MACHINE FIELD GROUND DETECTOR RELAY

TYPES
PJG11E
PJG11F

GENERAL ELECTRIC
PHILADELPHIA, PA.
MACHINE FIELD GROUND DETECTOR RELAY
TYPES PJG11E AND PJG11F

INTRODUCTION

APPLICATION

Short circuits in normally ungrounded equipment can often be prevented by discovering and removing a ground as quickly as possible before a second ground can cause a fault and possible serious damage. The PJG11 relay is designed primarily for the detection of grounds in normally ungrounded machine field circuits, and can be used to sound an alarm. The Type PJG11F relay may be used either for alarm or for tripping duty. To ensure that this protection will function for a ground in the alternator field winding, it is necessary that the rotor iron be grounded without depending on the path through the bearings, as the oil film may withstand the voltage applied by the relay, and thus prevent the relay from operating when required. Any grounding means must not be installed where it will bypass the bearing insulation which is provided for prevention of shaft currents.

The Type PJG relays incorporate an internal filter to reduce the ripple voltage output to approximately one-half volt or less.

RATINGS

The Types PJG11E and PJG11F relays are rated for either 120 or 240 volts, 50/60 or 25 cycles. Although the voltage rating is determined only by the connection of the transformer primary, the relays should be ordered for the particular rating desired. If it later becomes necessary to use the relay on the other rating the change may be easily effected as described in the section titled CONNECTIONS.

These relays may be used with machine fields rated 375 volts or less and with celling excitation up to 600 volts but should not be used with machine fields which can rise above 500 volts buck or reverse direction. The alarm contact 64F2 will make and carry five amperes continuously. The interrupting rating of these contacts for non-inductive circuits are as follows:

<table>
<thead>
<tr>
<th>VOLTS</th>
<th>24</th>
<th>48</th>
<th>125</th>
<th>250</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMPS</td>
<td>5</td>
<td>2.0</td>
<td>1</td>
<td>.3</td>
</tr>
</tbody>
</table>

BURDENS

The maximum burdens of these relays at their rated voltage and frequency are, 30 volt-amps for 60 cycle relays and 36 volt-amps for 50 cycle relays both at unity power factor.

The burdens under the condition of no fault, i.e. transformer, rectifier and lamp load, are 8 volt-amps for 60 cycle relays and 9.6 volt-amps for 50 cycle.

RECEIVING, HANDLING AND STORAGE

Reasonable care should be exercised in unpacking the relay in order that none of the parts are injured or the adjustments disturbed.

If the relays are not to be installed immediately, they should be stored in their original cartons in a place that is free from moisture, dust and metallic chips. Foreign matter collected on the outside of the case may find its way inside when the cover is removed and cause trouble in the operation of the relay.

DESCRIPTION

The relay consists of two voltage units (designated as 64F1 and 64F2), a transformer, a full wave rectifier, test resistor, indicating lamp and filter capacitor.

The voltage units are of the plunger type, with moving contacts fastened directly to the armature assembly. The armatures are adjustable on the plunger rods, their position determining the operating value of the device. The units have been adjusted at the factory to secure the operation and sensitivity described below and it should not be necessary to change these settings under normal operating conditions. The 64F1 unit is a self-reset...
NOTE-
TRANSFORMER PRIMARY SHOWN CONNECTED FOR 240V.
FOR 120V, CONNECTION CONNECT AS SHOWN.

Fig. 1 (0148A4029) Internal Connections for Type PJGIIIF and PJGIIIF Relays
device equipped with a hand-reset indicating target. The 64F2 unit is similar to the 64F1 unit except that it has an additional hinged armature assembly. The plunger assembly of the unit serves as the electrical reset function. The PJG11F relay incorporates the hand reset feature. Operation occurs when the hinged armature, disengages the latch and allows the plunger assembly to drop, operating the contacts. The unit is reset by the action of the plunger assembly which resets the moving contact assembly to the latched-up position or by the manual operation of the reset lever. It should be noted that the normal condition of the 64F2 contacts, as shown in the internal connection diagrams, refer to the unit in the reset or latched-up position.

CASE

The case is suitable for either surface or semi-flush panel mounting and an assortment of hardware is provided for either mounting. The cover attaches to the case and also carries the reset mechanism when one is required. Each cover screw has provision for a sealing wire.

The case has connections at the bottom only for the external connections. The electrical connections between the relay units and the case studs are made through spring backed contact fingers mounted in stationary molded inner and outer blocks between which nests a removable connecting plug which completes the circuits. The outer block, attached to the case, has the studs for the external connections, and the inner block has the terminals for the internal connections.

The relay mechanism is mounted in a steel framework called the cradle and is a complete unit with all leads being terminated at the inner block. This cradle is held firmly in the case with a latch at the top and the bottom and by a guide pin at the back of the case. The cases and cradles are so constructed that the relay cannot be inserted in the case upside down. The connecting plug, besides making the electrical connections between the respective blocks of the cradle and case, also locks the latch in place. The cover, which is fastened to the case by thumbscrews, holds the connecting plug in place.

To draw out the relay unit the cover is first removed, and the plug drawn out. Shorting bars are provided in the case to short the current transformer circuits. The latches are then released, and the relay unit can be easily drawn out. To replace the relay unit, the reverse order is followed.

A separate testing plug can be inserted in place of the connecting plug to test the relay in place on the panel either from its own source of current and voltage, or from other sources. Or, the relay unit can be drawn out and replaced by another which has been tested in the laboratory.

