



Installation/Maintenance Instructions IB DR GTS

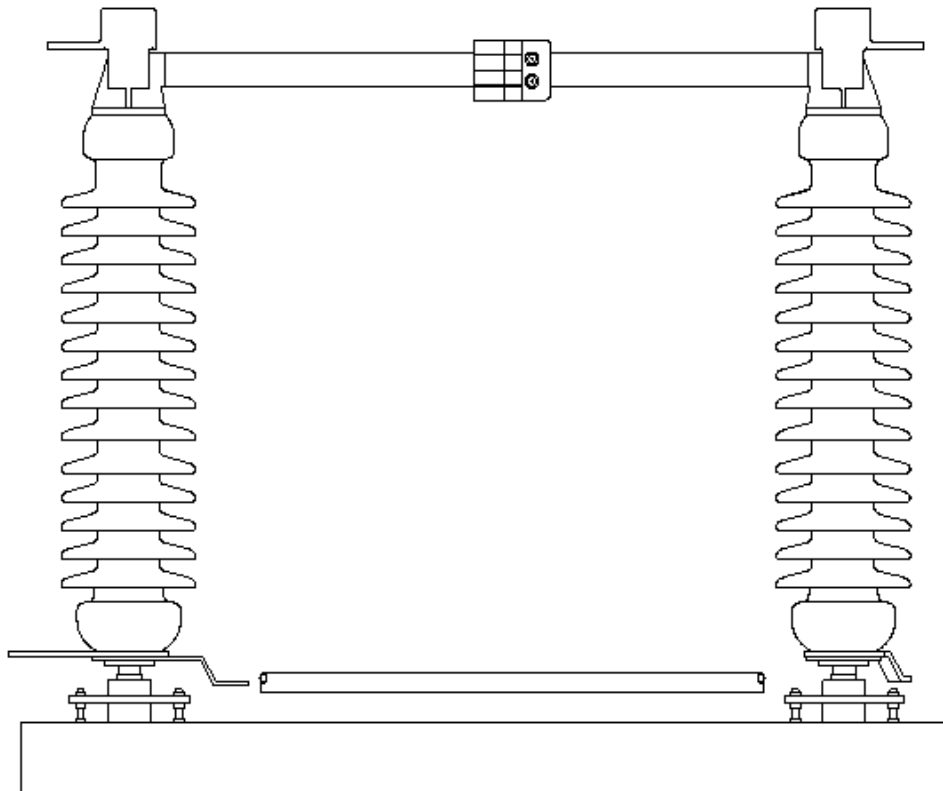
Type DR, Gear Torsional System
Group-Operated, Side Break
550 KV Max. Design

IMPORTANT: Read manual before installing or maintaining equipment! Make absolutely sure that equipment is de-energized and properly grounded.

This manual should be used in conjunction with the factory drawings. The drawings contain critical information, which if not followed could affect the operation of the switch.

Instructions can not cover all possible variations in equipment nor provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be required or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the concern should be referred to the factory.

For Technical Assistance Call 276-688-3328



RECEIVING INSPECTION

Check the total shipment for completeness against the bill of material and installation drawings. If the switch shipping crate or the switch shows evidence of shipping damage note the damage on the bill of lading.

HANDLING AND STORAGE

Trucking and handling of power switching equipment, after being received at its destination, should be done with the consideration that porcelain is frequently included and can be broken by sudden jarring or careless handling. Therefore, care should be exercised to prevent breakage or distortion of parts which could cause subsequent trouble, delay or inconvenience in installation. Switching equipment should be properly stored prior to installation to protect it from damage.

WARNING WARNING WARNING WARNING WARNING WARNING

Before any installation is started, make absolutely sure that applicable equipment is de-energized and properly grounded. Protect the installers adequately from adjacent electrically energized parts by using barriers, screens, etc.

Factory installation drawings should be followed during installation. It is recommended that, insofar as it is possible to do so, that switching equipment be fully assembled and adjusted at ground level before it is placed into position. This should minimize final adjustments.

Rigging, which is used for erecting the switching equipment, must be adequate for the switching equipment involved. Attachments for hoisting should be made to the switch bases unless otherwise instructed. Lifting of switches by the insulator units, contacts, or live parts must be avoided, because of possible damage to these parts.

