FISHER RESEARCH LABS

XLT-16

Sonic and Ultrasonic
Sound Detector and Leak Detector
For Liquids and Gases

Operating Manual

FISHER RESEARCH LABORATORY

CONTENTS

INTRODUCTION

Historically, much acoustical liquid leak detection was done with a crow bar or screw driver held firmly against a pipe to transmit sounds to the water operator's ear. There are still successful practitioners of this method, however, today's pipe materials and operating conditions make these older methods much more difficult. This is true principally because in many areas the pipes being laid are no longer made of metal, but rather plastic or asbestos-cement, which are much poorer conductors of sound. In addition, more distracting sounds are present from traffic and urbanization. Noises from things like vehicles, can be serious distractions to leak detection listening.

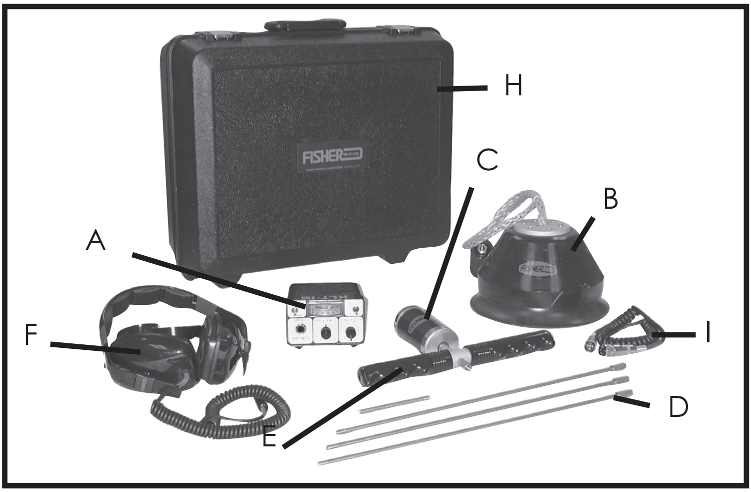
Modern electronic leak detection equipment not only amplifies the raw leak sounds coming up from the ground, but allows the operator to selectively filter out distracting sounds. He can more easily identify the unusual sound of a leak, because it stands out from the normal flow sounds. The Fisher XLT-16 Sonic and Ultrasonic Sound Detector and Leak Detector for Liquids and Gases was designed to be a first line defense to assist water managers, consultants and plant engineers in reducing or eliminating losses of water, air, and other liquids and gases. All who set out on this pursuit should realize that there are no magic short cuts in acoustical leak detection, especially in detecting liquid leaks. Anyone starting this discipline will need to spend some time with this particular system and have full knowledge of the layout, depths, pipe materials, pipe lengths, couplings, valves, and pressure history of the system and the precise location of the centerlines of each underground pipeline to be surveyed. A *minimum* of three hours per week for six weeks is recommended to become familiar with leak detection. Even then, it is still a skill that must be maintained, preferably on a weekly basis.

Leak detection is largely a "process of elimination" when there are no obvious signs in an area where leaks are present. In the water industry, when the master meters in an area are compared to the service meter totals and there is a significant discrepancy, leaks can be expected. As much as possible, isolate this area, so that all flow in the area can be monitored. Older parts of the system and areas with higher than normal leak history should be the first areas of suspect (of course if water is surfacing or draining into sewers, etc., you may want to start in that vicinity). Recent excavations are always a reason to suspect that a water line was disturbed and started leaking. Once the area is systematically narrowed down using the above criteria, arbitrarily start in the middle of the selected section. It is assumed at this point that the operator recognizes sonic leak sounds. Sonic leak sounds are within the normal hearing range of 150 to 8,000 Hz. Liquid leaks are in this frequency range. The accessory Ultrasonic Probe gives the XLT-16 the capacity to sense gaseous liquids which are at the higher frequency range of 38 kHz to 42 kHz and convert them to human hearing range of 300 cycles to 4,000 cycles.

