S&C Type AS-1A and AS-10 Switch Operators

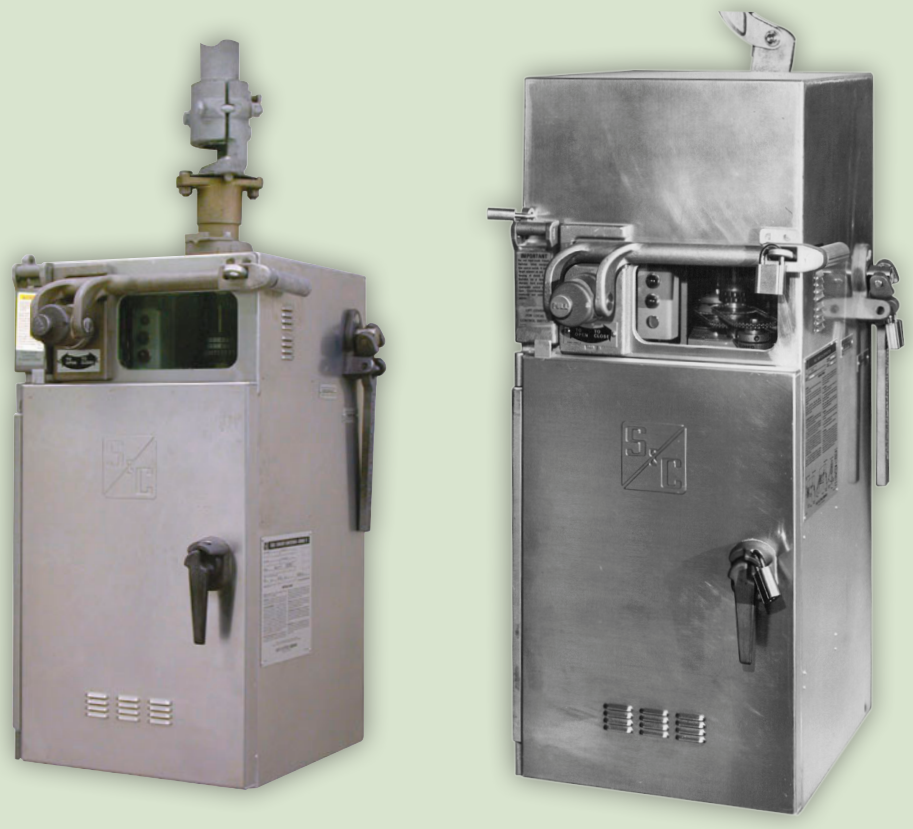
High-speed Type AS-1A and AS-10 Switch Operators are expressly designed for power operation of Alduti-Rupter® Switches.

Contents

Introduction

Historically, switches in the field still require manual operation, but with the AS-1A and AS10 Switch Operators, Alduti-Rupter Switches provide a field-proven reliable way to add power-operated functionality.

Type AS-1A Switch Operators are intended for use with Alduti-Rupter Switches with rotating-type operating mechanisms and have a maximum operating time of 0.75 seconds. Type AS-10 Switch Operators are intended for use with S&C Alduti-Rupter Switches with reciprocating-type



operating mechanisms and have a maximum operating time of 1.2 seconds. This high operating speed provides sufficient moving-contact velocity in the Alduti-Rupter Switch interrupters to ensure full interrupting capability and long operating life.

The operators' high operating speed also provides adequate closing velocity for 25/34.5-kV and 34.5-kV for three-pole side-break integer style and three-pole vertical-break integer style switches. The side-break integer style switches have a one-time duty-cycle fault-closing rating of 15,000 amperes RMS asymmetrical, and the vertical-break integer style switches have one-time duty-cycle fault-closing ratings of 20,000 or 30,000 amperes RMS asymmetrical for switches rated 600 amperes or 1200 amperes respectively.

Type AS-1A and Type AS-10 Switch Operators may be furnished with optional source-transfer control compatibility. This accessory permits use of the switch operator, along with a second switch operator and a Micro-AT® Source-Transfer Control in a weatherproof enclosure to provide automatic source transfer for primary-selective overhead distribution systems.

Figure 3 on page 3 describes some of the important Type AS-1A Switch Operator features. These features are discussed in detail in the "Construction and Operation" section that starts on **page 6**, and they apply to Type AS-10 Switch Operators as well. Type AS-10 Switch Operators, however, use a gearbox housed in the upper portion of the enclosure that transmits motion to an output shaft at the rear of the enclosure.

A lever and clevis-fitting arrangement attached to this output shaft is used to drive the reciprocating-action vertical operating pipe. See **Figure 4 on page 4.**

FIGURE 1. A Type AS-1A Switch Operator for Alduti-Rupter Switches with rotating-type operating mechanisms.

FIGURE 2. A Type AS-10 Switch Operator for Alduti-Rupter Switches with reciprocating-type operating mechanisms.

