ABB

ABB Automation Inc.
Substation Automation and Protection Division
Coral Springs, FL 33065

Instruction Leaflet

41-766.1N

Effective: November 1998
Supersedes I.L. 41-766.1M, Dated August 1998
(|) Denotes Changes since previous issue

Type SC, SC-1 Instantaneous Current and SV, SV-1Instantaneous Voltage Relays

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.

1.0 APPLICATION

The types SC and SC-1 current relays and the types SV and SV-1 voltage relays are applicable where an instantaneous plunger relay of high accuracy is required. These relays are suitable for protective service, and for auxiliary service where some of their special features are desired. They are adjustable over a wide range of voltage or current, are provided with mechanical operation indicators, and have a calibrated scale which indicates the pickup setting. Both contacts can readily be changed from “make” to “break”. The volt-ampere burden is low.

The SC and SV relays have a high ratio of dropout to pickup (85 to 98% for the ac relays). The SC-1 and SV-1 have a lower ratio of dropout to pickup (35 to 60% for the ac relays). The SV should not be used if the normal applied voltage is in the vicinity of pickup (plus or minus 10%).

The SC may be used in fault detector applications where direct energization of a breaker trip coil is involved. It should not be used to energize a timer. The SV should be used only in overvoltage applications.

2.0 CONSTRUCTION

The types SC, SC-1 and SV and SV-1 relays operate on the solenoid principle. A U-shaped iron frame, mounted on the molded base, supports the coil and serves as the external magnetic path for the coil. The coil surrounds a core and flux shunt. The upper end of the core is threaded and projects through the upper side of the frame, to which it is fastened by a nut. A tube threaded on the outside at its lower end is assembled in the core, and the threaded end extends below the core. A Fluorosint®* bushing, which is the lower bearing for the plunger shaft, is assembled in the lower end of this threaded tube. It is held in place by two split spring sleeves, one above and one below the bearing. The split sleeves must be compressed to insert them in the tube and they will remain at any position in which they are placed. The bearing for the upper end of the plunger shaft is a Fluorosint ® bushing which is pressed in the upper end of the core. This bearing is visible when the plunger is in the energized position. The plunger itself does not touch the walls of the tube in which it moves.

A flux shunt which surrounds the core is screwed on the tube, and its lower end projects below the relay

* *Registered Trademark of The Polymer Corp.*

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.

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frame. The position of this shunt determines the pick-up setting of the relay. The lower end of the shunt is beveled and knurled, so that it can be grasped by the fingers and turned to change the setting. A calibrated scale plate is mounted adjacent to the shunt. A groove just above the knurl in the lower end of the shunt serves as an index mark, and the relay pick-up setting is indicated by the calibration scale marking which is adjacent to the groove.

The construction of the plunger, core and flux shunt (which differ in details in the various types of these relays) causes the plunger to float in its energized position, without being held against a stop, even when energized much above the pickup value. Consequently, there is negligible noise and chatter, even on heavy overloads and in 25 hertz applications.

The core, shunt and plunger construction also provides the high ratio of dropout to pickup in the SC and SV relays. This ratio is above 90% for any pickup setting. In the latch type relays it is necessary for the plunger to rise with sufficient force to operate the latch positively and to deflect the stationary contacts sufficiently to prevent their opening, when the relay is de-energized, due to play in the latch. It is necessary to have a lower ratio of dropout to pickup in order to obtain this characteristic, and this lower ratio may be desirable in some applications where the latch is not required. The plunger floats in its operated position just as in the SC and SV relays. The dropout ratio varies somewhat for different shunt positions, but is constant for any one setting.

The shunt is held in any desired position by pressure from a curved arm made of sheet spring steel, which is fastened to the bottom of the coil frame at the rear of the shunt. This spring arm is shaped to extend around the shunt to the front of the relay, and in its normal position it exerts sufficient pressure against the shunt to prevent any creeping of the shunt or undesired change of setting. The front end of the spring arm has a bent-over tab on which thumb-pressure may be applied to move the arm out of contact with the shunt while the position of the latter is being changed.

The stationary contacts are assembled on slotted brackets. These are held in position on the base by filister-head screws which are threaded into the terminal inserts. Lockwashers are assembled inside the molded terminal bushings between the inserts and the base, as a safeguard against loosening of the screws. By rotating the bracket on its mounting screw and moving it along its slot, the contact assembly can be made either normally open or normally closed. The moving contacts are mounted on a Micarta insulation plate which is secured to the threaded end of the plunger shaft by a nut. The front edge of this insulation plate operates the indicator. The rear portion of the plate is slotted and a post screwed to the frame passes through this slot to prevent the plate from rotating. The moving contacts are double-faced so that they can be “make” or “break” and are connected to the base terminals by flexible leads. All contacts are pure silver. The contacts will carry 5 amperes continuously, and will interrupt 5 amperes at 115 volts ac, or 1 ampere at 125 volts dc.

The mechanical operation indicators used on these relays are shockproof, and can be used to indicate on the up stroke or down stroke of the plunger. The indicator is reset by pulling out the knurled stud which projects through the cover nut. The indicator should be reset after each relay operation, otherwise there may be a one or two percent decrease in the operating value of the relay. The operation indicator is assembled at the factory to indicate on the up stroke of the plunger but by removing the two mounting screws which fasten the indicator to the main frame, turning the indicator bracket around and at the same time swinging the indicator flag 180° about its shaft, the indicator can be set to indicate on the down stroke of the plunger. The rivet weight must be removed from the indicator flag and the latch screen turned around to complete the assembly.

In certain applications, an extremely wide range of current adjustment is desirable, and certain styles of SC and SC-1 relays have been provided with tapped coils to meet this requirement. The coil taps are brought out to a tap block mounted on the lower end of the relay frame or on the relay sub-base, depending on the type of case used. The connector plate on the tap block is marked with the minimum pickup value of each tap and the shunt is adjusted in the usual manner to obtain any pickup setting between taps. The scale plate is not calibrated for the relays with tapped coils, as there is not sufficient space for marking a scale for each tap. However, the scale plate is supplied in order that a customer may mark on it the individual relay setting or settings if desired.

3.0 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 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.

4.0 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 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.

Several factors may affect the dropout ratio of the relay. Whatever affects the ratio does so because either the dropout or pickup or both are affected. Obviously, incorrect assembly or interchange of parts, such as the use of the SC plunger with the SV core tube, will alter the electrical characteristics. However, the factor most likely to be encountered in service is friction. This may be due to dirt or foreign material between the plunger shaft and its bearings, to excessive pressure of the indicator screen on the indicator, or to leads so mis-shaped that they tend to rotate or tilt the moving contact insulation plate with appreciable force.

In order to remove the plunger and shaft assembly, it is necessary to remove the setscrew and nut at the top of the shaft. The spool-shaped bushing assembled on the upper end of the plunger shaft has a portion of its center section machined off so that the shaft is exposed at this point and can be prevented from turning by gripping shaft and bushing with a pair of long-nose pliers while removing the set screw and nut. Then by pressing down with the fingers on the upper end of the shaft, the lower split sleeve which retains the lower bearing will be forced out of the threaded tube, the bearing will drop out freely, and the upper split sleeve will be forced out far enough to permit grasping it for removal. The shaft and plunger assembly then can be removed.

The shaft and plunger assembly should be handled carefully to avoid bending the shaft or damaging the bearing surfaces. *The shaft should never be gripped on it upper bearing surface, below the spool-shaped bushing*, when loosening the nut and setscrew, as this would almost certainly damage the bearing surface. The shaft bearing surfaces should not be cleaned or polished with any abrasive material, as the abrasive particles might become imbedded in the shaft and cause difficulty later. The plunger shaft and bearings may be cleaned by wiping them carefully with a clean, lint-less cloth. Use no lubricant on the plunger shaft or bearings when re-assembling the relay, since this will eventually become gummy and prevent proper operation. It is recommended that the shaft be cleaned at intervals of approximately two years. When replacing the lower bearing and the split sleeves, the shorter sleeve (assembled below the bearing) should be pushed in until it is flush with the end of the threaded tube.