Liquid leaks are described by some as a hiss or gurgle and stand out from normal flow sounds. Gaseous leaks, being in a much higher frequency range, are described as a sputter. In practice, one cannot really know the sound until experiencing it anymore than he can know the sound of a siren or bell when described as a “wail” or “ding” until he actually hears it. Going to the site of a known leak and listening to it, as well as areas upstream and downstream would be an excellent introduction.

There is no real substitute for spending some hours listening to one’s own water system so that the normal flow sounds are very well ingrained into one’s memory. After several sessions of listening to these same or very similar sounds of flow, a leak sound will stand out as being distinctively different. When this sound is identified, it then becomes a more simple task of pinpointing or closing in on it so that a repair can be made. Remember, not all leaks sound alike and probably no two sound exactly alike, but if you approach leak detection as a “process of elimination” knowing that it really is important to know where the leaks are not located, as well as finding the leaks themselves, you will continue methodically until you are confident that all leaks of consequence have been found in the area.

INSTRUMENT SET AND ACCESSORIES



The XLT-16 Instrument set and Accessories

A. Control Box: The Controls are contained in a sturdy, compact ABS box. The function of each control is explained on page 6. Built into the control box is a "loudness limitation" to protect the hearing of the operator from sudden blasts.

B. Big Foot Probe: This probe is used only on pavement such as concrete or asphalt. The replaceable rubber shield forms close contact with the pavement to keep out above-ground distracting sounds.

C. Hydrophonic Cylinder Probe: This probe is used with either the four inch sound rod or the T-handle and one or more of the 16 inch sound rods and the four inch rod for a point when screwed together. When tightening the rods or T-handle in place, be sure not to twist the internal wiring in the probe which can eventually cause a short circuit or break the internal wires.

The probe with sound rods can go through small apertures to gain access to valves, or pipes for listening. It also can be pushed into the ground to touch or be near a pipe when it is attached to the T-handle and one or more of the 16 inch sound rods. The cylinder probe is attached to the four-inch probe rod for evaluating sounds close to the surface such as a lawn watering system or penetrating pipe insulation for direct contact with pipe. It is important that this probe is always held vertical when in use.

D. Sound Rods: Three sound rods can be joined in 16-inch sections up to a total of 48 inches for direct or indirect contact probing of deeply buried pipe. Also furnished is the four-inch rod described above which has a point on the end for piercing the ground. Total length can then be 52 inches.

E. T-Handle: The T-Handle is screwed on below the hydrophonic cylinder probe before threading on the Sound Rods to prevent strain on the probe when pressing the rod or rods into the ground.

F. Headphones: These headphones have been constructed for unusual comfort during long periods of use and maximum ability to shut out distracting sounds while providing excellent response through the entire frequency range. Using standard 8 ohm stereo headphones instead of the ones supplied with this set, will lessen audio sensitivity.

G. Carrying Strap: The black strap is snapped to the bracket on the bottom side of the control box for carrying around the neck or over the shoulder. This leaves the hands free to move the probe and to make tuning adjustments during the leak survey.

H. Carrying Case: The high impact polypropylene case is lined with molded compartments and foam to securely hold each component during transport.

I. Coil Cord: This cable has two male jacks. One fits into the socket on the back of the control box (5 pin connection) and the other into the socket located on the Big Foot handle, the hydrophonic cylinder probe housing or the accessory, Little Foot Probe, (4 pin connection). The jack should be fully inserted into the receptacle and the nut tightened securely.

J. **Little Foot: (Part No. 202357)** This transducer or probe is an optional accessory. It is normally used for sensing leaks in slab floors, walls or ceilings. The operator presses the probe against the concrete and turns it on or off using the red button. In is **OFF**, and out is **ON**.

K. **Ultrasonic Probe: (Part No. 202352)** This accessory probe with its own connecting cord is used to sense telltale sounds in the 38 to 42 kHz range. Some of these are leaks in pressurized telephone cable, bearing wear in rotating machinery, steam trap problems, corona discharge in electric power insulations and pinhole liquid gaseous leaks. The probe must be pointed at the source of sound for best results.

