Inspections, Compliance, Enforcement, and Criminal Investigations

Ground Fault Circuit Interrupter

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DEPT. OF HEALTH, EDUCATION, AND WELFARE PUBLIC HEALTH SERVICE FOOD AND DRUG ADMINISTRATION *ORA/ORO/DEIO/IB*

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Related Program Areas:
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ITG SUBJECT: GROUND FAULT CIRCUIT INTERRUPTER

A Ground Fault Circuit Interrupter (GFCI) is an automatic electrical circuit breaking safety device for protection against line-to ground faults. A GFCI offers protection to users of electrical equipment against possible fatal electrica shock from faulty equipment or accidental grounding.

FDA employees are required, from time to time, to use a variety of electrical equipment (drills, saws, temperature monitoring equipment, etc.) in questionable areas such as wet floors or other potentially hazardous electrical grounding areas. In the field, the available electrical power sources may or may not be wired with a properly grounded electrical system or other safeguards against electrical shock hazards. The use of a GFCI by the Investigator in the field can provide him additional protection against unforeseen line-to-ground shock hazard while using electrical equipment.

A number of different portable GFCI's are commercially available which can be used between the power source (115-125 V, single phase) and any portable power tool or tools. Figure 1[4] is an example of a portable GFCI unit. GFCI units differ in current trip levels (e.g., 0.2, 0.75, 5, 10 or 20 milliamperes) and trip time (e.g., 15 to 30 milliseconds). The lower current trip levels (0.2, 0.75 and 5 milli- amperes) are recommended for small portable tools. The sensation of electrical shock is not eliminated with GFCI trip levels over 0.75 milliamperes, but all GFCI's will break the electrical circuit quickly enough to prevent electrical injury. All GFCI units should have test and reset switches or buttons and should be tested before each use. When working in extreme temperature environments, it is a good practice to perform the circuit test after the GFCI reaches ambient temperature. The GFCI is not a fuse box or circuit breaker and does not react to overloads, only to ground faults. The GFCI will offer protection for all electrical equipment with two or three prong plugs. GFCI units are also available for 220 volt systems, although it is not known if these are portable.

Figure 1[5]

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(image size 10KB)[11]

Figure 2[8]

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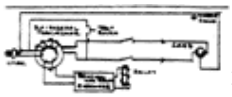

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The basic circuitry of a GFCI is designed to detect any unbalanced current occuring between the hot and neutral load wires. In other words, normally, the amount of incoming current should equal the amount of outgoing current. A shown in figure 2[13], the circuitry incorporates a differential (Ring) transformer which monitors the incoming and outgoing current, and if an unbalanced current exists, such as current passing through a person's body to ground, then a voltage is induced between the differential (Ring) transformer and sensing circuit. The sensing circuit instantl

energizes a relay opening the circuit breaker which disconnects electrical power to the load line and to the power tool. The testing circuit is a bypass around the transformer producing an uneven current about the transformer simulating a current leakage and activating the GFCI.

The use of a GFCI does not preclude the user from having to exercise extreme care and common sense in the use of all electrical equipment. Three wire to two wire adapters should be properly grounded, and extension cords should be in good repair with hot and neutral wires connected to proper connector terminals. All power tools and wiring should be in good repair. If at all possible, electrical equipment should be operated on dry and non-conductive surfaces. The GFCI operating instructions provided with the unit should be read and understood.

Examples of GFCI Manufacturers and/or Distributors

1. Pass & Seymour, Inc., Syracuse, New York 13209
2. Daniel Woodhead Co., 3411 Woodhead Dr., Northbrook, Illinois 60062
3. Square D Co., Milwaukee, Wisc. 53201
4. Sears and Roebuck Co., Chicago, Illinois
5. Bell Electric, 2600 W. 50th, Chicago, Illinois

Purchasers should consult with their local electrical supplies dealer for other manufacturers and distributors.

Reference

1. NFPA Handbook of the National Electrical Code Copyright 1972, McGraw-Hill, Inc., New York, N. Y.

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