INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE JD TIMING RELAY

CAUTION Before putting relays into service, remove all blocking which may have been inserted for 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 JD relay is a timing relay for general auxiliary service requiring up to 30 seconds maximum timing. It can be supplied for either a-c or d-c circuits. Two designs are available, a rack type having a slow reset, and a ratchet type with a quick reset.

CONSTRUCTION AND OPERATION

The type JD relay consists of either a rack or ratchet timing element and a contactor switch if supplied. The construction and operation of these elements are as follows:

Ratchet Timing Element

A clapper type electromagnet is mounted in the lower rear of the element. Its armature is hinged at the lower end while the upper end fastens to a leaf spring. The top of the leaf spring is attached to a horizontal rod. The other end of the rod is attached to a short horizontal arm assembled on a vertical shaft, which carries the moving contact arm and the ratchet gear. The pawls and ratchet are mounted on the top of a larger gear which meshes with a pinion on a shaft that carries a large disc. This disc rotates between the poles of a permanent magnet to provide damping.

When the relay coil is energized, the armature closes and deflects the leaf spring, which pushes on the horizontal rod to rotate the contact shaft. The rotation of this shaft causes the ratchet to rotate the disc between the damping magnets. When the coil is deenergized, the pawls release the ratchet and the contacts and armature reset instantaneously thru the action of the springs and gravity. If time delay on deenergization of the relay is desired, the relay is supplied with the same ratchet and pawls assembled so that motion of the contact arm is transmitted to the damping disc only when the armature is returning to the deenergized position.

The stationary contact assembly consists of flat silver contacts attached to the free ends of two leaf springs. These springs are fastened one above the other to a moulded mounting block. A small set screw provides adjustment of the contact follow and adjustment so that both contacts will make simultaneously.

A similar set of contacts and supporting arms are bent around a moulded block fastened to the semi-circular time lever scale. These are known as the adjustable contacts since their position is adjustable around the time lever scale. The flexibility of the U-shape bend of the arm around the block provides the contact follow. The electrical connections are made thru flexible leads.

The moving contacts are two small rounded silver contacts of the "dumbell" type, fastened on the end of an arm to provide front and back contacts. The other end of this arm is clamped to an insulated shaft which is rotated directly by the push rod and is connected through the ratchet and gear to the disc

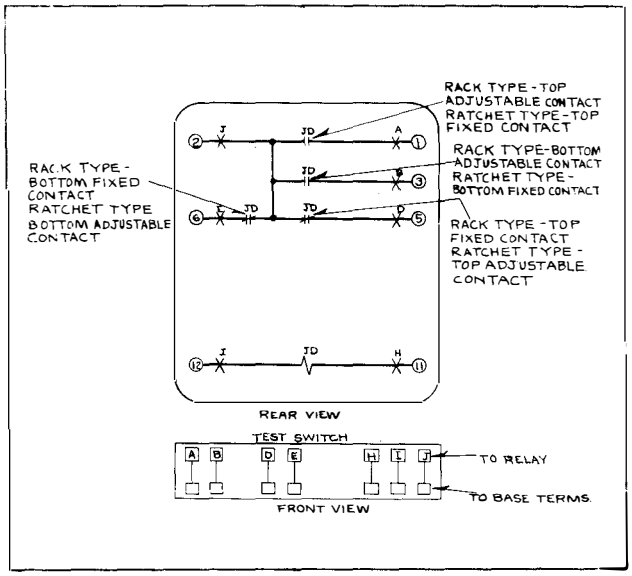

Fig. 1—Internal Schematic of the Rack or Ratchet Type JD Relay in the Type FT Case with Double Pole Double Throw Non-Independent Contacts.

