



S&C Switch Operators Type CS-1A

Supersedes Descriptive Bulletin 852-31 dated 10-29-79



S&C ELECTRIC COMPANY • Chicago
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DESCRIPTIVE BULLETIN 719-30

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S&C Switch Operators - Type CS-1A

INTRODUCTION

Type CS-1 A Switch Operators are high-speed operators expressly designed for power operation of S&C Mark V Circuit-Switchers.

Type CS-1A Switch Operators provide the high-speed, high-torque power operation required to secure the full inherent mechanical and electrical performance characteristics of Mark V Circuit-Switchers, including close interphase simultaneity, long life of fault-closing contacts under normal operating duties, and avoidance

of excessive switching transients due to prolonged or unstable prestrike arcing.

For Vertical-Break and Integer Style Mark V Circuit-Switchers, Type CS-1A Switch Operators also provide two-time duty-cycle fault-closing ratings of 30,000 amperes rms three-phase symmetrical,

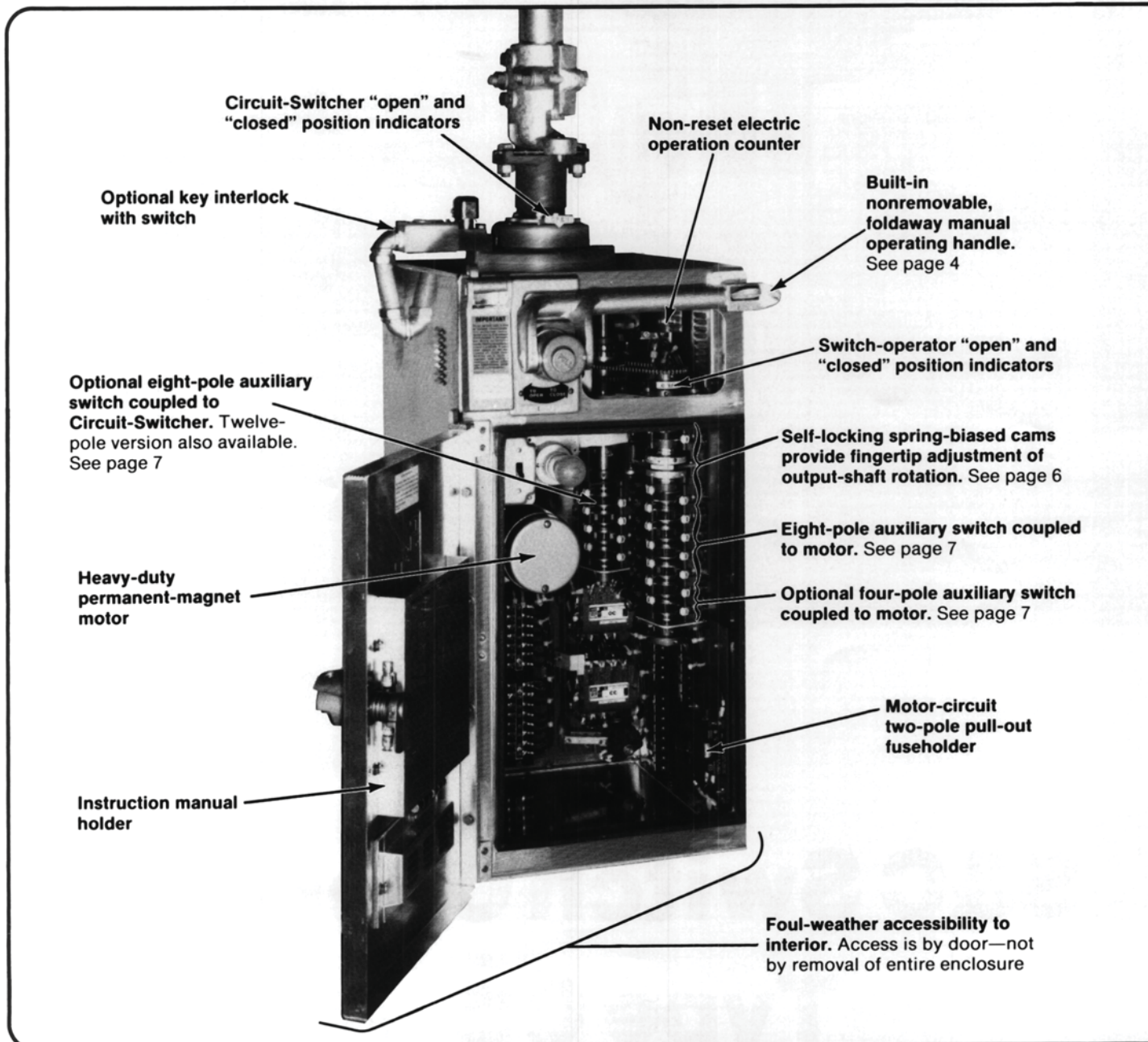


Figure 1. Interior of Type CS-1A Switch Operator.

