INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

TYPES SVF—SVF-1 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.

APPLICATION

Where dropout independent of frequency is required, the SVF and SVF-1 instantaneous undervoltage relays are recommended. Dropout is adjustable over the range of 24-36 and 30-45 volts for the SVF-1 and SVF relays respectively with a maximum dropout variation of ± 5% between 20 and 60 cycles. Where the relay is required to operate only during balanced 3 phase conditions, the single phase SVF or SVF-1 is suitable. Where balanced conditions may not exist when relay operation is required, the 3 phase relay design is recommended.

For supervising initiation of bus transfer, where the undervoltage relay is measuring the residual voltage of the motor load, the 3 phase SVF or SVF-1 is recommended, since one or more phase voltages may be reduced by a fault on the supply circuit prior to transfer.

CONSTRUCTION AND OPERATION

The single phase SVF and SVF-1 relays consist of an SV or SV-1 voltage unit respectively, a reactor, a series resistor and a full wave rectifier. The reactor is used in the A-C circuit to regulate the voltage applied to the SV or SV-1 units.

The three phase SVF and SVF-1 relays consist of an SV or SV-1 voltage unit respectively, a series resistor, and a three phase bridge rectifier. A transient voltage suppressor is used across the voltage unit in the SVF and SVF-1 3 Phase Relay.

Voltage Unit (SV or SV-1)

The types SV and SV-1 voltage units operate on the solenoid principle. A U-shaped iron frame, mounted on the moulded 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 frame. The position of this shunt determines the dropout 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.

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

† Trademark of the Polymer Corporation

SUPERSEDES I.L. 41-766.4
*Denotes change from supersedes issue.

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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. Lock washers are assembled inside the moulded 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 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 A-C, or 1 ampere at 125 volts D-C.

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.

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.

Several factors may affect the drop-out ratio of the relay. Whatever affects the ratio does so because either the drop-out or pick-up or both are affected. Obviously, incorrect assembly 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, 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 set-screw 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 longnose 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 if 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 its upper bearing surface, below the spool-shaped bushing, when loosening the nut and set screw, 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, lintless cloth. This may be moistened with benzene or some other cleaning solvent if necessary. Use no lubricant on the plunger shaft or

