SIEMENS-ALLIS

Switchgear

INSTRUCTIONS

SWITCH CUBICLE
HIGH VOLTAGE
TYPE QA
WITH LBS-SE OPERATOR

18X1890-04
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SWITCH RATINGS

KV		AMPERES				BIL KV
Nominal	Maximum	Cont.	Int.	Momentary	Fault Closing	
4.16	4.76	600	600	60,000	60,000	60
4.16	4.76	1200	1200	60,000	60,000	60
13.8	15.0	600	600	60,000	40,000	95
13.8	15.0	1200	600	60,000	40,000	95

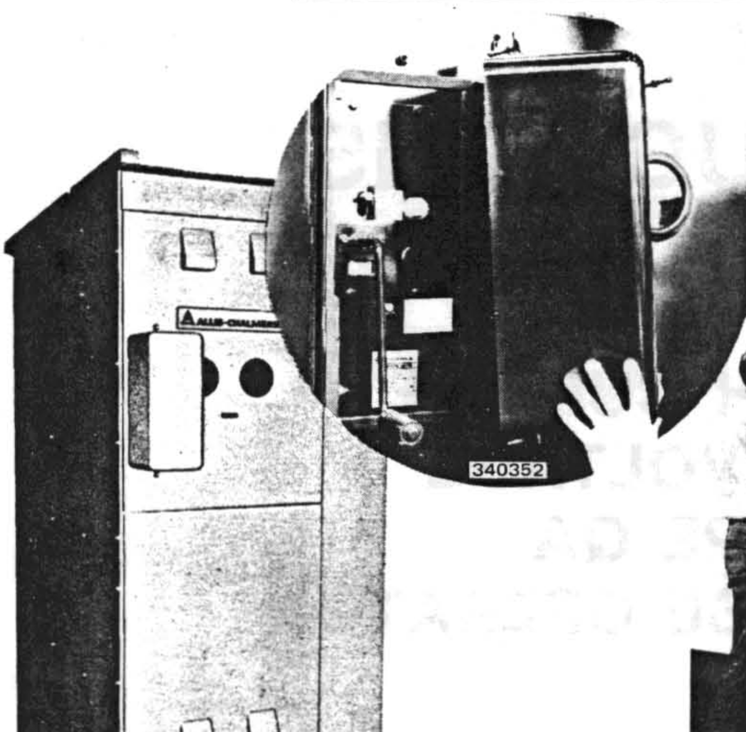


Fig. 1 – QA-36 outdoor switch cubicle with QA-14 transition unit. Inset shows operator removing weatherproof cover.

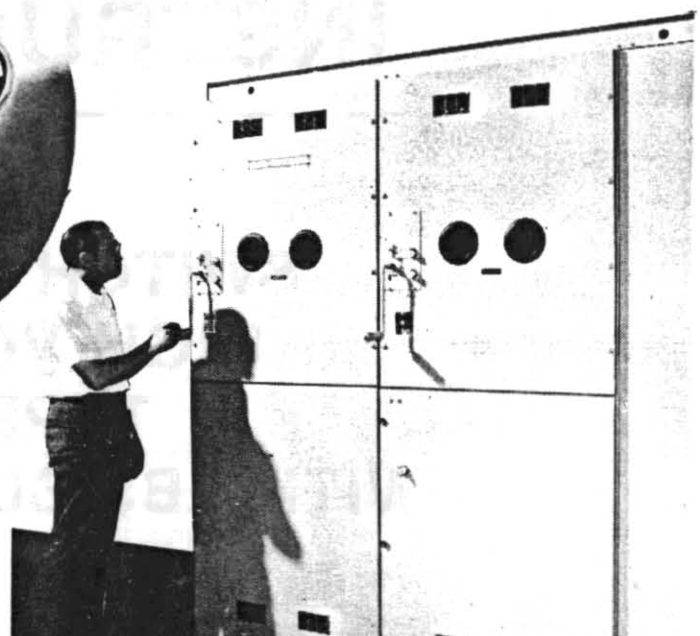


Fig. 2 – Indoor switch cubicle group arrangement.

INTRODUCTION

GENERAL INFORMATION

A standard 36-inch cubicle (QA-36) can be used individually with an open dry-type transformer, or adjacent to any auxiliary high voltage unit in which proper bus entry and alignment can be made. A 14-inch wide transition unit is added when the 36-inch wide cubicle is used with liquid-filled or sealed dry-type transformers.

This equipment has been designed to operate in a system having a circuit capacity as specified by the customer. If for any reason the equipment is later used in a different system, or if the short-circuit capacity of the system is increased, the momentary rating of the switch, the interrupting capacity of the fuses, and the bus capacity must be checked. Failure on the part of the user to receive approval of intended changes from the supplier may be cause for voiding the warranty.

WARRANTY

For warranty coverage, see the sales contract.

GENERAL DESCRIPTION

Type QA-36 refers to the complete cubicle. LBS-SE refers to Load Break Switch with Stored Energy operator. It is a manually-operated, single-throw, gang-operated switch that is used as a disconnect and circuit interrupter. A quick-break, quick-make blade, (or quick-acting blade), combined with an arc chute, provides positive, three-phase interruption of transformer magnetizing and load currents.

Available in either fused or unfused arrangements, the Type LBS-SE switch is rated to interrupt load current at distribution voltages from 2.4 through 13.8 kv. An interrupter switch differs from a circuit breaker in that it will interrupt *full load current, but not overload or fault currents.*

It is equipped with a true stored energy mechanism.

Closing and opening energy is pre-stored in the springs by rotating the charging handle. When the energy is needed, it is simply released by pressing down on the latch release. The resulting high-speed closing and opening assures safe operation and long life.

The handle for the operation is mounted on the front of the unit at eye-level. Adjacent to the handle are inspection windows through which position of the switch may be visually checked.

This switch is available in three versions:

standard switch – two-position (open/closed);

duplex switch – two 2-position switches bussed together on the load side, to provide "line 1," "open" and "line 2."

selector switch – three visually identified positions of "line 1," "open" and "line 2". This switch consists of a type LBS-SE 2-position (open/close) 600-amp interrupter switch in series with a 2-position (line 1/line 2) disconnect. It is mechanically interlocked to prevent operation when the interrupter is closed. The interrupter is identical to single feeder units and interrupts any load current. The disconnect is mounted in the cable compartment and is operated from the front of the unit.

RECEIVING and HANDLING

The cubicles are securely blocked and braced for shipment. They are crated, boxed or covered, depending on shipping conditions. Whatever the method of shipment, every precaution has been taken to insure safe arrival of the equipment. If special handling is required, it is so indicated. Although all moving parts are blocked, avoid rough handling when unloading.

To facilitate unloading, four lifting bars are bolted to the sills at the front and rear of outdoor units, while lifting angles or channels are used on indoor units. When lifting outdoor units, use cable spreader bars at the top to prevent distorting the cubicle. After installation, remove and scrap the lifting angles and bars.

If means for lifting are not available, the group may be moved by placing pipes or rollers under the wooden skids. To prevent distortion of the assembly, place at least one roller at each end. When removing the rollers, lower the assembly carefully to avoid dropping.

NOTE: Do not remove wooden skids when either rolling units or moving them with a fork lift truck.

> **CAUTION:**
> Forklift trucks should be used with discretion as improper lift points could cause extreme damage to shipping sections.

When groups of load center substations are shipped together, each substation is numbered. All crates for a particular substation are numbered the same, in accordance with the "General Arrangement and Floor Plan" drawing of that substation.

UNCRATING

Be careful when uncrating equipment. The use of sledge hammers and crowbars may damage the finish, if not the equipment itself. Use nail pullers.

Check all packing material to insure against accidentally throwing away small parts.

Do not remove identity cards until the switchgear installation is complete.

INSPECTION

As soon as possible after uncrating, inspect the equipment for any damage which may have occurred in transit. Also check the shipping manifest to be sure all items have been received. If any damage or shortage is detected, note this on the freight bill and contact the carrier immediately.

NOTE: This inspection must be made within 15 days after equipment is received or carrier will not allow claim.

Also report any shortage or damage to the nearest Allis-Chalmers sales office within the 15-day period.

Unusual circumstances may require partial shipment of equipment. In these cases, provisions are made for easy installation of these portions of the complete job.

STORAGE

If the switches will not be installed immediately, uncrate, inspect and store in a clean, dry place.

Before placing in storage, inspect and grease steel surfaces of gears, drive screws, etc., to prevent rusting. Protect mechanism, contacts, etc., from dust and grit with suitable covers. Energize the space heaters to prevent damage from condensation. (Space heaters are standard on all outdoor units and are available as an optional extra on some indoor switch cubicles.)

Indoor cubicles are neither weatherproof nor dripproof; therefore, store them indoors. If they must be stored outdoors, provide an adequate covering, and place a heat source of approximately 500 watts output per unit inside the cubicles to prevent condensation.

INSTALLATION

FOUNDATION

Whether installing the switch cubicle on an existing floor or on a new floor, follow the sill channel and anchor bolt dimensions shown on the "General Arrangement and Floor Plan" drawing. Typical floor plans for indoor and outdoor equipment are shown in Figs. 3 and 4. For outdoor switch cubicles, remove the lifting channel cover plates. The anchor bolts may then be installed. When replacing the cover plates, omit the lifting bars and replace screws in tapped holes.

CONDUIT

Install conduit for power and control connections in the area indicated on the "General Arrangement and Floor Plan." Keep conduit ends a maximum of 2 in. above the finished floor to prevent wash water from soaking the cables. Cap and tape ends to keep out moisture and vermin. In indoor installations, conduit ends should be a maximum of 2 in. above the unit's floor line.

ERECTION

Switch cubicles are usually shipped as single groups, If the shipment includes several groups, the "General Arrangement and Floor Plan" drawing will indicate the size and relative location of each group. Before installing, make sure that the floor is level.

