Oil Switches

COOPER Power Systems

Type TSC; Three-Phase; Installation Instructions

S260-20-10
Service Information

CAUTION:
DO NOT ENERGIZE THIS EQUIPMENT OUT OF OIL

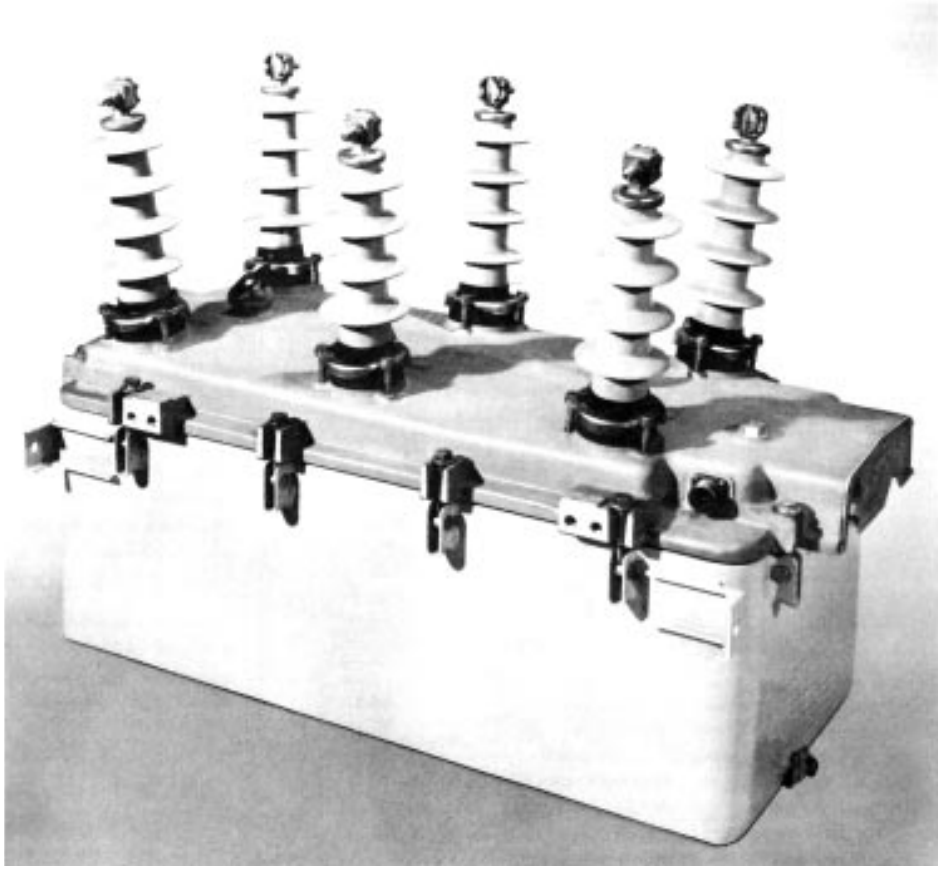


Figure 1.
Type TSC oil switch.

SHIPMENT AND ACCEPTANCE

Each switch is completely assembled, inspected, adjusted, and tested at the factory and is filled to the correct level with insulating oil. It is in good condition when accepted by the carrier for shipment.

Upon receipt, inspect the switch thoroughly for damage and loss of parts or oil incurred during shipment. If damage or loss is discovered, file a claim with the carrier immediately. Save the shipping carton or crate—with all packing— for inspection.

Check for oil leakage and tighten all bolts that may have loosened during shipment—especially the bolts attaching the head to the tank.

STORAGE

If the switch is stored for any appreciable time before installation, provide a clean, dry storage space in an area where the possibility of mechanical damage—especially to the bushings—will be minimized.

April 1988 • Supersedes 9/77
Printed in USA

DESCRIPTION

The Cooper Power Systems Type TSC switch is a three-phase oil-filled device designed specifically for capacitor switching applications on 20/34.5-kv distribution systems. With a capacitive switching current rating of 135 amps and momentary and latching ratings of 12,000 asymmetical amps, the TSC switch can switch capacitor banks rated up to 6000 kvar.

