INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE RC AUTOMATIC RECLOSING RELAY
WITH INSTANTANEOUS TRIP LOCKOUT

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 RC automatic reclosing relay is used for automatic reclosure of AC or DC electrically operated circuit breakers after they have been opened by overcurrent or other protective relay action. The relay may be adjusted to provide several reclosures at predetermined time intervals, so that in case the breaker does not remain closed after the first reclosure additional reclosures will be made. The first reclosure usually is an instantaneous reclosure through preclosed contacts since system operating experience has shown that the majority of faults are of a temporary nature, such as lightning flashovers, and will not be re-established after interruption of the fault current. Consequently, service interruption can be minimized by the use of instantaneous first reclosure. However, the first reclosure may be delayed if desired.

In case the circuit breaker does not remain closed after the first reclosure, the relay will make additional reclosures at suitably graded intervals. It is common practice to make two additional reclosures, but the relay may be adjusted to make any number up to a total of six reclosures if desired. If the breaker does not remain closed after the final reclosure, the timing drum stops in the "Lockout" position, and any further attempts at reclosure must be made by manual operation of the control switch. However, if the breaker remains closed after any automatic reclosure, or, subsequently, after manual reclosure, the relay timing drum will advance to and stop at the "Start" position, where the relay is in readiness for another cycle of automatic reclosures following the next tripping of the breaker.

For any automatic reclosing application, the de-rating factors for breaker interrupting ability should be checked when choosing any particular reclosing cycle. Also, when using instantaneous first reclosure it is necessary that the protective relays open their contacts within 10 cycles or less after the breaker is tripped in order that the trip circuit will be de-energized before reclosure takes place. Full advantage of minimum service interruption permitted by use of instantaneous first reclosure will not be realized in consumer plants unless proper application is made on the customer's apparatus of such under-voltage time delay, field removal, and synchronous motor unloading devices as are necessary.

CONSTRUCTION AND OPERATION

The type RC relay consists basically of a synchronous motor operated timing element, an instantaneous relay element and a second relay element which has optional provision for a slight time-delay on pick-up and has a latch which holds its contact actuator in an intermediate position after its coil is deenergized. The latch is released mechanically by the timing element at the end of an adjustable interval following de-energization of the latching element coil. In order to meet the requirements of special applications, certain modifications or auxiliaries have been developed also.

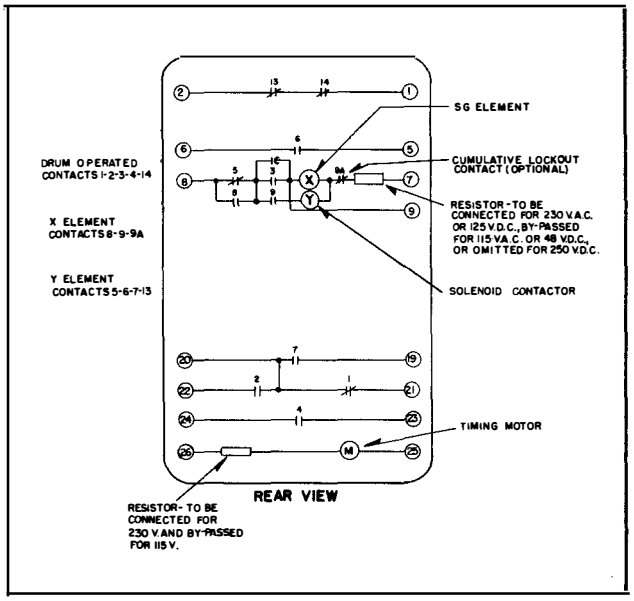


Fig. 1—Internal Schematic Connections of Type RC Reclosing Relay Without Z Element. In Standard Relay Case.

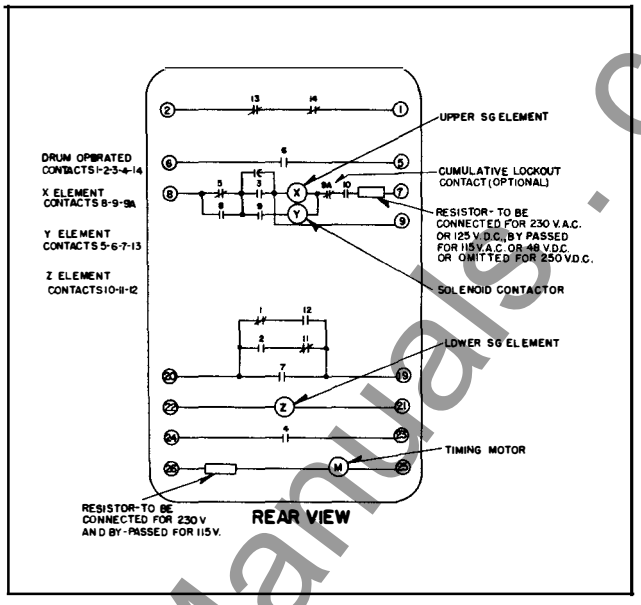


Fig: 2—Internal Schematic Connections of Type RC Reclosing Relay With Z Element. In Standard Relay Case.

The type RC recloser can be supplied in the standard relay case with glass cover, for projection mounting, or in the Flexitest case for projection or for flush mounting. With either type of case the same terminal arrangement and numbering is used, so that the same external connection diagrams are applicable to either type of case. Internal schematic connections for the standard case are shown in Figs. 1 and 2, and for the Flexitest case in Figs. 3 and 4. In these diagrams the motor of the timing element is designated as "M", the coil of the instantaneous element as "X" and the coil of the latching element as "Y". The contacts actuated by each element are indicated in the Figures.

