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Supersedes 41-962.2E Dated September 1985

( | ) Denotes Change Since Previous Issue

# Type SX Toggle Relay



**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.**

## 1. APPLICATION

Type SX relay is a toggle type relay intended for auxiliary service where the relay contacts should change position when the operate coil is energized and not reset until the reset coil is energized. An automatic time delay on reset of 5 to 15 cycles may be obtained using relays supplied with a telephone type relay unit (X).

In a typical application, the type SX relay is used to provide selective reclosing. The breaker is instantaneously reclosed only after it is tripped by the carrier or instantaneous trip relays. The typical connection of this scheme is shown in Figure 10. The instantaneous or carrier trip circuit is trip circuit No. 1 and energizes 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 type SX relay stays operated until the reset coil is energized. After the reclosure is completed, a switch on the breaker auxiliary contactor energizes the reset coil for subsequent operation. Note that the 52x contact (or equivalent) must be closed only during the

closing stroke of the breaker. 52a may be used if x relay is included.

## 2. CONSTRUCTION

The SX toggle relay consists of a type SX toggle unit, and a telephone type relay unit (when used).

### 2.1 Toggle Unit (SX)

The SX toggle unit consists of two electromagnets with a common armature. One end of the armature has two pins which rest in a groove in the molded base. The other end of the armature is held in one of two positions by means of a toggle spring which produces the toggle action. The toggle spring is protected during shipment by a removable lock pin which limits the forward motion the armature. The lock pin does not affect the normal operation of the relay and may be left on after installation. The moving contacts are mounted at one end of the armature on either side.

## 3. OPERATION

When the SX-0 operation coil is energized the armature is toggled over closing the right hand contacts, front view. These contacts will remain closed until the reset coil, SX-R, is energized.

Relays supplied with a telephone relay unit (X) have an automatic time-delayed reset feature. The opening of the left-hand SX contacts de-energizes the telephone relay (X). After approximately 10 cycles, the (X) relay drops out, closing its back contact which completes the SX-R coil circuit. A typical ap-

*All possible contingencies which may arise during installation, operation or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding this particular installation, operation or maintenance of this equipment, the local ABB Power T&D Company Inc. representative should be contacted.*