The TSC switch is equipped with a simple, fast-response mechanism that switches all three phases simultaneously from a common shaft operated by the release of preloaded springs. Double-blade moving contacts, mounted directly to the shaft, are rotated in 90-degree increment into and out of springloaded, finger-type stationary contacts. The fast rotating action provides contact opening and closing times of about five-eighths of one cycle. The operating springs are preloaded by an electric motor and reduction gear device to the point of release to provide this fast rotating action. Total operating time for the motor to load and release the springs for either an open or a close operation is 15 seconds maximum. A solenoid-operated clutch engages the motor drive to the operating mechanism.

The TSC switch may also be manually operated by a single, downward pull of the manual operating handle which is located under the sleet hood at the front of the switch.

Table 1
Ratings and Specifications

Nominal system voltage (kv rms}	34.5
Rated maximum voltage (kv rms)	38.0
Rated impulse withstand (BIL) (kv crest)	150
Low-frequency insulation level withstand (kv rms)	
Dry, one minute	70
Wet, ten seconds	60
Rated momentary current (asymmetrical amps)	12000
Short-time symmetrical current (amps)	
One-half second	8000
One second	7600
Rated making current (asymmetrical amps)	12000
Rated capacitive continuous and switching current (amps)	135
Rated inductive continous and switching current (amps)	
75—100% power factor	300
50 — 75% power factor	200
Under 50% power factor	100
Control Data	
Nominal operating voltage, 60 Hz (vac)	115
Inrush current amps	10
Inrush duration (cycles)	2
Steady-state current (amps)	3.0
Maximum operating time for electrical close or open operation (see)	15
Net weight of switch (with oil) (lb)	535
Oil capacity (gal)	35

INSTALLATION

PRELIMINARY CHECKS

Make sure the oil in the switch tank is at the proper level by checking the dipstick in the head casting. Replenish any loss with new, dry, transformer oil.

If the switch has been stored for any length of time or is being relocated, check the dielectric strength of the oil in accordance with ASTM-approved testing procedures. For the physical properties of the oil used in Cooper Power Systems distribution switchgear, see Reference Data R280-90-1.

1. In new equipment, the oil must have a minimum dielectric strength of 26 kv. If less than 26 kv, filter the oil to restore its dielectric strength to an acceptable level.
2. If the equipment has been in service and is being relocated, the minimum dielectric strength of the oil must be at least 22 kv. If less than 22 kv—or if the oil is contaminated with carbon sludge—replace the oil. About 35 gallons of oil are required to fill an empty tank to the correct level.

LIFTING A SWITCH

Follow all approved safety practices when making hitches and lifting the equipment. Lift the load smoothly and do not allow the load to shift.

The Type TSC switch has two lifting lugs—**both** must be used when lifting the switch. Maximum strength is attained with a vertical lift attached to the lugs. Use a spreader bar with a fixed attachment point for the hook at the load center.

If a sling is used for lifting a TSC switch, it must have a fixed attachment point at the load center. Rig the switch so that the sling height is equal to—or greater than—the distance between lifting lugs.