The mounting holes in the operation indicator screen are slotted so that its position can be adjusted. For relays in which the moving contacts are not latched in the operated position, the screen should be so located that the indicator positively enters the screen opening when the contacts barely touch. For latch-type relays, the screen should be so located that good contact is still obtained when the relay is de-energized. The pressure of the screen against the indicator may be adjusted by bending the screen between its lower end and the large elongated hole.This pressure should be such that the indicator will be held at any further position to which it is moved after entering the screen opening. However, the minimum amount of pressure necessary to obtain this adjustment should not be exceeded appreciably, since the pick-up value, and consequently the ratio, will be affected. The purpose of this pressure is to eliminate indicator rattle which might otherwise occur under certain energized conditions.

The moving contact leads pass through insulation sleeves assembled on the shanks of the terminal clips which are attached to the base terminals. These sleeves are notched at their upper ends, and the notches are toward the center of the relay. The leads are bent at approximately a right angle where they pass out through the notches, which aids in preventing them from coming into contact with the stationary contact brackets. Figure 1, (page 8) shows properly coiled and assembled moving contact leads.

Although the moving contact leads are very flexible, if the leads have been pulled out of their original shape by handling they may exert sufficient side pressure on the shaft bearing or twisting force against the guide post to cause appreciable friction and wear. If this condition continues for a long period of time, the resulting wear may affect the relay calibration or the dropout ratio noticeably. In extreme cases the wear may progress to a degree which may occasionally cause failure of the plunger to drop down when the relay is de-energized.

Correct shaping of the leads is not difficult, and they may be checked readily by removing the guide post and the nut at the top of the shaft. The plunger should be held in the raised position, either by energizing the relay or by pressing lightly against the collar under the insulation plate after raising the plunger manually. With the plunger raised, the insulation plate should be oscillated slightly in a horizontal plane by twisting it horizontally and releasing it. If in several trials the plate comes to rest with the center line of the contacts approximately parallel to the base and with its mounting hole fairly well centered with the end of the shaft, if the plate does not tip appreciably, and if the leads have a safe clearance to the stationary contact brackets, the leads are properly shaped.

If this check shows that re-shaping is necessary, it may be possible to obtain sufficient correction by bending the leads sharply where they emerge from the insulation sleeves. One or two pairs of tweezers are tools for re-shaping the leads. If it is necessary to re-coil the leads, they should be wound around a rod having a diameter of approximately 5/32”. The coils then should be stretched out just enough to avoid side pull or twisting force on the plunger assembly.

In all relays except the SV-1 relay for ac, if the stationary contacts are assembled so that they close when the relay is energized, they should be located so that they barely touch the moving contacts when the latter are 5/32” above the de-energized position. The moving contacts can be held in this position while the adjustment is being made by inserting a 5/32” spacer between the shaft collar and the top of the core. This dimension should be 3/16” on the SV-1 relay for ac. Both contacts should touch at the same time when the plunger is raised. When the plunger is moved upward against its stop, there should be a slight deflection of the stationary contact stop springs, but this should not exceed 1/32”. When the stationary contacts are reversed so that they are closed when the relay is de-energized, they should be located so that they just touch the moving contacts when the latter are 1/32” above the de-energized position. On some relays it may be found that when the contacts are used in this position the relay may operate at values a few percent below the scale markings. The adjustments specified for the stationary contacts are important. Failure to observe them may cause improper relay operation, either directly or after a period of service. Contact position should not be used as a means of altering the ratio of dropout to pickup.

5.0 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.

THIS SPACE RESERVED FOR NOTES

CHARACTERISTICS OF TYPES SC AND SC-1 RELAYS

Type	Frequency	Range of Adjustment Amps.	Max. Amps. Continuous	Watts at 5 Amps. 60 Cycles	V.A. at 5 Amps. 60 Cycles	Dropout Ratio-AC	Dropout Ratio-DC
SC	DC, 25 to 60 Hz	.5-2	1.5	99	225	85-98%	65-80%
SC	DC, 25 to 60 Hz	1-4	3	28	65	85-98%	65-80%
SC	DC, 25 to 60 Hz	2-8	6	6.9	19	85-98%	65-80%
SC	DC, 25 to 60 Hz	4-16	12	1.5	5	85-98%	65-80%
SC	DC, 25 to 60 Hz	10-40	25	.24	.7	85-98%	65-80%
SC	DC, 25 to 60 Hz	20-80	40	.07	.16	85-98%	65-80%
SC	DC, 25 to 60 Hz	40-160	40	.03	.05	85-98%	65-80%
SC	DC, 25 to 60 Hz	4-100	10-15-20	1.7-0.6-0.18	5-1-0.2	85-98%	65-80%
SC-1	DC, 25 to 60 Hz	.5-2	1.5	100	210	35-60%	25-40%
SC-1	DC, 25 to 60 Hz	1-4	3	24	60	35-60%	25-40%
SC-1	DC, 25 to 60 Hz	2-8	6	6	16	35-60%	25-40%
SC-1	DC, 25 to 60 Hz	4-16	12	1.5	5	35-60%	25-40%
SC-1	DC, 25 to 60 Hz	10-40	25	.25	.65	35-60%	25-40%
SC-1	DC, 25 to 60 Hz	20-80	40	.07	.16	35-60%	25-40%
SC-1	DC, 25 to 60 Hz	40-160	40	.03	.05	35-60%	25-40%
SC-1	DC, 25 to 60 Hz	4-100*	10-15-20	1.7-0.6-0.18	5-1-0.2	35-60%	25-40%

** Coil has taps on which minimum pickups are 10 and 30 amperes.*

CHARACTERISTICS OF SV AND SV-1 RELAYS

Type	Frequency (Hertz)	Range of Adjustment Volts	Max. Volts Continuous	Watts at 115 V. AC (125 V. For DC)	V.A. at 115 V.	Dropout Ratio
SV	60	7-16	16	—	—	85-98%
SV	60	70-160	160	3.4	7.3	85-98%
SV	60	140-320	320	—	—	85-98%
SV	60	280-640	640	—	—	85-98%
SV	50	70-160	180	2.8	6.1	85-98%
SV	25	70-160	200	1.5	2.5	85-98%
SV	DC	50-150	150	4.8	—	65-80%
SV	DC	100-300	300	—	—	65-80%
SV-1	60	7-16	16	—	—	40-80%
SV-1	60	70-160	160	4.1	8.5	40-80%
SV-1	60	140-320	320	—	—	40-80%
SV-1	60	280-640	640	—	—	40-80%
SV-1	50	70-160	180	3.5	7.1	40-80%
SV-1	25	70-160	200	1.4	3.2	40-80%
SV-1	DC	50-150	150	4.8	—	25-40%
SV-1	DC	100-300	300	—	—	25-40%

NOTES: Standard current relays are calibrated on 60 hertz. This calibration is approximately correct for 25 hertz and dc applications, but there will be discrepancies of 10% to 15% at some points on the scale.

Values of watts and volt-amperes in the tables are average for various plunger and shunt position.

For the SC relay, volt-amperes for pickup at minimum setting are approximately 3.4 and 1.4 for 60 and 25 hertz. Watts at minimum setting are approximately 1.0, .65 and .57 for 60 hertz, 25 hertz and DC respectively. Multiply values by 16 for approximate burdens at maximum setting.

For the SC-1 relay, volt-amperes for pickup at minimum setting are approximately 3.5 and 1.3 for 60 and 25 hertz. Watts at minimum settings are 1.3, .7 and .57 for 60 hertz, 25 hertz and dc respectively. Multiply values by 16 for approximate burdens at maximum setting.

* The V.A. burdens of the SC and SC-1 relays at 3, 10 and 20 times minimum pickup current are approximately 31, 240 and 770 V.A. respectively.

Dropout ratio varies somewhat with pickup adjustment but will be approximately constant for any given pickup setting. Limits in tables include variables such as friction and other individual relay variations.

Maximum continuous volts given for the SV and SV-1 relays for ac are for the relay set for minimum pickup. With the relay set for maximum pickup the continuous voltage can be increased 10 to 20%.