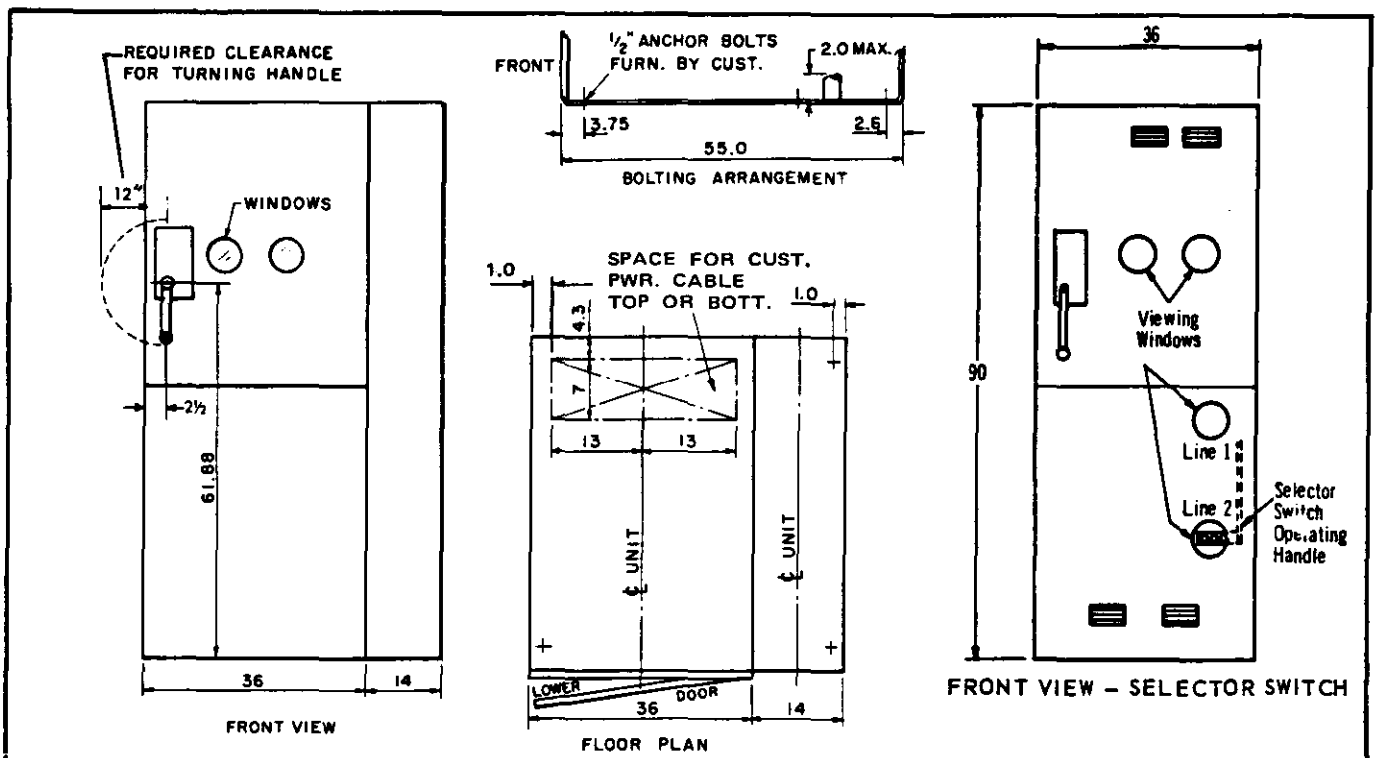


Fig. 3 – Indoor floor plan arrangement and bolting.

When only a single unit is involved, set in place and anchor. If multiple units are involved, align the front of each succeeding unit with the first and bolt the units together before anchoring.

NOTE: When connecting the switch to the system, avoid placing any stress on the insulators or bushings.

BUS BAR JOINTS

When it is necessary to make bus bar joints in the field, all required hardware is furnished. Adequate clearance is provided; therefore, insulation of joints is not required. Connections are made with 1/2-in. bolts, tightened with a torque wrench to 50-foot-pounds. Tightening the bolts as specified will prevent connections from becoming loose as bus bars alternately heat and cool during changes in load.

Bolts provided for these connections are specially designed to withstand the stresses imposed by the torque specified and by the subsequent expansion of the bus bars. Do not replace them with standard bolts. If replacements are needed, use SAE Grade 5 heat-treated bolts.

Precut cables with suitable terminators are provided for making connections to a liquid-filled transformer, as shown in Fig. 5. To insure ease of assembly and proper fit of mating parts, position the switch and transformer according to dimensions indicated on the "General Arrangement" drawing.

Transformer connections are protected by a hood assembly, consisting of a hood, cover, and an angle for sealing the 1-in. space between the switch and the transformer top plate. Gaskets are furnished for the throat connection on outdoor units only. Place gaskets carefully and bolt securely to assure a weatherproof joint.

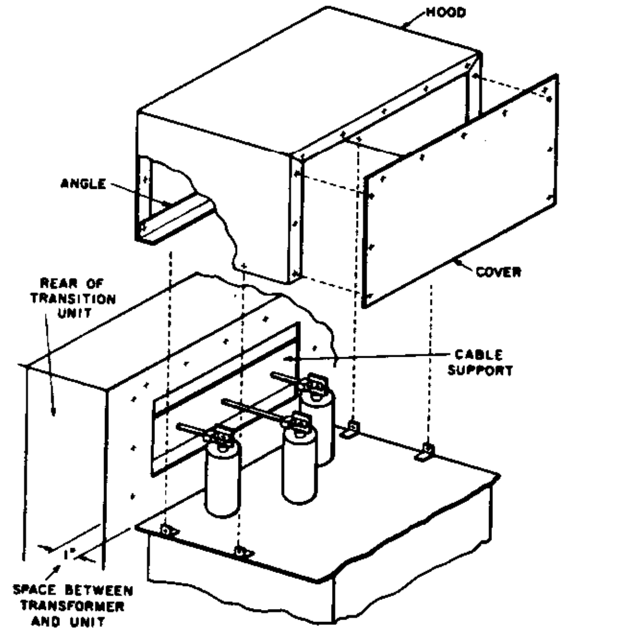


Fig. 5 — Flexible cable connections to the transformer, protected by a hood assembly (above).

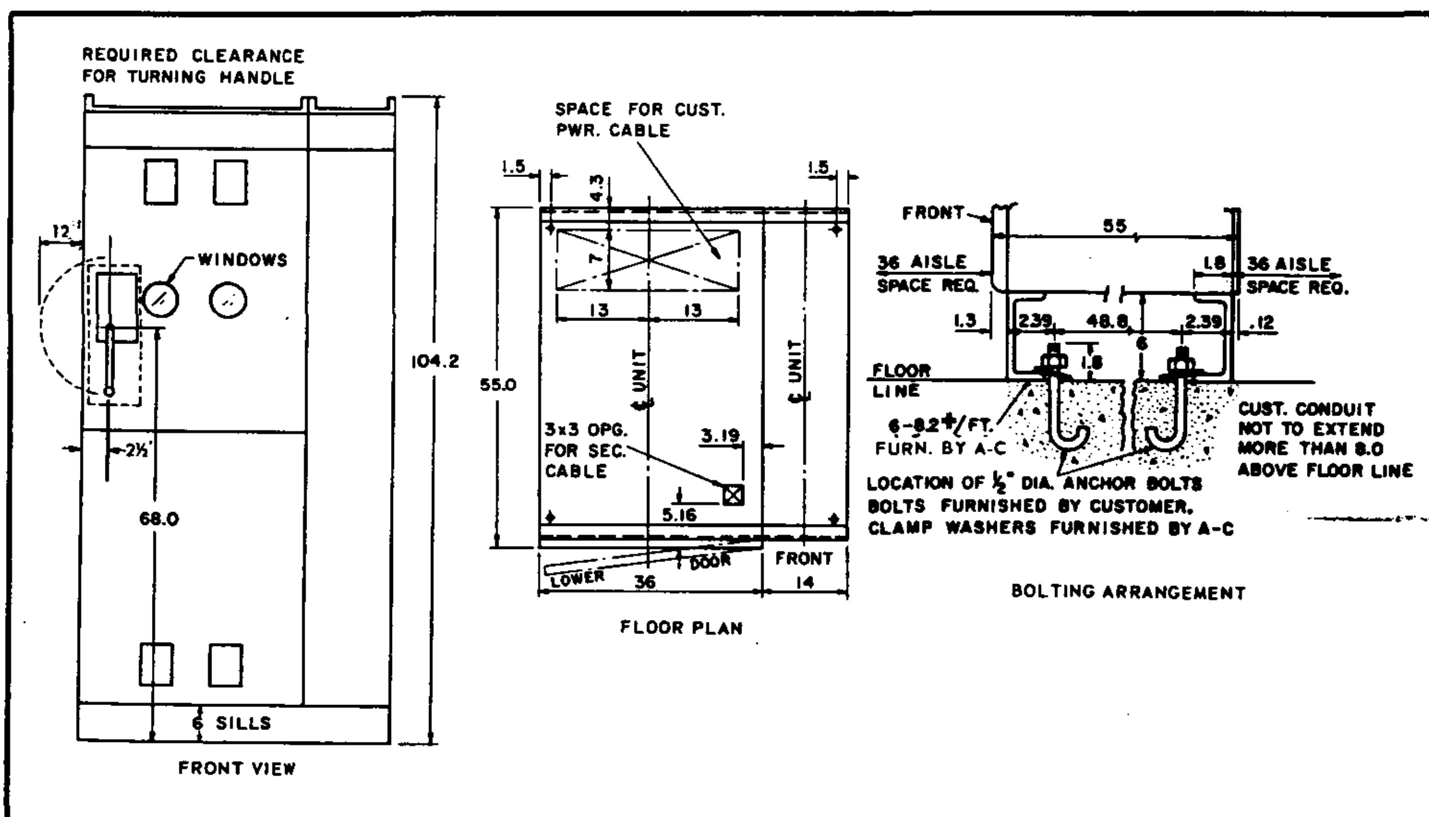


Fig. 4 — Outdoor floor plan arrangement and bolting.

CABLE CONNECTIONS

See typical terminal locations, Figs. 6 and 7. Before making cable connections, consider phase rotation. When the switch is feeding a transformer, phasing is traced from the transformer throat. For typical customer's cable connections, see Fig. 9. Refer to cable manufacturer's recommendations for detailed information.

POTHEAD CONNECTIONS

Potheads* must be coordinated with other switchgear components to meet space, dielectric, momentary current and thermal current requirements. Allis-Chalmers potheads meet these requirements when installed as a component of metal-enclosed switchgear.

In standard Allis-Chalmers switchgear units, the pothead mounting is such that the pothead may be removed from the mounting without disassembly. Each three-conductor pothead, or group of three single-conductor potheads, is on a separate mounting plate.

The manner in which potheads are mounted makes it possible to connect cable outside the unit or on the floor of the unit. Cables may also be installed in the mounted position. Sufficient distance between the pothead entrance and the floor of the unit permits dropping the pothead body over the cables to make the stress cones.

Pothead bodies are not furnished in different sizes to match the various cable sizes within an installation. One three-conductor body is furnished to accommodate all sizes up to approximately 750 mcm. One single-conductor body will take all cable sizes up to approximately 1000 mcm. This permits the installation of larger cable if the loads outgrow originally selected cable sizes.