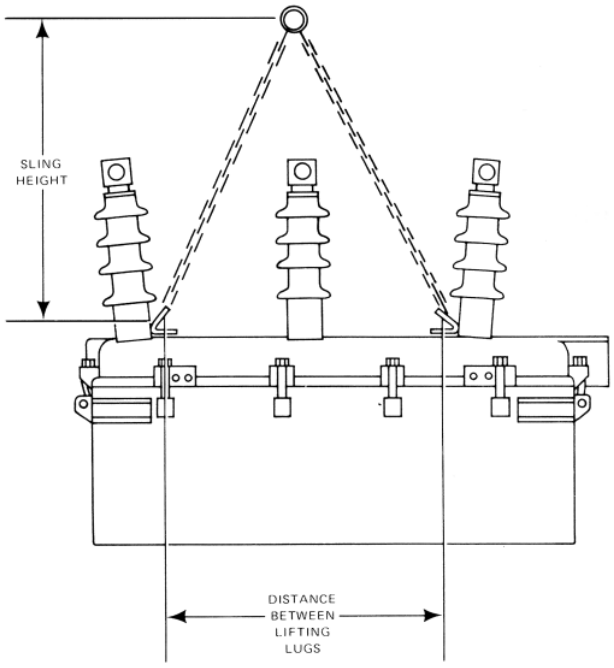


Figure 2.
Lifting a Type TSC oil switch.

MOUNTING

The Type TSC switch can be easily installed using specially designed pole-mounting or capacitor structure-mounting frames. A windlass-type hoist is also available for both frames to facilitate inspection and maintenance of the switch. Instructions for the assembly and installation of the mounting frames are furnished with the frames. Essential dimensional information for these installations is shown in Figures 3 and 4.

Outline dimensions for the TSC switch are shown in Figure 5 to accommodate any custom-built mounting installation.

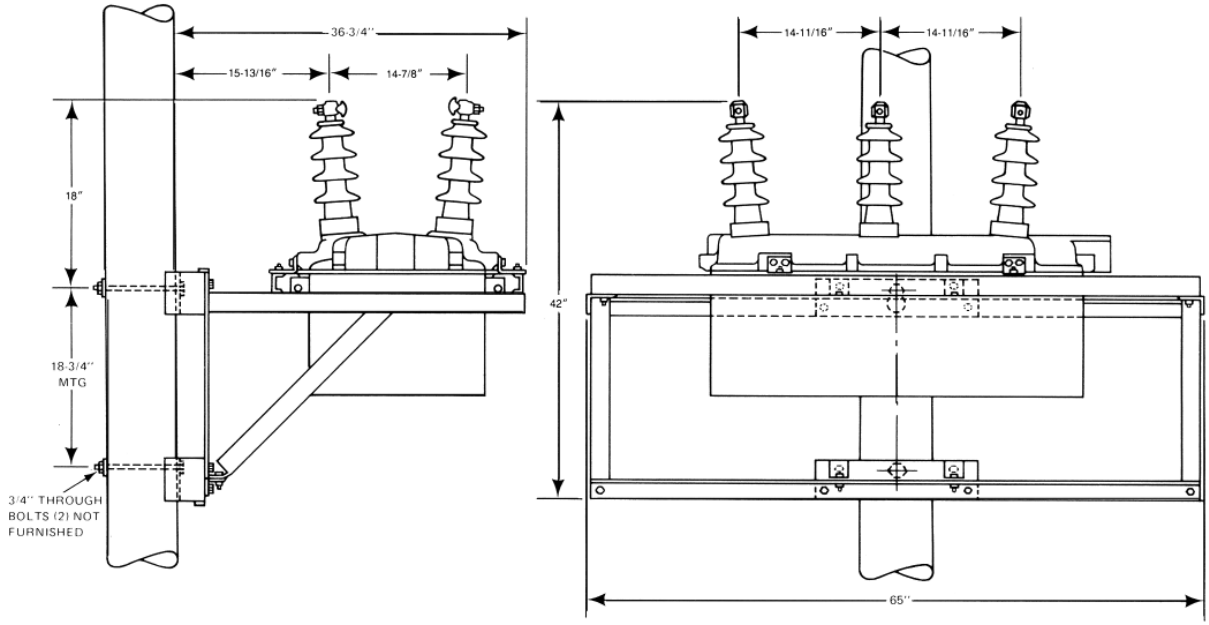


Figure 3.
Direct-pole-mounting hanger KA2TSC1.

