Airborne Applications

The Airborne sensor is used to detect sound waves which travel to the Tru Pointe® 2100 through the air. The most common airborne application is compressed air or refrigerant leak detection.

Leaks

When searching for leaks with the Tru Pointe® 2100, remember that you are listening for the turbulent flow of the gas as it flows from the leak orifice (refer to “Principles of Operation” on page 15 for a more detailed explanation). The Tru Pointe® 2100 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.

1. Stand several feet from the suspected leak area and reduce the sensitivity of the Tru Pointe® 2100 until only 1 or 2 LED’s are lit.
2. Scan around fittings, flanges and all other suspected leak sources.

   NOTE: If the LED Bar Graph Display is at maximum, reduce the sensitivity and continue scanning.
3. The sound in the headset and the LED Bar Graph Display will increase as the unit gets closer to a leak.

In the case of large refrigerant leaks remove the nose cone and the waveguide and increase the sensitivity. Then sweep the instrument over the entire area.

Reducing Background Noise Interference

The Tru Pointe® 2100 detects a narrow band of ultrasonic sound, therefore although there may appear to be an overwhelming background noise, the sound may not be within the detection range of the Tru Pointe® 2100.

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 Tru Pointe® 2100, although the fan motor may produce a “buzz” or “hum”.

> **EXAMPLE:** Mechanical vibrations sound very different from leak sounds. Shake a set of keys, and then take a short quick breath through the nose. Listening to both sounds through the Tru Pointe® 2100 is a good example of how its direct translation process helps to distinguish the difference between the two signals.

Practice listening to different components of the test area, this will help to identify problems from other normal operational sounds.

The following methods can help reduce the amount of background noise detected by the Tru Pointe® 2100:

1. Placing the flexible waveguide onto the airborne sensor will make the reception of the Tru Pointe® 2100 more directional. This helps shield the sensor from competing sounds entering from other directions. Cupping a hand around the end of the wave guide will also help to reduce the background noise.

2. 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.

Sometimes 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 methods above for reducing the background noise.

Frequency Selection (Airborne)

Another method of reducing background noise is by adjusting the frequency band. The dominant background sounds which interfere with the leak detection may be avoided by switching to another frequency. The proper setting will depend on the environment. In general, we have found “AirH” to be most effective for leak detection.

Recording Overall System Noise

Use the Tru Pointe® 2100 to record sound levels of compressor noise, fan vibration, fan belts, motors, and even noisy ducts. The overall ultrasonic sound level of a system can be recorded and compared to previous and current readings. The Tru Pointe® 2100 will only record the ultrasonic range of a noisy system. This part of the sound will increase in proportion to the sonic part and is an indication of the problem.

Taking a Baseline Reading

When taking a reading of overall noise level, begin by reducing the sensitivity until the bar graph reads less than 1/2. This will give you room on the display for future readings.

IMPORTANT: The digital circuitry of the Tru Pointe® 2100 allows for great accuracy and consistency, but the operator must note the settings to ensure success. Record the sensitivity, volume, sensor type and the numeric level reading on the display, as well as the position from which the reading was taken. This will be your baseline for future tests.

Touch Probe Applications

Ultrasound not only travels through air but solid materials as well. The touch probe sensor 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.

Frequency Selection (Touch Probe)

Changing the frequency bands of the touch probe sensor allows the user to hear different sounds within a system. For example in a steam trap, the Probe High setting makes it easy to isolate the sound of a steam traps purge cycle, while the Probe Low setting allows you to hear the trickle

of condensate coming into trap as well. There are times when this is beneficial, and times when there is so much background noise that the Low setting may not be effective.
The sound of most bearings comes alive in the Low range probe, however, very high speeds and/or vibration sometimes make it necessary to use the High frequency probe. Your experiences with your equipment will determine which is the best setting for you.

Steam Traps

A steam trap is a device which works much like an automatic faucet, opening only at times when condensed steam (water) has accumulated in the trap. The steam trap then will open to purge the condensate, while retaining the steam for maximum efficiency. Common problems arise when a malfunctioning steam trap fails in either the open or closed position. When this happens it can often go undetected. Left uncorrected in the closed position, faulty steam traps will cause problems such as “water hammer”. If failed in the open position, the trap will constantly release live steam, drastically reducing system efficiency. These are problems that can be quite costly.

> **NOTE:** It is fairly common for large manufacturing and processing plants to spend tens of thousands of dollars on steam system conservation programs (equipment and personnel) designed to locate and repair failing steam traps. Ultrasonic detectors play an important role in these programs.

To test steam traps you will use the touch probe sensor. Press the “MODE” button until the display reads the desired probe mode, then press ▲ and ▼ to activate the touch probe 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 Tru Pointe® 2100. 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. To detect the flow of condensate in pipe, switch to “PrbS”. Switching to “PrbS” allows you to hear sonic (audible) sounds, and is used as a mechanical stethoscope.

Thermal Expansion Valves (TXV)

The Tru Pointe®2100 can be used to test a TXV, check valve, ball, needle, gate… any type of valve which may be leaking internally.

Any fluid or gas passing from the upstream side (high pressure) to the downstream side (low pressure) through a poorly seated valve will generate ultrasound, and clearly be heard using the Tru Pointe® 2100.

