UNION SWITCH & SIGNAL
645 Russell Street
Batesburg, SC 29006

Service Manual 5711

DA-10
SWITCH MACHINE

and

Retrofit Valve Head

Part Numbers

N425001-01
N425001-02
N425002-01
N425002-02
X425000-04
X425000-05

Description ■

Installation ■

Operation ■

Maintenance ■

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1.1 Ordering Information

Description	Order No.	Reference Item (See Figure 1-3)
12Vdc DA-10 retrofit kit	N425002-01	A
24Vdc DA-10 retrofit kit	N425002-02	B
DA-10 (12Vdc) machine only	N425001-01	C
DA-10 (24Vdc) machine only	N425001-02	D
DA-10 (12Vdc) with cover and base plate	X425000-04	E
DA-10 (24Vdc) with cover and base plate	X425000-05	F

Table 1-1 DA-10 Switch Machine Ordering Information

1.2 Description and Operation

The model DA-10 Direct Acting Switch Machine combines fast piston action with a stable pressure level. This is accomplished by eliminating all intervening mechanisms between the piston and switch, which maintains cylinder air pressure at all times.

The DA-10 with its 5" piston and 6" stroke is designed to satisfactorily operate from 55 to 130 PSI with a 12- or 24-volt supply voltage. With 100 PSI air pressure and a 22-volt supply, the DA-10 Switch Machine achieves one cycle (normal-to-reverse or reverse-to-normal) within 0.4 seconds. In addition, the 5" diameter cylinder of the DA-10 suitably replaces both the 4" and 5" cylinders of its predecessors.

The layout of the machine, including a switch circuit controller, is illustrated in Figure 2-1. The control circuits (including a detector track circuit and switch circuit controller) are generally arranged so that displacement of the switch, caused by trailing traffic, will reverse switch position when the switch reaches mid-stroke. This forces the switch full-stroke to align for reversal of the trailing traffic, as long as the detector track is occupied.

The track switch to which the machine is applied should have freely-hinged point heels to prevent bending of the point and closure rail when the switch is thrown.