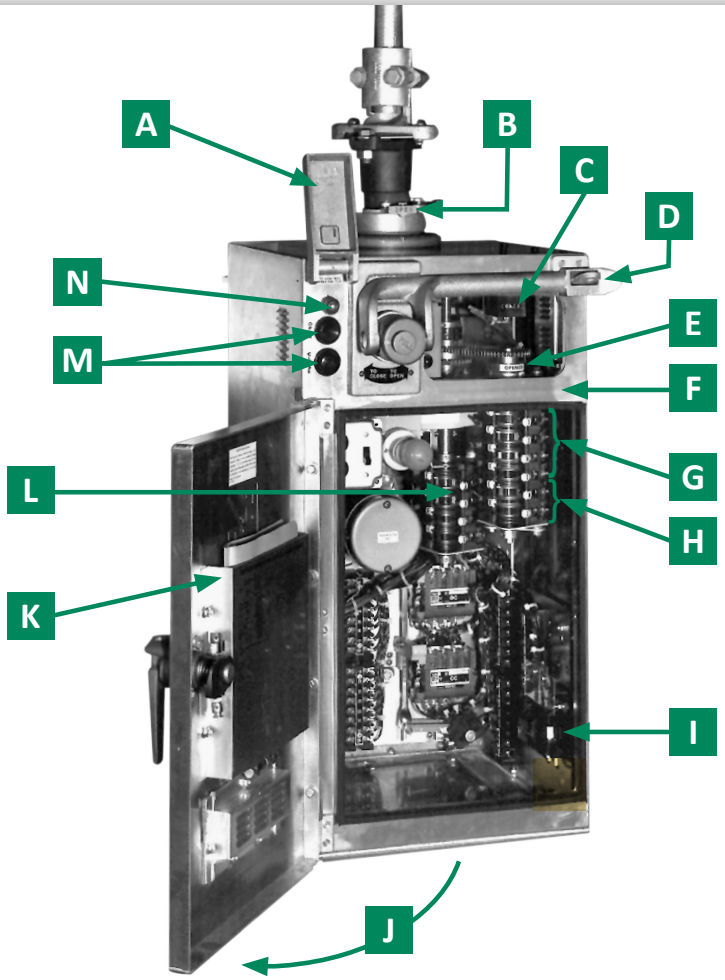


FIGURE 3. Interior of a Type AS-1A Switch Operator.

A Padlockable protective cover for pushbuttons

B Alduti-Rupter Switch switch position indicator

C Non-reset electric Operation counter

D Built-in nonremovable, foldaway operating handle

E Switch-operator OPEN and CLOSED position indicators

F Travel Limit switch

G Eight-pole auxiliary switch coupled to motor. See **page 9.**

H Optional four-pole auxiliary switch coupled to motor. See **page 9.**

I Motor-circuit two-pole pull-out fuse holder

J Foul-weather accessibility to interior. Access is by door, not by removal of entire enclosure

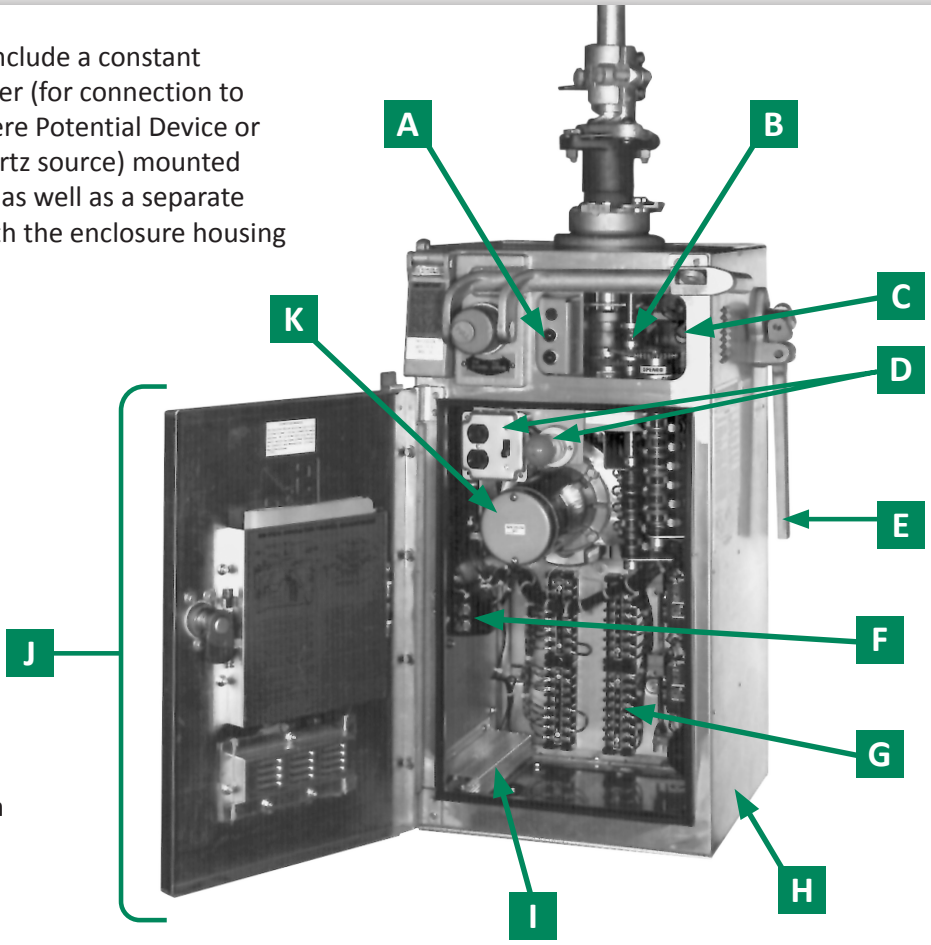
K Instruction manual holder

L Optional eight-pole auxiliary switch coupled to Alduti-Rupter Switch. Twelve-pole version also available. See **page 9**.

