INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPES RS AND RSN CARRIER AUXILIARY RELAYS WITH GROUND PREFERENCE FOR PLATE KEYED CARRIER SETS

CAUTION Before putting protective 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 RS relay is an auxiliary relay used in the carrier relaying scheme to block or prevent instantaneous tripping for faults external to the line section to which it is applied and to permit instantaneous simultaneous tripping for internal faults. The relay is arranged to respond to indications of fault power and direction provided by the phase and ground relays, thereby controlling the transmission of the carrier signals. The response to ground faults may be given preference over the response to phase faults.

The type RSN relay is identical to the type RS except that it includes additional blocking elements to prevent tripping due to out-of-step system conditions. These elements do not prevent or delay instantaneous fault tripping during out-of-step conditions except for three phase faults. Three phase faults occurring during out-of-step conditions can be cleared by tripping after a short time delay.

For type HZ carrier relaying either the RS or RSN relay may be used depending on application requirements. With type HZM distance relays, however, the RS relay, which has no out-of-step blocking facilities, is always used. The HZM relay is set so that it does not trip for power swings from which the system can recover without going out-of-step. If the system does go out-of-step, tripping may be desired. To meet this requirement, a separate impedance-type out-of-step tripping relay is used. The out-of-step elements of the RSN cannot be used since the Z3 element of the HZM relay is set with its maximum reach opposite to that of the Z2 element.

CONSTRUCTION AND OPERATION

The type RS or RSN relay consists of directional auxiliary, receiver and alarm units, contactor switches and operation indicators. In addition, the type RSN relay contains three voltage units, a combination pendulum and time-delay drop-out relays which are the out-of-step elements. The construction and operation of the relay units are described below. Complete details of the operation of this relay in the carrier relaying scheme is described in I.L. 41-904.

Directional Auxiliary Elements

These are two solenoid type contactor switches designated as CSP and CSG. The plunger of the contactor switch operates a spring leaf arm with a silver contact surface on one end and rigidly fixed to the frame on the other end. The stationary contact is also fastened to the frame and in the deenergized position the contacts are held closed by the leaf spring. When the coil is energized, the plunger travels upward breaking the contacts. The CSP switch is energized by the operation of the directional and second impedance units of the phase relays, and the CSG switch, by the operation of the directional and overcurrent elements of the ground relay. The back contacts of the two switches are connected in series in the oscillator and amplifier cathode circuits. The operation of either of these switches opens up the cathode circuit to stop carrier and to open the short around the

RRT Operating Coil. Ground preference is obtained by the connection of the auxiliary (CSO) contacts in parallel with CSP contacts. In this case if the ground relay starts carrier, the phase relays cannot stop carrier and thus the ground relay completely supersedes the phase relays, as far as carrier control is concerned.

Receiver Unit

The polarized relay consists of an armature and contacts 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, as shown in Fig. 3, 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 right, depending upon the adjustment.

Two stationary contact screws are mounted to the left (front view) of the moving contact assembly and adjusted for normally open contacts. These contacts are designated, RRP and RRG, and are connected in the phase and ground trip circuits respectively. One stationary contact screw is mounted to the right of the assembly and adjusted for normally closed contact. This contact is designated RRB and used in connection with the Out-of-step protection features. These contacts are operated by two concentric coils, RRT and RRH, which are placed around the armature and within the magnetic frame. RRT is the operating coil and receives its energy from the local battery when either CSP or CSG is opened. RRH is the holding coil and receives its energy from the carrier transmitted either from the local transmitter or the one at the other end of the section. These two coils are connected to oppose each other with the operating coil RRT, operating to close the RRP and RRG contacts and trip; and the holding coil, RRH to hold the RRP and RRG contacts open and block tripping. The restraining torque of the RRH coil is sufficient to overcome the operating torque

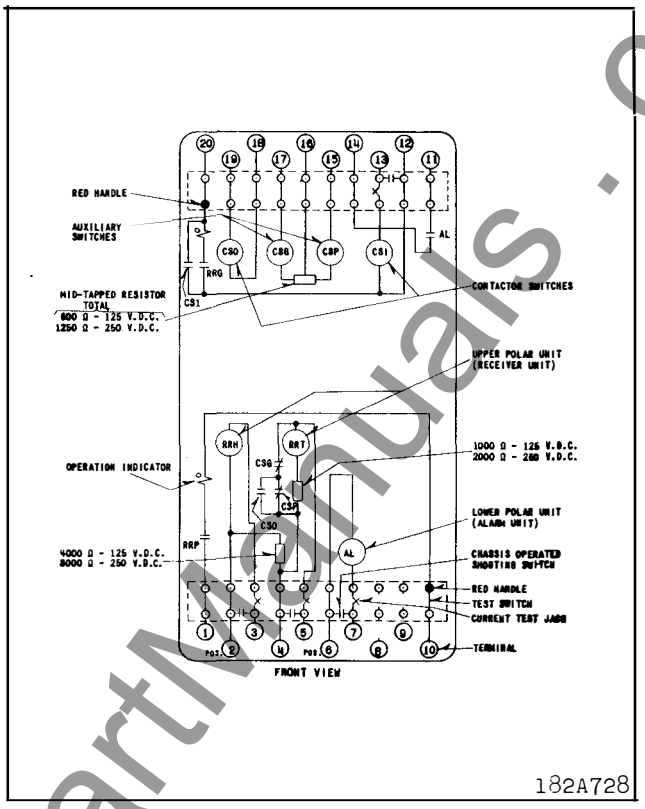


Fig. 1. Internal Schematic of the Type RS Relay in Type FT42 Case.

of the RRT coil. Consequently, RRP and RRG contacts cannot close as long as RRH is energized.

Alarm Unit

The alarm unit is similar in construction to the receiver element except that it is energized by a single coil and operates a single set of contacts. The coil is energized by the received carrier to close the contacts and give an alarm. This unit has a higher-pick-up than that of the receiver unit in order to obtain a direct check on the sensitivity of the tubes in the carrier transmitter-receiver. The failure of the alarm relay to pick-up when carrier is started indicates insufficient output from the transmitter-receivers.

Contactor Switch

The contactor switches CS1 and CSO are small solenoid auxiliary switches connected in series in the trip circuit. The plunger of the switch has a circular conducting disc

mounted on its lower end, and as the plunger travels upward, the disc bridges three silver stationary contacts. The contacts of CS1 seal in the RRG trip circuit until the auxiliary switch on the breaker opens the trip circuit. The contacts of CSO are in parallel with the CSP contacts so that ground faults will take preference over phase faults.

Operation Indicators

Two operation indicators show whether the fault was a phase fault or a ground fault by indicating which relays did the actual tripping, the phase relays thru RRP, or the ground relay thru RRG.

Out-of-Step Elements

The three voltage units designated as A, B, and C are contactor switches similar to those described above except that each is provided with a set of back or normally closed contacts as well as the normal make contacts. Their coils are energized by the third impedance unit of the corresponding phase relay thru the contacts of an auxiliary switch CSA from the trip voltage source. The back contacts of the voltage elements are connected in parallel and permit tripping as long as any one of the back contacts is closed. The front contacts of the voltage elements are in series with the back contact on the receiver element, RRB, and the coil of the pendulum relay.

The pendulum relay is a telephone type relay with a horizontal spring arm extending between two contact points. A counterweight is fastened to the free end of the arm. The X2 relay is a telephone type relay with slow drop-out characteristics. A solenoid attracts an iron right-angle bracket which in turn operates a set of break and make contacts. Drop-out delay is obtained by the air gap and adjustment between the solenoid core and the armature, and the copper slug on the core. X2 is energized by the pendulum relay contacts with its back contact in parallel with the back contacts of the voltage switches and connected in the phase trip circuit. When the pendulum relay is energized, its arm is pulled downward, to close the lower contact. This energized the X2 relay. After the pendulum relay is deenergized, the pendulum will oscillate for a short time alternately breaking and making both of its contacts. Consequently, the X2 relay will not drop-out until after the pendulum oscillations have deenergized its coil. The complete operation of these elements during out-of-step are explained in connection with the operation of the carrier scheme. See I.L. 41-904.

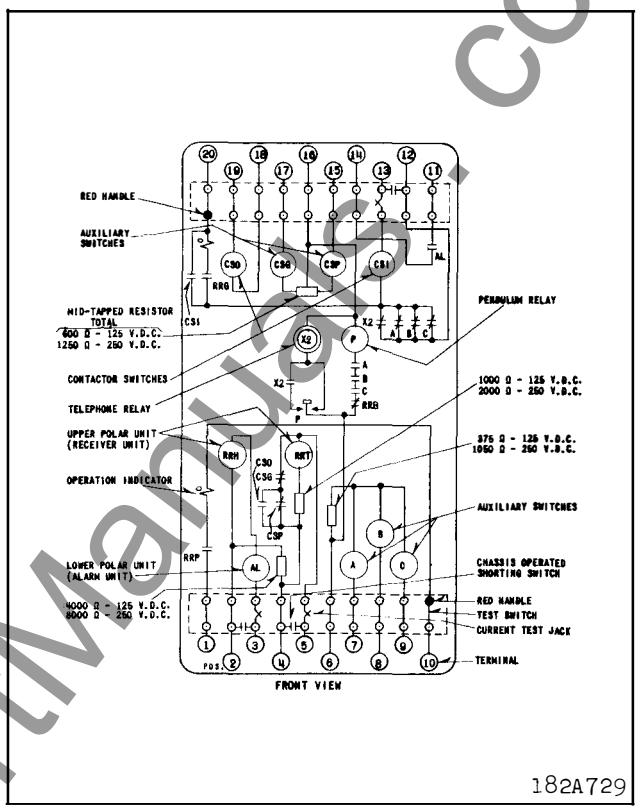


Fig. 2. Internal Schematic of the Type RSN Relay in Type FT42 Case.