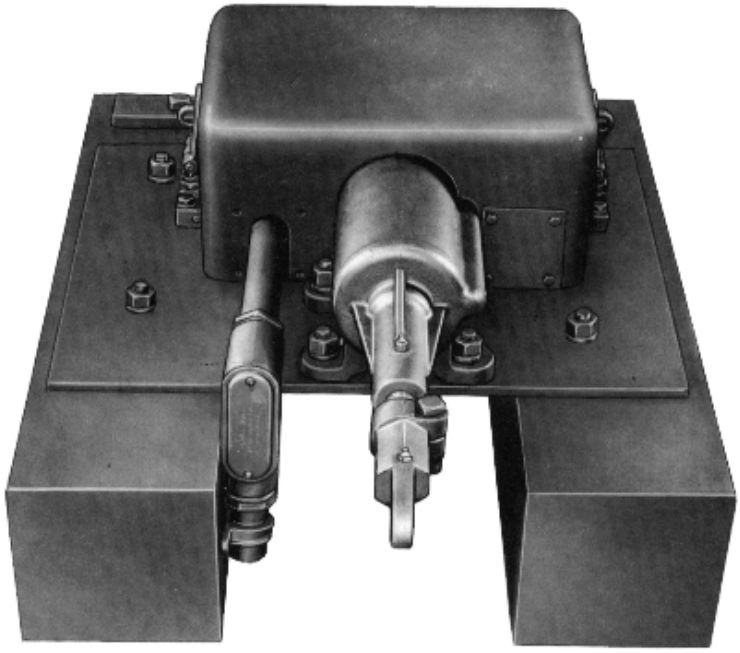

Figure 1-1 Style DA-10 Direct Acting Switch Machine

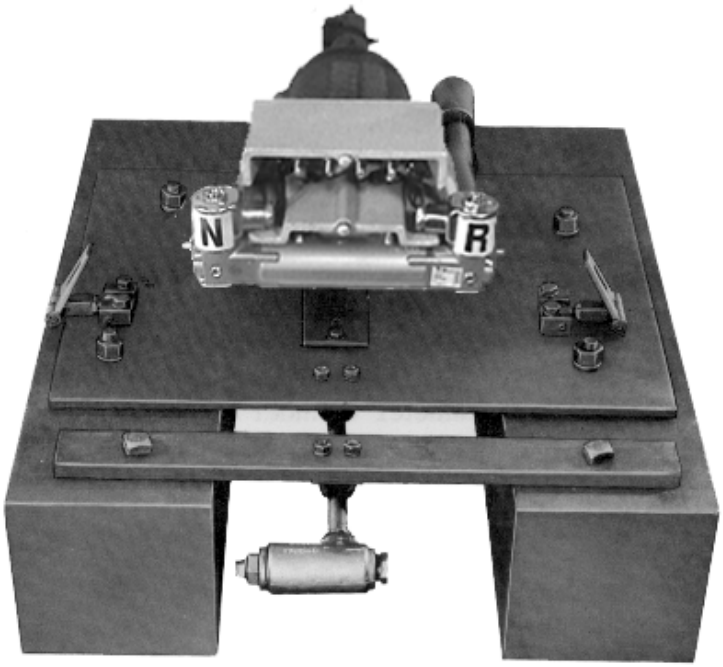

Figure 1-2 Switch Machine with Cover Removed

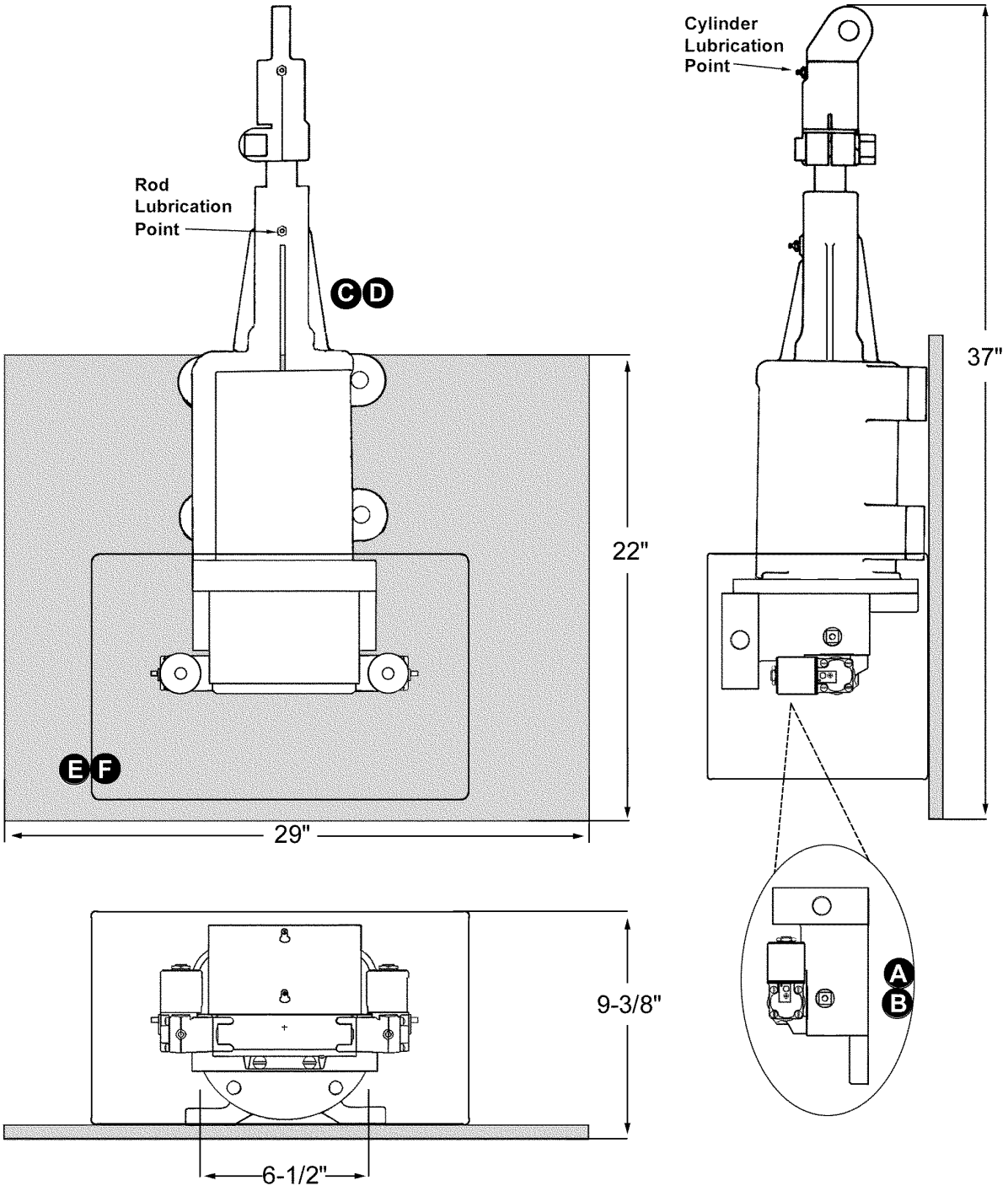

Figure 1-3 DA-10 Switch Machine

1.3 Cylinder and Valve Head

The cylinder and the piston rod guide of the DA-10 Switch Machine (Figure 1-3) are constructed as a single component to ensure accurate rod alignment.

The rod packing consists of two shaft seals located in recess near the cylinder bore. The open ends of the seals oppose each other, such that the seal facing the cylinder guards against air loss from the cylinder cavity. In addition, the seal facing the grease reservoir prevents grease from being forced into the cylinder from the reservoir (see Figure 5-1).

The scraper ring, located at the outer end of the piston rod guide, removes dirt from the rod on the return stroke. The length of the piston rod guide prevents piston rod exposure for the bearing portion of the rod.

The rod is fitted with a piston, two 5" packing cups and followers. “O” rings are used to prevent secondary air leakage across the piston. The cups are greased through a port located at the rod eye. Lubricant is forced through a hole running the entire length of the piston rod. The rod eye is threaded to the piston rod and then clamped to prevent rotation.

The valve head is mounted to the cylinder with four (4) bolts to retain the piston's motion. In addition, the head serves as a mounting platform for the operating valve and is ported to direct air flow appropriately.

1.4 Operating Valve

The operating valve is directly fastened to the valve head with three (3) screws. The valve directs air to either the top or bottom of the piston, depending on the direction movement is required. For Normal movement, air is forced to the track side of the piston. For Reverse movement, air is forced to the field side of the piston. The flow of air through the valve is entirely dependent on the position of the valve's spool. The spool moves back and forth within the valve body and is always in one of two positions. Spool movement is achieved through a small "pilot" burst of air at the end of the spool. The air burst is initiated by activation of the solenoid coil when the machine is called to throw. Reference Figure A-3 for Valve Body Assembly drawing.

2.1 Connecting to Switch

The DA-10 Switch Machine design provides a six-inch (6”) maximum throw of the piston rod. The following procedure adapts the DA-10 to a particular switch stroke. Reference Figure 2-1.

A. Before connecting the machine to the switch, push the piston rod into the cylinder as far as possible and mark the piston rod at the end of the cylinder housing. Withdraw the piston rod three inches (3”) to the mid-position.

