tector 2 through the air. The most common airborne application is for leak detection.

Leaks
When searching for leaks with the Steam Tector 2, remember you are listening for the turbulent flow of the gas as it exits the leak orifice (refer back to "Principles of Operation" for a more detailed explanation). The Steam Tector 2 is capable of hearing leaks from over fifty feet away, but it is best to hold the instrument as close to the test area as safely possible.

Stand a few feet from the suspected leak area, and reduce the sensitivity until only the first one or two lights are lit on the LED bargraph meter. Check around fittings, flanges and all other suspected areas. If at anytime the display is at maximum due to background noise in the area, reduce the sensitivity (and volume if necessary) and continue searching. The sound in the headset, and the bar graph meter will increase as the unit is drawn closer to the leak. Using the yellow flexible waveguide will help reduce background noise interference and also make the units sensitivity more directional allowing you to pinpoint the precise location of the leak.

In the case of larger leaks which may over concentrate "sniffer" type leak detectors. Try removing the waveguide and increasing the sensitivity. Then sweep the instrument over the entire unit. Leaks may be where you least suspect them, and the Steam Tector may very likely detect something even from a greater distance.

Too Much Background Noise???
The Steam Tector 2 detects a narrow band of ultrasonic sound, therefore although there may appear to be overwhelming background noise, the sound may not be within the detection range of the Steam Tector 2. Notice that you can yell directly into the sensor and your voice will not be translated in the headset.

The circuitry is capable of reproducing the sound signature of the signal it detects. This means that the sound you hear is closely related to the actual sound. It is an **actual translation**, not an electronically synthesized tone, or "beep".

Leaks sound like a "hiss" or rushing sound, while **compressors** "chatter" a rhythmical mechanical pattern. **Fans** should not produce any wind noise detectable by the AccuTrak, although the **fan motor** may produce a "buzz" or "hum".

Example: Mechanical vibrations sound very different from leak sounds. Shake a set of keys, then take a short quick breath through your nose. Listening to both sounds through the AccuTrak is a good example of how the direct translation process of the AccuTrak helps you to distinguish the difference between the two signals.

Practice listening to different components of your system, this will help you to identify the sound of a leak from other normal operational sounds.

Methods of reducing background noise interference.
Placing the flexible wave guide onto the airborne sensor will make the reception of the Steam Tector 2 more directional. This helps shield the sensor from competing sounds entering from other directions. Cupping your hand around the end of the wave guide will also help to reduce the background noise.

Reducing the sensitivity will suppress the effect background noise has on the display, and also in the headset. This will help make the leak sound more identifiable.

The most interfering background sounds come from areas of high turbulence within a pipe. This can be where high velocity flow changes direction, or is restricted such as within a partially closed valve. These situations will produce a high frequency hiss which is very similar to the sound of the leak. Use the standard methods for reducing background noise. If you are still unsuccessful, shut the system down. Although the pressure may be somewhat reduced, it should still be sufficient for leak testing.

Recording overall system noise.
Use the Steam Tector 2 to record sound levels of compressor noise, fan vibration, fan belts, motors, and even noisy ducts.

The overall sound level of a system can be recorded and compared to previous and future readings. If a system owner is complaining about increased noise coming from certain equipment, this can be verified if previous Steam Tector 2 readings were taken.

Although the Steam Tector 2 will only record the ultrasonic range of a noisy system, this part of the sound will increase in proportion to the sonic part the customer is hearing and complaining about.

Taking a baseline reading.
When taking a reading of overall noise level, begin by reducing the sensitivity until the bargraph reads slightly less than 1/2, (approximately 6). This will give you room on the display for future readings.

IMPORTANT: Record the sensitivity and volume setting, the numeric level reading on the display (E.), and the position from

which the reading was taken. This will be your baseline for future tests.

