GUTERMANN

AQUASCOPE 550

Operating Manual

JW V 1.3 Date 14/02/2013

Contents

1. Introduction

Welcome to the AQUASCOPE 550 low frequency leak detection System. The AQUASCOPE 550 is a digital acoustic Leak Locator which is specifically designed to enable the professional leak hunter to find difficult leaks. It's ergonomically designed and light-weight for user comfort. It has superior sound quality and amplification to help detect quiet leaks. The unique feature of frequency multiplication enhances the sound of large diameter and plastic pipe leaks to make them audible to the human ear.

The AQUASCOPE 550 has 3 preset filters and 1 adjustable filter which allow the operator to create the filter to suppress unwanted interference and background noise while focusing on the leak noise. With the large display the operator can observe the frequency spectrum of sound enabling the ease of filter choice. The system has a versatile hand probe for direct sounding and leak location on soft ground. For the ground microphone or combined locator system a shielded robust ground microphone (Geophone) with its high performance sensor is available for pin pointing through hard surfaces.

1.1. System Components

Depending on which AQUASCOPE 550 system was purchased, the following configuration is supplied:

All Configuration Types include

- Amplifier control unit with Neck Strap
- Stereo Headphones
- Connection Cable

Hand probe Locator (see chapter 4)

- Hand probe microphone
- 3 x Probe rods including 1 with a tip
- 1 x Tripod and magnet

Ground Mic Locator (see chapter 5)

- Geophone
- T bar handle and rod

Combined Locator

- All of the above components.

2. How to install the batteries

The amplifier takes 2 x (LR14) C Cell batteries which are located in the battery compartment on the left side. Unscrew the cover by turning in an anti- clockwise direction. Insert the batteries with the positive (+) pointing out as shown below in Fig 1. Screw the cover back on until hand tight.

Fig. 1 Batteries

Fig. 2 Battery Compartment cap

Note: To conserve battery ensure the AQUASCOPE 550 is switched off while not in use or being stored. Always use a good quality alkaline or Lithium battery, for example Duracell or Energizer. If the device is not used for a long time, it is recommended to take out the batteries.

3. Connecting the Headphones

The Headphone is connected to the AQUASCOPE 550 control unit via 2 possible methods, firstly the 5 way Binder connector closest to the top of the unit and/or secondly the 3.5mm stereo jack socket. There is a volume control on the standard headphone cable for adjustment for your comfort of sound level. The aviation headphones don't have this facility.
Take care when storing the headphones and cables as it may be possible to trap them when closing the carry case.

Fig. 3 Binder Headphone connection

Fig. 4 In carry case

4. The Hand probe Microphone

Screw the desired amount of probe rods together as required, generally an extension together with the Tip rod is recommended. Next, attach the rod assembly to the hand probe Microphone. The longer the rod assembly the more background noise is introduced especially on windy days. It is also possible to lag the rod with pipe insulation to reduce wind. Use the Binder plug to connect the hand probe to the lower socket on the AQUASCOPE 550, see fig 7.noise.
The hand probe is used for direct sounding on pipes and fittings. For direct sounding we recommend to use the “filter off” mode described in chapter 10.

Fig.5 Hand probe Component Parts

Fig.6 Hand probe Assembly using 2 x rod sections

Fig.7 Hand probe connected to Aquascope 550 using the lower binder connector

4.1 Techniques using the hand probe Microphone with Rods

The following photos show example methods of using the AQUASCOPE 550 hand probe:

Fig.8 Listening directly on a Water Meter

Fig.9 listening directly on a Valve or Hydrant

Fig.10 listening directly on a pipe with the rod inserted through soft soil

Fig.11 listening to the pipe directly

Caution: when probing through the soil it's highly recommended that a certified insulated probe such as a punch bar is used. This helps prevent the possibility of electrical shock or damaging the aluminium rods while probing through the ground.

4.2 Techniques using the hand probe Microphone with Tripod

The tripod microphone is used to find leaks buried in concrete slab, walls and shallow ground. This microphone has less sensitivity than the ground microphone which makes it easier to pinpoint leaks in these conditions since too much amplification is confusing to the user. Screw the magnet

into the sensor and attach to the tripod foot. The connecting cable can be used to place, lift or move the hand-probe.