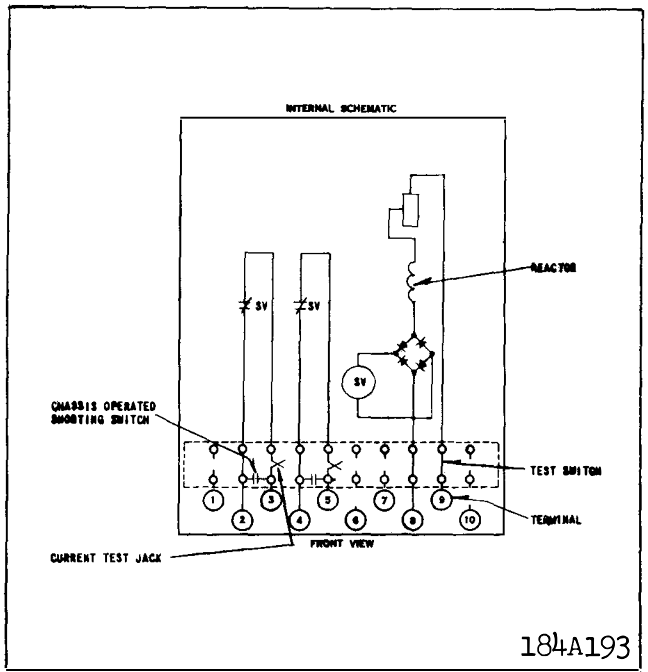

Fig. 1. Internal Schematic of the SVF and SVF-1 Single Phase Relays

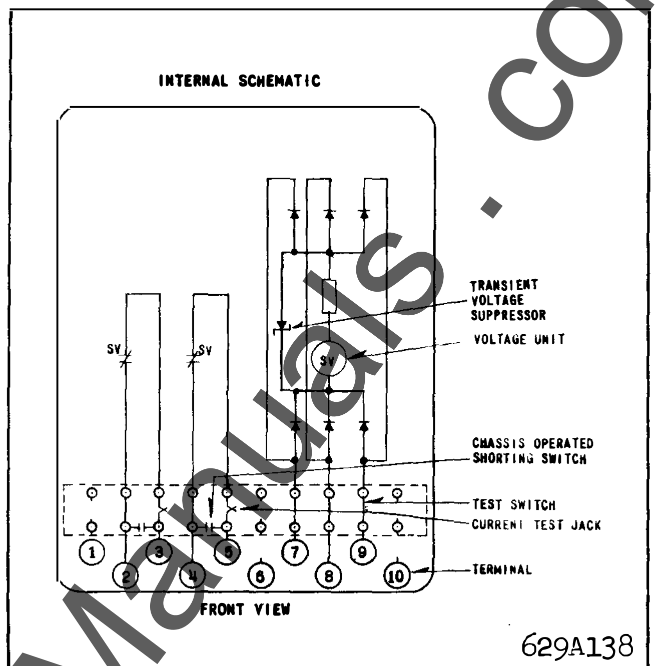

Fig. 2. Internal Schematic of the SVF and SVF-1 Three Phase Relays

bearings when reassembling 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 moving contact leads pass through insulation sleeves assembled on the shanks of the terminal slips 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.

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 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 convenient 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, 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. 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.

CHARACTERISTICS AND SETTINGS

The types SVF and SVF-1 single phase and three phase relays are supplied with drop out voltages constant between 20 and 60 cycles, and have a scale calibrated in drop out volts covering a range of 30 to 45 volts for the SVF relays, and 24 to 36 volts for the SVF-1 relays. These relays are desired for operation on a supply having a nominal value of 120 volts. The scale markings are determined by reducing the voltage gradually from 120 volts. The characteristics of the relays are such that at any setting, the relay will drop out at the same value of voltage (within 5%) for any frequency between 20 and 60 cycles. The pickup voltages will vary somewhat on various relays, and is approximately 95 volts or less for a 45 volt dropout setting for the SVF relays, and 100 volts or less for a 36 volt dropout setting for the SVF-1 relays.

The insensitivity of the single phase relays to frequency is obtained primarily by operating the voltage unit on full-wave rectified a-c. To compensate for the tendency of the voltage unit to respond to instantaneous voltage values and, therefore, to drop out at higher R.M.S. voltages as the frequency decreases a reactor is used in the a-c circuit. The effect of the reactor is to cause the rectified current to increase slightly as the frequency decreases, thus keeping the dropout point at approximately the same R.M.S. voltage value throughout the frequency range. The series resistor in the a-c supply renders negligible the effect of the relay coil temperature on the operating point. Because of residual magnetism, when the voltage is reduced from 120 volts, the dropout point may be slightly higher than it is when reduced from the pickup values.

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

3 Phase Relays †

Relays energized at 120 volts balanced 3 ϕ voltage – Burden in volt-amperes.

	Freq.	Phase A	Phase B	Phase C
SVF	60	9.6	9.6	9.6
SVF	25	9.6	9.6	9.6
SVF-1	60	9.6	9.6	9.6
SVF-1	25	9.6	9.6	9.6

Single Phase Relays †

Relays energized at 120 volts

	Freq.	VA.
SVF	60	17
SVF	25	18.5
SVF-1	60	17
SVF-1	25	18.5

† NOTE: Values of volt-amperes are average for various plunger and shunt positions.

