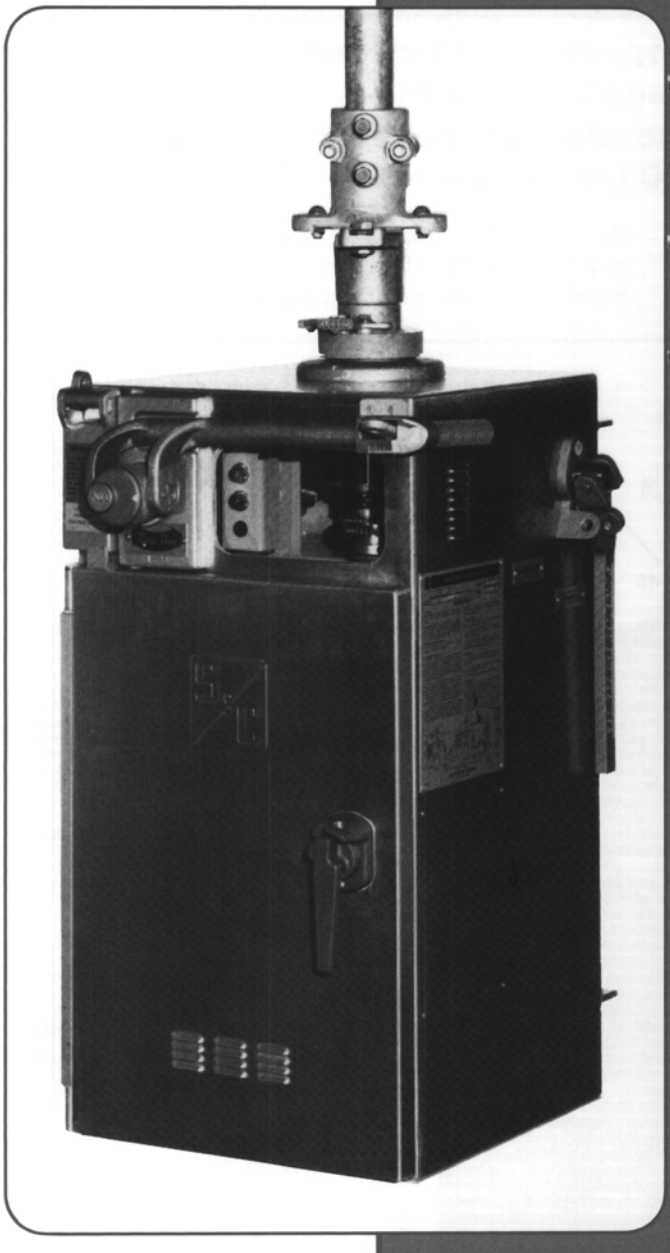
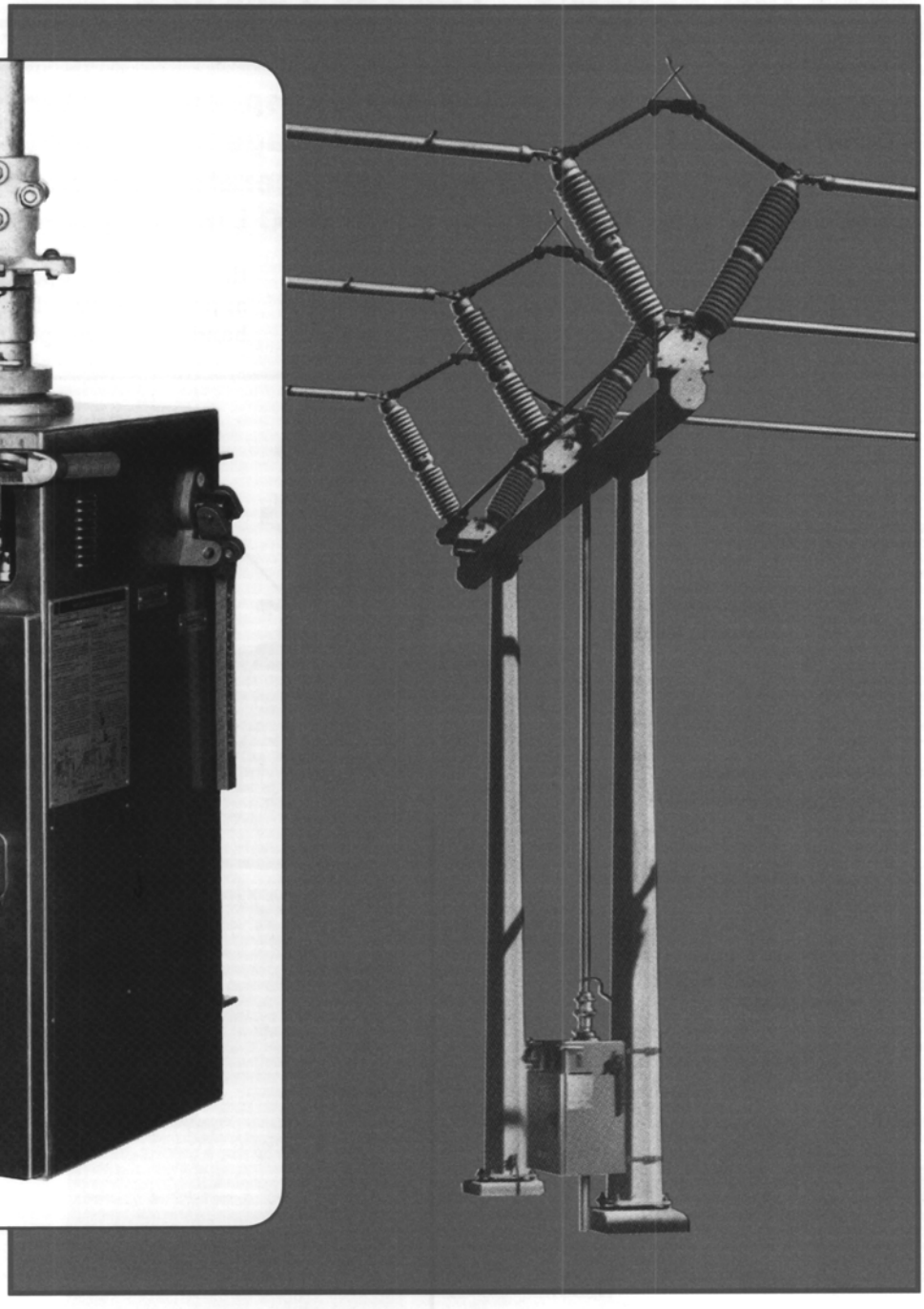




