Westinghouse

Type PG Auxiliary Relay
(Formerly Type X4 Relay)

INSTRUCTIONS

CAUTION

Before putting protective relays into service, remove all blocking which may have been inserted ror the purpose of securing the parts during shipment, make sure that all moving parts operate freely, inspect the contacts to see that they are clean and close properly and operate the relay to check the settings and electrical connections.

APPLICATION

The Type PG relay is a polarized relay for use in d-c circuits where a low pick-up low impedance relay is required. One particular application is its use in the carrier start circuit of the carrier relaying scheme to prevent operation of the X-3 auxiliary trip blocking relay unless carrier is started by the protective relay. The X-3 element is mounted in the type RSN relay for this application. The PG relay thus prevents any other function which starts carrier from energizing the X-3 relay, such as telemetering and communication.

CONSTRUCTION AND OPERATION

The type PG relay consists of a polarized unit having three independent contact circuits (2 make and 1 break). The moving contacts and armature are mounted on a leaf spring supported symmetrically within a magnet frame. The armature rides in the front air gap of the frame with the contacts projecting outside.

The poles of a permanent magnet clamp directly to each side of the frame. Two adjustable shunts are located across the rear air gaps. These change the reluctance of the magnetic path so as to force some of the flux thru the moving armature which is fastened to the frame midway between the two rear air gaps. Flux in the armature polarizes it and creates a magnetic bias, causing it to move towards either the left or the right, depending upon the adjustment.

The element is adjusted so that with the coil de-energized, the armature is attracted to the right hand or the south pole of the permanent magnet. With positive as shown in the schematic wiring diagrams the armature is drawn to the north pole, closing the make contacts.

Normally, only one set of make contacts is used and these are connected in series with the coil of the X-3 relay, as shown on the various carrier current relaying schematic application diagrams. The coil of the relay is connected in series with the carrier start circuits of the protective relays, and is energized only when one or more of the carrier starting elements operate.

CHARACTERISTICS

The standard relay has a minimum pick-up of 0.2 ampere d-c and its coil resistance is 0.2 ohm. The coil will stand 4 amperes d-c continuously or 110 amperes d-c for 1 second. The relay operates in approximately 1/4 cycle above two times pick-up.

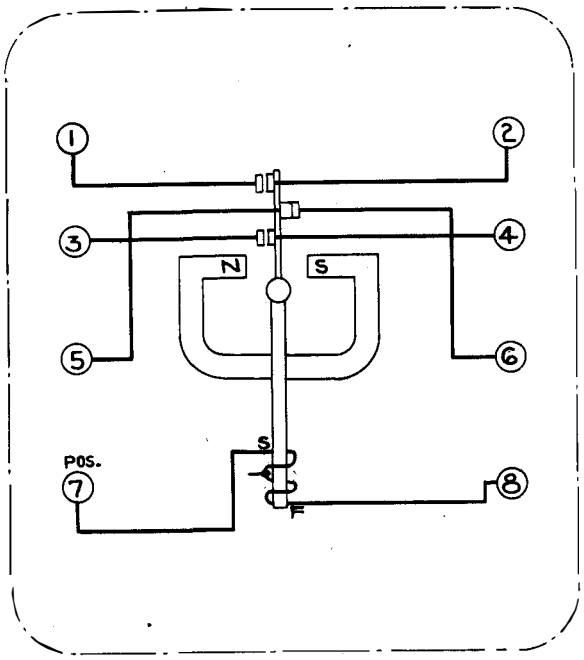
The contacts will close 1.0 ampere at 125 Volts d-c, 250 Volts d-c, or 115 Volts a-c. The contacts will interrupt .5, .25, 1.0 amperes non-inductive at 125 Volts d-c, 250 Volts d-c, or 115 Volts a-c respectively.

RELAYS IN TYPE FT CASE

The type FT cases are dust-proof enclosures combining relay elements and knife-blade test switches in the same case. This combination provides a compact flexible assembly easy to maintain, inspect, test and adjust. There are three main units of the type FT case: the case, cover and chassis. The case is an all welded steel housing containing the hinge half of the knife-blade test switches and the terminals for external connections. The cover is a drawn steel frame with a clear window which fits over the front of the case with the switches closed. The chassis is a frame that supports the relay elements and the contact jaw half of the test switches. This slides in and out of the case. The electrical connections between the base and chassis are completed through the closed knife-blades.

