INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPE SX TOGGLE RELAY

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

APPLICATION

Type SX relay is a toggle type relay intended for auxiliary service where the relay contacts should operate and not reset until reset coil is energized.

In a typical application, the type SX relays are used to provide selective reclosing where the breaker is instantaneously reclosed only after it is tripped by the carrier or instantaneous trip relays. The typical connections of this scheme is shown in Fig. 4. The instantaneous or carrier trip circuit is trip circuit No. 1, and operates the series operating coil of the type SX relay. This closes the type SX relay contact to initiate reclosing. All of the other trip circuit paths are combined in trip circuit No. 2 which by-pass the type SX relay operating coil.

The advantage of this toggle relay is its high operating speed and its positive toggle action. If the trip current is well above the operating value of the relay, the relay contacts will close positively even though its coil is immediately shorted out by the seal-in contactor switch.

Where an instantaneous back-up element such as type HZ or HZM relay first impedance element or instantaneous trip attachments are used and not included in the selective reclosing circuit thru the type SX relay, the back-up trip circuit should include a suitable resistor to prevent shorting the type SX relay before the other trip circuit operates.

One type SX relay is required in each instantaneous trip path. For the type HKB Carrier Relays and the type HZ or HZM Carrier Relays using type RS Relay, one type SX relay is required and connected in series in the carrier trip path as shown in Fig. 1.

For the type HZ Carrier Relays with out-of-step blocking using the type RSN relay a two unit relay (Fig. 2) is required, one in the phase carrier trip circuit and one in the ground carrier trip circuit as shown in Fig. 5. In this scheme reclosing is initiated whenever the trip coil is energized by the directional unit thru the second impedance unit and carrier (RRP) for phase faults, or by the directional, ground overcurrent and carrier units (RRG) for ground faults. The operating coil of one type SX Relay is connected in the Z1 and RRP phase trip circuit, and of the other in the D_o, I_o and RRG ground trip circuit. Energizing the trip coil through any of these paths picks up the type SX relay and the seal-in switches. The latter immediately shorts out the type SX relays but not before these contacts close the reclosing circuit. The back-up trip circuits by-pass the type SX operating coils.

An alternate method for selective reclosing is to use a third point of the seal-in contactor switch to energize a voltage type operating coil of the type SX relay. This is particularly applicable to the type HKB Carrier Relay where the extra point of the contactor switch is brought out to a base terminal.

The type SX relay stays operated until the reset coil is energized. After the reclosure is completed, a switch on the breaker auxiliary contactor energized the reset coil for subsequent operations.

For a ring bus, or double breaker, the d-c control circuits of the breakers are usually fused separately. When selective reclosing is used with this arrangement a two unit relay (Fig. 3), with independent reset coil circuits, is required.

CONSTRUCTION AND OPERATION

The type SX relay consists of two electro-magnets with a common armature. The armature is constructed with a toggle joint, and the spring mounted on one of the pole pieces provides pressure on the end of the armature so that it will remain against that pole piece to which it is moved, either electrically, after the operating force is removed. The mov-

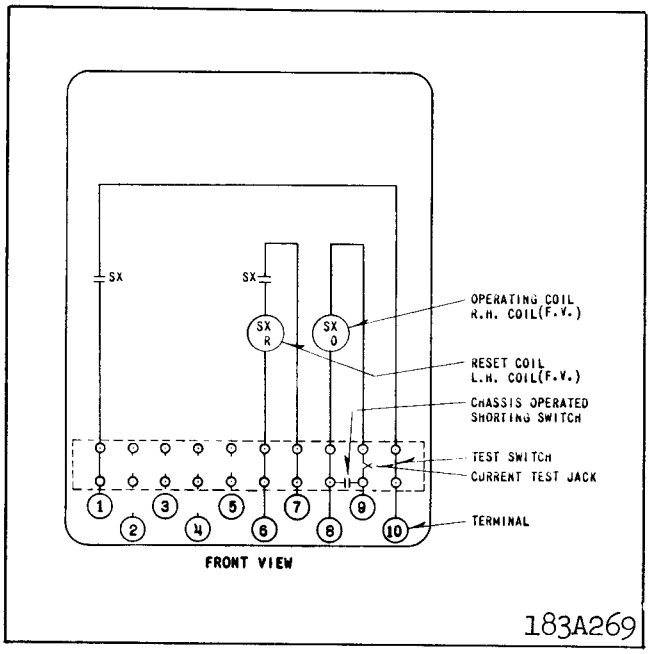

Fig. 1. Internal Schematic of the Type SX Relay in the Type FT11 Case. For Relay with voltage type operating coil, the current test jack and shorting switches associated with terminals 8 and 9 are omitted.