B. Block the switch in the middle position. Connect the switch operating rod to the screw-eye at the end of the piston rod. Tighten and lock operating rod nuts at the switch point adjuster (basket).

C. The above procedure will ensure that the mid-point of switch stroke will correspond to the middle position of the piston rod. The purpose of this adjustment is to guarantee that movement of the switch points is stopped by the stock rail, rather than by the piston rod striking the valve head.

The DA-10 Switch Machine has been designed to require a minimum of servicing. The length of the period between servicing is dependent upon the frequency of cylinder operations, use and severity of climatic conditions.

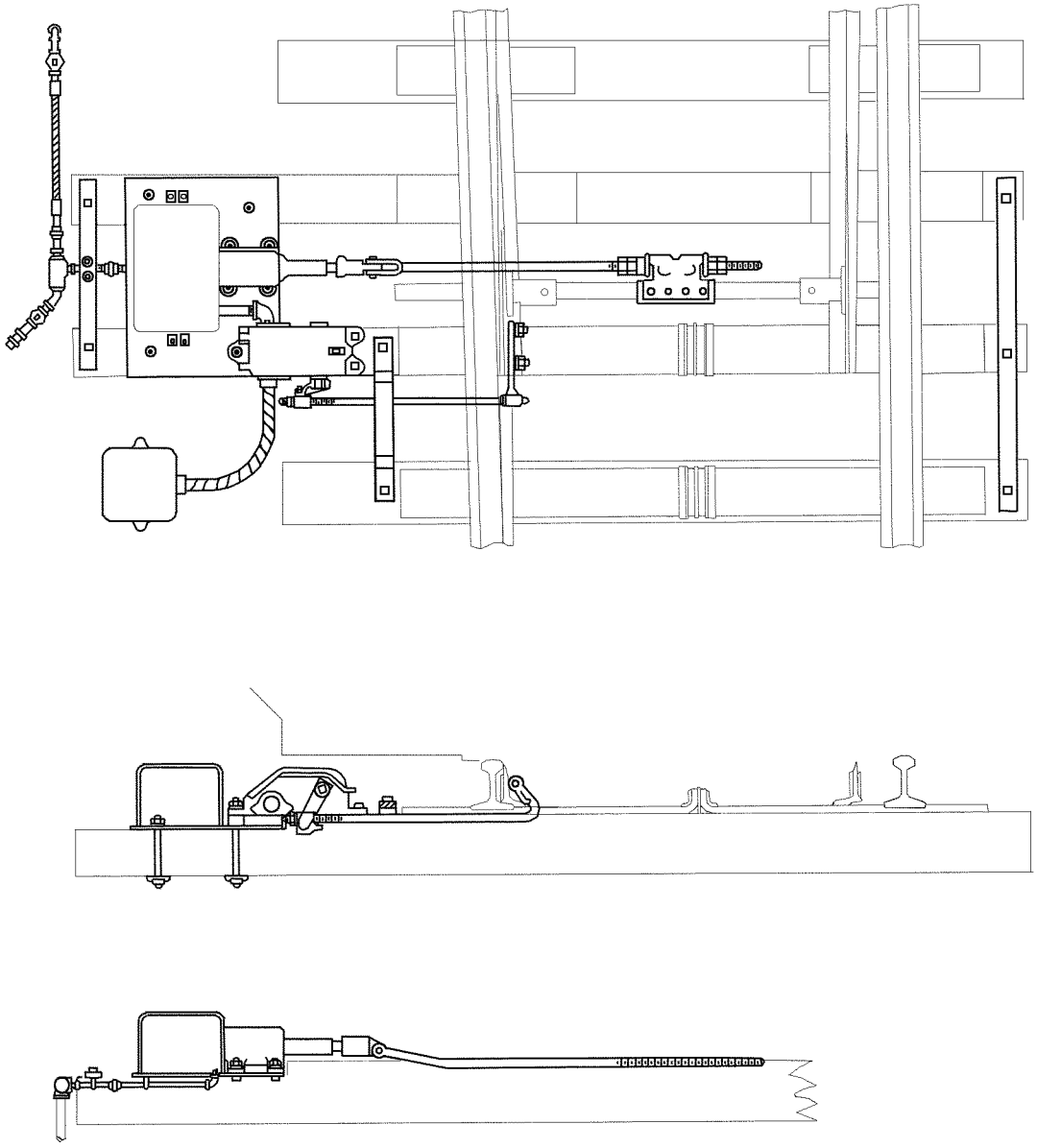

Figure 2-1 Typical Layout of Style DA-10 Switch Machine

3.1 General Information

The new DA-10 Retrofit Kit is designed to convert a DA-10 Pneumatic Switch Machine with a 5” piston, built prior to December 1998, from US&S “iron-clad” style magnets to new “coil” style magnets. The changeover procedure requires very little time, due to complete replacement of the machine’s head assembly.