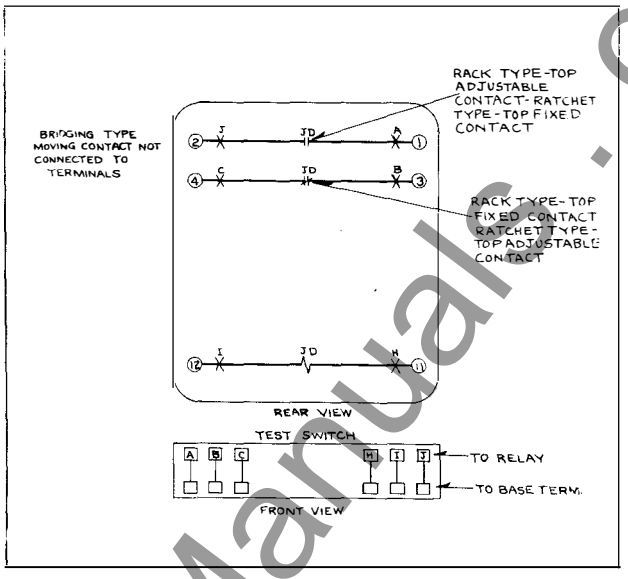

Fig. 2—Internal Schematic of the Rack or Ratchet Type JD Relay in the Type FT Case with Single Pole Double Throw Independent Contacts.

shaft. Depending upon the circuit arrangement, the contacts are either insulated or electrically connected through the moving arm and spiral spring. One end of the spiral spring is fastened to the contact arm and the other to a clamp on the moulded block.

Rack Timing Element

The clapper type electromagnet construction is similar to that used in the ratchet type element. It operates a horizontal rod that terminates in a rack. A guide tube holds the rod in position. The pinion is mounted on the main shaft below the damping disc. The moving contact assembly also is fastened to a contact arm on this shaft and is similar to the moving contact described above for the ratchet timing element except that one end fastens to a slotted spring adjuster disc which in turn fastens to the moulded block mounted on the element frame. The stationary contacts also are the same type as described above.

The movement of the electromagnet armature pushes the horizontal rod and rack forward to rotate the disc and contacts. When the relay coil is deenergized, the armature resets to rotate the disc and contacts in the opposite direction. Thus there is time delay on either energizing or deenergizing the relay.

Contactor Switch (When Supplied)

The d-c. contactor switch in the relay is a small solenoid type switch. A cylindrical plunger with a silver disc mounted on its lower end moves in the core of the solenoid. As the plunger travels upward, the disc bridges three silver stationary contacts. The coil is in series with the main contacts of the relay and with the trip coil of the breaker. When the relay contacts close, the coil becomes energized and closes the switch contacts. This shunts the main relay contacts, thereby relieving them of the duty of carrying tripping current. These contacts remain closed until the trip circuit is opened by the auxiliary switch on the breaker.

CHARACTERISTICS AND SETTINGS

The ratchet type relay has a quick reset (less than 10 cycles for maximum contact travel), and is available in the following ranges: Its accuracy is approximately within 10% at maximum time.

2 to 15 seconds
4 to 30 seconds

The rack type relay has a much slower reset characteristic but is more accurate (within 5%

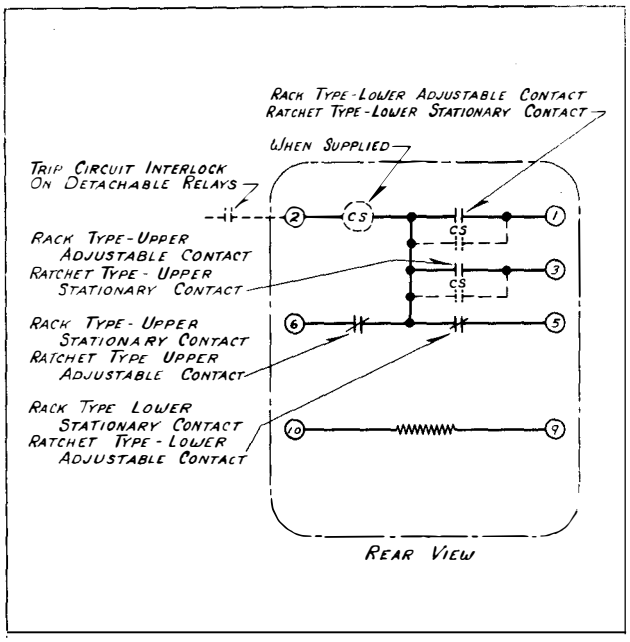

Fig. 3—Internal Schematic of the Rack or Ratchet Type JD Relay in the Standard Case with Double Pole Double Throw Non-Independent Contacts.