Step 1—Check Bases

Check bases to make sure that insulator supports, spacers and rotor bearing tops are square and level. The tops of the two supports on the hinge end must be exactly the same height. If necessary, make adjustments with leveling screws.

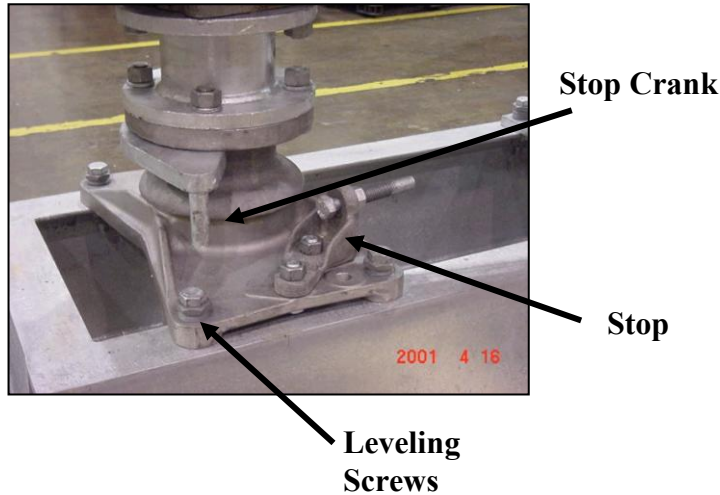
Step 2—Assemble Insulators

Assemble the insulator stacks to switch base. In some cases, involving higher voltage switches, the installer may choose to mount the switch bases on the structure before assembling the insulators. In such cases the switch bases should be mounted on the supporting structure in the positions shown on the installation drawing. The bases should be level and parallel to each other. Make sure that the base for the drive phase is in the correct location. After placing the hardware into the insulator through the rotor stem flange, twist the porcelain back toward the open stop position until the stop crank is against the stop bolt (figure 1). Doing this at each phase provides a consistent starting point and is important to final three-phase adjustment.

Step 3—Insulator Stack Alignment

Insulator stacks of switches can be aligned using leveling screws as shown in Fig. 1.

Figure 1



Step 4—Mount Current-Carrying Parts

Fig. 1 shows the switch crank and connecting rod lever in the closed position. Assemble the current-carrying parts on the insulator stacks with the bolts provided. Normally, the blade end of the switch is mounted at the end of the switch, where the interphase rods are installed. However, the switch may be operated from the jaw end without any noticeable difference. Refer to installation drawing for intended or preferred positioning of jaw and blade ends.

Step 5—Mount Switches

Assemble the switches on the supporting structure in accordance with the positions shown on the installation drawing. The switches should be mounted level and parallel with each other. In case of a warped structure, shimming under the switch bases may be required. See Fig. 2 for proper rigging.

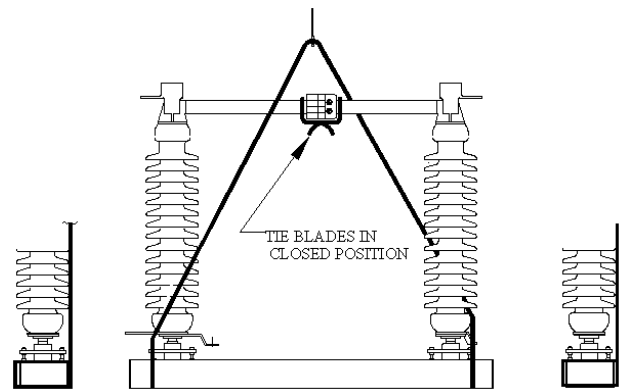


Fig. 2 Proper Rigging for Center Break

Step 6—Switch Blade Adjustment

To adjust the pole unit contacts:

Important: Before adjusting the pole unit contacts, attach the line or bus connections to the terminal pads of the switch pole units. Refer to section on terminal connection.

2. Close the switch pole unit until the switch crank is firmly against its CLOSED position stop. In the CLOSED position, the beaver tail contact should rest in line with the finger springs of the jaw contacts (Fig. 3).
3. Use the adjusting nuts between the switch base and rotor bearing (Fig. 4) to attain proper beaver tail contact penetration into the jaw. Ensure that the beaver tail is in line with the fingers' springs as shown in Fig. 3. The jaw contacts should be centered on the beavertail contact.