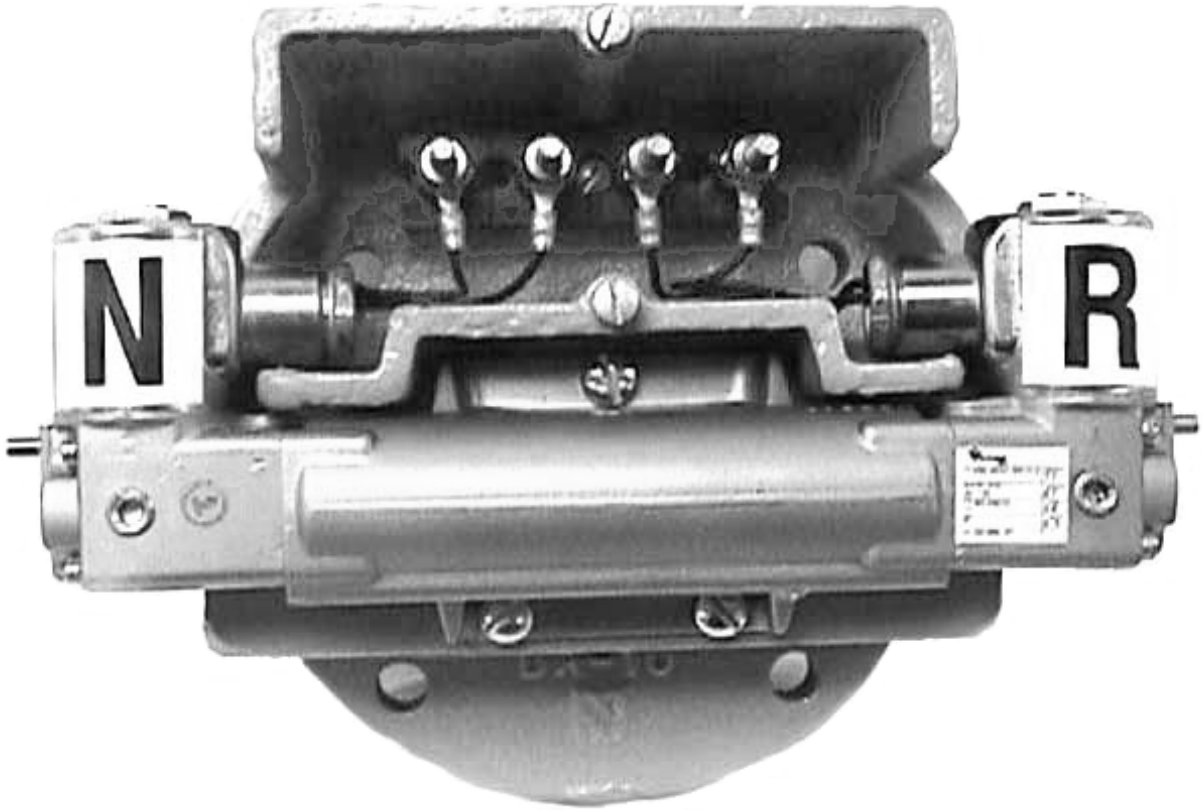

Figure 3-1 DA-10 Retrofit Kit

3.2 Installation

Installation of the Retrofit Kit requires the removal of the old valve head assembly, which includes the Pilotair valve, the magnet assemblies and the head. The head assembly can be removed as a single unit and then disposed of properly. The Retrofit Kit comes complete with hardware and gasket for immediate installation. The air supply hose and electrical connections from the existing installation will connect directly to the new retrofit head.

Regarding electrical connections, the new design includes an integral junction box with “AAR” style terminals for the termination of electrical leads. This junction box is threaded to receive standard ½” NPT threaded conduit fittings, which may or may not be used, depending on the layout configuration.

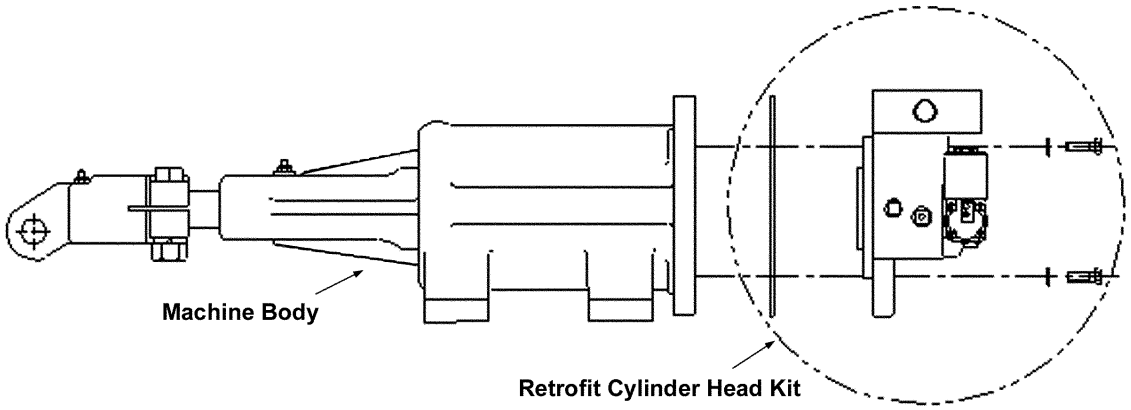

Figure 3-2 DA-10 Retrofit Valve Head Kit Installation Procedure

3.3 Installation Procedure

1. Disconnect and inspect electrical leads and air hose. Replace leads and/or hose as necessary.

2. Remove existing valve head assembly from machine body (4 bolts).

3. Clean flange surface on valve head with suitable degreasing agent.

4. Examine piston, seals and cylinder for excessive wear or damage. Replace if necessary.

5. Remove junction box cover plate from new valve head.

6. Place gasket on new valve head.

7. Assemble valve head to cylinder with ½" bolts and lock washers (included with kit). Tighten bolts in an alternating pattern.

8. Connect the air line and electrical leads.Verify air supply and wiring by cycling switch machine.

9. Replace junction box cover plate.

4.1 Machine Operation

The switch machine can be operated automatically or manually. Manual operation is achieved by pressing the appropriate Manual Operation button on either end of the Operating Valve, as indicated by the Normal “N” or Reverse “R” labels.

