



# MONARCH INSTRUMENT

*Instruction Manual*



## Monarch UltraPro AG-500 Ultrasonic Leak Detector

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## SAFEGUARDS AND PRECAUTIONS



Read and follow all instructions in this manual carefully, and retain this manual for future reference.

Do not use this instrument in any manner inconsistent with these operating instructions or under any conditions that exceed the environmental specifications stated.

This instrument is not user serviceable. For technical assistance, contact the sales organization from which you purchased the product.

Monarch Instrument's Limited Warranty applies. See [www.monarchinstrument.com](http://www.monarchinstrument.com) for details.

Warranty Registration and Extended Warranty coverage available online at [www.monarchinstrument.com](http://www.monarchinstrument.com).

## Scanning Techniques

### Using LED Graph on Receiver and/or Headphones For Locating Leaks

Depending on the amount of ultrasonic signature being detected, use either the level of intensity on the LED graph and/or the audible amount of sound through the headphones. As you get closer to the problem decrease the volume. As the sound gets louder, repeat the process until you have pinpointed the location. Please note that the volume control is independent of the bar graph intensity during an inspection. With minute leaks, the LED bar graph may not move up from the first position. In this situation, use the audible signal as discussed above.

### Using Air or Contact Probes

The air and contact probes are used to optimize the response depending on the type of inspection. The air probe is best used for detecting ultrasounds associated with a pressure leak or an electrical corona. The contact probe is best used to detect the ultrasounds generated from within a casing such as in a gear, bearing, pump, solenoid, valve, or steam trap housing.

## TECHNICAL SPECIFICATIONS

<b>Dimensions:</b>	Width: 4.0" [10.2 cm], Depth: 1.5" [3.8 cm], Length: 6.0" [15.2 cm]
<b>Weight:</b>	UltraPro Receiver: 10 oz [283.5 g], Kit: 3 lbs [1.4 kg]
<b>Housing:</b>	Chemical Resistant ABS with Protective rubber boot
<b>Battery Life:</b>	Approx. 20 hours
<b>Power Requirement:</b>	Standard 9-Volt
<b>Power Consumption:</b>	26 mA, typical
<b>Frequency Response:</b>	36,000-44,000 Hz
<b>Circuitry:</b>	Solid State - no calibration required
<b>Headphones:</b>	Industrial Grade
<b>Headphone Connector:</b>	3.5mm phone plug
<b>Operating Temp. Range:</b>	50 to 140 °F [10 to 60 °C]

## OPERATING INSTRUCTIONS

### Safety Precautions

While the UltraPro AG-500 allows you to focus on diagnosing a problem in a fast and effective manner, never lose awareness of your surroundings.

- The UltraPro AG-500 and probes are an extension of your hand. Keep a safe distance from moving parts and electrical areas.
- Never over reach or de-stabilize your footing while using the UltraPro AG-500.
- Always be aware of the headphone cord when near moving parts.
- Never use the air or contact probes as a lever, pry bar, or for other unintended purposes.
- Never use the contact probe for diagnosing electrical problems.

### Basic Operational Procedures

*Note:* Please read all safety precautions above before proceeding.

The UltraPro AG-500 ultrasonic detector is simple to use. No Calibration or training is required. Use the following steps:

1. Plug the headphones into the jack on the front face of the Receiver. **Do not place the headphones on before you turn on the power.**
2. Select the air or contact probe as needed (see Using Air or Contact Probes below).
3. Turn the rotary knob clockwise to “on” and watch for the LED bar to settle to the bottom position.
4. Place the headphones on and adjust the volume until you can just hear the background noise (hiss). Please note that increasing the volume does not increase the unit’s detection sensitivity. Setting the volume control too high can lead to operator fatigue.
5. When using the air probe, point the probe in the direction of your free hand while lightly rubbing your forefinger and thumb together 2+ feet away. The response should be the sound of sandpaper on wood. You can vary the distance and increase/decrease the level of volume accordingly. While performing this test, familiarize yourself with the directional sensitivity of the probe while sweeping the probe past your fingers at various distances.
6. When using the contact probe, adjust the sensitivity while lightly rubbing your finger along the tip of the rod.

### General Principal of Operation

The UltraPro AG-500 operates on the principle of detecting high frequency ultrasonic waves that are created by turbulence or friction from all moving parts, liquids and gases. These “sounds” reside far above the range of the human ear and tend to be highly directional. This directional aspect of ultrasonic waves allows one to isolate a suspect signature sound from other background noises and detect its exact location. Ultrasonic leak detection is very useful in preventive maintenance, trouble-shooting, quality control and diagnostics in the automotive, industrial, manufacturing and process industries.

### General Applications

- |                              |   |
|------------------------------|---|
| 1. Air/Vacuum Leaks          | Both vacuum and compressed air leaks create an energy packet or wave front, which can result in an ultrasonic emission with a differential of 1 psi and/or a hole down to 0.005”.             |
| 2. Gas and liquid turbulence | Turbulence associated with internal/external valve leaks, cavitation, and blockages in liquid and air/gas lines.  |
| 3. Electrical discharge      | Electrical discharge associated with insulation breakdown, tracking, corona, and arcing.  |
| 4. Mechanical wear           | Condition of mechanical wear in bearings, injectors, valves and race assemblies, shafts, and gears. Also accurate indication of proper lubrication in anti-friction bearings.                 |
| 5. Sound generation          | Can be used in conjunction with Tone Generators to detect container cracks and leaks in seals, window/door seals and tanks. <i>(The Tone Generator is matched to UltraPro peak response.)</i> |