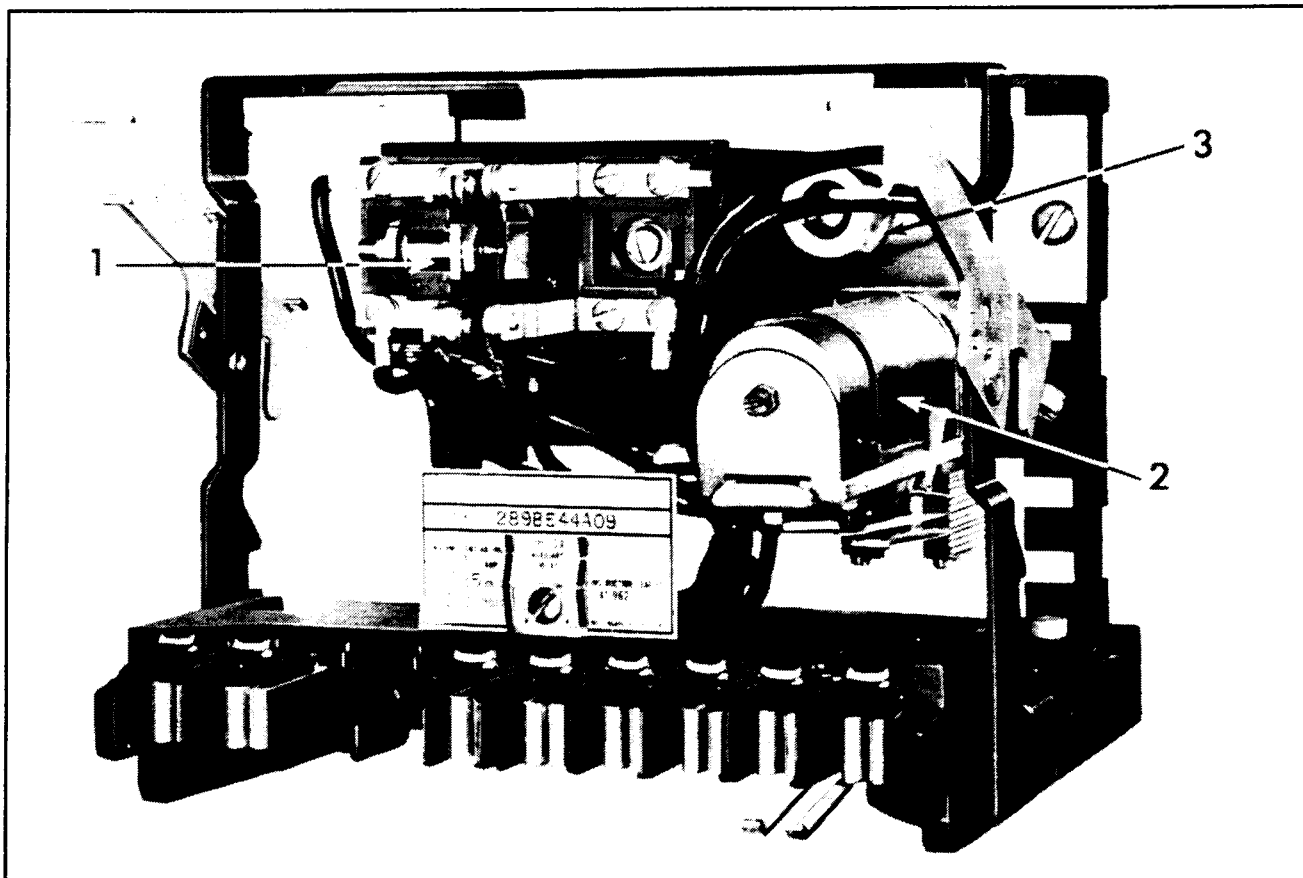


Figure 1. Type SX Toggle Relay Without Case. 1—Toggle Unit. 2—Telephone Relay Unit (when used). 3—Resistor (when used).

plication is selective reclosing when a 52X contact is not available for resetting the relay.

#### 4. CHARACTERISTICS

The type SX unit is supplied with DPDT contacts. It is available for 120 or 240 volts, 50 or 60 hertz (intermittent duty), and for 125 or 250 volts dc or for 1.5 or 10 amperes dc (continuous duty). The unit is supplied with the operating and reset coils in any combination of the above ratings as desired. The unit operates at 80 percent of its rated voltage or 90 percent of rated current. Contacts should not be used as a coil interrupting contact with the current coil.

Relays used for selective reclosing are usually provided with a 1 ampere operating coil having a 1 watt power consumption. This coil is used in order to keep the resistance in series with the trip coil to as low a value as possible.

The operating time of the type SX relay, when energized from a dc source through a resistance load and when using the 1 ampere coil, is approximately 0.027 seconds at rated current, 0.008 seconds at 300 percent and 0.005 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 0.007 seconds.

The operating time when energized from a 120 volt 60 hertz source is less than 1 cycle. When energized from a 125 volt dc source, the operating time is less than 2 cycles.

Burden is 5.5 watts at rated voltage, 1 watt at rated current.

Dc contact rating is 625 watts interrupting capacity.

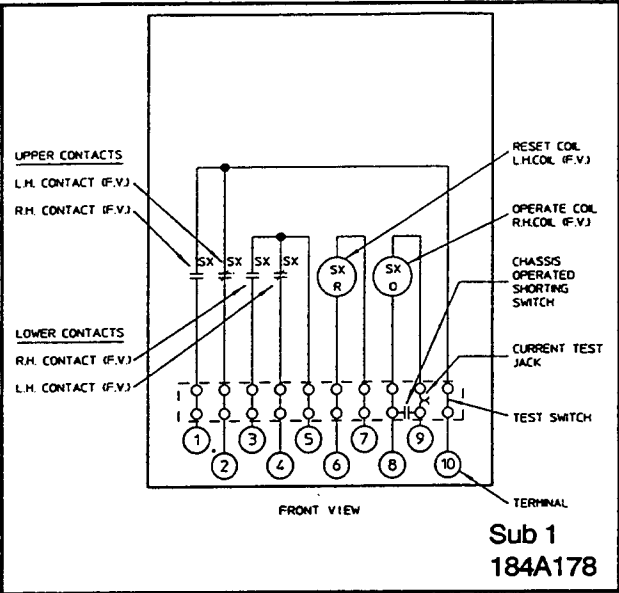


Figure 2. Internal Schematic of the Type SX Relay in the Type FT-11 Case. (For relay with voltage type operating coil, current test jack and shorting switches associated with terminals 8 and 9 are omitted.)