Figs. 2 and 4 also show a "Z" element. This is a second instantaneous element, very similar to the X element, which is connected across the green indicating light of the circuit breaker control. Its contacts perform the same functions as two "a" and one "b" breaker auxiliary switches in the external connections used with the relays of Figs. 1 and 3. This permits a reduction in the number of control wires required, and frequently is advantageous when existing breaker installations are being converted to automatic reclosing duty.

Timing Element

The timing element of the RC relay consists of a small synchronous motor mounted with a reduction gear train between the two main frame plates of the relay, a contact actuating drum driven by the gear train, an assembly of four contacts mounted on the front plate adjacent to the drum at its upper right (front view), and a single contact assembly mounted on the front plate to the left of the drum (front view). The contacts in the assembly of four, counting from the front of the assembly, are designated as numbers 1, 2, 3, and 4. The fifth contact, mounted separately, is designated as number 14. These correspond to the similarly numbered contacts shown on the internal schematic diagrams.

The motor of the standard relay has a coil which is rated at 115 volts, 60 cycles for intermittent duty. For 230 volt service a resistor (mounted at the top of the standard case and at the bottom right-hand side, front view, of the Flexitest Case) is connected in series with the motor by moving one resistor lead from one terminal to the other. A motor and suitable gearing can be supplied for 50 cycle duty, but not for 25 cycle duty.

The gear train is constructed so that various gears can be brought into mesh to

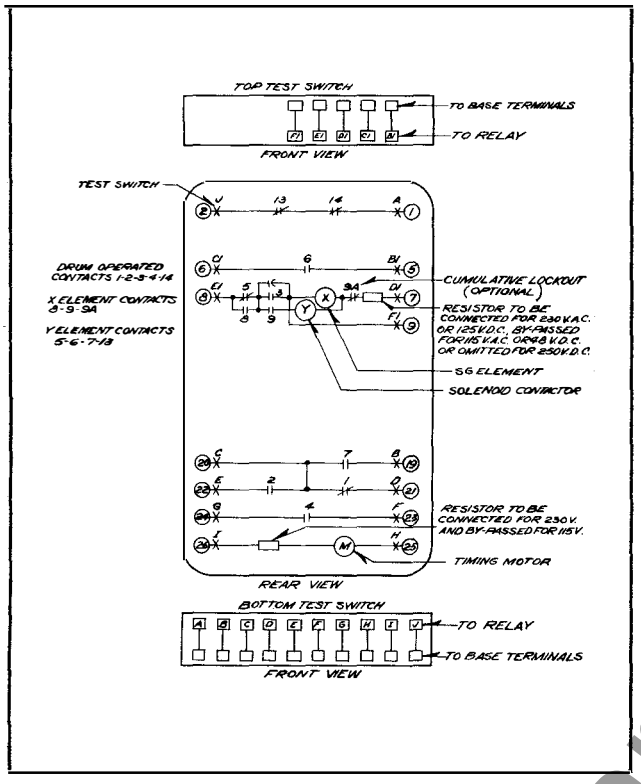


Fig. 3—Internal Schematic Connections of Type RC Reclosing Relay Without Z Element. In the Type FT Flexitest Relay Case.

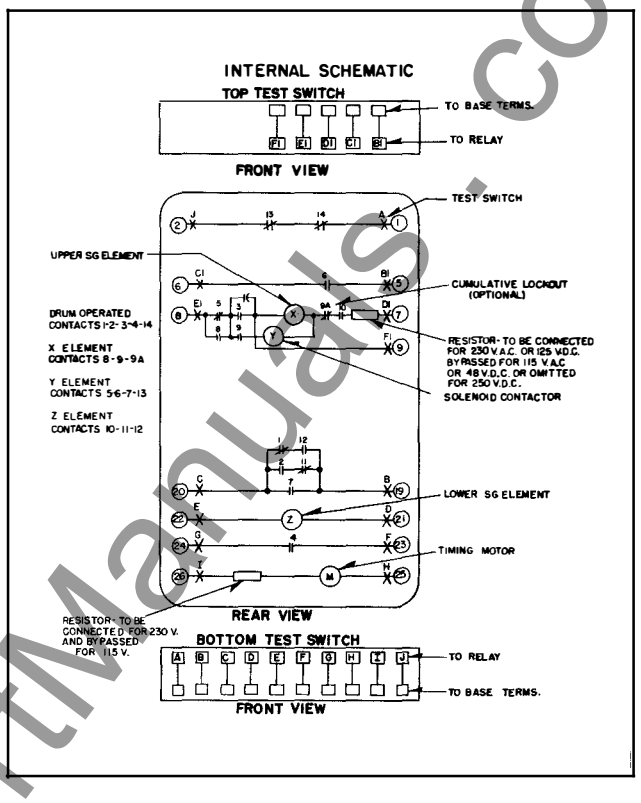


Fig. 4—Internal Schematic Connections of Type RC Reclosing Relay With Z Element. In the Type FT Flexitest Case.

drive the drum through one revolution in either 60, 90, 180 or 360 seconds. Pressure on a push rod which extends through the drum shaft to the front of the assembly demeshes the driven gear on the drum shaft and permits free manual rotation of the drum. A ratchet assembly at the rear end of the drum shaft permits the drum to be rotated in the counter-clockwise direction only, as inadvertent rotation in the opposite direction might damage the moving contact springs.