CHARACTERISTICS

The characteristics of the various elements of the relays are as follows:

	125 Volts Avg. Ohms	250 Volts Avg. Ohms
CSP or CSG Coil	70	70
CSP & CSG Tapped Resistor	600	1250
Carrier Resistor	4000	8000
RRT Operating Coil	1100	1100
RRT Coil Resistor	1000	2000
RRH Holding Coil	1700	1700
AL Alarm Coil	500	500
P Pendulum Relay	2000	2000
A, B, C, Contactor Switches	1170	1170
X2 Telephone Relay	2000	2000
CS1 Contactor Switch(2 amps)	0.23	0.13
CSO Contactor Switch	27	27
Operation Indicator (1 amp.)	0.16	0.16

The pick-up and operating values of these elements are given under "Adjustments and Maintenance".

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 four mounting holes on the flange for semi-flush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

The carrier relaying d-c schematic (supplied with the carrier order) should be consulted for details of the external connections of these relays.

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.

All contacts should be cleaned periodically. A contact burnisher S#182A836H01 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.

Directional Auxiliary Units

The two contactor switches, CSP and CSG, have adjustable plunger travel. Adjust the two nuts on the bottom of the fixed shaft so that the plunger has 3/16" travel after the lower contacts make. The plunger should have 1/64" travel in the opposite direction after the upper contacts make. This is accomplished by screwing down the set screw on top of the switch until the upper contacts are just able to make as the plunger hits the upper stop. Then back off this screw one turn and lock in place.

Each contactor switch has a section of a tapped resistor in series with it, and will pick up positively when rated trip circuit voltage is applied across the coil and its section of the resistor.

The pick-up of the coil and its resistor is 45-60 volts for the 125 volt relays and 90-120 volts for 250 volt relay. These elements have an intermittent rating, and should not be energized for more than a few seconds.

Polar Receiver Unit

Back off contact screws so that they do not make contact. Screw magnetic shunts into the all-out position (5 or 6 screw threads showing.) The armature should remain against whichever side it is pushed with this adjustment.

Contact Adjustment

Push the armature to the left, and adjust both left hand contacts until they barely make a light circuit. At this point, give both stationary contacts an additional three turn follow. Then push the armature to the right and adjust the top and bottom right hand contact stops for three turns follow, and then the center contact for three and one-half turns follow.

Calibration

Apply 125 volts D.C. to the 125 volt relay or 250 volts D.C. to the 250 volt relay across the RRT coil, operating coil resistor, and the carrier resistor in series, with polarity as shown in the schematic diagram.

The CSP and CSG back contacts should be blocked open. The armature should move to the left when observing the polar unit from the front. (all future references to armature movement shall be given as viewed from the front of the relay).

To the holding coil, RRH, apply 10 to 20 milliamperes d.c. current observing correct polarity. The armature should now move to the right. De-energize both coils and see that the back contacts stay closed, or simply that the armature stays up against the right hand contact stops.

Run both shunt screws all the way in, and then back out the left hand shunt screw approximately 6 turns. Back out the right hand shunt screw approximately 9 turns.

Re-energize the operating coil with 125 or 250 volts d.c. and the holding coil with 4 milliamperes d.c. Adjust the right hand contact shunt screw until the armature moves to the left. If the armature moves to the left, at a value of holding coil current greater than 4 milliamperes, the right hand shunt screw should be turned out to lower this value to the correct 4 milliampere point.

Increase the holding coil current to 6 milliamperes and adjust the left hand shunt screw until the armature resets, or moves to the right. If the armature resets at a value of current less than 6 milliamperes, the left hand shunt screw should be turned out. This will increase the reset value of the armature and provide for the correct 6 milliampere reset value.

Minor adjustments of both shunt screws must be made several times until the desired operating points are obtained, since the adjustments of one shunt screw affect the adjustment on the other shunt screw.

If adjustments of the two shunt screws do not give proper calibration, it will usually be necessary to reduce or increase the contact follow depending upon whether the current differential, between pickup and dropout, is too small or too large.

The armature should operate with a snappy action at both the opening and closing values of holding coil current.

Polar Alarm Unit (Normal Adjustment)
Contact Adjustment

Adjust the right and left hand contacts for three turns follow as described under contact adjustment of the polar receiver unit.

Calibration

Turn both shunt screws all the way in. Then back out both shunt screws approximately seven turns. Apply 8 milliamperes d.c. to the coil observing correct polarity, and then screw in the left hand shunt screw until the armature moves to the right. If the armature moves to the right at a value of current less than 8 milliamperes, screw the left hand shunt out until the armature moves to the right at 8 milliamperes. Check the dropout point by reducing the d.c. current. The armature should move to the left between the limits of 4 and 6 milliamperes. If it fails to do so, adjust the right hand shunt screw until it does. It will then be necessary to recheck the pickup and dropout points again and make any minor adjustments to the shunt screws that may be necessary until correct calibration is obtained.

In general, screwing in the left hand shunt screw reduces the pickup current of the relay. Screwing in the right hand shunt screw increases the dropout current. This will in turn cause a change in the pickup current, making necessary several slight readjustments of both shunt screws to obtain the desired calibration. The armature as finally calibrated should pickup and dropout with a snappy action.

Polar Alarm Unit (Telemetering Adjustment)

Telemetering impulses over the carrier channel would normally impulse the alarm element and the alarm bell unless they are disconnected. To retain the alarm feature for communication signalling, a time delay circuit

is used which requires reconnection and readjustment of the alarm unit to have the opposite polarity and normally closed contacts. Where specified, this adjustment is made before shipment. This adjustment gives approximately 1 second delay.

Contact Adjustment

Adjust the right and left hand contacts for three and one-half turns follow as described under contact adjustment of the polar receiver unit.

Calibration

Turn both shunt screws all the way in. Then back out both shunt screw approximately seven turns. Reverse the polarity of the coil and apply 6 milliamperes d.c. to the coil. The armature should move to the left at this value of current. If the armature moves to the left at values of current greater than 6 milliamperes d.c., screw in the right hand shunt screw, and if the armature moves to the left at values of current less than 6 milliamperes, the right hand shunt screw should be turned out.

Decrease the current to 1 milliampere and if the armature does not move to the right at this value of current, screw in the left hand shunt screw until it does move to the right.

As finally calibrated, the contacts should open at 6 milliamperes or less, and close at 1 milliampere.

The pickup and dropout points should be rechecked since any change of the shunts affects both calibration points.

If proper calibration cannot be attained by use of the two shunt screws, it will usually be necessary to increase or decrease the follow of the contacts.

With the polar alarm unit coil de-energized, the armature should stay up against the right hand contact assembly as finally calibrated. Snappy action of the armature should occur at both the pickup and dropout calibration points.

CSI and CSO Contactor Switches

* 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 and screwing up the core screw of the switch until the contacts just separate. Then 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 CS-1 switch should pick up at 2 amperes d.c. Test for sticking after 30 amperes d-c is passed thru the coil. The CSO switch should pick up at .12 amperes D.C. Test for sticking at 1.0 ampere D.C.

Operation Indicator

Adjust the indicators to operate at one ampere d-c gradually increased. Test for sticking after 30 amperes d-c has been applied. Check the indicator and the contactor. switches at 5 and 30 amperes d-c to make sure that the indicator operates before its coil is shorted by the contactor switch.

Out of Step Blocking Units
for Type RSN Relay Only

Telephone Relay

Energize the telephone relay, X2, by applying 80 volts d-c with the pendulum relay armature held in the operated position. The telephone relay should operate positively, when the pendulum relay armature is held down to make the lower contact and should not operate when the armature is held up to make the top contact.

Pendulum Relay

To check the operation of the pendulum relay, connect jumpers across the make contact

on the voltage elements, A, B, and C, and apply 125 volts or 250 volts d-c across the pendulum relay. (The voltage will depend upon the relay range.) The pendulum relay armature should be pulled against the core screw and the X2 telephone relay should pick-up. Remove the jumpers from the voltage switch contacts. The pendulum relay armature should oscillate and hold the X2 relay closed for approximately 3 seconds. This is the standard factory adjustment. The drop-out of the pendulum and X2 relay combination can be adjusted from approximately 20 cycles to 10 seconds. The drop out time of X2 is adjusted by means of the armature set screw. The time that P will keep X2 picked up is adjusted by changing the spacing of the two outer contacts of the P relay.