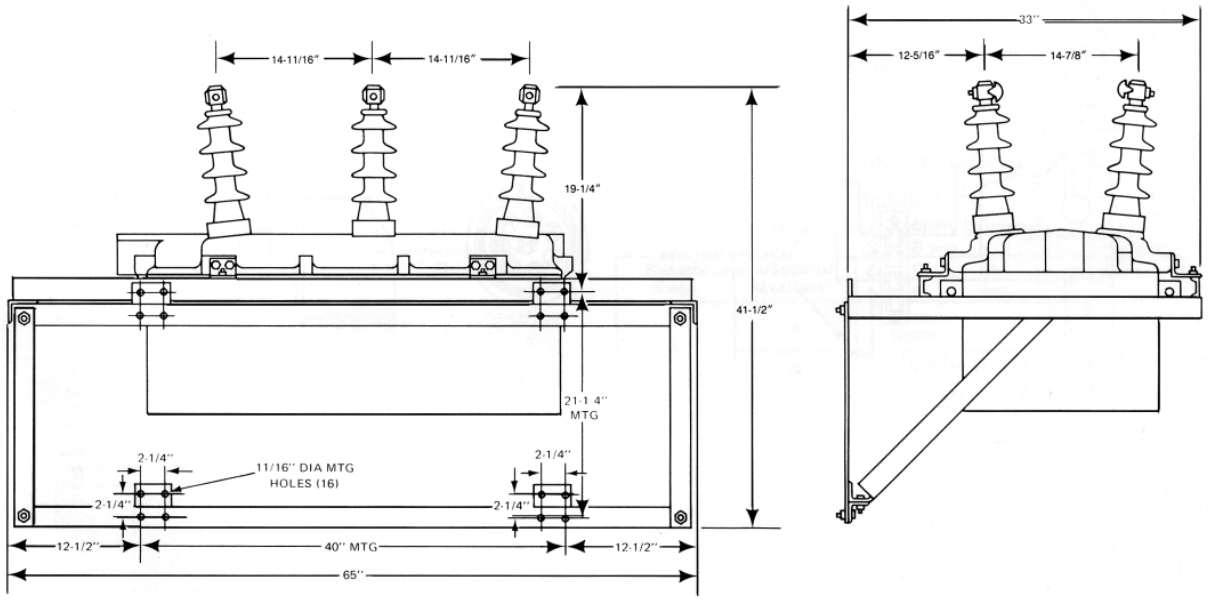


Figure 4.
Capacitor-structure-mounting hanger KA2TSC2.

NOTE: Dimensions shown are for general information only. For critical construction dimensions, refer to factory.

