The Sound Choice for Leak Detection.™

S30 Ground Microphone

User Manual

Version F
MAN-130-0003

fluidconservation.com (800) 531-5465 1960 Old Gatesburg Road, Suite #150, State College, PA 16803

TABLE OF CONTENTS

1.0 INTRODUCTION

The FCS S30 Analog is a precision leak detection/location instrument incorporating several unique and advanced features, including:

- Low Noise Design: To help the operator detect the minimum signal level possible.
- Manual Volume Control: To provide great versatility.
- Analog Meter: To ensure consistent and accurate sound intensity measurements.
- Adjustable Meter Control: To ensure accurate readings in a variety of environments.
- Lightweight, compact, rugged and weather resistant to withstand daily field use.

The S30 is designed as a survey instrument for use with the AX80 transducers.

2.0 SYSTEM COMPONENTS

2.1 TRANSDUCERS
2.1.1 AX-80 (standard) with replaceable 6' cable or 10' cable

2.2 S30 CONSOLE

2.3 HEADPHONES

2.4 GEOPHONE ADAPTOR PLATE (GROUND MICROPHONE)

2.5 PROBE ROD SET (3 PIECE)

2.6 BELT-MOUNTED CARRY CASE

2.7 PROTECTIVE STORAGE CASE

3.0 CONNECTIONS, CONTROLS AND INDICATIONS

Rear Panel

Diagram I – Rear Panel

3.1 **SENSOR CONNECTOR:** Accepts the male LEMO plug from the AX80 transducer.

3.2 **TRANSDUCER (SENSOR) CABLE:** The AX80 transducer is provided with a rugged 10 ft. cable. This cable is mounted to the transducer by means of a screw-on type connector. This allows for replacement of the cable in case of damage to a connector or the cable itself. Under typical day-to-day use, the cable should remain attached to the transducer. The connector assembly has been mounted to the transducer and packed with a special purpose silicone grease to waterproof the sensor and to prevent corrosion of the terminals.
Note: WHENEVER THE CONNECTOR/CABLE ASSEMBLY IS DISCONNECTED FROM THE TRANSDUCER, REPACK THE CONNECTOR WITH A DAB OF G.E. #661 SILICONE GREASE. DO NOT USE ANY OTHER SUBSTANCE.

3.3 **BACKLIGHT SWITCH:** Controls the backlight mode of the unit. To enable the meter backlight, press the switch into the "ON" position. To turn the backlight off, select the "OFF" position.

3.4 **HEADPHONE/CABLE JACK:** Used to provide the audio output to the operator. For survey, insert the headphone plug into the jack to monitor the output.

FRONT PANEL

Diagram II - Front Panel

3.5 **ON/OFF BUTTON:** Depressing and hold down on the ON/OFF BUTTON to keep the S30 on and active. The red light will come on to indicate that the S30 is operating. Release the ON/OFF button and the S30 will turn off indicated by the on/off light going out.

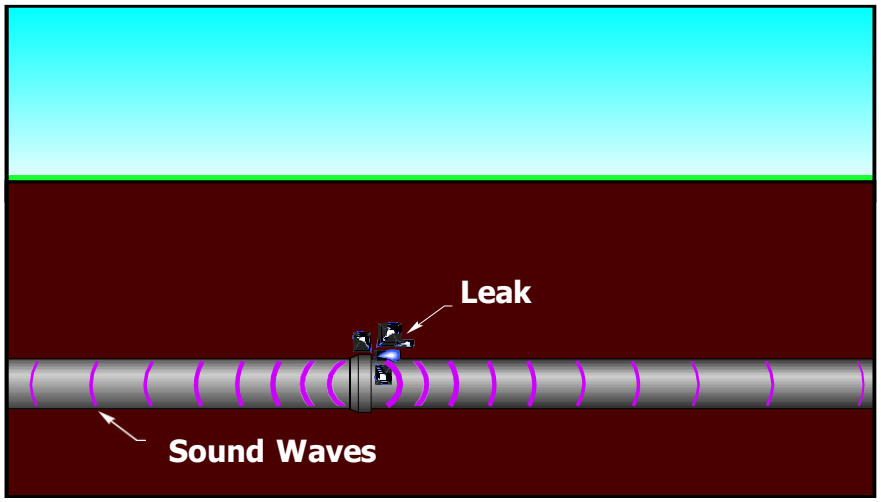
3.6 **ANALOG METER:** Indicates signal level. The meter reads between 0 and 10 typically, depending on the intensity of the leak signal input. The meter can provide valuable assistance to the operator in determining the approximate location of a leak.