M Externally operable Open/Close pushbuttons

N Optional remote-control Blocking switch

12-Vdc models also include a constant burden battery charger (for connection to an S&C 30-Volt-Ampere Potential Device or other 120-Volt 60-Hertz source) mounted on a swingout panel, as well as a separate compartment beneath the enclosure housing



See S&C Specification Bulletin 769-31 for a complete listing of available accessories.

FIGURE 4. Interior of a Type AS-10 Switch Operator.

A Optional Position Indicatlng lamps

B Position-indexing drums make recoupling foolproof (See **page 8**)

C Laminated safety-plate window for inspection of the built-in internal decoupling mechanism (See **page 6**)

D Optional duplex receptacle and convenience-light lampholder with switch

E External decoupling handle to operate internal decoupling mechanism (See **page 7**)

F Space heater circuit two-pole pull-out fuse holder

G Terminal blocks that readily accommodate large-size conductors

H Anti-friction bearings throughout; tapered roller bearings for all high-torque gear-train shafts

I Space heater to induce ventilation

J Tamper-resistant design—welded enclosure; baffled louvers; gasketed, flanged door opening; cam-action door latch; provisions for padlocking (See **page 6**)

K Heavy-duty permanent-magnet motor

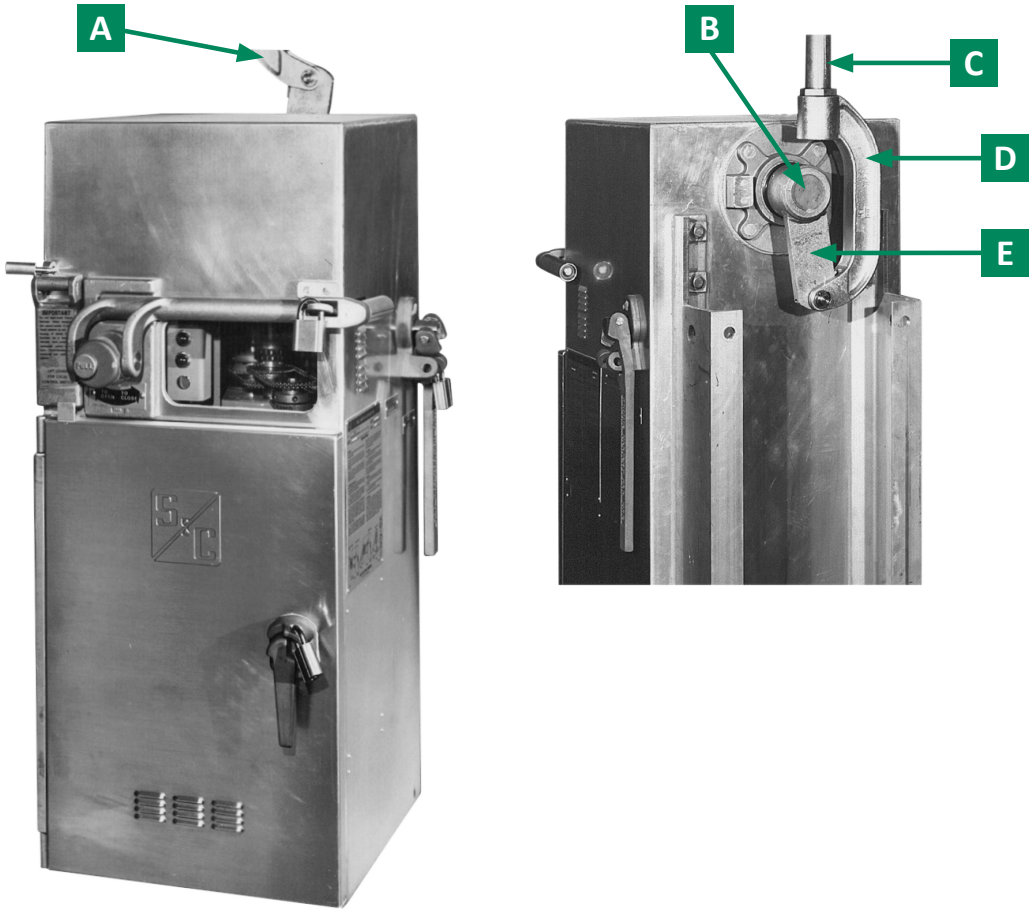


FIGURE 5. Exterior of a Type AS-10 switch operator.

A Clevis fitting (in switch Closed position)

B Output shaft

C Vertical operating pipe

D Clevis fitting (in switch Open position)

E Operating lever

Construction And Operation

The Enclosure

The switch operator is housed in a weatherproof, dustproof enclosure of sturdy, 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 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:

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

Power Train

The power train consists essentially of a reversible motor coupled to the output shaft. Motor direction is controlled by a supervisory switch that 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 on Type AS-1A Switch Operators by means of self-locking spring-biased cams. (On Type AS-10 Switch Operators, the cams are permanently set at the factory and do not require field-adjustment.) 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 Alduti-Rupter Switch is located on the front of the switch operator enclosure. See **Figure 6**. 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.