5. 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.

6. 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

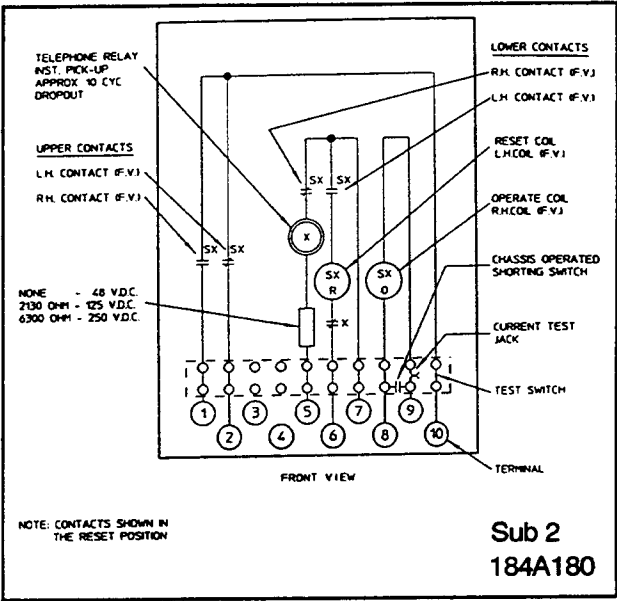


Figure 3. Internal Schematic of the Type SX Relay with Telephone Relay unit in the Type FT-11 Case. (For relay with voltage type operating coil, the current test jack and shorting switches associated with terminals 8 and 9 are omitted.)

adjustments at regular maintenance periods, the instructions below should be followed.

6.1 Acceptance Check

The following check is recommended to insure that the relay is in proper working order.

6.2 SX Toggle Unit

Calibration Check: If correctly adjusted, the unit will operate without chattering at 80 percent of rated voltage.

6.3 Telephone Relay (X)

Calibration Check: The telephone relay should pick-up at 80 percent of rated dc voltage.

The time delay on drop-out, should be 10 cycles as set at the factory before shipment.

6.4 Routine Maintenance

All relays should be inspected periodically and the operation should be checked at least once a year or at such other time intervals as may be dictated by experience to be suitable to the particular application.

All contacts should be periodically cleaned. A contact burnisher Style # 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.

## **6.5 Calibration**

Use the following procedure for calibrating the relay if the relay has been taken apart for repairs or if the adjustments have been disturbed. This procedure should not be used unless it is apparent that the relay is not in proper working order (See "Acceptance Check").

### **6.5.1 SX Toggle Unit**

If the SX Toggle Unit has been dismantled, it is necessary to check the toggle action and the contact follow after reassembling it. Set the gap between the lower pole pieces at  $11/64"$ . The contact follow should be set at  $.037"$ . This may be obtained by adjusting the stationary contacts to just make when there is a  $.020"$  gap between the residual pin in the armature, and the upper pole pieces. The adjusting screw assembly should be pushed down until there

is enough tension to cause the residual pin to rest against the pole piece. With the lock nut tightened, adjust the adjusting screw until there is equal toggle pressure on each side. This may be done mechanically with a gram gauge and should be 58 grams when measured between the rivets of the moving contact. This may also be done electrically by energizing the coils. The mechanical and electrical over-center balance usually does not coincide. Either one may be used.

### **6.5.2 Telephone Relay Unit (X)**

If it is desired to change the time delay on dropout, this may be done by turning the residual screw in the armature. The approximate range of adjustment is 5 to 15 cycles.