Removing Chassis:-To remove the chassis, first remove the cover by unscrewing the captive nuts at the four corners. There are two cover nuts on the S size case and four on the L and M size cases. This exposes the relay elements and all the test switches for inspection and testing. The next step is to open the test switches. Always open the elongated red handle switches first before any of the black handle switches or the cam action latches. This opens the trip circuit to prevent accidental trip out. Then open all the remaining switches. The order of opening the remaining switches is not important. In opening the test switches they should be moved all the way back against the stops. With all the switches fully opened, grasp the two cam action latch arms and pull outward. This releases the chassis from the case. Using the latch arms as handles, pull the chassis out of the case. The chassis can be set on a test bench in a normal upright position as well as on its top, back or sides for easy inspection, maintenance and test.

After removing the chassis a duplicate chassis may be inserted in the case or the blade portion of the switches can be closed and the cover put in place without the chassis. The



FRONT VIEW

Figure 1
Internal Schematic of the Type PG or X-4 Relay in the Standard Case.

chassis operated shorting switch located behind the short circuiting test switch prevents open circuiting that circuit when the short circuiting type test switches are closed.

When the chassis is to be put back in the case, the above procedure is to be followed in the reversed order. The elongated red handle switch should not be closed until after the chassis has been latched in place and all of the black handle switches closed.

Electrical Circuits:-Each terminal in the base connects thru a test switch to the relay elements in the chassis as shown on the internal schematic diagrams. The relay terminal is identified by numbers marked on both the inside and outside of the base. The test switch positions are identified by letters marked on the top and bottom surface of the moulded blocks. These letters can be seen when the chassis is removed from the case.

The potential and control circuits thru the relay are disconnected from the external circuit by opening the associated test switches. Opening the short circuiting test switch short-circuits that circuit and disconnects one side of the relay element but leaves the other side of the element connected to the external circuit thru the current test jack jaws. This circuit can be isolated by inserting the current test plug (without external connections), by inserting the ten circuit test plug, or by inserting a piece of insulating material approximately 1/32" thick into the current test jack jaws. Both switches of the short circuiting test switch pair must be open when using the current test plug or insulating material in this manner to short-circuit the external circuit.

A cover operated switch can be supplied with its contacts wired in series with the trip circuit. This switch opens the trip circuit when the cover is removed. This switch can be added to the existing type FT cases at any time.

Testing:-The relays can be tested in service, in the case, but with the external circuits isolated or out of the case as follows:

Testing In Service:-The ammeter test plug can be inserted in the current test jaws after opening the knife-blade switch to check the current thru the relay. This plug consists of two conducting strips separated by an insulating strip. The ammeter is connected to these strips by terminal screws and the leads are carried out thru holes in the back of the insulated handle.

Voltages between the potential circuits can be measured conveniently by clamping #2 clip leads on the projecting clip lead lug on the contact jaw.

Testing In Case:-With all blades in the full open position, the ten circuit test plug can be inserted in the contact jaws. This connects the relay elements to a set of binding posts and completely isolates the relay circuits from the external connections by means of an insulating barrier on the plug. The external test circuits are connected to these binding posts. The plug is inserted in the bottom test jaws with the binding posts up and in the top test switch jaws with the binding posts down.

The external test circuits may be made to the relay elements by #2 test clip leads instead of the test plug. When connecting an external test circuit to the short circuiting elements using clip leads, care should be taken to see that the current test jack jaws are open so that the relay is completely isolated from the external circuits. Suggested means for isolating this curcuit are outlined above, under "Electrical Circuits."

Testing Out of Case:-With the chassis removed from the base, relay elements may be tested by using the ten circuit test plug or by #2 test clip leads as described above. The factory calibration is made with the chassis in the case and removing the chassis from the case will change the calibration values by less than 1 or 2%. It is recommended that the relay be checked in position as a final check of the calibration.

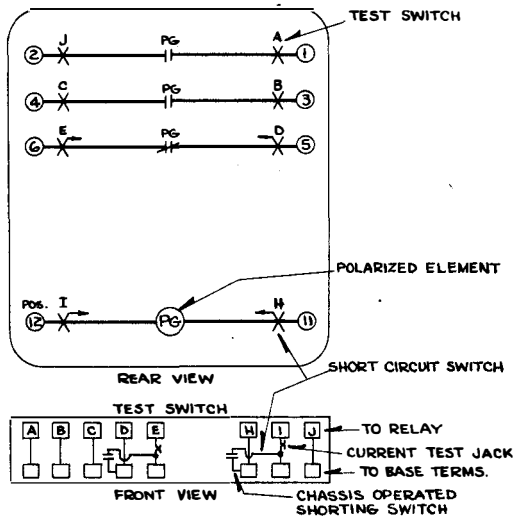
INSTALLATION

The relays should be mounted on switchboard panels or their equivalent in a location free from dirt, moisture, excessive vibration and heat. Mount the relay vertically by means of the two mounting studs for the standard cases and the type FT projection case or by means of the four mounting holes on the flange for the semi-flush type FT case. Either of the studs or the mounting screws may be utilized for grounding the relay. The electrical connections may be made direct to the terminals by means of screws for steel panel mounting or to terminal studs furnished with the relay for ebony asbestos or slate panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the studs and then turning the proper nut with a wrench.