The motor and gear train are rotatably mounted, and a small dial mounted on the front bearing of the assembly contains indices which are brought into line with an index mark on the nameplate to mesh the proper gears for the four drum speeds indicated. A clamping screw at the edge of the dial prevents further movement of the gear assembly after any desired setting has been made. In order to change the drum speed, the clamping screw should be loosened, the push rod should be depressed, the motor and gear assembly should be rotated to the desired position by pressure on one or more of the posts between the motor mounting plate and the gear mounting plate, and the clamping screw should be tightened.

The four contacts of the drum contact assembly at the upper right of the drum are identical in construction. Contacts #1 and #2 are operated by the two front cams of the drum. These cams are notched and permit no adjustment of the intervals that the contacts are open or closed. The relative points of closure for these two cams are adjusted at the factory and should not be changed. The three rear cams are constructed so that screws can be set at any point on their periphery. The screws are threaded into nuts which are held in a continuous groove below the surface of the cam, and can be moved to any position. The heads of the screws set in the first two of these three cams actuate the #3 and #4 contacts, while the screws in the rear cam reset the latch which prevents the Y element from returning to its normal de-energized position.

*One of the screws in the rear cam mounts a Micarta block to the rear of the drum. The cam action of this block actuates contact number 14, which is mounted to the rear left of the drum.

A dial at the front of the cam assembly has 60 divisions, each of which corresponds to a one-second time interval when the gear assembly is set at the 60-second speed or to proportionally longer intervals at the slower speeds. An index plate mounted on the front of the molded support for the drum contact assembly contains "Start" and "Lockout" index marks adjacent to the edge of the drum dial. When the zero mark on the dial is opposite the "Start" index, the relay is in position to go through a reclosing cycle when its associated breaker is opened by protective relay action. When the drum has stopped with the dial zero opposite the "Lockout" index, the relay will make no further automatic reclosures and the next breaker reclosure must be made manually.

The edges of the three rear drum cams each have 12 equally spaced white marks, and the spaces between marks correspond to 5 seconds with the gearing set for the 60-second speed. These markings aid in locating the contact operating screws when setting up the drum for any particular reclosing cycle.

X Element

The X Element is similar to an open-type SG relay, and is mounted at the bottom of the front plate of the RC relay. It has two normally-open contacts. The lower of the two contacts is designated as #8 on the schematic diagrams, and the upper contact as #9. This element may be operated on AC or on DC. It has a core resembling the standard AC core for the SG relay, but the core has a heavier plating to prevent the armature from holding closed on residual magnetism when used on DC.

Automatic reclosing may sometimes be applied to installations of older circuit breakers which can be reclosed only a limited number of times before inspection or maintenance is necessary. For such applications the X element can be provided with a cumulative-lockout contact, which is designated as contact 9A on the schematic diagrams. This contact is operated by a ratchet mechanism, which is advanced one step each time the X element armature closes and opens. A maximum of 16 such steps are possible before contact 9A opens, but the ratchet can be set so that any lesser number of steps will open the contact. When contact 9A opens, no further automatic reclosures can be made. The relay cover must be removed to reset the ratchet. The ratchet teeth are numbered so that ready observation through the cover can be made of the number of reclosures remaining before the relay locks out by opening contact 9A.

Y Element

The Y element consists of a solenoid, located between the upper ends of the two mechanism mounting plates, which when energized attracts a plunger toward the rear of the relay against spring action. A Micarta disc mounted on the front end of the plunger actuates contacts numbers 5, 6, and 7, and releases the latch arm, mentioned previously in the description of the Timing Element. The release of the latch arm allows contact #13 to open. This contact assembly is mounted on the front plate directly to the left of the latch arm (front view) and directly above the drum operated contact number 14. When the solenoid is de-energized, the plunger resets to the point where the Micarta disc strikes the latch arm. The latch must be reset by rotation of the timing drum before the plunger can reset fully.

In the fully reset position the Micarta disc holds contact #5 closed, while contacts #6 and 7 are open. The disc also holds the latch arm in its reset position. In turn, contact #13 is held closed by means of an insulating arm extending from the vertical member of the latch arm. Contact #5 is the center one of the three contact assemblies mounted around the disc, while contact #6 is on the left hand and contact #7 is on the right hand (front view). As the plunger moves toward the energized position contact #5 opens, contact #7 closes, the latch arm is released opening

contact #13, and contact #6 closes, in that succession. When the solenoid is de-energized, contact #6 opens but contact #7 is still closed at the position where the disc is stopped by the latch arm. Contact #7 remains closed and contacts 5 and 13 remain open until the latch arm is reset by the cam action of the timing drum.

The solenoid plunger moves in a closely fitting bronze cylinder. The rear end of the cylinder is closed by a core screw, in the inner face of which is inserted an annular copper shading ring to prevent chattering of the plunger when the solenoid is energized by A. C. The core screw also contains an orifice and an adjustable needle-valve screw to regulate the rate at which air escapes from the cylinder when the plunger moves toward the core screw. The valve screw and locknut can be seen behind the rear plate of the relay. The time delay provided by retarding the escape of air from the solenoid cylinder is useful when the RC relay is used with mechanically full-automatic breaker mechanism where no checking device is available on the latch mechanism. When non-automatic breaker mechanisms of trip-free mechanisms equipped with latch-checking contacts are used, the time-delay feature is not required. A hole extends axially through the plunger and its front extension on which the Micarta disc is mounted, and a screw is threaded into the front end of this hole to close it. Removal of this screw allows free escape of the air in the cylinder and permits the fastest operation of the Y element. The majority of present applications do not require delayed action of the Y element, and the screw can be removed.