S&C Switch Operators Types LS-1 and LS-2

Supersedes Descriptive Bulletin 852-33 dated 10-29-79

S&C ELECTRIC COMPANY • Chicago
S&C ELECTRIC CANADA LTD. • Toronto

DESCRIPTIVE BULLETIN 753-30

November 13, 1989

INTRODUCTION

Type LS-1 Switch Operators are low-speed operators expressly recommended for non-S&C high-voltage disconnects and interrupters . . . Type LS-2 Switch Operators are high-speed operators especially designed for S&C Line-Rupters .

Type LS-1 Switch Operators bring high-quality power operation to outdoor high-voltage disconnects and interrupter switches not of S&C manufacture for which the LS-1's low operating speed (4 to 7 seconds) is appropriate. Type LS-2 Switch Operators, on the other hand, are high-speed operators (with a maximum

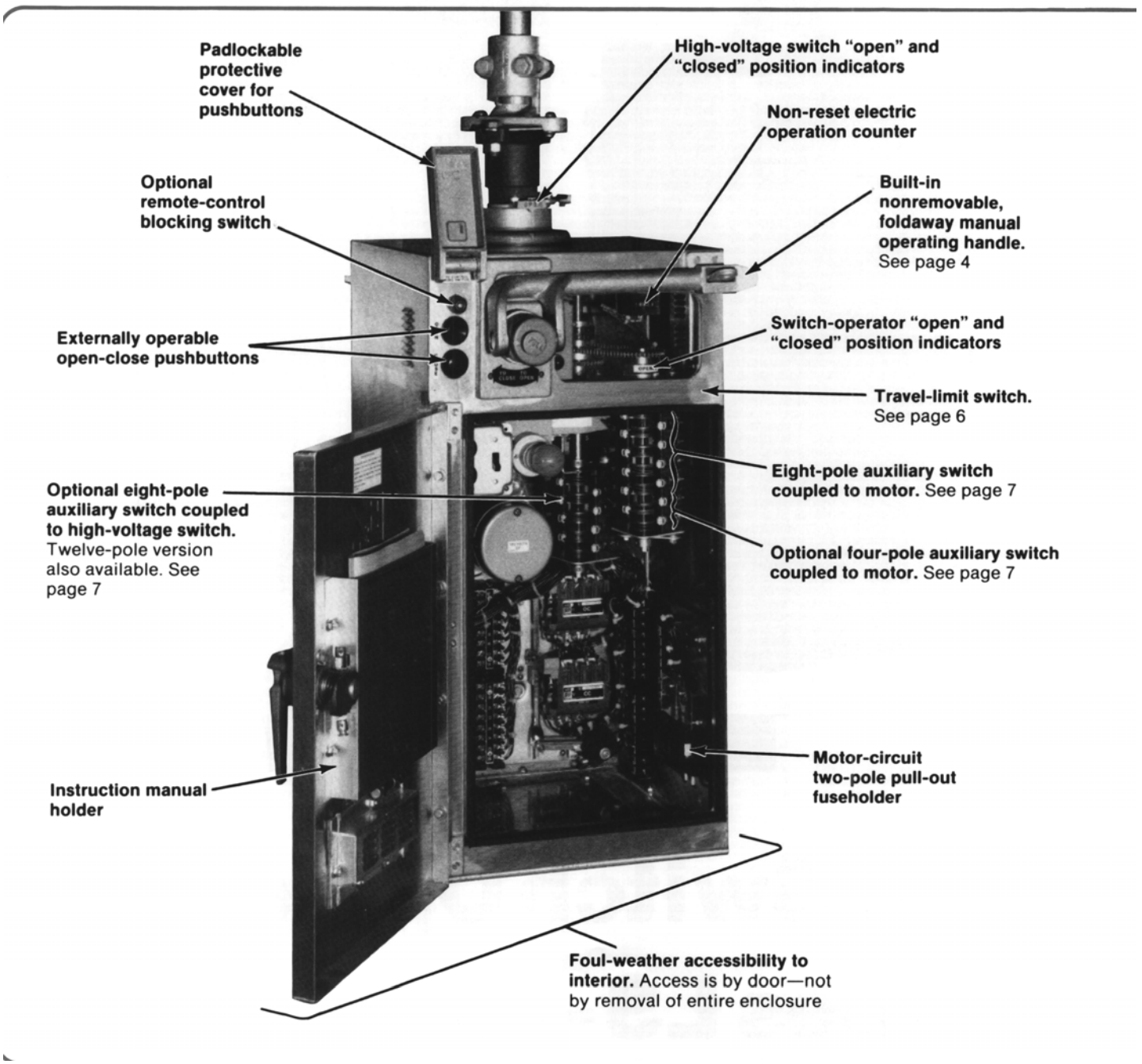
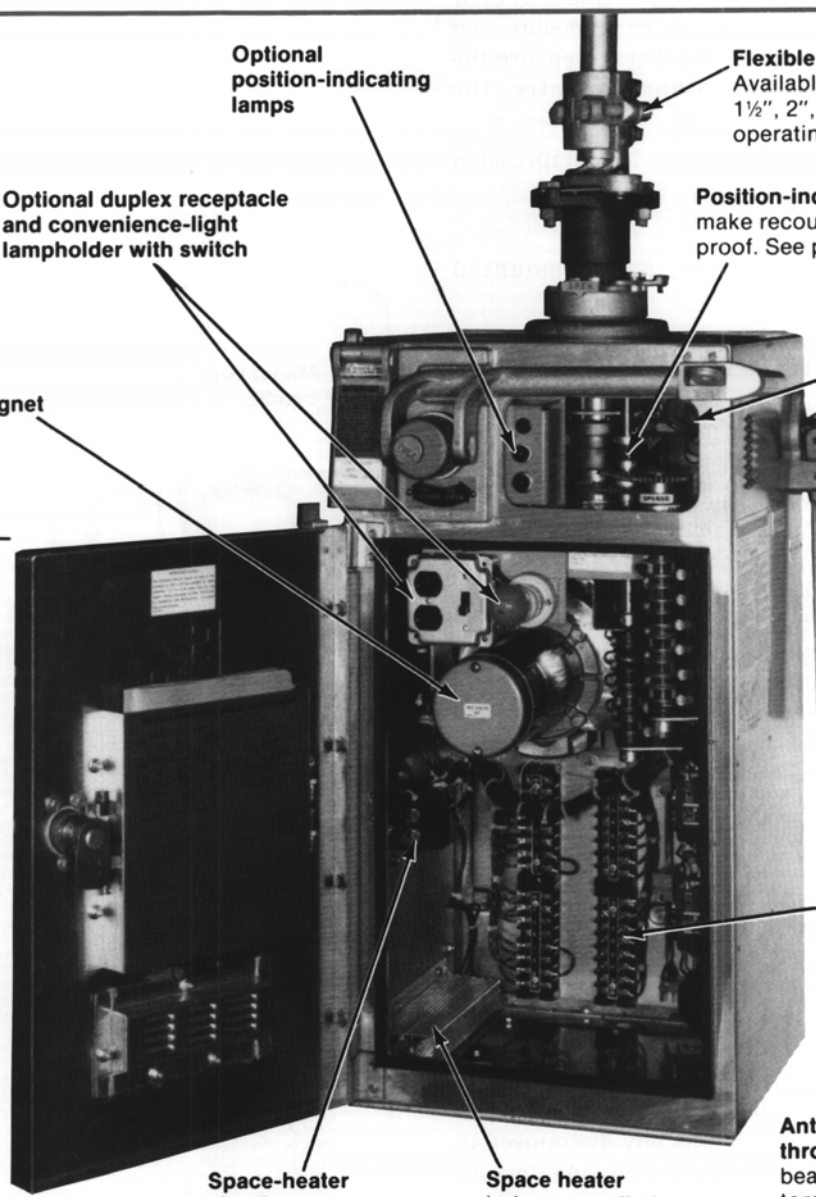