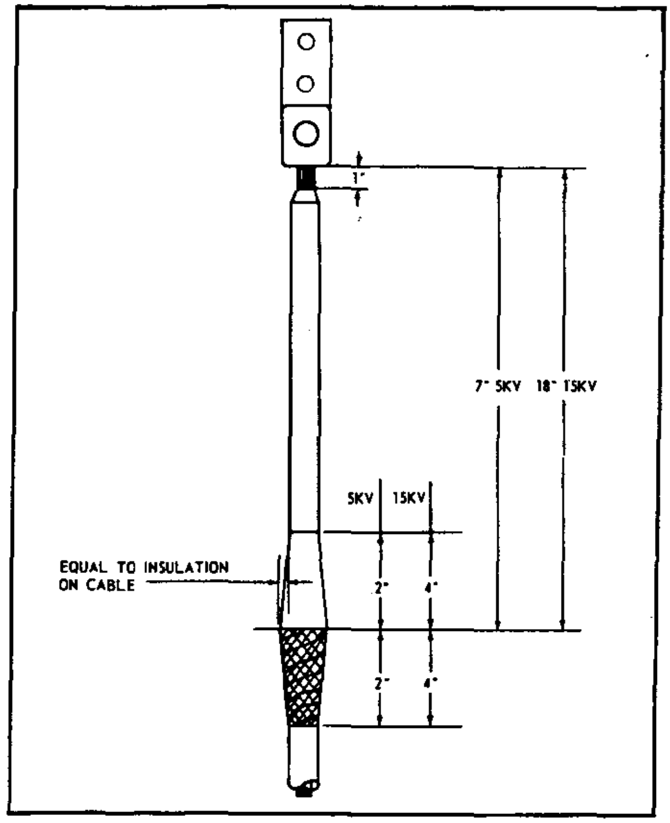


Fig. 9 – Typical customer's cable connections.

*Potheads are shipped with accessories or assembled with undrilled studs or clamping glands and with uncut wiping sleeves.

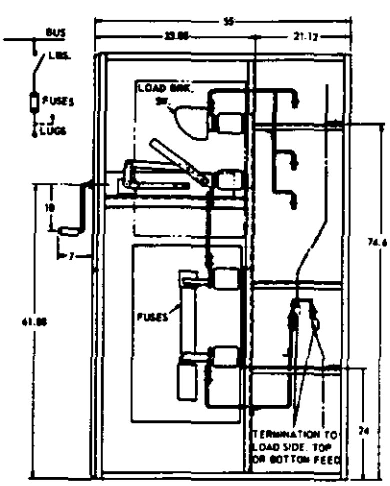


Fig. 6 – Indoor upfeed or downfeed connection to transformer primary switch.

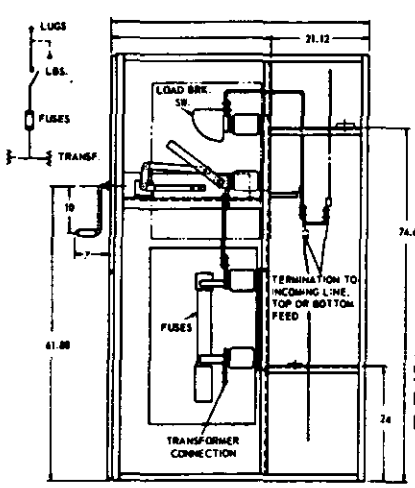


Fig. 7 – Indoor upfeed or downfeed connection to feeder switch.

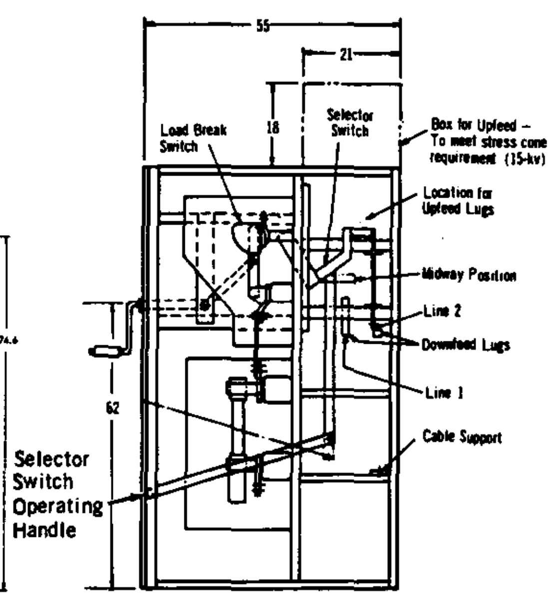


Fig. 8 – Upfeed or downfeed connecction–selector switch.

Three-conductor potheads have their entrance offset. If two potheads are mounted in one unit, the offsets are therefore in opposite directions. This provides more work space when wiping lead to the wiping sleeve of the pothead and the lead of the cable.

Allis-Chalmers potheads are designed to meet momentary current rating of 70,000 amps and 4-second rating of 44,000 amps.

Potheads are an integral part of switchgear and are, therefore, required to stand the same tests as other switchgear components.

See Figs. 10, 11 and 12 for typical pothead connections and locations.

MATERIALS REQUIRED

The following materials, with the exception of insulation compound and tarred rope, are not included with the switchgear, unless covered by contract, but are needed to properly install pothead connections. (A cable termination kit may be obtained from the cable manufacturer.):

(a) Insulating compound.

(b) Solder (50-50) for connectors.

(c) Solder (60-40) for wiping joints.

(d) Stearine for solder and wiping flux.

(e) Insulating tape* for reinforcing cable conductor insulation and for stress relief cones.

(f) Copper tinsel braid for stress relief cones, if required.

(g) Dry cotton tape.

(h) Tarred rope for filling clamp-type cable glands.

Tools and equipment required for installing potheads:

(a) Kit of cable jointer tools, including hacksaw, knife and wrenches.

(b) Blow torch.

(c) Gasoline furnace for heating solder and compound.

(d) Solder pot and ladle.

(e) Melting vessel for melting compound.

(f) Funnel, filling and vent pipes for compounding.

(g) Thermometer (200 to 500 degrees F).

Note the following general instructions:

(a) Keep conductor insulation and internal parts of the pothead clean and free of moisture.

(b) Avoid sharp bends in insulated conductors.

(c) Remove lead sheath carefully to avoid cutting the insulation. Tear off the last few layers to prevent cutting the individual conductor insulation.

(d) If the temperature is below 15 F, cable must be warmed prior to bending. Always heat potheads to prevent compound from congealing too quickly on cold surfaces. Avoid direct application of heat on porcelains or on parts with porcelain inserts.

* Follow recommendations of cable manufacturer for type of insulating tape.

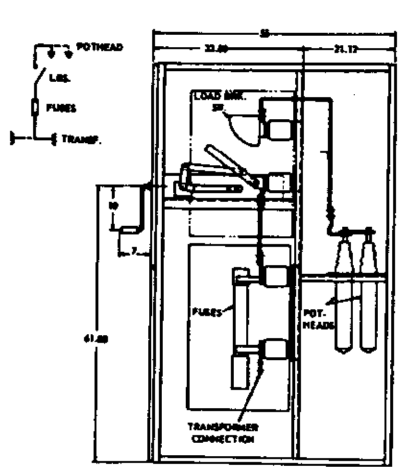


Fig. 10 – Indoor downfeed pothead connection.

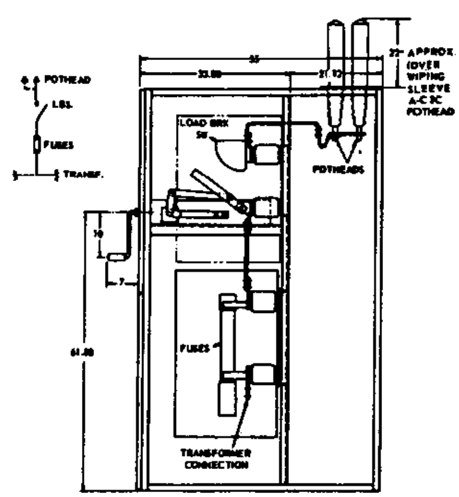


Fig. 11 – Indoor upfeed pothead connection.

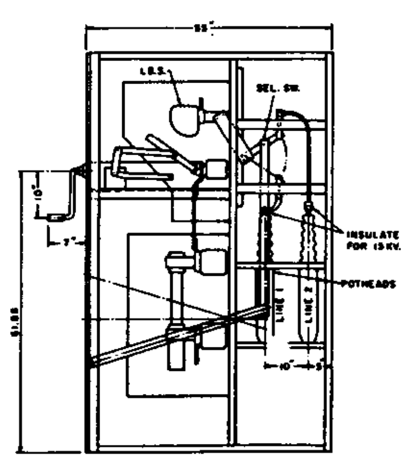


Fig. 12 – Indoor pothead connection – selector switch.

(e) Carefully follow the dimensions given in Figs. 13 and 14. In all cases, avoid the formation of air and gas pockets.

(f) Fill the potheads with compound from the bottom up. This will allow compound to rise evenly and force air up and out at the top, thereby eliminating voids. Clean off all surplus and spilled compound.

(g) After pothead has cooled, retighten all bolts.

PACKING, WIPING SLEEVE GLANDS AND SUPPORTS

When packing glands are furnished, cut the gland to suit the outside diameter of the cable, and pack as shown for the clamp-type terminals, Fig. 15.

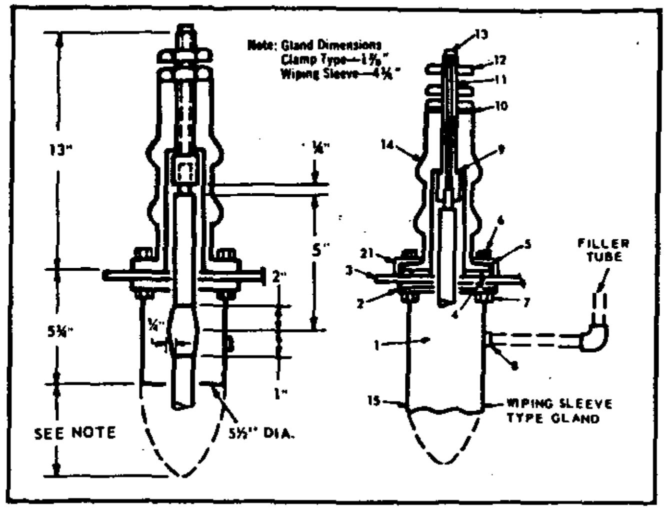


Fig. 14 – Single-conductor potheads.

CAUTION:

Item 4 – Be sure to center on hole in support plate. (Item 3)

Item 5 – Two required.

Item 6 – Torque to 90 in. lbs.

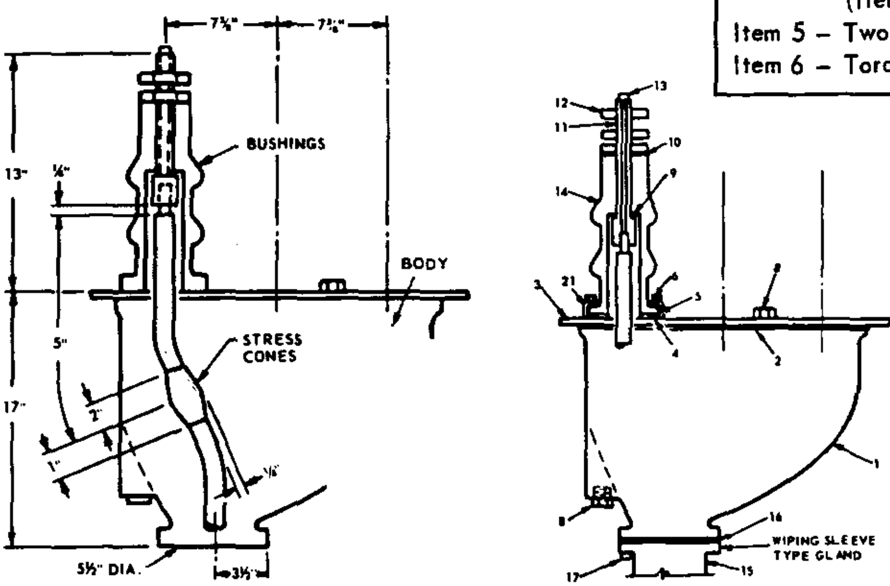


Fig. 13 – Three-conductor potheads.