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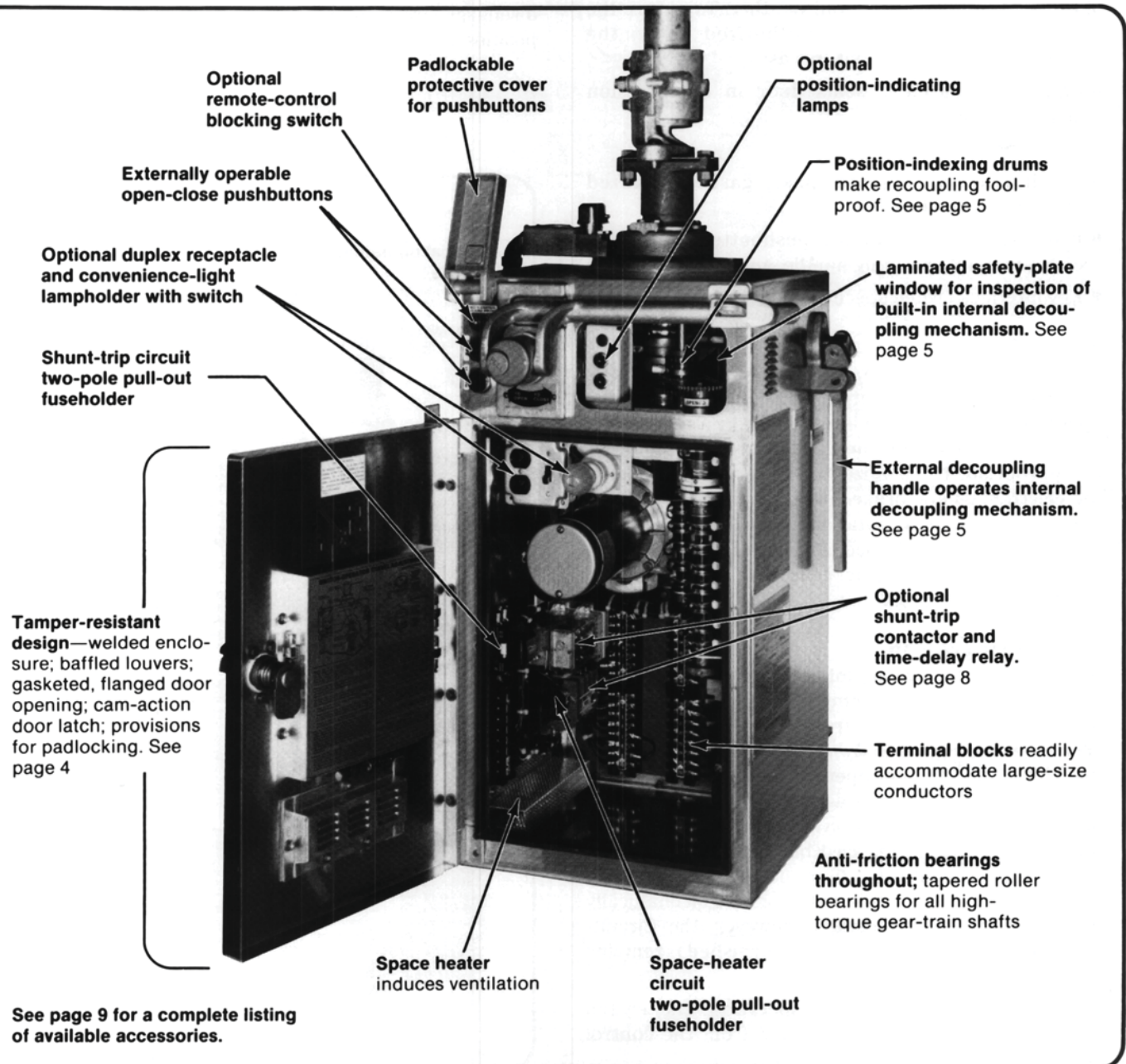


76,500 amperes peak; and opening and closing without hesitation under 3/4-inch ice formation.

And for Center-Break Style Mark V Circuit-Switchers, Type CS-1A Switch Operators also provide two-tune duty-cycle fault-closing ratings of 40,000 amperes rms three-phase symmetrical, 102,000 amperes peak; and

opening and closing without hesitation under 1½-inch ice formation.

Shown below in Figure 1 are some of the important features of Type CS-1A Switch Operators. These features are discussed in detail in the "CONSTRUCTION AND OPERATION" section.