## **7. 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.

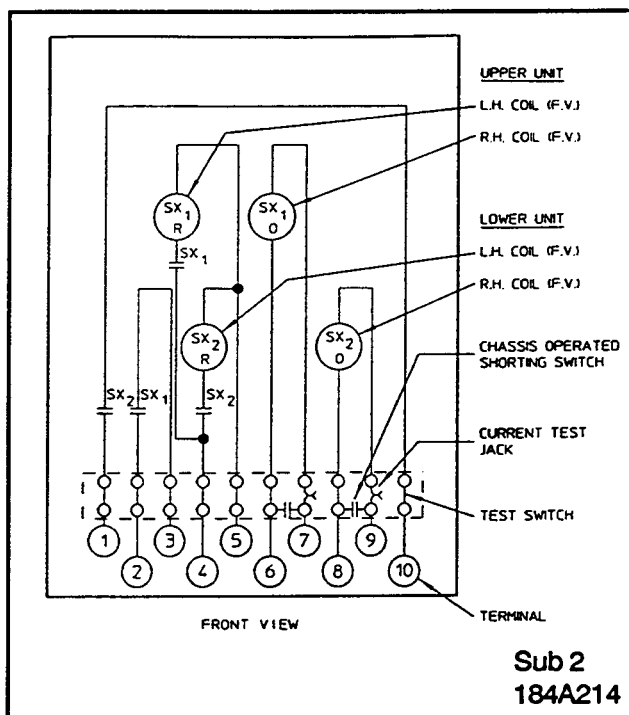


Figure 4. Internal Schematic of the Type SX two unit Relay, current actuated operating coils, in Type FT-11 Case – for selective reclosing where phase and ground protection cannot have a common SX operate coil. (For relay with voltage type operating coils, the current test jacks and shorting switches associated with terminals 6, 7, 8 and 9 are omitted.)

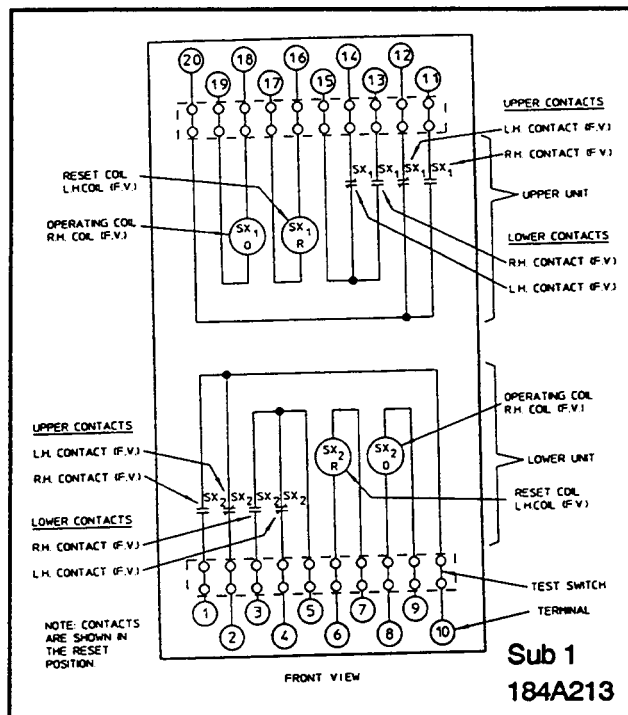


Figure 5. Internal Schematic of the Type SX two unit Relay, voltage operated, with operating and reset coil circuits to independent terminals, in the Type FT-22 Case.

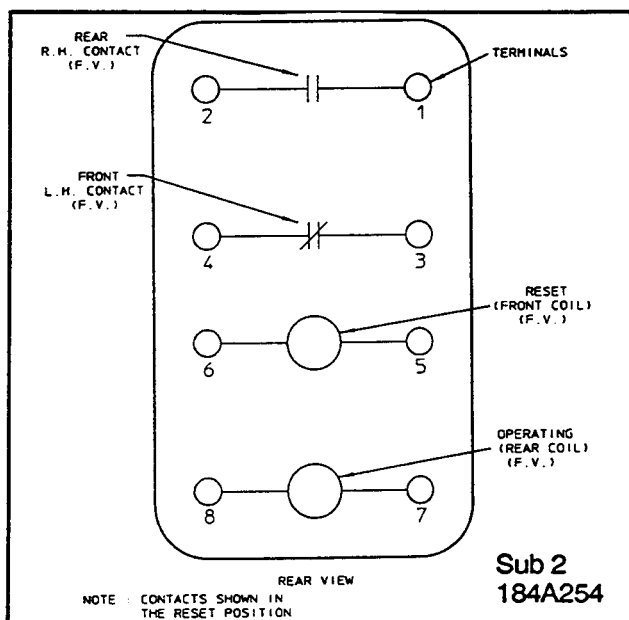


Figure 6. Internal Schematic of the Type SX Relay, with Independent 1 Make and 1 Break Contacts, in small glass case.