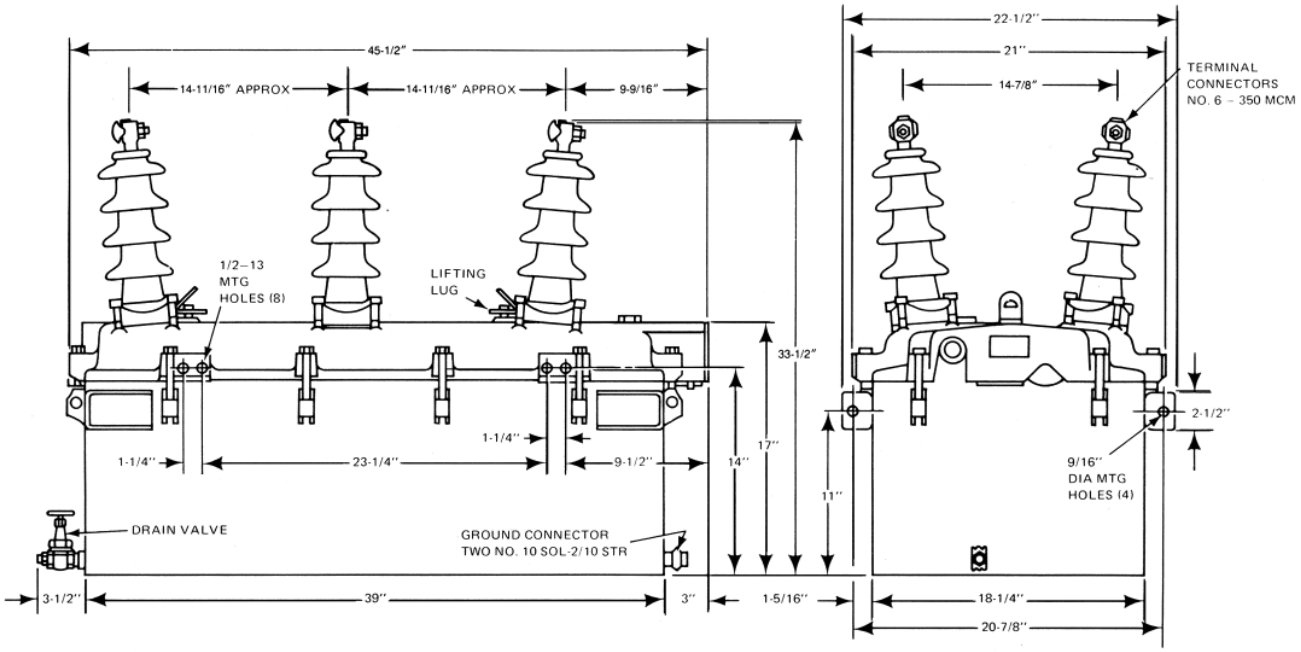


Figure 5.
Outline dimensions for the Type TSC oil switch.

CONNECTIONS

Main Wiring

Primary connections to the TSC switch are made at the universal clamp-type bushing terminals that accommodate either copper or aluminum conductors from no. 6 solid through 350 mcm in a vertical or horizontal position.

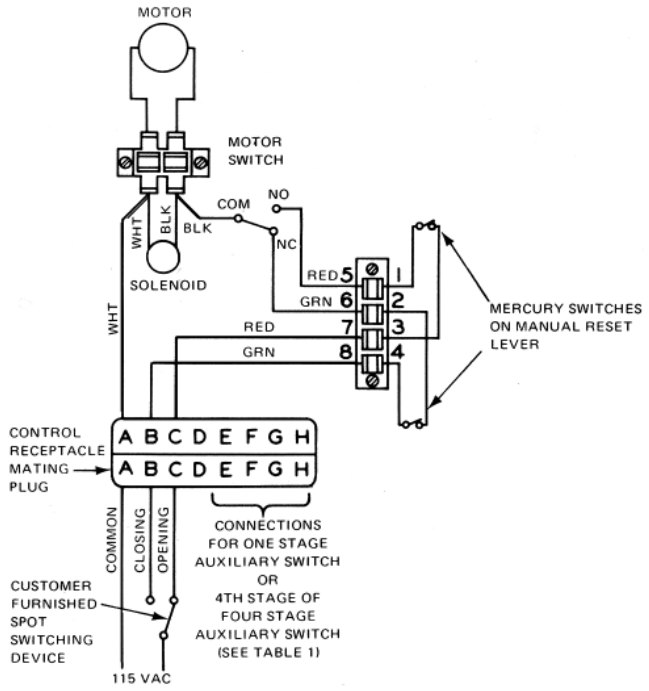


Figure 6.
Connection diagram—standard Type TSC switch.

Control Wiring—Standard Switch

The control circuit is permanently wired to an 8-pin receptacle in the switch head casting. The mating plug is furnished as standard with the switch.

Internal connections to the receptacle and customer connections to the plug are shown in Figure 6. Pin arrangement for the plug is shown in Figure 7.

A single-pole/double-throw switching device (furnished by the customer) is required to operate the switch. The device must hold in both the CLOSE and the OPEN positions for at least 10 seconds to allow the motor to charge the operating springs and operate the fast-response mechanism.