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CONSTRUCTION AND OPERATION

The Enclosure

The switch operator is housed in a weatherproof, dust proof enclosure of sturdy, 3/32-inch sheet aluminum. All seams are welded and enclosure openings are sealed with gasketing or O-rings at all possible water-ingress points. A fused space heater is provided to maintain air circulation for condensation control. The space heater is factory-connected for 240-volt ac operation but can be readily field-reconnected for 120-volt ac operation. Access to the interior components is by door rather than by removal of the entire enclosure-an obvious advantage during foul weather. To ensure the utmost security against unauthorized entry, the enclosure includes such features as:

- Cam-action latch . . . seals door in compression against gasket
- Two concealed hinges
- Laminated safety-plate glass, gasket-mounted observation window
- Padlockable door handle, pushbutton protective cover, manual operating handle, and selector handle
- Key interlock (when specified).

Power Train

The power train consists essentially of a reversible motor coupled to the output shaft at the top of the operator. Motor direction is controlled by a supervisory switch which actuates the open or closing contactor as appropriate to energize the motor and to release the electromagnetic brake. Fingertip precision adjustment of output-shaft rotation is provided by means of self-locking spring-biased cams. Antifriction bearings are used throughout; the gear-train shafts feature tapered roller bearings.

Manual Operation

A built-in nonremovable, foldaway manual operating handle, for manually opening and closing the Circuit-Switcher, is located on the front of the switch-operator enclosure. See Figure 2. By pulling the latch knob on the hub of the manual operating handle, the handle can be pivoted from its storage position to the cranking position. As the handle is pivoted forward, the motor brake is mechanically released, both leads of the control source are automatically disconnected, and both the opening and closing motor contactors are mechanically blocked in the open position. However, the Circuit-Switcher shunt-trip device (if furnished) remains operative.▲

If desired, during manual operation, the switch operator may also be disconnected from the control

▲ Unless the switch operator is in the open position.

source by removing the motor-circuit two-pole pull-out fuseholder, located on the right-hand inside wall of the enclosure. Likewise, the shunt-trip device may be rendered inoperative by removing the shunt-trip circuit two-pole pull-out fuseholder, located on the left-hand inside wall of the enclosure.

The position of the Circuit-Switcher is shown on an indicator located on the output-shaft collar. See Figure 2. The position of the switch operator is shown on an indicator visible through the observation window. See Figure 3. The manual operating handle may be disengaged from the switch-operator mechanism at any position of the handle and padlocked.

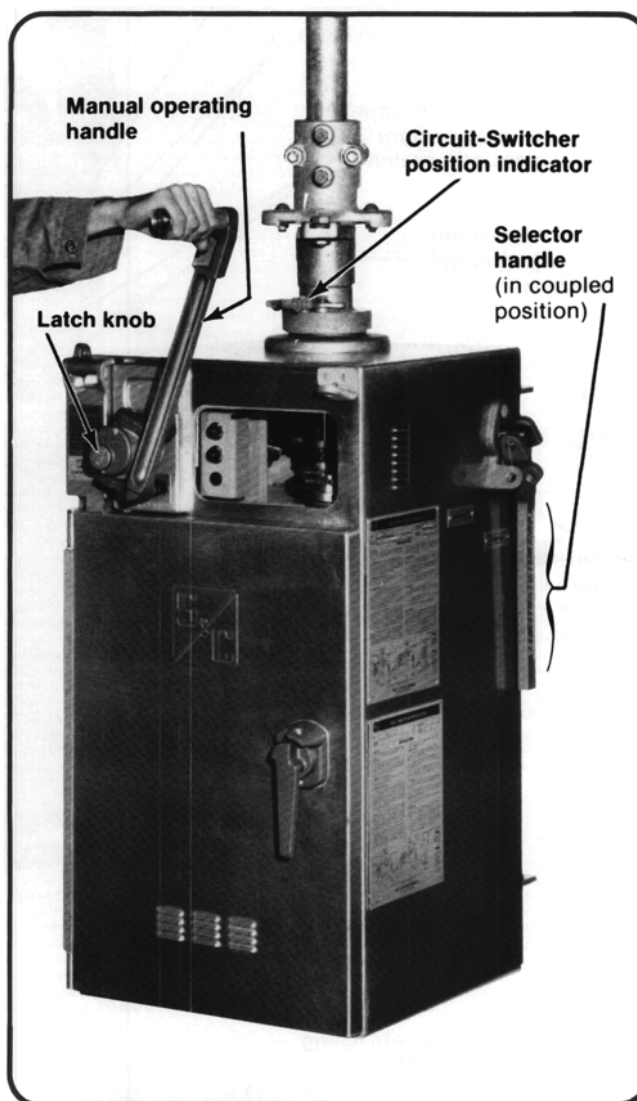


Figure 2. Manual operation.

Externally Operable Internal Decoupling Mechanism

An integral external selector handle, for operation of the built-in internal decoupling mechanism, is located on the right-hand side of the switch-operator enclosure. See Figure 2. By swinging this handle upright and rotating it clockwise 50°—as shown in Figure 3—the switch-operator mechanism is decoupled from the output shaft. When thus decoupled, the switch operator may be manually or electrically operated without operating the Circuit-Switcher and the shunt-trip device (if furnished) is rendered inoperative.* Moreover, when decoupled, the switch-operator output shaft is prevented from moving by a mechanical locking device within the operator enclosure.