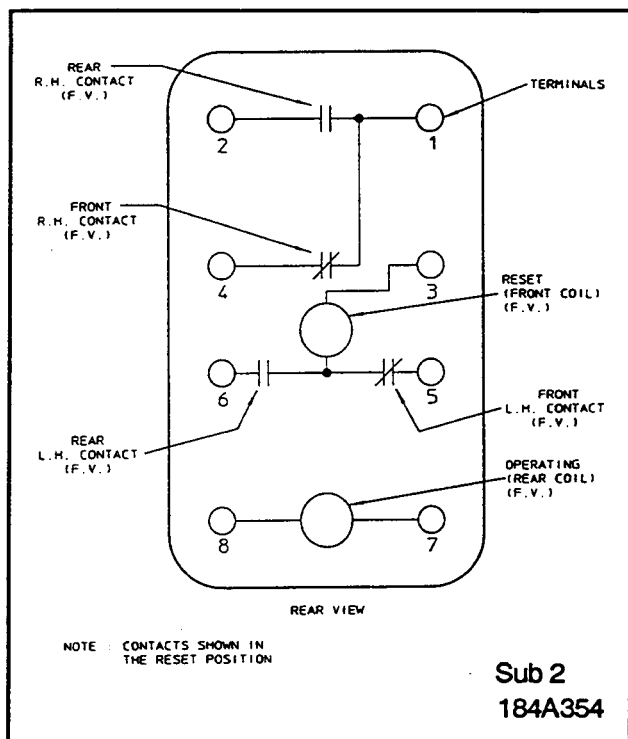


Figure 7. Internal Schematic of the Type SX Relay, with independent Make-Break contact and Reset Coil interrupting contact, in small glass projection case.

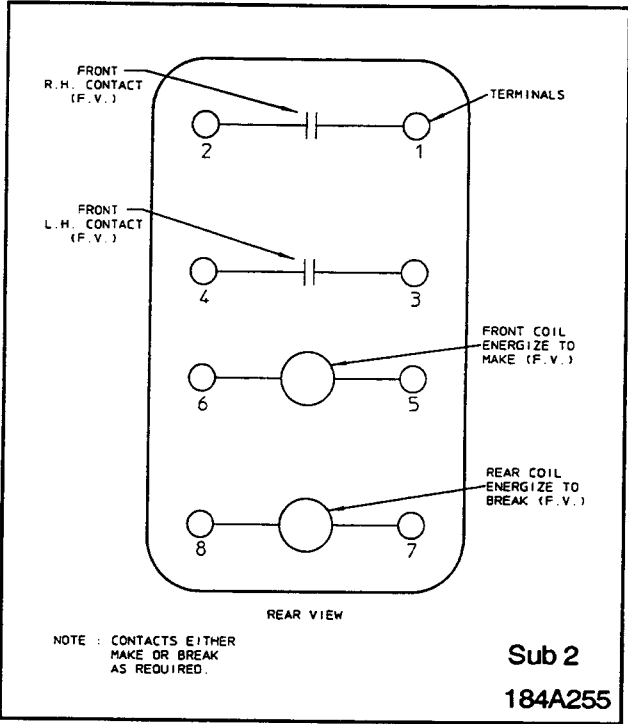


Figure 8. Internal Schematic of the Type SX Relay, voltage actuated operating and reset coil, with two independent Make or Break contacts, in small glass case.