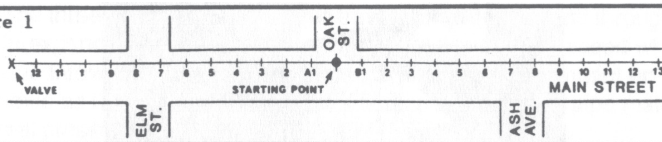
CONTROL BOX

1. **Batt Test, Mute/Normal Switch:**
   This two position toggle switch is spring loaded in the normal position and allows the set to be on if the sensitivity knob is turned on, *but only* if the coil cord or probe is connected. Pressing the switch up, turns the sound off and shows the condition of the batteries on the meter.
2. **Meter:**
   This analog meter indicates battery condition when the aforementioned toggle switch is pushed up and sensitivity knob is in any position but off. The meter also indicated signal strength during a leak search. The coil cord or probe must be connected to get any readings on the meter.
3. **Filter On/Off Switch:**
   When the filter is ON, the frequency knob controls the input of the sound to the meter and the headphones. The frequency band at the setting of the frequency knob comes in clear while frequencies above and below the setting are masked or filtered. When the switch is OFF, all sounds and frequencies from less than B to more than J come through equally well. This is a broad pass or it as no electronic filtering, causing the frequency knob settings have no effect.
4. **Sensitivity Knob:**
   This knob turns on the set and sets the level of sensitivity. The set cannot turn on however, unless the coil cord, or a probe is plugged in at the back of the box.
5. **Frequency Knob:**
   The setting point of this knob, when filter is ON, will allow clear perception of all input sounds from the probe for that frequency setting while masking or filtering out frequencies above and below the setting.
6. **Headphone Jack:**
   This female receptacle accepts standard 1/4” stereo headphone plugs, although sound is monaural.
7. **Probe Connection:**
   This female socket, (5 pin), is located on the opposite side from the panel and accepts the male connector from the coil cord or the ultrasonic probe’s connector.

LIQUID LEAK DETECTION PRINCIPLES

More ground can be covered, (i.e., more pipeline can be surveyed in a given time), if leak detection is accomplished by a two-person team. One, of course, is the operator of the instrument and the other accompanies him with a clipboard and form(s) showing a sketch of the area to be surveyed and “boxes” to enter meter readings at the test points.

Figure 1



"A" LEG					"B" LEG				
FILTER OFF A	SENS LEVEL	FILTER ON	FREQ SETTING	SENS LEVEL	FILTER OFF B	SENS LEVEL	FILTER ON	FREQ SETTING	SENS LEVEL
1.					1.				
2.					2.				
3.					3.				
4.					4.				
5.					5.				
6.					6.				
7.					7.				
8.					8.				
9.					9.				
10.					10.				

Referring to the chart above, when you are starting, you should coincide with a valve location or known joint. Your initial senses should then be over the joints, every 20 feet, until you reach the end of the section being surveyed. If nothing is sensed, go back to the midpoint and again sense every 20 feet in the opposite direction. If this again does not elicit a leak, go back to the starting point and work the “A leg” again by bisecting the original sensing points. This would then be followed by bisecting the test points on the “B leg.” Continue working in this manner if needed.

Let’s refer to the equipment for a moment. In your initial search of both legs, you will have the filter switch in the off position on the XLT-16. Once a leak sound is identified, switch filter on and a slow rotation of the frequency knob will be made This will also mask frequencies above and below the leak sound. Usually, the leak sound will be found between a reading of E and F. The bandwidth knob can be considered as a fine tuning control of the frequency knob but normally is left in the 12 o’clock position until a precise fine “tuning” is needed. After the frequency knob is placed in its best position, rotate the bandwidth knob slowly to further enhance the perception of the leak sound. From that point on, the operator and his assistant will be making efforts to pinpoint the leak, making small movements with the Big Foot Probe and listening as well as recording the meter level with each placement. At the highest level of a leak sound, a 1" hold should be made. The 1/4" stainless rod or rods with the cylinder probe should then be pushed down through the pavement to confirm that the leak sound is present. An impact driver can help clear the way through the pavement and below it. Sometimes water comes up from such a hole as a further confirmation of a nearby leak. Before drilling the hole, however, refer to pages 13-14 on "quartering" the leak.