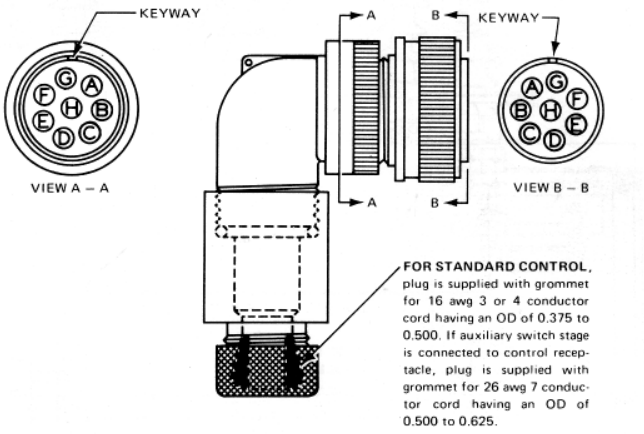


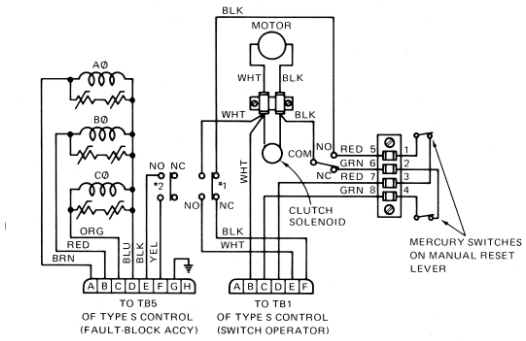
Figure 7.
Control plug—standard Type TSC switch.

Control Circuit—Load-Transfer Switch

A factory-installed accessory modifies the control circuit of the switch for use with the Type S control in automatic load-transfer schemes:

Accessory KASTSC1 provides all the necessary switch modifications and additions for use with the Type S control **with the** fault-block feature. This includes internal bushing current transformers for fault-current sensing, additional auxiliary switch contacts, and necessary circuit modifications all wired to a six-pin and an eight-pin receptacle as shown in Figure 8. The pin orientation for the mating plugs (also included) is shown in Figure 9.

Accessory KASTSC2 provides all the necessary switch modifications for use with the Type S control **without** the fault-block feature. This accessory includes an additional auxiliary switch contact and necessary circuit modifications wired to the six-pin receptacle shown in Figure 8. The pin orientation for the six-pin mating plug (also included) is shown in Figure 9.



NOTE: For transfer scheme without fault block, cts 1-2 aux sw and eight-pin receptacle are omitted.

Figure 8
Connection diagram—Type TSC switch wired for use with Type S auto load-transfer control.

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Connection diagram—Type TSC switch wired for use with Type S auto load-transfer control.

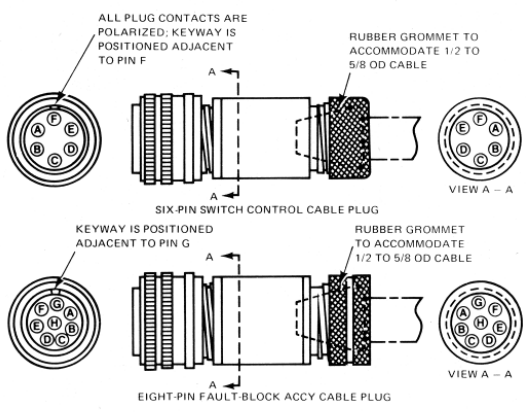

Figure 9.
Control plug—Type TSC switch wired for use with Type S auto load-transfer switch.

Accessory Auxiliary Switch Wiring

A one-, three-, or four-stage auxiliary switch is available as an accessory. Each stage consists of two sets of contacts— one normally open (NO) and one normally closed (NC). Each contact set is wired separtely to receptacles mounted on the head as follows:

One-stage switch: Wired to the spare pins of the 8-pin control receptacle.

Three-stage switch: All three stages are wired to a 14-pin accessory receptacle.

Four-stage switch: First three stages are wired to the 14-pin accessory receptacle; the fourth stage is wired to the spare pins in the 8-pin control receptacle.

Pin wiring designations are shown in Table 2. Pin orientation of the mating plug (supplied with the accessory) is shown in Figure 10.