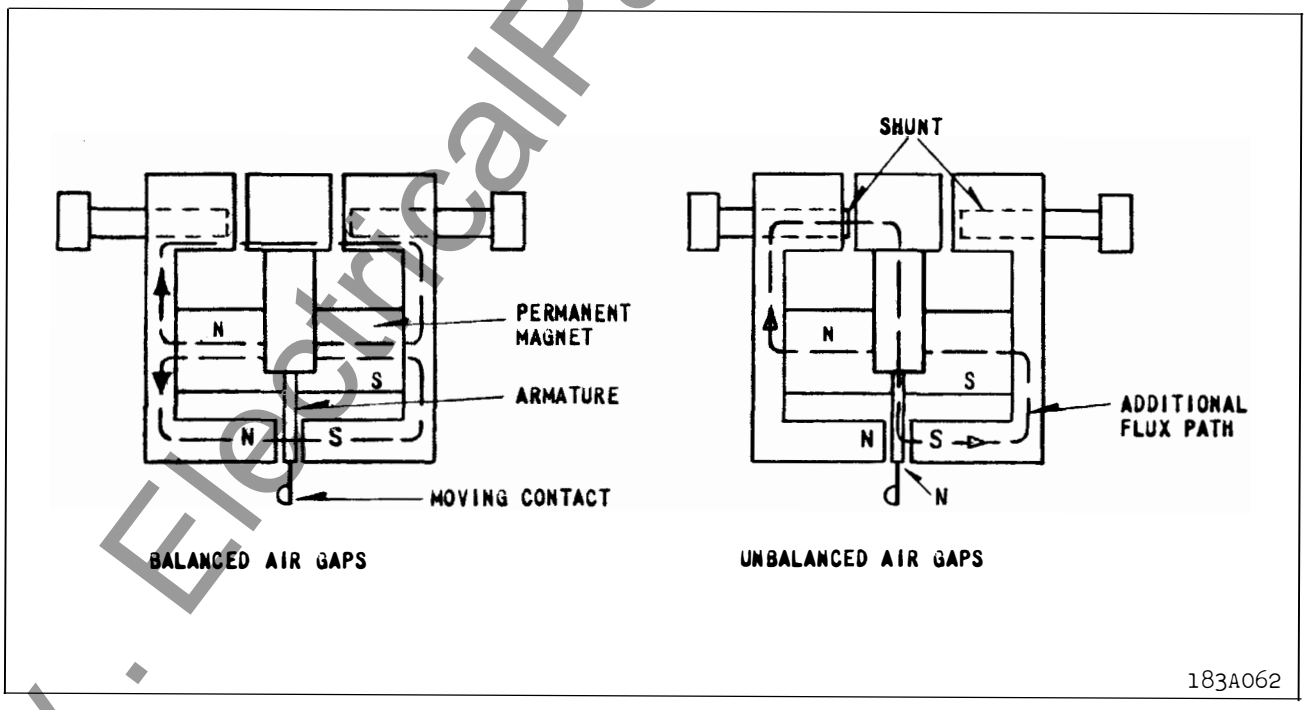
Voltage Switches

Voltage switches, A, B, and C, should be adjusted so that there is a clearance of 1/64" between the plunger and the core with the plunger picked up.

Energize each switch separately thru the common resistor. The switches should pick-up at 35 volts for the 125-volt relay and 50 volts for the 250-volt relay. Check to make sure the switches do not stick closed after rated voltage (125 to 250 volts) is applied.

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.



✱ *Fig. 3. Polar Unit Permanent Magnet Flux Paths.*

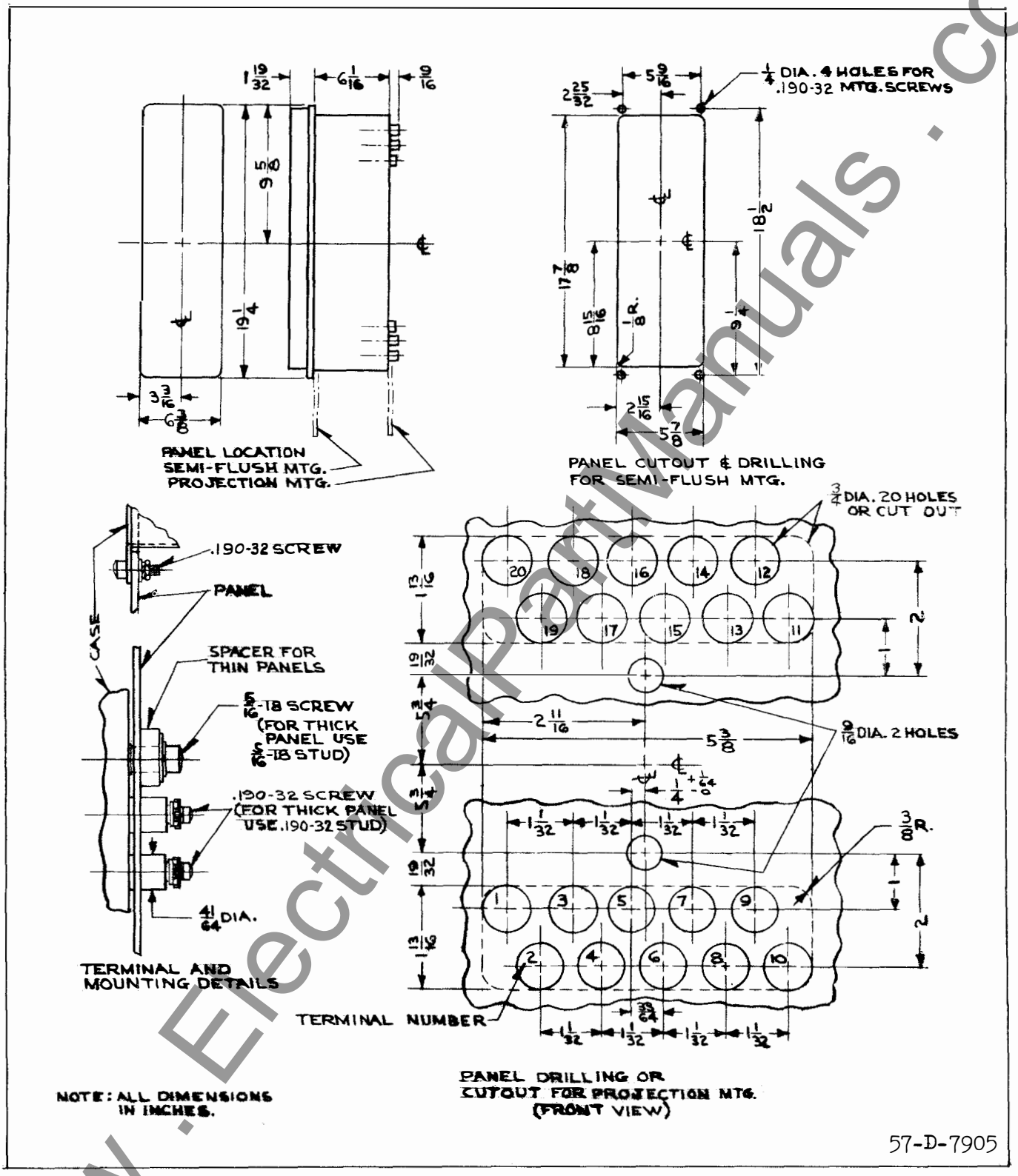


Fig. 4. Outline and Drilling Plan for the Type RS and RSN Relays in the Type FT42 Case.

INSTALLATION • OPERATION • MAINTENANCE

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APPLICATION

The type RS relay is an auxiliary relay used in the carrier relaying scheme to block or prevent instantaneous tripping for faults external to the line section to which it is applied and to permit instantaneous simultaneous tripping for internal faults. The relay is arranged to respond to indications of fault power and direction provided by the phase and ground relays, thereby controlling the transmission of the carrier signals. The response to ground faults may be given preference over the response to phase faults.

The type RSN relay is identical to the type RS except that it includes additional blocking elements to prevent tripping due to out-of-step system conditions. These elements do not prevent or delay instantaneous fault tripping during out-of-step conditions except for three phase faults. Three phase faults occurring during out-of-step conditions can be cleared by tripping after a short time delay.

For type HZ carrier relaying either the RS or RSN relay may be used depending on application requirements. With type HZM distance relays, however, the RS relay, which has no out-of-step blocking facilities, is always used. The HZM relay is set so that it does not trip for power swings from which the system can recover without going out-of-step. If the system does go out-of-step, tripping may be desired. To meet this requirement, a separate impedance-type out-of-step tripping relay is used. The out-of-step elements of the RSN cannot be used since the Z3 element of the HZM relay is set with its maximum reach opposite to that of the Z2 element.

CONSTRUCTION AND OPERATION

The type RS or RSN relay consists of directional auxiliary, receiver and alarm units, contactor switches and operation indicators. In addition, the type RSN relay contains three voltage units, a combination pendulum and time-delay drop-out relays which are the out-of-step elements. The construction and operation of the relay units are described below. Complete details of the operation of this relay in the carrier relaying scheme is described in I.L. 41-904.

Directional Auxiliary Elements

These are two solenoid type contactor switches designated as CSP and CSG. The plunger of the contactor switch operates a spring leaf arm with a silver contact surface on one end and rigidly fixed to the frame on the other end. The stationary contact is also fastened to the frame and in the deenergized position the contacts are held closed by the leaf spring. When the coil is energized, the plunger travels upward breaking the contacts. The CSP switch is energized by the operation of the directional and second impedance units of the phase relays, and the CSG switch, by the operation of the directional and overcurrent elements of the ground relay. The back contacts of the two switches are connected in series in the oscillator and amplifier cathode circuits. The operation of either of these switches opens up the cathode circuit to stop carrier and to open the short around the

RRT Operating Coil. Ground preference is obtained by the connection of the auxiliary (CSO) contacts in parallel with CSP contacts. In this case if the ground relay starts carrier, the phase relays cannot stop carrier and thus the ground relay completely supersedes the phase relays, as far as carrier control is concerned.

Receiver Unit

The polarized relay consists of an armature and contacts 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, as shown in Fig. 3, 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 right, depending upon the adjustment.