A. SUMMARY OF ACOUSTICAL LEAK DETECTION PRINCIPLES

1. Be thoroughly familiar with your equipment and be sure that all its electrical and physical connections are tight so that distracting noises are not introduced.

2. Leak detection personnel should be selected carefully. Develop specialists who are the only ones who do detection. A special aptitude is not nearly as important as having person(s) being enthusiastic about results and consider liquid conservation a challenge. Leak detection is most successfully done by persons who are methodical and possess good common sense and who know the pipeline systems they are working.

3. Practice with the equipment in various areas of your water system BEFORE there are serious leaks suspected.

4. Do not be hasty in making your final pinpoint prior to excavation.

B. LEAK SOUNDS

A pressurized liquid escaping through an orifice in a buried pipe will generate three types of sounds. Type I sounds are caused by the friction of the escaping liquid against the orifice and are generally in the 500 - 1,000 Hz range. Type II sounds are generated by the liquid striking the soil. Type III sounds are caused by the turbulence of the liquid circulating in the eroded soil cavity adjacent to the leak. Type II and Type III leak sounds are normally below 400 Hz.

The three different sound waves travel along the pipe and through the soil in expanding concentric circles much like the ripples caused when a stone is thrown into a pond. The distance traveled is dependent on such variables as the type of sound, size of leak, pipe diameter, pipe material, internal pressure and composition of the ground.

Type I sounds may travel a considerable distance through the soil and even farther down the pipe wall, while Type II and III sounds will travel only a very short distance away from the leak. Dry, sandy soil will transmit sound waves best while damp clay absorbs vibration. Water—saturated soil of any type greatly dampens leak sounds. For example, a given leak sound may be detectable 100 feet along the pipe if the fill is dry sand, but only 5-20 feet if the fill is saturated mud.

C. COMPETING SOUNDS (Normal and distracting sounds)

The sound generated by the leak competes with other normal everyday sounds in the area. You may hear a combination of water flowing through pipes, pump noises in the system, meters clicking, machinery running, traffic noises, power stations, pedestrians walking and sounds created by vibrations from all things other than the leak itself. Even the wind may become part of the local sound level.

It is sometimes necessary to survey water systems late at night or early in the morning in order to eliminate heavy traffic sounds.

In all leak detection, it is an abnormal sound that you must identify, and you cannot accurately and quickly detect that abnormal sound unless you are thoroughly familiar with the normal sounds.

LIQUID LEAK DETECTION

A. Whenever possible, the operator should study the liquid system plans for:

1. location of pipes. The locating of metallic pipes can be accomplished with a pipe and cable locator, such as the Fisher M- Scope TW-6, TW-7700,TW-8800 or the FX-3.
2. location of joints, valves, and siphons, meter boxes, etc.
3. location of service laterals.
4. pipe sizes and types (cast iron, cement, asbestos, PVC, etc.)
5. water system pressure.
6. location of all pumps and nearby noise sources.

B. Check for surface indentations indicating settling of the soil. Again, this can occur at a considerable distance from the actual leak as water flows along the path of least resistance.

C. Check all water meter indications. If the service (house, factory, etc.) has turned off all taps and water services, the meter should indicate zero flow of water. The general area of the leak can often be determined by comparison of meter readings. Meters themselves provide easily accessible test points.

D. Using the hydrophonic cylinder probe and sound rod, the operator may make direct contact with the pipe or the meter and evaluate the sounds. This may lead to detection of a leak in fittings, the pipeline itself or branches of the system.