Figure 1. Interior of Types LS-1 and LS-2 Switch Operator.

operating time of 2.2 seconds) expressly intended for application with S&C Line-Rupters.

Shown below in Figure 1 are some of the important features of Type LS-1 and Type LS-2 Switch Operators. These features are discussed in detail in the "CONSTRUCTION AND OPERATION" section.



See page 8 for a complete listing of available accessories.

CONSTRUCTION AND OPERATION

The Enclosure

The switch operator is housed in a weatherproof, dustproof 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 opening or closing contactor as appropriate to energize the motor and to release the electromagnetic brake. Fingertip precision adjustment of the output-shaft travel-limit switch contacts (over a 35- to 235-degree range) 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 high-voltage switch, 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.

If desired, during manual operation, the switch operator may also be disconnected from the control source by removing the motor-circuit two-pole pull-out fuseholder, located on the right-hand inside wall of the enclosure.

The position of the high-voltage switch 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.

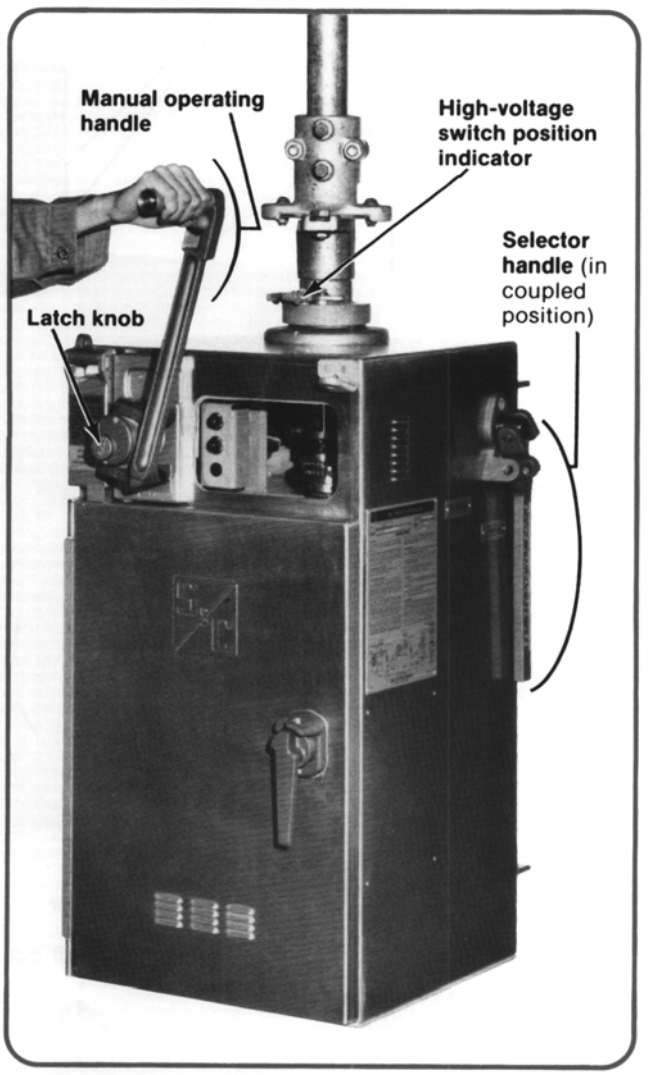


Figure 2. Manual operation.

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 high-voltage switch. 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 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" high-voltage switch 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 high-voltage switch. 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.