Two stationary contact screws are mounted to the left (front view) of the moving contact assembly and adjusted for normally open contacts. These contacts are designated, RRP and RRG, and are connected in the phase and ground trip circuits respectively. One stationary contact screw is mounted to the right of the assembly and adjusted for normally closed contact. This contact is designated RRB and used in connection with the Out-of-step protection features. These contacts are operated by two concentric coils, RRT and RRH, which are placed around the armature and within the magnetic frame. RRT is the operating coil and receives its energy from the local battery when either CSP or CSG is opened. RRH is the holding coil and receives its energy from the carrier transmitted either from the local transmitter or the one at the other end of the section. These two coils are connected to oppose each other with the operating coil RRT, operating to close the RRP and RRG contacts and trip; and the holding coil, RRH to hold the RRP and RRG contacts open and block tripping. The restraining torque of the RRH coil is sufficient to overcome the operating torque

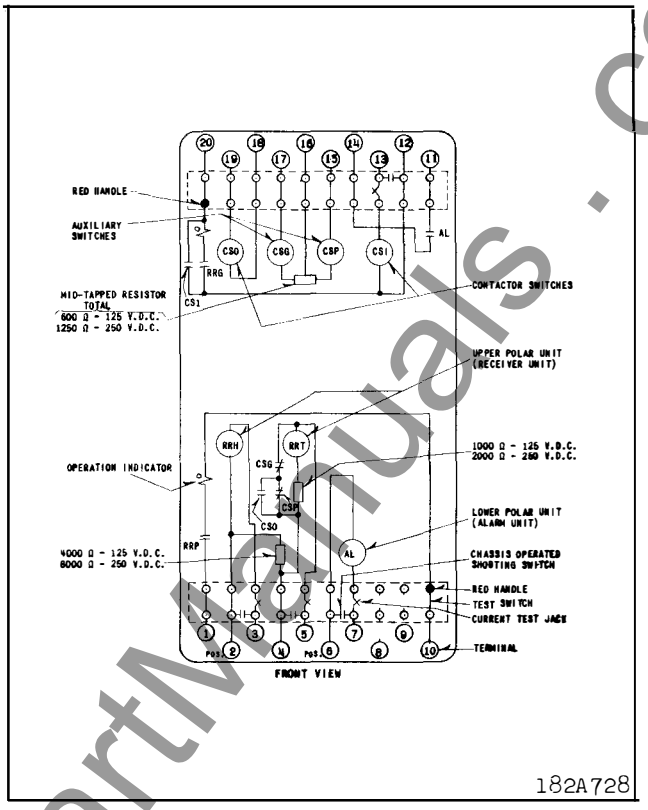

Fig. 1. Internal Schematic of the Type RS Relay in Type FT42 Case.

of the RRT coil. Consequently, RRP and RRG contacts cannot close as long as RRH is energized.

Alarm Unit

The alarm unit is similar in construction to the receiver element except that it is energized by a single coil and operates a single set of contacts. The coil is energized by the received carrier to close the contacts and give an alarm. This unit has a higher-pick-up than that of the receiver unit in order to obtain a direct check on the sensitivity of the tubes in the carrier transmitter-receiver. The failure of the alarm relay to pick-up when carrier is started indicates insufficient output from the transmitter-receivers.

Contactor Switch

The contactor switches CS1 and CSO are small solenoid auxiliary switches connected in series in the trip circuit. The plunger of the switch has a circular conducting disc

mounted on its lower end, and as the plunger travels upward, the disc bridges three silver stationary contacts. The contacts of CS1 seal in the RRG trip circuit until the auxiliary switch on the breaker opens the trip circuit. The contacts of CSO are in parallel with the CSP contacts so that ground faults will take preference over phase faults.

Operation Indicators

Two operation indicators show whether the fault was a phase fault or a ground fault by indicating which relays did the actual tripping, the phase relays thru RRP, or the ground relay thru RRG.

Out-of-Step Elements

The three voltage units designated as A, B, and C are contactor switches similar to those described above except that each is provided with a set of back or normally closed contacts as well as the normal make contacts. Their coils are energized by the third impedance unit of the corresponding phase relay thru the contacts of an auxiliary switch CSA from the trip voltage source. The back contacts of the voltage elements are connected in parallel and permit tripping as long as any one of the back contacts is closed. The front contacts of the voltage elements are in series with the back contact on the receiver element, RRB, and the coil of the pendulum relay.

The pendulum relay is a telephone type relay with a horizontal spring arm extending between two contact points. A counterweight is fastened to the free end of the arm. The X2 relay is a telephone type relay with slow drop-out characteristics. A solenoid attracts an iron right-angle bracket which in turn operates a set of break and make contacts. Drop-out delay is obtained by the air gap and adjustment between the solenoid core and the armature, and the copper slug on the core. X2 is energized by the pendulum relay contacts with its back contact in parallel with the back contacts of the voltage switches and connected in the phase trip circuit. When the pendulum relay is energized, its arm is pulled downward, to close the lower contact. This energized the X2 relay. After the pendulum relay is deenergized, the pendulum will oscillate for a short time alternately breaking and making both of its contacts. Consequently, the X2 relay will not drop-out until after the pendulum oscillations have deenergized its coil. The complete operation of these elements during out-of-step are explained in connection with the operation of the carrier scheme. See I.L. 41-904.

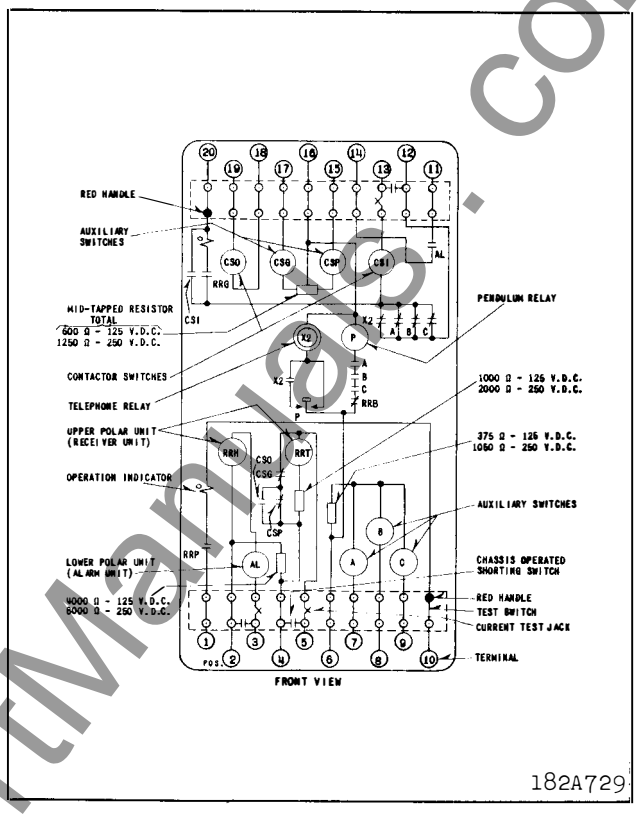

Fig. 2. Internal Schematic of the Type RSN Relay in Type FT42 Case.

CHARACTERISTICS

The characteristics of the various elements of the relays are as follows:

	125 Volts Avg. Ohms	250 Volts Avg. Ohms
CSP or CSG Coil	70	70
CSP & CSG Tapped Resistor	600	1250
Carrier Resistor	4000	8000
RRT Operating Coil	1100	1100
RRT Coil Resistor	1000	2000
RRH Holding Coil	1700	1700
AL Alarm Coil	500	500
P Pendulum Relay	2000	2000
A, B, C, Contactor Switches	1170	1170
X2 Telephone Relay	2000	2000
CS1 Contactor Switch(2 amps)	0.23	0.13
CSO Contactor Switch	27	27
Operation Indicator (1 amp.)	0.16	0.16

The pick-up and operating values of these elements are given under "Adjustments and Maintenance".

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 four mounting holes on the flange for semi-flush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

The carrier relaying d-c schematic (supplied with the carrier order) should be consulted for details of the external connections of these relays.

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.

All contacts should be cleaned periodically. A contact burnisher S#182A836H01 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.

Directional Auxiliary Units

The two contactor switches, CSP and CSG, have adjustable plunger travel. Adjust the two nuts on the bottom of the fixed shaft so that the plunger has 3/16" travel after the lower contacts make. The plunger should have 1/64" travel in the opposite direction after the upper contacts make. This is accomplished by screwing down the set screw on top of the switch until the upper contacts are just able to make as the plunger hits the upper stop. Then back off this screw one turn and lock in place.

Each contactor switch has a section of a tapped resistor in series with it, and will pick up positively when rated trip circuit voltage is applied across the coil and its section of the resistor.

The pick-up of the coil and its resistor is 45-60 volts for the 125 volt relays and 90-120 volts for 250 volt relay. These elements have an intermittent rating, and should not be energized for more than a few seconds.

Polar Receiver Unit

Back off contact screws so that they do not make contact. Screw magnetic shunts into the all-out position (5 or 6 screw threads showing.) The armature should remain against whichever side it is pushed with this adjustment.

Contact Adjustment

Push the armature to the left, and adjust both left hand contacts until they barely make a light circuit. At this point, give both stationary contacts an additional three turn follow. Then push the armature to the right and adjust the top and bottom right hand contact stops for three turns follow, and then the center contact for three and one-half turns follow.

Calibration

Apply 125 volts D.C. to the 125 volt relay or 250 volts D.C. to the 250 volt relay across the RRT coil, operating coil resistor, and the carrier resistor in series, with polarity as shown in the schematic diagram.

The CSP and CSG back contacts should be blocked open. The armature should move to the left when observing the polar unit from the front. (all future references to armature movement shall be given as viewed from the front of the relay).

To the holding coil, RRH, apply 10 to 20 milliamperes d.c. current observing correct polarity. The armature should now move to the right. De-energize both coils and see that the back contacts stay closed, or simply that the armature stays up against the right hand contact stops.

Run both shunt screws all the way in, and then back out the left hand shunt screw approximately 16 turns. Back out the right hand shunt screw approximately 9 turns.

Re-energize the operating coil with 125 or 250 volts d.c. and the holding coil with 4 milliamperes d.c. Adjust the right hand contact shunt screw until the armature moves to the left. If the armature moves to the left, at a value of holding coil current greater than 4 milliamperes, the right hand shunt screw should be turned out to lower this value to the correct 4 milliampere point.

