

FAQs CTRL UL101 Product Questions

1. What is the CTRL UL101 (UL101)?

The UL101 Receiver is a hand-held, non-destructive diagnostic tool, which detects ultrasound centered in a narrow frequency band around 40,000 Hz. The receiver supplies output to a headset as well as to an analog meter. The output indicates the operating condition of bearings, gears, and other mechanical components. It can also be used to detect gas and liquid leaks, or detect the presence of electrical problems such as corona discharge.

2. What is the power source for the UL101?

A 9-volt alkaline battery is used to power the UL101, and the UT2000 Transmitter as well. A single battery can power the UL101 for up to 36 hours of continuous use. With typical use of the UL101, the life of the battery is approximately 5 months. The meter output becomes a battery power indicator by turning the output switch in the down position where only the headphones are pictured. The battery will need to be replaced if the needle drops below the "5-10" mark on the meter. The old battery can be used in the UT2000 for an additional 30 continuous hours. A single fresh battery can power the UT2000 for up to 300 hours of continuous use.

3. What is the UL101's sensitivity?

The following characteristics of the UL101 have been observable under normal conditions without any attachments:

- a. A leak with a diameter equal to or greater than 0.1 mm (.004 in) in a system under 5 psi of pressure can be detected from distances up to 50 feet.
- b. The UT2000 Transmitter can be heard with the Receiver - without any attachments - up to approximately 160 feet. (Testing was performed at 250 meters above sea level at a temperature of 31° C (88° F), 67% humidity, with 10mph winds.)
- c. The UL101 provides instantaneous information. For example, a new ball bearing that has been installed without lubrication will produce a high intensity ultrasound in the first few seconds of operation that is not detectable with vibration analysis or infrared.

The UL101 was tested by NASA in comparison with other ultrasonic sensors, including one built by NASA, and was able to detect ultrasound from a greater distance with a better signal-to-noise ratio. This is one of the determining factors that led NASA to choose the UL101 for use on the International Space Station after NASA scientists performed numerous tests between the UL101 and several other ultrasonic devices.

4. What is the difference between the Standard and the Intrinsically Safe models of the CTRL UL101?

There is no difference in the performance of the Standard, Intrinsically Safe, or even the Space-Hardened models of the UL101. Different manufacturing processes are used for the various models to ensure safe operating conditions in various environments. For example, the Intrinsically Safe model is manufactured with a protective coating on the PC board that meets

requirements for intrinsically safe certification to ensure the unit does not spark in a highly flammable environment.

5. What does Intrinsically Safe mean?

Intrinsically Safe means that the unit will not produce any spark or hot surface during normal operation or electrical malfunction in an explosive environment.

The Intrinsically Safe CTRL UL101 is manufactured in compliance with the requirements of ANSI/UL 913-88, for DIVISION 1, CLASS I, Groups A, B, C and D, CLASS II, Groups E, F, G and CLASS III. It also complies with DIVISION 2, CLASS I, Groups A, B, C and D, CLASS II, Groups F, G, and CLASS III.

6. Why is the UL101 centered at a frequency of 40 kHz?

There are three ranges of sound with respect to what humans can or cannot hear: infrasonic, audible, and ultrasonic. Sounds below 20 Hz are infrasonic and cannot be heard by the human ear. Sources of infrasound include whale songs and seismic activity. Humans can hear sounds between 20 Hz and 20,000 Hz (20 kHz). Once a mechanical defect can be heard at this audible level, damage to the component and possibly to the surrounding components has already occurred. Any sound with a frequency above 20 kHz is ultrasonic.

It has been well documented for the past 50 years that 40 kHz, which falls within the ultrasonic range, is the optimal frequency for listening for different kinds of industrial defects such as bearing wear and gas leaks. In fact, 98% of all piezoelectric microphones are centered at 40 kHz. All ultrasonic devices used for leak detection on the market today use these microphones.

7. Can you capture or record output from the CTRL UL101?

A distinction needs to be made with respect to recording a signal or output and making a measurement of the sound. A simple tape recorder can record the audible output of the UL101. The signal output can be recorded by CTRL's Data Acquisition software in order to take a visual snapshot of the ultrasonic output of a single component for the trending. The signal is displayed on a screen, allowing the user to look for peaks in amplitude, e.g. indicating a scratch or race on a bearing or crack on a tooth of a gear. Increased intensity may also indicate a need for immediate lubrication.