3.7 **METER GAIN:** Allows the operator to adjust the sensitivity of the meter when the noise level is too high or too low for the present setting. Turn the meter clockwise one click if the meter is reading 0. Turn the meter counterclockwise one click if the meter is reading above 10. Please note, though, that meter readings can only be compared when the gain setting remains the same.

3.8 **VOLUME CONTROL:** Rotating this inner knob allows the user to control the volume level of the headphones (Each headphone also has a control on the ear piece.) Turn the inner knob clockwise to increase the volume and counterclockwise to decrease the volume. Note that the meter reading is completely independent of the volume control.

4.0 LEAK SOUND WAVES

The characteristic sound produced by a leak is a form of energy that results from fluid escaping under pressure. This sound energy travels as sound waves down the pipe in both directions from the leak site. These waves are carried through the piping fluid and through the walls of the pipe. Therefore, in order to detect leak sound, a device must be able to detect the leak sound vibrations in the pipe wall or alternatively on pipe fittings (valves, hydrants, etc.).



5.0 TRANSDUCER

Sound Pick-Up Transducers are the devices used to detect the leak sound by generating an electrical signal in response to a mechanical vibration. The standard transducer available for use with the S30 is:

AX-80 Transducer (accelerometer)

Accelerometers are transducers designed to be placed in physical contact with the pipe. The vibration that results from the sound waves is sensed by a piezoelectric crystal in the accelerometer that generates a small electrical signal proportional to the vibration. The amount of signal in volts is determined by the intensity of the vibration as measured in units of gravity, or "g's". Therefore, the sensitivity of an accelerometer can be measured in Volts/g.

Because they use sensitive crystals to produce the electrical signal, these accelerometers are susceptible to damage by mechanical shock. They are rated for a shock of approximately 5000 g's; dropping the accelerometer onto a hard surface from 3.5 feet results in a shock of approximately 50,000 g's. HANDLE THE ACCELEROMETERS WITH CARE, AS THEY ARE SENSITIVE PIECES OF EQUIPMENT.

6.0 LEAK DETECTION WITH THE S30

To utilize the S30 for detecting unknown leaks, a leak survey must be conducted. A leak survey is the process of monitoring the distribution system for the sound of leaks.

6.1 ACCESS POINTS AND SURVEY FREQUENCY

The typical access points that are used when conducting a leak survey are: Main Line Valves, Fire Hydrant Valves, Fire Hydrants and Service Connections. The number of access points to be monitored will vary depending on how thorough a survey you wish to conduct.

There are some rules of thumb that are helpful in determining "how much is enough" with respect to leak surveys. These rules are based on extensive field experience, but should still be used only as guidelines. The predominant factor in determining the distance between listening points is the type of pipe. For the distances listed below, the most significant leaks in a system will be monitored.

METALLIC (Iron, Steel, Copper) - sound on access points at least every 500 ft.

ASBESTOS-CEMENT (Transite, etc.) - sound on access points at least every 250 ft.