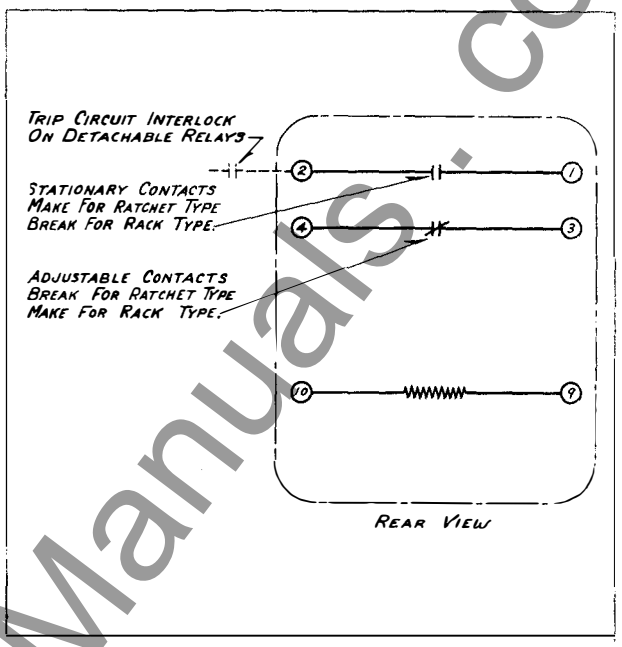

Fig. 4—Internal Schematic of the Rack or Ratchet Type JD Relay in the Standard Case with Single Pole Double Throw Independent Contacts.

at maximum time) since there is no lost motion between ratchet and pawls. Its characteristics are as follows:

Range in Seconds	Reset Time In Seconds
0.25 to 4	0.50 to 5.0

The coils for either type relay are available for 48, 125 or 250 volts d-c, or 115 or 230 volts a-c. The normal contact is double pole double throw as shown in Fig. 1. Independent type contacts as shown in Fig. 2 are also available.

A time lever scale marked in equal divisions permits the adjustment of the adjustable contacts, which fixes the deenergized position of the moving contacts. The scale divisions have no direct relation to the operating time but provide a convenient reference when the relay is being set for a particular time delay.

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 houses the relay elements and supports 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 corners. 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 opening 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 for test as well as on its back or sides for easy inspection and maintenance.

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.

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 in 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.

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

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 down.

The external test circuits may be made to the relay elements by #2 test clip leads instead of the test plug.

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 a small percentage. It is recommended that the relay be checked in position as a final check on 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

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

Rack Timing Element

If the rack assembly has been dismantled, the rack should be placed in mesh with the pinion so that when the L.H. adjustable contact lever is set at zero and the left-hand contacts are deflected 1/16", the front tooth of the rack will be opposite or slightly in front of (less than 1/8") the centerline of the disc shaft.

The relay is then adjusted for the required reset time (usually 5 seconds for full travel) by means of the damping magnet and the spiral spring adjuster. Moving the damping magnet toward the center of the disc reduces the time delay. The initial tension of the spiral spring can be varied by rotation of the slotted plate to which one end of the spring is fastened.

The operating time on the energized stroke is affected by the position of the two nuts at the rear of the push rod and by the shape of the leaf spring which engages these nuts at its slotted end. Bending of this spring above or below the end of the back-up spring may be necessary. The required timing may be obtainable by various combinations of adjustments and no definite procedure can be specified. However, the adjustments should be such that the armature will close positively at 70% of rated voltage.

In order that the timing may be consistent on repetitive operation, it is important that all moving parts be clean and free from burrs or similar sources of friction. The airgap above and below the damping disc should be inspected to see that there is clearance to the magnet and that there are no particles adhering to the magnet and touching the disc.

Ratchet Timing Element

The spiral spring on the moving contact shaft of the ratchet-type JD relay is usually adjusted for 3/4 turn initial tension at the factory and is then soldered so that no further adjustment is possible. The position of the nuts on the rear of the push rod is adjusted so that with the armature closed and with the left-hand contacts closed and deflected approximately 1/16", the flat spring assembled on the armature barely touches its hairpin-shaped stop. The pressure of the flat spring against its stop can be varied by opening or closing the angle of the inverted V bracket on which it is supported.

A spring wire mounted in a bar screwed to the right-hand side of the movement frame is deflected when the armature approaches the closed position, and serves to prevent sticking of the armature because of residual magnetism. This wire should be bent so as to obtain about 1/16" to 3/32" deflection of the wire when the armature is against the pole face.

