

# INSTANTANEOUS UNDERVOLTAGE RELAY PJV17A



POWER SYSTEMS MANAGEMENT DEPARTMENT



PHILADELPHIA, PA.

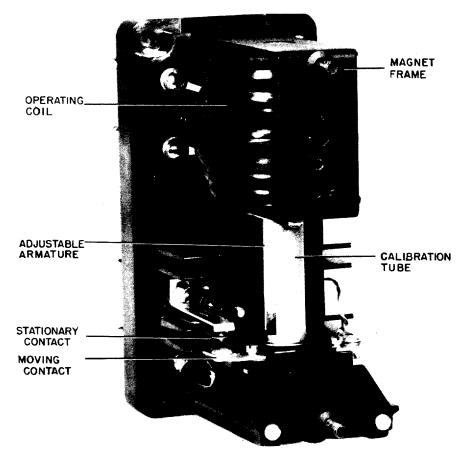


Fig. I (8030295) PJV17A Relay with Cover and Nameplate Removed

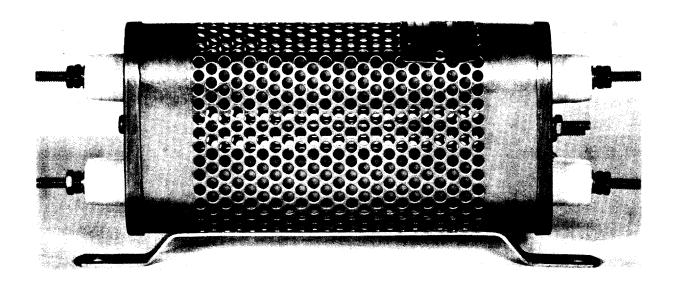


Fig. 2 (8030294) Two Stick Cage Resistor Typical of the External Resistor Used with PJVI7A Relays

## INSTANTANEOUS UNDERVOLTAGE RELAY TYPE PJV17A

#### DESCRIPTION

The PJV17A relay is an instantaneous d-c undervoltage relay with extra high dropout designed specifically to be used to monitor the d-c charging supply for a station battery and to sound an alarm if this supply fails.

The relay is equipped with both an a-c and d-c coil with external resistors for each. Also the relay has one normally open and one normally closed contact but no target. It is packaged in a surface mounted, back connected molded case, and is normally used in conjunction with one time delay drop-out auxiliary relay.

#### **APPLICATION**

Because the PJV17A drops out at 95% of pickup voltage or more, it finds applica tion wherever a high-speed, extra high dropout, d-c relay is required. It should be noted that although the PJV17A relay is applied to detect undervoltage, the relay requires an a-c supply in addition to the d-c voltage being measured.

Usually the PJV17A relay is used to detect station battery undervoltage and to provide an alarm. Since some operating conditions may temporarily lower the d-c voltage, it is suggested that the PJV17A be used in conjunction with a time delay dropout auxiliary relay to prevent false alarms.

Fig. 3 shows the PJV17A used in conjunction with a time delay dropout HGA65D relay which provides a time delay of about two seconds and at the same time monitors the a-c supply to the battery charger. This arrangement will sound an alarm not only when a prolonged d-c undervoltage occurs but also when the a-c power is lost without waiting for the battery voltage to decay.

When the PJV17A relay is used to monitor either a lead-acid or a nickel-cadmium battery, it is suggested that the dropout be set about 98% of the fully charged open circuit voltage of the battery. For example, the fully charged open circuit voltage of a 60 cell lead-acid battery will be 123 volts and the suggested PJV17A setting about 121 volts. Also the relay must pick up at the lowest acceptable battery charger output.

TABULATION OF EXTERNAL RESISTOR VALUES REQ'D FOR PUV17A							
MODEL	DC CIRCUIT				AC CIRCUIT		
	CONTINUOUS		SERIES RESOHMS	VOLTS CONTINUOUS	FREQUENCY IN CYCLES	SERIES RES.OHMS	
12PUV17A1	48	102	150	115	50/60	300	
12PJV17A2	125	102	510	115	50/60	300	
12PJV17A3	48	102	150	115	25	510	
12PJV17A4	125	102	510	115	25	510	
12PJV17A8	250	102	1200	115	50/60	300	
12PJV17A12	24	23.5	36	115	50/60	300	
12PJV17A13	125	102	510	460	50/60	3900	
12PJV17A15	125	102	510	230	50760	1200	
12PJV17A16	250	102	1200	400	50/60	3900	
12PJV17A17	48	102	150	230	50/60	1200	
12PJV17A19	24	23.5	36	230	50/60	1200	
12PJV17A20	250	102	1200	230	50/60	1200	
12PJV17A21	500	350	3900	115	50/60	300	
12PJV17A22	36	23.5	68	230	50/60	1200	
12PJV17A23	250	102	1200	115	25	510	
12PJV17A24	48	102	150	230	25	1000	
12PJV17A25	250	102	1200	230	25	1000	
12PJV17A26	360	102	1700	230	50/60	1200	
12PJV17A27	12	23.5	NONE	115	50#60	300	
12PJV17A28	32	23.5	60	115	50/60	300	