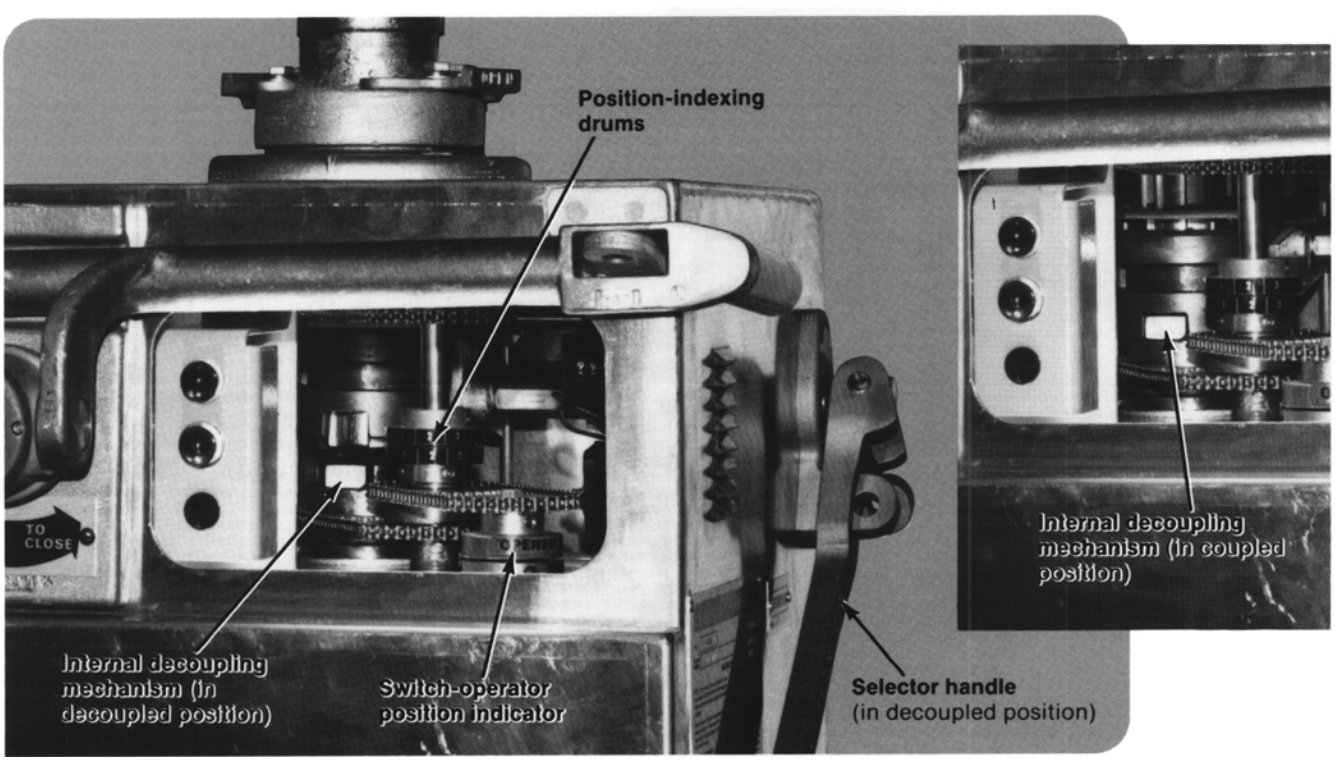


Figure 3. Views of switch operator through observation window.

Travel-Limit Adjustment

A travel-limit switch coupled to the motor governs the extent of output-shaft rotation in the opening and closing directions, over a 35- to 235-degree range. It includes two contacts that are operated by cam-actuated rollers. See Figure 4.

Opening travel is precisely adjusted by raising and turning the opening-stroke travel-limit cam to the required position. Similarly, closing travel is adjusted by lowering and turning the closing-stroke travel-limit cam to the required position.