Increase the holding coil current to 6 milliamperes and adjust the left hand shunt screw until the armature resets, or moves to the right. If the armature resets at a value of current less than 6 milliamperes, the left hand shunt screw should be turned out. This will increase the reset value of the armature and provide for the correct 6 milliampere reset value.

Minor adjustments of both shunt screws must be made several times until the desired operating points are obtained, since the adjustments of one shunt screw affect the adjustment on the other shunt screw.

If adjustments of the two shunt screws do not give proper calibration, it will usually be necessary to reduce or increase the contact follow depending upon whether the current differential, between pickup and dropout, is too small or too large.

The armature should operate with a snappy action at both the opening and closing values of holding coil current.

Polar Alarm Unit (Normal Adjustment)

Contact Adjustment

Adjust the right and left hand contacts for three turns follow as described under contact adjustment of the polar receiver unit.

Calibration

Turn both shunt screws all the way in. Then back out both shunt screws approximately seven turns. Apply 8 milliamperes d.c. to the coil observing correct polarity, and then screw in the left hand shunt screw until the armature moves to the right. If the armature moves to the right at a value of current less than 8 milliamperes, screw the left hand shunt out until the armature moves to the right at 8 milliamperes. Check the dropout point by reducing the d.c. current. The armature should move to the left between the limits of 4 and 6 milliamperes. If it fails to do so, adjust the right hand shunt screw until it does. It will then be necessary to recheck the pickup and dropout points again and make any minor adjustments to the shunt screws that may be necessary until correct calibration is obtained.

In general, screwing in the left hand shunt screw reduces the pickup current of the relay. Screwing in the right hand shunt screw increases the dropout current. This will in turn cause a change in the pickup current, making necessary several slight readjustments of both shunt screws to obtain the desired calibration. The armature as finally calibrated should pickup and dropout with a snappy action.

Polar Alarm Unit (Telemetering Adjustment)

Telemetering impulses over the carrier channel would normally impulse the alarm element and the alarm bell unless they are disconnected. To retain the alarm feature for communication signalling, a time delay circuit

is used which requires reconnection and readjustment of the alarm unit to have the opposite polarity and normally closed contacts. Where specified, this adjustment is made before shipment. This adjustment gives approximately 1 second delay.

Contact Adjustment

Adjust the right and left hand contacts for three and one-half turns follow as described under contact adjustment of the polar receiver unit.

Calibration

Turn both shunt screws all the way in. Then back out both shunt screw approximately seven turns. Reverse the polarity of the coil and apply 6 milliamperes d.c. to the coil. The armature should move to the left at this value of current. If the armature moves to the left at values of current greater than 6 milliamperes d.c., screw in the right hand shunt screw, and if the armature moves to the left at values of current less than 6 milliamperes, the right hand shunt screw should be turned out.

Decrease the current to 1 milliampere and if the armature does not move to the right at this value of current, screw in the left hand shunt screw until it does move to the right.

As finally calibrated, the contacts should open at 6 milliamperes or less, and close at 1 milliampere.

The pickup and dropout points should be rechecked since any change of the shunts affects both calibration points.

If proper calibration cannot be attained by use of the two shunt screws, it will usually be necessary to increase or decrease the follow of the contacts.

With the polar alarm unit coil de-energized, the armature should stay up against the right hand contact assembly as finally calibrated. Snappy action of the armature should occur at both the pickup and dropout calibration points.

CSI and CSO Contactor Switches

Adjust the stationary core of the switch for a clearance between the stationary core and the moving core of 1/32" when the switch is picked up. This can be done by turning the relay up-side-down and screwing up the core screw of the switch until the contacts just separate. Then 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 CS-1 switch should pick up at 2 amperes d.c. Test for sticking after 30 amperes d-c is passed thru the coil. The CSO switch should pick up at .12 amperes D.C. Test for sticking at 1.0 ampere D.C.

Operation Indicator

Adjust the indicators to operate at one ampere d-c gradually increased. Test for sticking after 30 amperes d-c has been applied. Check the indicator and the contactor switches at 5 and 30 amperes d-c to make sure that the indicator operates before its coil is shorted by the contactor switch.

Out of Step Blocking Units
for Type RSN Relay Only

Telephone Relay

Energize the telephone relay, X2, by applying 80 volts d-c with the pendulum relay armature held in the operated position. The telephone relay should operate positively, when the pendulum relay armature is held down to make the lower contact and should not operate when the armature is held up to make the top contact.

Pendulum Relay

To check the operation of the pendulum relay, connect jumpers across the make contact

on the voltage elements, A, B, and C, and apply 125 volts or 250 volts d-c across the pendulum relay. (The voltage will depend upon the relay range.) The pendulum relay armature should be pulled against the core screw and the X2 telephone relay should pick-up. Remove the jumpers from the voltage switch contacts. The pendulum relay armature should oscillate and hold the X2 relay closed for approximately 3 seconds. This is the standard factory adjustment. The drop-out of the pendulum and X2 relay combination can be adjusted from approximately 20 cycles to 10 seconds. The drop out time of X2 is adjusted by means of the armature set screw. The time that P will keep X2 picked up is adjusted by changing the spacing of the two outer contacts of the P relay.

Voltage Switches

Voltage switches, A, B, and C, should be adjusted so that there is a clearance of 1/64" between the plunger and the core with the plunger picked up.

Energize each switch separately thru the common resistor. The switches should pick-up at 35 volts for the 125-volt relay and 50 volts for the 250-volt relay. Check to make sure the switches do not stick closed after rated voltage (125 to 250 volts) is applied.

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.

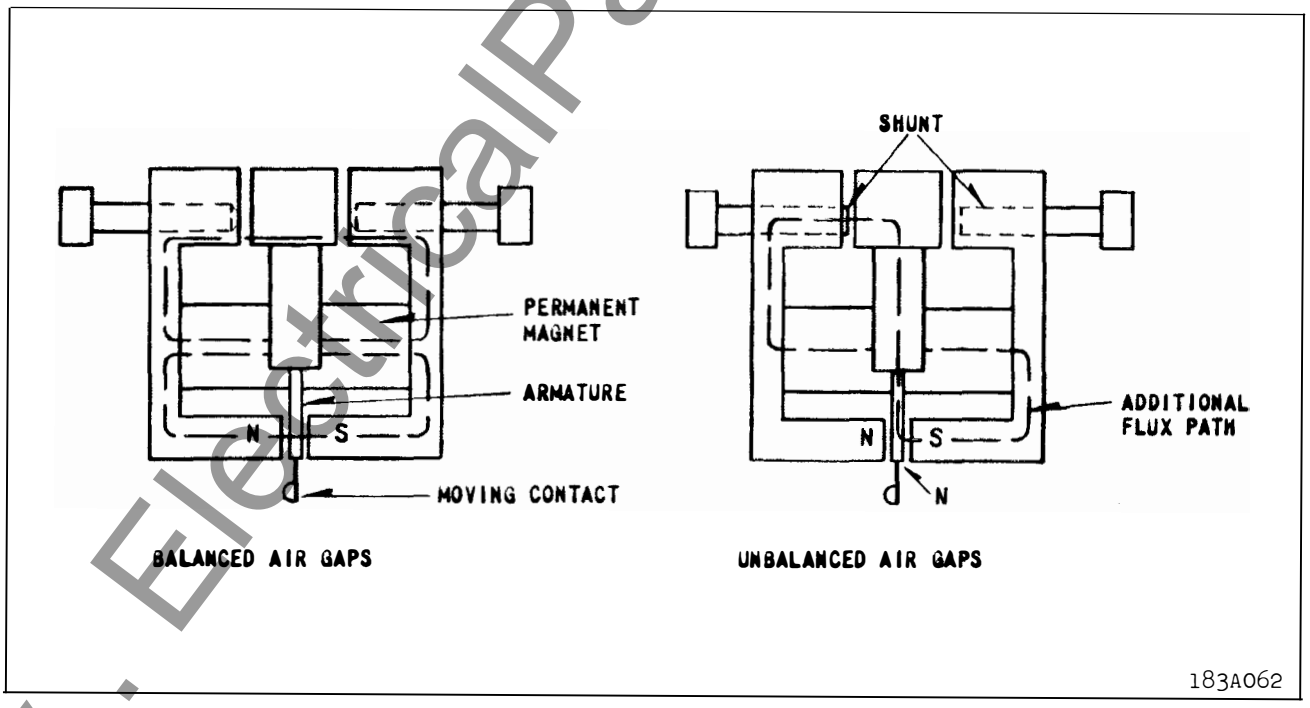

Fig. 3. Polar Unit Permanent Magnet Flux Paths.