TABLE A

#### RATINGS

## INTERRUPTING RATINGS TABLE B

Table A gives detailed information on the PJV17A relay coil ratings and the external resistors which are used with these coils. The external resistors are supplied as a part of the relay and each relay is calibrated with its resistors.

Table B gives the relay contact interrupting ratings. These contacts will make and carry five amperes continuously or 30 amperes for two seconds.

A-C VOLTS	AMPS			
M-0 VOLID	INDUCTIVE	NON-INDUCTIVE		
115 230 460	1 0.5 0.25	2.5 1.0 0.5		
D-C VOLTS				
24 48 125 250	0.5 0.25 0.15 0.075	2.5 1.0 0.5 0.15		

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

#### CHARACTERISTICS

#### OPERATING PRINCIPLES

The PJV17A is a plunger-type relay which operates by electromagnetic attraction. The contacts are opened and closed by an amrature drawn up vertically into a solenoid. The high dropout feature results from limiting the armature travel to retain a sizeable air gap in the magnetic circuit when the relay is picked up. The action of the a-c coil also helps to establish a positive dropout point.

The PJV17A relay can be adjusted by changing the vertical position of the armature on its threaded shaft. The relay will drop out at 95% or more of the pickup voltage at any setting.

#### BURDEN

The volt-ampere burden of the a-c winding is approximately 40VA.

The resistances of the d-c windings are given in Table A.

#### CONSTRUCTION

The PJV17A relay contacts are operated directly by the plunger (armature) which moves vertically inside the calibrating tube. This adjustable armature is mounted on the threaded portion of a plunger rod which carries the moving contacts upward as the armature is drawn upward into the solenoid by the flux established by the operating coils. Guides for the plunger rod are provided at the top by a hole in the pole piece and at the bottom by the fit of the molded contact carrier inside the calibrating tube.

A projection of the molded base parallel to the moving contact support prevents rotation of the moving contacts. Openings in the side of the calibrating tube allow access to the armature to permit adjustment.

The stationary contacts, magnet frame and coil, are mounted on a compound base. The normally closed fixed contacts are similar to the normally open fixed contacts except they are mounted below the moving contact and the backstop arm is omitted. The cover is attached to the front of the relay by means of two thumb screws. See Fig. 5 for dimensions and panel drilling.

### RECEIVING, HANDLING AND STORAGE

These relays, when not included as part of a control panel, will be shipped in cartons designed to protect them against damage. Immediately upon receipt of a relay, examine it for any damage sustained in transit. If injury or damage resulting from rough handling is evident, file a damage claim at once with the transportation company and promptly notify the nearest General Electric Apparatus Sales Office.

Reasonable care should be exercised in unpacking the relay. 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.

#### ACCEPTANCE TESTS

Immediately upon receipt of the relay an inspection and acceptance test should be made to insure that no damage has been sustained in shipment and that the relay calibrations have not been disturbed.

#### VISUAL INSPECTION

Check the nameplate stamping to insure that the model number, rating and calibration range of the relay received agree with the requisition.

Remove the relay from its case and check by visual inspection that there are no broken or cracked molded parts or other signs of physical damage, and that all screws are tight. Also check to see that the flexible moving contact leads extending back from the contacts have not been deformed.

#### MECHANICAL INSPECTION

- It is recommended that the following mechanical adjustments be checked:
- 1. Operate the plunger by hand and allow it to reset to insure that all parts are free from friction or binds.
- 2. The wipe on a normally open or normally closed contact should be approximately 1/64 inch. The normally open contact gap with the armature fully reset should be 1/32 inch. A backstop should be present above the normally open contact. The gap between the backstop and contact brush at the tip should be approximately 1/16 inch with the armature reset.