The desired time for maximum contact travel is obtained at the factory by varying the strength and position of the damping magnet. After selection of the proper strength magnet, considerable variation in timing still can be obtained by varying the position of the magnet with respect to the center of the disc.

After other adjustments have been made the relay should be checked to see that the armature will close at 70%, or less, of rated voltage. There should be no difficulty in obtaining this pick-up if the relay is being adjusted for the usual time-ranges.

Contactor Switch (When Supplied)

Adjust the stationary core of the switch for a clearance between the stationary core and the moving core of 1/64" when the switch is picked up. This can be done by turning the relay up-side-down or by disconnecting the switch and turning it up-side-down. Then screw up the core screw until the moving core starts rotating. Now, back off the core screw until the moving core stops rotating. This indicates the points where the play in the assembly is taken up, and where the moving core just separates from the stationary core screw. Back off the core screw approximately one turn and lock in place. This prevents the moving core from striking and sticking to the stationary core because of residual magnetism. Adjust the contact clearance for 3/32" by means of the two small nuts on either side of the Micarta disc. The switch should pick up at 2 amperes d-c. Test for sticking after 30 amperes have been passed through the coil.

Contacts

All contacts should be periodically cleaned with a fine file. S#1002110 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.

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 name-plate data.

ENERGY REQUIREMENTS

The burdens of the coils are as follows:

Coil Rating

48 volts d-c.	6 watts
125 volts d-c.	6.5 watts
250 volts d-c.	13 watts (with series resistor)
115 volts 60 cycles	25 v.a.
230 volts 60 cycles	25 v.a.

