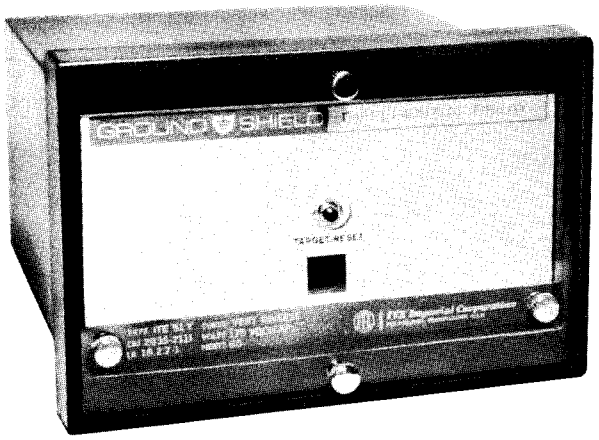
IB-18.1.7-4
ISSUE B

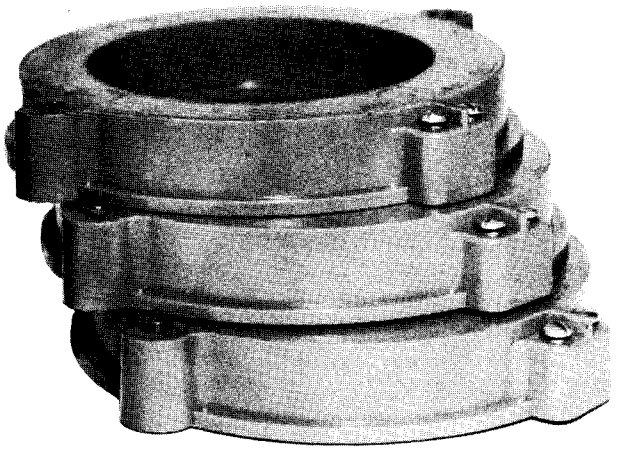
GROUND PROTECTION SYSTEMS

INSTRUCTIONS

GROUND-SHIELD™
3-PHASE DIFFERENTIAL SYSTEM

TYPE GRD (2 AMPERES) DRAWOUT MOUNTED
For Phase and Ground Fault Protection of
MOTORS—GENERATORS—REACTORS—3-PHASE LOADS





I·T·E Imperial Corporation

INSTRUCTIONS FOR GROUND-SHIELD 3-PHASE DIFFERENTIAL SYSTEM TYPE GRD RELAY (2 AMPERES)—TYPE GS SENSORS

APPLICATION

The GROUND-SHIELD differential system provides fast, sensitive protection against phase-to-phase or phase-to-ground faults occurring in 3-phase motors, generators, reactors, etc. This system consists of three solid core current sensors and one 3-phase, solid state ground differential relay, which operates the shunt trip device on the circuit breaker. The ground differential relay and the associated current sensors are connected in a self-balancing scheme. The GROUND-SHIELD differential system has a sensitivity of 2 amperes primary fault current, operates in 2 cycles, and is significantly more economical than comparable conventional differential relays operated from current transformers.

RECEIVING, HANDLING, STORAGE

Upon receipt of the GROUND-SHIELD system (when not included as part of a switchboard) examine for shipping damage. If damage or loss is evident, file a claim at once and promptly notify the nearest I-T-E Imperial Corporation Sales Office. Use normal care in handling to avoid mechanical damage. The GROUND-SHIELD system has no moving parts and if kept reasonably clean and dry, has no practical limit to its operating life.

MAINTENANCE AND RENEWAL PARTS

No maintenance is required on the GROUND-SHIELD system. Should the relay be damaged physically or electrically due to improper connections or application, it is recommended that a new relay be ordered from the factory. When ordering the relay, state the type relay, catalog number, control voltage and serial number of the relay.

For moderate damage, relays should be returned to Relay & Control Section, where repairs will be made for a nominal charge.

SIZE AND RATING

Application to circuits is independent of circuit current rating. Sensors are selected by physical opening necessary to accommodate conductors.