However, there are many environmental variables that need to be considered for taking ultrasonic measurements, such as temperature, humidity, rpm's of component under test, pressure of contact, etc. There is currently no ultrasonic device on the market that can be used to take repeatable and reliable measurements of a single component because all of these variables change with respect to time and with respect to the operating conditions of the component under test.

8. How durable is the CTRL UL101?

The UL101 is made with a single PC board mounted in an aluminum housing without isolated parts. This prevents the unit from being easily broken when dropped. Of the few units that have come in for repair, one was dropped 3 stories onto concrete pavement and another was run over by a forklift. The UL101 is used in extreme environments on a daily basis. Some have been used on a regular basis for 10-15 years without incident.

9. What do I do if my unit needs repairs?

If your UL101 unit is in need of repair, call the CTRL service department at 1.877.287.5797. The service department will issue an RMA (Returned Merchandise Authorization) number and provide further instructions.

10. Is training available for the CTRL UL101?

The UL101 is very easy to learn and use with only a few minutes instruction. However, CTRL is committed to helping its customer's achieve the best possible and most effective implementation of ultrasonic technology for predictive maintenance, quality control, and safety. Each kit comes with an interactive multi-media training CD-ROM that outlines the fundamentals of ultrasound for predictive maintenance and provides an introduction to some common applications. CTRL also provides a 1½ day training course at our headquarters in Westminster, MD each month for customers who would like an in depth overview and hands-on training of the UL101 and its applications. Further on-site training is available for those that wish to be trained on their own equipment in their own environment.

11. Why is the UL101's meter analog versus digital?

The UL101 uses an analog meter for three main reasons: 1) in general, a digital meter or readout provides no real advantage over an analog meter, 2) an analog reading provides more information and is more accurate than digital, and 3) an analog meter consumes far less power, prolonging the life of the battery.

Digital Readings Provide No Real Advantage Over Analog

Probably one of the biggest misconceptions about ultrasound detection devices is that a digital readout is more beneficial than analog – and that it can be used to measure or trend. All meters, whether analog or digital, gauge only the intensity of the ultrasound signal the unit has received. A digital reading can actually be very misleading. For example, no accurate correlation can be established between size of hole, rate of flow, and a digital reading. A larger hole allows more air to escape, but can produce less ultrasound, which would result in a lower reading. In this case, a digital reading would not provide any useful information regarding the amount of air loss. Consider the following:

In both scan and contact modes of operation there are many variables that affect the meter reading, such as temperature, humidity, rpm's of component under test, pressure of contact, test location, etc. When locating a compressed gas or steam leak with an ultrasonic detector, the level of the reading from where you first detected the leak will change when you move in any direction. The size of the leak doesn't change, but the reading or level does based on where you took the reading.

Analog Meters Provide More Information Than Digital Meters

Digital meters are less accurate than analog meters, as information is lost during the conversion from analog to digital. A digital meter does not display all of the information from the sound it receives. The information that is lost with digital readings can be very important in diagnosing the condition of the component under test. Additionally, the UL101 is so sensitive it picks up ultrasound that might not even register on a meter. It's the ability to hear these low intensity ultrasounds that provide you the greatest opportunity to detect potential problems in time to keep damage/wasted energy at a minimum or from occurring.

Analog Meters Consume Far Less Power Than Digital

Because the meter on the UL101 is analog and consumes less power than a digital meter, the receiver will work for 33-36 hours on a single 9-volt battery without any degradation to the signal. By turning the receiver on and off during routine testing, the battery will operate for as much as 6 months. Other ultrasonic products that use a 9-volt battery to power the receiver and a digital meter will only work for 8 continuous hours total. Signal degradation occurs beforehand. Ultrasonic units that use a rechargeable battery will work for less than 8 hours. Again, signal degradation occurs much earlier than the consumption of the battery. Rechargeable batteries are often nickel-cadmium batteries that retain memory. If they are not completely discharged, the battery life will actually diminish. Furthermore, if a rechargeable battery is left on, the receiver may not be ready for use during a critical time.

Finally, the UL101 is an ultrasonic "detection" device, not an ultrasonic "measuring" device. The tool's value is based on its incredible ability to detect and pinpoint the location of defects due to its unique signal to noise ratio. The explanations above illustrate the principal that the analog meter is practical, economical, and effective.