Resistor in Series With X and Y Elements

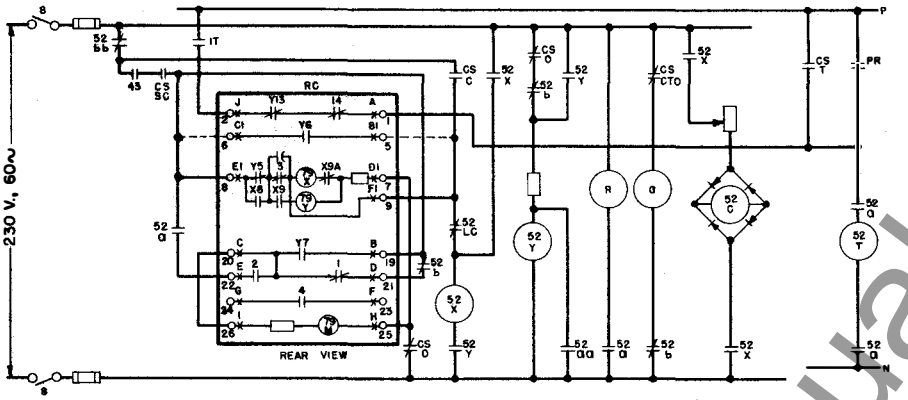
The X and Y elements are energized only momentarily, and consequently they will not be damaged if used on circuit voltages much higher than their minimum rated operating voltage. Also, they can be energized from either AC or DC circuits. This makes it possible to use the same relay at various system locations where the control voltages differ, and thus reduces the number of spare relays which should be carried in stock as replacements. However, in order to avoid excessive energy in the coils at the higher control voltages, a resistor mounted inside the relay is connected in series when the relay is to be used on these voltages. The resistor is located at the bottom of the relay in the standard case and at the bottom left-hand side (front view) of the Flexitest case. The X and Y element coils are in parallel after the #9 contact closes, so that a single resistor is sufficient to limit the current for both elements. The resistor is connected in the circuit for 230 volts AC or 125 volts DC, and is by-passed (by shifting one lead from one end of the resistor to the other) for 115 volts AC or 48 volts DC. For applications where the control voltage is 250 volts DC, different coils are used in the X and Y elements and the resistor is omitted.

Z Element

The Z element, when used, is mounted at the bottom of the relay case. Its function was described previously. It consists of a standard open-type SG relay with one SPST and one SPDT contact. The lower contact of the relay is designated as #10 on the internal schematic diagrams, and the upper set of contacts as #11 and #12. As the coil of the Z element may be energized for long periods, it must have a continuous rating and can be used on only one control voltage and frequency.

Capacitor Across #3 Contact

Normally the #3 contact is not required to interrupt current. However, in event of failure of the breaker auxiliary switch 52bb (figs. 5 and 6) to open when the breaker closes, continuous energization of the intermittently rated X and Y element coils will be prevented by opening of the #3 contact when the head of the contact operating screw in the drum passes beyond the end of the #3 contact spring. This will de-energize the X element, which in turn will-de-energize the Y element. The interrupting capacity of the #3 contact is ample for any AC application, but in order to assure adequate interrupting capacity for 125 or 250 volt D.C. applications a small capacitor is connected across the #3 contact to act as an arc suppressor.



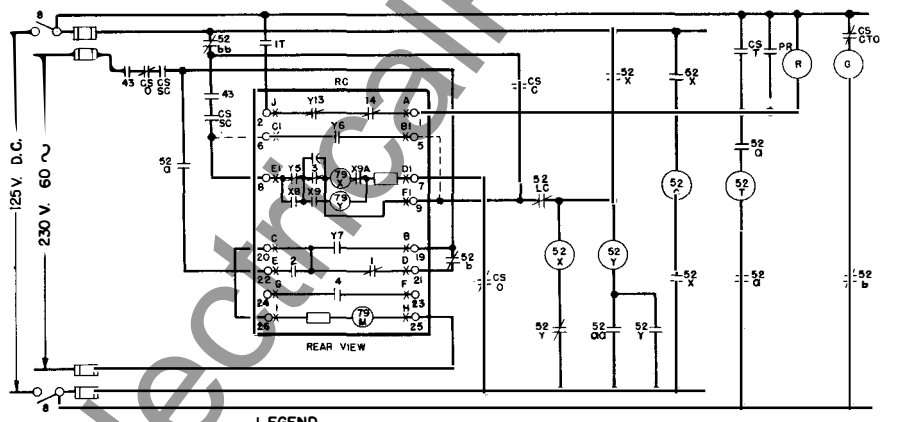
LEGEND

CS-CONTROL SWITCH
PR-PROTECTIVE RELAY
8 - CONTROL POWER SWITCH
43-AUTOMATIC OPERATION CUTOUT SW.
52-OIL CIR. BKR. AUX. SW.-OPEN.
a WHEN BKR. IS OPEN
52-OIL CIR. BKR. AUX. SW.-CLOSED
b WHEN BKR. IS OPEN
52-OIL CIR. BKR. MECH. SW.-CLOSED
aa IN OPER. POSITION
52-OIL CIR. BKR. MECH. SW.-OPEN
bb IN OPER. POSITION
1-2-3-4-14-RC RELAY DRUM OPERATED CONTACTS
IT - PROTECTIVE RELAY, INSTANTANEOUS TRIP

52-LATCH CHECK SW. LC
52-OIL CIR. BKR. CLOSING COIL C
52-CONTROL RELAY X
52-CUTOFF RELAY Y
79-RC RELAY MOTOR M
79-RC RELAY CONTACTOR ELEM. X
79-RC RELAY SOLENOID ELEM Y

NOTE: FOR RECLOSURE THROUGH INDEPENDENT CONTACTS (BUT NOT INSTANTANEOUS) MAKE DOTTED CONNECTIONS AS SHOWN AND OPEN CONNECTION TO TERMINAL 9.