INPUT AND OUTPUT CIRCUIT DUTY RATINGS

For input and output circuit duty ratings, refer to tables shown at bottom of page 3.

INSTALLATION

MOUNTING

The sensors should be mounted with care to avoid undue stress on the mounting bushings. Cable conductors should be centered in the sensor window.

For motors with high inrush (in excess of 3000 amperes), it is suggested that the two cables be taped together, and roughly centered in the sensor window to eliminate possibility of error due to leakage flux (spacers which are provided can be used for centering).

Ground sensors should be short circuited during maintenance periods. This will prevent the presence of moderate sensor output voltages if a ground should occur during the maintenance period. The sensor mounting dimensions are shown in Figure 1.

The relay should be mounted in a location where the drawout board and the reset pushbutton are accessible and can be reached at any time without danger to the operator. Relay mounting dimensions are shown in Figure 2.

CONNECTIONS

For wiring diagrams see Figures 3-4. Wires from the sensors to the relay should be at least #14 gauge wire and can be used for distances up to 2000 feet in circuit length. Larger wire should be used for greater distances.

CAUTION: A circuit breaker auxiliary switch, 52a, should always be used in series with the shunt trip coils to prevent thermal damage to the tripping circuit.

The GRD ground relay cannot be used directly with a capacitor trip device.

TESTING

HIGH POTENTIAL TESTS

Do not apply high voltage tests to solid state relay circuits. If a control wiring insulation test is required, bond all terminals together before applying test voltage from bonded bundle to ground.

PUSH-TO-TEST FEATURE

A push-to-test button is provided as a standard feature of the semiflush drawout relay.

This test feature enables one to check the operation of an installed system by applying an input signal to the relay which then operates in a normal manner to trip its associated interrupting device.

The pushbutton is recessed to prevent accidental operation.

OPERATION INDICATOR

An operation indicator is provided as a standard feature of the semi-flush drawout relay.

COVER PHOTO 52638A

The operation indicator shows international orange when the relay operates due to a ground fault. The indicator retains correct status memory independent of control power.

Reset is accomplished by pressing the reset push-button.

CAUTION: Do not poke the orange target with pointed object; it can be easily damaged.

OPERATIONAL TESTS

It is not necessary to schedule periodic maintenance and testing of this ground protection system. However, if tests are desired to confirm the proper functioning of the system, one of the following procedures can be used.

A. Mounted in Switchgear

Tests should be made on a de-energized main circuit. If tests are to be made on an energized circuit, be sure to take all necessary precautions.

1. Insert a test wire through the window of any one of the three sensors.

2. Apply control power to the circuit breaker trip circuit.

3. Apply 2 amperes through test wire, the relay will trip the breaker. Immediately return the test current to zero after breaker operation. Push reset pushbutton.

4. If breaker does not trip, interrupt the input circuit immediately, then check continuity of trip circuit including trip coil. This can be done by shorting out relay terminals 7 and 12.

5. Repeat steps 3-4 above with the other 2 sensors, one at a time.

CAUTION: Relay output SCR will be damaged unless an "a" auxiliary switch opens trip circuit after trip operation.

B. Bench Tests—(Without Circuit Breaker)

1. Connect relay and any one of the three sensors as shown on page 6 (top).

2. Increase the primary current so that approximately 2 amperes flow through the sensor window. Auxiliary relay will pick-up when GRD relay operates. Immediately return the test current to zero after relay operates.

3. To repeat test, push reset pushbutton to drop out auxiliary relay. Also push GRD relay reset pushbutton.

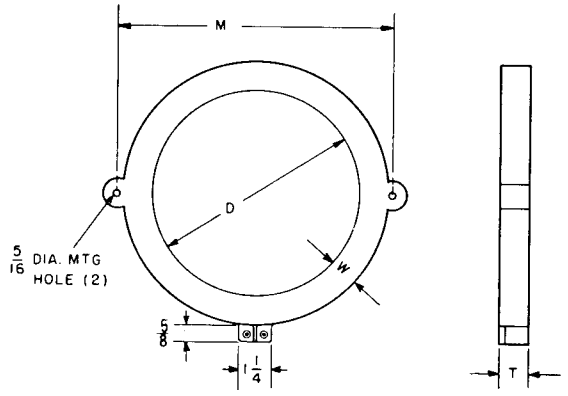
4. Repeat steps 2-3 above applying test current to terminals 1-2 and terminals 5-6, one pair at a time (in place of terminals 3-4).