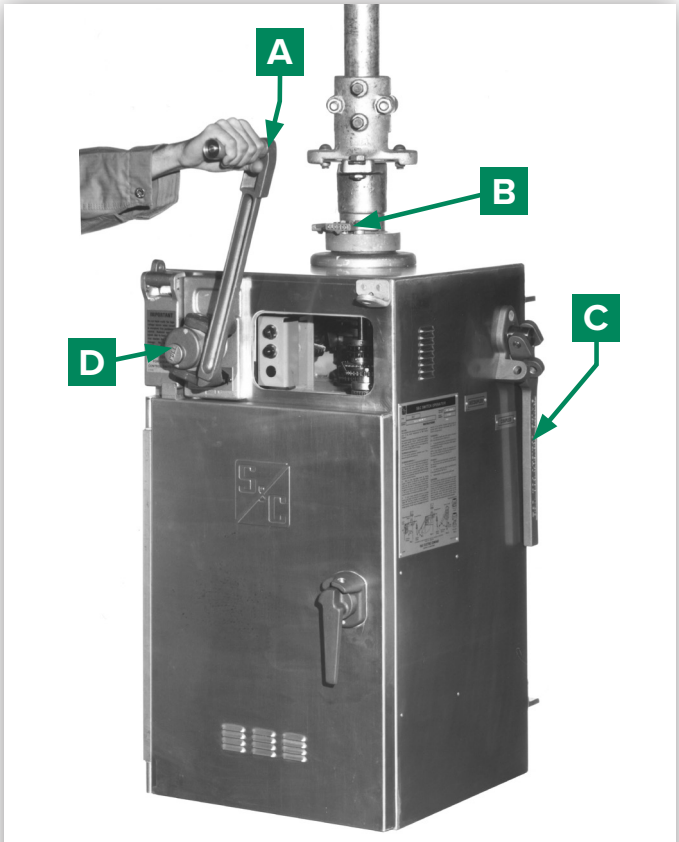


FIGURE 6. Manual operation.

A	Manual operating handle
B	Alduti-Rupter Switch Position indicator
C	Selector handle (in Coupled position)
D	Latch knob

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 fuse holder, located on the right-hand inside wall of the enclosure.

On Type AS-1A Switch Operators, the position of the Alduti-Rupter Switch is shown on an indicator located on the output-shaft collar. See **Figure 6 on page 6**. The position of the switch operator is shown on an indicator visible through the observation window. See **Figure 7**. 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 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 6 on page 6**. By swinging this handle upright and rotating it clockwise 50°, as shown in **Figure 7**, 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 Alduti-Rupter Switch. Moreover, when decoupled, the switch-operator output shaft is prevented from moving by a mechanical locking device within the operator enclosure.

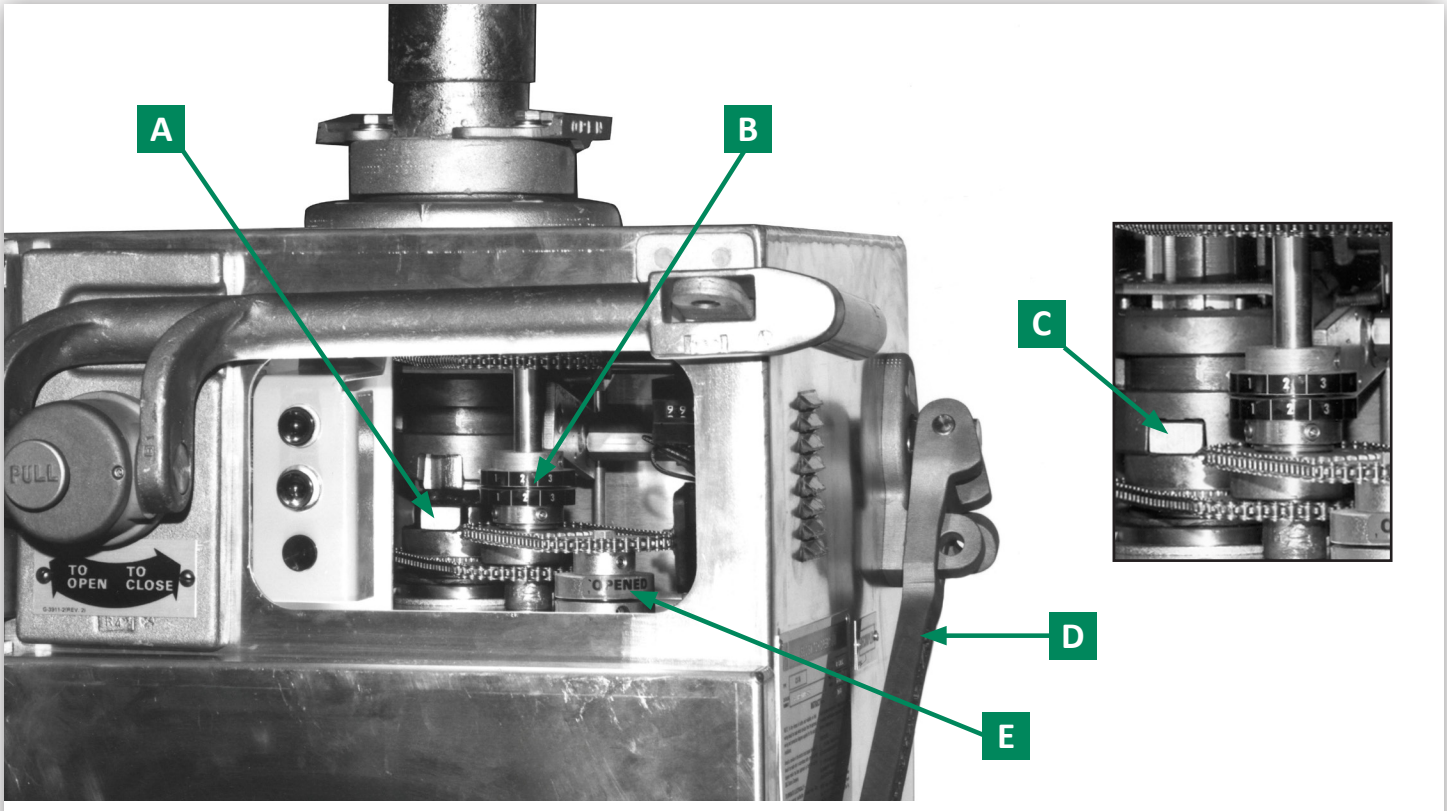


FIGURE 7. Views of the switch operator through the observation window.