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

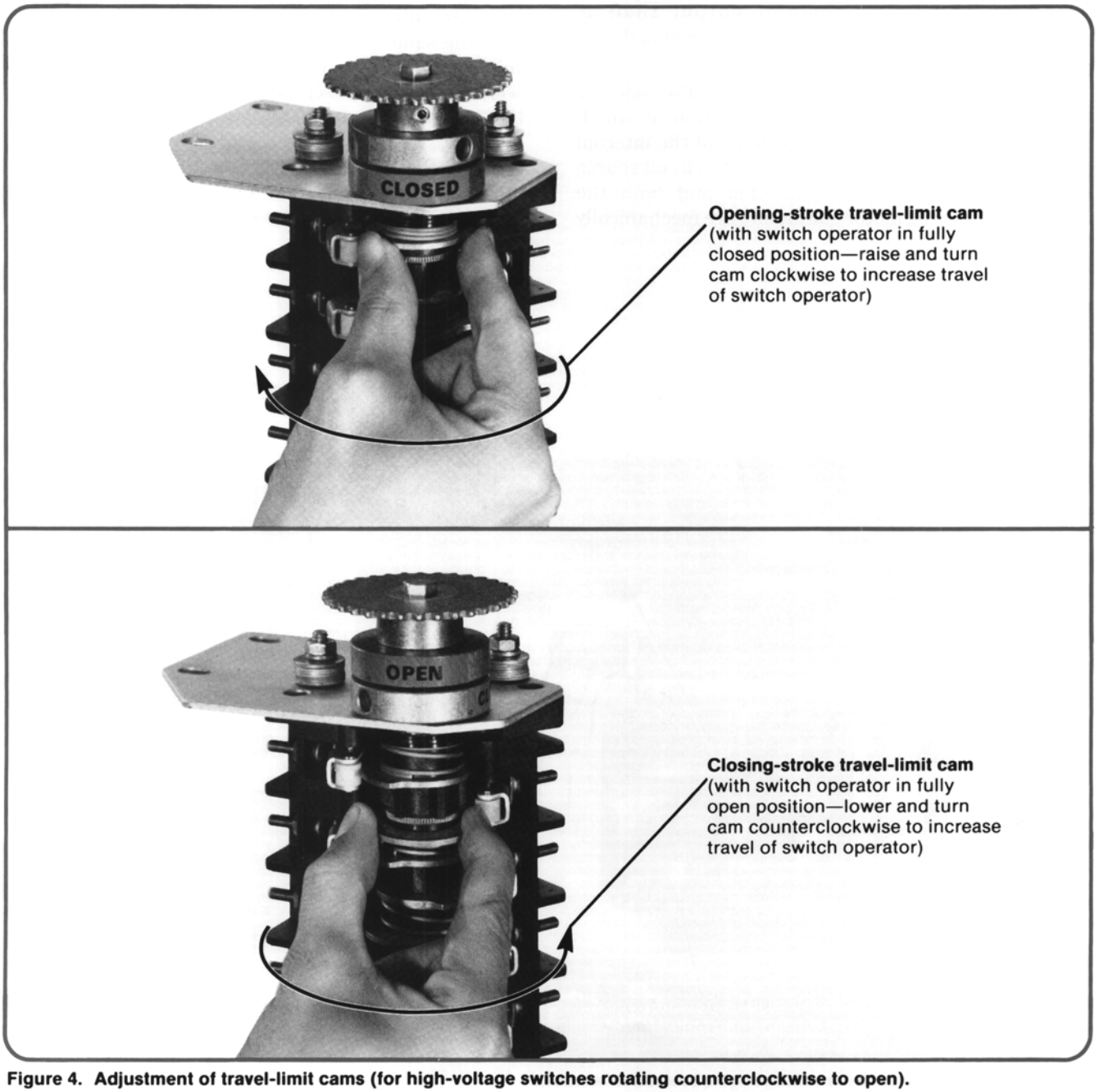


Figure 4. Adjustment of travel-limit cams (for high-voltage switches rotating counterclockwise to open).

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 flocks (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 cams, 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 high-voltage switch is also available as an option, and can be provided so that external contacts can be established to monitor high-voltage switch 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").