Fig.12 Tripod & magnet

Fig.13 magnet

The following photos show example methods of using the AQUASCOPE 550 hand probe with Tripod:

Fig.14 using the tripod attached to the hand probe microphone

Fig.15 listening to a leaking pipe through the wall

Fig. 15 has a Microphone handle with a push button; it's an alternative method of activating the sound instead of the Lower rotary switch on the AQUASCOPE 550 control unit. It's a useful feature when listening with the probe rods on meters, valves and hydrants to allow single hand operation.

4.3 How to find leaks with the AQUASCOPE 550 listening stick

An electronic listening stick is usually used to perform a leakage survey by walking the street listening on every valve, hydrant and accessible service connection. Each sounding is usually for 10 to 30 seconds. It takes longer to assess the noise when there is more background noise. It is not unusual to perform this work at night in busy cities when the pressure is highest and the background noise is lowest. It is important to hold the stick still and firmly pressed against the pipe, valve or hydrant. Ensure there is no long grass or cables making contact with the stick.

The electronic listening stick is usually a localization tool used to localize the leak position; however when the leak is suspected to be in a pipe under soft ground, the electronic listening stick can be used to pinpoint the leak. It is preferable to make the hole with an electrically insulated punch bar or another probe and then insert the stick into the hole made. Extreme Care should be taken to ensure there is no contact with other underground services. Check with your company Health and Safety Officer before proceeding with this method.

1. Listen on all fittings in an area making note of the noise level, frequency and characteristics. It is usual to listen at each location for a period of 10 to 30 seconds, waiting for background noise to stop. If there is noise generated from consumption, pumps, road works or heavy traffic you will need to return when the noise stops.

2. Note the minimum noise detected on each reading on a map.

3. Analyse the minimum noise levels on the map to identify the area of interest.

4. Use a pipe locator to trace and mark the pipe location in the area of interest and check to see if there are any other services in the same trench as your pipe.

5. If it is safe to do so, make a series of holes at 3 meter intervals in the ground with an insulated punch bar and insert the probe from the electronic listening stick into the ground as deep as it is safe.

6. Continue this process along the section of pipe work until the leak is found. Holes will need to be made at 1 meter intervals when the leak has been located to a 6 meter span.

7. Determine which point has the loudest minimum noise.

8. Perform a “star check” moving about 30 cm from this point to all 8 points of a star. Each point should have a lower noise than the pin-pointed leak

position. If a point has a louder noise than the centre, this could be the correct position, repeat the star check to verify.

4.4 How to find Leaks with the AQUASCOPE 550 Tripod foot

The tripod foot is a pinpointing tool that attaches to the electronic listening stick in place of the probe bars. It is used to find leaks in concrete slab, shallow underground pipes and in walls. It should always be placed or held in a still position during operation.

1. Localise the leak position with noise loggers or an electronic listening stick. If a Correlator is available this can be used to narrow down the location to a much smaller area.

2. It is best practice to locate the pipe position with a pipe locator.

3. Follow the path of the pipe listening for the leak at 1 meter intervals. Each sample should last long enough to capture a minimum noise value, typically 20 to 30 seconds.

4. When the location with the highest minimum noise has been identified use your leakage experience to confirm this is a leak noise.

5. Perform a “star check” moving about 30 cm from this point to all 8 points of a star. Each point should have a lower noise than the pin-pointed leak position. If a point is louder this could be the correct position, repeat the star check to verify.

5. The Ground Microphone/Geophone

To assemble the Geophone, take the T-bar handle and screw into the stainless steel plate of the Geophone base in a clockwise direction. There should be no thread visible once complete. When attaching the cable ensure the notch lines up between the 4 way plug on the cable and the socket of the T-Bar.
For the Geophone with the optional cable between the handle and mic all connections must be hand tight without any risk of unwinding during operation.