#### **ELECTRICAL TESTS**

It is recommended that the following electrical checks be made immediately upon receipt of the relay. Note that all tests should be made with the relay in its case and in a level position.

1. Pickup and Reset - The units are normally supplied from the factory with the bottom of the armature aligned with a mark on the calibration tube which corresponds to a dropout of 98% of rated voltage. It should be sufficient to check the dropout at this setting. Apply rated AC voltage to the AC coil (studs 5-6) in series with the AC resistor. Gradually increase DC test voltage applied to the DC coil (studs 1-2) in series with the DC resistor. The relay should pick up, closing its normally open contacts with one continuous motion. The test voltage should then be gradually decreased until the contacts reset atapproximately 98% of rated DC voltage. The pickup value should be no more than 106% of the dropout voltage.

#### INSTALLATION PROCEDURE

If after the performance of the AC-CEPTANCE TESTS, the relay is held in storage before shipment to the job site, it is recommended that the visual and mechanical inspection described in the section on ACCEPTANCE TESTS be repeated before installation.

Also the relay should be set at the dropout value to be used and it should be checked. When making this check, the relay should be installed in its permanent location and preheated. The position of the armature should be adjusted, if necessary, to obtain the desired dropout. After the dropout is set, check that the relay will pick up at the lowest acceptable battery charger output voltage with normal a-c voltage on the outer operating coil.

#### PERIODIC CHECKS AND ROUTINE MAINTENANCE

In view of the vital roll of protective relays in the operation of a power system it is important that a periodic test program be followed. It is recognized that the interval between periodic checks will vary depending upon environment, type of relay, and the user's experience with periodic testing. Until the user has accumulated enough experience to select the test interval best suited to his individual requirements it is suggested that the following points be checked at an interval of from one to two years:

#### MECHANICAL CHECKS

Manually operate the armature and allow it to reset to make sure that there is no excessive friction or tendency to bind.

Check the contact gap and wipe and the backstop position; values should agree with those given in the section under AC-CEPTANCE TESTS.

Examine the contact surfaces for signs of tarnishing or corrosion. These fine silver contacts should be cleaned with a burnishing tool, which consists of a flexible strip of metal, with an etched, roughened surface. Burnishing tools designed especially for cleaning relay contacts can be obtained from the factory. Do not use knives, files or abrasive paper or cloth of any kind to clean relay contacts.

Using connections as indicated in Fig. 4 check the relay pickup and dropout. Set the battery charger at its lowest charging rate and vary the test resistor to check the pickup and dropout. The pickup voltage should be 106% or less of the dropout voltage. A voltmeter with at least 1000 ohms per volt should be used for making the test. If it is necessary to make adjustments refer to the section on SERVICING.

#### SERVICING

If any of the mechanical or electrical check points described in the previous sections are found to be out of limits, the following points should be observed in restoring them.

#### 1. Friction

If there is any tendency to bind or if excessive friction is present, check to see

that the moving contact molded support has adequate (0.010 inch) clearance from the compound relay base. Inadequate clearance would indicate that the relay has been damaged and probably the damage would be deformation of the calibrating tube. This tube would have to be straightened and/or a shim placed behind the magnet frame to move it away from the base. Also check to see that the armature and the molded contact guide move freely inside the calibrating tube and that no foreign matter is present between them and the calibrating tube.

If the flexible leads from the moving contact have been damaged, they should be reformed as follows:

- a. The flexible leads should be twisted no more than one turn over the complete length of the lead.
- b. There should be a  $90^{\circ}$  bend in the lead at the terminal screw.

- c. The leads should be free over the complete travel of the contacts; that is, they should touch no part of the relay except the terminals to which they are connected.
- d. The leads should not pull the contact assembly towards the base.

Note that if the flexible leads are not correctly formed, they may seriously affect the relay calibration.