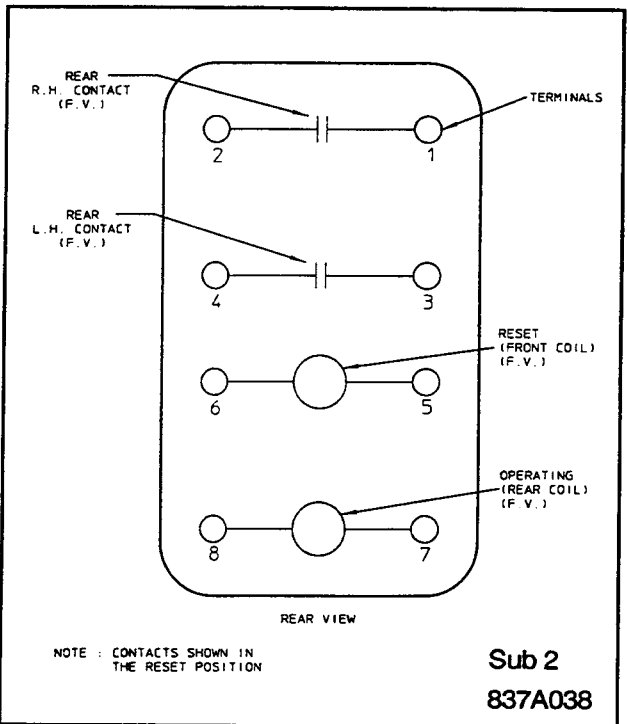


Figure 9. Internal Schematic of the Type SX Relay, current actuated operating coil, with two independent Make contacts, in a small glass case.

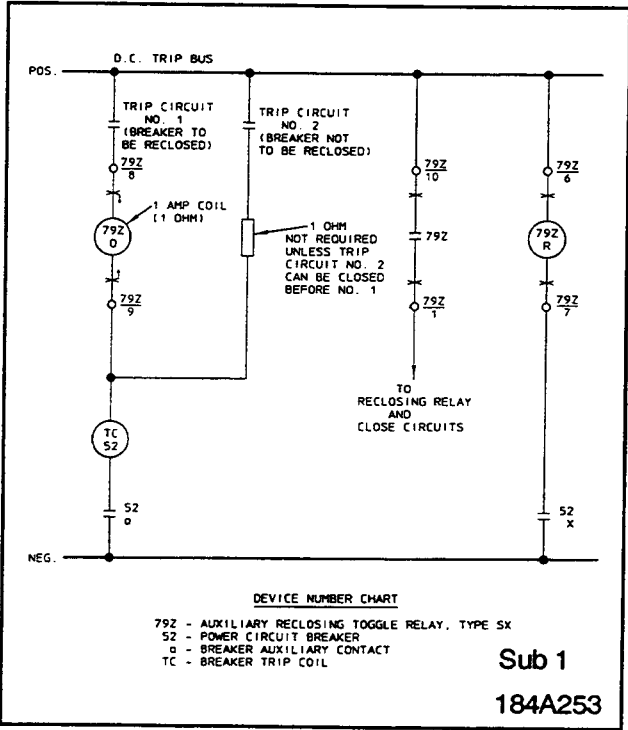


Figure 10. Typical External Schematic for Selective Reclosing Using the Type SX Relay.

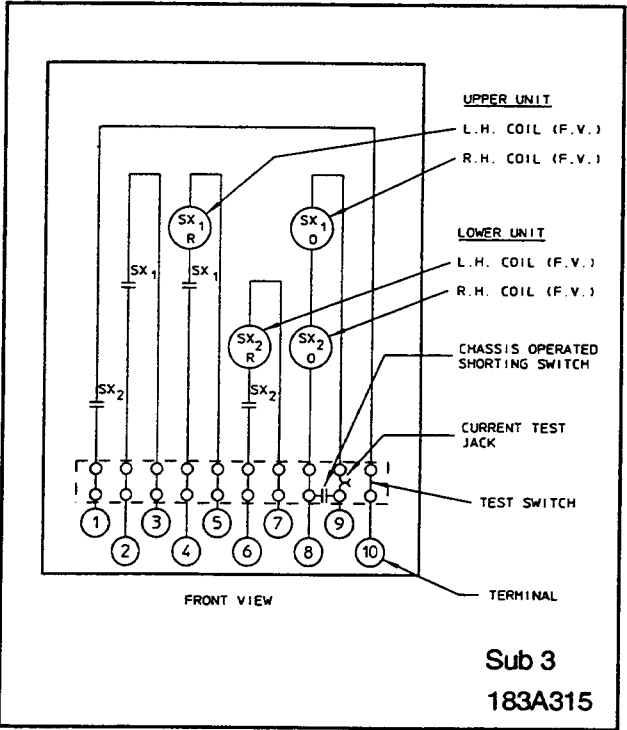


Figure 11. Internal Schematic of Type SX two unit - Double Pole Toggle Units - for Selective Reclosing in a double breaker scheme, in Type FT-11 Case.