Figure 1: View of Type SV Relay showing correct shaping of moving contact leads

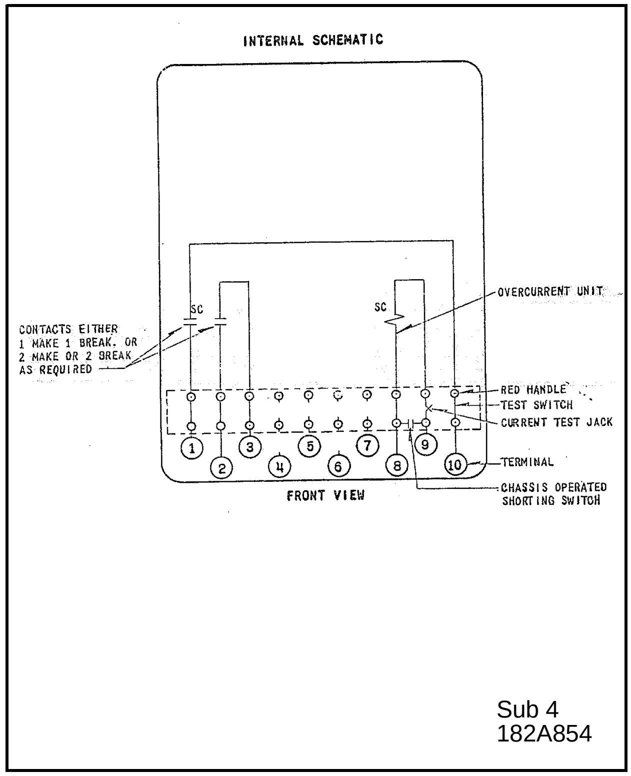


Figure 2: Internal Schematic of the Single Unit Type SC or SC-1 Relay in the Type FT-21 Case

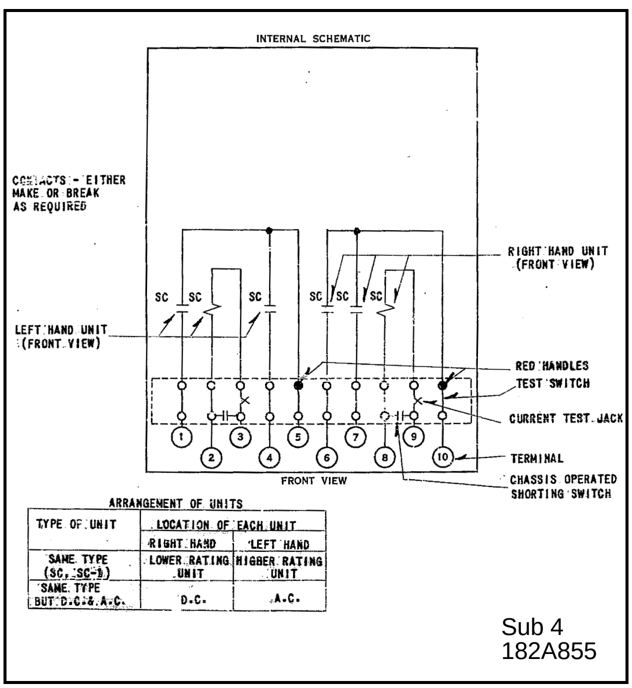


Figure 3: Internal Schematic of the Double Unit Type SC or SC-1 Relay in the Type FT-21 Case

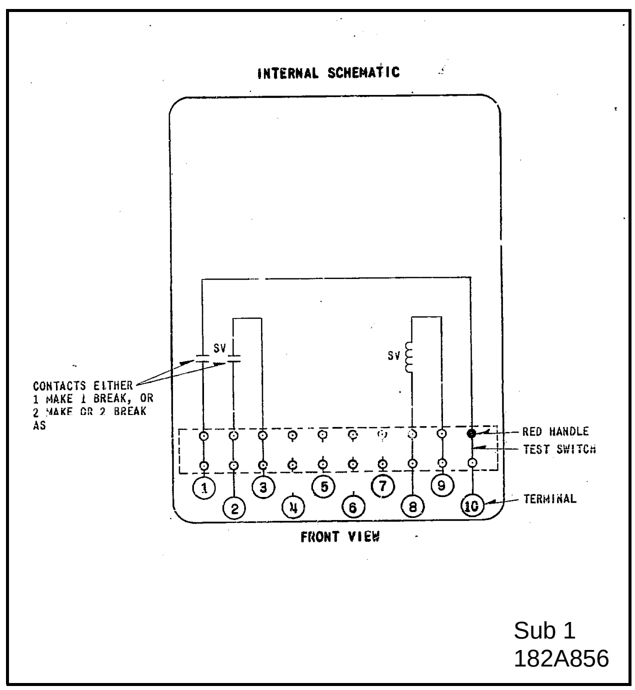
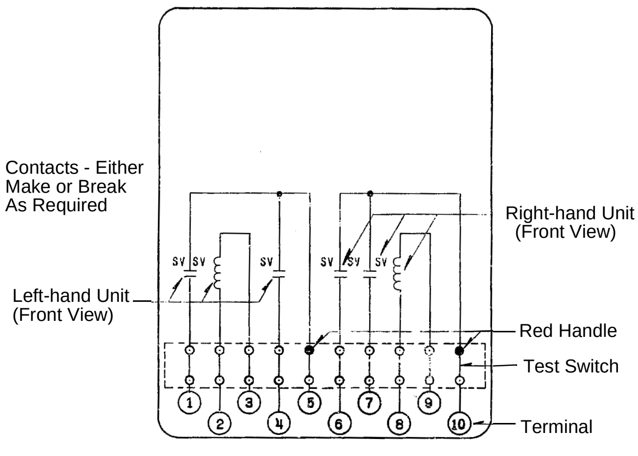


Figure 4: Internal Schematic of the Single Unit Type SV or SV-1 Relay in the Type FT-21 Case



ARRANGEMENT OF UNITS

TYPE OF UNIT	LOCATION OF EACH UNIT	
	RIGHT HAND	LEFT HAND
SAME TYPE (SV, SV1)	LOWER RATING UNIT	HIGHER RATING UNIT
SAME TYPE BUT DC & AC	DC	AC

Sub 1
182A857

Figure 5: Internal Wiring of the Relays in the Small Glass Case

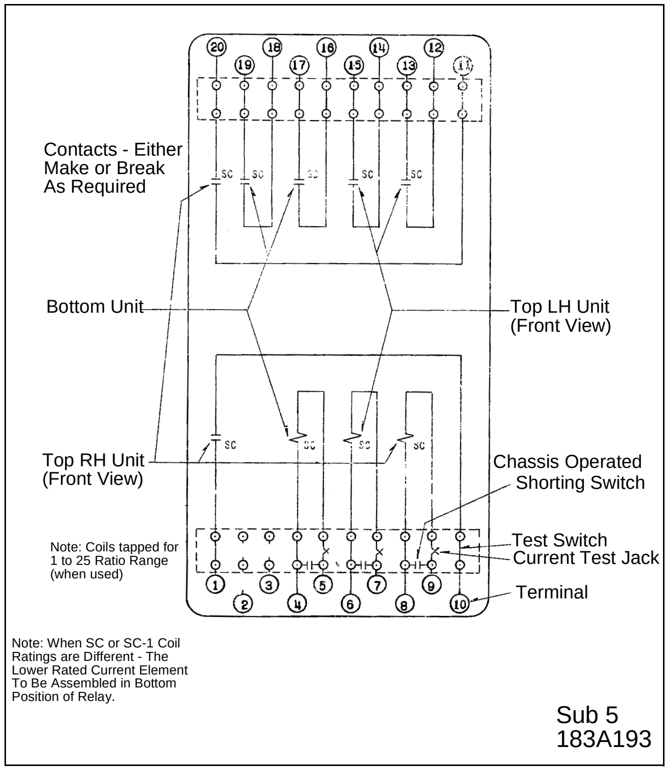


Figure 6: Internal Schematic of the Single Unit Type SC or SC-1 Relay in the Type FT-21 Case