This test method is very similar to that of steam traps. Use the touch probe to test around the perimeter of the valve housing. The sound will be loudest at the point of the leak (the area where the gate, ball, needle, etc. seats into place to stop the flow. Use the sensitivity or frequency

adjustment to eliminate any extraneous pipe noise and you will be able to hear only the internal flow of the valve.
By using the readings on the display and your ear, you can determine which side of the valve is leaking.

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 Tru Pointe® 2100 by touching the bearing housing with the touch probe and listening for abnormal sounds. Periodic preventive maintenance tests can prevent major disasters in both the machinery and down time.

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 just by using your ear. When time passes between tests, however, it is very important to log your results because the slope of the curve that you will generate will predict the future failure of the bearing.

To take a reading on a mechanical system, such as a bearing or gear box, you must use the touch probe 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 Tru Pointe® 2100 itself to hold the tip in place.

Adjust the sensitivity so that the intensity meter reads 5-6 LEDs. 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, sensitivity, and frequency range.
2. Record the level on the alphanumeric display.
3. Record or mark the test point where the level was taken.
4. Record the temperature using a thermometer

By recording this Data you have the most accurate and repeatable test possible. Although the sound of a moving machine member may fluctuate, the Tru Pointe® 2100's 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 future tests.

Charting your results

Ultrasound will be produced differently for all types of systems. It may be strong on one side of a bearing shaft, and weak on the other, depending upon the unique wear patterns. Therefore it is very important to mark the test point, so that future readings can be taken from the exact same position. Doing the same test with the sensitivity set differently can completely change the results, therefore it is extremely important to keep track of the instruments settings for future tests to be valid. These values can be entered into a computer spreadsheet program for creating charts, and storing data.

Keep this information in your files, or tagged on the equipment itself. When returning to the same equipment, perhaps several weeks or months later, you have the information you need to make a decision as to the degree of wear in a particular piece of equipment.

It is worthwhile to show this information to supervisors and plant management. The problems you identify and correct will eliminate costly downtime and energy loss, ultimately saving your Corporation money. More scheduled repairs and less emergency work keeps your business under control.

Vibration

Vibration, misalignment, or moving machinery which is not properly balanced can be deadly to a system. These things can cause 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 Tru Pointe® 2100.

EXAMPLE: Maintaining a system using multiple pumps or motors all of the same type. After testing a sample of these bearings, the will be able to determine what readings are normal or abnormal for each type.

REMINDER: To insure success, be consistent. If you test a compressor bearing, for example, test the same place, at the same sensitivity setting. It is a good idea (although not necessary) to test units when they are new, and keep your own records of what is acceptable for a new piece of equipment.

See the previous section on charting your results.

WARNING! Be careful when working around rotating machinery. The headphones will dampen much of the sound around you. Use care, and be alert at all times. Make certain the headphone cord is away from moving machine parts.

SoundBlaster® Sound Generator

The SoundBlaster® ultrasonic sound generator is used to detect leaks in enclosures which are not under pressure.

This item can be placed inside a vessel such as tank or walk-in freezer compartment. The sound generator emits a powerful 115dB ultrasonic tone which will follow the empty passage a gas or liquid would travel to produce a leak. The tone can then be identified at the point of exit by using the Tru Pointe® 2100 detector.

6 Principle of Operation

The principle of operation of the Tru Pointe® 2100 is based on the turbulent flow of fluids and gasses. Turbulent flow has a high content of ultrasound, which the Tru Pointe® 2100 can detect. 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.

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 Reynolds number, the pressure differential across the leak, and the physical dimensions and characteristics of the orifice. This is why it is impossible to quantify the size of a leak with ultrasonic technology. A smaller leak may generate more sound than a larger one.

The Tru Pointe® 2100 detects ultrasound NOT the presence of a specific gas. It is NOT a gas “Sniffer”. Because of this fact, the Tru Pointe® 2100 can function in areas where heavy wind or a concentration of fumes renders other detectors useless.

WARNING! Ultrasonic detectors will not indicate a leak if there is no turbulent flow producing sound when checked. If you suspect a toxic gas, natural gas, or other combustible gas leak and it is not detected by the Tru Pointe® 2100, do not assume it doesn’t exist, and use another method as verification there is no gas leak present.

5 Care and Service

The Tru Pointe® 2100 is constructed of durable, impact resistant ABS; however it is also a precision electronic test instrument which should be handled with care and respect. We suggest you follow these simple instructions to insure many years of reliable performance.

1. If you find yourself working in damp areas or the instrument is exposed to oils, or chemical agents that corrode, make sure that you wipe it clean with a soft cloth and window cleaner. Be very gentle around the front of the instrument so that the sensor is not damaged. Periodically, use an automotive plastic polish on the case to bring back its original luster.
2. Keep both sensor openings free of dirt, oils, moisture, or any other foreign substances. Use the yellow waveguide to protect the airborne sensor when using the unit in harsh environments.
3. When performing touch probe applications, do not use excessive pressure on the item being tested. Bent probes or cracked sensor housings are considered abuse, and will not be covered under warranty.
4. Keep the instrument stored in its protective carrying case when not in use.
5. Your Tru Pointe® 2100 comes with a high quality, 9 Volt Battery. However, all batteries have the possibility of leaks. Remove the battery if the unit is not to be used for longer periods of time and store it in one of the two storage locations at the lower left portion of the carrying case foam.

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