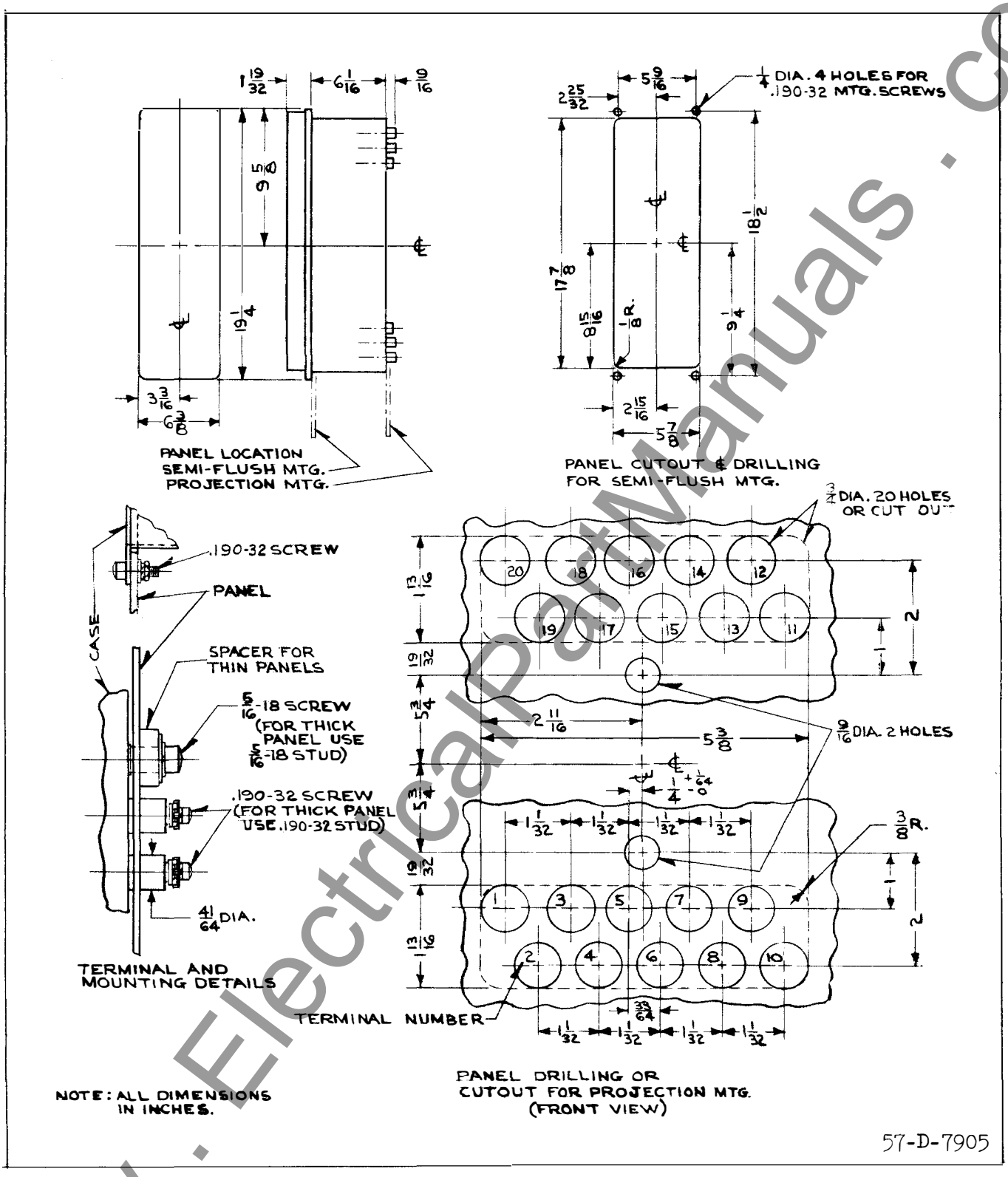

Fig. 4. Outline and Drilling Plan for the Type RS and RSN Relays in the Type FT42 Case.

WESTINGHOUSE ELECTRIC CORPORATION
METER DIVISION **NEWARK, N.J.**
Printed in U.S.A.

INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPES RS AND RSN CARRIER AUXILIARY RELAYS WITH GROUND PREFERENCE FOR PLATE KEYED CARRIER SETS

CAUTION Before putting protective 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 RS relay is an auxiliary relay used in the carrier relaying scheme to block or prevent instantaneous tripping for faults external to the line section to which it is applied and to permit instantaneous simultaneous tripping for internal faults. The relay is arranged to respond to indications of fault power and direction provided by the phase and ground relays, thereby controlling the transmission of the carrier signals. The response to ground faults may be given preference over the response to phase faults.

The type RSN relay is identical to the type RS except that it includes additional blocking elements to prevent tripping due to out-of-step system conditions. These elements do not prevent or delay instantaneous fault tripping during out-of-step conditions except for three phase faults. Three phase faults occurring during out-of-step conditions can be cleared by tripping after a short time delay.

For type HZ carrier relaying either the RS or RSN relay may be used depending on application requirements. With type HZM distance relays, however, the RS relay, which has no out-of-step blocking facilities, is always used. The HZM relay is set so that it does not trip for power swings from which the system can recover without going out-of-step. If the system does go out-of-step, tripping may be desired. To meet this requirement, a separate impedance-type out-of-step tripping relay is used. The out-of-step elements of the RSN cannot be used since the Z3 element of the HZM relay is set with its maximum reach opposite to that of the Z2 element.

CONSTRUCTION AND OPERATION

The type RS or RSN relay consists of directional auxiliary, receiver and alarm units, contactor switches and operation indicators. In addition, the type RSN relay contains three voltage units, a combination pendulum and time-delay drop-out relays which are the out-of-step elements. The construction and operation of the relay units are described below. Complete details of the operation of this relay in the carrier relaying scheme is described in I.L. 41-904.

Directional Auxiliary Elements

These are two solenoid type contactor switches designated as CSP and CSG. The plunger of the contactor switch operates a spring leaf arm with a silver contact surface on one end and rigidly fixed to the frame on the other end. The stationary contact is also fastened to the frame and in the deenergized position the contacts are held closed by the leaf spring. When the coil is energized, the plunger travels upward breaking the contacts. The CSP switch is energized by the operation of the directional and second impedance units of the phase relays, and the CSG switch, by the operation of the directional and overcurrent elements of the ground relay. The back contacts of the two switches are connected in series in the oscillator and amplifier cathode circuits. The operation of either of these switches opens up the cathode circuit to stop carrier and to open the short around the

RRT Operating Coil. Ground preference is obtained by the connection of the auxiliary (CSO) contacts in parallel with CSP contacts. In this case if the ground relay starts carrier, the phase relays cannot stop carrier and thus the ground relay completely supersedes the phase relays, as far as carrier control is concerned.

Receiver Unit

The polarized relay consists of an armature and contacts 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, as shown in Fig. 3, 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 right, depending upon the adjustment.

Two stationary contact screws are mounted to the left (front view) of the moving contact assembly and adjusted for normally open contacts. These contacts are designated, RRP and RRG, and are connected in the phase and ground trip circuits respectively. One stationary contact screw is mounted to the right of the assembly and adjusted for normally closed contact. This contact is designated RRB and used in connection with the Out-of-step protection features. These contacts are operated by two concentric coils, RRT and RRH, which are placed around the armature and within the magnetic frame. RRT is the operating coil and receives its energy from the local battery when either CSP or CSG is opened. RRH is the holding coil and receives its energy from the carrier transmitted either from the local transmitter or the one at the other end of the section. These two coils are connected to oppose each other with the operating coil RRT, operating to close the RRP and RRG contacts and trip; and the holding coil, RRH to hold the RRP and RRG contacts open and block tripping. The restraining torque of the RRH coil is sufficient to overcome the operating torque

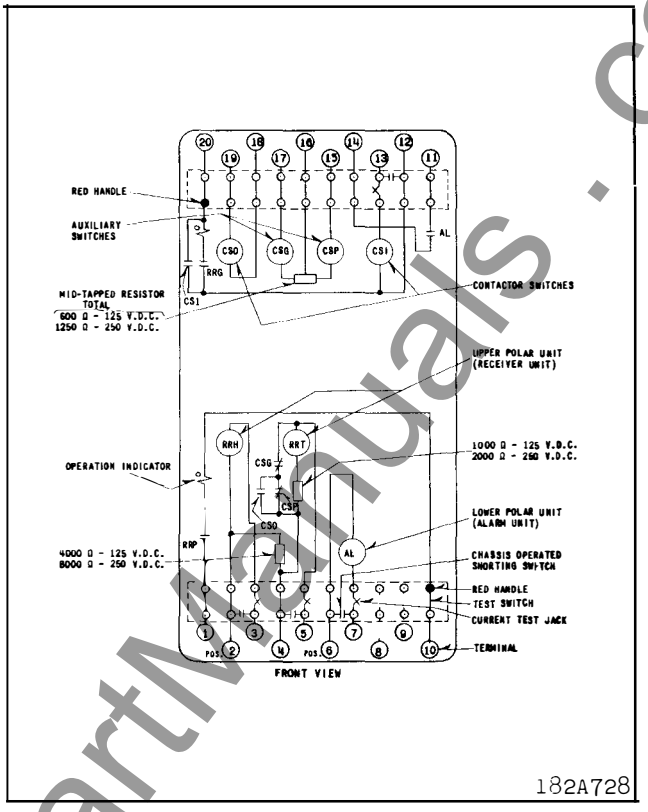

Fig. 1. Internal Schematic of the Type RS Relay in Type FT42 Case.

of the RRT coil. Consequently, RRP and RRG contacts cannot close as long as RRH is energized.

Alarm Unit

The alarm unit is similar in construction to the receiver element except that it is energized by a single coil and operates a single set of contacts. The coil is energized by the received carrier to close the contacts and give an alarm. This unit has a higher-pick-up than that of the receiver unit in order to obtain a direct check on the sensitivity of the tubes in the carrier transmitter-receiver. The failure of the alarm relay to pick-up when carrier is started indicates insufficient output from the transmitter-receivers.

Contactor Switch

The contactor switches CS1 and CSO are small solenoid auxiliary switches connected in series in the trip circuit. The plunger of the switch has a circular conducting disc

mounted on its lower end, and as the plunger travels upward, the disc bridges three silver stationary contacts. The contacts of CS1 seal in the RRG trip circuit until the auxiliary switch on the breaker opens the trip circuit. The contacts of CSO are in parallel with the CSP contacts so that ground faults will take preference over phase faults.

Operation Indicators

Two operation indicators show whether the fault was a phase fault or a ground fault by indicating which relays did the actual tripping, the phase relays thru RRP, or the ground relay thru RRG.