A Internal decoupling mechanism (in Decoupled position)

B Position indexing drums

C Internal decoupling mechanism (in Coupled position)

D Selector handle (in Decoupled position)

E Switch operator Position indicator

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 (except for 12-Vdc models) 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 7 on page 7**. The selector handle may be padlocked in either position.

Recoupling is foolproof. It is impossible to couple an "open" Alduti-Rupter 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 Alduti-Rupter 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 7 on page 7**. 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

On Type AS-1A Switch Operators, a travel-limit switch coupled to the motor governs the extent of output-shaft rotation in the opening and closing directions. It includes two contacts that are operated by cam-actuated rollers. See **Figure 8**.

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.

On Type AS-10 Switch Operators, a travel-limit switch coupled to the motor is also used to govern the extent of output-shaft rotation in the opening and closing directions. It also includes two contacts operated by cam-actuated rollers. However, these cams are permanently set at the factory to produce

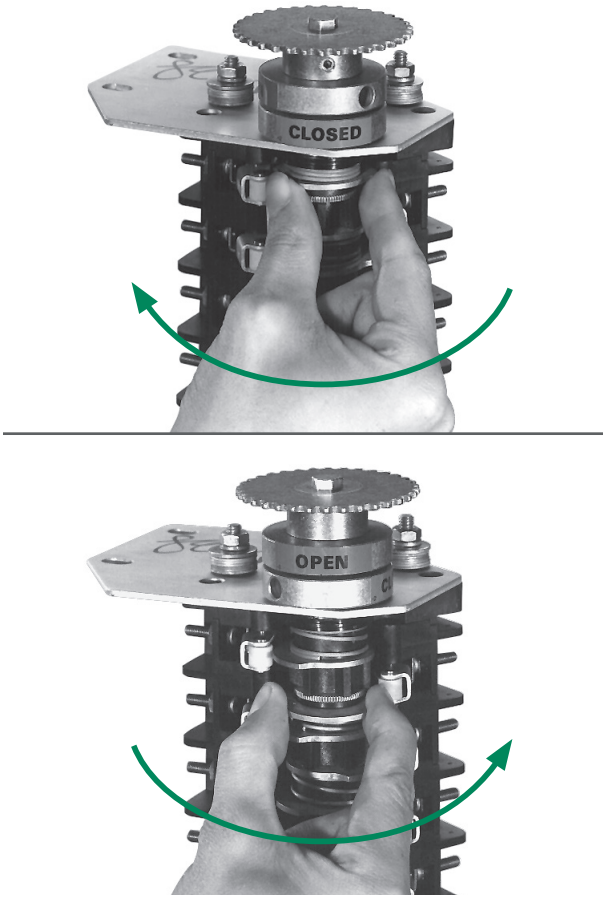


FIGURE 8. Adjustment of travel-limit cams on Type AS-1A Switch Operators (for Alduti-Rupter Switches rotating counterclockwise to open.)

(Top) Opening-stroke travel-limit cam (with switch operator in fully Closed position—raise and turn cam clockwise to increase travel of switch operator).

(Bottom) Closing-stroke travel-limit cam (with switch operator in fully Open position—lower and turn cam counterclockwise to increase travel of switch operator).

an output-shaft rotation of 180 degrees and cannot be field-adjusted. Thus, no travel-limit adjustments are necessary on Type AS-10 Switch Operators.

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 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. Cam position is adjusted by raising (or lowering) the cam toward its adjacent spring and rotating it to the desired position. See **Figure 9**. An extra four-pole auxiliary switch coupled to the motor and using the same construction is available as an option (catalog number suffix "-Q").

An extra auxiliary switch coupled to the Alduti-Rupter Switch is also available as an option, and can be provided so external contacts can be established to monitor Alduti-Rupter Switch operations. This auxiliary switch also uses self-locking spring-biased cams. It can be furnished in an eight-pole version (catalog number suffix "-W") or in a 12-pole version (catalog number suffix "-Z").