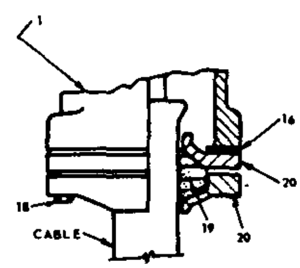


Fig. 15 – Detail of clamp-type cable gland.

Item	Name	** Conductors	Dwg. No.	Item	Name	** Conductors	Dwg. No.
1	Pothead Body	(3C)	18-446-206-001*	11	Stud Terminal		18-270-769-002
		(1C)	18-446-151-001*	12	Hood Nut		18-631-859-006
2	Gasket	(3C)	18-240-252-001*	13	Vent Screw		00-615-471-417
		(1C)	18-140-471-001		Washer		00-615-007-196
3	Support Plate	(3C)	18-178-221-001*		Gasket		18-140-469-006
		(1C)	18-178-221-001*	14	Insulator		18-363-987-001
4	Gasket		18-140-469-010				18-363-734-001*
5	Gasket		18-140-469-002	15	Wiping Sleeve	(1C)	18-230-399-001
6	Cap Screw ⅜" x 2¼"	(1C)	00-611-345-476			(3C)	18-261-493-001
	Screw (Brass)	(3C)	00-655-017-036	16	Gasket		18-160-750-001
	Lock Washer		00-655-059-200	17	Cap Screw ⅜" x 1"		00-611-289-466
	Washer (Brass)		14-104-595-018	18	Cap Screw ⅜" x 1½"		00-611-289-470
7	Hex Nut ⅜"		00-631-059-106	19	Hemp Rope		(Tarred)
8	Pipe Plug 1"		00-711-497-006	20	Packing Ring		18-261-494-001
9	Gasket		18-140-469-003	21	Insulator Support		18-240-300-001
10	Gasket		18-140-469-004				
	Key Washer		18-140-468-001				

** (1C) Single Conductor; (3C) Three Conductor.
Wipe Clamp

STRESS RELIEF CONES

Stress relief cones increase the strength of the cable insulation against puncture at the end of the grounded shielding. They also increase overall internal dielectric strength and reliability of the cable termination. Stress cones are recommended for all shielded cables and the higher voltage single-conductor lead covered cables. Belling out lead sheath is usually sufficient for lower voltage lead covered cables.

On paper or varnished cambric insulated cables, a double cone of half-lapped insulating tape* is built up. The lower slope is wrapped with copper tinsel braid, tucked under the bell at end of lead sheath and soldered to the lead sheath and/or to the cable shielding tape. On rubber-insulated cables, the double cone may be built up of insulating tape* and shielded with standard copper tinsel braid as above.

Step A – Preparing the Cable

Determine the length of each conductor to extend from the position of the wiping sleeve or packing gland to the point of connection to the stud terminal. Establish location of stress relief cone on the cable so that it will be approximately in the center of the pothead body. Remove shielding and conducting tapes down to bottom of stress cone (point "X," Fig. 16). Bare the end of the conductor and solder to stud terminal.

Step B – Building the Stress Relief Cone

Starting at the terminal end, wrap insulating cloth tape*, half-lapped, down to the edge of the metal shielding tape. Continue wrapping back and forth until the double cone of proper diameter is obtained. Finish by wrapping the final layer of tape* on the conductor and on up to the stud terminal.

Step C – Shielding

Starting slightly below the middle of the double cone, apply copper tinsel braid to the lower half. Wrap so that the upper edge is even and continue wrapping down the cone – over cable shielding or tuck under lead sheath. Solder the tinsel braid between turns and to ground connecting wire.

*Follow recommendations of cable manufacturer for type of insulating tape.

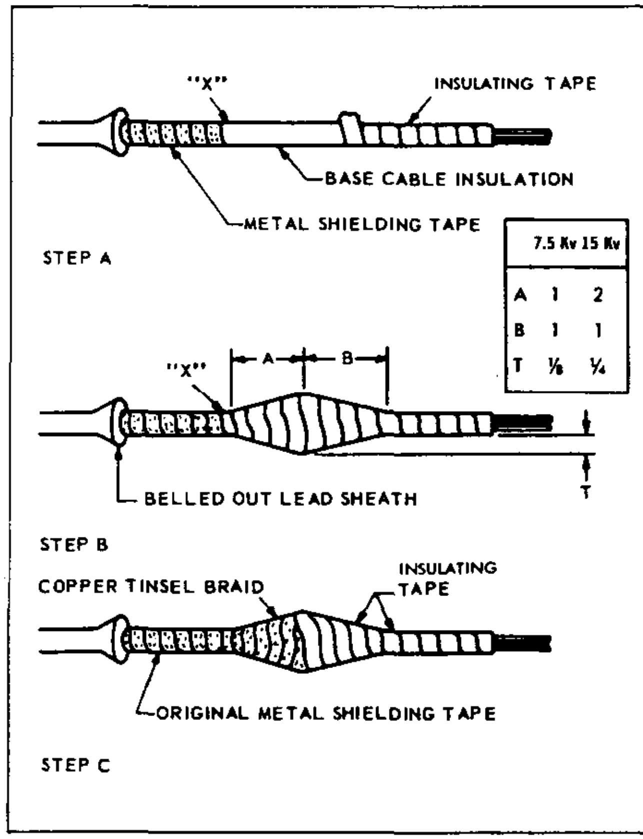


Fig. 16 — Typical pothead cable connections.

CABLE INSTALLATION

1. Check cable gland and stud to see that they fit the cable. These items may be furnished with pilot holes only. Drill out if necessary with a clearance of approximately 1/16 in. oversize of cable sheath and conductor, respectively.
2. Slide cable gland, cable gasket and pothead body down over cable.
3. Train cable into proper position, allowing sufficient length to make connections.
4. Mark cable sheath approximately 1 to 1½ in. above the bottom of the gland.
5. Remove lead sheath from the cable to point marked, being careful not to damage insulation. Bell out lead sheath as shown in Figure 16. For braided cables remove braid down to point "X."
6. Remove belt insulation (outer layers of insulation around all conductors) from the cable to point "X" above the lead bell.
7. Fan out conductors into final position, avoiding sharp bends (three-conductor only). Cut off conductors to proper length to fit into studs. Remove cable insulation from end of conductor at least 1/4 in. longer than depth of hole in stud.
8. Solder cables solidly into the studs. (For voltages above 7,500, make stress cones on cables as shown in Fig. 16.)
9. Install studs in insulators with gaskets and key washers in place. Bolt insulators firmly to their mounting plate. Tighten nut next to key washers on studs.
10. Bolt pothead body against insulator plate with gasket in place.

11. Bolt cable gland to pothead body with gasket in place.

12a. *For Upright Pothead* (cable leading down). Wipe joint between cable and wiping sleeve, or pack stuffing box, and pull up tight to seal against cable sheath.

12b. *For Inverted Pothead* (cable leading up). Wipe joint between cable and wiping sleeve, inserting a greased wire next to cable sheath if wiping sleeve gland is used. After wiping, remove greased wire to provide an air vent when filling pothead with compound. If packing gland is used, do not pack until after filling.

13a. *Filling Upright Pothead.* Remove vent screws from top of studs. Insert standpipe into pothead body and extend it above highest point of pothead. Melt compound per instructions and fill body until compound in body solidifies. Remove standpipe and insert plug and gasket.

13b. *Filling Inverted Pothead.* Do not remove vent screws in studs. Make sure these are tight. Venting is provided by hole left in wiped joint or through packing space, depending on type of gland used. Insert standpipe above highest point of pothead. Melt compound per instructions and fill body until compound reaches vents. Keep standpipe hot and full until compound in body solidifies. Remove standpipe and insert filling hole plug and gasket. Solder hole in wiped joint or insert packing, and tighten clamp to seal joint between cable and pothead body.

Allis-Chalmers potheads are designed with base flange to match G & W base size 4, so that G & W fittings can be used on these potheads. Fitting flange is 5 3/8 in. outside diameter for base size 4.

MAXIMUM CABLE SIZE — ALLIS-CHALMERS POTHEADS

	Outside Diameter (in.)
Single cable entering porcelain	2½
Bare cable entering connectors	1⅞ max. ¼ min.
Cable entering wiping sleeve	3¼
Cable entering conduit support	2¾
Cable entering packing ring	3

TAPING JOINTS

NOTE: Taping of joints is required only on customer's cable connections to 15-kv selector switch primary terminals (see Figs. 8 and 17) and customer's cable connections to 15-kv potheads (See Figs. 12 and 18).

When insulated supports for incoming cable are furnished, lash cables securely to the horizontal supports.

After completing the primary connections (Figs. 9, 13, and 14), when necessary as indicated in NOTE above, proceed as follows: Insulate high voltage connector joints and wrap them with Allis-Chalmers no-corona tape. Use approximately 2 ft of this metallic mesh tape to form a regular, but not necessarily straight surface over the bolt heads.

Wrap joints with three layers of Empire cloth sheet 0.010 in. thick (approximately 6 ft long), wide enough so that edges overlap adjoining insulation about 3 in. and long enough to overlap ends 3 in. Stagger the overlapping of the ends as much as possible, and tie the layers firmly with bias cut yellow Empire cloth tape 0.010 in. thick by ¾ in. wide (approximately 30 ft long).

Perform this insulation operation twice for 5-kv and 7.5-kv equipment and three times for 15-kv equipment, using six sheets and nine sheets, respectively, of 0.010 in. thick Empire cloth per joint. Then tape joints with one layer of half-wrapped electrical tape (one roll). See Figs. 17 and 18 for typical insulated joints.