If it is necessary to replace a contact proceed as follows:-

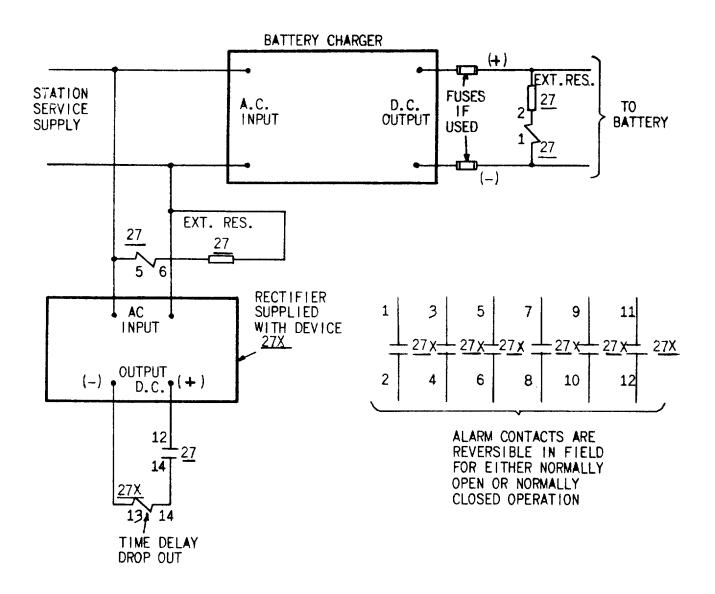
- a. Each stationary contact brush should be adjusted to have an initial tension of about 15 grams as measured with a standard gram gauge.
- b. There should be about a 1/32" gap between the upper stationary and movable contacts when the lower contact is just barely open.

- c. Both normally open and normally closed contacts should have a 1/64 inch wipe.
- e. After adjustments are complete the section of the fixed contact brush to which the contact tip is attached should be nearly horizontal.

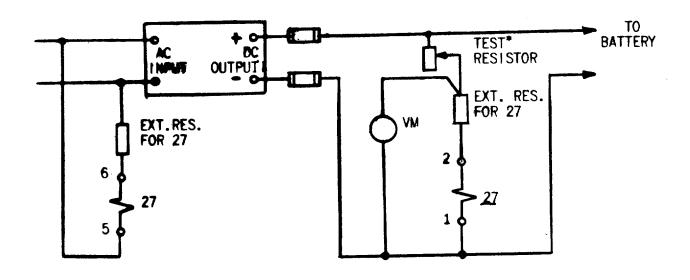
#### RENEWAL PARTS

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 the part wanted, and give complete nameplate data. If possible, give the General Electric requisition number on which the relay was furnished.



<u>LEGEND</u> <u>27</u> – PJV17A <u>27</u> – HFA650



\*WARIABLE TEST DESISTOR INSERTED IN DC OFFERATING CIRCUIT TO VARY 27 RELAY VOLTAGE FOR TEST.

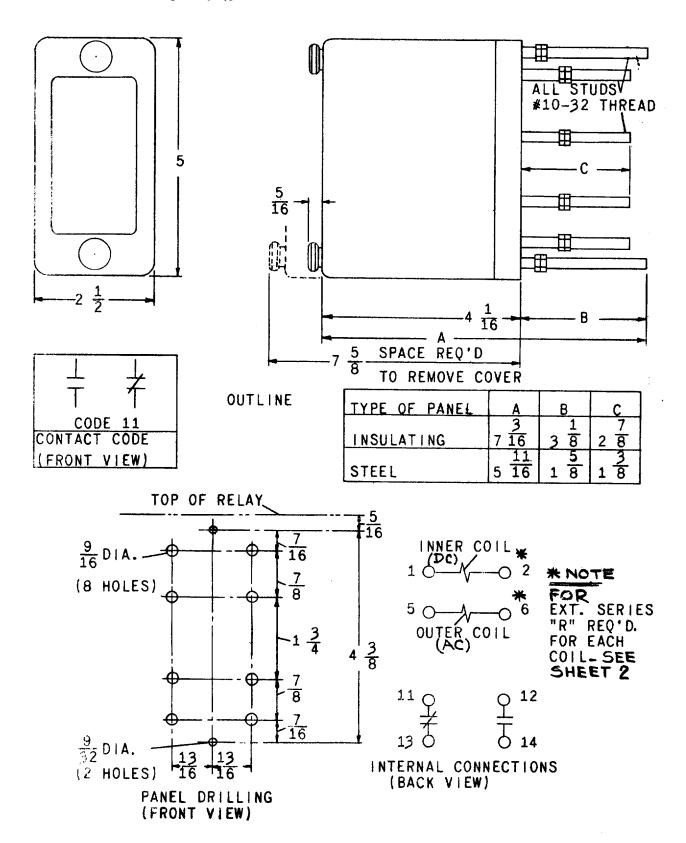


Fig. 5 (6400678-3) Outline, Panel Drilling And Internal Connections For The PJVI7A Relay