INPUT CIRCUIT DUTY RATINGS

	Amperes of Ground Fault Current
Momentary (2 Cycles)	80,000
Short Time (½ Second)	60,000
Continuous (Alarm Duty)	300

OUTPUT CIRCUIT DUTY RATINGS

Nominal Voltage	Range	Max. Current, Amps RMS or AVG.		
		2 Cycles	1 Second	Continuous
125 Vdc	70-140	30	7.5	1
48 Vdc	28-60	30	7.5	1
120 Vac	50-130	30	7.5	—



Catalog Number	D	M	W	T
302B0200	2-1/8	5-1/16	1-1/8	1-7/8
302B0300	3-1/8	6	1-1/8	1-7/8
302A0500	5	7-1/2	1	1-1/4
302A0800	8	10-3/4	1-1/8	1-1/4

NOTE: Round cable spacers are provided with the 2 larger sensors to maintain clearances from sensor. Spacers add to outside dimension 1 inch (for D=5) or 2 to 3 inches (for D=8).

Fig. 1 — Toroidal Ground Sensors — Outline

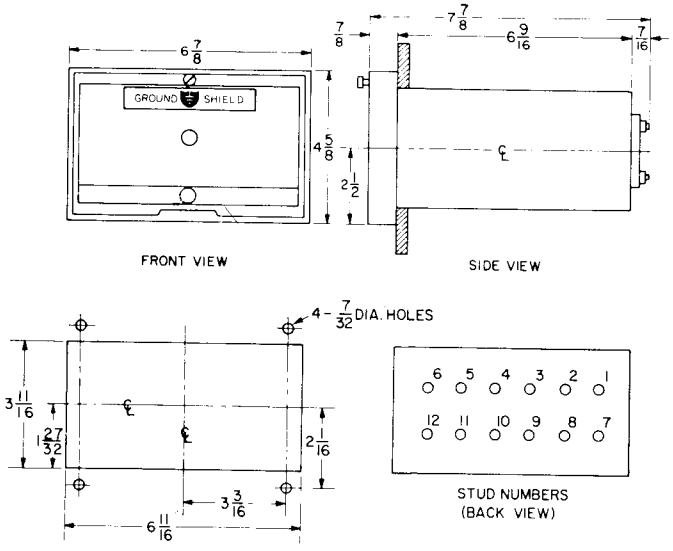


Fig. 2 — Semi-Flush Mounted Relay Outline and Drilling

NOTE: All dimensions are in inches.