INSTALLATION

LOCATION

The location should be clean and dry, free from dust and excessive vibration and well lighted to facilitate inspection and testing.

MOUNTING

The relay should be mounted on a vertical surface. The outline and panel drilling diagram is shown in Fig. 5.

CONNECTIONS

The internal connection diagram for the relays is shown in Fig. 1.

Typical external connection diagrams are given in Figs. 2 and 3.

Note that the difference between the 120V and 240V models lies in the method of connecting the primary windings of the transformer, parallel for 120V and series for 240V. The primary winding leads are of such length that if it is desired, the relay rating may be changed from 120V to 240V or vice-versa by changing the primary connections as indicated. Only the 120V and 240V ratings may be interchanged as described.

GROUND CONNECTIONS

One of the mounting studs or screws should be permanently grounded by a conductor not less than No. 12 B & S gage copper wire or its equivalent.

PRINCIPLES OF OPERATION

The operation of the Type PJG11 relay as a ground detector may be understood by referring to the internal and external connection diagrams. In the normal (reset) condition the relay ground indicating unit 64F1 is in the down position while unit 64F2 is in the latched-up position. The contacts of the latter unit in the 64F1 coil circuit are closed and the remaining contacts open. The coil of 64F1 is connected to the negative lead of the protected machine field through a normally closed contact of the test-reset switch, and to the positive terminal of the full-wave rectifier through the normally closed
Fig. 2 External Connections for Type PJG11E Relay (0148A4061-1)

Fig. 3 External Connections for Type PJG11F Relay (0148A4060-1)

Fig. 4 Text Circuit for PJG11F Relay Using Test Plug (418A781)
contacts of 64F2. The negative terminal of the rectifier is connected solidly to ground. The rectifier is energized continuously from an a-c source through a small power transformer contained in the relay case. The indicating lamp indicates potential across the d-c terminals of the rectifier and that the 64F2 unit is in the latched-up position. The occurrence of a ground in any part of the machine field circuit completes the coil circuit of 64F1 causing it to operate, energizing the "operate" coil of 64F2. This trips the latch on 64F2 allowing the moving contact assembly fall to the unlatched position closing the alarm circuit contacts and also de-energizing the coil of 64F1 which drops out. If the ground occurs in the negative lead of the machine field the voltage appearing across the coil of 64F1 will be the d-c voltage (75 volts) output of the full-wave rectifier. If the ground occurs within the machine field winding or in the positive lead of the field the voltage drop across the 64F1 coil will be the d-c output of the rectifier plus the voltage drop in the field winding between the negative field lead and the ground. This explains the necessity for de-energizing the 64F1 coil immediately upon the occurrence of a ground; it would not be practical to obtain the desired sensitivity of the ground indicating unit 64F1 with a coil capable of withstanding continuously the rectifier output voltage plus the full machine field voltage.

After the ground has been located and removed the relay may be put back in service by means of its own hand-reset button or electrically by closing the circuit of the 64F2 reset coil brought out to studs 7 and 8 by a test-reset switch. This is accomplished by operating the switch to the "reset" position which energizes the reset coil of 64F2 causing the moving contact assembly of the unit to return to the latched-up position. It should be noted that the test-reset switch referred to here and shown in the external connection diagram is not included with the relay but must be ordered separately.

**MAINTENANCE**

**ADJUSTMENTS AND INSPECTION**

The relay has been adjusted at the factory to secure the performance described under OPERATION. The ground detector unit 64F1 has been adjusted to respond to grounds in the negative field lead of up to 500 ohms at 80 percent of rated a-c relay voltage. For grounds in the positive lead the sensitivity in ohms is as follows: 125 volts, 3200 ohms; 250 volts, 5000 ohms; 375 volts, 7800 ohms. Under normal operating conditions it should not be necessary to change these adjustments.

A mechanical inspection of the relay should be made at least once every six months. If contacts require cleaning it should be done as described below and an operation test should be made at more frequent intervals. Turn the TEST-RESET switch, if included, to the TEST position. This causes the coil of 64F1 to be connected in series with a 500 ohm test resistor across the d-c terminals of the rectifier simulating a ground fault. Unit 64F1 should operate energizing 64F2 operating coil causing the latter unit to drop from the latched position sounding the alarm. The relay may be reset by turning the switch to the RESET position. The test switch is not used with the Type PJG11F relay. Testing circuit for this relay using a test plug is shown in Fig. 4.

**CONTACT CLEANING**

For cleaning fine silver contacts, a flexible burnishing tools should be used. This consists of a flexible strip of metal with an etched roughened surface, resembling in effect a superfine file. The polishing action is so delicate that no scratches are left, yet corroded material will be removed rapidly and thoroughly. The flexibility of the tool insures the cleaning of the actual points of contact.

Fine silver contacts should not be cleaned with knives, files, or abrasive paper or cloth. Knives or files may leave scratches which increase arcing and deterioration of the contacts. Abrasive paper or cloth may leave minute particles of insulating abrasive material in the contacts and thus prevent closing.

The burnishing tool described is included in the standard relay tool kit obtainable from the factory.

**RENEWAL PARTS**

It is recommended that sufficient quantities of renewal parts be carried in stock to enable the prompt replacement of any that are worn, broken, or damaged.

When ordering renewal parts, address the nearest Sales Office of the General Electric Company, specify quantity required, name of part wanted, and give complete nameplate data. If possible give the General Electric Company requisition number on which the relay was furnished.
Fig. 5 Outline and Panel Drilling for Type PJG Relay  (K-6209273)

GENERAL ELECTRIC COMPANY, PHILADELPHIA, PA.