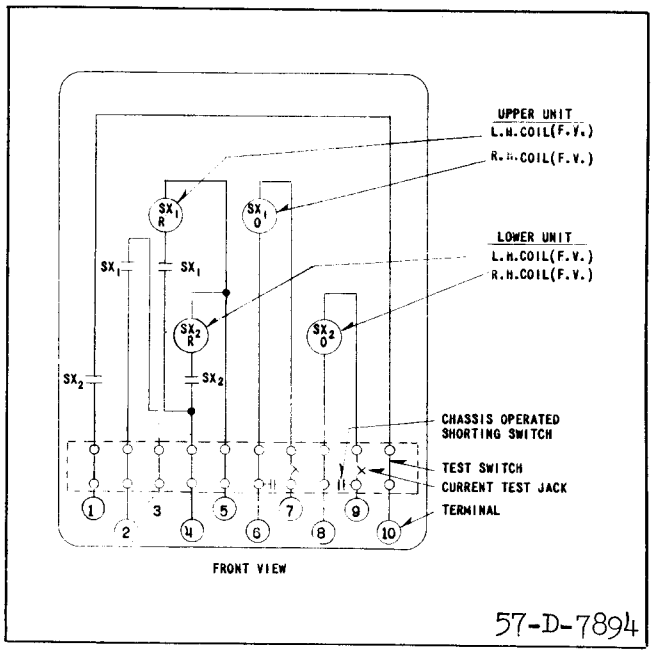

Fig. 2. Internal Schematic of the Type SX two unit Relay with operating coil circuits to independent terminals in the Type FT11 Case.

ing contact or contacts are mounted at the top of the armature, and the stationary contacts are mounted above the two pole pieces.

CHARACTERISTICS

The type SX relay usually is supplied with two contacts which close in the operating position. One contact is used to set up the reclosing circuit. The other contact is used to interrupt the reset coil circuit when the relay resets.

The relay is available for 115 or 230 volts, 25, 50 or 60 cycles, for 125 or 250 volts d-c service, or for 1, 5 or 10 amperes d-c. These ratings are for intermittent service only. The relay operates at 80 percent of its rated voltage. The relay is supplied with the operating and reset coils in any combination of the above ratings as desired.

Relays used for selective reclosing are usually provided with a one-ampere operating coil having a lower power consumption and which requires special adjustment of the toggle spring. This coil is used in order to keep the resistance in series with the trip coil to as low a value as possible. Its use should be restricted to such applications as necessitate a minimum value of coil resistance.

The resistances of standard 1, 5 and 10 ampere coils are 15, 0.75 and 0.2 ohms respectively. The resistance of the special one-ampere coil is 2.4 ohms.

The relay contacts will carry 5 amperes continuously. They will interrupt non-inductive circuits carrying 20 amperes at 115 volts a-c, 10 amperes at 230 volts a-c, 2 amperes at 125 volts d-c, or 0.75 amperes at 250 volts d-c.

The operating time of the type SX relay, when energized from a d-c source through a resistance load and when using the special low resistance one-ampere coil, is approximately .027 seconds at rated current, .008 seconds at 300 percent and .005 at 2000 percent of rated current. At 2000 percent of rated current in a circuit having approximately the same ratio of inductance to resistance as a typical trip coil, the operating time is approximately .007 seconds.