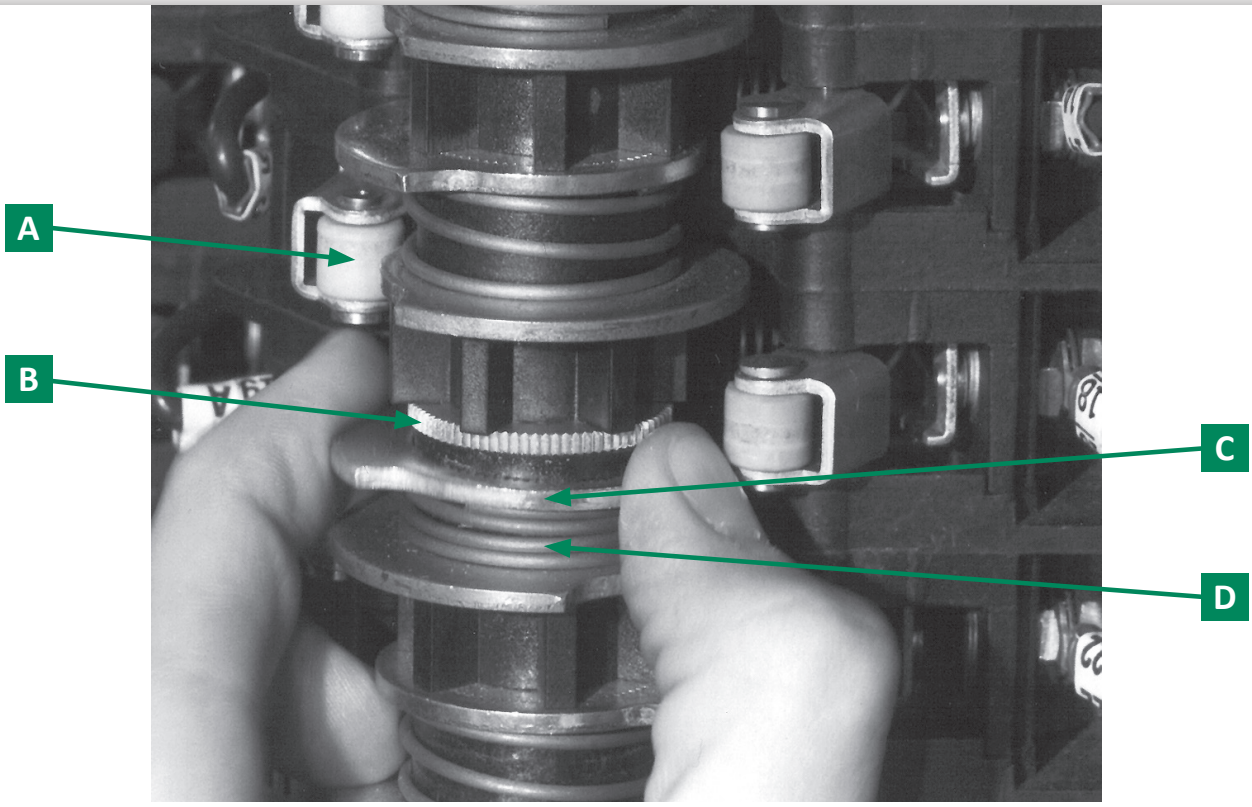


FIGURE 9. Adjustment of cams on the auxiliary switch.

A	Roller	C	Cam (lowered toward adjacent spring)
B	Inner gear	D	Adjacent spring

Ratings

Motor and Control Voltage	Operating Lever[1, 2] Sector	Operating Lever[1, 2] Length, Inches	Maximum Operating Time, Seconds[3]	Minimum Locked-Rotor Torque at Rated Control Voltage, Inch-Lbs.	Accelerating Current, Amperes	Catalog Number	Schematic Wiring Diagram Drawing Number
12 Vdc			0.75[4]	18500	—	38854R3[5]	CDR-3127
48 Vdc			0.75[4]	21500	80	38847R4-A	CDR-3113R1
125 Vdc	—	—	0.75[4]	21500	30	38847R4-B	CDR-3113R1
115 V 60 Hz			0.75[4]	18000	46	38847R4-D	CDR-3128R1[6]
230 V 60 Hz			0.75[4]	18000	23	38847R4-E	CDR-3128R1[6]

TABLE 1. Type AS-1A Switch Operator

Alduti-Rupter Switches— rotating-type operating mechanism 7.2 kV through 46 kV

1 Applicable for Type AS-10 Switch Operators only. Operating lever travels in left-hand or right-hand sector as indicated, viewed from front (door side) of switch operator. Operating lever in the Up position corresponds to the Closed position of the Alduti-Rupter Switch.

2 Refer to the "-S8" or "-S9" standard minor modification appearing on the applicable Alduti-Rupter Switch erection drawing bill of material when selecting an "RH" or "LH" switch operator. Where bracket SA-39154 or SA-39155 is indicated, specify an "RH" switch operator; where bracket SA-39868 is indicated, specify an "LH" switch operator. Consult the nearest S&C Sales Office.

3 Based on minimum battery and external control wire size requirements specified in S&C Information Bulletin 769-60; operating time will be less if larger than minimum battery size and/or external control wire size is used.

4 Applicable to Alduti-Rupter Switches with operating-mechanism rotation of 90 degrees; operating time will be greater if switch has increased operating-mechanism rotation. Typical running speed of switch-operator output shaft: 26 revolutions per minute.

5 Includes 12-Vdc battery and constant-burden battery charger for connection to an S&C 30-Volt-Ampere Potential Device or other 120-Volt, 60-Hertz source.

6 CDR-3205 for catalog numbers 38847R4-D, 38847R4-3, 38852R4-D, 38852R4-E, 38853R4-D, and 38853R4-3 when furnished with source-transfer compatibility (suffix "-U").