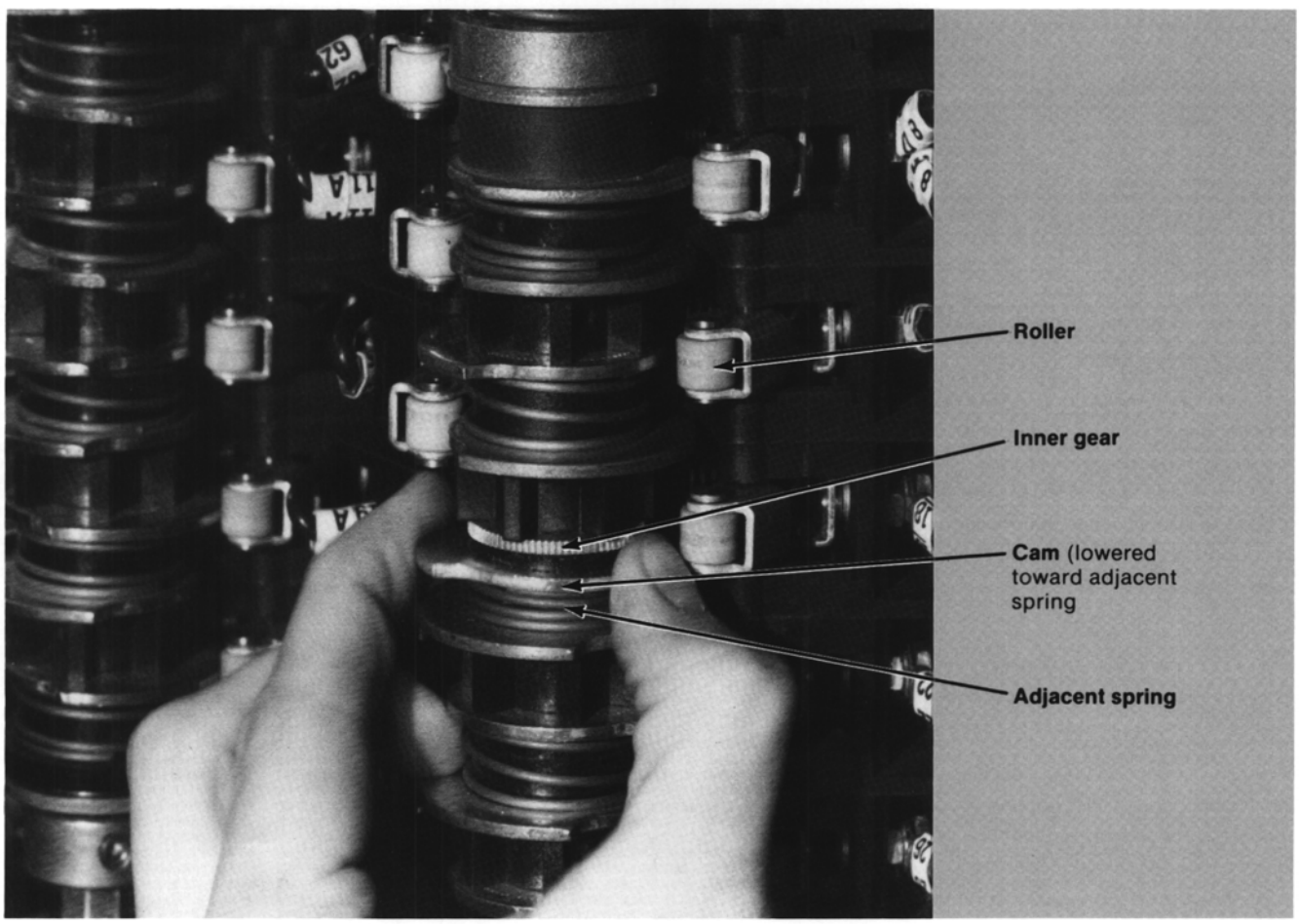


Figure 5. Adjustment of cams on auxiliary switch.

SPECIFICATIONS

SWITCH OPERATORS- Types LS-1 and LS-2

Application		Switch Operator Type	Motor and Control Voltage	Maximum Operating Time, Seconds ①	Minimum Locked-Rotor Torque at Rated Control Voltage, Inch-Lbs.	Acceler-ating Current, Amperes	Catalog Number	Schematic Wiring Diagram Drawing Number
High-Voltage Device	Rating of High-Voltage Device							
Outdoor Disconnects and Interrupter Switches Not of S&C Manufacture	7.2 kv thru 345 kv	LS-1	48 v dc 125 v dc	4 to 7♦	18 000 21 500	27 10	38857R1-A 38857R1-B	CDR-3133
S&C Line-Rupters	115 kv thru 230 kv	LS-2	48 v dc 125 v dc	2.2	18 000 21 500	30 15	38915-A 38915-B	CDR-3238