ADJUSTMENTS AND MAINTENANCE

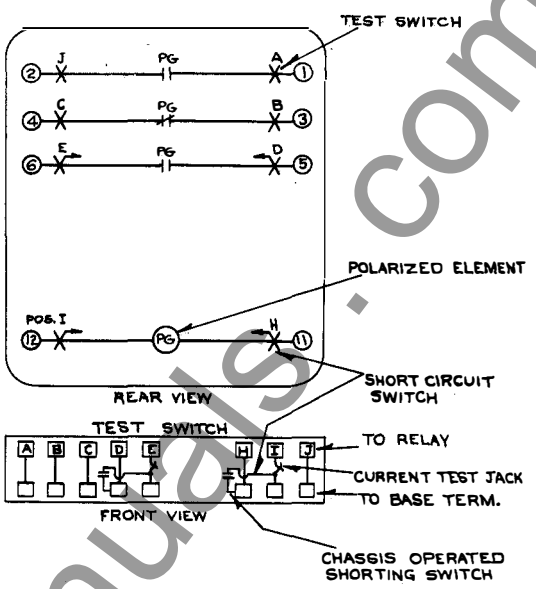
All contacts should be periodically cleaned with a fine file. S#1102110 file is recommended for this purpose. The use of abrasive material for cleaning contacts is not recommended because of the danger of embedding small particles in the face of the soft silver and thus impairing the contact.

The proper adjustments to insure correct operation of this relay have been made at the factory and should not be disturbed after



WITH POSITIVE ON TERMINAL 12, THE MAKE CONTACTS CLOSE TO THE LEFT (FRONT VIEW).

Figure 2
Internal Schematic of the Type PG Relay in the Type FT Case with a Shorting Switch on the Break Contact.



WITH POSITIVE ON TERMINAL 12, THE MAKE CONTACTS CLOSE TO THE LEFT. (FRONT VIEW)

Figure 3
Internal Schematic of the Type PG Relay in the Type FT Case with a Shorting Switch on the Make Contact.

receipt by the customer. If the adjustments have been changed, the relay taken apart for repairs, or if it is desired to check the adjustments at regular maintenance periods, the instructions below should be followed.

Back off the contact screws so that they do not make contact. Screw the magnetic shunts on both sides of the element to the all-out position. The armature should remain against whichever side it is pushed with this adjustment.

Contact Adjustment:-Pass 2 amperes d-c thru the full coil with positive on terminal 7 or 12. The armature should move to the left. Adjust the two left-hand contacts until they each just barely make a light circuit. A flickering light is permissible. After both contacts are thus adjusted, give both the left-hand contacts an additional 1/3 of a turn to secure the required 8 mil follow. Reverse the polarity of the current and adjust the single right-hand in a like manner.

Calibration:-Screw in the left-hand shunt until the top air gap is shunted. This increases the armature bias towards the right-hand contact. Apply 0.2 ampere d-c. to the coil with positive on terminal 7 or 12 and screw in the right-hand shunt until the armature resets; this should happen at not less than 0.175 ampere. Lock the shunts in place and recheck the calibration several times.

RENEWAL PARTS

Repair work can be done most satisfactorily at the factory. However, interchangeable parts can be furnished to the customers who are equipped for doing repair work. When ordering parts, always give the complete nameplate data.