During the intermediate segment of the selector handle travel, which includes the position at which actual disengagement (or engagement) of the internal decoupling mechanism occurs, the motor-circuit source

* Only the shunt-trip device is rendered inoperative. The switch operator can still be opened through the user's protective-relay circuit. Thus "elective" checkout of the system protective scheme is possible at any time.

leads are momentarily disconnected and both the opening and closing motor contactors are mechanically blocked in the open position. Visual inspection, through the observation window, will verify whether the internal decoupling mechanism is in the coupled or decoupled position. See Figure 3. The selector handle may be padlocked in either position.

Recoupling is foolproof. It is impossible to couple an "open" Circuit-Switcher with the switch operator in the "closed" position, or vice-versa. Coupling is possible only if the switch-operator output shaft is mechanically synchronized with the switch-operator mechanism. This synchronization is readily achieved by manually or electrically operating the switch operator to bring it to the same position (open or closed) as the Circuit-Switcher. The switch-operator position indicators, seen through the observation window, will show when the approximate open or closed position has been attained. See Figure 3. Then, to move the switch operator to the exact position for coupling, the manual operating handle is turned until the position-indexing drums are numerically aligned.

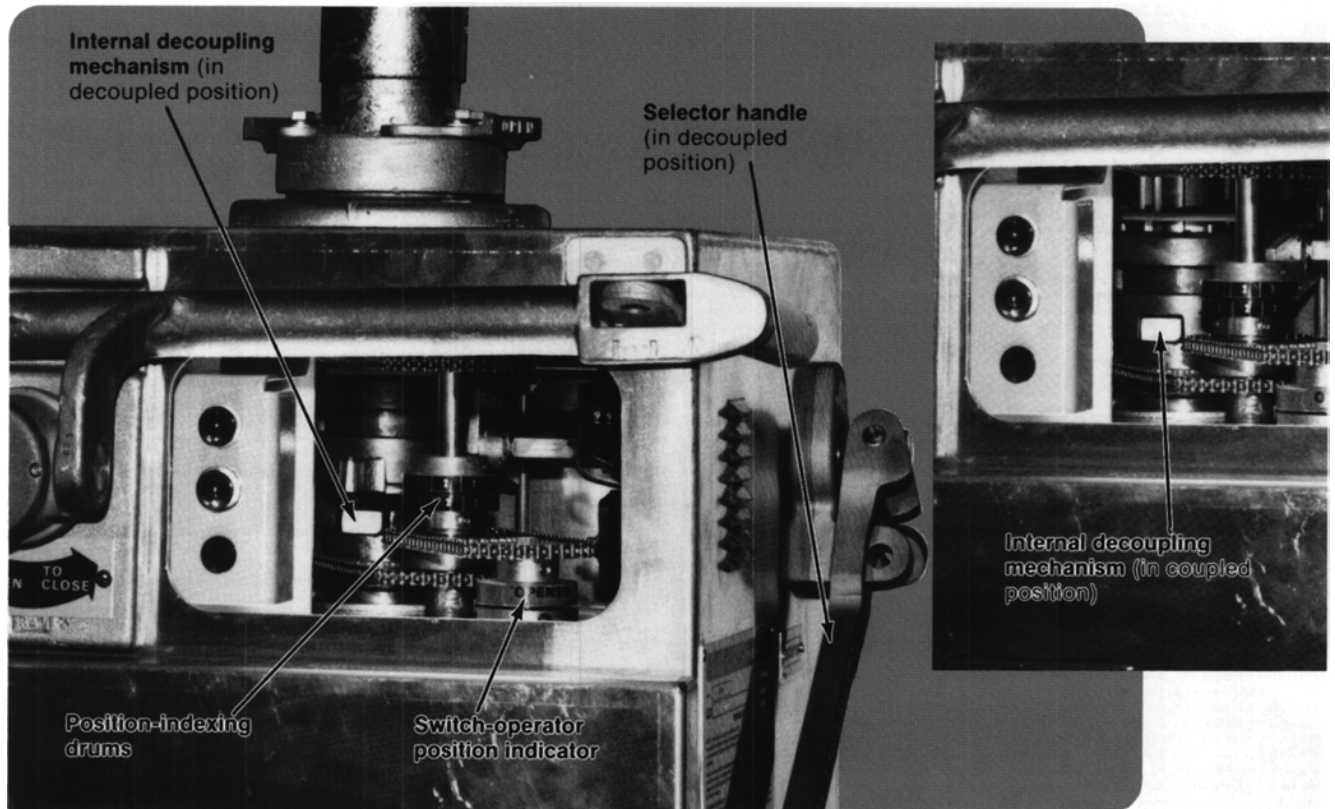


Figure 3. Views of switch operator through observation window.