Motor and Control Voltage	Operating Lever[1, 2] Sector	Operating Lever Length, Inches (mm)	Maximum Operating Time, Seconds[3]	Minimum Locked-Rotor Torque at Rated Control Voltage, Inch-Lbs.	Accelerating Current, Amperes	Catalog Number	Schematic Wiring Diagram Drawing Number
12 Vdc	LH	4⅝ (117)	1.2	18500	—	38855R3[4]	CDR-3127
48 Vdc	LH	4⅝ (117)	1.2	21500	80	38852R4-A	CDR-3113R1
125 Vdc	LH	4⅝ (117)	1.2	21500	30	38852R4-B	CDR-3113R1
115 V 60 Hz	LH	4⅝ (117)	1.2	18000	46	38852R4-D	CDR-3128R1[5]
230 V 60 Hz	LH	4⅝ (117)	1.2	18000	23	38852R4-E	CDR-3128R1[5]
12 Vdc	RH	4⅝ (117)	1.2	18500	—	38856R3[4]	CDR-3127
48 Vdc	RH	4⅝ (117)	1.2	21500	80	38853R4-A	CDR-3113R1
125 Vdc	RH	4⅝ (117)	1.2	21500	30	38853R4-B	CDR-3113R1
115 V 60 Hz	RH	4⅝ (117)	1.2	18000	46	38853R4-D	CDR-3128R1[5]
230 V 60 Hz	RH	4⅝ (117)	1.2	18000	23	38853R4-E	CDR-3128R1[5]

TABLE 2. Type AS-10[6] Switch Operator

Alduti-Rupter Switches—reciprocating-type operating mechanism 7.2 kV through 46 kV

1 Applicable for Type AS-10 Switch Operators only. Operating lever travels in left-hand or right-hand sector as indicated, viewed from front (door side) of switch operator. Operating lever in the Up position corresponds to the Closed position of the Alduti-Rupter Switch.

2 Refer to the "-S8" or "-S9" standard minor modification appearing on the applicable Alduti-Rupter Switch erection drawing bill of material when selecting an "RH" or "LH" switch operator. Where bracket SA-39154 or SA-39155 is indicated, specify an "RH" switch operator; where bracket SA-39868 is indicated, specify an "LH" switch operator. Consult the nearest S&C Sales Office.

3 Based on minimum battery and external control wire size requirements specified in S&C Information Bulletin 769-60; operating time will be less if larger than minimum battery size and/or external control wire size is used.

4 Includes 12-Vdc battery and constant-burden battery charger for connection to an S&C 30-Volt-Ampere Potential Device or other 120-Volt, 60-Hertz source.

5 CDR-3205 for catalog numbers 38847R4-D, 38847R4-3, 38852R4-D, 38852R4-E, 38853R4-D, and 38853R4-3 when furnished with source-transfer compatibility (suffix "-U").

6 This switch operator has output characteristics equivalent to a linear actuator having a stalled-force rating of 4000 pounds (for 12-Vdc models), 4600 pounds (for 48-Vdc and 125-Vdc models), or 3800 pounds (for 115-Volt 60-Hertz and 230-Volt 60-Hertz models); a stroke length of 9 inches (229 mm); and a typical operating speed of 12 inches (305 mm) per second at mid-stroke.