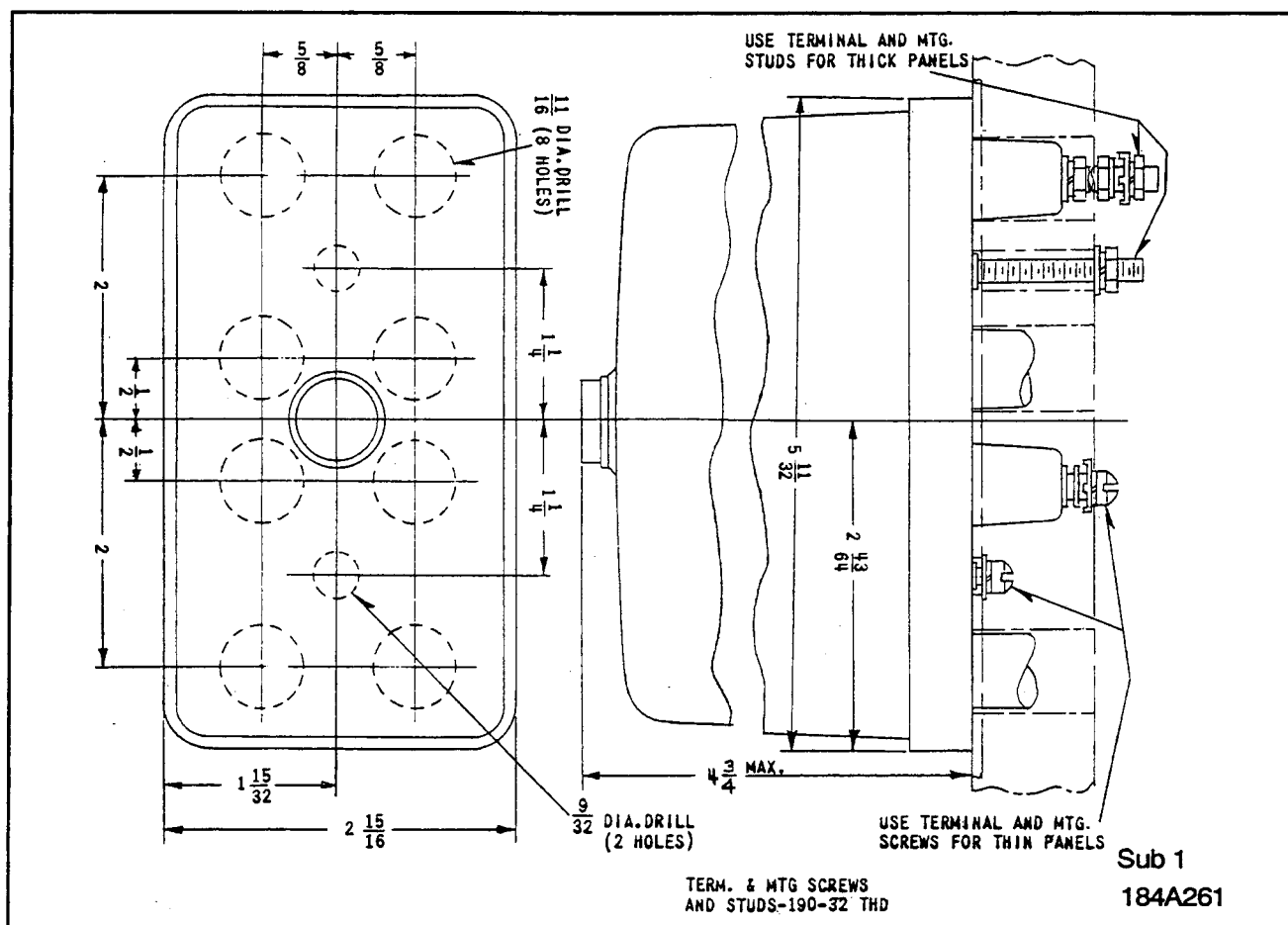
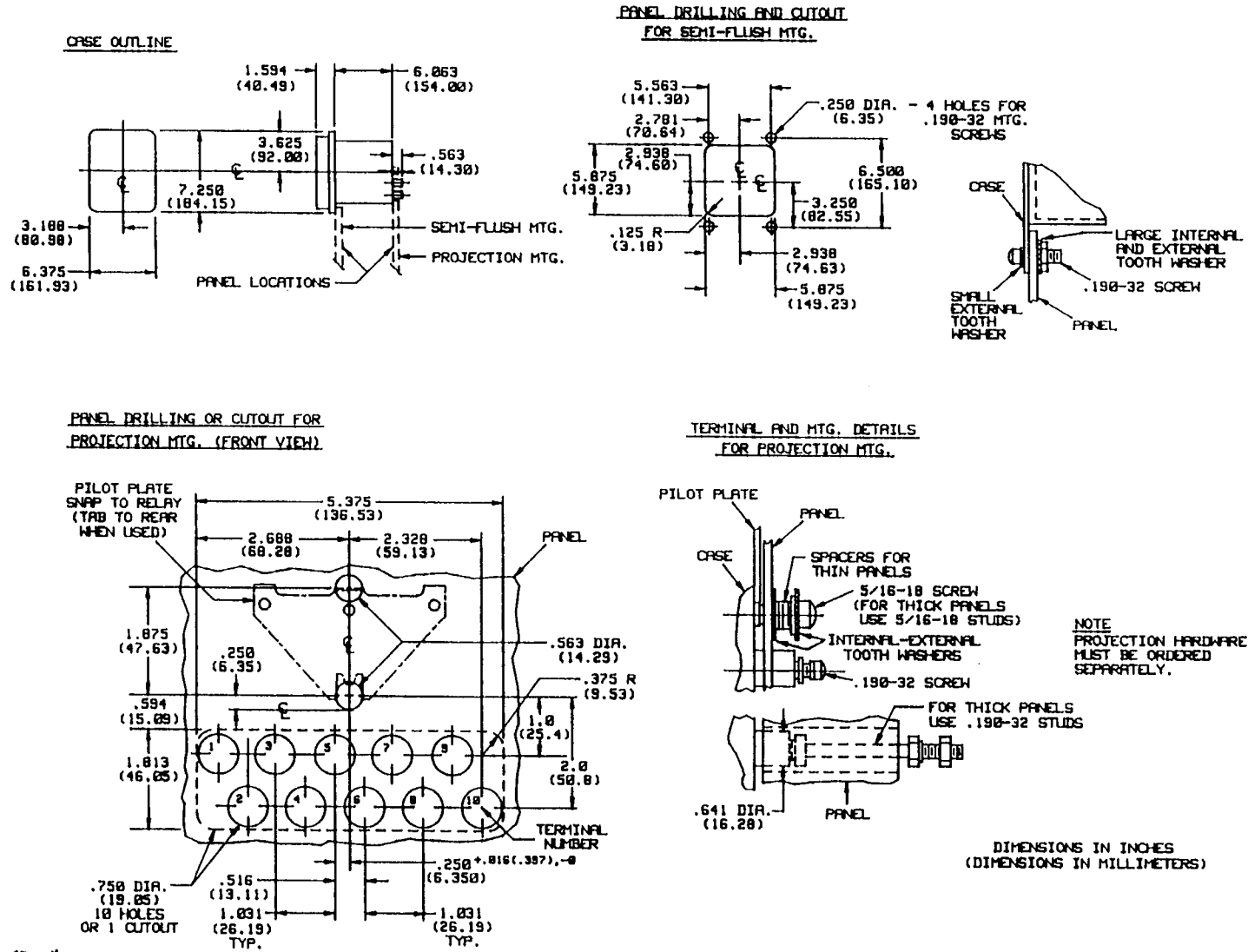


Figure 12. Outline and Drilling Plan for the Type SX Relay in the Small Glass Projection Case

\* Denotes Change

Figure 13. Outline and Drilling Plan for the Type SX Relay in the Type FT-11 Case.

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\* Denotes Change

Figure 14. Outline and Drilling Plan for the Type SX two Unit Relay in the Type FT-22 Case.