Fig. 5—Typical External Connections of the Type RC Reclosing Relay Without Z Element, in Either Standard or Flexitest Case. Used in an A.C. Breaker Control Circuit.



LEGEND

CS- CONTROL SWITCH
PR- PROTECTIVE RELAY
8 - CONTROL POWER SWITCH
43-AUTOMATIC OPERATION CUTOUT SW.
52 - OIL CIR. BKR. AUX. SW. - OPEN
a WHEN BKR. IS OPEN
52 - OIL CIR. BKR. AUX. SW. - CLOSED
b WHEN BKR. IS OPEN
52 - OIL CIR. BKR. MECH. SW. CLOSED
aa IN OPER. POSITION
52 - OIL CIR. BKR. MECH. SW. OPEN
bb IN OPER. POSITION
1-2-3-4-14-RC RELAY DRUM OPERATED CONTACTS
IT- PROTECTIVE RELAY, INSTANTANEOUS TRIP

52 - LATCH CHECK SW. LC
52 - OIL CIR. BKR. CLOSING COIL C
52 - CONTROL RELAY X
52 - CUTOFF RELAY Y
79 - RC RELAY MOTOR M
79 - RC RELAY CONTACTOR ELEM. X
79 - RC RELAY SOLENOID ELEM. Y

NOTE: FOR RECLOSURE THROUGH INDEPENDENT CONTACTS (BUT NOT INSTANTANEOUS) MAKE DOTTED CONNECTIONS AS SHOWN AND OPEN CONNECTION TO TERMINAL 9.

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Fig. 6—Typical External Connections of the Type RC Reclosing Relay Without Z Element, in Either Standard or Flexitest Case. Used in a D.C. Breaker Control Circuit.

Terminal Arrangement

Due to variations in system operating practices, equipment and control voltage sources, there will be many modifications of the general circuit breaker reclosing scheme employing the RC relay. In order that a single style of the RC relay may be applicable to a wide variety of reclosing schemes, certain of the coils and contacts have been brought out to independent base terminals. A number of these terminals will be connected by external jumpers for particular connections schemes. This is apparent on examination of Figs. 5, 6 and 7. The connections as shown provide instantaneous reclosure through contacts Y5 and 3. Also, contacts Y13 and 14 provide lockout of the instantaneous trip circuit (when provided) of the protective relay after the first tripout. The dotted connections shown in Figs. 5, 6 and 7 are made by connecting a jumper between terminals 6 and 8 and by removing the connection from terminal 9 and connecting it to terminal 5. This connection may be used when reclosure through independent contacts is desired. In this case, reclosure made through contact Y6 after 79X and 79Y pick up. If the instantaneous trip lockout is not needed an instantaneous reclosure through independent contacts may be obtained using the dotted connections of Figs. 5, 6 or 7 and connecting contacts Y13 and 14 in parallel with contact Y6 by connecting jumpers between terminals 1 and 5 and terminals 2 and 6. Contact #4 is supplied primarily to energize an alarm if the relay stops at the lockout position. For this purpose (again referring to Fig. 6) a jumper can be connected between terminals 21 and 23, with terminal 24 connected to the alarm device. With contact #4 set to close at the lockout position, this connection will permit the alarm to be energized only when the breaker is open and the drum is at the lockout position. However, contact 4, in standard or modified form may be adjusted to close at any position during the reclosing cycle to perform a function other than alarm. It is obvious from consideration of these variations in the relay functions that it is advantageous to have the relay elements connected to independent terminals and to use external terminal jumpers as required when making external connections.

Operation of Motor on D. C.

An A. C. Source must be available for operation of the motor of the RC relay. This usually is available, but in some installations there may be no A.C. source, or the existing source may not be sufficiently reliable. In such cases a vibrating-type D. C.-A. C inverter may be used to energize the motor. An inverter is available which can be energized directly from 125 volts D. C., or from 250 volts D. C. through a resistor potentiometer. The external connections, which with an A. C. supply are made to terminals 25 and 26, are changed to the D.C. input terminals of the inverter, and the A.C. output terminals are connected to terminals 25 and 26.

Typical Operating Cycle

The functioning of the relay and associated equipment for a typical reclosing cycle will be described for the installation shown in Fig. 6. With the RC relay adjusted for one instantaneous and two subsequent timed reclosures, assume that the breaker trips because of a fault. The timing drum will be at the "Start" position, and a drum screw will be holding contact #3 closed. The breaker switches 52b and 52bb close, energizing the motor 79M through contact #1, and the drum begins to rotate. At the same time the coil of the contactor element 79X is energized through drum contact #3, contact Y5, and integrating lockout contact 9A when used. When the breaker latch checking switch 52LC closes, the breaker control relay 52X is immediately energized through the preclosed contacts Y5 and 3. This in turn energizes the closing coil of the breaker, 52C. Simultaneously, contactor element 79X seals in through its contact X8, while its other contact, X9, energizes the coil of solenoid element 79Y to open contacts Y5 and Y13 and close contacts Y6 and Y7. As the circuit breaker closes, the breaker auxiliary switches 52b and 52bb open, and 52a closes. Opening 52bb de-energizes 79X and 79Y. The latter then resets against its latch

to open contact Y6 and remains in this position, thus leaving contacts Y5 and Y13 open and contact Y7 closed until the latch is released. Before the latch is released, the drum-operated contact 14 will be opened and will remain open until the drum returns to the "Start" position. Contact Y7 keeps the motor circuit closed, in case the breaker remains closed after the first reclosure, until the drum can rotate far enough to close contact #2. This permits the drum to continue through one revolution to the "Start" position. Since contact Y5 stays open, "pumping" is prevented if the fault has not cleared and the breaker immediately trips again. This sequence constitutes the operations necessary to obtain an instantaneous initial reclosure and is obtained only when drum contact #3 is closed when the relay is in the "Start" or reset position. To eliminate the immediate reclosing feature, contact #3 is adjusted so that it does not make contact in the reset position.

