Ultrahound II Specifications

Frequency Response	40 kHz ± 1 kHz
Gain	100 dB max
Directional Response	< 2°
Monitoring	Headphones & LCD dB
Dish Diameter	250 mm
Power Supply	4 x AA
Weight	1 kg
Weight (incl case)	5 kg

www.mittoninstruments.com

Ultrahound II

Electric Discharge Detector

MITTON
INSTRUMENTS

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Pressing the MODE button places the control unit into manual mode. This allows the user to set the gain. Pressing the RANGE button provides 20 dB increments of additional gain, ranging from 20 dB through to 80 dB (the Ultrahound II has a fixed minimum gain of 40 dB). Readings of less then 10 dB are typically representative of background noise (eg wind, atmospheric). Note that audible detection is generally the most sensitive method for detecting discharge. The dB level is a relative indicator only.

Battery

Four AA alkaline batteries are used. The display includes a Lo Bat indication. The batteries will last approx 30 hours of continuous use. Unless manually switched off, the Ultrahound II will auto-switch off after 5 mintes.

Headphones

Standard low impedance padded headphones are used. This is an advantage in excluding external audible noise especially where the discharge noise level is suspected to be low strength.

Proving Device

A separate battery powered 100 Hz discharge simulator for proving the Ultrahound II operation is included. The output of the simulator is less then 1 µW but is quite detectable by the Ultrahound II.

To test the Ultrahound II, place the simulator on a raised (eg 1 m) position in an open area. Switch on and from a distance of approx 20 m, sight the dish on the small hole near the flashing LED on the simulator. When detecting using the wand, approach to approx 1 m from the simulator.

A typical electrical discharge signal will be heard through the headphones. The simulator can be used to experiment and become familiar with the sensitivity and directionality of the Ultrahound II using both the dish and the wand.

Warning

The Ultrahound II is designed for use around and near high voltage equipment, and minimum safe electrical clearances must be maintained.

Other Uses

The Ultrahound II can also be used to detect small high pressure air or gas leaks since such leaks often emit noise in the ultrasonic range.

Wooden Poles

Damaged or dirty insulators on wood pole lines can result in pole fires and outages as well as RFI. If a wood pole line is susceptible or has a history of faults then the Ultrahound II may be used as part of a routine patrol to provide an early warning of damaged or dirty insulators. In some cases fog or humid conditions may enhance any discharge noise. Patrolling early morning can be useful.

Cable Terminations

Cable terminations are a common point of failure. The Ultrahound II (using the dish) can be used to check cable terminations on poles. The wand accessory can be used for closer inspection or for ground mounted HV cable terminations (eg on switchgear). **DO NOT encroach minimum approach distances.**

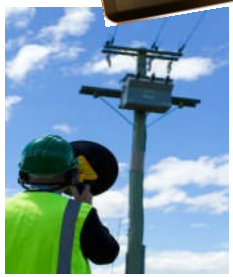
Routine Diagnostic Tool

The Ultrahound II may also be used as a routine diagnostic tool. A routine sweep of an HV installation (eg substation) or patrol of a distribution or transmission line hardware may identify noise. While not necessarily causing RFI, any detected discharge may indicate faulty, polluted or damaged insulator hardware or fittings or cable terminations.

Using the Ultrahound II

Operating the Ultrahound II is straightforward. Connect the headphones and parabolic dish (or wand). Switch the control unit on using the ON/OFF push button. Adjust the volume control to suit the background noise conditions. The Ultrahound II gain defaults to auto-ranging (this is suitable for most situations).

Aim the dish in the direction of the suspected discharge source. There is a visual sight near the centre of the back of the dish. Use this in conjunction with the sight on the sensor mount to identify the discharge under investigation.



As the dish (or wand) is swept across the suspected noise source, a crackling or buzzing sound will be heard in the headphones. The signal may often sound like a 100 (120) Hz buzz since in a 50 (60) Hz system the gap or air breakdown is usually occurring twice per cycle. The audio signal will peak when the dish or wand is pointing directly at the electrical discharge.