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

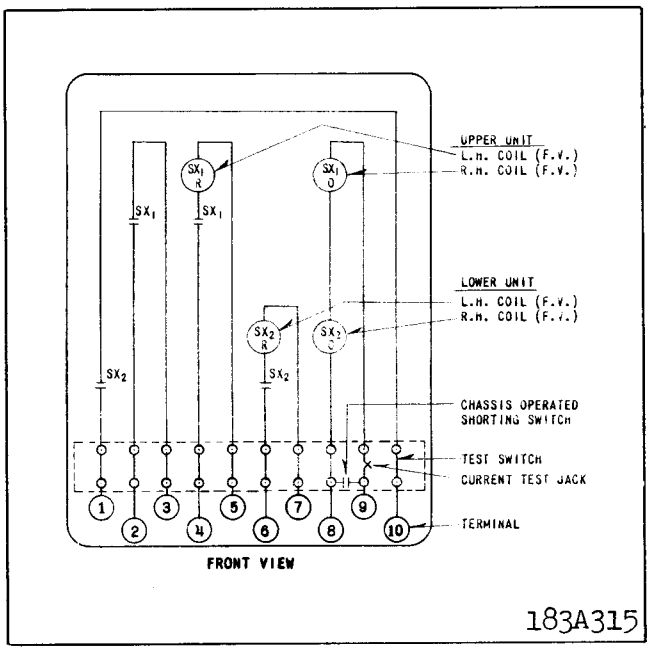

Fig. 3. Internal Schematic of the Type SX two unit Relay with reset coil circuits to independent terminals in the Type FT11 Case.

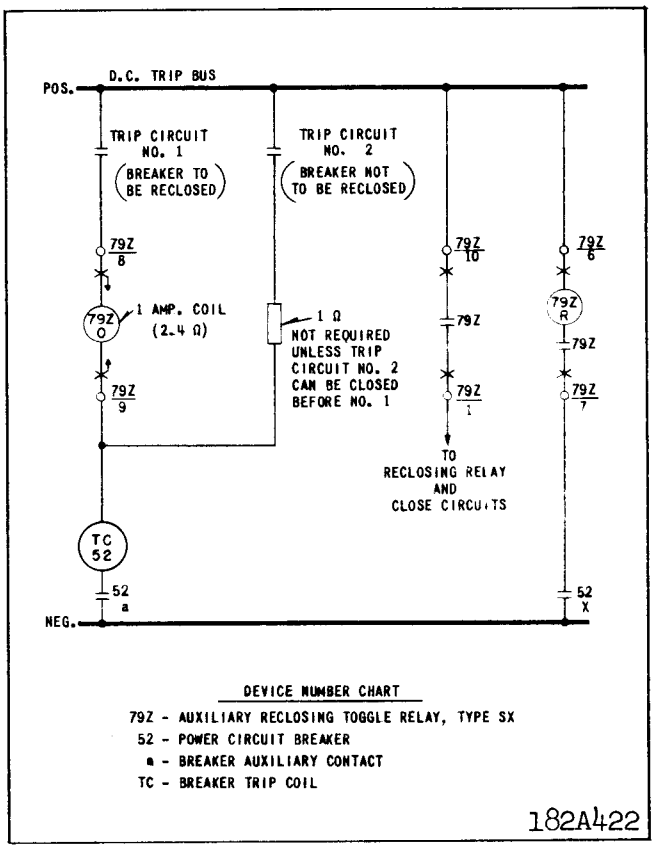

Fig. 4. Typical External Schematic for Selective Reclosing Using the Type SX Relay.

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.

ADJUSTMENT 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 ar 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.

If the relay has been dismantled, it is necessary to check the toggle action and the contact follow after reassembling it. The clearance hole for the mounting screw in the pole piece under the toggle spring is large enough to permit some variation in the pole piece position. The gap between the two pole pieces should be 1/4". The thickness of the armature measured over the copper rivets which serve as anti-residual spacers in the air gap is 5/32" to 11/64", so that the movement of the armature at this point is about 5/64" to 3/32".

When the armature is at dead center with respect to the toggle action, it should have equal travel to either pole piece. The position of the armature at dead center, and also the force required to transfer the armature from one side to the other, is controlled by the shape of the toggle spring and can be adjusted by bending the spring as required. A screw is provided to assist in adjusting the pressure of the spring