If the breaker trips after the first reclosure, so that subsequent timed reclosures become necessary, the following operations take place. The motor continues to run through contacts #1 and Y7. This rotates the drum to cause contact #2 to close and #3 to open. After contact #3 opens, a screw on the rear drum cam releases the latch on solenoid element 79Y, which permits contacts Y7 to open and Y5 and Y13 to close. The equipment now is in position for another reclosure, which will occur as soon as contact #3 is closed by the next screw on the drum. From this point the sequence of operations is identical with that described previously, and subsequent reclosures are effected in a similar manner.

If the breaker does not remain closed after the last reclosure, the motor 79M runs until contact #1 opens and the timing drum stops at the lockout position. If the breaker remains closed after any reclosure, the motor continues to run until contact #2 opens, which causes the drum to stop at the reset position.

CHARACTERISTICS

The standard rating for the type RC reclosing relay is as follows:

Motor	115/230 V. 60 Cycles
X and Y Elements	115/230 V. 60 Cycles or 48/125 V. D. C.
Z Elem. (when used)	125 V. D. C.
Drum Speeds	60-90-180-360 Sec./ Rev.

Special relays are available with voltage ranges as above but for 50 cycle operation. Also, relays can be supplied with a minimum rating of 24 volts D.C. for the X and Y elements, or with a single rating of 250 volts D. C. for these elements.

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 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. 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. When the chassis is to be put back in the case, the above procedure is to be followed in the reversed order.

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.

Testing

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

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.

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. It is recommended that the relay be checked in position as a final check on 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. Readjustment after receipt by the customer will be necessary only as required by the reclosing cycle requirements and the supply voltages of a particular application. In making such changes, in reassembling the relay after repairs, or in checking the adjustments at regular maintenance periods, the instructions below should be followed.

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.

The resistors in series with the motor and the X and Y elements should be connected in or out of the circuit as required by the voltage of the supply to which the relay will be connected and as described in a paragraph under "Construction and Operation".

If the circuit breaker mechanism with which the relay is to be used does not require that operation of the Y element be retarded the air-escape screw at the front of the plunger assembly should be removed and the adjustment of the needle-valve screw at the rear of the Y element is not of interest. In the standard relay the needle-valve screw is adjusted for a delay of 5 to 15 cycles with a 230 volt, 60 cycle, supply connected across the X and Y element coils in parallel with the resistor in series. The time delay will vary with the magnitude and frequency of the supply voltage impressed across the coil, of course, and on other voltage supplies some readjustments of the valve screw may be necessary. A precise adjustment of this delay is not required.

In order to assure self-sealing of the X element before the Y5 contact opens, the X8 contact is adjusted to close when the X9 contact still has a gap of approximately 3/64".

In setting the operating screws in the drum to obtain a desired reclosing cycle, certain precautions should be observed. The drum speed selected should be the fastest which will accommodate the total of the intervals between reclosures. The sum of these intervals should not exceed 5/6 of the total number of seconds for one revolution of the drum. For example, if the 60-second drum speed is used, the last reclosure should occur not later than 50 seconds from the "Start" position. This allows time for the #3 contact to open and for the Y element latch operating screw to travel out of contact with the tip of the latch arm before the drum stops at the "Lockout" or "Start" positions.

A thin-headed screw is located in the #3 contact cam near the "Start" position. This screw acts as a stop to prevent a contact operating screw for instantaneous first reclosure from being set too far in a counterclockwise direction and possibly closing the #3 contact with the drum at the "Lockout" position. Screws must always be set at least 8 dial divisions apart in order to allow the #3 contact to open and the Y element latch to return to its normal position before the next reclosure. The minimum time interval between reclosure, then, is 8, 12, 24, or 48 seconds depending upon the drum speed used. Careful setting of the #3 contact screw and the latch release screw is necessary to obtain these minimum intervals. The drum should have rotated at least 1/64" beyond the point where the end of the #3 contact spring has dropped off of the head of the drum screw before the Y element latch releases the plunger. Similarly the next closure of the #3 contact should not occur until the latch operating screw in the rear cam has travelled at least 1/64" beyond the point where it is no longer in contact with the tip of the latch arm.

Unless relays are ordered with the drum set up for a specific reclosing cycle, they are shipped with the gearing set at the 60-second speed, and with an instantaneous first reclosure and two subsequent reclosures at 15 seconds and 45 seconds from the start of the cycle.

The intervals can readily be changed to any other desired values by loosening the screws by about one turn, sliding them to the desired position, and re-tightening them. Also, additional screws, washers and lockwashers for the drum are shipped with the relay so that the drum can be set up to make a greater number of reclosures if necessary.

The exposed bearings and gearing of the relay should not be lubricated. The motor bearing contains a supply of special lubricant sufficient for from three to five years service. This lubricant does not congeal at low temperatures and permits satisfactory operation of the motor at ambient temperatures of 30° F to -40° F, such as sometimes may

occur in installations of outdoor switch housing. This oil is available in 1 oz. bottles under S#1538840.

REPAIRS AND 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.

