



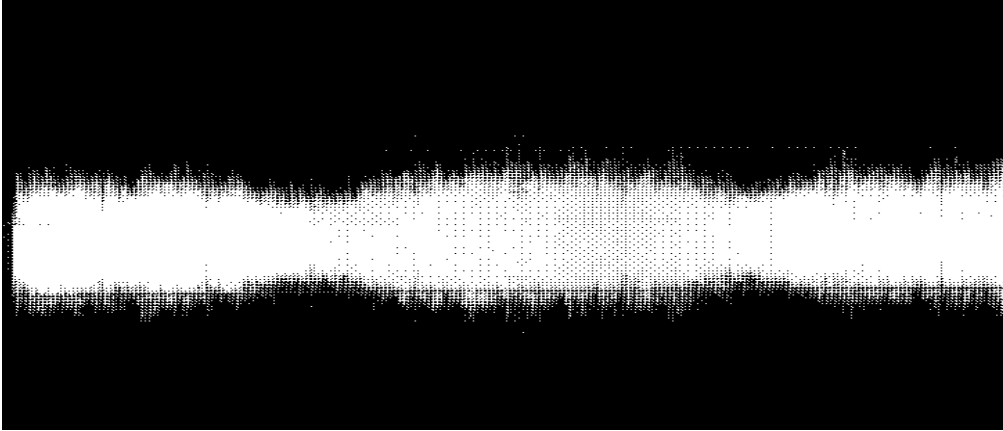
Partial Discharge Detection in Transformers

Detecting partial discharge in the insulation and windings of power and instrument transformers is a well-documented use of acoustic emission monitoring. Discharges are due to electric arcing, which vaporizes the dielectric fluid in the discharge path, creating a bubble cavitation effect. These sudden bursts of acoustic energy are transmitted by the fluid to the external wall, where an acoustic emission sensor can sensitively pick them up. The AED-2000 is the ideal instrument for this application, combining thresholded event and counts measurement, along with modulated audio output. The ideal frequency range has been determined from previous studies to be 100-200 kHz. A Model i150 sensor (150 kHz) is shown being held to the transformer wall by AEC's Model MAG-1 magnet.

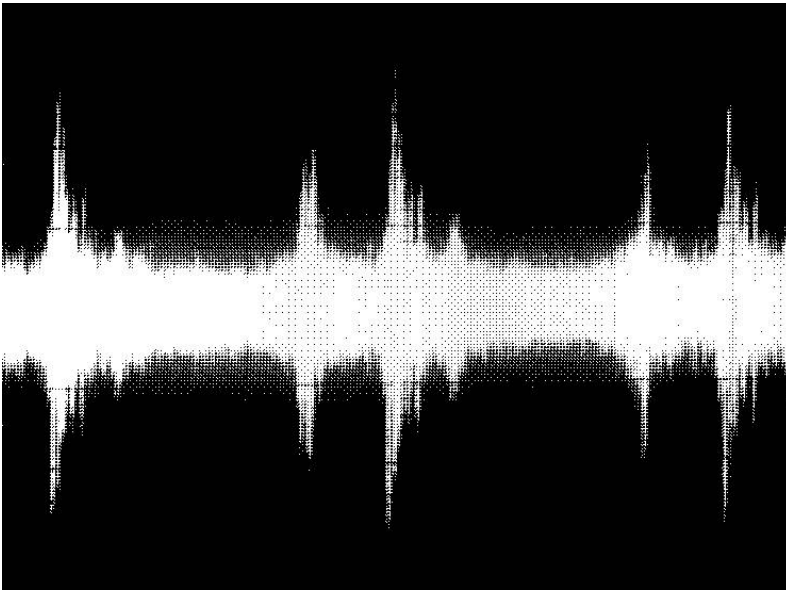
Since the induced acoustic signal will transmit a number of feet in the wall before becoming completely attenuated, the location of the source must be determined by probing at several locations in a search pattern until the strongest signal is obtained (highest count rate). A regular maintenance program might include recording the readings at standardized locations on the exterior shell of the transformer. The AED-2000 can store these readings for later upload to a computer database. Sometimes the discharges are evident only under

distinctive or high load conditions. The AED-2000 can be used to continuously log readings to computer via the serial interface port.

Discharges typically take place in a regular pattern associated with the 60-cycle AC waveform as shown in the oscilloscope image below.



Core noise associated with the transformer power cycle—no discharges.



Partial discharge burst-like emissions evident on power cycle at regular intervals. The AE threshold is set above the core noise level, so only the burst type emission activity is counted (events and counts). In the RMS mode, the peak-to-average RMS ratio should also show an increase when such activity is detected.



The AED-2000 and the 40 kHz airborne probe can be used to monitor electrical discharges associated with insulators and high tension lines. The sound of electrical discharge from an insulator can be heard by double clicking on the icon below.