Fig.16 T-Bar handle for Geophone

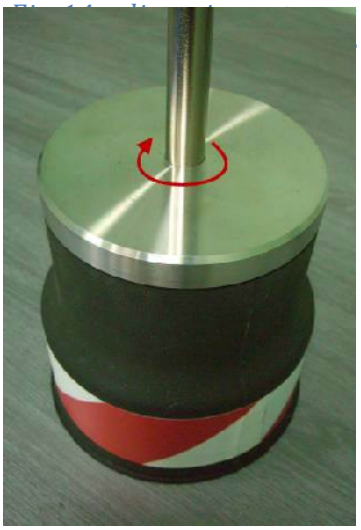

Fig.17 Threading the T-bar handle onto the Geophone base

Fig.18 Screw the 4 way plug of the connection cable into the handle

5.2 Techniques using the Geophone

Use the Geophone to surface sound and pin point on compact earth, concrete and Tarmac. When sounding on grass use the hand-probe or a piece of plywood to act as a sounding board, this will help to reduce the tickling sound caused by the blades of grass.

Fig.19 sounding using a Geophone on concrete

Fig.20 sounding using the Geophone on grass with a wooden board

Fig.21 sounding using the Geophone on paving

Fig.22 sounding using the Geophone on Tarmac

With reference to Fig. 23 below, when using the Geophone to pin point the leak move along the path of the pipe in regular (1ft or 300mm) intervals taking a reading at each point, this is depicted by the diagram below which shows a buried pipe and the Geophone taking readings at regular intervals. Use the memory button (see chapter 10.3) to analyze the results and return to the loudest point to confirm the leak.

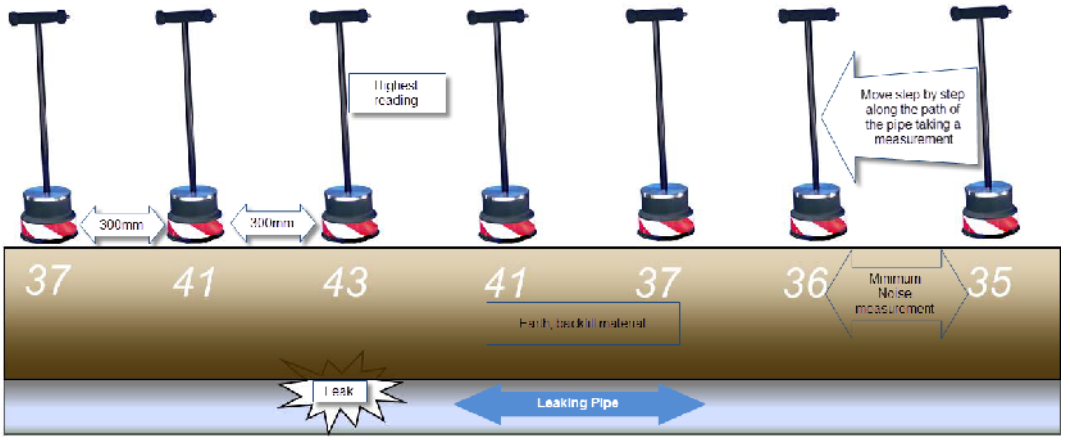

Fig.23 Method of Pin Pointing with a Geophone

Note: In clay soils there maybe 2 high readings with a lower reading in between due to the water leak created a cavity and the water hitting the walls of the cavity.

5.3 How to find leaks with the AQUASCOPE 550 Geophone

The ground microphone is a pinpointing tool that is used to find leaks under sealed surfaces. It has more sensitivity than the tripod foot which is an advantage in finding leaks in deeper pipes but a disadvantage finding leaks in good noise conductors like concrete slab. It should always be placed or held in a still position during operation.

1. Localise the leak position with noise loggers or an electronic listening stick. If a Correlator is available this can be used to narrow down the location to a much smaller area.

2. It is best practice to locate the pipe position with a pipe locator.

3. Follow the path of the pipe listening for the leak at 1 meter intervals. Each sample should last long enough to capture a minimum noise value, typically 20 to 30 seconds.

4. When the location with the highest minimum noise has been identified use your leakage experience to confirm this is a leak noise.

5. Perform a “star check” moving about 30 cm from this point to all 8 points of a star. Each point should have a lower noise than the pin-pointed leak position. If a point is louder this could be the correct position, repeat the star check to verify.