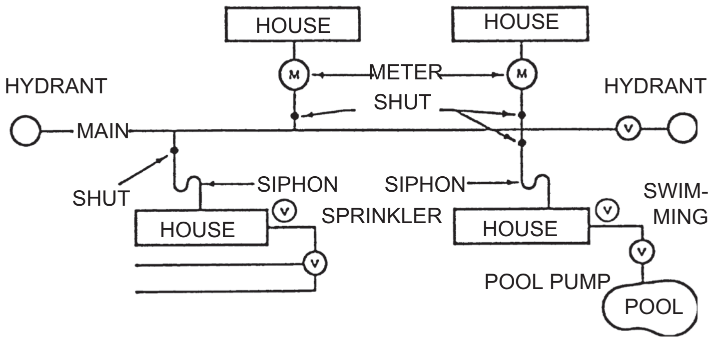


Figure 2

LIQUID LEAK OPERATION

When the operator has prepared his survey or search plan, the XLT-16 can be brought into service.

A. Connect the headphones and probe to be used, making certain the plugs are fully inserted and tight.
B. Turn the sensitivity knob to the 2 position.
C. Check the batteries in BATTERY TEST. If OK, proceed to D, otherwise, replace and then proceed to D.
D. Turn filter switch to OFF position.
E. Turn the sensitivity knob until meter registers 2.
F. If using the “Big Foot”, “Little Foot”, or hydrophonic cylinder probe with rod(s), place the probe on the ground and test the sensitivity of the unit by tapping your foot on the ground near the probe. If the instrument settings are correct, a loud noise will be heard in the headset and the meter will indicate a rapid rise and fall with each tap of the foot. The

SURVEY DETECTION WITHOUT DIRECT PIPE CONTACT

A. First test all pre-selected accessible test points where you can make physical contact. (See Figure 3 for typical test points).

1. Check all service shut-off controls, valves, meters and exposed fittings. At the first check point adjust sensitivity so that meter reads 2. Use the same probe throughout the initial evaluation. When a leak sound is heard, you will know it either by a higher meter indication or from a difference in the sound and volume or both. (A meter increase by itself may only mean an increase in flow.)

2. After listening to the test points, the operator should evaluate the entire system, even if a leak was discovered at the out-set in the exposed fitting survey. To do this, the center line of the main must be accurately located and marked along its entire length. If the main is under the street or sidewalk, the operator should use the Big Foot probe. At consistent intervals of five to twenty feet directly over the joints, sense the sound without changing the control settings, and record the value indicated on the meter.

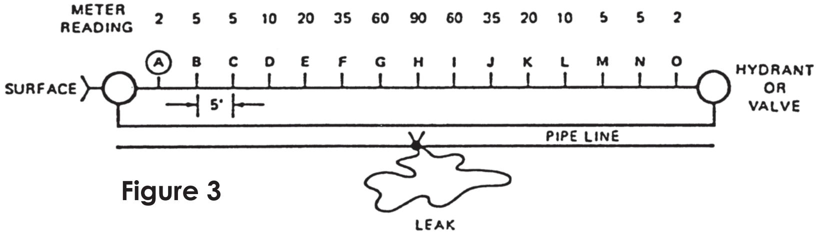


Figure 3

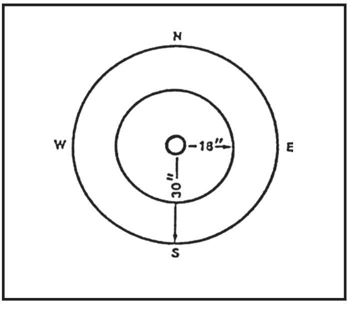


Figure 4

B. QUARTERING

Center the leak sound by "quartering" the isolated leak area (See Figure 4). At the test point which generated the highest meter reading, drill a one inch diameter hole in the concrete or pavement to better conduct the sound using the hydrophonic cylinder probe and test rod(s). Water may come up from this hole. Establish the leak frequency by setting the sensitivity at a level giving approximately mid-scale (4-6) deflection on the meter, then rotate the FREQUENCY knob until the meter needle hits its highest point.