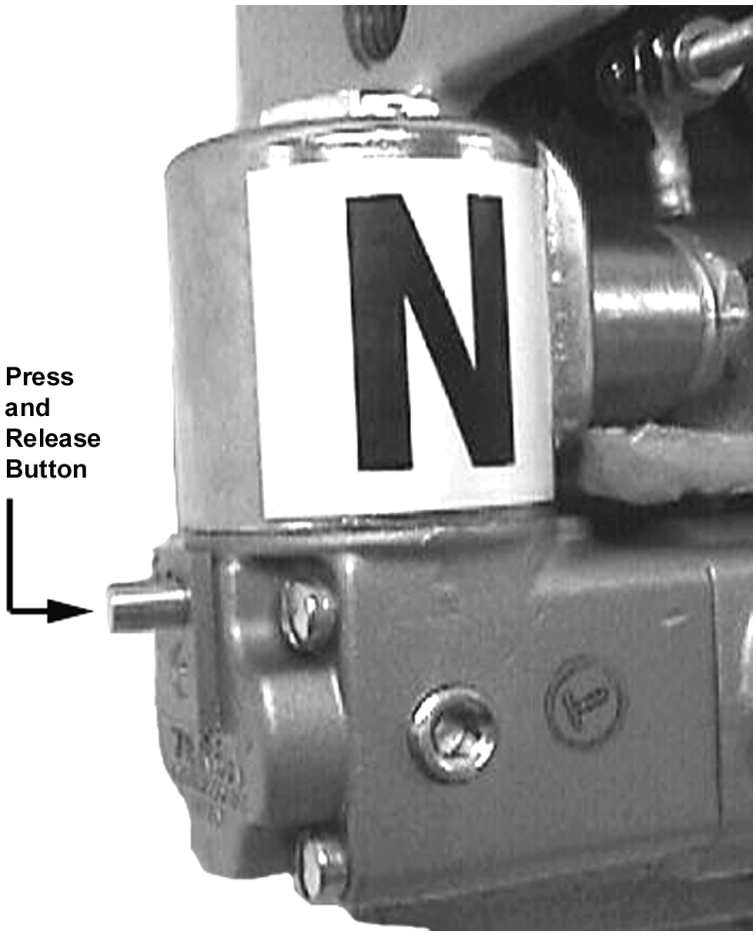

Figure 4-1 Manual Operation Button

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5.1 Machine Lubrication

The DA-10 Switch Machine is fully lubricated prior to shipment and no lubrication is necessary before installation. However, the piston rod and cylinder cavity ("U" cups) require periodic lubrication. These areas are factory lubricated with Shell Aeroshell Grease #6. Reference Figure 1.3 for lubrication points. Lubrication intervals for each location will differ and care should be taken to avoid excessive lubrication. Be aware that excessive lubrication of the cylinder cavity can produce a grease build-up and shorten the stroke of the machine. The piston rod should remain well lubricated at all times.

The operating valve should be repacked with grease when rebuilt. The original lubricant used is Texaco Molytex EP-2; however, an equivalent lubricant may be suitable for rebuilding. Texaco Molytex EP-2 meets AAR Specification M-929-75.

Please note: the OEM lubricants in the cylinder and operating valve are not compatible. The two lubricants should not be mixed or substituted for one another.

5.1.1 Air Line Lubrication

In order to maintain reliability and normal life of machine components, it is important to filter (40-50 microns) and lubricate the air passing through the machine. Regarding air line lubricator oils, many brand name oils may be suitable for use if they have a paraffin base and aniline point in the range of 200° -220° F (95° -105° C). Oils must be thin enough to atomize in the lubricator. Users should be advised not to use penetrating oils or detergent type oils, as they will damage the seals, thicken in cold weather and wash out assembly grease. Thick oils do not atomize sufficiently.

The table below lists commercially available light oils recommended for use as air line lubricant with the DA-10 Switch Machine. They are compatible with the original equipment nitrile (rubber) seals of the machine. However, these oils may be detrimental to seal compounds in other equipment. When choosing an air line lubrication oil, consideration should be given to all equipment served by the lubricator to avoid detrimental effects on vulnerable sealing compounds.

Manufacturer	Lubricant
Chevron Oil Co.	GST Oil 32
CITCO	Pacemaker T-32
Exxon	Teresstic 32
Gulf Oil Corp.	Harmony 32
Mobil Oil Corp.	DTE Light
Shell Oil Co.	Turbo 32
Sun Oil Co.	Sunvis 932
Texaco Inc.	Regal Oil R & O 32
Union Oil Co.	Turbine 32