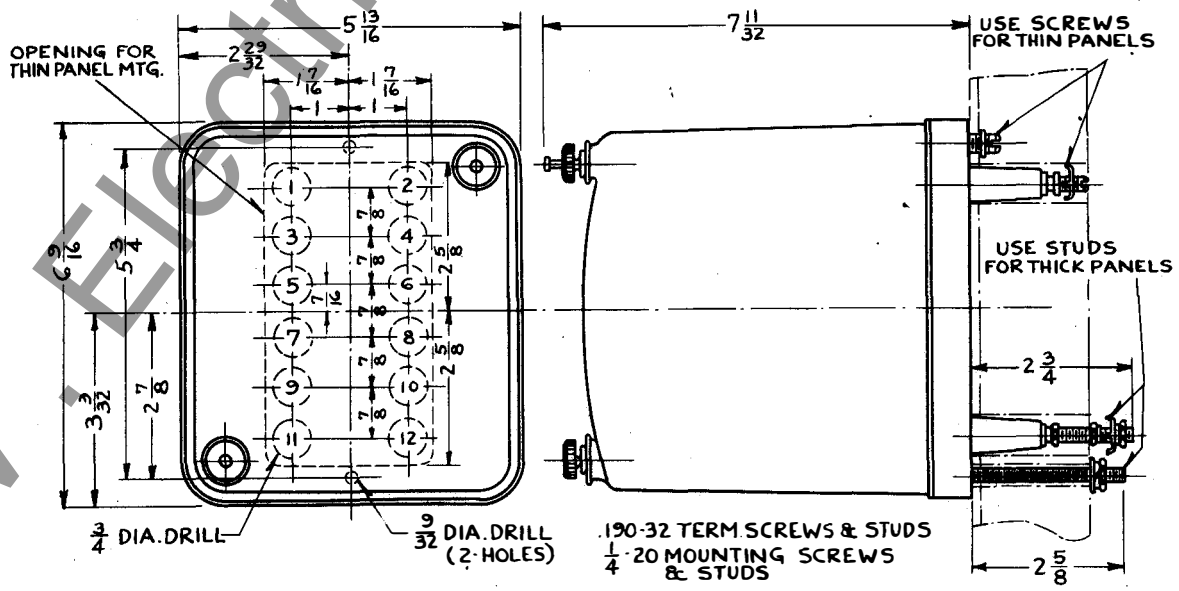


Figure 4
Outline and Drilling Plan for the Standard Projection Case. See this Internal Schematic for the Terminals Supplied. (For Reference Only.)