Contents

Introduction

The Ultrahound II can be used to pinpoint a source of RFI, arcing or partial discharge on a power system. The Ultrahound II is designed to detect the presence of ultrasonic noise, which is just one part of the noise spectrum emitted by electrical discharges. The advantages of ultrasonic detection are that audible background noise can be excluded and accurate pinpointing of the discharge source is possible.

The Ultrahound II consists of a parabolic reflector which is a high gain, highly directional antenna that focuses the signal on to an ultrasonic sensor. A short directional sensor (wand) is also used for discharge detection at close proximity.

High gain, low noise electronics then decodes the ultrasonic signal and converts it to the audible spectrum.

The Ultrahound II is suitable for detecting electrical discharge from power lines and substation equipment.

Electrical discharging (sparking) and corona (air discharge) can cause interference with radio and television receivers. Electrical discharge can also indicate a faulty item of equipment, such as a damaged insulator, loose tie wire or faulty cable termination. Corona discharge may be caused by incorrect equipment assembly or sharp metallic hardware items.

The Ultrahound II can typically be used at distances of up to 40 m from the noise source. It is primarily designed to work within a range of 10 m – 30 m using the dish and within 2 m using the wand.

Power System RFI

An electrical discharge produces a broad spectrum of light, sound and radio frequency energy. The RF energy can cause interference with radio and television reception and transmission. RFI is particularly troublesome in fringe areas of radio and TV reception.

On a TV, the interference appears as static lines across the screen while AM radio reception can be drowned out by frying, buzzing noises.

Gap Discharge RFI

Damaged insulators and loose hardware are the most common cause of gap discharge. Gap discharge is the breakdown of an air gap either via tracking across a surface, jumping across a small air gap or a combination of both.

Gap discharge is most likely to be present under dry or drying conditions. Wet hardware is less likely to discharge since the moisture bridges the gap. Gap discharge may be intermittent, such a when fog or high humidity is present.

Corona Generated RFI

Corona discharge is usually only experienced on systems above 66 kV. The high voltage causes ionisation of the air close to the conductor or hardware.

The proper design of hardware usually minimises corona. Sharp items of hardware are the most common causes of corona, such as a damaged conductor surface.

Corona is less noticeable under dry conditions. However, when the humidity increases (fog, rain), corona is more likely to exist.

Partial Discharge

Partial discharge is a localized breakdown within an insulating materials such as cable insulation, gas or oil. In contrast to corona or gap discharge, partial discharge noise is of much less intensity. Nevertheless, it can be a sign of impending failure.

Limitations

The Ultrahound II is not designed to accurately measure levels of discharge since this depends on how close the sensor is to the source. However, a relative signal strength can be measured where noise from similar items can be compared. The Ultrahound II includes a decibel level meter for this purpose. Any detection of discharge should be followed with closer visual and physical inspection.

Gap Discharge and Corona Detection

If an electrical discharge is suspected to be causing RFI (AM radio, TV interference) then once the general area of the RFI source is identified, the Ultrahound II can then be used to pinpoint the cause. In some cases, where formal complaints have been made, the Radio Inspectors may provide information as to the general area of the RFI noise source.

The area where the RFI may be coming from can be roughly located by tuning a vehicle radio to an AM frequency (not a strong radio station). Driving around the area may indicate the most likely region of RFI noise.

If power lines are in the area then the source is likely to a associated with the line hardware. In some cases the RFI source may be some distane from where the interference is being experienced. This happens because the power line can act as an antenna. The RFI source may be several hundreds of metres or even several kilometres away.

Once the suspected hardware is identified, the Ultrahound II can be used to pinpoint the faulty component.

Note that RFI can is only apparent if there is radio or TV equipment in the vicinity and the noise to signal ratio is excessive. RF emission from power lines can still exist but not result in interference.