Out-of-Step Elements

The three voltage units designated as A, B, and C are contactor switches similar to those described above except that each is provided with a set of back or normally closed contacts as well as the normal make contacts. Their coils are energized by the third impedance unit of the corresponding phase relay thru the contacts of an auxiliary switch CSA from the trip voltage source. The back contacts of the voltage elements are connected in parallel and permit tripping as long as any one of the back contacts is closed. The front contacts of the voltage elements are in series with the back contact on the receiver element, RRB, and the coil of the pendulum relay.

The pendulum relay is a telephone type relay with a horizontal spring arm extending between two contact points. A counterweight is fastened to the free end of the arm. The X2 relay is a telephone type relay with slow drop-out characteristics. A solenoid attracts an iron right-angle bracket which in turn operates a set of break and make contacts. Drop-out delay is obtained by the air gap and adjustment between the solenoid core and the armature, and the copper slug on the core. X2 is energized by the pendulum relay contacts with its back contact in parallel with the back contacts of the voltage switches and connected in the phase trip circuit. When the pendulum relay is energized, its arm is pulled downward, to close the lower contact. This energized the X2 relay. After the pendulum relay is deenergized, the pendulum will oscillate for a short time alternately breaking and making both of its contacts. Consequently, the X2 relay will not drop-out until after the pendulum oscillations have deenergized its coil. The complete operation of these elements during out-of-step are explained in connection with the operation of the carrier scheme. See I.L. 41-904.

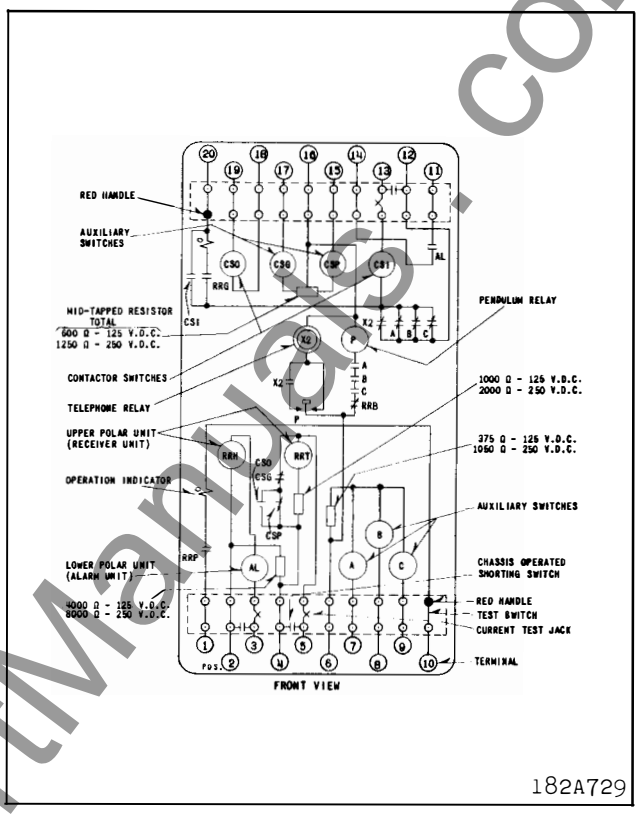

Fig. 2. Internal Schematic of the Type RSN Relay in Type FT42 Case.

CHARACTERISTICS

The characteristics of the various elements of the relays are as follows:

	125 Volts Avg. Ohms	250 Volts Avg. Ohms
CSP or CSG Coil	70	70
CSP & CSG Tapped Resistor	600	1250
Carrier Resistor	4000	8000
RRT Operating Coil	1100	1100
RRT Coil Resistor	1000	2000
RRH Holding Coil	1700	1700
AL Alarm Coil	500	500
P Pendulum Relay	2000	2000
A, B, C, Contactor Switches	1170	1170
X2 Telephone Relay	2000	2000
CS1 Contactor Switch(2 amps)	0.23	0.13
CSO Contactor Switch	27	27
Operation Indicator (1 amp.)	0.16	0.16

The pick-up and operating values of these elements are given under "Adjustments and Maintenance".

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 four mounting holes on the flange for semi-flush mounting or by means of the rear mounting stud or studs for projection mounting. Either a mounting stud or the mounting screws may be utilized for grounding the relay. The electrical connections may be made directly to the terminals by means of screws for steel panel mounting or to the terminal studs furnished with the relay for thick panel mounting. The terminal studs may be easily removed or inserted by locking two nuts on the stud and then turning the proper nut with a wrench.

For detailed FT case information refer to I.L. 41-076.

The carrier relaying d-c schematic (supplied with the carrier order) should be consulted for details of the external connections of these relays.

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.

All contacts should be cleaned periodically. A contact burnisher S#182A836H01 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.

Directional Auxiliary Units

The two contactor switches, CSP and CSG, have adjustable plunger travel. Adjust the two nuts on the bottom of the fixed shaft so that the plunger has 3/16" travel after the lower contacts make. The plunger should have 1/64" travel in the opposite direction after the upper contacts make. This is accomplished by screwing down the set screw on top of the switch until the upper contacts are just able to make as the plunger hits the upper stop. Then back off this screw one turn and lock in place.

Each contactor switch has a section of a tapped resistor in series with it, and will pick up positively when rated trip circuit voltage is applied across the coil and its section of the resistor.

The pick-up of the coil and its resistor is 45-60 volts for the 125 volt relays and 90-120 volts for 250 volt relay. These elements have an intermittent rating, and should not be energized for more than a few seconds.

Polar Receiver Unit

Back off contact screws so that they do not make contact. Screw magnetic shunts into the all-out position (5 or 6 screw threads showing.) The armature should remain against whichever side it is pushed with this adjustment.

Contact Adjustment

Push the armature to the left, and adjust both left hand contacts until they barely make a light circuit. At this point, give both stationary contacts an additional three turn follow. Then push the armature to the right and adjust the top and bottom right hand contact stops for three turns follow, and then the center contact for three and one-half turns follow.

Calibration

Apply 125 volts D.C. to the 125 volt relay or 250 volts D.C. to the 250 volt relay across the RRT coil, operating coil resistor, and the carrier resistor in series, with polarity as shown in the schematic diagram.

The CSP and CSG back contacts should be blocked open. The armature should move to the left when observing the polar unit from the front. (all future references to armature movement shall be given as viewed from the front of the relay).

To the holding coil, RRH, apply 10 to 20 milliamperes d.c. current observing correct polarity. The armature should now move to the right. De-energize both coils and see that the back contacts stay closed, or simply that the armature stays up against the right hand contact stops.

Run both shunt screws all the way in, and then back out the left hand shunt screw approximately 6 turns. Back out the right hand shunt screw approximately 9 turns.

Re-energize the operating coil with 125 or 250 volts d.c. and the holding coil with 4 milliamperes d.c. Adjust the right hand contact shunt screw until the armature moves to the left. If the armature moves to the left, at a value of holding coil current greater than 4 milliamperes, the right hand shunt screw should be turned out to lower this value to the correct 4 milliampere point.

Increase the holding coil current to 6 milliamperes and adjust the left hand shunt screw until the armature resets, or moves to the right. If the armature resets at a value of current less than 6 milliamperes, the left hand shunt screw should be turned out. This will increase the reset value of the armature and provide for the correct 6 milliampere reset value.

Minor adjustments of both shunt screws must be made several times until the desired operating points are obtained, since the adjustments of one shunt screw affect the adjustment on the other shunt screw.

If adjustments of the two shunt screws do not give proper calibration, it will usually be necessary to reduce or increase the contact follow depending upon whether the current differential, between pickup and dropout, is too small or too large.

The armature should operate with a snappy action at both the opening and closing values of holding coil current.

Polar Alarm Unit (Normal Adjustment)

Contact Adjustment

Adjust the right and left hand contacts for three turns follow as described under contact adjustment of the polar receiver unit.

Calibration

Turn both shunt screws all the way in. Then back out both shunt screws approximately seven turns. Apply 8 milliamperes d.c. to the coil observing correct polarity, and then screw in the left hand shunt screw until the armature moves to the right. If the armature moves to the right at a value of current less than 8 milliamperes, screw the left hand shunt out until the armature moves to the right at 8 milliamperes. Check the dropout point by reducing the d.c. current. The armature should move to the left between the limits of 4 and 6 milliamperes. If it fails to do so, adjust the right hand shunt screw until it does. It will then be necessary to recheck the pickup and dropout points again and make any minor adjustments to the shunt screws that may be necessary until correct calibration is obtained.

In general, screwing in the left hand shunt screw reduces the pickup current of the relay. Screwing in the right hand shunt screw increases the dropout current. This will in turn cause a change in the pickup current, making necessary several slight readjustments of both shunt screws to obtain the desired calibration. The armature as finally calibrated should pickup and dropout with a snappy action.

Polar Alarm Unit (Telemetering Adjustment)

Telemetering impulses over the carrier channel would normally impulse the alarm element and the alarm bell unless they are disconnected. To retain the alarm feature for communication signalling, a time delay circuit

is used which requires reconnection and readjustment of the alarm unit to have the opposite polarity and normally closed contacts. Where specified, this adjustment is made before shipment. This adjustment gives approximately 1 second delay.

Contact Adjustment

Adjust the right and left hand contacts for three and one-half turns follow as described under contact adjustment of the polar receiver unit.

Calibration

Turn both shunt screws all the way in. Then back out both shunt screw approximately seven turns. Reverse the polarity of the coil and apply 6 milliamperes d.c. to the coil. The armature should move to the left at this value of current. If the armature moves to the left at values of current greater than 6 milliamperes d.c., screw in the right hand shunt screw, and if the armature moves to the left at values of current less than 6 milliamperes, the right hand shunt screw should be turned out.