ENERGY REQUIREMENTS

The maximum burdens for the various elements of the standard RC relay when energized from a 115 V. 60 cycle supply are listed below:

Contactor Element (Device 79X)
Open position ----------47 v. a.
Closed position ----------32 v. a.

Solenoid Element (Device 79Y)
Open position ----------145 v. a.
Closed position ----------80 v. a.

Synch. Motor (Device 79M) -8 v. a.
Auxiliary elem. (Device 79Z)
When Used
Closed position - 10 v. a. at 115 V
60 Cycle
3.5 watts at
125 V. D. C.

The burdens of the X and Y elements occur only momentarily during the reclosing cycle but the motor, of course, is energized throughout the reclosing cycle. The X and Y elements can be energized for a 5 minute period and the motor for a 15 minute period without injury, which gives then an ample factor of safety for their duty cycle. The Z element can be energized continuously.

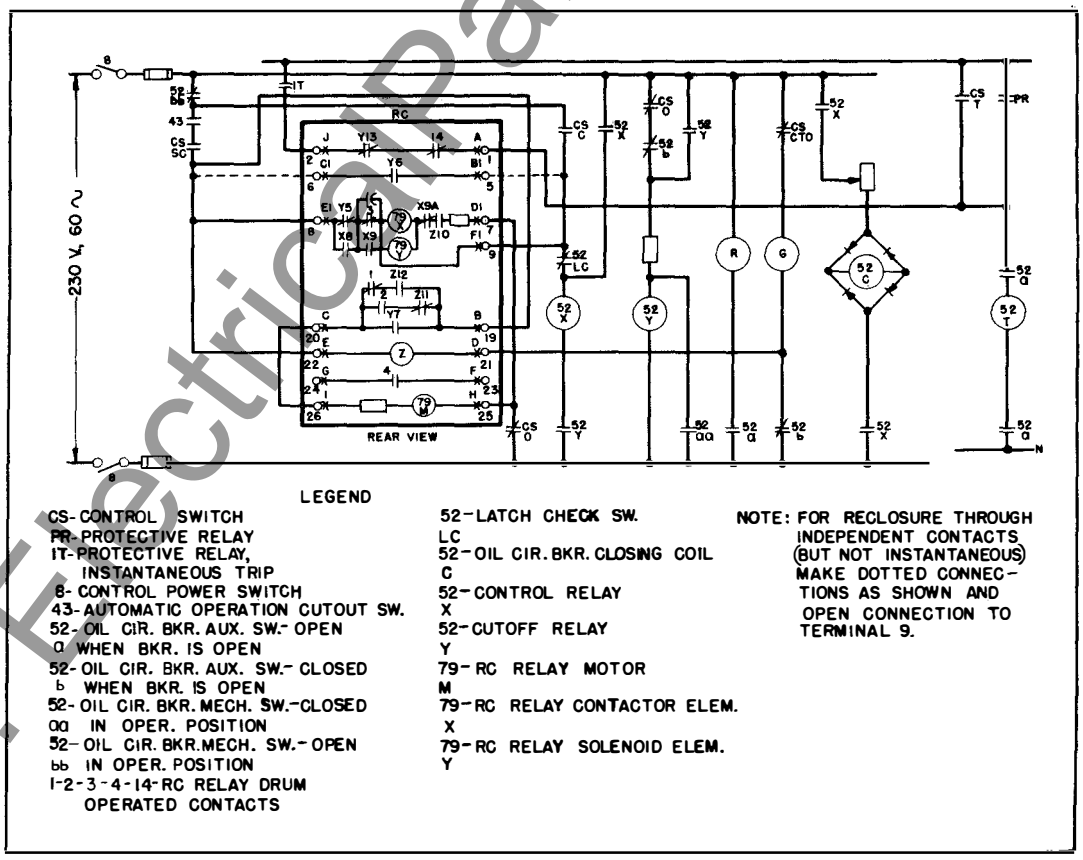

Fig. 7—Typical External Connections of the Type RC Reclosing Relay With Z Element, in Either Standard or Flexitest Case. Used in an A.C. Breaker Control Circuit.