4. Ensure that the two blades are in line with each other. If adjustment is necessary, loosen the mounting bolts for the insulator and live parts and move the blades in or out as needed. Re-tighten all mounting hardware.
5. Test the operation of the switch. During closing, the beaver tail end should enter the center of the jaw contacts smoothly and without excessive binding.

If further adjustment is required, loosen the set screw and the piercing setscrew on the connection rod ends (Fig. 1). Slide the connection rod end to adjust the entry point of the beavertail. Re-tighten the set screw. After all adjustments are complete, re-tighten the set screw and puncture the connecting rod with the piercing set screws for each pole unit.

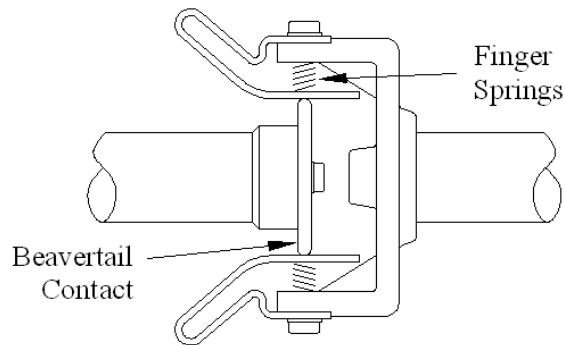


Fig. 3 Blade and Jaw Contact Alignment

Step 7—Mount T-Box

In most cases the T-Gear Box will be mounted to the operating pole. If the T-box is not installed, it is universal to each phase. First step is to connect the T-box to the worm gear shaft of the operating pole with the connecting linkage and four pins provided (fig. 4). Then mount the T-box and its supporting base on the structure in the position shown on the installation drawing. Figure 4 & 5 shows a typical arrangement using the T-Box.

Figure 4



Connecting linkage

Figure 5



Step 8—Install Operating Mechanism and Vertical Operating Pipe

Either MO-10 or a worm gear mechanism is supplied.

Install Vertical Operating Pipe

Attach vertical operating pipe to T-box shaft with coupling pins supplied (Fig. 5). At this point, check drawings for accessory equipment (auxiliary switches, mechanical interlocks, position indicators, ground straps, etc.) which mounts on vertical operating pipe and install before continuing the installation. The vertical pipe is predrilled at one end for a 5/8" diameter pin, two of which are shipped together with a coupling in a bag for connection to the T-box shaft.

Install Pipe Splice and Guide Plate

When structure height exceeds 23 feet, a pipe splice and guide plate are furnished and should be installed. The pipe splice and both pieces of pipe are drilled to receive the 5/8" diameter pins. The guide plate should not be solidly mounted until after the vertical pipe has been completely installed. Then bolts holding the guide plate on the structure should be tightened so the hole in the guide plate lines up with the normal position of the pipe so that no binding occurs.

CAUTION CAUTION CAUTION CAUTION CAUTION CAUTION

When installing motor operators, be sure the drive motor circuit is de-energized by motor limit switches just before the switch and offset bearing stops make contact.

Motor Operator

For remote operation, a motor operator is supplied and it should be installed per the instructions supplied with it. For lubrication of pins and bearing areas of switch operators, see Table 1 page 8.