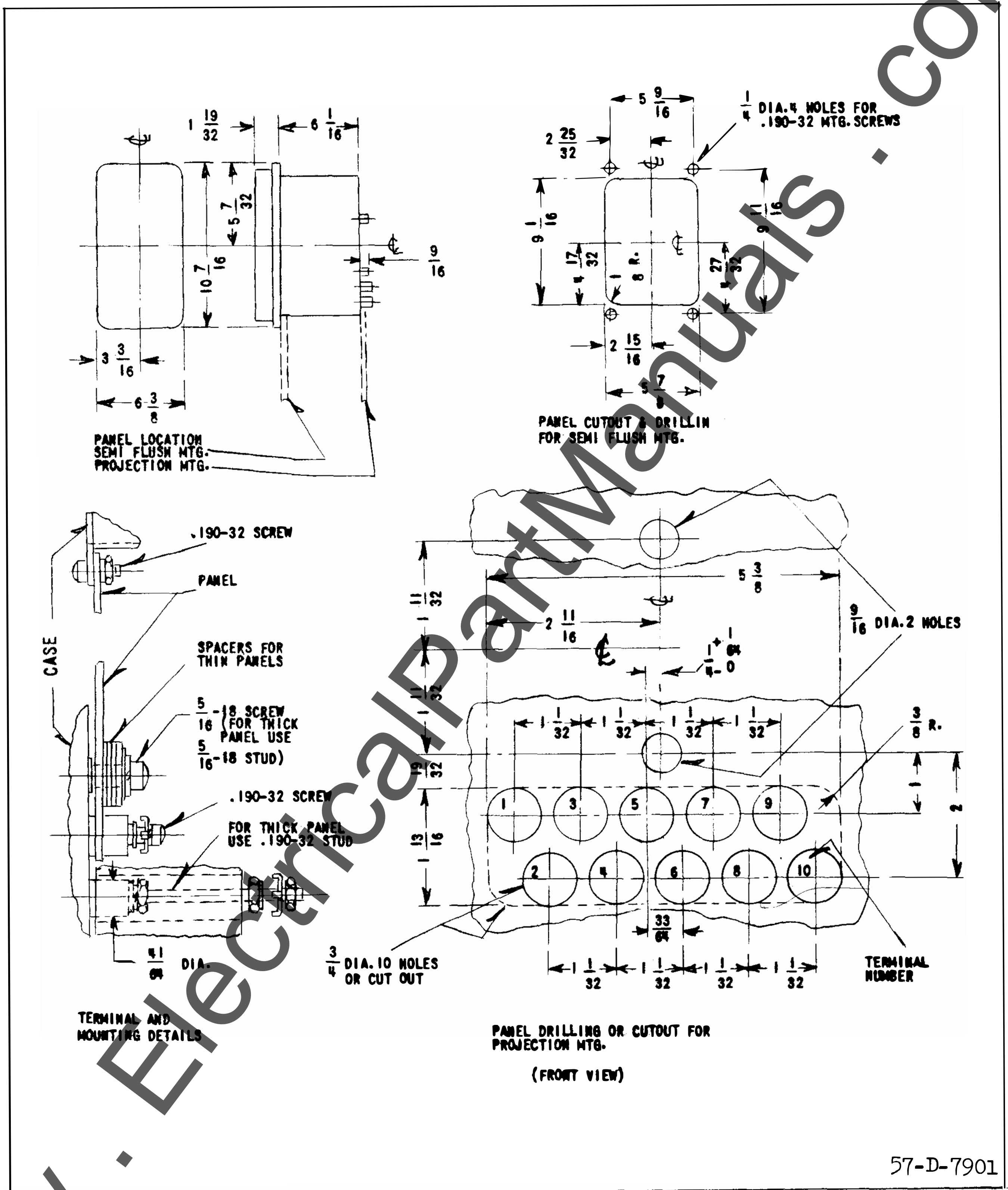

Fig. 3. Outline and Drilling Plant for the SVF and SVF-1 in the Type FT 21 Case

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RELAY-INSTRUMENT DIVISION **NEWARK, N. J.**

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