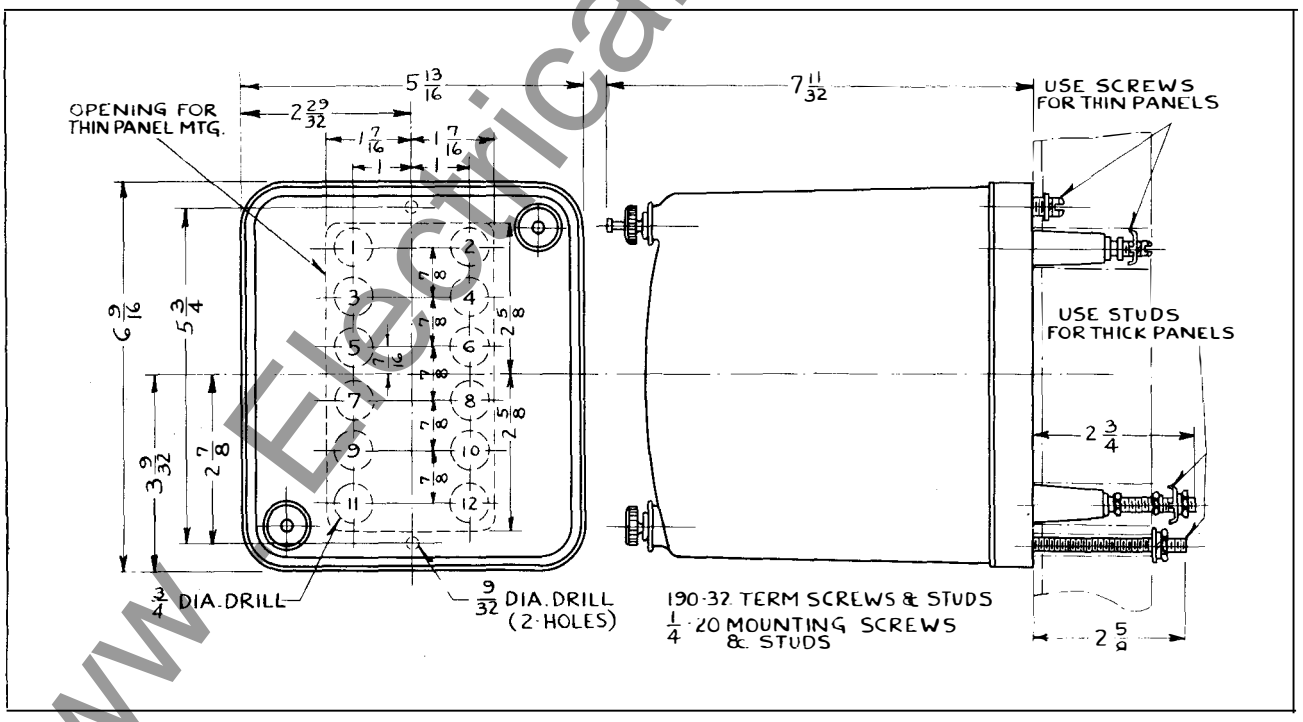

Fig. 5—Outline and Drilling Plan for the Standard Projection Type Case. See the Internal Connections for the Terminals Supplied. For Reference Only.

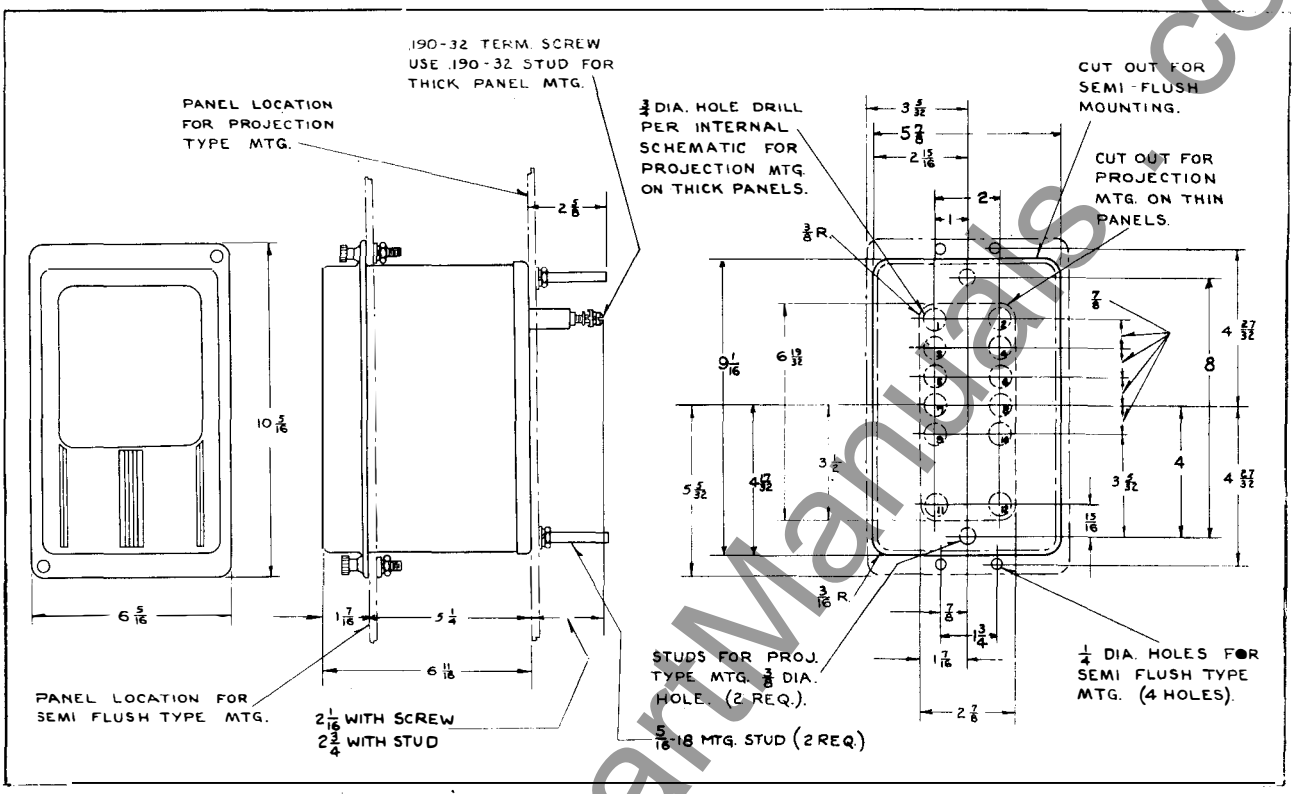

Fig. 6—Outline and Drilling Plan for the S10 Semi-Flush or Projection Type FT Case. See the Internal Schematic for Terminals Supplied. For Reference Only.

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