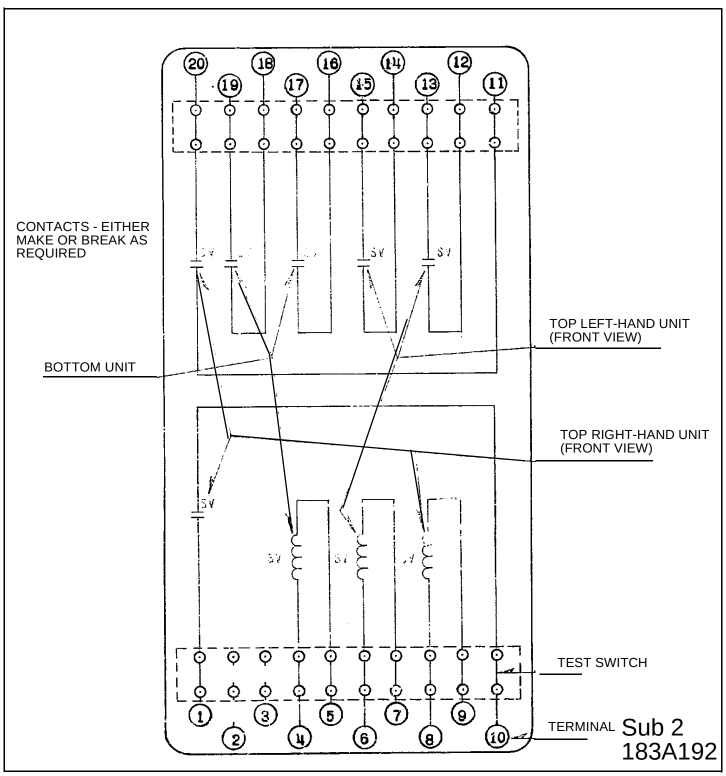


Figure 7: Internal Schematic of the Double Unit Type SC or SC-1 Relay in the Type FT-21 Case