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CONSTRUCTION AND OPERATION — Continued

Travel-Limit Adjustment

A travel-limit switch coupled to the motor governs the extent of output-shaft rotation in the opening and closing directions. It includes six contacts that are operated by cam-actuated rollers. Positioning of the cams to properly engage the rollers is accomplished by means of two travel-limit discs—one for the opening stroke, one for the closing stroke. See Figure 4.

Each travel-limit disc is precisely adjusted by means of a self-locking spring-biased cam. Opening travel is adjusted by raising and turning the opening-stroke travel-limit disc to the required position on the indicator plate, while holding the handwheel as shown. Similarly, closing travel is adjusted by lowering and turning the closing-stroke travel-limit disc to the required position on the indicator plate, while holding the handwheel.

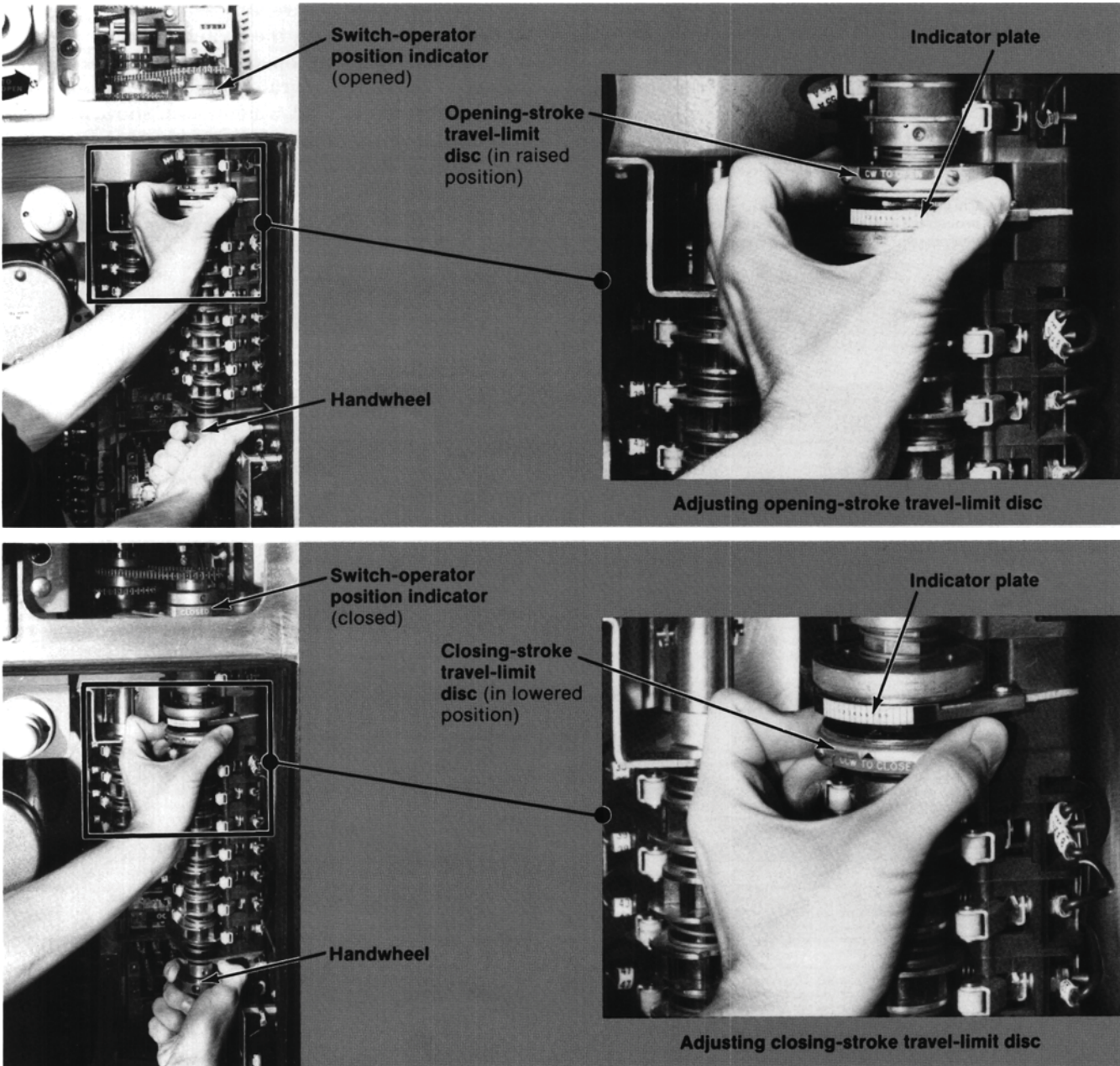


Figure 4. Adjustment of travel-limit discs.

Actuating the opening-stroke travel-limit disc de-energizes the opening contactor, which then de-energizes the brake-release solenoid to halt motion of the mechanism. Actuating the closing-stroke travel-limit disc de-energizes the closing contactor, which then also de-energizes the brake-release solenoid to halt motion of the mechanism.