Decrease the current to 1 milliampere and if the armature does not move to the right at this value of current, screw in the left hand shunt screw until it does move to the right.

As finally calibrated, the contacts should open at 6 milliamperes or less, and close at 1 milliampere.

The pickup and dropout points should be rechecked since any change of the shunts affects both calibration points.

If proper calibration cannot be attained by use of the two shunt screws, it will usually be necessary to increase or decrease the follow of the contacts.

With the polar alarm unit coil de-energized, the armature should stay up against the right hand contact assembly as finally calibrated. Snappy action of the armature should occur at both the pickup and dropout calibration points.

CSI and CSO Contactor Switches

* 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 and screwing up the core screw of the switch until the contacts just separate. Then 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 CS-1 switch should pick up at 2 amperes d.c. Test for sticking after 30 amperes d-c is passed thru the coil. The CSO switch should pick up at .12 amperes D.C. Test for sticking at 1.0 ampere D.C.

Operation Indicator

Adjust the indicators to operate at one ampere d-c gradually increased. Test for sticking after 30 amperes d-c has been applied. Check the indicator and the contactor. switches at 5 and 30 amperes d-c to make sure that the indicator operates before its coil is shorted by the contactor switch.

Out of Step Blocking Units
for Type RSN Relay Only

Telephone Relay

Energize the telephone relay, X2, by applying 80 volts d-c with the pendulum relay armature held in the operated position. The telephone relay should operate positively, when the pendulum relay armature is held down to make the lower contact and should not operate when the armature is held up to make the top contact.

Pendulum Relay

To check the operation of the pendulum relay, connect jumpers across the make contact

on the voltage elements, A, B, and C, and apply 125 volts or 250 volts d-c across the pendulum relay. (The voltage will depend upon the relay range.) The pendulum relay armature should be pulled against the core screw and the X2 telephone relay should pick-up. Remove the jumpers from the voltage switch contacts. The pendulum relay armature should oscillate and hold the X2 relay closed for approximately 3 seconds. This is the standard factory adjustment. The drop-out of the pendulum and X2 relay combination can be adjusted from approximately 20 cycles to 10 seconds. The drop out time of X2 is adjusted by means of the armature set screw. The time that P will keep X2 picked up is adjusted by changing the spacing of the two outer contacts of the P relay.

Voltage Switches

Voltage switches, A, B, and C, should be adjusted so that there is a clearance of 1/64" between the plunger and the core with the plunger picked up.

Energize each switch separately thru the common resistor. The switches should pick-up at 35 volts for the 125-volt relay and 50 volts for the 250-volt relay. Check to make sure the switches do not stick closed after rated voltage (125 to 250 volts) is applied.

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.

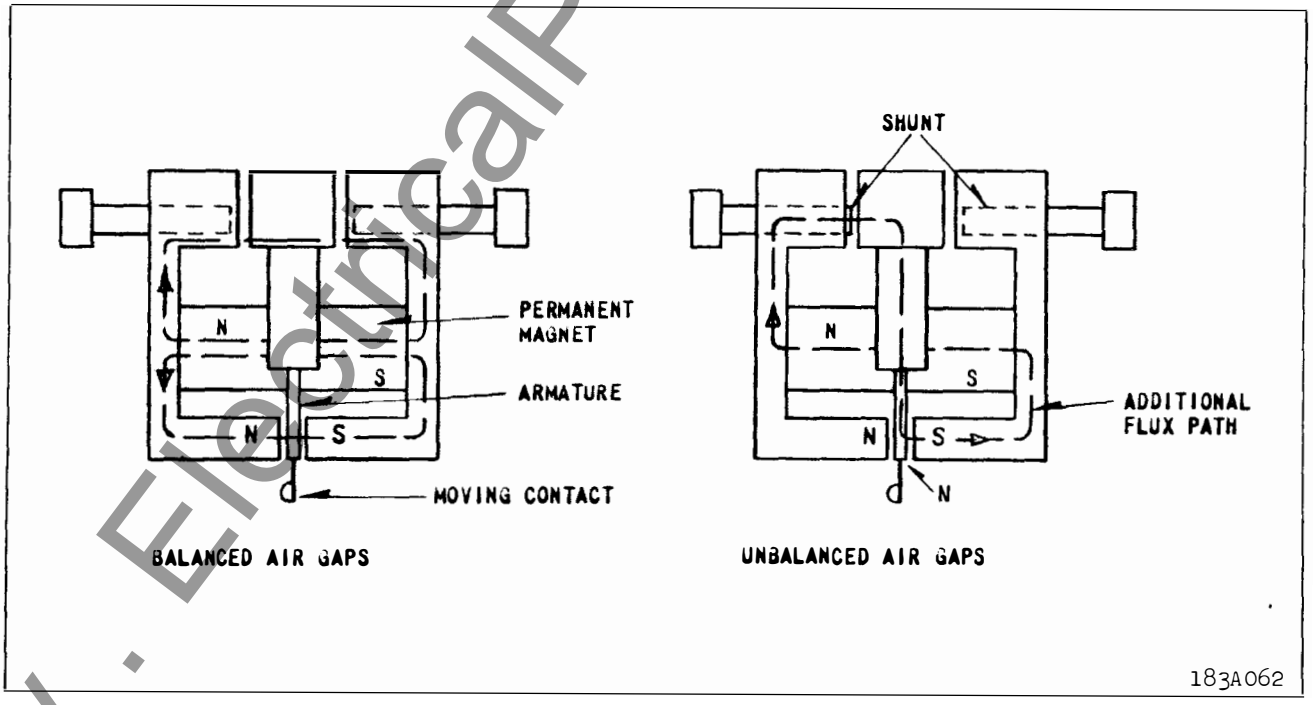

Fig. 3. Polar Unit Permanent Magnet Flux Paths.

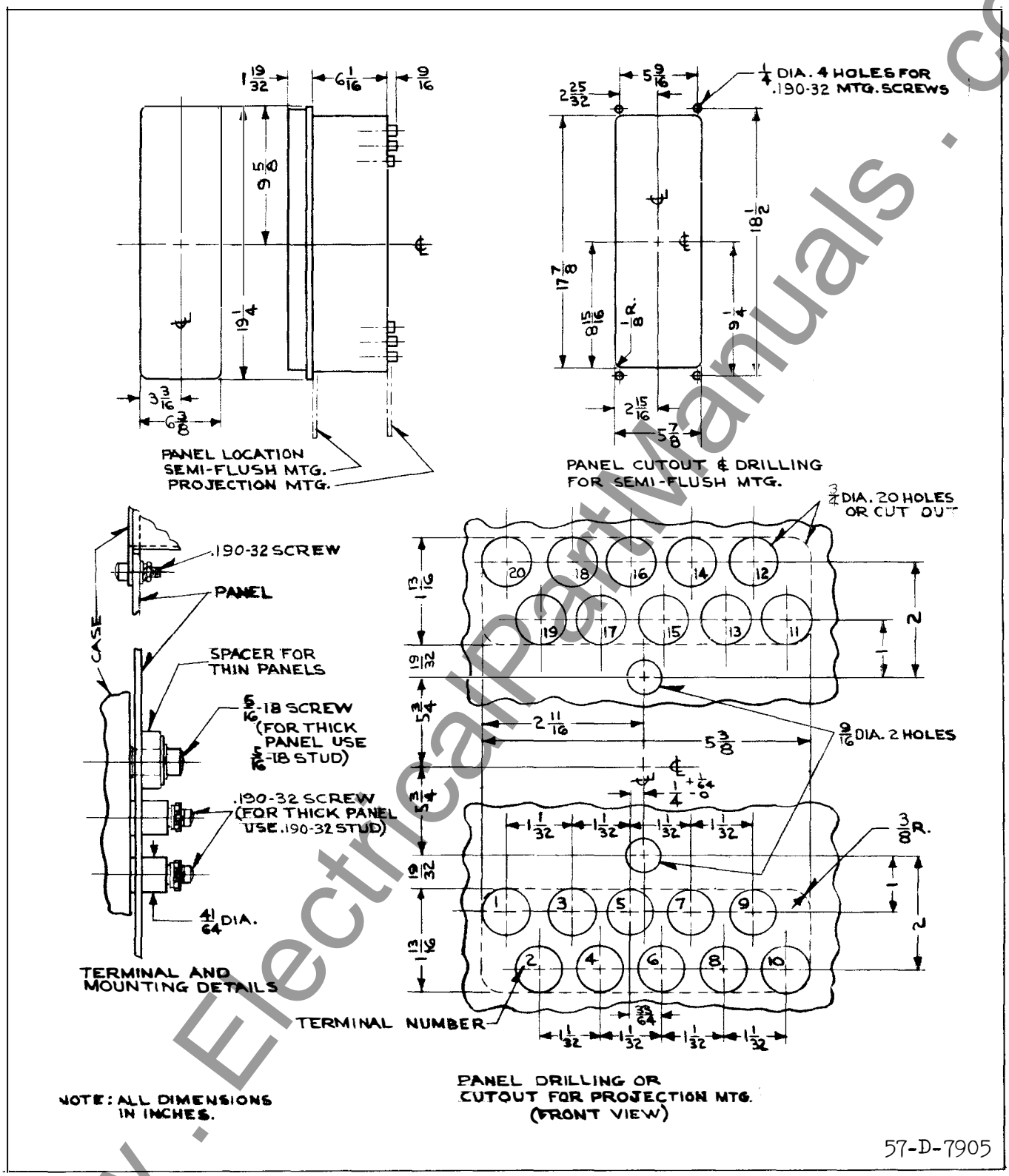

Fig. 4. Outline and Drilling Plan for the Type RS and RSN Relays in the Type FT42 Case.