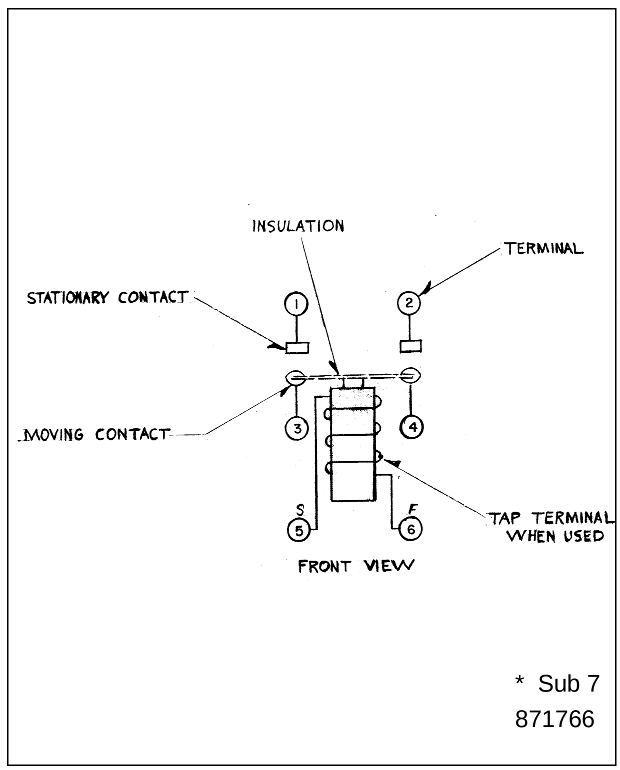


Figure 8: Internal Wiring of the Relays in the Small Glass Case

* Denotes Change

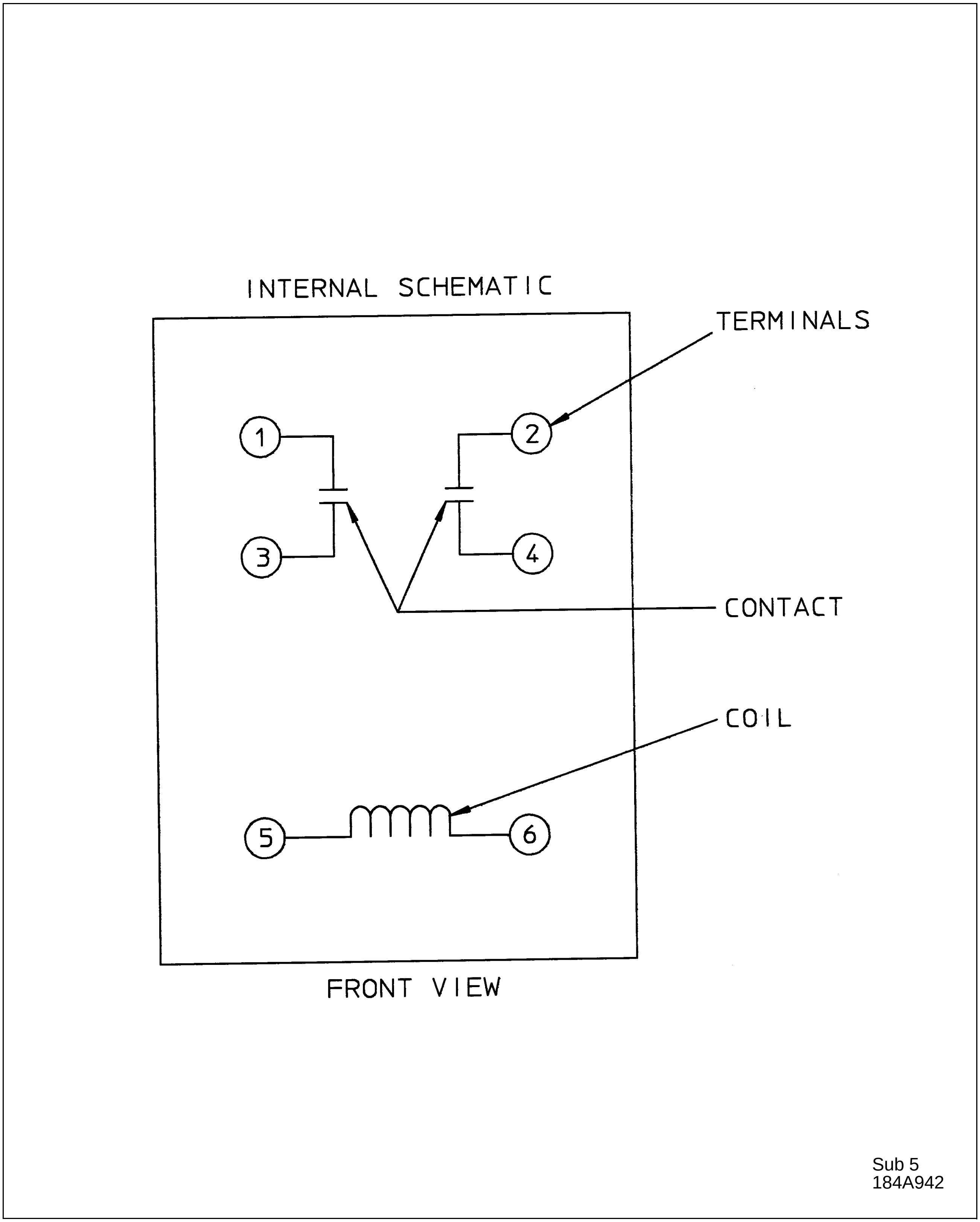


Figure 9: Internal Schematic for Relays in Front Connected Case

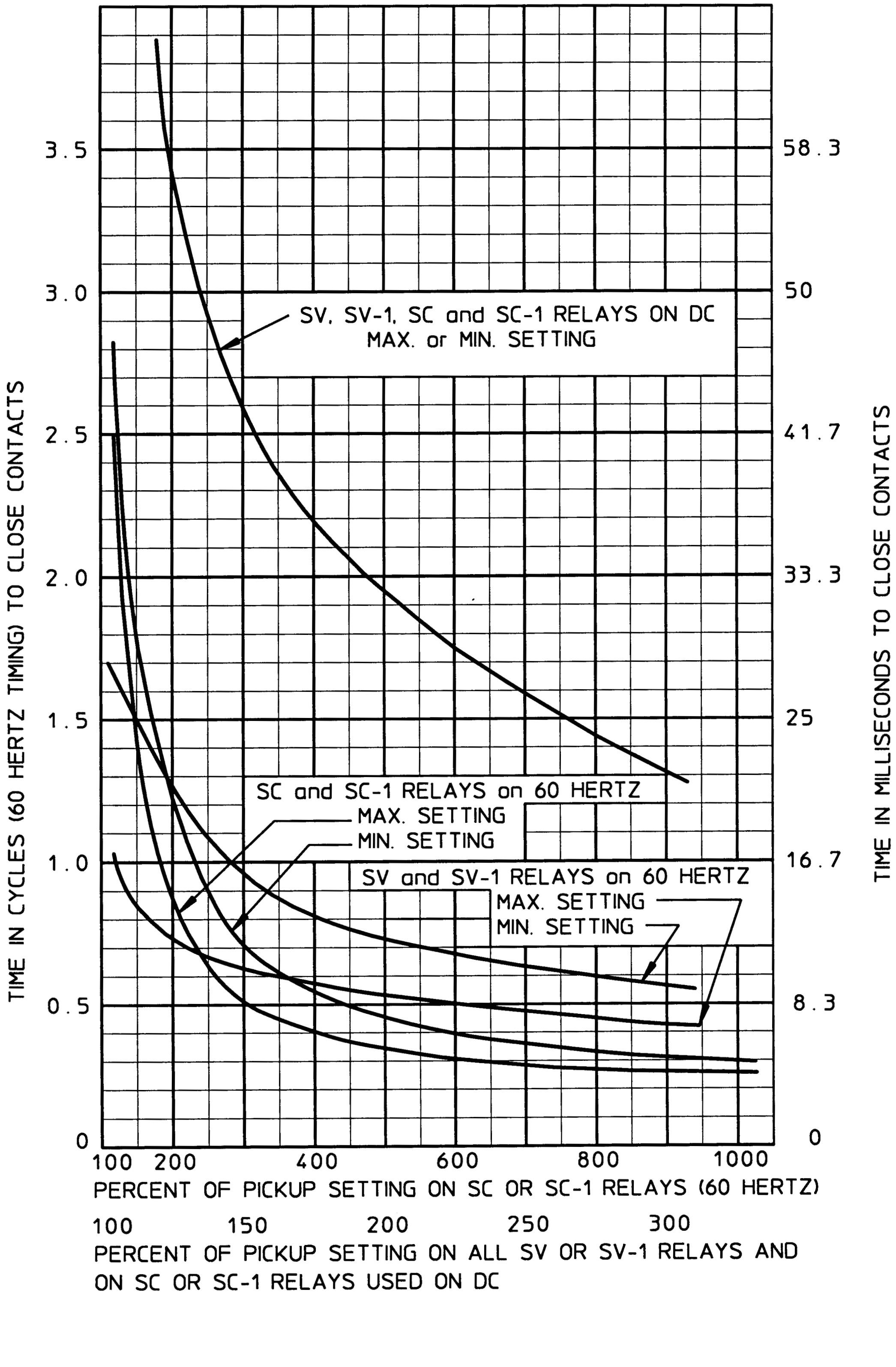


Figure 10: Typical Time Curves for the Types SC and SV Relays (Using Flux Shunt for Pickup Adjustment)