### Why Use Ultrasonic Listening Devices?

The human ear only hears about 1/3 of the existing spectrum of sound. Actually most of us are capable of detecting nothing above the 12,000 to 14,000 cycles per second level, depending upon age and other factors. Ultrasound is in the 20,000 to 43,000 cycles per second range. For a leak to happen there must be an opening in the system that carries a gas or fluid. As the hole is rarely uniform, the jagged edges cause the escaping liquid or gas into random circular motions or turbulence. This turbulence is what the UltraPro detects. It is commonly known that faults, malfunctions, and/or flaws in mechanical, electrical, and pneumatic devices, as well as manufactured container type objects, start as small defects or leaks. The physical size of these defects is of such relatively small size the sounds that they produce are above the range of human hearing and are not detectable aurally. *Since these sounds are above the normal level of hearing,* the UltraPro AG-500 is required to transform or convert the ultrasound to an audible level. The UltraPro AG-500 incorporates a process whereby the audible signal bears a close likeness to the natural incoming sample. We call this process “Sound Signature Technology”; the result is a gas leak sounds like a “hiss” and a defective bearing sounds like a “clicking or chatter”.

The UltraPro AG-500 uses a technology called heterodyning to convert the ultrasonic range into the audible range. Since this unit is tuned to listen to the ultrasonic range, it is unaffected by everyday sounds such as wind, voices, and traffic which can further mask the technician’s ability to listen for a potential problem. The UltraPro AG-500 also incorporates **AGC (Automatic Gain Control)**, which allows one to study ultrasonic sounds associated with the roar of a valve leak or literally the blink of an eye. AGC stops the need for high/low sensitivity switches by allowing the internal circuitry to seek the optimum level of gain for the given situation. This allows the UltraPro AG-500 total ease-of-use and immediate application without having to fiddle with knobs or seeking correct settings. The UltraPro AG-500 was designed to be extremely effective yet easy to use, allowing the technician to concentrate on analyzing the problem and not on the operation of the instrument.

## UltraPro AG-500 OVERVIEW

The UltraPro AG-500 is a unique item of diagnostic test equipment that has achieved outstanding results in reducing downtime and maintenance related costs. Through the detection of ultrasonic sound, the UltraPro AG-500 is used to inspect and check such items as ignition systems, vacuum problems, air brake systems, bearings, gear trains, cam and tappet assemblies, internal combustion engine valving and piston blow-by, gaseous piping and ducting, seals in refrigerated van bodies, air ducts, hydraulic systems, Freon leaks, and many other components.

The UltraPro AG-500 KIT consists of an ultrasound receiver, ultrasound tone generator, air probe, contact probe and industrial headphones. The receiver is sensitive only to ultrasonic energy in the frequency range of 36,000 to 44,000 Hz. The energy is amplified by internal circuitry and converted either to audible sounds, available through the headphones and an intensity reading on the Red LED Display. The ultrasonic receiver is used with the tone generator to check for faulty seals in non-pressurized enclosures like automotive cabin windows/doors/roofs, etc. It is fast and easy to use and takes very little training! The Tone Generator “fills the item being tested with noise” for the Receiver to detect at the leak source.

### The UltraPro AG-500 KIT



1. UltraPro AG-500 Receiver
2. Two Anodized Aluminum Probes — 12” air probe and a precision length contact probe
3. Industrial Headphone set with 3.5 mm stereo jack
4. Carrying case with form-fitting foam
5. Tone Generator

### UltraPro AG-500 Receiver

The UltraPro AG-500 Receiver is an easy-to-use unit incorporating audio feedback and a 10 bar LED indicator for visual intensity of signal. The Receiver has a permanently fixed 2” directional receiver port, 3.5 mm stereo jack and a rotary on/off volume control switch. It is powered by (1) 9-Volt battery.

The LED display allows the user to zero in on a steady state source of ultrasonic sound when locating a gaseous or vacuum leak or using the Tone Generator. Simply watch for a rise in the bar levels as you get closer to the location of the leak/noise source.

Simply use the method described in step 5 under the Basic Operational Procedures to test the performance of the Receiver. If no sound is heard, replace the battery.

## Probes

Both the air and contact probes are precision parts, designed to optimize the response of the UltraPro AG-500 Receiver when needed. The 12” air probe serves to extend reach or to facilitate in isolating a leak among multiple suspect areas. The contact probe is supplied with a rubber grommet which should be installed 0.25” from the threaded cap end. Do not modify the probes in any way and never use the probes for anything other than described in this manual.

## Tone Generator

The Tone Generator emits a warble output centered at 40kHz for use in testing seal integrity in non-pressurized vessels. The human ear cannot hear this output, so the Tone Generator must be used with the UltraPro AG-500 Receiver and headphones. The Tone Generator is powered by (1) 9-Volt battery, and can operate up to 40 feet [12 m] to locate leaks. If the red indicator on the Tone Generator is on, the unit is emitting noise. Verify operation with the Receiver.



### Receiver and Tone Generator Guidelines

- The UltraPro AG-500 Receiver and Tone Generator are rugged but still precision instruments. Avoid rough handling.
- The carrying case should be used whenever possible for protection and transportation.
- The port openings of the Receiver and Tone Generator contain the heart of the UltraPro AG-500’s operation, a precision transducer/transmitter. During use, guard against any foreign matter or liquids from entering these areas.
- The Receiver and Tone Generator are not waterproof and should be protected from the elements.
- To prolong battery life, make sure each unit is turned off when not in use.

### Batteries and Replacement

Both the UltraPro AG-500 Receiver and Tone Generator use one 9-volt battery each. Alkaline are required. To replace the battery in the Receiver, the protective rubber boot has to be removed first. When replacing the Tone Generator battery, be careful not to strain or pinch wires. Always remove the battery during a period of long storage.

### Calibration

The UltraPro AG-500 system has been optimally tuned at the factory and should require no recalibration during its life under normal conditions.