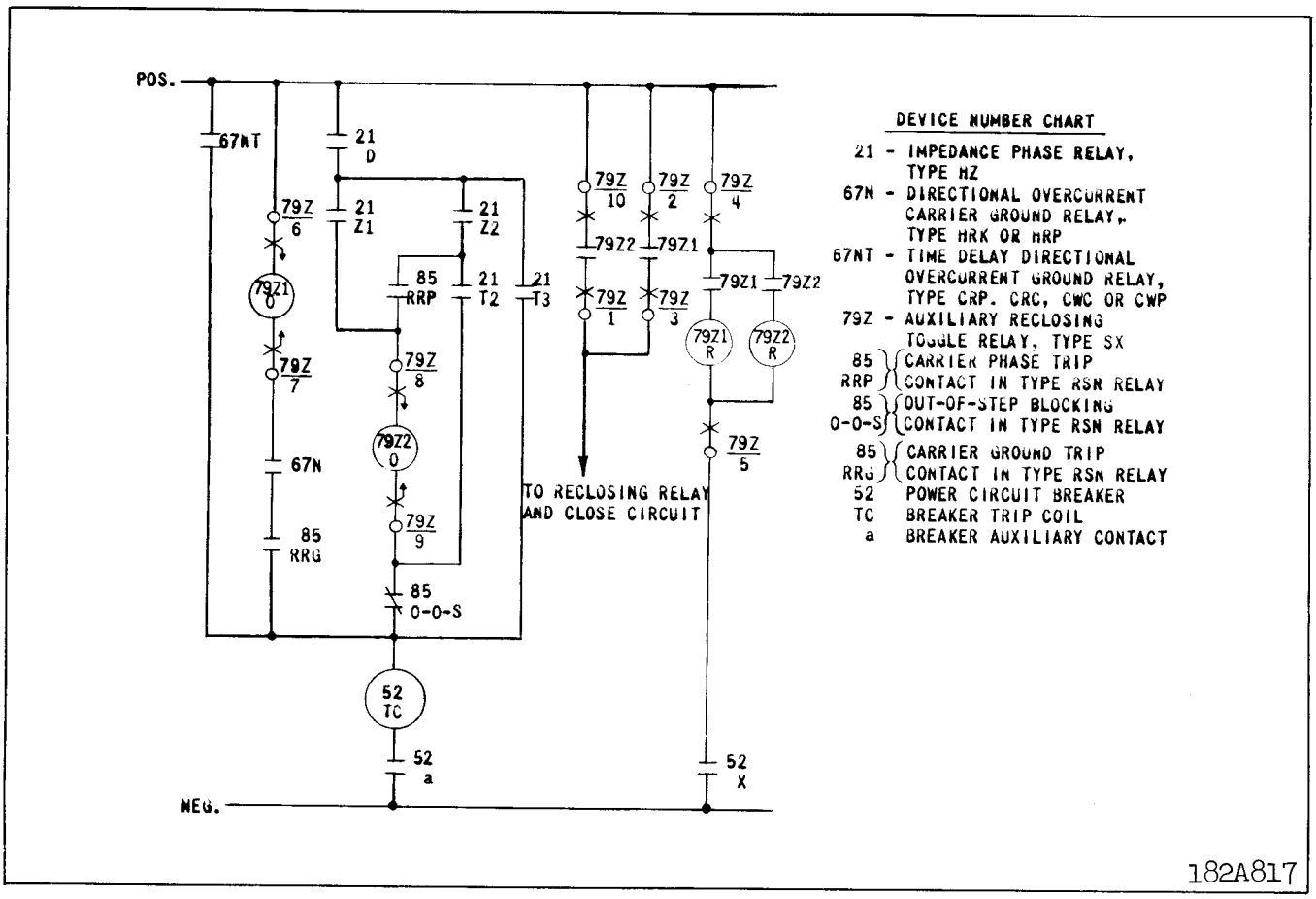

Fig. 5. Typical External Schematic for Selective Reclosing Using the Type SX two unit Relay with the Type HZ-RSN Carrier Relays.

on the toggle member and consequently the force required to move the armature from one position to the other. The bends in the spring should be approximately correct initially, however. A set screw in the side of the pole piece locks the screw after the adjustment is made.

The standard adjustment is such that an operating force of 3 ounces or more applied close to the toggle hinge will transfer the armature from one position to the other. The force required can be greater than 3 ounces but should be low enough to permit the relay to operate at 80 percent of its rating. On relays having the special one-ampere low energy coil, the operating force must be considerably less, and it is particularly important that the spring be shaped so that the armature has equal travel on both sides of the dead center position.

The stationary contacts should be adjusted (by bending) so that there is a small gap to the moving contacts when the armature is at dead center, and the contact follow should not be such as to prevent the armature from touching the pole piece when the operating coil is de-energized. Even with the low energy operating coil, the resulting follow will be sufficient to insure positive contact if the armature position in the gap is correct at dead center. If the armature does not rest against the pole piece with the operating coil de-energized, it is possible that the contacts may close but bounce to the permanently open position when the coil is de-energized. This will not occur on a correctly adjusted relay.