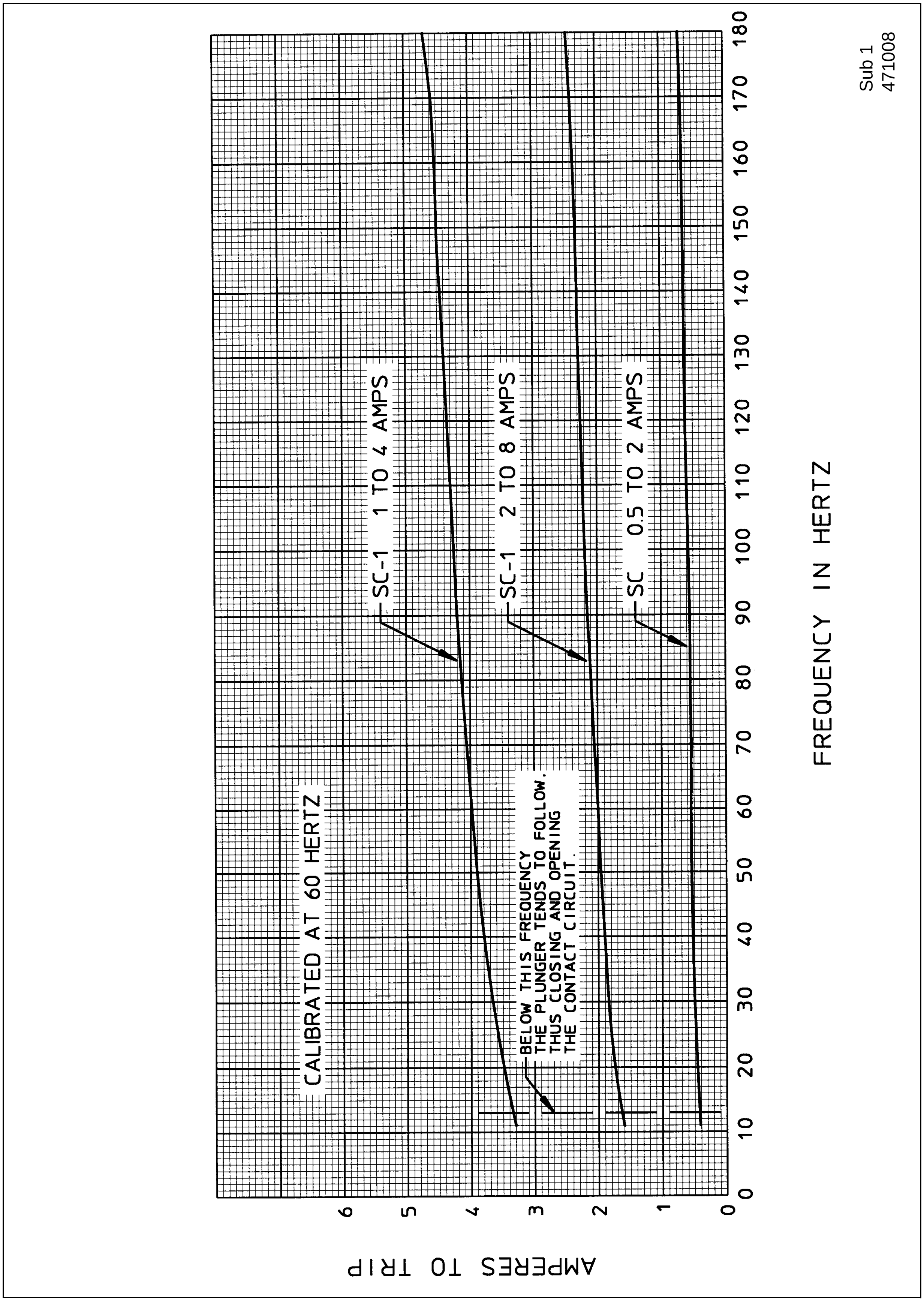


Figure 11: Typical SC & SC-1 Current Relays dc or 25 to 60 Hertz

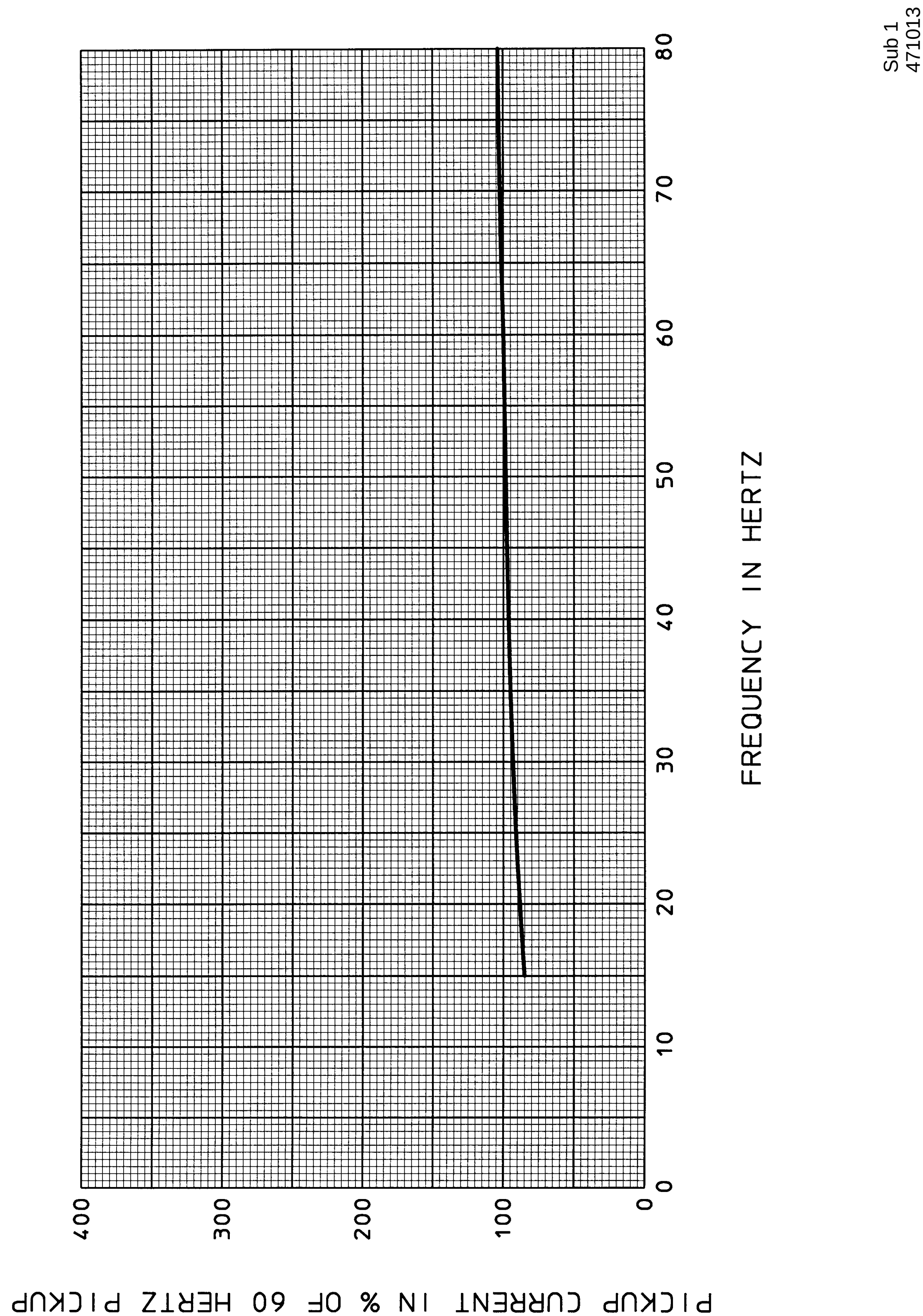


Figure 12: Pickup on Variable Frequency for SC & SC-1 Current Relays

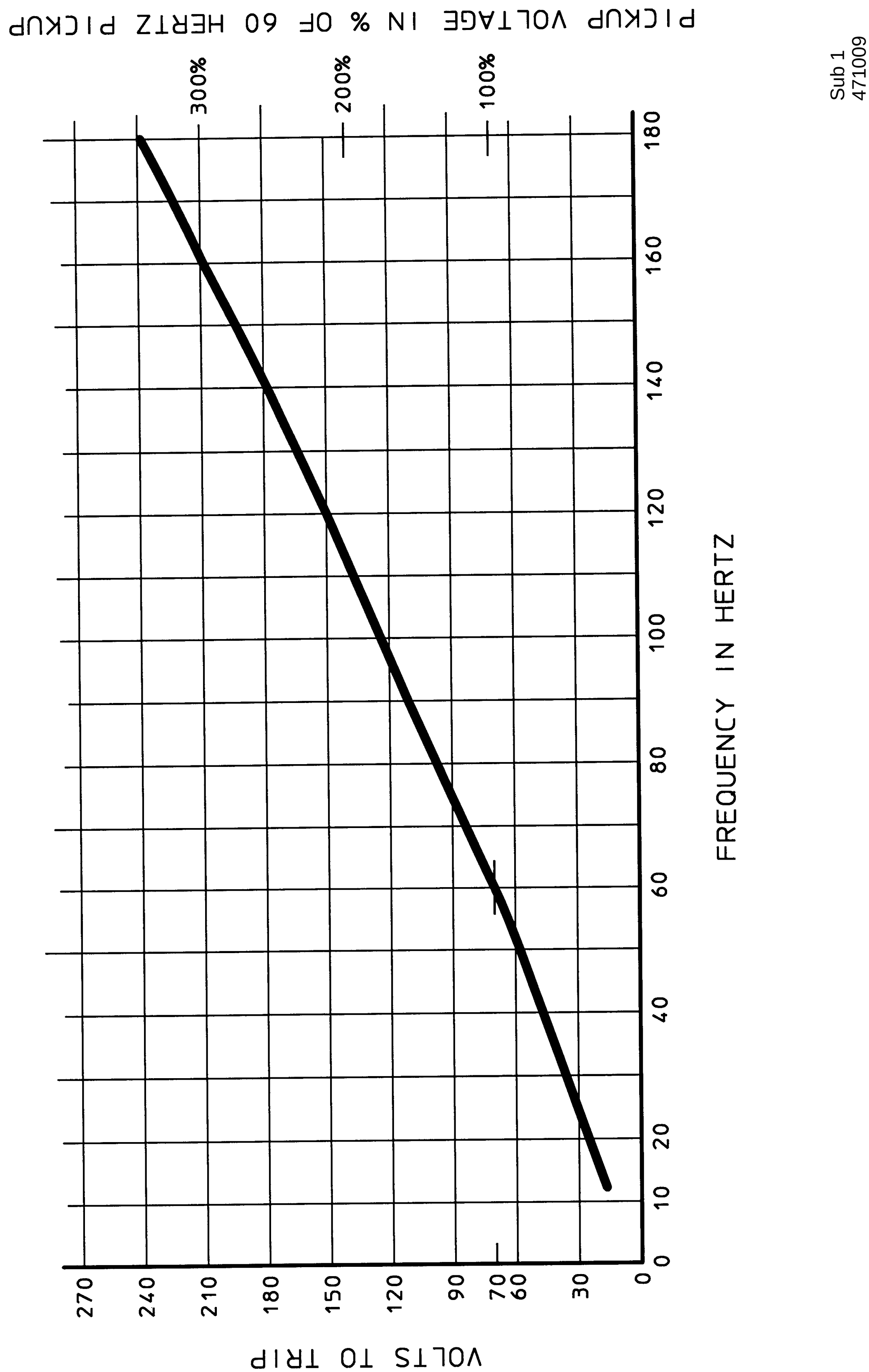


Figure 13: Typical Type SV Voltage Relay (120 Volts 60 Hertz Range 70 to 150 Volts)