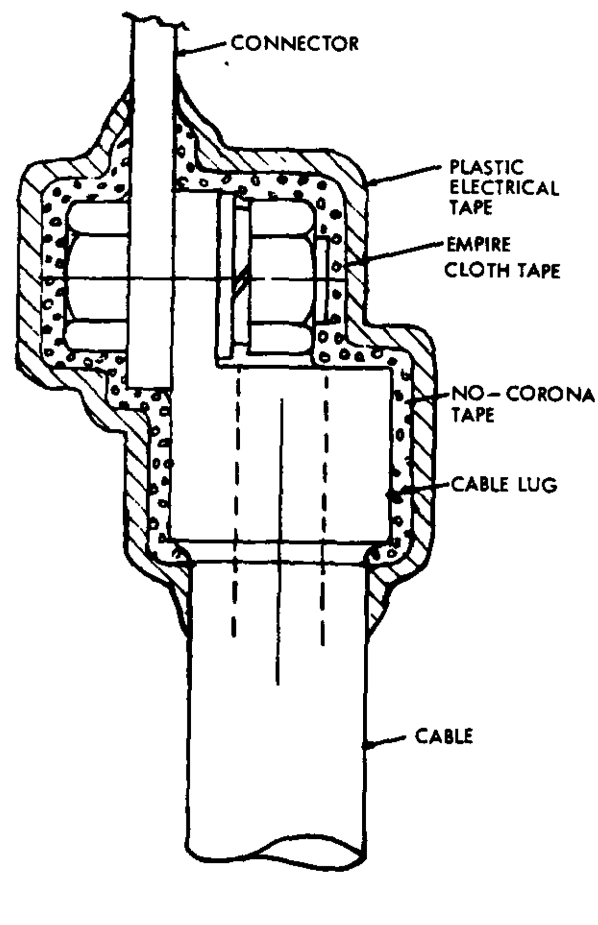


Fig. 17 — Example of joint taping for cable connections required only on 15-kv selector switch.

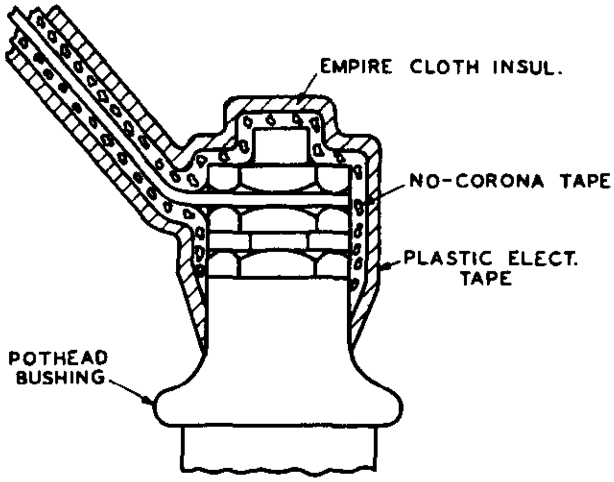


Fig. 18 – Typical insulated taped joint on pothead bushing, 15kv only.

GROUND CONNECTION

A common ground bus is incorporated in all units for properly grounding the equipment after installation.

The ground bus is accessible in the primary cable area. Connections to this ground bus must be made so that a reliable ground connection is obtained. Consult latest National Electrical Code for ground connection standards.

SECONDARY WIRING

Secondary wiring, when required, is carefully installed and tested at the factory. A terminal block is furnished for customer's connections as shown in the "Wiring Diagram."

If special connections are required, such as a source of supply for heaters, wired terminal blocks are provided for this purpose.

INSPECTION

A thorough inspection and test must be made before placing equipment in service. If any defects are found, correct them immediately.

Check the following points:

1. High voltage connections properly installed.
2. Electrical disconnecting contacts, machined parts, operating mechanism, etc., checked for lubrication and operation.
3. Blockings, supports and temporary ties removed from switches, instruments, relays, etc.
4. Proper fuses, correctly placed.
5. Temporary wiring jumpers (used on the secondaries of current transformers tied to external devices, as shown on wiring diagrams) removed.
6. Incoming primary and secondary connections properly made and checked for shorts and undesired grounds.
7. All equipment removed during assembly, replaced.
8. Operating handles working easily.
9. Interlocks performing properly.

FINAL TESTING

1. Perform a Megger test on the high voltage circuit to be sure all connections made in the field are properly insulated. A Megger test on the control circuit is also advisable.
2. If possible, perform a dielectric test on the high voltage circuit for one minute at one of the following voltages (corresponding to the rated voltage of the equipment):

60-CYCLE AC

Rated Kv	Test Kv
4.16	14.3
13.8	27.0

NOTE: Potential transformers, lightning arresters, surge capacitors, etc., are disconnected during this test.

A dielectric test on secondary and control circuits is made at 1130 volts. The above test voltages are in accordance with NEMA standards.

OPERATION

WARNING

DISCONNECT SWITCH FROM ALL EXTERNAL POWER SOURCES BEFORE PERFORMING ANY INSPECTION OR MAINTENANCE OPERATION.

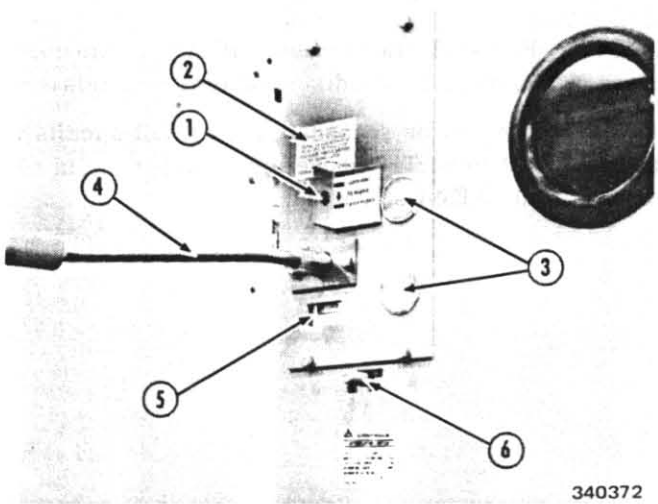
GENERAL INFORMATION

The load break switch is completely adjusted, tested and inspected at the factory before shipment. No additional adjustment is necessary; however, check to be sure shipment and storage have not resulted in damage or change of adjustment.

After installing the switch, close it manually to check proper functioning of the operator and contacts. See Section on "Manual Operation" before proceeding.

MANUAL OPERATION

For manual operation, the charging screw is actuated by a handle on the front of the switch. This handle must be pushed in to engage the charging screw shaft. Rotate the handle slowly while pushing in to align it with the screw shaft. Because of its symmetrical construction, the handle will engage the shaft within 180° rotation. After the handle is released it will spring back and disengage itself from the charging screw. An interlock is provided to prevent operation of the trip lever while handle is engaged to the screw shaft. Depressing the trip lever will release the springs for either closing or opening action. See Fig. 19.



1. Trip lever
2. Charging instructions
3. Provision for key interlock
4. Charging handle
5. Switch position indicator
6. Lower panel interlock

Fig. 19 – Front panel details.

OPERATING PRECAUTIONS

Observe the following precautions when operating the load break switch:

1. See that all parts operate freely. The trip lever will move freely up and down when properly adjusted. If the lever does not move freely, check to make sure that the charging nut is in full charged or full discharged position, that the fuse door is properly closed or key interlocks (Fig. 20) are conditioned to permit switch operation. The charging handle will move easily to engage the charging screw shaft, provided the trip lever is up in the reset position. The fuse door interlock will prevent reset of the trip lever which, in turn, will prevent charging of the springs.

2. Always turn the operating handle to the full stop position in either direction. For manual operation, the complete traverse of the charging nut is accomplished with 5½ turns of the operating handle. The latch check plate will prevent operation of the trip lever unless the charging nut is near the full stop position.

3. Charged springs may be discharged merely by operating the handle without opening or closing the switch blades. Even during the 5½ charging revolutions, the operator may reverse the rotation of the handle and remove any charge on the springs. It is recommended that the springs always remain fully charged or fully discharged. After the switch has been closed, the operating springs can be charged and left charged indefinitely. The subsequent opening operation would only require depressing the trip lever.

4. The front plate has provisions for attaching a padlock to keep the trip lever in a depressed position. This prevents the operator from charging the springs and performing an opening or closing operation of the switch blades.

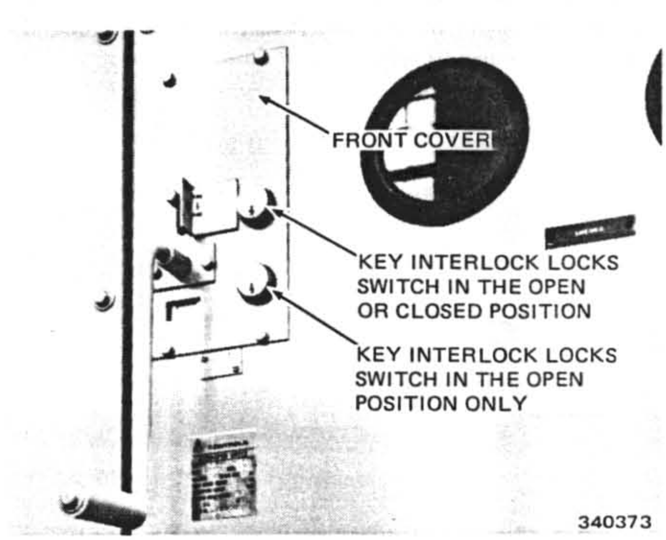


Fig. 20 – Key interlocks on front plate.

OPERATING SEQUENCE

To Close Load Break Switch

Condition: Switch is open, springs are discharged,* and trip lever is in the reset position.

1. Push handle in to engage drive screw.
2. Turn handle counterclockwise to full stop. (Springs are then charged.)
3. Push down on trip lever to CLOSE switch.

To Open Switch

Condition: Switch is closed, springs are discharged,* and trip lever is in the reset position.

1. Push handle in to engage drive screw.
2. Turn handle clockwise to full stop. (Springs are then charged.)
3. Push down on trip lever to OPEN switch.

* Switch can remain in spring-charged position. If spring is in charged condition, proceed directly to Step 3.

As the switch is closed, the extended tip (1) of the main stationary contact (2) (see Fig. 21) is used as the main closing contact. The main switch blade (3) engages with this tip in closing before the quick-make, quick-break blade (4) closes with contacts inside the arc chute (5). Any arc that occurs on closing is drawn between the extension of the main blades (6) and the extended ball-shaped tip, protecting the contacts inside the arc chute from high fault currents. The main contact surfaces, below the extended tip and below the extension of the switch blade, are still unharmed; the switch will still carry its full rated current and will still interrupt its full rating.

After closing the switch manually, inspect the arc chute for friction marks or chipping where the quick-make, quick-break blade enters the arc chute. (See Fig. 19). If such evidence is apparent, the blade must be re-aligned. Refer to "ADJUSTMENT OF LOAD BREAK SWITCH" in the MAINTENANCE section.