6. Wearing the Control Unit

Fig.24 Neck Band Mounted Control Unit

Attach the AQUASCOPE 550 control unit around the neck using the strap provided. The Neck band can be adjusted to suit.

7. Operation of the AQUASCOPE 550 Control Unit

7.1 The Display

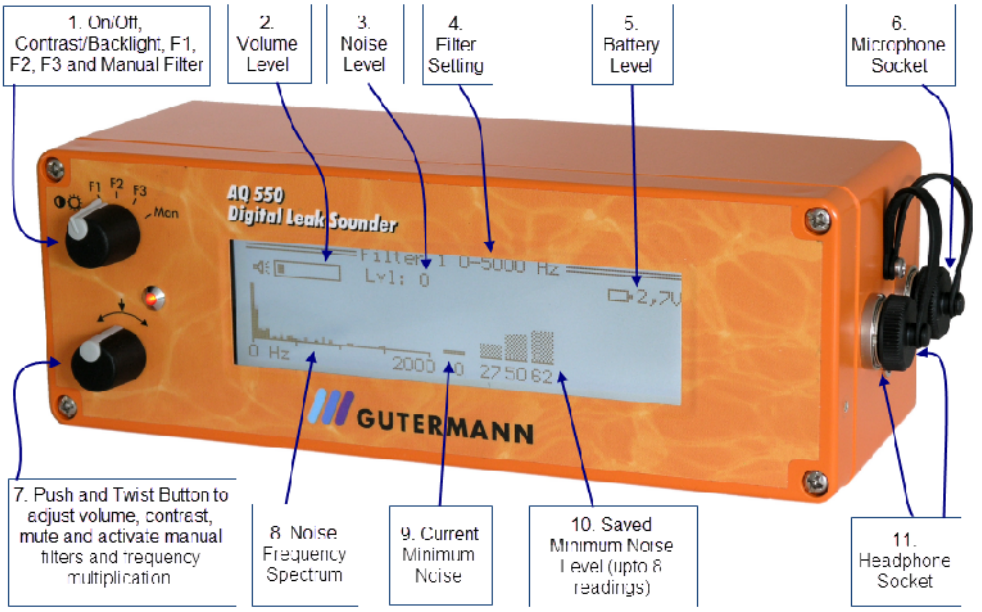

Fig.25 AQUASCOPE 550 Switches, Display and Connectivity

The large display shows the following information:

2. Top left is the Volume Level and is adjusted by turning the bottom rotary switch.

3. Next to the volume level is Lvl: this is the Current Noise Level.

4. The very top is the Filter Setting and changes depending if the top rotary switch is set to F1, F2, F3 or Man.

5. Top right is the battery level. A New pair of batteries should read 3v. Once the battery voltage drops below 1.5v then it's time to replace them.

8. Bottom left of the display is the Live Noise Frequency Spectrum.

9. Bottom centre current Minimum Noise Levels. The minimum noise level (value between 00 and 99) is indicated during a listening session. From the moment the "listen" button is pressed, the AQUASCOPE-550 automatically samples and records the lowest noise level, indicating the true leak noise without ambient interference. When the "listen" button is pressed again, this value will automatically be saved in the memory.

10. Saved Minimum Noise Levels – a maximum of 8 saved readings.

7.2 Switches function

Fig.26 Rotary Switches operation- Contrast

1. Contrast: Turn the Top Rotary Switch clockwise 1 notch to select the contrast function then turn the bottom rotary switch to adjust the contrast- clockwise to darken and anti-clockwise to lighten.

Fig.27 Rotary Switches operation - Backlight

2. Backlight: With the Top switch in the first notch position press the bottom switch to activate the backlight. The screen indicates the Backlight is on; press the bottom switch to deactivate the backlight.

Fig.28 F1 Selector

Fig.29 Filter 1 0-5000Hz

3. Select F1 on the top switch to activate the open Filter 0 to 5000Hz, which allows the full range sound to be heard once the bottom switch is pressed. Turn the bottom switch to adjust the volume to at least half way on the volume level.

