

The LS-2 operator is a high-performance and robust addition to Line-Rupter[®] Switch installations.

Introduction

Type LS-2 Switch Operators are high-speed operators with a maximum operating time of 2.2 seconds and are especially designed for Line-Rupter Switches. Shown in **Figure 2 on page 3** are some of the important features of Type LS-2 Switch Operator.

Construction And Operation

The Enclosure

The switch operator is housed in a weatherproof, dustproof enclosure of sturdy, $\frac{3}{32}$ -inch (2.4-mm) 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-Vac operation but can be readily field-reconnected for 120-Vac operation.

Access to the interior components is by door instead of by removing the entire enclosure, providing an advantage during foul weather. To ensure the utmost security against unauthorized entry, the enclosure includes such features as:

- A cam-action latch that seals the door in compression against a gasket
- Two concealed hinges
- A laminated safety-plate glass, gasket-mounted observation window
- A padlockable door handle, a pushbutton protective cover, a manual operating handle, and a selector handle
- A key interlock (when specified)





- Flexible coupling. Available in sizes to fit 11/2-, 2-, 2¹/₂- or 3-inch vertical operating pipe.
- В Position-indexing drums make recoupling foolproof. See page 4.
- С Laminated safety-plate window for inspection of built-In internal decoupling mechanism.
- D External decoupling handle operates internal decoupling mechanism. See page 4.
- Ξ Anti-friction bearings throughout; tapered roller bearings for all high-torque geartrain shafts
- F Terminal blocks readily accommodate large conductors.

- Space heater induces ventilation.
- Η Space-heater circuit two-pole pull-out fuseholder
- Tamper-resistant design—welded enclosure; baffled louvers; gasketed, flanged door opening; cam-action door latch; provisions for padlocking.



- Heavy-duty permanent-magnet motor
- Κ

L

- Optional duplex receptacle and convenience-light lampholder with switch
- Optional position-indicating lamps

Power Train

The power train consists of a reversible motor coupled to the output shaft at the top of the operator. Motor direction is controlled by a supervisory switch that actuates the opening or closing contactor as appropriate to energize the motor and to release the electromagnetic brake.

Fingertip precision adjustment of the outputshaft travel-limit switch contacts (over a 35- to 235-degree range) is provided by means of selflocking spring-biased cams. Antifriction bearings are used throughout, and the gear-train shafts feature tapered roller bearings.

Manual Operation

A built-in nonremovable, foldaway manual operating handle used to manually open and close the highvoltage 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 pullout fuse holder 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 on page 4**. The manual operating handle may be disengaged from the switch-operator mechanism at any position of the handle and padlocked..

Externally Operable Internal Decoupling Mechanism

An integral external decoupling handle used to operate the built-in internal decoupling mechanism is located on the right-hand side of the switchoperator enclosure. See **Figure 3**. By swinging this handle upright and rotating it clockwise 50°, the switch-operator mechanism is decoupled from the output shaft. See **Figure 2**.

When decoupled, the switch operator may be manually or electrically operated without operating the high-voltage switch. 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 decoupling handle travel, which includes the position at which actual disengagement (or engagement) of the internal decoupling mechanism occurs, the motorcircuit 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



- Internal decoupling mechanism (in the
- Decoupled position)

В



D

E

Decoupling handle (in the Decoupled position)

Internal decoupling mechanism (in the Coupled position)

mechanism is in the Coupled or Decoupled position. See **Figure 3 on page 4**. 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 Open or Closed position 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 on page 4**. 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.

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 operated by camactuated rollers. See **Figure 4**.

Opening travel is precisely adjusted by raising and turning the opening-stroke travel-limit cam. 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 deenergizes the opening contactor, which then deenergizes the brake-release solenoid to halt motion of the mechanism. Actuating the closingstroke travel-limit cam de-energizes the closing contactor, which then also de-energizes the brakerelease solenoid to halt required position.



Opening-stroke travel-limit cam (with the switch operator in the fully Closed position, raise and turn the cam clockwise to increase switch-operator travel)



Closing-stroke travel-limit cam (with the switch operator in the fully Open position, lower and turn the cam counterclockwise to increase switchoperator travel)

FIGURE 4. Adjustment of travel-limit cams (shown 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 blocks (six contacts are available if the switch operator is furnished with optional Position Indicating lamps.) These contacts are furnished so external circuits can be established to monitor switching operations.

As with the travel-limit cams, each auxiliary switch contact has a self-locking spring-biased cam that permits precise adjustment of cam-roller engagement at the desired point in the operating cycle. The 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 using the same construction is available as an option.

An extra auxiliary switch coupled to the high-voltage switch is also available as an option and can be provided so external contacts can be established to monitor high-voltage switch operations. This auxiliary switch also uses self-locking spring-biased cams. It can be furnished in an eight-pole version or in a 12-pole version. For ordering information, see S&C Specification Bulletin 753-31.



FIGURE 5. Adjustment of cams on auxiliary switch.

Ratings

Application					Minimum		Schomatia
High-Voltage Device	Rating of High- Voltage Device	Switch Operator Type	Motor and Control Voltage	Maximum Operation Time, Seconds ¹	Torque at Rated Control Voltage, Inch- Lbs.	Accelerating Current, Amperes	Wiring Diagram Drawing Number
Line-Rupter Switches	115 kV thru 230 kV	LS-2	48 Vdc 125 Vdc	2.2	18 000 21 500	30 15	COR-3238

TABLE 1. S&C Type LS-2 Switch Operator Ratings.

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 a larger-than-minimum battery size and/or external control wire size is used.