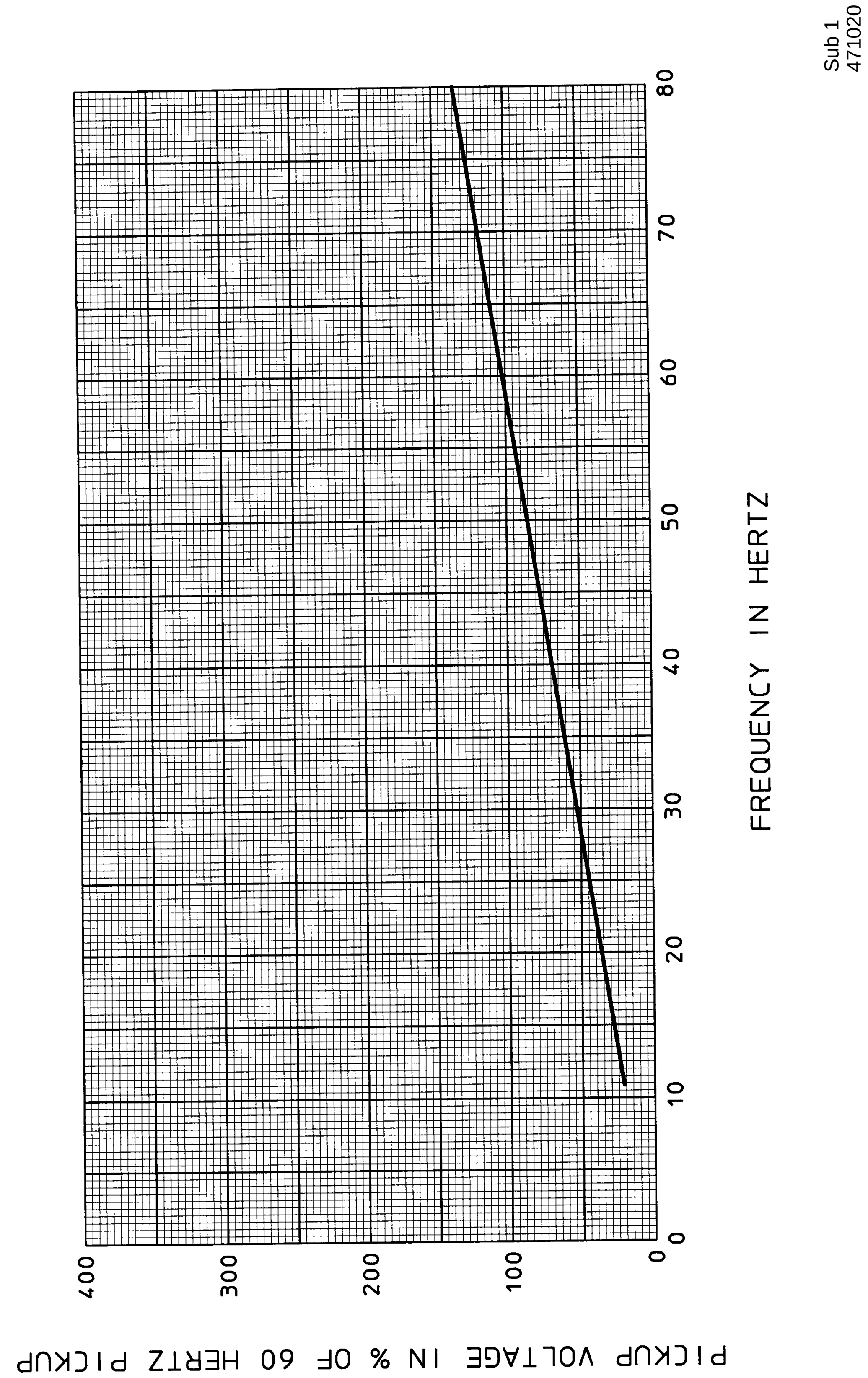


Figure 14: Pickup on Variable Frequency for SV Relay 120 volts 60 Hertz (Set at 70 volts)

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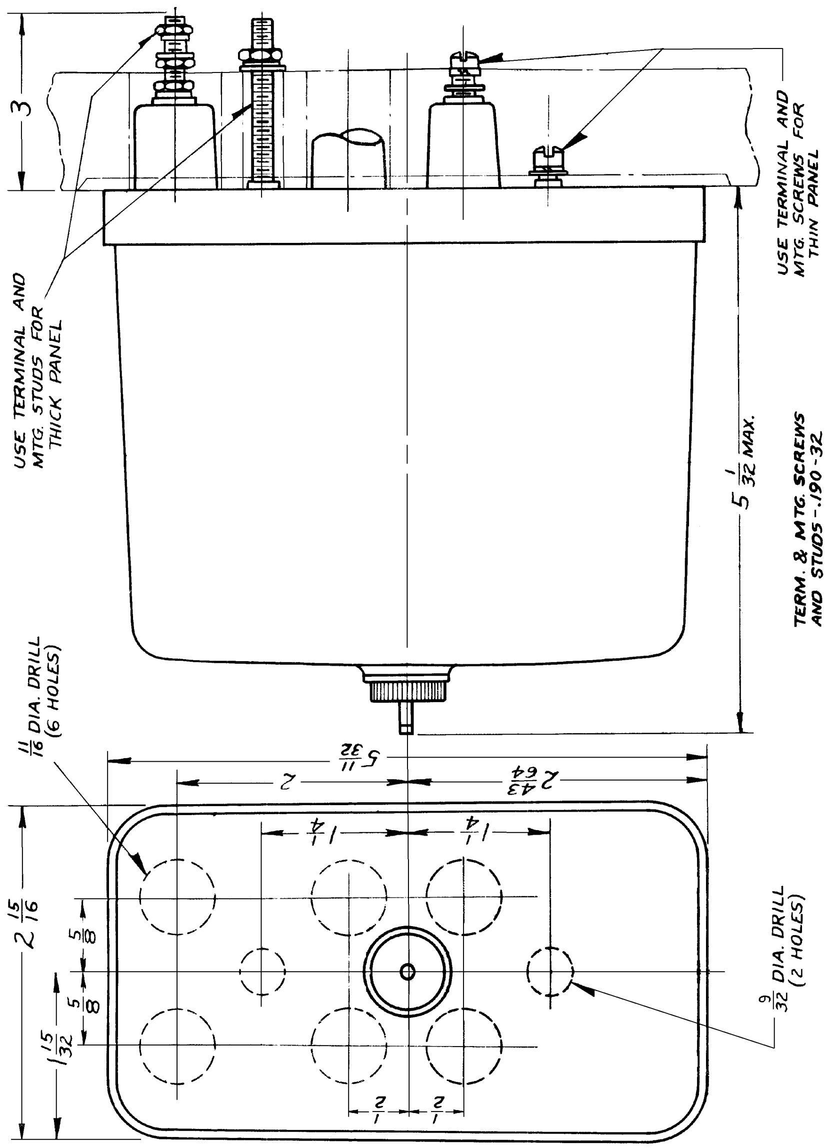

Figure 15: Outline and Drilling Plan for Single Unit Relays in small glass projection case