1. Mark the spot on the surface over which the strongest signal is heard.
2. At a distance of 18 inches, compare the meter readings at the four points of the compass around the leak. Strong and equal readings at all four points indicate that the leak has been centered. If a higher reading is obtained at one of the points compared to the others, relocate the marked spot on the surface in that direction and again "quarter the leak".
3. At a distance of 30 inches, again quarter the spot marked on the surface. Being farther from the noise source, the subsurface will muffle more of the total signal and provide consistence of signal strength. Continue re-quartering the leak until its precise location is determined, adjusting in the direction of the highest meter reading.

As you continue refining the location of the leak, you will hear the leak sound more clearly. Rely on your hearing to detect and identify the exact sound of the leak and you will recognize the hiss of water escaping through an orifice, the tumbling action of sand and pebbles as the water impacts on them, and the characteristic sound of the pipe vibration itself.

SURVEY DETECTION WITH DIRECT PIPE CONTACT

Where the leak conditions or circumstances do not respond to the SURVEY DETECTION WITHOUT DIRECT PIPE CONTACT method, it is necessary to use probe contact with exposed sections on the pipe line or through bore holes. These may consist of meters, risers, shut-off valves, or an exposed part of the pipe itself. This is a much slower routine. In some cases, contact may have to be made by inserting the sound rods through a small drill hole in the earth or concrete to make physical contact with the pipe. If a piece of the pipe is already exposed, the sound rod and hydrophonic cylinder probe provide direct contact. Remember that the cylinder probe must always be held vertical.

***NOTE:** Prior to any excavating or digging, you may be required by law to contact your state or local underground alert agency.*

A. Place the hydrophonic cylinder probe rod on a water meter which is close to a supposed leak and listen.
B. Best results are obtained when the sound rod is placed directly on the pipe, either side of the meter to reduce clicking sounds, but you may also place it on top of the meter. The probe itself should *NOT* be hand held in position or distracting sounds may be added. Use the T-Handle.
C. Move the detector and probe to adjacent meters and record the readings on both sides of the meter selected.
D. The highest meter reading will be obtained at the water meter or lateral nearest the actual leak. If readings do not decrease on one lateral or another, continue to survey an additional meter away from the initial checkpoint.
E. When the highest reading is obtained indicating the water meter or lateral closest to the leak, check the lateral and main in that vicinity by the *non-contact* method.
F. When the leak is not detected by the non-contact methods, bore holes should be drilled to the main and laterals and the Sound Rods used to contact the

pipe. These holes should be about six feet apart. With three bore holes, it is quite possible to accurately locate the leak. If the middle hole does not give the highest reading on the meter, a fourth or fifth hole will be necessary to locate the leak. The contact closest to the leak will provide the highest reading on the meter.

G. In cutting the street for leak repair, favor the area in the vicinity of the highest indication on the meter. This location must be carefully centered through the Quartering methods (See page 13), either with or without direct contact through additional bore holes.

NOTE: *A leak the size of a needle point will generate vibrations sufficient to carry five to six feet along the pipe. Larger leaks will cause greater vibrations. The distance that sound will carry along a pipe increases proportionally with the size of a leak (if internal pressure is equal). In all cases, the strongest vibration is at or above*

PERIODIC LEAK SURVEY

If a periodic leak survey indicates leak noise, a survey should be conducted by the non-contact method in the vicinity over the main and a contact method survey should be conducted at nearby water meters. Before drilling holes to the main, attempt to narrow down the suspect area by actual contact at service connections or by the non-contact method. If a leak noise can be detected at several service connections, it is evident that the leak is on the main and not on any of the laterals tested.

If, on the other hand, the leak sound is indicated on only one lateral (at the meter), it can be assumed that the leak is on that particular lateral leading from the main.

To obtain valid results, follow a distinct routine and record the readings methodically. Keep a record of all known factors regarding the pipe system traversed. Work with a sketch of the layout of the area showing all valves, services and hydrants with notes as to the open or closed position of the valves.