LARGE MOTOR PROTECTION—WIRING DIAGRAMS

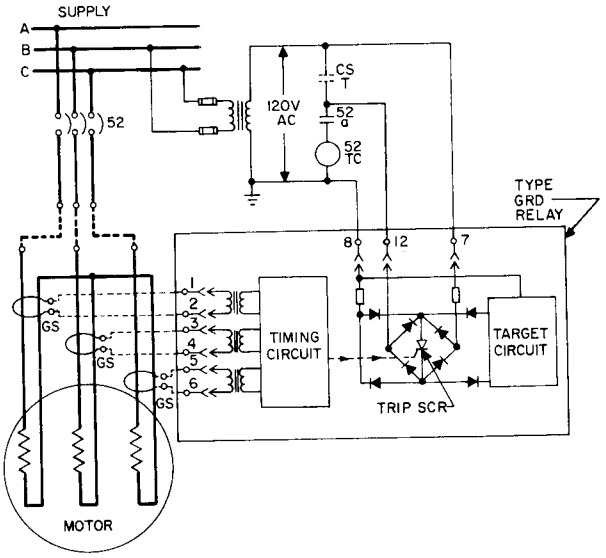


Fig. 3 — 120 Vac Control Power

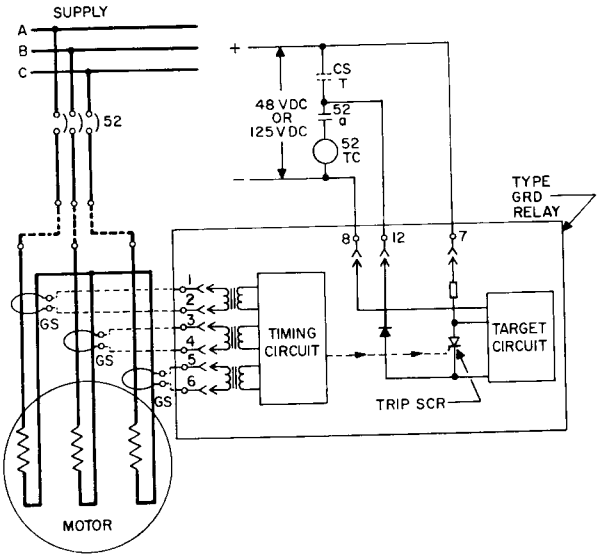


Fig. 4 — 48 or 125 Vdc Control Power

OPERATION TEST CONNECTIONS

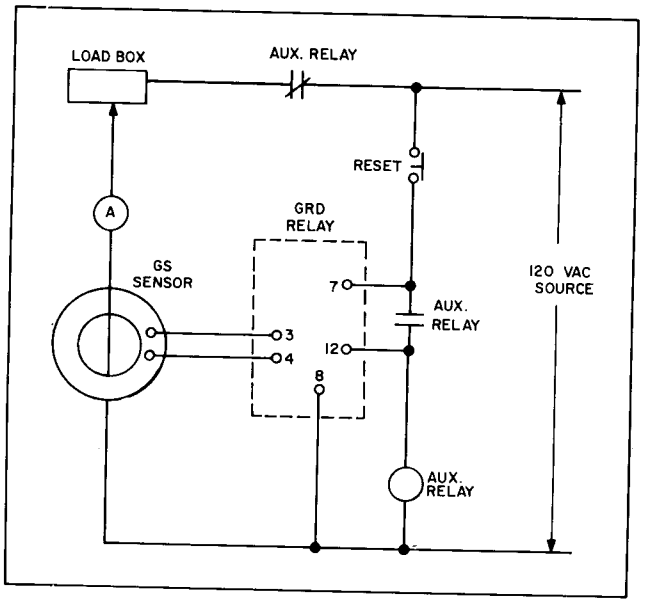


Fig. 5 — 120 Vac Semi-Flush Mounted Relay

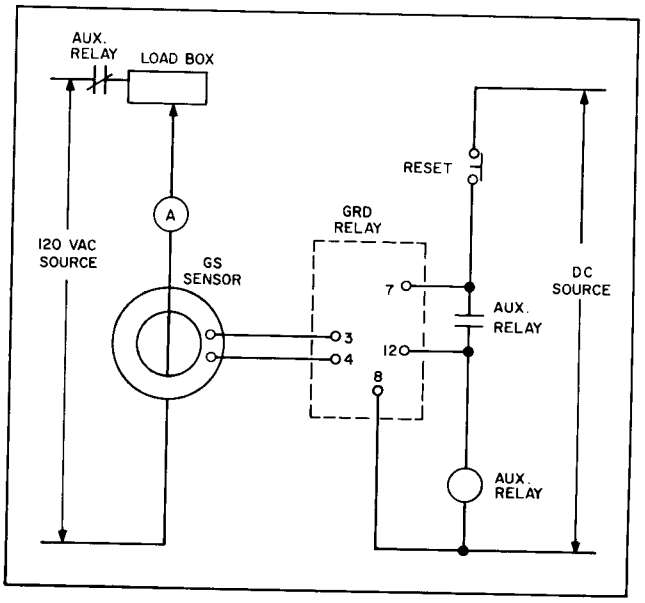


Fig. 6 — 48 and 125 Vdc Semi-Flush Mounted Relay

NOTES

ITE Imperial Corporation

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