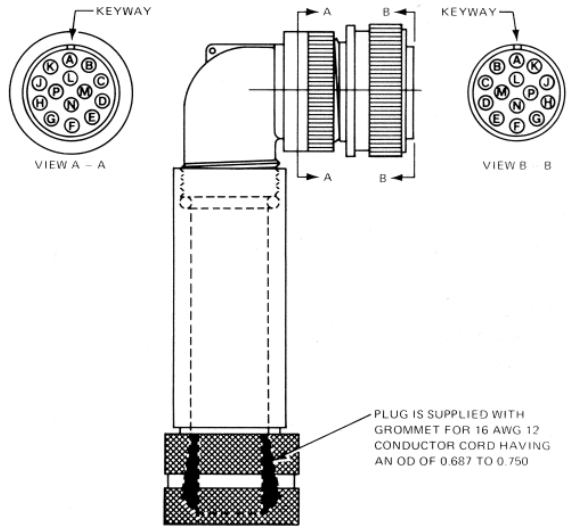

Figure 10.
Type TSC switch accessory plug.

Table 2
Auxiliary Switch Wiring*

Switch Stage	Type of Contact**	Wire Color	Receptacle Pin	
1	a	Yellow Orange	A B	14-pin accessory receptacle
	b	Red Brown	C D	
2	a	Yellow Orange	F G	
	b	Red Brown	H J	
3	a	Yellow Orange	L M	
	b	Red Brown	N P	
4	a	Yellow Orange	E F	8-pin control receptacle
	b	Red Brown	G H	

*If only a single-stage auxiliary switch is ordered, the switch is wired to the 8-pin control receptacle in the fourth-stage position.

**The a contact is open when the TSC switch is open; the b contact is closed when the TSC switch is open.

OPERATION

With the TSC switch mounted and connected as described in preceding paragraphs, operate the switch electrically and manually before placing it in service.

ELECTRICAL OPERATION

The TSC switch is electrically opened and closed by means of a customer-furnished SPDT switching device as shown in Figure 6.

MANUAL OPERATION

The TSC switch is manually operated by means of the red handle under the sleet hood (Figure 11). Pulling down the handle will either open or close the switch depending upon its previous position. A disc-type contact-position indicator shows the switch position. When the operating handle is pulled down, the manual reset lever is also pulled down with the same motion. In the down position the manual reset lever disables the motor circuit, providing local manual override.

When the operating handle is released, it automatically returns to its up position under the sleet hood. The manual reset lever, however, must be returned manually to its up position before the motor circuit is armed and the switch is returned to remote electrical control.

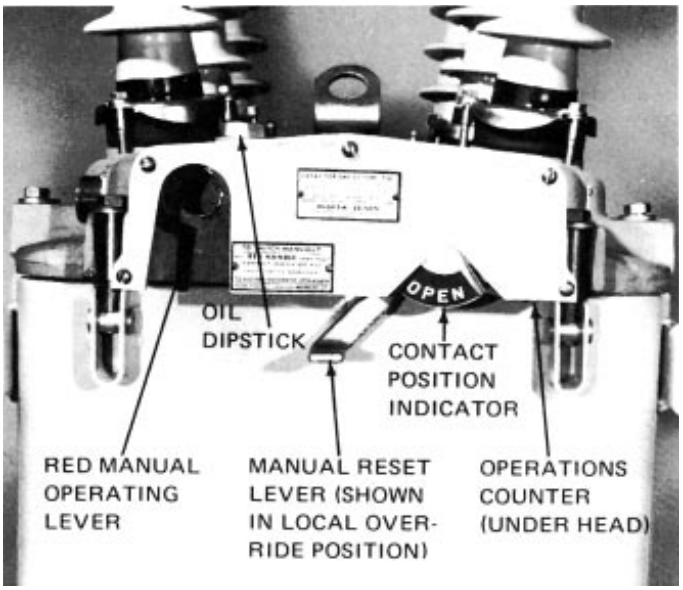

Figure 11.
Type TSC switch indicator and operating levers.

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