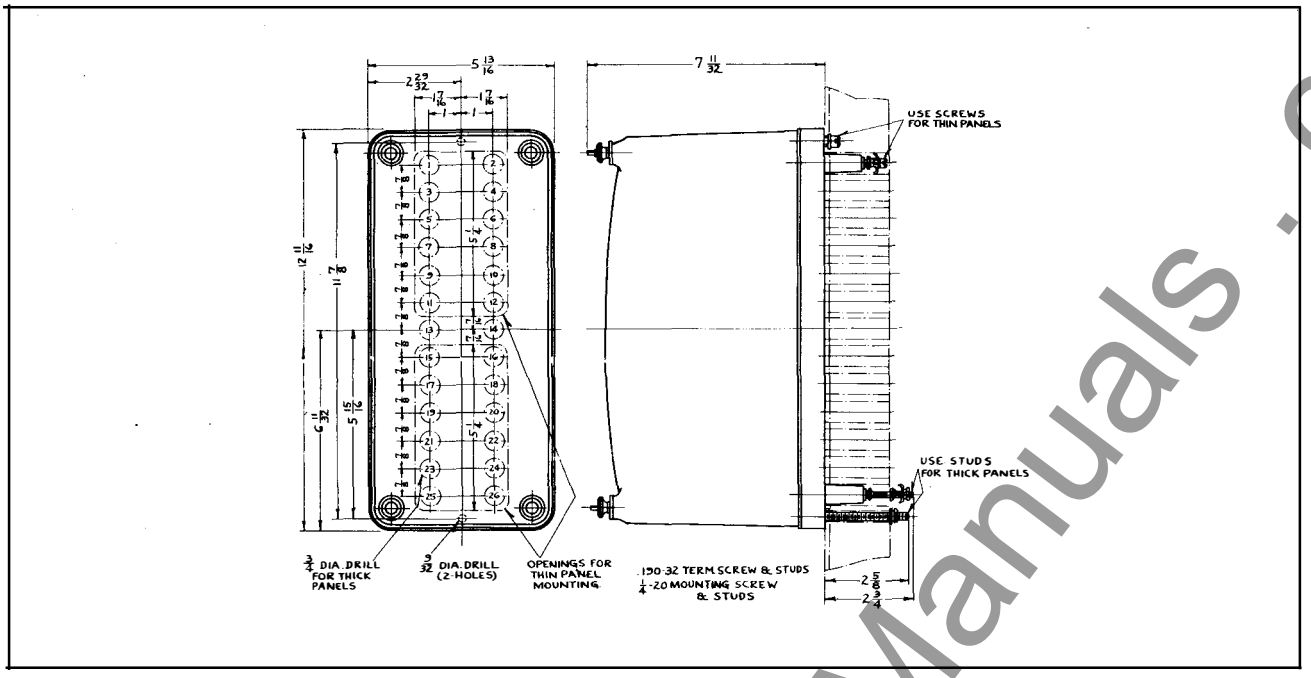

Fig. 8—Outline and Drilling Plan for the Standard Projection Case. See the Internal Schematic for the Terminals Supplied. For Reference Only.

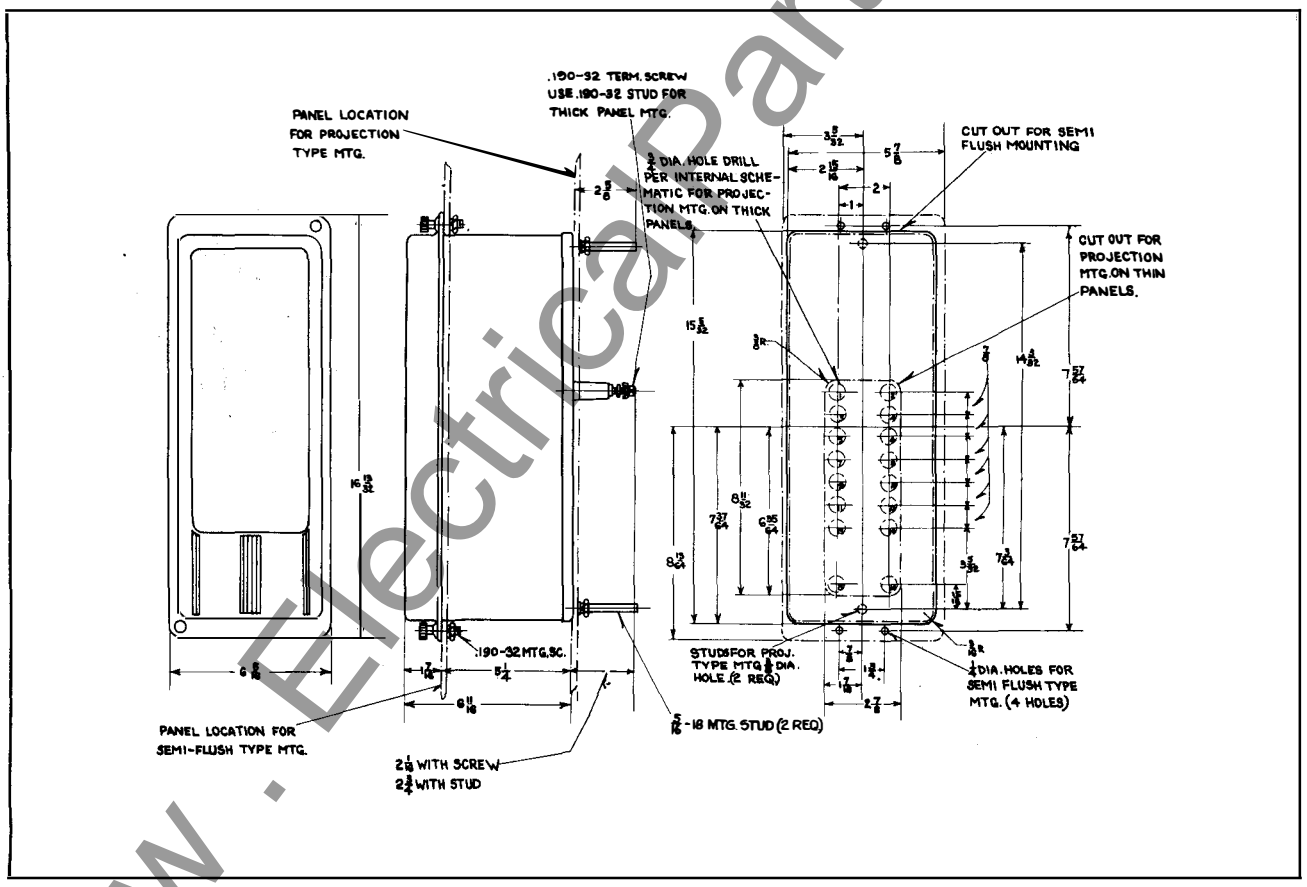

Fig. 9—Outline and Drilling Plan for the M-20 Projection or Semi-Flush Type FT Flexitest Case. See the Internal Schematic for Terminals Supplied. For Reference Only.

WESTINGHOUSE ELECTRIC CORPORATION
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