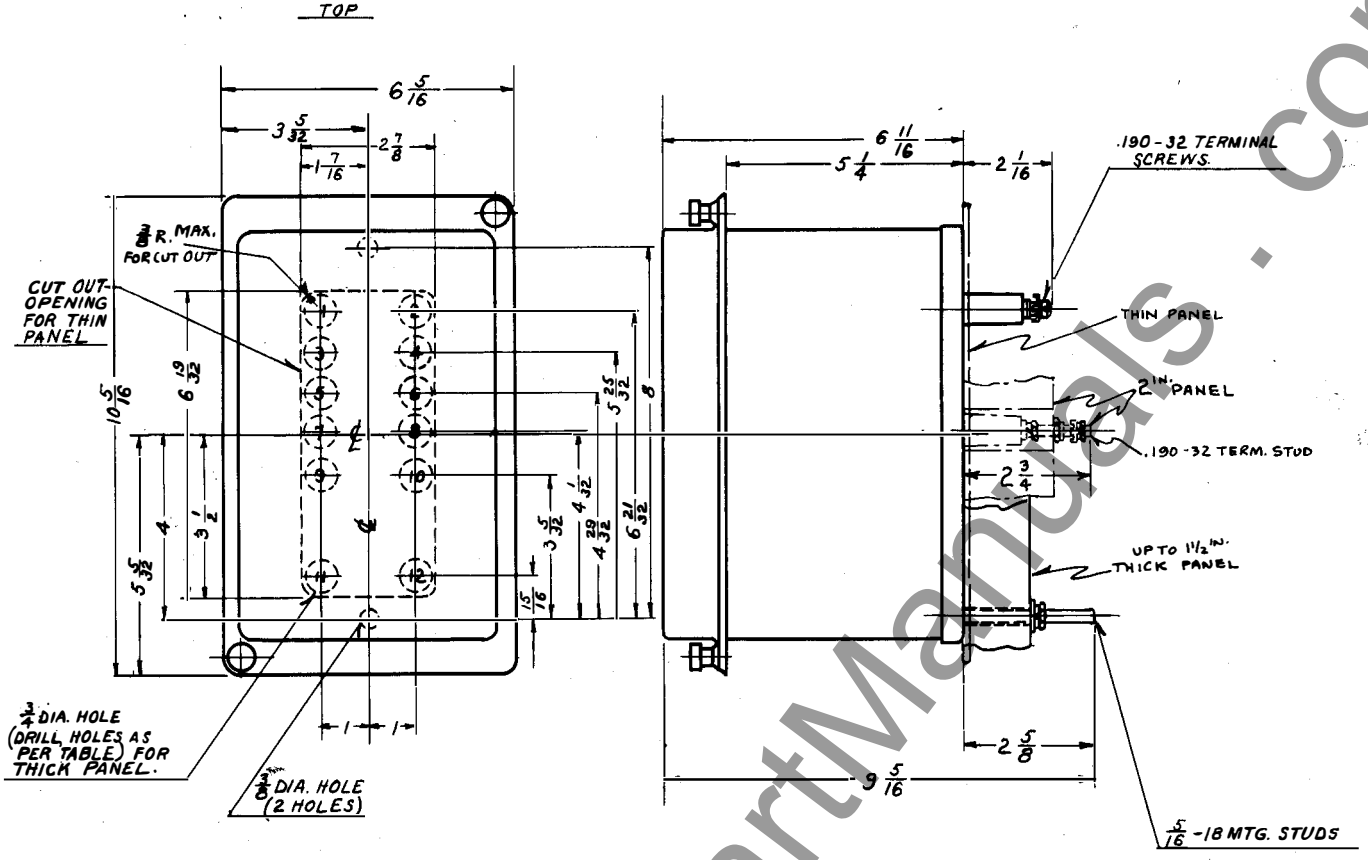


Figure 5
Outline and Drilling Plan for the S10 Projection Type FT Case. See the Internal Schematic for the Terminals Supplied. (For Reference Only).

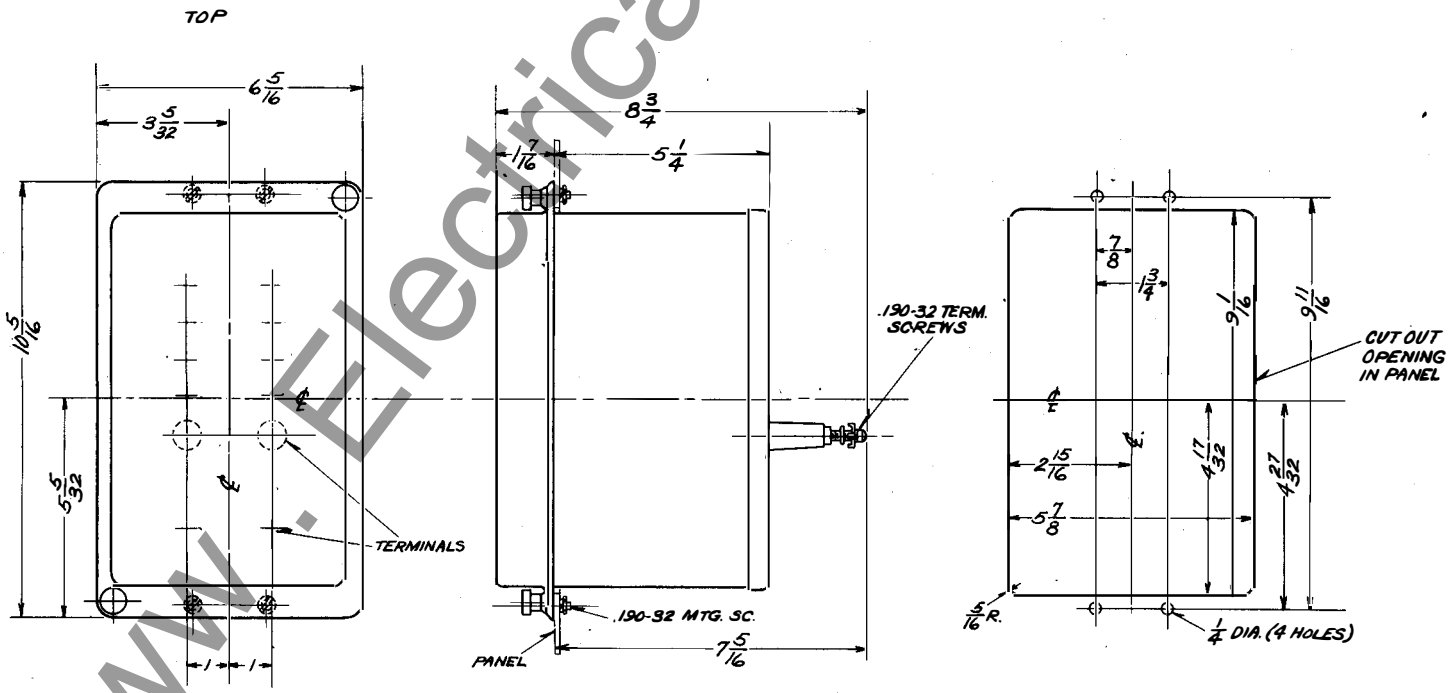


Figure 6
Outline and Drilling Plan for the S10 Semi-Flush Type FT Case. (For Reference Only).