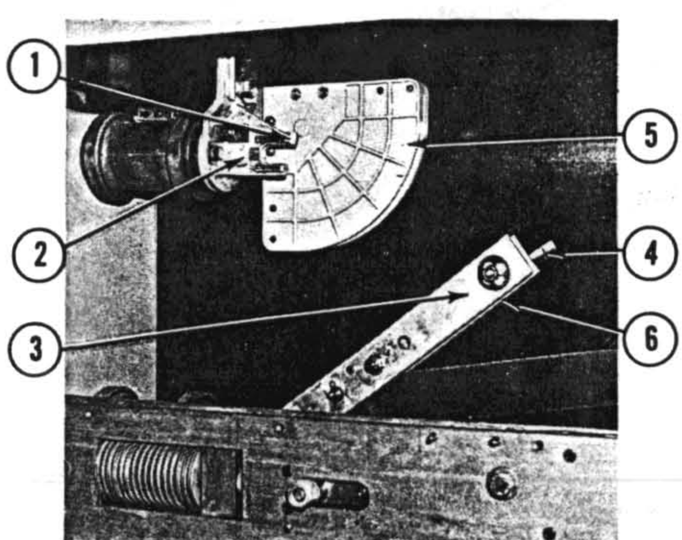


Fig. 21 – Load break switch details.

ELECTRICAL OPERATION

Another method (optional) of charging the springs is by means of an electric motor, mounted on the front of the operator. An electric solenoid, mounted on top of the operator, actuates the trip lever. The motor and solenoid may be controlled by switches mounted on the front of the switch cubicle, or by remotely located switches.

STORED ENERGY OPERATOR MECHANISM

The operator mechanism is a true stored energy device. Energy for closing and opening operation is stored separately from the closing or opening release action. See Figs. 22, 23 & 24 for relative positions of stored energy operator mechanism components during stages in the operating sequence.

Figure 22 shows the operator mechanism with switch blades open and springs discharged. Trip lever (8) is spring-loaded to hold locking lever (6) down. The locking lever blocks horizontal travel of spring shaft (5) to the left. The belleville springs (4) are now positioned between surfaces of the spring shaft (5) and the charging bar assembly (3). Counterclockwise rotation of the charging screw (1) causes the charging nut (2) to travel to the left, thus moving the attached charging bar assembly (3) to the left and compressing the springs. The charge check plate (10) is attached to the trip lever (8) and prevents downward travel of the trip lever until the charging nuts has traveled to the end of its charging stroke. This prevents operation of the switch unless the springs (4) are fully charged.

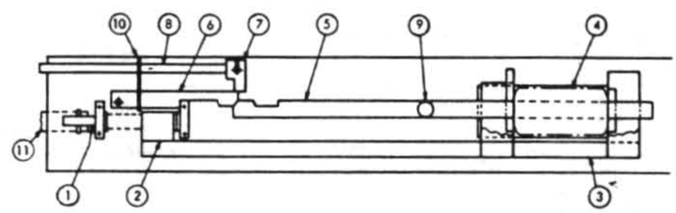


Fig. 22 – Switch in open position, with springs discharged.

LEGEND

(1) CHARGING SCREW
(2) CHARGING NUT
(3) CHARGING BAR ASSEMBLY
(4) BELLEVILLE SPRINGS
(5) SPRING SHAFT
(6) LOCKING LEVER
(7) TRIP CAM
(8) TRIP LEVER
(9) OUTPUT PIN
(10) CHARGE CHECK PLATE
(11) OPERATING HANDLE

After the springs are fully charged, the charge check plate (10) will clear the charging nut (2) and permit trip lever (8) to be depressed. This condition is shown in Fig. 23. Trip cam (7) will then rotate counterclockwise, permitting locking lever (6) to rise. With no restraint on the spring shaft (5), the charged springs will discharge, driving the spring shaft to the left. This force is then transmitted to the switch blades through connection on output pin (9). Figure 24 illustrates this condition.

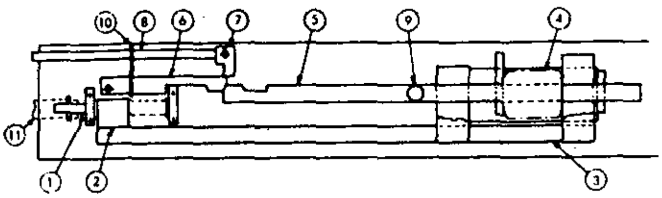


Fig. 23 – Switch in open position, with springs charged.

The opening operation follows the same sequence. With the switch closed, the spring shaft (5) is positioned as shown in Fig. 24. The locking lever (6) will now drop and prevent travel of spring shaft (5) to the right. The trip lever (8) will rise, thus holding locking lever (6) down and drawing charge check plate (10) up above the charging nut (2). Clockwise rotation of charging screw (1) will drive charging nut (2) to the right. The charging bar assembly (3), in turn, moves to the right and compresses the springs (4) against spring shaft (5). When the springs are fully charged, charging nut (2) will be at the end of its travel to the right. Charge check plate (10) will now clear the charging nut and trip lever (8) can be depressed. Depressing the trip lever rotates trip cam (7), permitting locking lever (6) to rise and release spring shaft (5). Springs will then discharge, driving spring shaft (5) to the right. The connecting link from output pin (9) will then open the switch blades.

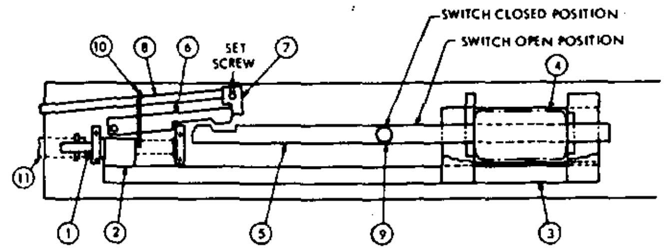


Fig. 24 – Switch in closed position, with springs discharged and trip lever depressed.

INTERLOCKS

When fused switches are furnished, mechanical interlocks (Fig. 25), which prevent access to the fuses unless the switch is open and the springs are discharged by

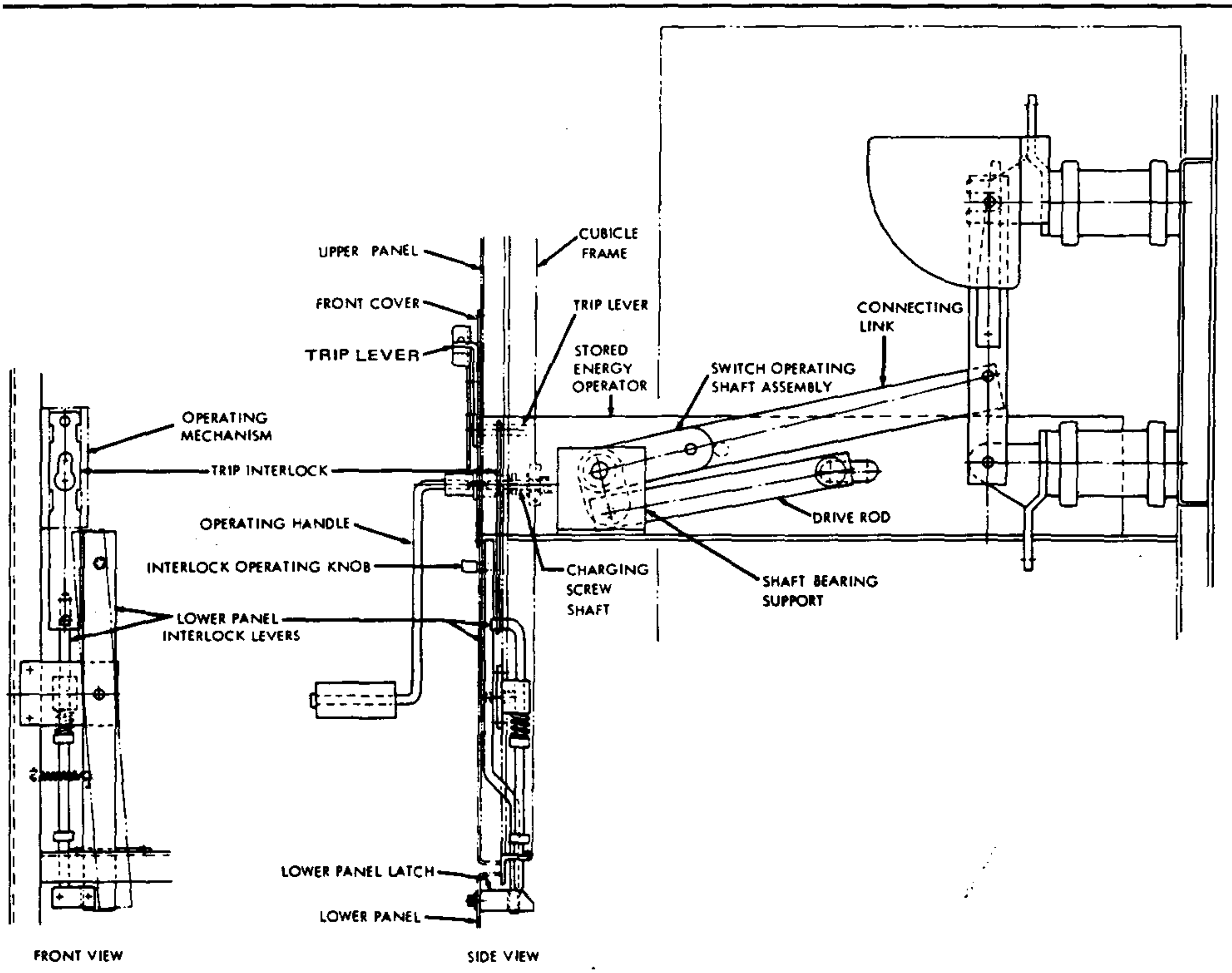


Fig. 25 – Typical load break switch operating and interlocking arrangements.

means of an interlock bar assembly, are supplied as standard. This assembly holds the fuse access door closed when the switch is closed. To gain access to the fuses when the switch is open, loosen the three knurled screws on the access door and push the interlock operating knob to the left. The mechanical interlock prevents pushing the handle in to charge the springs when the door is open.

Key interlocks (Fig. 20) can be supplied when specified. The lower lock on the front plate retains the key when the switch is in the closed position. With the switch locked in the open position, the key can be removed and then used to unlock the door leading to the fuses. With this door open, the key is retained in the lock, thus preventing the switch from being inadvertently closed.

Note that only one key is required. Since each lock is originally furnished with a key, as a safety precaution remove one of the keys and keep it in a safe place where it will not be accessible to operating personnel.

When isolator-type switches are provided, and when required by the customer, key interlocks are furnished to prevent operating the switch under load. The operation is similar to that of the door interlock. The transformer secondary circuit breaker must be tripped to release a key, which may then be used to unlock the switch by means of the upper key interlock so that the switch may be opened or closed. This is a different set of locks from those in the fuse door interlock system. As before, make available to the operator only one of the two keys furnished.

Other key interlock schemes are available for special requirements.

FULL ENERGY INTERLOCK (DETAILS)

Refer to Fig. 24. Notice that the charging nut (2) must traverse the full length of the screw (1) in either direction to store maximum energy in the springs. If the charging nut stops at some intermediate position, and pressure is applied to the trip lever (8), the charging check plate (10) will strike the top of the charging nut and prevent downward movement of the trip lever.