A systematic test on the easily available points will quickly show in what particular section of a line a leak is located. For example, if on the previous survey checkpoint number 101 indicated 30 on the meter, and on this survey indicates 35 or 40 or more, in all probability, there is a leak in that area. Checkpoint identification may be accomplished through the use of a distinctive color of spray paint, such as dayglow orange.

When there are no points available for long distance between readings, it is generally worthwhile to provide bore holes or small openings to the main so the sound rods may be used.

If a large leak is suspected and the general location has been determined, holes at intervals of from 100 to 200 feet will provide sufficient indication to narrow down the search quickly. When the search is narrowed down by examination at these widely spaced holes, closer spacing and search within the narrowed area is justified.

Before narrowing down by additional drilling, attempt to find the leak with the Big Foot probe in the non-contact method. If a leak sound is detected between two widely spaced holes, the non-contact method is usually very effective in eliminating further drilling by indicating actual leak sounds.

Do not expect the Big Foot to record the same intensity as when using sound rods. When the sound rod gives a reading of 90 in the vicinity of the leak, the reading may be only 25 or 30 when using the Big Foot. This is perfectly normal because vibration will travel through a rod at a much greater distance and at a higher intensity than it will through the ground.

When commencing a leak survey, if the sound level at the first checkpoint is recorded with a meter sens control setting in a specific position, all subsequent readings should be taken with the same sensitivity control setting.

Surveys should not be conducted in conditions of high wind or rain because noise created could make readings unreliable. The coil cord should not be allowed to flop around in the wind.

When an automobile or truck passes close to the probe, the meter needle goes way up until the vehicle has passed out of range. Should a constant vehicle noise be detected at such a high level for several minutes, turn the instrument off.

SPECIAL APPLICATIONS

1. **PVC or Non-Metallic Pipe**: These are poor sound conductors. Sound transmission along the pipe is poor, but ground transmission is unchanged. By isolating the leak (see "Quartering") through measurements at short intervals the operator will detect PVC leaks through the noise generated by water under pressure escaping through an orifice and impacting the surrounding material.
2. **Pipe Under Cement Slab, Pool Decking, etc.:** Detection of these leaks can be accomplished by laying out a grid over the surface. The grid should be at intervals of about one foot. Each grid intersection should be tested for sound intensity, applying the same methods as in "Survey & Detection" and "Quartering."
3. **Wall Leaks:** Wall leaks can be detected and located by using the Big Foot probe. Care must be used so that hand motion is minimized. A wall may be surveyed in the same manner as pipe under cement, i.e., setting up a grid.
4. **Radiant Heating Leaks:** See #1 above.
5. **Asbestos Insulated Pipe:** Turn off all rotary pumps in the heating system. If pressure in the system is too low, use compressed air or allow the pipe to gravity drain, and turn on the valve to listen for the sound of air escaping. This technique may also be applied in detecting leaks in swimming pool systems. An ultrasonic sound detector such as the Fisher XLG-80 can be very helpful.
6. **Encased Pipe**: In this case, the water escaping through an orifice soon fills up the encasement. Subsequent escaping water impacts on water only, generating no characteristic noise. In these instances, the entire system must be purged of water and pressurized by air. As the air escapes through an orifice, a high frequency signal is generated which can be detected with some sonic leak detectors. Do not exceed 5 PSI when introducing air into the system to prevent pressure surges which could create new leaks. The Fisher XLG-80 can be used for ultrasonic situations.

GASEOUS LEAK DETECTION PRINCIPLES

The ultrasonic probe (accessory) allows the XLT-16 to detect air and other gaseous leaks in a frequency range of 38 to 42 kHz. Those higher frequencies are converted to the human hearing range.

As with any new instrument or equipment, you should practice with some known conditions to familiarize yourself with the control box and to know what kind of results to expect. For example, barely turn on an air line to a point where the sound of escaping air cannot be heard. Now, with the filter OFF, point the ultrasonic probe at the air valve from one to two feet away. You will notice a hissing sound. Now try it from 4-6 feet away. You will immediately discover how directional the ultrasonic probe is. Try sensing the escaping air at further and further distances until you lose the sound.