Fig.30 F2 Selector

Fig.31 Filter 2 100-5000Hz

4. Select F2 on the top switch to activate the Filter 100 to 5000Hz, which allows the frequency bandwidth from 100Hz to 5000Hz to be set cutting out any low frequency noise. This option is most suited for Metallic pipes. Sound is heard once the bottom switch is pressed.

Fig.32 F3 Selector

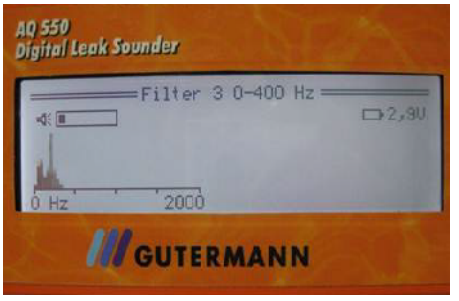

Fig.33 Filter 3 0-400Hz

5. Select F3 to activate the low pass filter of 0Hz to 400Hz. This is recommended for leaks on Non Metallic pipes and when there is back ground noise.

Fig.34 Man Selector

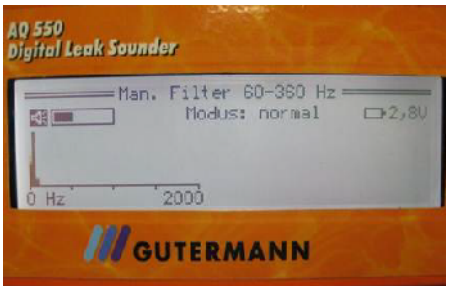

Fig.35 Man Filter e.g.60-360Hz

6. Select Man to use the manual filter options and adjust them by Double Pressing the bottom switch, hold down on the second press then move the cursor by turning the switch. The cursor will move between low filter, high filter, Modus and speaker symbol. To select the option leave the cursor on the item until it flashes, then turn the bottom switch to change the item. Once the selection has been

completed just allow a 2 second pause and the cursor will stop flashing. Repeat the process for changing other options.

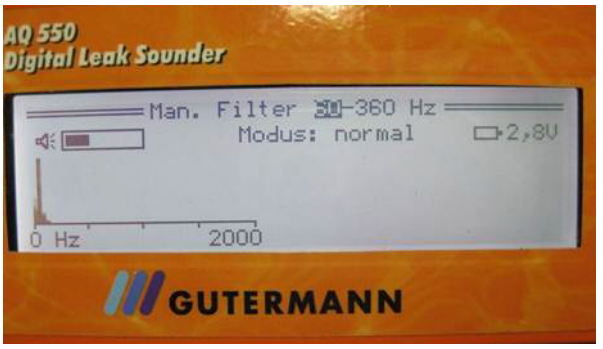

Fig.36 Rotary Switches operation- lower filter frequency

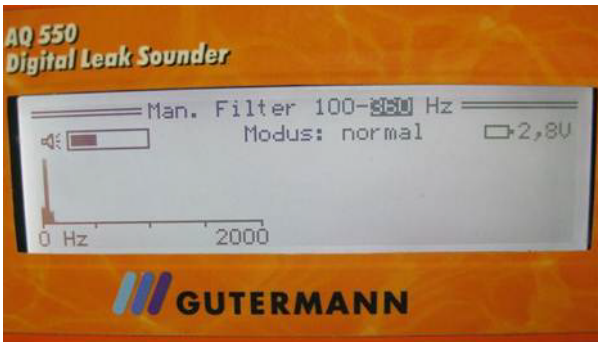

Fig.37 Rotary Switches operation- upper filter frequency

7.3 Storing Minimum Noise Level

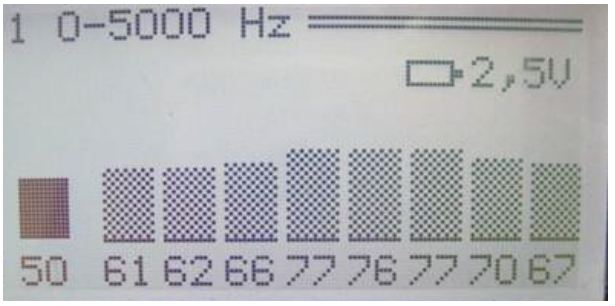

Fig38. Noise Level

The signal bar/level is stored by a single press of the lower switch to freeze the bar followed by a quick second press to store. After the saved bar moves right, press the switch again to reactivate the sound. Up to 8 readings may be saved and displayed on screen. To clear the memory press and hold the bottom switch for 3 seconds.