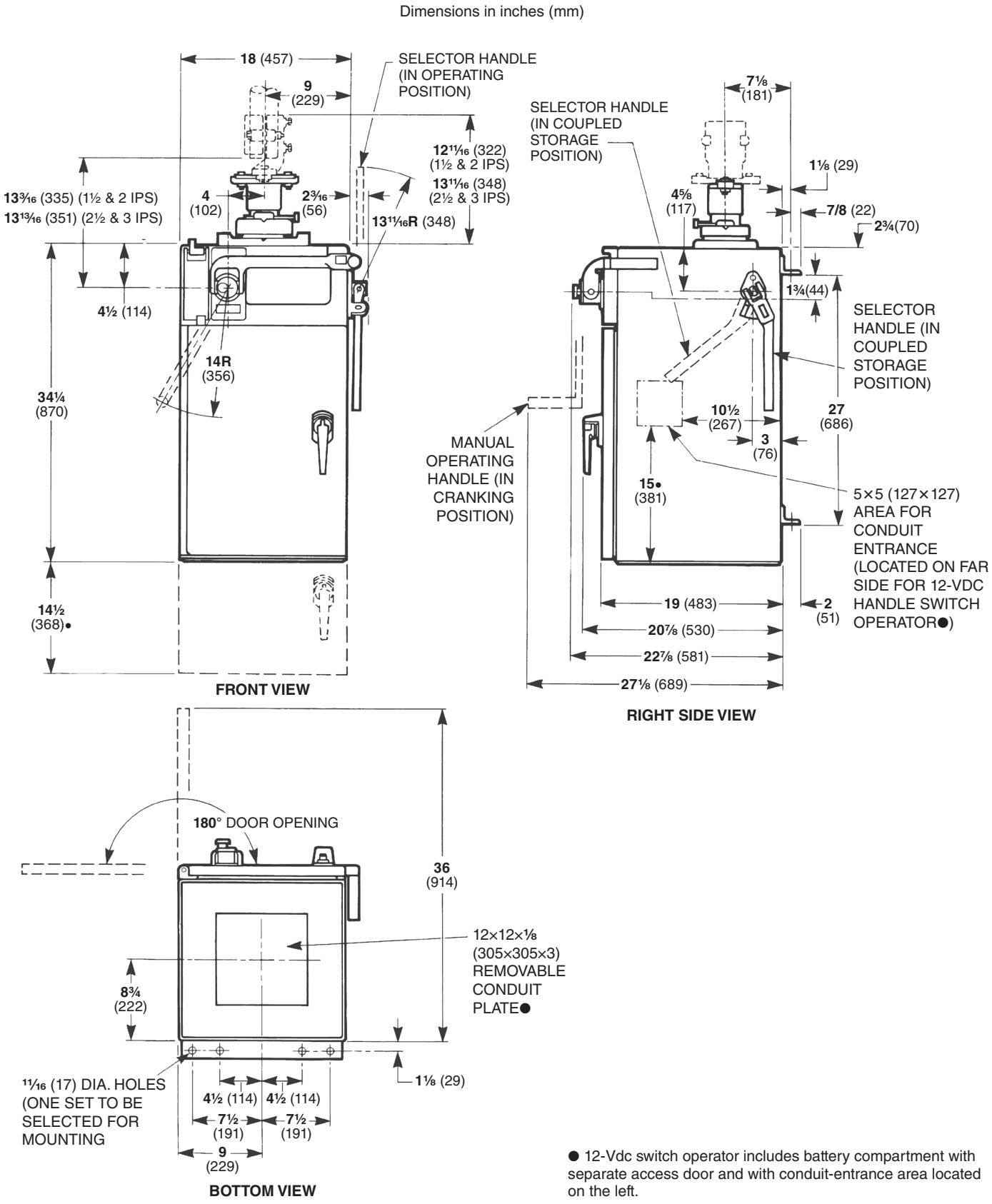
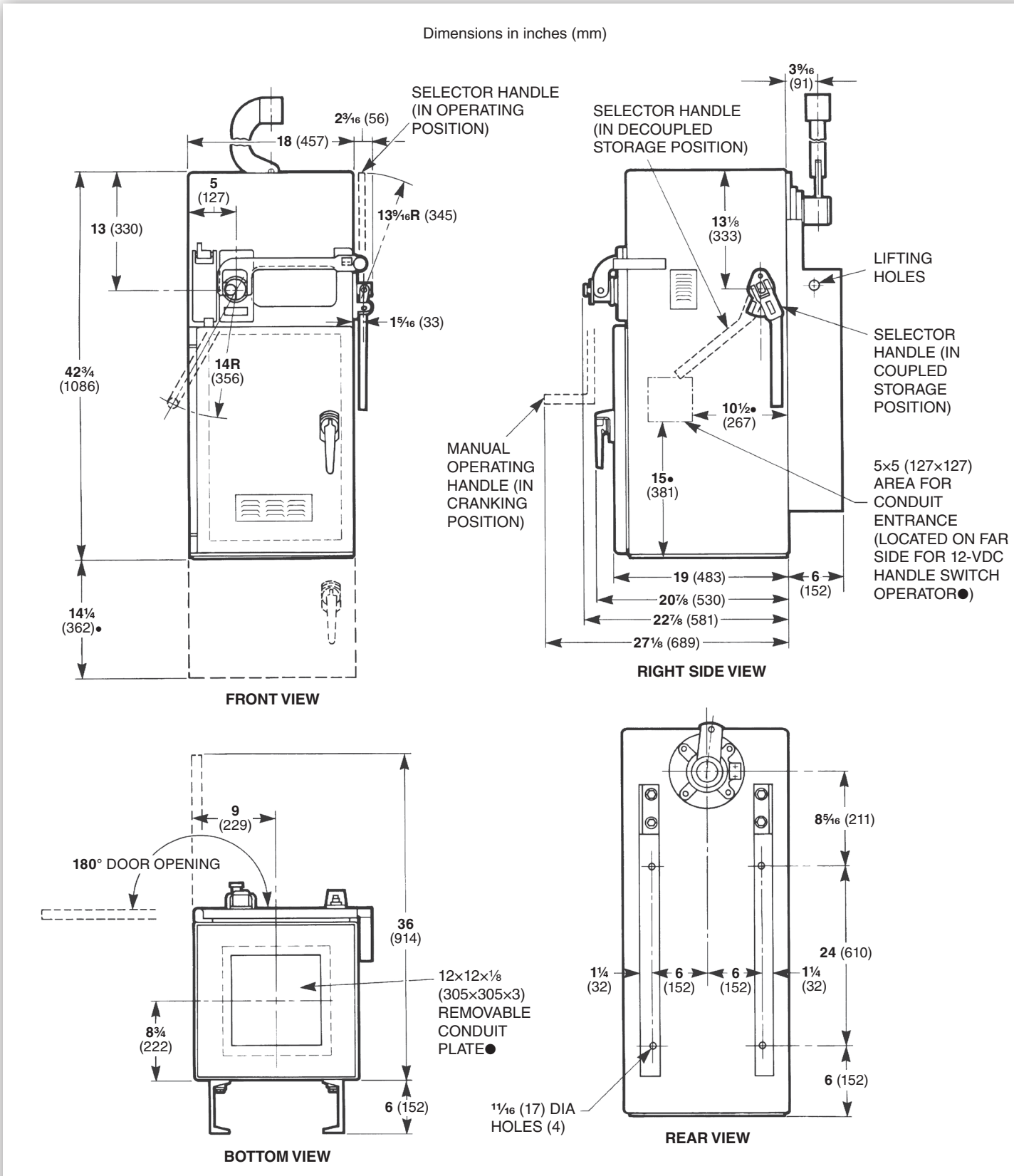


FIGURE 10. Type AS-1A Switch Operators.



● 12-Vdc switch operator includes battery compartment with separate access door and with conduit-entrance area located on the left.

FIGURE 11. Type AS-10 Switch Operators.

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