There are many applications for ultrasonic leak detection such as pressurized telephone cables, bearing sounds in rotating machinery, valves, both for liquid and gas. Other applications include electrical discharges such as corona discharge which takes place before the arcing, steam traps and general mechanical trouble shooting.

Long before bearings vibrate and get hot, there are changes in the volume of ultrasonic sounds emitted. These sounds are an early warning of bearing failure. If a valve is properly seated, there is no flow hence, no sound. Both liquid and gas line valves emit some ultrasonic frequencies which are detectable when leaking, even in noisy environments. A corona discharge sounds like a buzz or frying bacon. If the discharge is not corrected, there may soon be a destructive arc.

Steam traps are virtually always in a noisy environment making “blow-bys” a challenge to detect. Armed with the XLT-16, you may detect the “blow-bys”, “machine-gunning”, oversized traps and blockages.

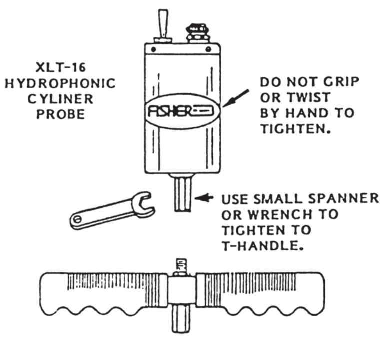
To reiterate, there is no substitute for practice in any new discipline. try using your XLT-16 in known trouble conditions. You will be programming your hearing perception to forestall trouble.

CARE

The Fisher XLT-16 is one of the finest liquid leak detection instruments available to date and deserves reasonable care to keep it at peak operating efficiency. Always check the batteries before going out on a leak survey and change if necessary. Always keep all components stored in the original foam lined case to prevent loss or damage.

CAUTION

A.



B. The XLT - 16 is not certified for use in a flammable atmosphere or to sense flammable gas leaks.

SPECIFICATIONS

Subject to improvement or modification without notice.

Frequency

Sonic Range ....Tunable 100 Hz - 5 kHz
Flat Band 100 HZ - 15 kHz

Ultrasonic Range ....32 kHz - 42 kHz

Listening frequency for both ranges:

Tunable ....100 Hz - 5 kHz
Flat Band ....100 Hz - 15 kHz

Gain .... 85 dB

Filters .... Tunable and Flat Band
Batteries...2 each 9 volt (NEDA 1604)
Battery Life ....20 hours - intermittent use
(Standard carbon/zinc batteries)
Headset Impedance ....150 Ohms

Weight .... 16 lbs. (7.3 kg.)
25 lbs., 8 oz. (11.6 kg) in case.

Case Dimensions......................7 1/4" x 19" x 15" (18.4 x 48.2 x 38.1 cm)
(In carrying case with both accessory transducers)

Fisher Research Laboratory does not warrant suitability to specific use. Fisher Research Laboratory shall in no event be liable for any direct, incidental, consequential or indirect damages

FISHER RESEARCH LABS

QUALITY

Fisher detectors are renowned for their quality.
Each detector is hand crafted in the USA with pride

PERFORMANCE

The worldwide underground utility industry relies on Fisher.
Our instruments are durable, dependable, and locate deeper.

REPUTATION

Fisher produced the first patented metal detector in 1931. For over 80 years, the Fisher logo has been a mark of excellence.

2 - YEAR LIMITED WARRANTY

Fisher believes in the products we produce and backs this belief with a 2 year limited warranty.

Proof of purchase is required to make a claim under this warranty.

NOTE TO FOREIGN COUNTRY CUSTOMERS

This warranty may vary in other countries, check with your distributor for details.
Warranty does not cover shipping costs.

SERVICE

Fisher is committed to providing you, our valued customer, with superior service. Each and every instrument is rigidly tested and carefully inspected during assembly and before shipment.
Should you have any questions or problems, contact:

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