2. Touchprobe Applications (Internal sounds, bearings, valves, steam traps).
Ultrasound not only travels through air but solid materials as well. The touchprobe sensor (B.) is used to detect abnormal system sounds which are **internally** generated. Such sounds include abnormal flow in piping, valves, and steam traps. Other applications include the detection of friction or increased wear in bearings, motors and gears.

Warning: *To insure a good contact, and accurate readings the touchprobe is sharp! Be careful not to injure yourself or others!*

Steam Traps

The Test:

To test steam traps you will use the touchprobe sensor (B.). Press the "MODE" button (F.) until the display reads "Prbe", then press "▲" or "▼" to activate the touchprobe sensor.

Making a firm contact, touch the end of the probe to the steam trap being tested. Apply just enough pressure to make a good contact, but do not push too hard! You will hear a clear translation of the internally generated ultrasonic sound. If the trap sounds appear to be masked by other system sounds, reduce the sensitivity, and touch just upstream and downstream from the trap to verify that what you hear is only the steam trap being tested.
A properly functioning steam trap will have a distinct on and off flow cycle which is easy to interpret with the Steam Tector 2. A strong rushing sound indicates that the trap is purging. You may want to listen to the sound of a good trap before trying to make important decisions on the condition of others. Knowing what a healthy trap sounds like will be a great advantage. There are many different types of steam traps. A "sputtering" sound may be quite normal for one type and not another. It would be helpful to know how a particular trap functions when making a decision as to its condition.

Bearings and Moving Machinery
The most common mechanical failure is a broken or seized bearing. However this type of failure normally does not happen instantly. When the bearing begins to fail, the sound that it makes changes. These changes occur in the ultrasonic range and can be detected with the Steam Tector 2 by touching the bearing housing with the touchprobe and listening for abnormal sounds. Periodic preventive maintenance tests can prevent major disasters in both the machinery and down time.

Note: *Large industrial processing plants check critical moving machinery (bearings) on a routine basis. Many firms have spent tens of thousands of dollars on vibration analysis instrumentation to help detect these hidden problems. Because of its high frequency capabilities many other companies use ultrasonic detection as an alternative, or even a complement to this equipment.*

While vibration analyzers work in the lower Hertz frequency range, the AccuTrak detects sound in the kilo-hertz range which is much higher. When a bearing begins to fail, changes occur in the ultrasonic (kilohertz) range before they can be detected with traditional vibration monitoring equipment.

Bearings... The First Test

The first test is very important! This is the reading that all future tests will be based on.

With some experience you will be able to compare two similar bearings and identify the sound of a good bearing from a worn one by just using your ear. When several months pass between tests, however, it is very important to log your results.

To take a reading on a mechanical system, such as a bearing or gear box, you must use the touchprobe attachment. Touch the end of the probe to the outer housing of the gear box or bearing, making a good contact. Do not press very hard at any given point when collecting data. Use just enough force to keep the tip of the probe in place, and try to be consistent with the amount of pressure you use. It is often effective to use only the weight of the Steam Tector 2 itself to hold the tip in place.

Adjust the sensitivity so that the intensity meter reads less than half. This gives you room on the display for future readings.

As the bearing wears the ultrasonic sound intensity will increase. Future readings can indicate the extent of this wear.

When testing a bearing or other moving machinery it is important to ...

1. Record your volume and sensitivity settings.
2. Record the level on the alphanumeric display.
3. Record or mark the test point where the level was taken.

By recording these things you have the most accurate and repeatable test possible. Although the sound of a moving machine member may fluctuate, the Steam Tector 2 built in peak hold feature will allow you to assign a number to the sound level emanating from the item being tested. Use this number to compare to future tests.

Vibration
Vibration, misalignment, or moving machinery which is not properly balanced can be deadly to a system. These things can cause leaks, and excessive wear bringing the life of any system to an early demise.

All these problems have a common warning signal; *increased ultrasonic energy*. This ultrasonic energy is generated from the friction associated with these problems, and can be detected with the Steam Tector. With experience, you will know what readings are good, and which are bad for the most common types of equipment you work on.