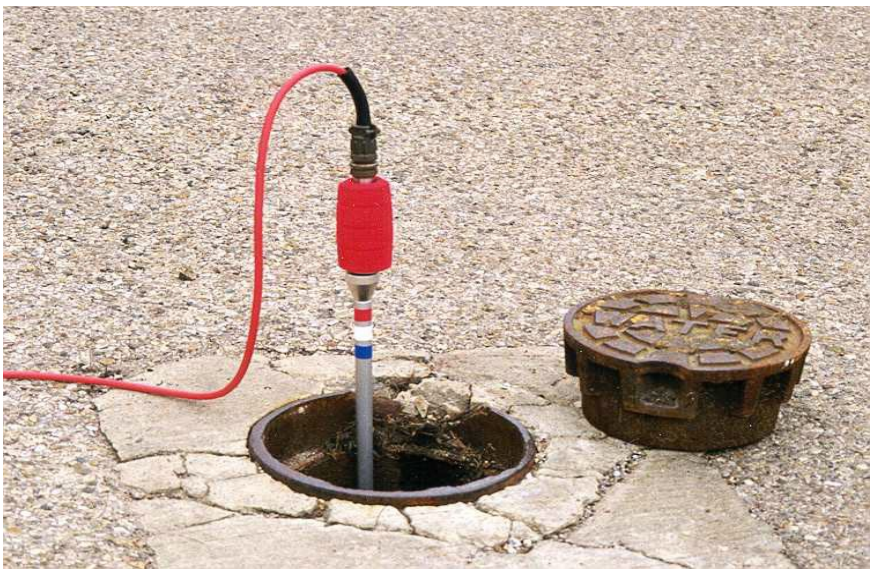
PLASTIC (PVC, Polyethylene) - sound all available access points (i.e. services, gate valves, hydrants, etc.).

From the information listed above, it should be clear that leak sound travels well in metallic pipe and not very well in plastic pipe. Once leak sound is detected, treat the leak as a "known leak" and listen at several access points to determine the approximate location and where to place the transducers for pinpointing with the correlator.

6.2 TRANSDUCER CONTACTING METHODS

The S30 provides two different methods of contacting these access points.

1. Magnet - to attach the transducer to iron or steel access points (e.g., valve operating nut).
2. Extendable Probe Rod - The rod can be made up for 17", 33" or 49" length to reach valves or curb stops below which may be buried or under water. Simply attach the magnet to the Wave Guide, followed by the rods to make up the desired length. See diagram below.



SOUNDING FOR LEAK NOISE

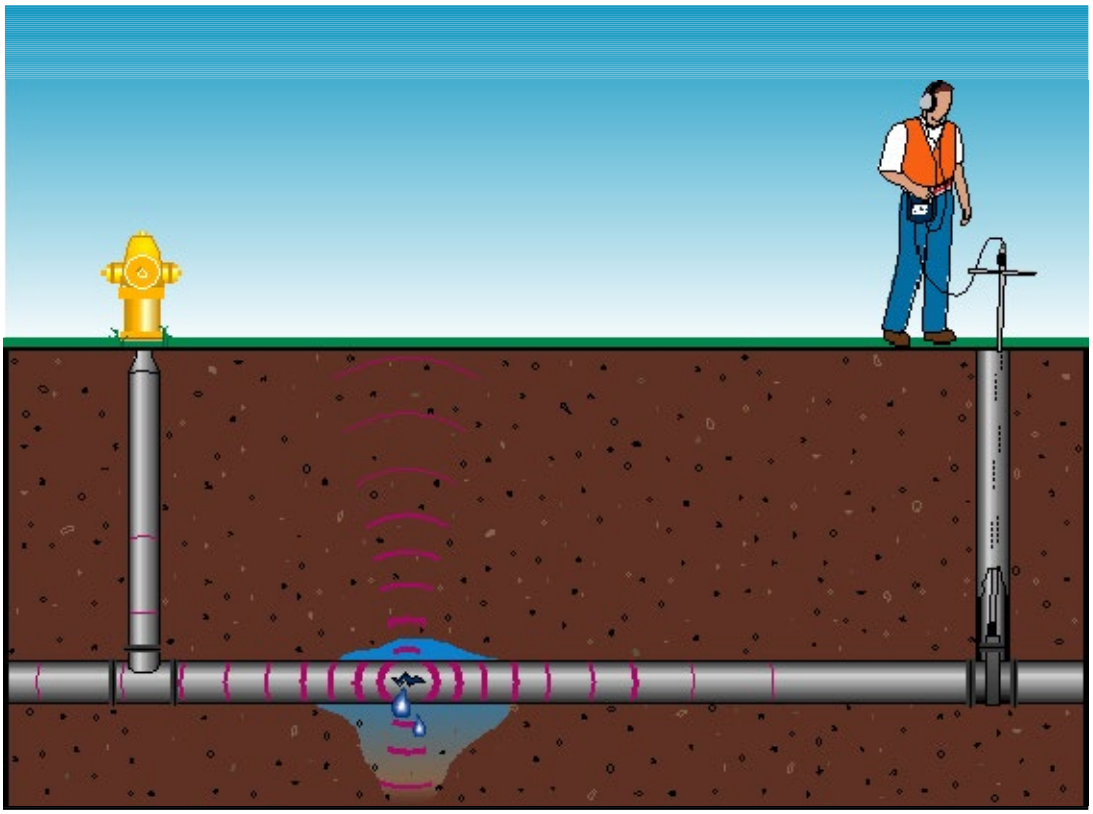
Once the transducer is properly positioned on the access point, turn the S30 on. Use the VOLUME CONTROL to set the S30 to a comfortable level for your ears. At this time the operator must determine two things:

1. Do you hear leak sound?

2. What is the intensity of that leak sound?

If leak sound is monitored, note the location and relative signal level for reference.

When this has been completed the operator advances to the next access point. The operator uses the intensity of the leak sounds to determine the approximate location of the leak. The stronger or greater the leak sound intensity, the closer to the leak.

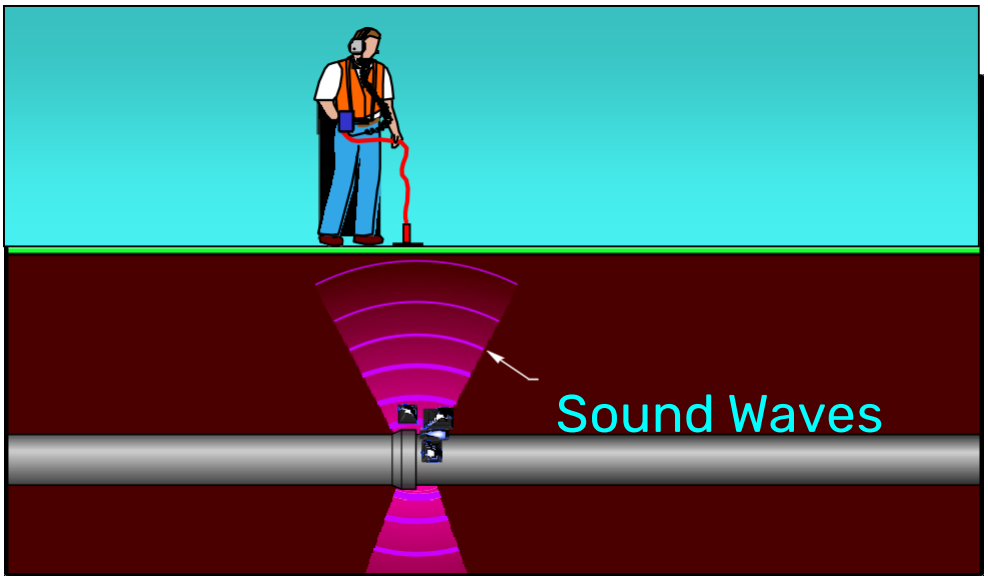


7.0 LEAK PINPOINTING WITH THE S30

The S30 can also be used as a leak pinpointing device. Leak sounds being emitted from a pressurized pipe can transfer through the ground and be detected on the surface above the leak. This technique is called "Surface Sounding" or "Ground Miking". The success of this method varies from leak site to leak site. The variables that dictate your effectiveness are: Depth of Pipe, Size of Leak, System Pressure, Soil Conditions, Surface Material, Traffic and Wind.

In order to effectively utilize this method, the operator must already know that there is a leak in the vicinity and he must know where the water main is located.

7.1 **SET-UP:** To properly use the S30 for pinpointing, the ground microphone plate should be attached to the bottom of the transducer magnet. See diagram below.



PINPOINTING: Place the transducer assembly on the ground above the water main. Press the "ON/OFF" BUTTON to activate the S30. Determine whether or not you hear the leak at this location. Use your ears and the meter to determine the intensity of the sound and make a notation of it. Move the transducer assembly about 3' and repeat the process

Fluid Conservation Systems
1960 Old Gatesburg Road
Suite 150
State College PA, 16803
(800) 531-5465
www.fluidconservation.com