Auxiliary Switches

An eight-pole auxiliary switch coupled to the motor is furnished as a standard feature. It provides eight individually adjustable contacts pre-wired to terminal blocks (six contacts are available if the switch operator is furnished with optional position-indicating lamps, Catalog Number Suffix “-M”). These contacts are furnished so that external circuits can be established to monitor switching operations.

Like the travel-limit discs, each auxiliary switch contact has a self-locking spring-biased cam which permits precise adjustment of cam-roller engagement at the desired point in the operating cycle. Cam position is adjusted by raising (or lowering) the cam toward its adjacent spring and rotating it to the desired position. See Figure 5. An extra four-pole auxiliary switch coupled to the motor and utilizing the same construction is available as an option (Catalog Number suffix “-Q”).

An extra auxiliary switch coupled to the Circuit-Switcher is also available as an option, and can be provided so that external contacts can be established to monitor Circuit-Switcher operations. This auxiliary switch also utilizes self-locking spring-biased cams. It can be furnished in an eight-pole version (Catalog Number Suffix “-W”) or in a twelve-pole version (Catalog Number Suffix “-Z”).

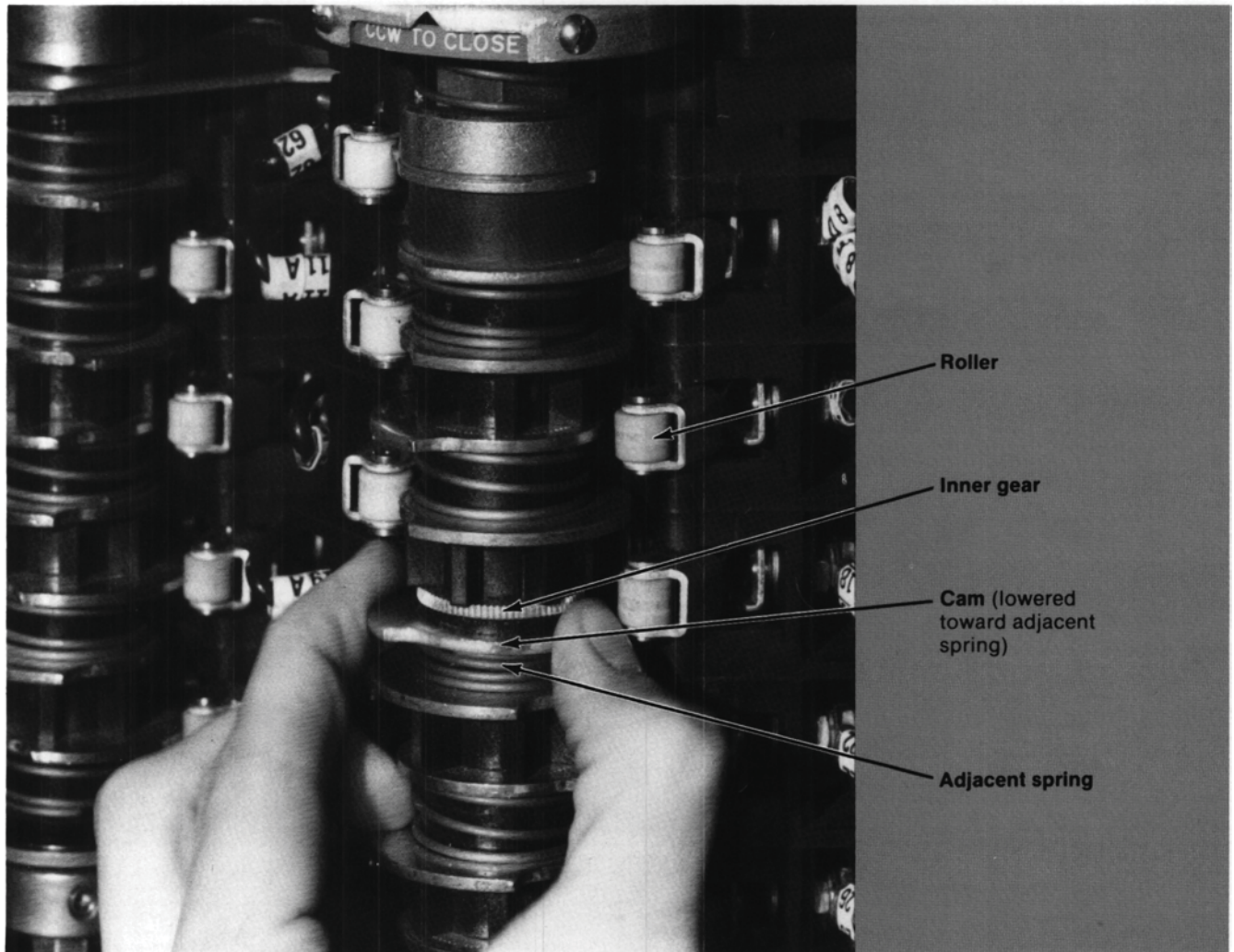


Figure 5. Adjustment of cams on auxiliary switch.

