EARTH FAULT RESISTANCE MONITOR

- Continuous online monitoring of faults while rotating or at standstill
- Fault resistance trending
- Continuously monitors field excitation voltage
- Alarm relay contact outputs
- Fault location indicator for ease of diagnosis and repair

TYPICAL APPLICATIONS

- Rotor protection through condition based maintenance
- Predictive maintenance for large generators and motors

CONTINUOUS ON-LINE MONITORING

The Earth Fault Resistance Monitor (EFREM) provides continuous wireless monitoring of insulation fault resistance and field voltage on brushless exciter generator/motor field windings, combining advanced ground fault measurement techniques with the latest innovations in digital telemetry.

The detection of field ground faults on generators or synchronous motors with brushless exciters has always been difficult. Conventional field ground detectors may detect the occurrence of faults but provide no advance warning or indication of the fault’s severity. The severity at the detection threshold may vary by several orders of magnitude, depending on fault location.

By combining a new generation of 16-bit digital rotor telemetry technology for the measurement of generator ground faults, Accumetrics overcomes these limitations with EFREM. Measurement of actual resistance allows users to monitor trends over time and track the progression of ground faults from their onset. This provides an early warning of impending failure and allows for predictive maintenance of a machine. The severity of ground faults can be used in making operational and maintenance decisions.
Accumetrics, Inc. provides digital telemetry systems used in a variety of applications such as aerospace, marine, defense, agriculture, transportation, milling operations, energy, and power generation. Systems transmit sensor data from rotating structures using wireless techniques, preserving the integrity of the data even in environments with high levels of electromagnetic interference. Measurement solutions range from single channel products, such as strain gage torque measurements, to advanced custom multichannel systems. Accumetrics, Inc. is a subsidiary of PCB Piezotronics, Inc., and PCB® is a wholly owned subsidiary of MTS Systems Corporation.

### SPECIFICATIONS

**Field Voltage**
- **Measurement Range:** 0 to 500 VDC (Contact factory for other ranges)
- **Measurement Transient without Damage:** 1000 volts for 5 seconds

**Resistance Measurement**
- **Measurement Range:** 0 to 80 M ohms
- **Accuracy (readings through digital interface):** Sum of ±250 ohms and ±0.5% of reading over the range of 0 to 500k ohms (exclusive of the effects of AC content and noise from the excitation system)

**Earth Fault Location Factor**
- **Range:** 0 to 100% representing ratio of potential at fault to total field voltage (0 at negative terminal and 100% at positive terminal)
- **Accuracy (readings through digital interface):** ±1% for a 10k ohms fault. Computation of location factor of field voltage accuracy is specified for ±252 V

**Receiver**
- **Alarm Outputs**
  - **Earth Fault:** Two independent alarm resistances, user selectable via computer interface from 500 Ohms to 1M ohms
  - **Malfunction:** Active upon detection of a malfunction in Monitor operation or loss of receiver power
- **Alarm Interfaces:** Form C relay; 6 A / 250 VAC

**Analog Outputs**
- **Analog Outputs Option:** Dual analog outputs Field V and Log Resistance (4-20 mA)
  - **Note:** this adds ±0.25% full scale current loop inaccuracy

**Digital Interface**
- **Computer Interfaces:** RS232, Ethernet
- **Output Data:** Earth Fault Resistance, Field Voltage, Location Factor when faults occur, Alarm and error conditions
- **User Settings:** Alarm Resistance Thresholds, Dwell Times, Network Settings
- **Software:** EFREM view data display and .CSV format, PC data archiving
- **Power:** 85 to 250 VAC 50 / 60 Hz, <20 W

**Physical**
- **Transmitter Weight:** 2.2 lb (1 kg) for shaft end mounting
- **Rotor Connections:**
  - Field Positive Terminal
  - Field Negative Terminal
  - Rotor Earth/Ground

**SPECIFICATIONS (continued)**

| Environment | Ambient Temperature | 32–185 °F (0–85 °C) at Rotor Module
|             | 32–122 °F (0–50 °C) at Receiver Unit |
| Rotor Speed | 0 to 3600 RPM for center-line and mid-shaft mounting (<16” Outer Diameter) |
|            | Call factory for larger shaft diameters or specialized mounting |

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Mid-shaft EFREM

End of Shaft EFREM

EFREM Receiver

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