

MITTON
Instruments



**RFI/TVI
Arc/Corona
Detector**



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Power System Radio/Television Frequency Interference (RFI/TVI)

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/TVI 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.



Ultrasound

The Ultrasound can be used to pinpoint a source of RFI/TVI caused by arcing on the power system. The Ultrasound is designed to detect the presence of ultrasonic noise, which is just one part of the noise spectrum emitted by electrical discharges. The Ultrasound consists of a parabolic reflector which is a high gain, highly directional antenna that focuses the signal on to an ultrasonic sensor. The advantages of ultrasonic detection are that audible background noise can be excluded and accurate pinpointing of the discharge source is possible.

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



The Ultrasound 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 or loose tie wire. Corona discharge may be caused by incorrect equipment assembly or sharp metallic hardware items.

The Ultrasound can be used at distances of up to 50 m from the noise source. It is primarily designed to work within a range of 20 – 30 m but will work equally well at shorter distances.

Gap Discharge RFI

Damaged or polluted insulators, loose hardware and cable termina-

tions 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 as 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. At lower voltages cable terminations may also exhibit corona discharge.

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

RFI Detection

If an electrical discharge is suspected to be causing RFI/TVI (AM radio, TV interference) then once the general area of the RFI source is identified, the Ultrahound 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/TVI 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 be associated with the line hardware. In some cases the RFI source may be some distance from where the interference is being experienced. This happens because the power line can act as an antenna. The RFI/TVI source may be several hundreds of meters or even several kilometres away.

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

Note that RFI/TVI can only occur if there is radio or TV equipment in

the vicinity. RF emissions from power lines can still exist but not result in interference.

Diagnostic Tool

The Ultrahound may also be used as a diagnostic tool. A general sweep of an HV installation or line hardware may identify noise. While not necessarily causing RFI/TVI it may indicate faulty, polluted or damaged insulator hardware or fittings or faulty corona prevention components on primary equipment.

Wooden Poles

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

Other Uses

The Ultrahound can also be used to detect pressurized air or gas leaks since these emit noise in the ultrasonic spectrum. For example, a pinhole leak in a bicycle tube can easily be located.

Using the Ultrahound

Operating the Ultrahound is straightforward. Remove the Ultrahound from its case and unfold the legs. Switch the Ultrahound on using the pushbutton (hold down). Adjust the volume control to suit the background noise conditions.

Point the instrument in the direction of the suspected discharge source. There is a visual sight near the centre of the back of the instrument. Use this in conjunction with the sight on the end to identify the object under investigation.

As the Ultrahound is swept across the suspected noise source, a crackling or buzzing sound will be heard from the speaker. The signal may often sound like a 100 Hz buzz since in a 50 Hz system the gap or air breakdown is occurring twice per cycle.

The audio signal will peak when the Ultrahound is pointing directly at the electrical discharge.

Battery Indicator and Charging

Rechargeable sealed lead acid batteries are used. The battery state is shown on the LED battery display by pressing the "Batt Test" button.

The battery will last approx 40 hours of continuous use but may lose capacity if stored for some time without use. Charge the battery for at least 8 hours, using the adaptor provided.

Headphones

Standard low impedance earphones or a padded headset may also be used. This is an advantage in noisy environments or where the noise level is suspected to be low strength.

Proving Device

A separate battery powered 100 Hz spark generator for proving correct Ultrahound operation is available. To test the Ultrahound, place the spark generator on a raised (eg 1 m) platform or post in an open area. Switch on, and from a distance of approx 30 m, sight the Ultrahound on the spark. A typical electrical discharge signal will be heard through the speaker. The spark generator can be used to experiment and become familiar with the sensitivity and directionality of the Ultrahound.

Frequency Response	37 kHz – 43 kHz
Noise Rejection	> 50 dB below 20 kHz
Directional Response	< 2 degrees
Output	Speaker or earphones
Diameter	300 mm
Weight	1 kg
Power Supply	12V rechargeable sealed lead acid battery

Specifications

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