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CONSTRUCTION AND OPERATION — Continued

Provision for S&C Shunt-Trip Device

S&C Mark V Circuit-Switchers equipped with the optional S&C Shunt-Trip Device provide 8-cycle maximum interrupting time. This high-speed circuit interruption facilitates the application of circuit-switchers at the primary side of transformers for protection of the transformers against internal faults, for multiple-contingency backup protection for overloads and secondary faults, and for protection of the source-side circuits from all kinds of transformer faults.

When the shunt-trip device is energized, a high-speed solenoid encased in a weatherproof housing on each pole-unit base rotates the slender low-inertia insulated shaft 15 degrees. This releases the stored energy within the brain for high-speed opening of the interrupter.

Type CS-1A Switch Operators, furnished with Mark V Circuit-Switchers equipped with the shunt-trip device, can be provided with an optional shunt-trip contactor and time-delay relay (Catalog Number Suffix “-HP”). This optional feature minimizes control-current inrush by energizing the shunt-trip device and switch-operator motor in sequence, thus generally permitting the use of smaller-sized control wire between the user's protective or control relay and the switch operator.

Sequence Control

Correct operation of Mark V Circuit-Switchers depends on charging and latching the stored-energy source within each brain as the disconnect blades move to the fully open position. The interrupter target located on the side of each brain housing appears yellow when the interrupter is open. The target appears gray (normal) when the interrupter is closed.

Interrupters should never be open while the blades are in the closed position. To close the interrupters, Circuit-Switcher must be completely opened and then reclosed. For this reason, the switch operator incorporates a control circuit that causes the switch operator to return automatically to the open position whenever the control-source voltage is restored while the switch operator is at any position between fully open and fully closed. Such action takes place regardless of the direction in which it was operating prior to loss of voltage. This control circuit is a built-in feature to prevent Circuit-Switcher from being closed from a partially open position after the interrupters have tripped open.



SPECIFICATIONS

SWITCH OPERATORS - TYPE CS-1A

Application		Motor and Control Voltage	Maximum Operating Time, Seconds ①	Minimum Locked-Rotor Torque at Rated Control Voltage, Inch-Lbs.	Accelerating Current, Amperes	Catalog Number	Schematic Wiring Diagram Drawing Number
High-Voltage Device	Style and Rating of High-Voltage Device						
S&C Mark V* Circuit-Switchers without Shunt-Trip Device	Integer, 34.5 kv thru 69 kv	48 v dc 125 v dc	1.5 1.5	21 500 21 500	80 30	38845R4-A 38845R4-B	CDR-3112R2
	Vertical-Break, 34.5 kv thru 161 kv						
S&C Mark V* Circuit-Switchers with Shunt-Trip Device	Center-Break, 230 and 345 kv, 3 gaps	115 v 60 hz 230 v 60 hz	1.5 1.5	18 000 18 000	46 23	38845R4-D 38845R4-E	CDR-3123R2
	Integer 34.5 kv thru 69 kv						
S&C Mark V* Circuit-Switchers with Shunt-Trip Device	Vertical-Break, 34.5 kv thru 161 kv	48 v dc 125 v dc	1.5 1.5	21 500 21 500	80 30	38846R5-AHP 38846R5-B§	CDR-3183 CDR-3184■
	Center-Break, 230 and 345 kv, 3 gaps						

① Based on minimum battery and external control wire size requirements specified in S&C Data Bulletin 719-60. operating time will be less if larger-than-minimum battery size and/or external control wire size is utilized.

★ The Type CS-1A Switch Operator is also suitable for use with equivalent models of Mark II, Mark III, and Mark IV Circuit-Switchers. Consult the nearest S&C Sales Office.

§ Catalog Number 38858R1-B, for applications where the Circuit-Switcher is used in conjunction with an S&C Automatic Control Device, unless the switch operator is ordered with the optional Shunt-Trip Contactor and Time-Delay Relay accessory, Catalog Number Suffix "-HP." In this instance, the catalog number is 3RS46R5-BHP.

■ CDR-3183 for Catalog Number 38846R5-BHP. CDR-3195 for Catalog Number 3885SR1-B.