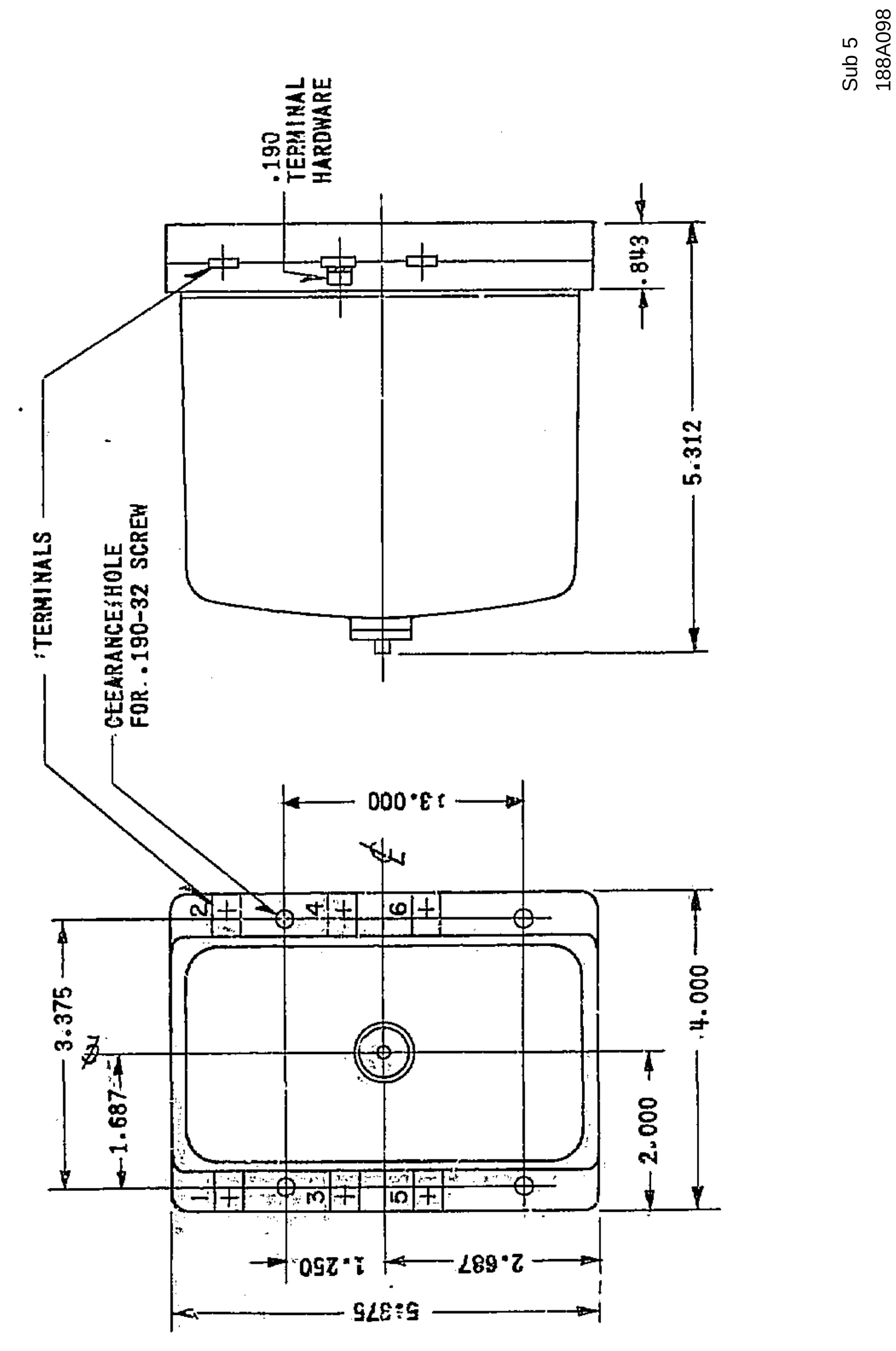

Figure 16: Outline and Drilling Plan for Relays in Front Connected Case

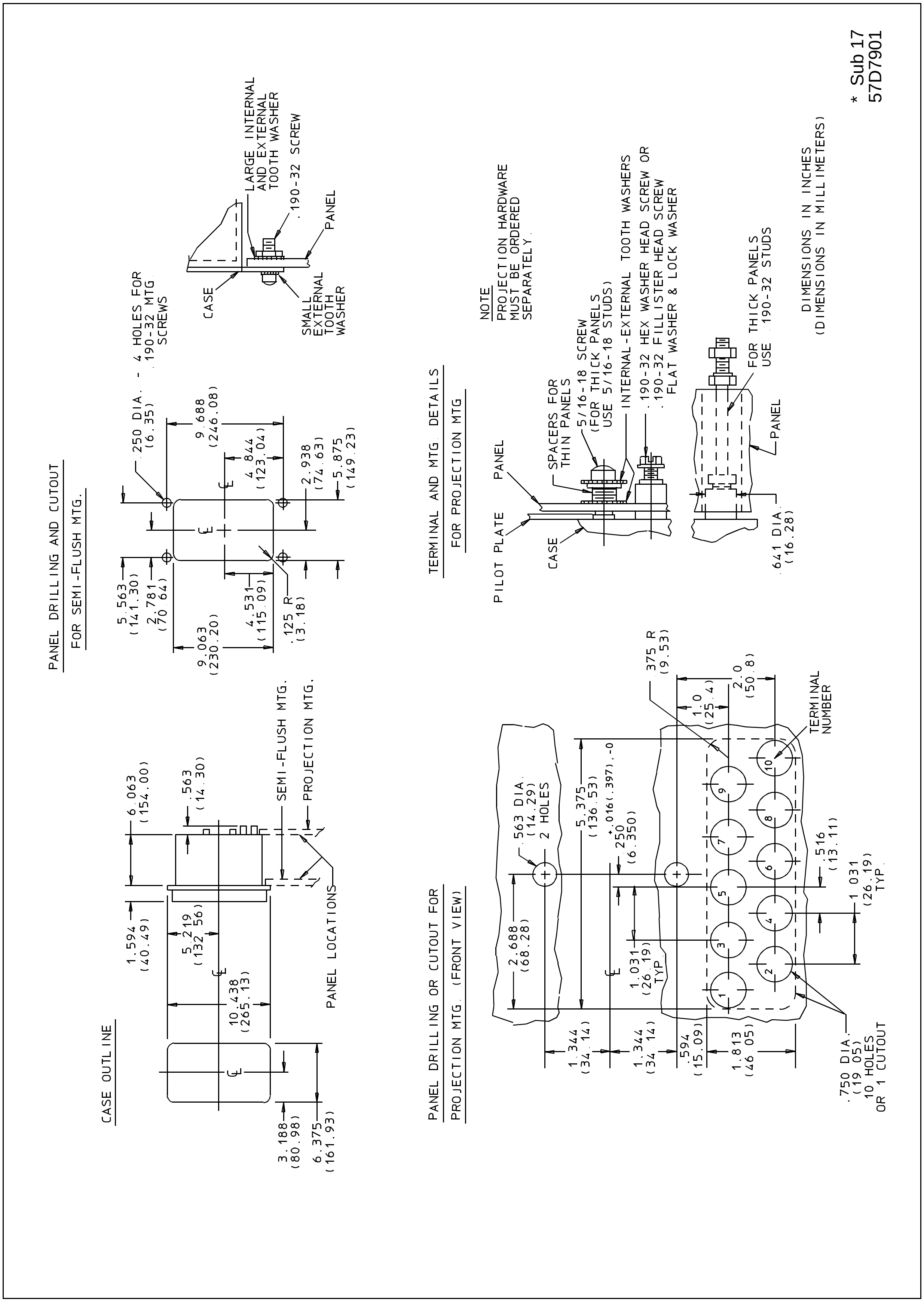

Figure 17: Outline and Drilling Plan for Single and Double Unit Relays in the Type FT-21 Case

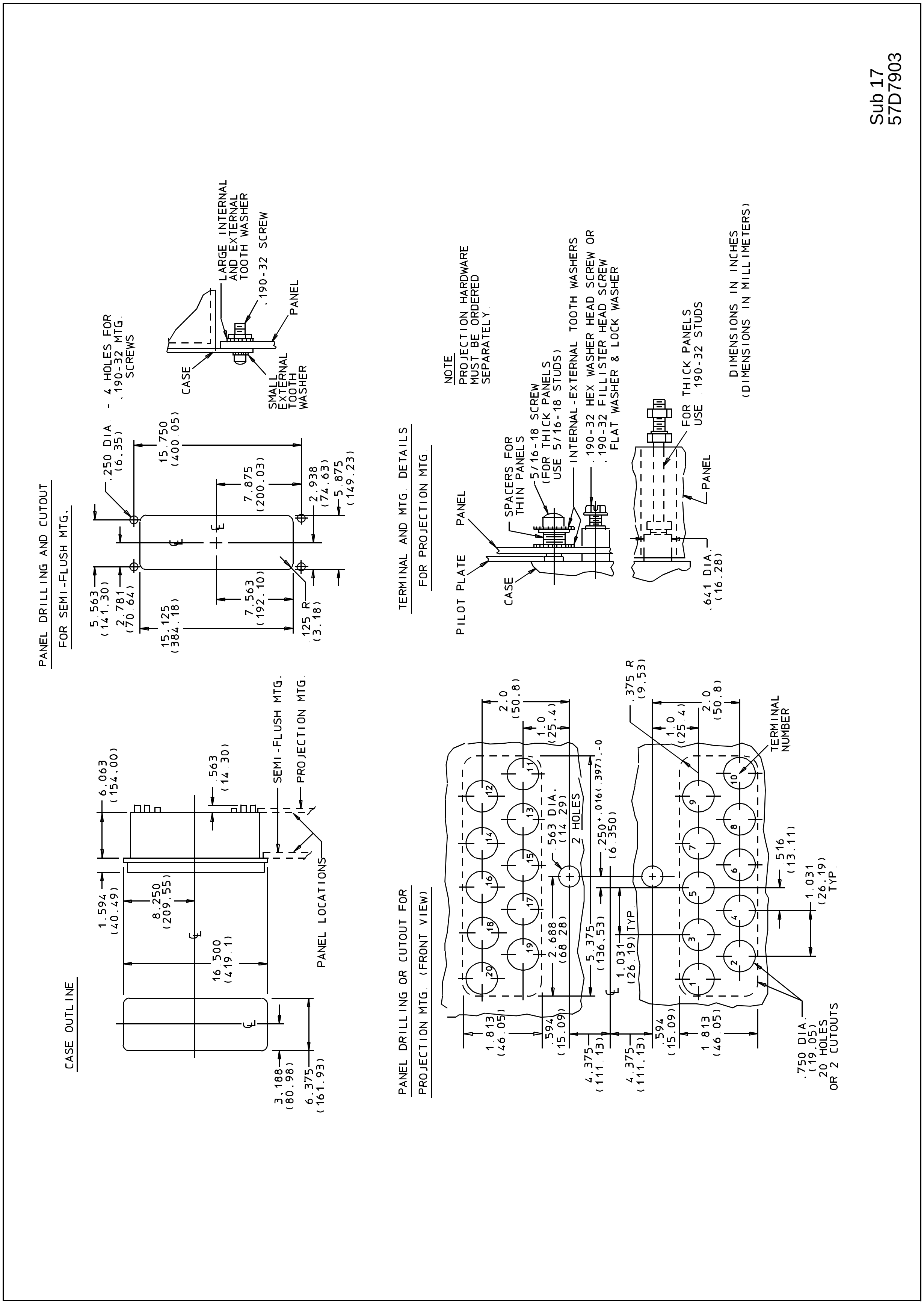

Figure 18: Outline and Drilling Plan for Three Unit Relays in Type FT-32 Case

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