TRIP INTERLOCKS (DETAILS)

Refer to Fig. 26. When the bolt of the key interlocks is extended to engage either notch in the trip interlock plate, the trip lever cannot be depressed to release the stored spring energy.

The key hole shaped slot in the trip interlock plate prevents movement of the trip lever unless the charging handle is disengaged from the charging screw. (The upper half of the key hole acts as a collar against the larger diameter of the charging handle.)

If the lower panel is open, the trip interlock plate is lowered by movement of the lower panel interlock lever. Again, the key hole shaped slot will prevent engaging the charging handle.

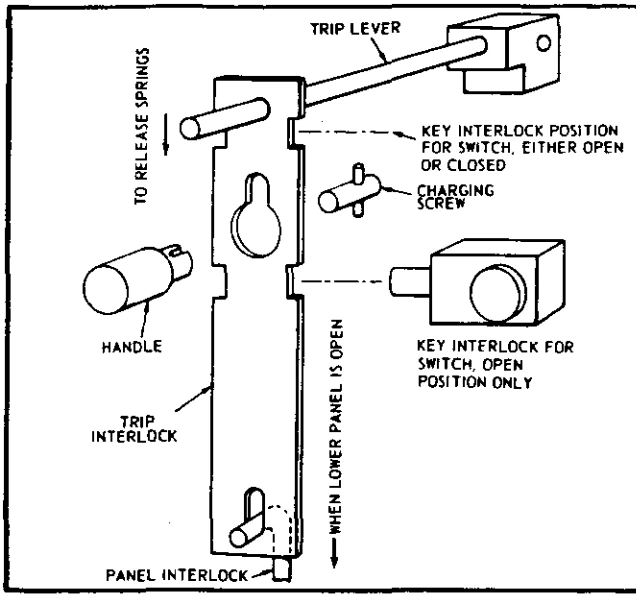


Fig. 26 – Trip interlock.

INDICATORS (DETAILS)

Refer to Figs. 19, 20 and 27. Various switch conditions are shown through the switch position indicator window on the front panel (Fig. 19, Item 5). Behind this window are a switch position indicator and a spring charge indicator (Fig. 27). These are moved vertically by cables as positions of either the switch or the springs within the cubicle change.

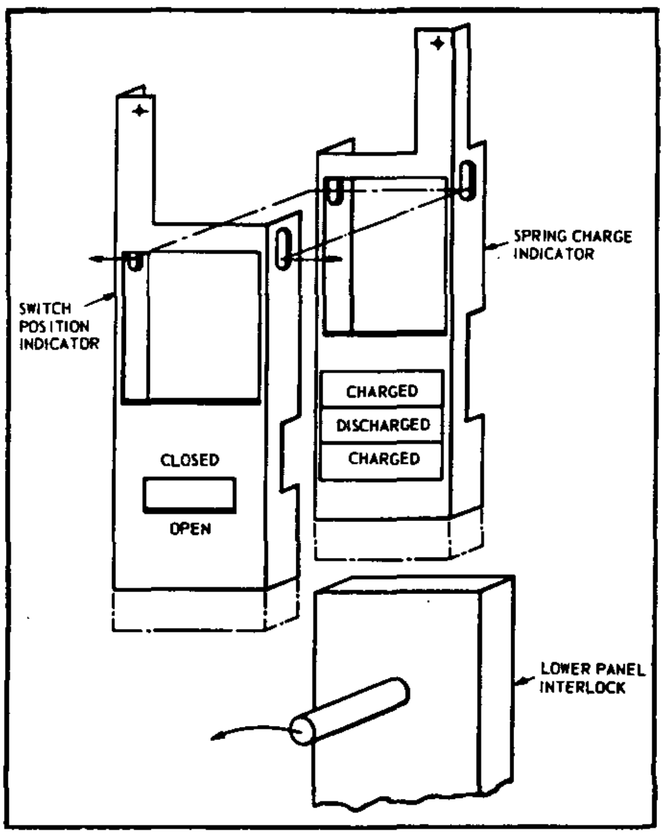


Fig. 27 – Indicator and lower panel interlock.

When the switch is open and the springs discharged, that condition is indicated through the window on the front panel. Both indicators will be in a raised position as shown by the solid lines (Fig. 27). The lower panel can then be opened. The position of these indicators will also permit the extension of the bolt of the lower key interlock (when furnished as shown in Fig. 20) to lock the switch in the open position.

When the switch is closed and/or springs charged, one or both of the indicators will be in a lowered position as shown by the dotted lines (Fig. 27). This will prevent moving the lower panel interlock to the left to open the lower panel.

MAINTENANCE

SAFETY WARNING

Before any maintenance work is performed within primary compartments, make certain that the equipment is completely de-energized, tested, grounded, tagged or properly identified, and released for work in an authorized manner.

PERIODIC INSPECTION

Thorough inspection at periodic intervals is important to satisfactory operation. Conditions affecting maintenance are weather and atmosphere, experience of operating personnel, and special operation requirements. The frequency of inspection and maintenance will, therefore, depend on installation conditions and can be determined only by experience and practice. It is recommended, however, that the following inspections be performed at least once a year or after 100 operations of a 600-amp switch or 20 operations of a 1200-amp switch whichever occurs first. More frequent inspection may be necessary if local conditions require.

1. Inspect interior for dust and dirt accumulation. Remove dust from all insulators.

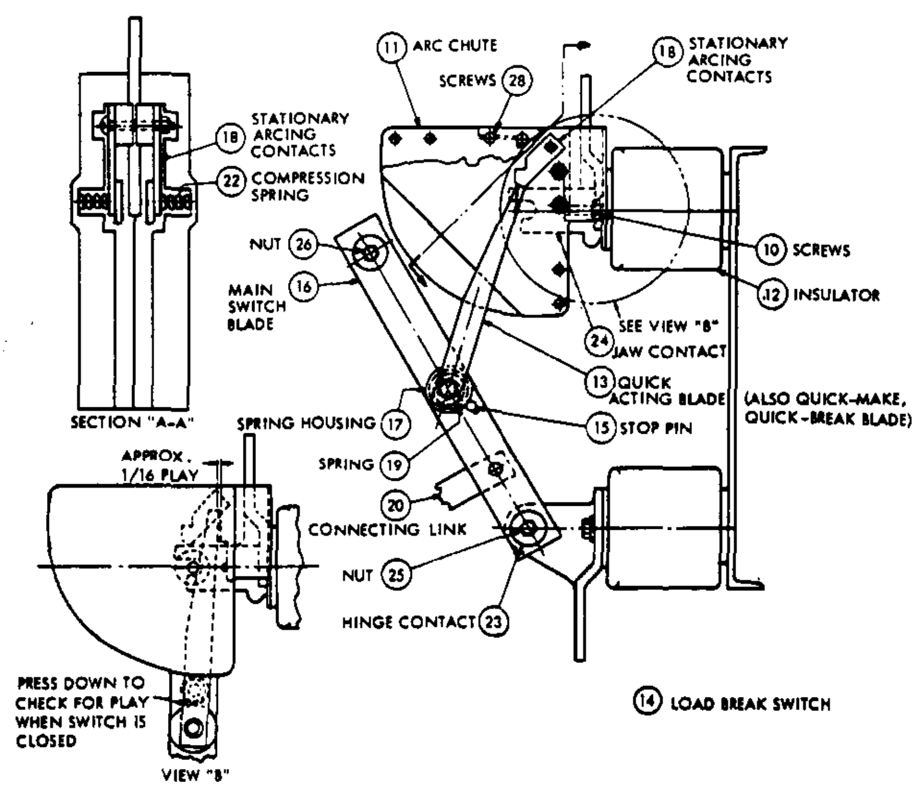


Fig. 28 – Typical load break switch pole unit

2. Inspect bus bars and cable connections to see that they are in proper condition. If they show signs of having overheated, check for poor or loose connections or for overloads.

3. Check condition of main contact, interrupting contact and arc chute. Replace any worn or damaged parts. (Lubricate main contacts with A-C Contact Lubricant.)

4. Examine and test the switch by moving mechanism to and from the closed position. Check arc chutes for loose bolts and retighten if needed. Check fastening of switch shaft assembly. Apply grease to parts requiring lubrication.

If extensive lubrication of the operator is necessary, see attached drawing 18-381-001-401 for removal and reinstallation of complete operator assembly.

5. Examine and test all safety interlocks.

ADJUSTMENT OF LOAD BREAK SWITCH

The following are principal components common to all types of load break switches. See Fig. 28 for identification of parts referred to in this description unless otherwise indicated.

QUICK-ACTING BLADE (OR QUICK-MAKE, QUICK-BREAK BLADE)

In the opening operation of a load break switch, the quick-acting blades (13) should remain locked in position with stationary arcing contacts (18) until stop pin (15) of main switch blade (16) acts on quick-acting blade spring housing (17). Continued opening movement of the main switch blades will draw the quick-acting blades (13) through their stationary arcing contacts (18) to complete a quick opening of the circuit due to the action of spring (19) on the quick-acting blades.

NOTE: Adjustment of quick-acting blade operation can only be accomplished by a slow closing alignment check.

If any of the quick-acting blades start to move with the initial movement of the main switch blades (16), or if they start to withdraw from the stationary contacts (18) before stop pin (15) starts to act on spring housing (17), the quick-acting blades (13) have not penetrated sufficiently into the stationary contacts (18). To rectify this, lengthen connecting link (20) by adjusting the eccentric spacer located on the opposite end of the connecting link. If the quick-acting blades (13) continue to withdraw from their stationary contacts (18) before stop pin (15) has acted on spring housing (17), check for missing compression spring (22) on stationary contacts (18).

Slow Closing Adjustment

WARNING

SWITCH MUST BE DE-ENERGIZED WHEN PERFORMING SLOW CLOSING ALIGNMENT CHECK.

Refer to Fig. 24.

Slow closing for checking load break switch alignment can be accomplished in the following manner: Remove front plate and handle assembly.* Remove pivot bolt from trip cam (7) and push trip lever (8) free of locking lever (6) just enough so that trip cam no longer engages locking lever (6). Then use handle (removed from cover) to crank switch closed. To avoid damaging the check plate, make sure that check plate (10) is clear of charging nut (2) before cranking.

WARNING

When reassembling operator after maintenance slow closing check, and before replacing pivot bolt in trip cam be certain that drive screw nut is at the end of its travel and springs are discharged. This will insure proper positioning of trip cam and relative parts and prevent the possibility of slow closing after assembly. Make certain that nut on pivot bolt is only tight enough to take up slack and does not restrict free movement of trip cam.

If operating mechanism has been removed from cubicle refer to 18-381-001-401, (found on page 20), for proper installation procedures and adjustments.

WARNING

After reassembly and before energizing equipment charge springs and close switch; recharge springs and open switch. Switch and interlocks must have functioned properly without any evidence of slow closing or premature discharge of springs.