7.4 How to use the Modus- Frequency Multiplier

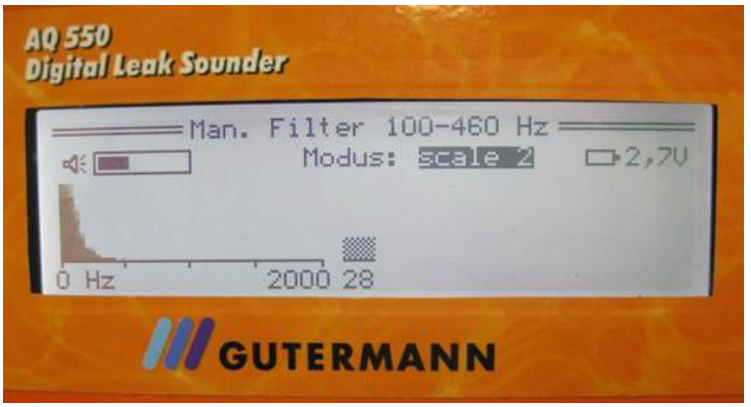

Fig.38 AQUASCOPE 550 Modus

The AS550 has a special feature which transforms lower, deeper frequencies (which are hard for the human ear to hear) into a higher frequency range in which can be heard. This option is called 'Modus' and can be activated when the top switch is set to 'Man'. Press the bottom switch twice, hold down on the second press and then move the cursor by turning the switch. The cursor will move between speaker symbol, low filter, high filter and Modus. To select Modus leave the cursor on the item until it flashes, then turn the bottom switch to change the Modus scale. Once the selection has been completed just allow a 2 second pause and the cursor will stop flashing. Repeat the process if any of the options wish to be changed. The Modus contains 5 options(normal and scale 1 to scale 4). Normal is the same as the F1 to F3 but the user may set the upper and lower filters.

When is Frequency Multiplication used?

It's used with Leaks in Low Pressure, PVC or large diameter pipes which may be too low to be heard by the human ear so it is necessary to increase the frequency to detect these leaks. This is achieved by different Scales produced by the AS550. In the field use scale 1 for pin pointing of low frequency leaks.

8. Technical Specifications

	Specification
1	The control unit is manufactured from ABS/Plastic material that is resistant to exposure from high levels of UV exposure.
2	Power supply comprises of 2 x standard “LR14” or “C Cell” Alkaline batteries.
3	The System has a Frequency range of 6 – 5000Hz
4	The control unit has amplification of 100DB or more.
5	The Sensitivity in the hand probe is 15v/g or more.
6	The Sensitivity in the ground microphone is 20 v/g or more.
7	The AQUASCOPE 550 has a display showing battery status, noise level, volume setting and frequency spectrum.
8	The Manual Filter setting is shown as a numeric value and the operator can manually tune into the exact filter setting required, increments across the entire frequency range are in blocks of 40Hz or less.
9	Activating the filters only takes one simple switch rotation.
10	The control unit has three preset filter settings and a manual option.
11	The ground microphone to cable connector is at a height greater than 400mm from the floor so it cannot be accidentally kicked by the operator.
12	The ground microphone to controller cable runs within the ground microphone handle, to reduce exposure to increased background noise from wind.

9. Trouble Shooting

Fault	Cause	Solution
No Sound	A Damaged Cable or Headphones	Replace connection cable or headphones
No Display	Dead batteries Contrast Setting	Replace batteries Adjust the Contrast
Intermittent display	Battery holder spring	Return to Gutermann
Corrupt Display	Circuit Board	Return to Gutermann
Sound in 1 earpiece	Headphone	Replace Headphone
Cannot plug in hand probe or Geophone	A Damaged connection socket	Return to Gutermann
Display inverted	Accidentally switched for left handed operators	This function has been disabled on new models