REPAIR 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 115 volt 60 cycle SX relay takes approximately 60 v.a. at rated voltage. The 125 volt d-c relay takes approximately 20 watts.

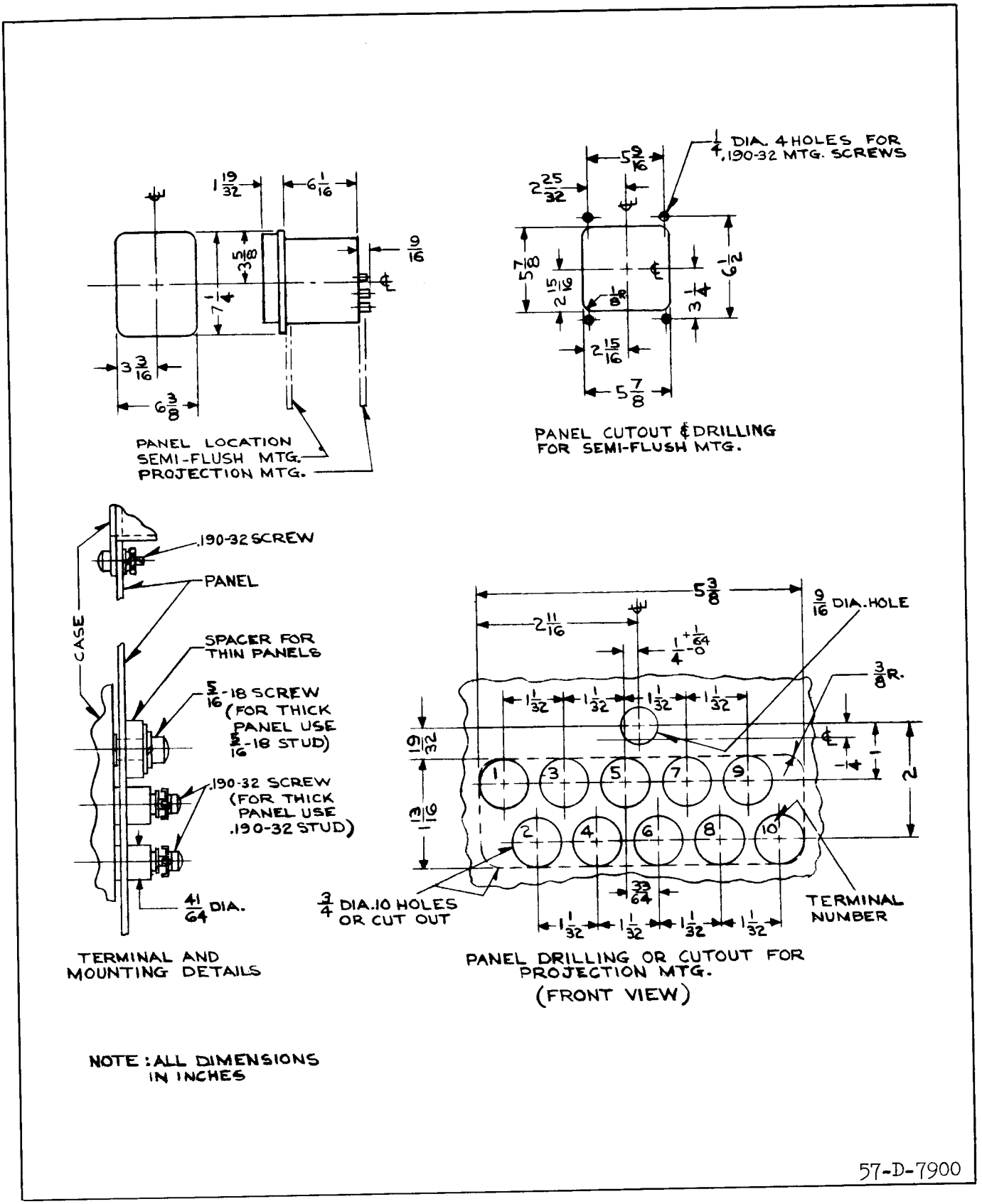

Fig. 6. Outline and Drilling Plan for the Type SX Relay in the Type FT11 Case.

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