ARC CHUTE

The quick-acting blade should be centered in the arc chute slot. If the blade does not center, loosen the two screws (10) holding jaw contact (24) and arc chute assembly (11) to insulator (12). Close switch assembly slowly while lining up arc chute (11) with quick-acting blade (13). When correct alignment has been achieved, tighten the two screws (10).

MAIN CONTACTS

Check contacts of main switch blade with jaw contact (24) to assure centering. Make adjustment at jaw contact if necessary.

To check contact pressure of main switch blade at hinge contact (23) and jaw contact (24), slack off nuts

(25) and (26) until evidence of pressure does not exist. (There must be no visible clearance between moving parts when switch is closed.) Then tighten nuts (25) and (26) one turn.

WARNING

KEEP FACE AND HANDS CLEAR OF QUICK-ACTING BLADES.

CAUTION

Slow closing will not fully close main blades. Return switch blades to open position before proceeding with reassembly of the operator.

CORROSIVE ATMOSPHERES

This equipment is designed to give top performance when installed in normal indoor or outdoor locations. Where abnormal conditions such as corrosive atmospheres are encountered, special precautions must be taken to minimize these effects. Exposed metal surfaces of noninsulated bus bars, disconnect switches, wire ends, instrument terminals, etc., must be protected.

Lubricate contact surfaces with a generous coat of A-C Contact Lubricant or other equally nonhygroscopic grease. If this type of grease is not available, petroleum jelly may be used. Protect other exposed members with a coat of Glyptol lacquer or any other corrosion-resisting paint.

When old grease becomes dirty, wipe the parts clean and apply new grease immediately. Do not apply lubricants to surfaces of insulating materials.

SPACE HEATERS

Outdoor equipment is furnished with two space heaters per cubicle. The space heaters are controlled by thermostats mounted inside the cubicle. They are factory-set to cut in and out at a definite temperature (open 110F, plus or minus 5 degrees). Where humid conditions exist, start heaters well in advance of energizing the equipment to insure that the insulation is dry.

RECOMMENDED SPARE PARTS

Item	Style Number	Qty*
Stationary Contact (lower)	18-711-735-001	3
Stationary Contact (upper)	18-713-157-001	3
Arc Chute	18-375-793-501	3
Movable Contact	18-376-028-502**	3
Insulator — 15 kv (Permarez)	00-871-275-001**	3
Insulator — 15 kv (Porcelain)	00-871-283-013	3
Insulator — 5 kv	00-871-311-112	3
Link (operating)	18-650-627-001	1
A-C Contact Lubricant	15-171-370-002	1

FUSES (EXPULSION)

Fuse Holder	Note 1	1
Fuse Refills	Note 1	3

FUSES (C.L.)

Fuse Units	Note 1	3

NOTE 1:

If unit contains fuses, spare parts should be ordered by specifying manufacturer of fuse, type of fuse and voltage/current rating required. For example,

"3-4.8 kv, 80E, G.E. Type EJ0-1 Fuse Units."

Allis-Chalmers part numbers can be determined by reference to drawings supplied with the unit.

TOUCH-UP SPRAY PAINT

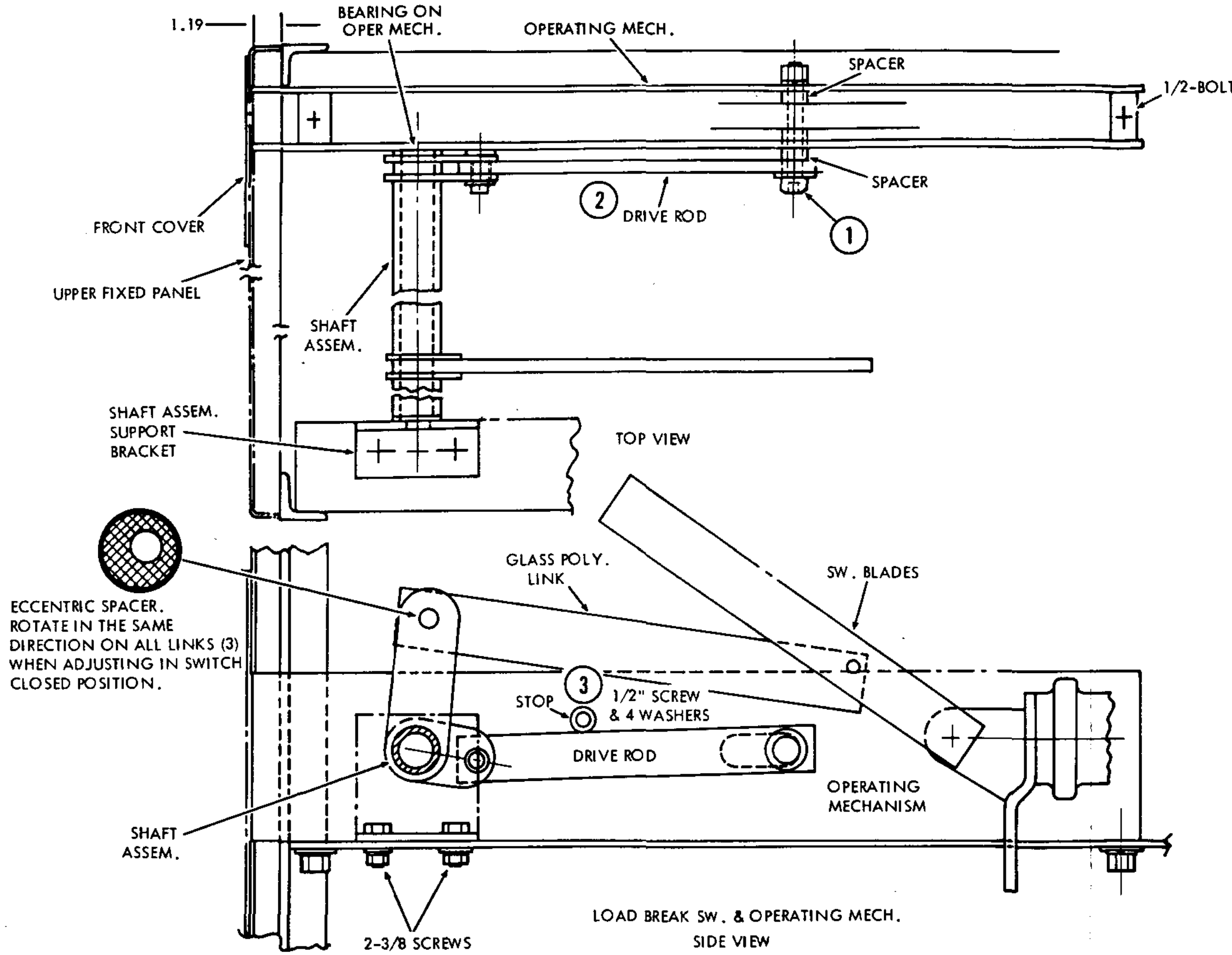
Light Gray, ASA61	18-168-000-001	1 pt.
Dark Gray, ASA24	18-168-001-002	1 pt.

*Recommended quantities apply to one unit.

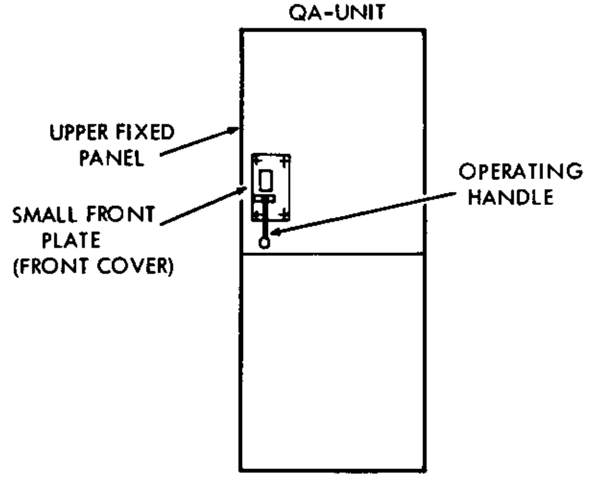
**Interchangeable only in sets.

SIEMENS-ALLIS

Switchgear
P.O. Box 14505
West Allis, Wisconsin 53214



LOAD BREAK SW. & OPERATING MECH.
SIDE VIEW



FRONT VIEW

PROCEDURE FOR REMOVING OPERATING MECHANISM FROM CUBICLE

1. Remove operating handle, noted on front cover by removing 2-1/4" screws. Remove spring in handle.
2. Remove front cover and upper fixed panel.
3. Remove bolt It.1 and spacers from operating mechanism to disconnect drive rod It.2.
4. Loosen 2-3/8" screws for fastening shaft assembly support bracket. This should allow shaft assembly to become free of bearing mounted on operator.
5. Remove 2 bolts fastening operating mechanism to frame. (1/2 Bolts)
6. Remove operating mechanism from unit.

PROCEDURE FOR REPLACING OPERATING MECHANISM IN CUBICLE

1. Place operating mechanism over mounting holes in frame.
2. Replace 2-1/2" screws, tighten partially, then align operator to maintain 1.19 dim. from frame angle to end of operator as shown on sketch, fully tighten 2-1/2" bolts.
3. Push shaft assembly on to bearing mounted on operating mechanism.
4. Remount shaft assembly to support bracket so that no play exists between bearing points and retighten 2-3/8" screws securely.
5. Reconnect drive rod It.2 with bolt It.1 and spacers. After checking for correct alignment tighten securely.
6. Loosen 1/2" screw It.3 so that the washers are free to move. After first opening of switch tighten bolt securely.

REPLACEMENT OF UPPER FIXED PANEL

1. Assemble operating handle to small front plate centering the shaft in the large hole before tightening (2) 1/4" screws.
2. Mount small front plate to upper panel (4) 1/4" screws.
3. Lift upper panel to position on switch cubicle engaging handle shaft onto the operator screw shaft. Place bolts for holding panel in place but do not tighten. Starting with the lower right hand, corner pry between the lower and upper panel, to shift the upper panel to approximately center the panel on the cubicle. Tighten the lower right hand bolt. Before tightening any bolt on the left side of the panel, shift the yellow trip button up or down, until the 1/2 inch diameter trip lever is engaged in the hole in the trip button. By prying on the lower left hand corner of the panel, lift the panel until the handle can slide in and out. Tighten lower left hand bolt. Tighten all fixed panel bolts, but do not tighten to the extent that the panel deflects inward.
4. Remove the operating handle and insert the push out spring. Replace handle which must engage drive shaft without binding and when pushed in returns freely when released.

RECOMMENDED TOOLS

1- 8" Adjustable Wrench
1- 10" Adjustable Wrench
1- 3/8" Allen Wrench
1- 5/16" Allen Wrench
1- Hammer
1- 3/4" Box Wrench
1- Punch 1/8
1- Punch 5/16
1- Scale Graduate to .01" to Read 1.19"
1- Instruction Book 18X1890-04
1- Pliers for Pulling Cotter Pins
1- Long Nose Pliers
1- Tube Lubriplate or Equal Lubricant
1- Small File