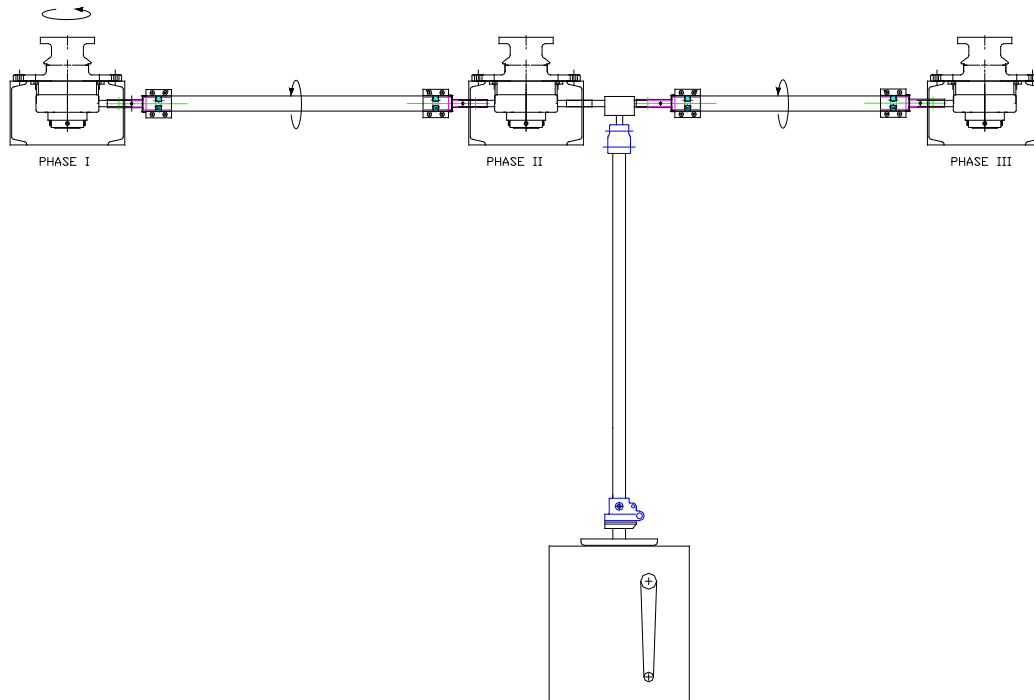
Step 9—Interphase Shaft Installation and Switch Adjustment:

Close each phase by turning the worm shaft. Install couplings to the worm shaft under each phase and at the end of the T-box (Fig. 6). Then install the interphase shaft as shown on the control drawing. Tighten bolts on the couplings and snug piercing bolts at this time. Manually operate switch in the open and close positions. If one phase is not timed with the others, simply loosen the coupling bolts and rotate the worm shaft of the phase that needs adjustment. Example: if phase "A" is lagging while opening, rotate worm shaft approximately (1/2) turn counter-clockwise, then tighten bolts and check for adjustment.



Figure 6

Typical Control Configuration



Step 10—Arcing Horn Installation

Arcing horns are supplied only when horn gap switches are ordered. Refer to your installation drawings to install the arcing horns.

Step 11—Installation of Corona Rings and Balls

The 242 and 362 kV switches use corona shields. (Switches rated at 169 kV and below do not require corona shields.) If corona shields have been supplied, install these components as shown on the single pole drawings.

Important: Prepare areas where ring supports contact switches' parts as per instructions for aluminum-to-aluminum connections on this page.

Step 12—Final Checks

Check all three poles for the following:

1. The beavertail contacts enter the center of their respective jaws at approximately the same time on closing.
2. In the CLOSED position, the blades must be in line with each other.
3. On opening, the blades should rotate approximately 90° from their fully CLOSED position.
4. Tighten all lock nuts and pierce bolts.

Terminal Connections

The aluminum surface of the terminal connection provides for easy current transfer.

Notice: In cases where a copper conductor is used, bolt a tinned terminal clamp (if available) to the aluminum switch terminal pad. If a non-tinned terminal clamp is used, apply a liberal amount of electrical joint grease at the joint and all over the pad of the fitting.

To connect aluminum-to-aluminum terminals:

1. Clean all contact surfaces of conductors and fittings using a stiff wire brush to remove heavy oxide coatings until the aluminum finish is visible and restored.
2. Coat these now clean contact areas with a liberal amount of corrosion inhibitor such as NO-OX-ID™A Special™ or No. 2 EJC.
3. Abrade the contact surface through the corrosion inhibitor again using the stiff wire brush.

Notice: Do not remove the compound.

4. Connect the terminals and torque the bolts as per Table 1.

To connect copper-to-aluminum terminals:

1. Except for plated surfaces, clean all contact surfaces of conductors and fittings using a stiff wire brush to remove heavy oxide coatings until the aluminum finish is visible and restored.
2. Prepare any bare copper surfaces in the usual manner.
3. Coat these now clean contact areas with a liberal amount of corrosion inhibitor such as NO-OX-ID™A Special™ or no. 2 EJC.
4. Abrade the contact surface through the corrosion inhibitor using a stiff wire brush.

Notice: Do not remove the electrical joint grease.