Table 5-1 Commercial Lubricants for use as Air Line Lubricant

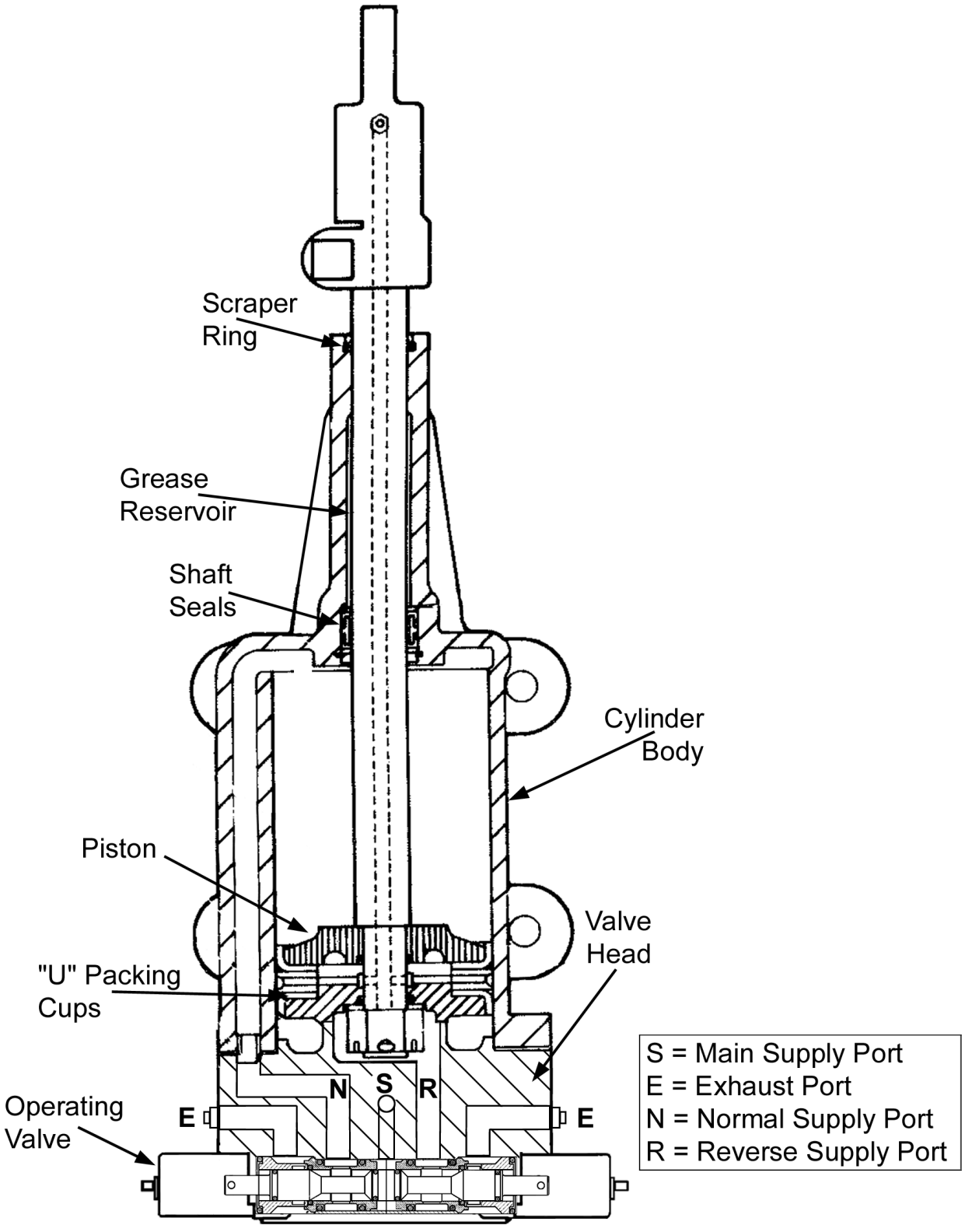

Figure 5-1 Operation of DA-10 Switch Machine

5.2 Service

The DA-10 Switch Machine should be removed at least once every one or two years (depending upon the use) and be returned to the shop for servicing. The Valve Head Assembly can be removed separately and replaced without removing the machine from the track. Spare coils and seals should be available for replacement. Reference Figures A-2 for appropriate seal components/kits.

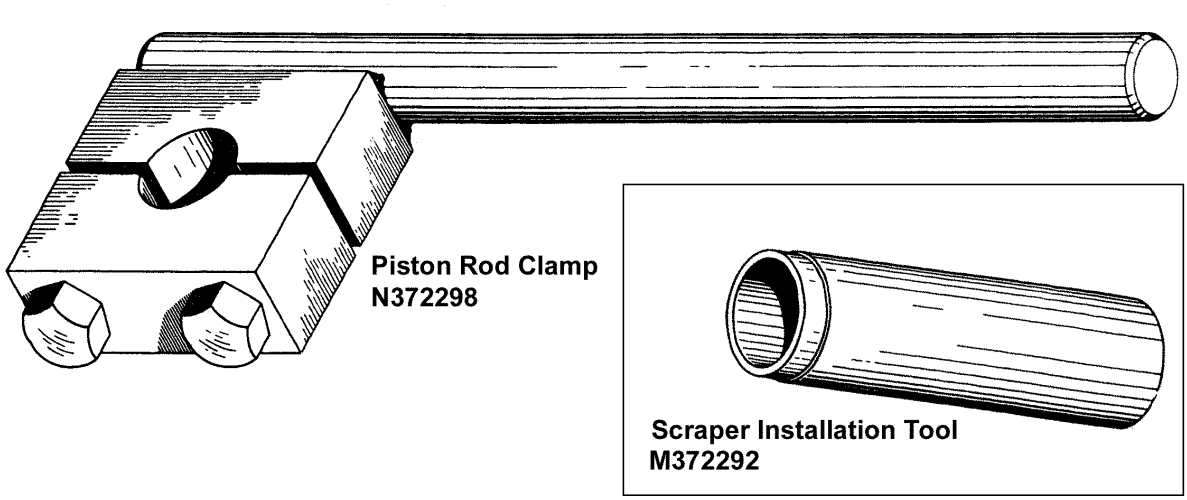

Figure 5-2 DA-10 Maintenance Tools

5.2.1 Cylinder

A. Figure 5-2 illustrates special tools used for DA-10 maintenance. To clean and service the switch cylinder, proceed as follows:

1. The extended piston rod should be clamped with tool M372298 before attempting to unscrew the rod eye. Remove the rod eye by first loosening the clamp bolt and unscrewing the eye.
2. Remove the valve head and withdraw the piston and rod. Clean the outer-end of the rod before removing to prevent damage to the “U” cups. **Handle the cylinder rod carefully to prevent scratching or scoring the surface.**
3. Remove the “U” packing gland by first removing the snap ring with a Waldes tool, PN: J39813.
4. Clean and examine the packing for wear and replace any worn parts. (It may be advisable to replace the “U” cups at this time).
5. Remove the scraper ring at the outer end of the ring using a pointed tool to extract the rubber holding ring. Examine parts and replace if necessary.
6. Clean the entire cylinder with cleanser and re-grease with lubricant prior to reassembly.