ACCESSORIES

Item	Suffix to be Added to Switch Operator Catalog Number
Shunt-Trip Contactor and Time-Delay Relay, minimize control-current inrush by energizing shunt-trip device and switch-operator motor in sequence①②	-HP
Deletion of Externally Operable Open-Close Pushbuttons	-J
Space Heater Thermostat	-K
Key Interlock with Switch, locks Circuit-Switcher open and disconnects motor-control circuit	-L
Position-Indicating Lamps (one red, one green), mounted inside the enclosure③	-M
Extra Auxiliary Switch (individually adjustable contacts), 4-PST (coupled to motor)	-Q
Duplex Receptacle and Convenience-Light Lampholder with Switch	-V
Extra Auxiliary Switch (individually adjustable contacts), 8-PST (coupled to Circuit-Switcher)④	-W
Remote-Control Blocking Switch, prevents remote operation of switch operator when the protective cover for the externally mounted open-close pushbuttons is open	-Y
Extra Auxiliary Switch (individually adjustable contacts), 12-PST (coupled to Circuit-Switcher)④	-Z

① Available as an optional accessory only with S&C Switch Operator Catalog Number 38846R5-B; included as standard equipment with Catalog Number 38846R5-AHP. Permits use of minimum-size control wire.

② Not available with S&C Switch Operator Catalog Number 38858R1-B.

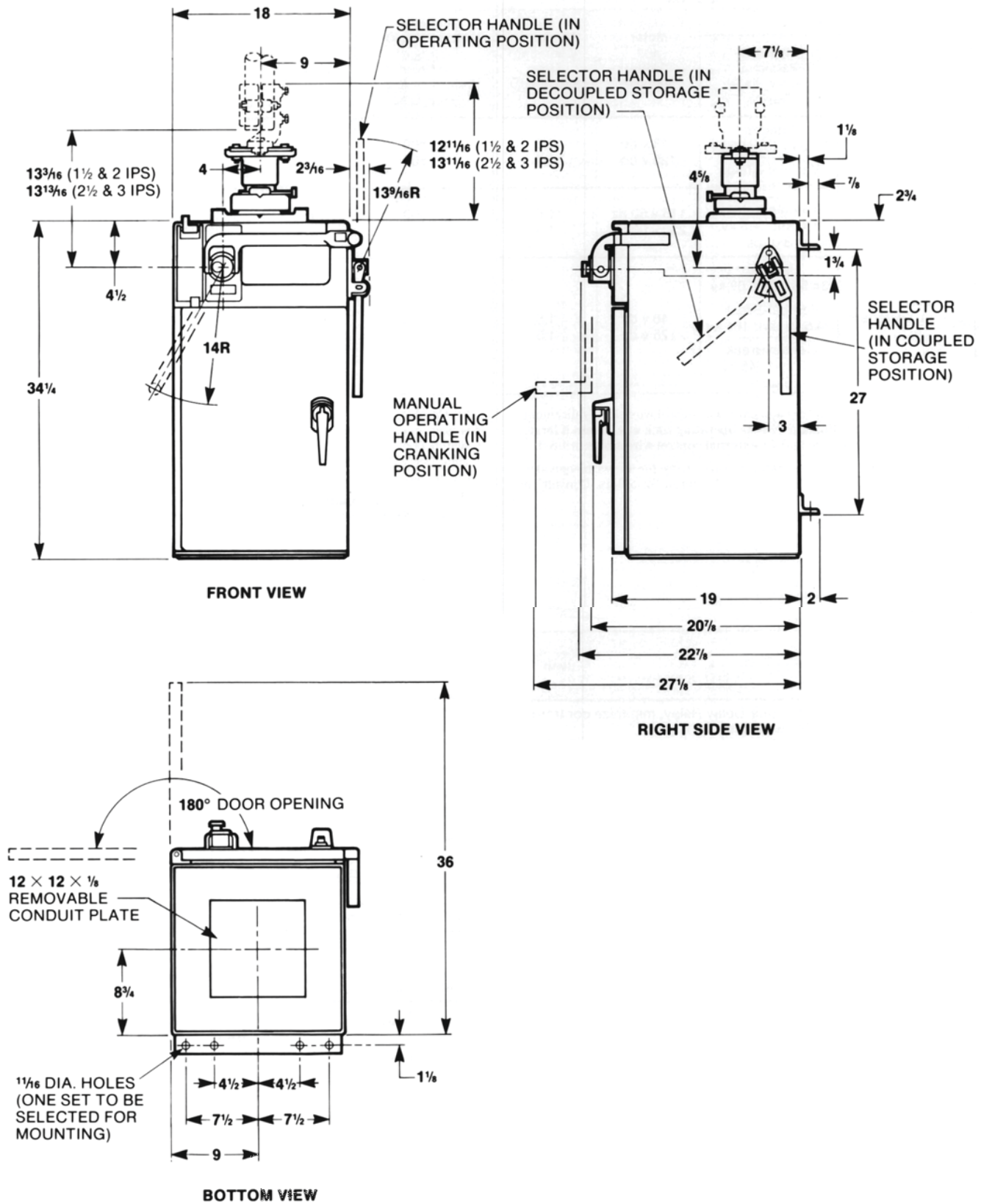
③ Not available in applications utilizing an S&C Circuit-Switcher Relay and Control Pack.

④ The 8-PST Extra Auxiliary Switch (Suffix "-W") cannot be furnished if the 12-PST version (Suffix "-Z") is specified, and vice versa



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SPECIFICATIONS — Continued



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