5. Connect the terminals and torque the bolts as per Table 1.

RECOMMENDED TORQUE FOR ALUMINUM BOLTS

Bolt Diameter, Inches	Lubricated Threads		Dry Threads	
	In. – Lbs.	Ft. – Lbs.	In. – Lbs.	Ft. – Lbs.
1/2	240	20	420	35
5/8	480	40	720	60
3/4	720	60	1140	95

MAINTENANCE

WARNING WARNING WARNING WARNING WARNING WARNING

Before servicing the switch, be sure it is disconnected from all electric power sources and properly grounded.

Maintaining the DR-9 Switch includes inspection. The frequency of inspection depends upon atmospheric conditions and frequency of operation. The service interval is largely determined by the user. Recommended maintenance is similar to that listed in the latest industry standards.¹

Complete the maintenance checklist items listed in the table to assure that all proper maintenance is carried out.

Notice: Contaminated environments or operation in sleet conditions also may require applying the lubricants at pivot points. The grease should be durable and able to retain its viscosity over a wide temperature range.

Field Lubrication of Outdoor Switches

* None required at installation unless switches were exposed to abnormal conditions during storage for a considerable length of time. During regular cleaning, give them a light coat of grease.

DR-9 Switch Maintenance Checklist	
Item to Check	Check
Under normal service conditions, inspect the jaw contacts at least once a year.	
Examine contacts to be sure that they are aligned, clean, and have a firm uniform pressure.	
If contacts are pitted or burned, remove and replace the old contacts with new ones.	
Clean the contact surfaces thoroughly by scraping off any contamination or deposit.	
After cleaning the contacts, apply a coat of lubricant, either DARINA #2 Grease or NO-OX-ID Grade "A" Special.	

Table 1

Field Lubrication of Outdoor Switches

Part Name	Type Lubricants Recommended	Amount Applied	Qty. Req'd. for (6) Three-pole Switches
Jaw Fingers	NO-OX-ID Grade "A" Special or Darina #2 Grease	Medium Coat	
Blade Ends	NO-OX-ID Grade "A" Special or Darina #2 Grease	Medium Coat	(1) Quart
Pins (On current carrying parts)	Darina #2 Grease or DC-4	*	
Pins (On control parts)	Darina #2 Grease or DC-4	Light Coat	(1) Quart
Bearing Areas (On control parts)	Darina #2 Grease or DC-4	Medium Coat	
Terminal Connections	NO-OX-ID Grade "A" Special or NO 2 EJC	Heavy Coat	(1) Quart

¹ ANSI C37.35 (American National Standard Guide for the Application, Installation, Operation and Maintenance of High-Voltage Air Disconnecting and Interrupter Switches)

*None required at installation unless switches were exposed to abnormal conditions for a considerable length of time. During regular cleaning, give them a light coat of grease.

Summary on total grease requirements for (6) three-pole switches.

(2) Quarts of Darina #2 Grease or (1) quart of Darina and

(1) Quart of DC-4.

(1) Quart of NO-OX-ID Grade "A" Special.

NOTE:

NO-OX-ID Grease may be obtained from:

SANDCHEM INC.

1600 South Canal St.

Chicago, IL 60616

Darina #2 Grease from:

Shell Oil Co. New York, NY

DC-4 Grease from:

Dow Corning Corporation

Midland, Michigan

NO 2 EJC-Electrical Joint Compound

Alcoa Conductor Products Co.

Division of Aluminum Company of America

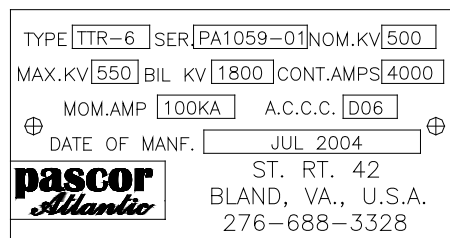
Pittsburgh, PA 15212

(Local distributors usually stock some of the above lubricants)

RENEWAL PARTS

To order renewal parts, refer to the switch nameplate (Fig. 7). This nameplate is attached to the base assembly of each switch pole. The same data is shown on "record" engineering drawings and many installation files. The master file at the factory for renewal parts is "keyed" to the serial number on the nameplate.

Figure 7



Renewal Parts Ordering Information

Switch Type

Part Name

Quantity Required

Serial Number

Max. KV

Refer your requests for renewal parts to the Factory.

Max KV

B.I.L. KV

Continuous Amps

MOM Amps