B. To install the “U” cups, proceed as follows:

1. Place one packing back-up ring in the recess.
2. Insert one “U” cup (lip turned toward the cylinder).
3. Install the two “V” ring retainers, back to back.
4. Install the second cup with the lip away from the cylinder.
5. Insert the second packing back-up ring.
6. Insert retaining ring.
7. Insert the wiper rings with their lips outward in the Piston Rod Guide.

   (The rubber compression ring portion is installed with tool UM372292).

C. The piston should be taken apart by removing the rod clamp nut, spacers and cups. All parts should be cleaned. “O” ring seals and US&S packing cup should be examined and replaced if worn excessively. The piston and rod should be reassembled, greased and then replaced into the cylinder. Carefully insert the rod into the “U” packing. The combination of the taper lead and the guiding washer will prevent damage to the cups if assembly is carefully made. The large cups should be inserted in the cylinders without damaging the sealing lips.

5.2.2 Operating Valve

The operating valve is primarily constructed of two components: the end operator and the valve mechanism. The end operator is the component fastened to either end of the valve body. The operating valve uses two end operators, one for each end. The valve mechanism includes the valve body and each of its internal component (seals, etc.). Reference Figure A-3 for illustration.

Regarding the end operator, no maintenance or repair is recommended. Should this item become defective, the valve should be replaced.

The valve mechanism includes “O” ring seals that require periodic maintenance. To disassemble the valve for inspection, cleaning and reworking, proceed as follows:

1. Remove four (4) screws from each end of valve. Remove the end operator from each end of valve mechanism.

2. Remove the spool from the valve body by pushing on either end of the spool.

3. To reassemble, lightly grease all parts with “O” ring grease, Texaco Molytex EP-2 or equivalent and reassemble in the opposite order above.

A.1 Technical Data

Rated Voltage	**Operating Voltage**	**Pick-up Voltage***	**Current Draw**** (@ Rated Voltage)
12	9.6 to 13.2	9.6	0.78
24	19.2 to 26.4	19.2	0.38

* Rated at 90 PSI air pressure and 70° F ambient temperature, meets AAR 12.2.10 - 1993 (Section 6i).

** Different value than previous magnet-equipped DA-10. Was:

12Vdc (5.0-14Vdc) @ 0.092 ampere draw
24Vdc (8.3-26Vdc) @ 0.058 ampere draw

Table A-1 Electrical Operating Specifications

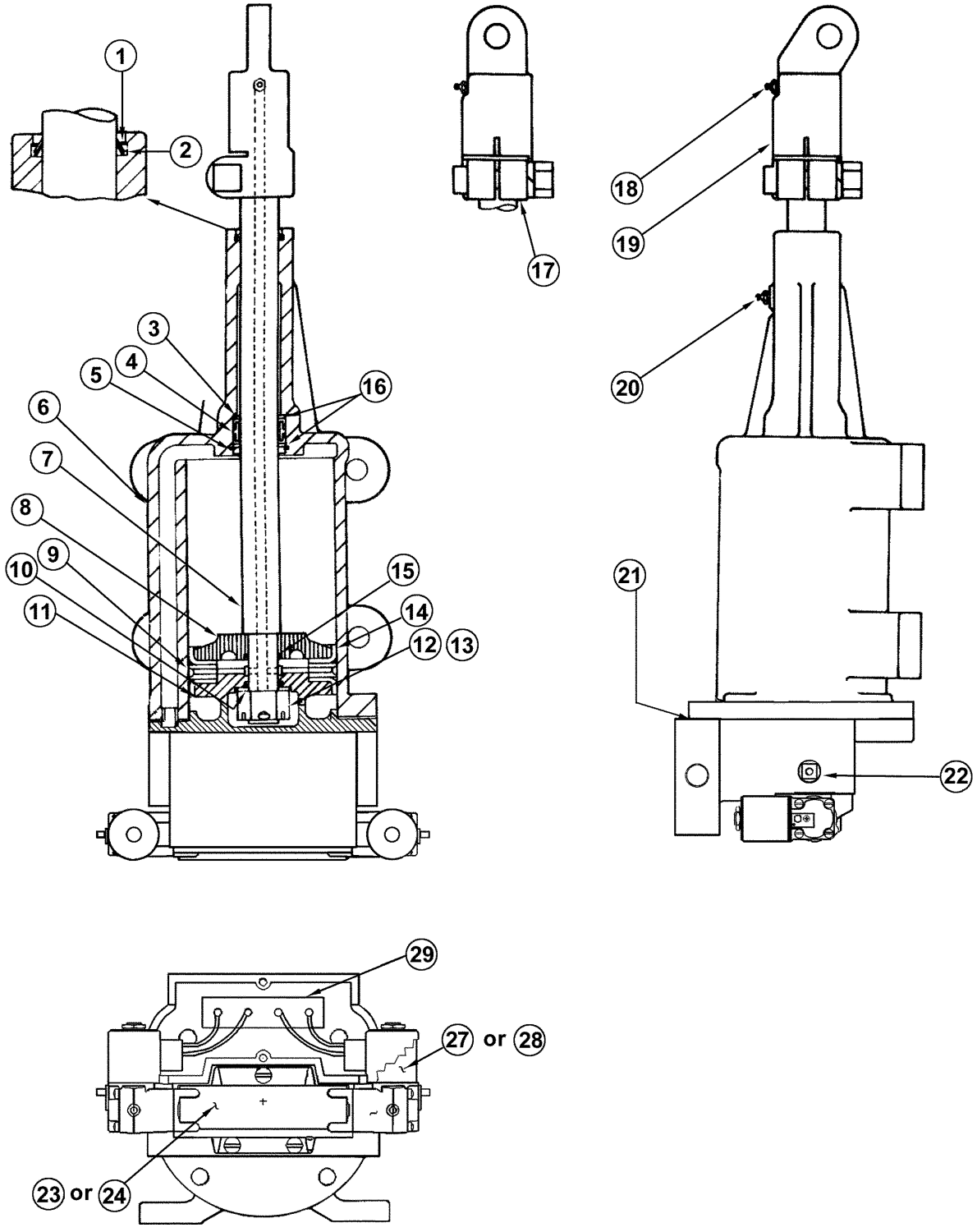

Figure A-1 Style DA-10 Switch Machine Assembly Drawing

A.2 STYLE DA-10 SWITCH MACHINE

P/N: N425001-01 (12 Volt)
P/N: N425001-02 (24 Volt)