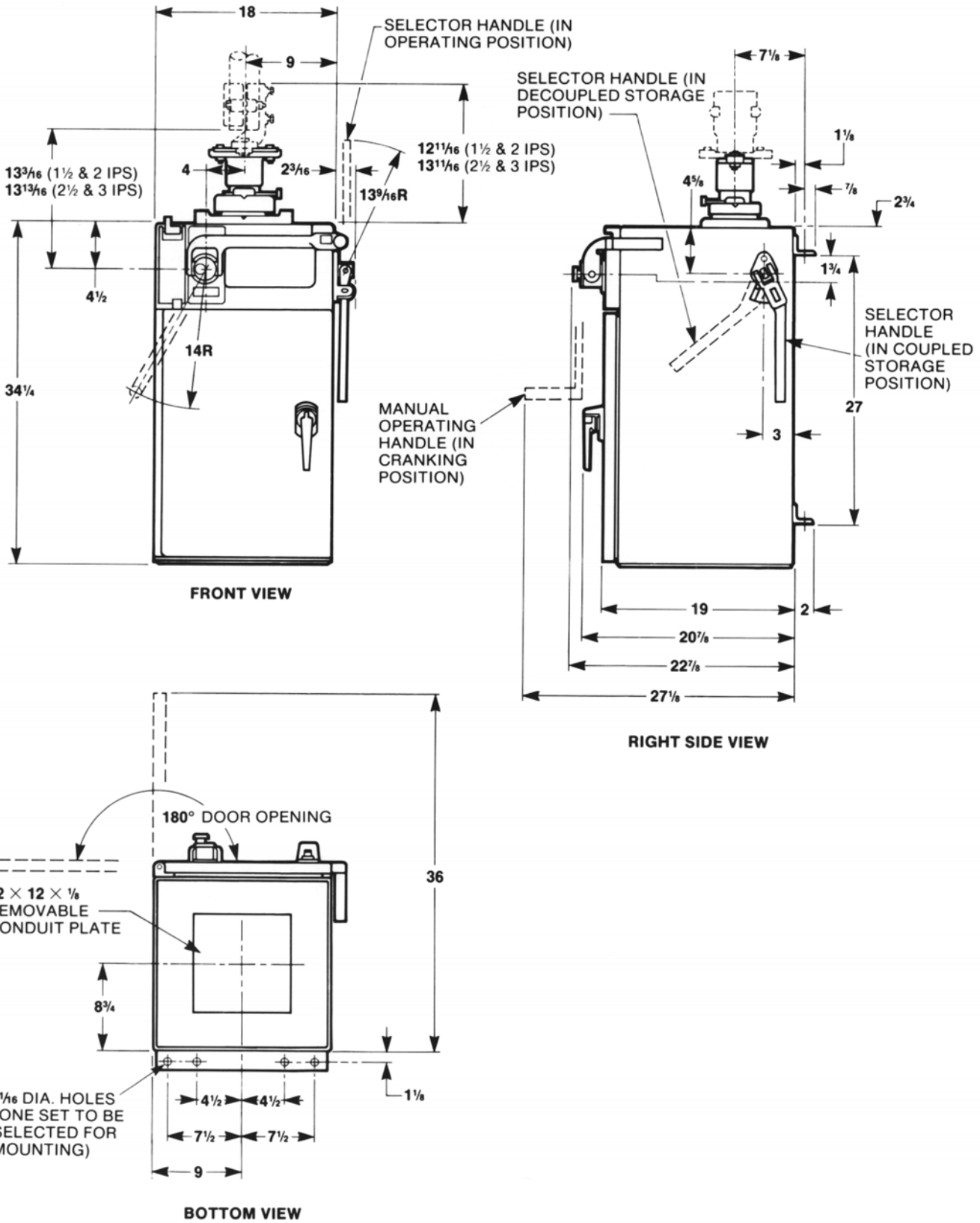
① Based on minimum battery and external control wire size requirements specified in S&C Data Bulletin 753-60; operating time will be less if larger-than-minimum battery size and/or external control wire size is utilized.

♦ Depending on torque requirements of the disconnect or interrupter switch, and assuming 180-degree vertical-pipe rotation.

ACCESSORIES

Item	Suffix to be Added to Switch Operator Catalog Number
Deletion of Externally Operable Open-Close Pushbuttons	-J
Space Heater Thermostat	-K
Key Interlock with Switch, locks high-voltage switch open and disconnects motor-control circuit	-L
Position-Indicating Lamps (one red, one green), mounted inside the enclosure	-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 high-voltage switch) ①	-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 high-voltage switch) ①	-Z

① The 8-PST Extra Auxiliary Switch (Suffix "-W") cannot be furnished if the 12-PST version (Suffix "-Z") is specified, and vice versa.


18
9
SELECTOR HANDLE (IN OPERATING POSITION)
13 3/16 (1½ & 2 IPS)
13 13/16 (2½ & 3 IPS)
4
2 3/16
12 11/16 (1½ & 2 IPS)
13 11/16 (2½ & 3 IPS)
13 9/16R
4½
14R
34¼
FRONT VIEW
SELECTOR HANDLE (IN DECOUPLED STORAGE POSITION)
7⅛
1⅛
4⅝
⅞
2¾
1¾
SELECTOR HANDLE (IN COUPLED STORAGE POSITION)
27
MANUAL OPERATING HANDLE (IN CRANKING POSITION)
3
19
2
20⅞
22⅞
27⅛
RIGHT SIDE VIEW
180° DOOR OPENING
36
12 × 12 × ⅛ REMOVABLE CONDUIT PLATE
8¾
11/16 DIA. HOLES (ONE SET TO BE SELECTED FOR MOUNTING)
4½
4½
7½
7½
9
1⅛
BOTTOM VIEW