ITEM	DESCRIPTION	US&S Part #	Qty
1	Ring, Retaining	J792183	1
2	Wiper	J791579	1
3	Packing, “U” Cup	J067436	2
4	Retainer, “V” Ring	J723192	2
5	Ring, Retaining	J791577	1
6	Cylinder	M371969	1
7	Rod, Piston	N371987	1
8	Follower, Piston	M371967	1
9	Follower, Piston	M106286	1
10	Spacer, Piston Nut	M371985	1
11	Follower, Piston	M371968	1
12	Cotter, 3/16 x 2 Steel T.P.C. 2	J048636	1
13	Nut, 1”—14 Hex. Slotted Steel Cad. P.C. 1	J480160	1
14	Packing	J067421	2
15	Ring, 1 x 1/4” “O”	J067427	2
16	Ring, Packing Back—up	M371990	2
17	Eye, Screw (Straight)	M371980	1
18	Fitting, 1/8” P.T. Str. Lub	J039137	1
19	Eye, Screw	N371979	1
20	Fitting, 1/8” P.T.F. Lub. (Pressure relief)	J039128	1
21	Gasket, Cyl. Head	M371998	1
22	Plug, Exhaust	M372007	1
23	Operating Valve, comp, 12V	J3373850004	1
24	Operating Valve, comp, 24V	J3373850003	1
25	NOT USED		
26	NOT USED		
27	Coil, 12 Volt	J7064140019	2
28	Coil, 24 Volt	J7064140018	2
29	Terminal block	M107471	1

A.3 Valve Assembly for DA-10 Switch Machine

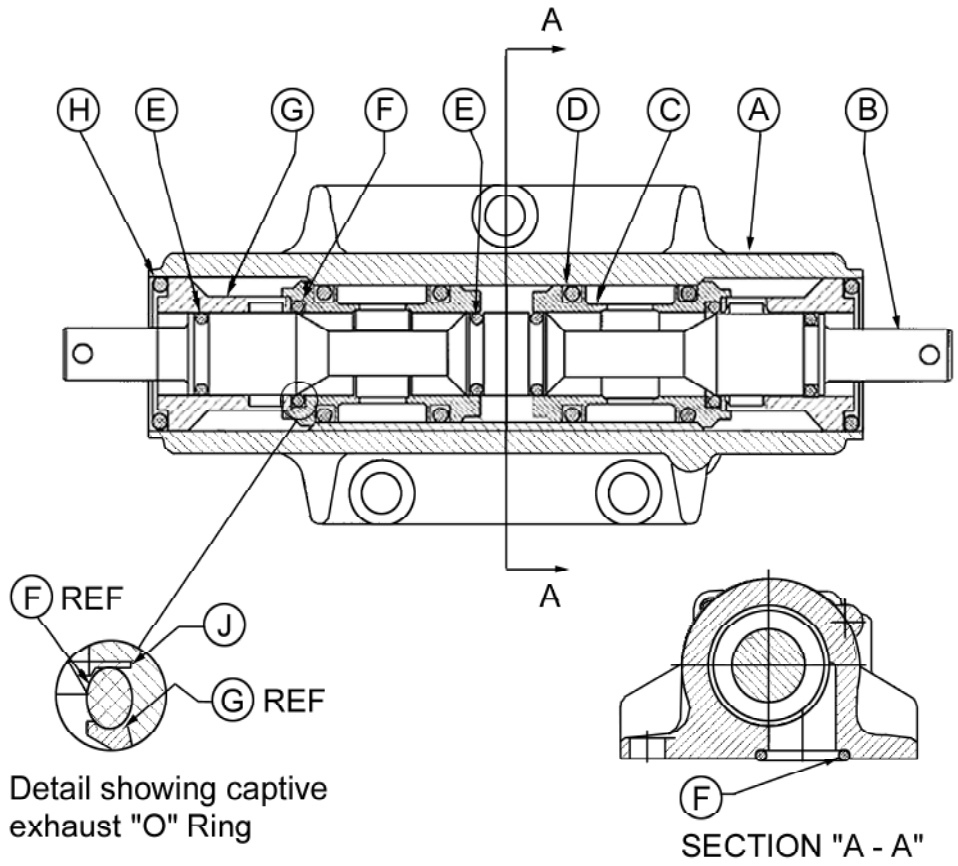

Figure A-2 Valve Body Assembly For DA-10 Switch Machine

Item No.	Description	Part Number	Qty
A	Body	Reference Only	1
B	Plunger (Spool)	Reference Only	1
C	Bushing	Reference Only	2
D	“O” Ring	Reference Only	4
E	“O” Ring	Reference Only	4
F	“O” Ring	Reference Only	7
G	Retainer	Reference Only	2
H	“O” Ring	Reference Only	2
J	Washer	Reference Only	2

**	Rebuild Kit	J0675840015	1

** Rebuild kit includes all soft seals required to rebuild operating valve.