

# AA Type Actuator Positioners

## Service Information



AA-1



AB-1

The AA-1, AB-1 and BA-1 Actuator Positioners are pneumatic Positioners used where accuracy is required and when the device to be operated has low force characteristics. Typical applications are positioning the butterfly valve of carburetors and the control arm of diesel engine governors.

- AA-1** Standard configuration, the AB-1 and the BA-1 are constructed from this basic model
- BA-1** Basic AA Type positioner with a "Vernier" feature added by the use of an additional diaphragm that is controlled by a separate valve (H-4 CONTROLAIR® Valve)
- AB-1** Basic AA Type positioner with a separately controlled stop cylinder.



### WARNING: INSTALLATION AND MOUNTING

The user of these devices must conform to all applicable electrical, mechanical, piping and other codes in the installation, operation or repair of these devices.

**INSTALLATION!** Do not attempt to install, operate or repair these devices without proper training in the technique of working on pneumatic or hydraulic systems and devices, unless under trained supervision.

Compressed air and hydraulic systems contain high levels of stored energy. Do not attempt to connect, disconnect or repair these products when a system is under pressure. Always exhaust or drain the pressure from a system before performing any service work. Failure to do so can result in serious personal injury.

**MOUNTING!** Devices should be mounted and positioned in such a manner that they cannot be accidentally operated.

## INSTALLATION

Mount the positioner firmly to the engine frame to prevent relative motion between the operator rod and the engine control arm. The positioner must be installed with the operator rod in the same plane as the engine control arm. Avoid interference with the connecting link which could cause friction and inaccuracy. For wet or dirty installations the positioner should be mounted with the diaphragm cover (ref. 3, page 4) up.

The most satisfactory linkage is a steel rod with ball joints or an adjustable clevis at both ends connected directly from the positioner to the control arm. It is very important to utilize the full travel of the positioner and to match the end travels of the control lever and the positioner rod.

For mounting dimension and pipe connections refer to the outline drawing elsewhere in this catalog.

**NOTE:** Before installation all air lines should be blown free of any moisture or harmful deposits.

For more information on installation and other applications refer to catalog SC-900.

## MAINTENANCE

Periodically disassemble the positioner for cleaning and lubrication. Refer to the appropriate exploded view.

1. Clean all metal parts with a nonflammable solvent and wash all rubber parts in soap and water.
2. Rinse parts thoroughly and blow dry with a low pressure air jet.
3. Inspect all parts and replace those which are worn or damaged.

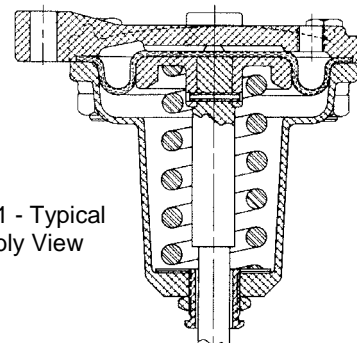


Figure 1 - Typical Assembly View

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## ADJUSTMENT

It is important to utilize the full travel of the positioner and to match the end travels of the control lever and the operator rod. The operator rod is adjustable in length from 1" to 5 1/2", which alters the end travel from 7/8" to 2 1/4". For decreased rod end travel, loosen the jam nut and screw the operator rod toward the lever arm. Tighten the jam nut to secure this position. Rod end travel can be increased by unscrewing the operator rod and then tightening the jam nut.

If the end travel of the governor control arm exceeds the maximum adjustment of the operating lever, the normal procedure is to drill a hole in the control arm at the point which has a travel range of two inches. Fasten the connecting link to the new hole and re-adjust the end travel of the control arm and operating lever to match.

As assembled, the adjustable elements of the positioner are matched to provide zero lever travel with indicated preload pressure (usually 10 psi), and maximum lever travel with rated top pressure (usually 60 psi).

The push rod and follower (ref. 5, pg. 4) travel is factory set to correspond to rated top pressure. If the top pressure of the control valve is greater or less than that of the positioner, the travel of the control valve handle can be made to match the travel of the operating lever by using the push rod and follower adjusting screw (ref. 9, pg. 4).

Two or more positioners can be matched to provide the same movement for a given change in air pressure. They can also be deliberately mismatched to provide different rod end travel to compensate for inequalities in operating characteristics of the controlled device. If necessary to adjust for incorrect initial pressure, remove or add shims (ref. 7, pg. 4) as needed, or reset the preload on the control valve.

## REPAIR AND CONVERSION

In late 1969 improvements were made starting with a stronger, lighter weight push rod and follower assembly (ref 5, pg. 4) and utilization of the smaller adjusting screw (ref. 9, pg. 4) from the A-2-H Actuator Positioner. (To accommodate the smaller adjusting screw, the main body (ref. 8, pg. 4) was modified.) To further simplify the various models a standard lever arm was designed along with the accompanying bearings, bolt and washers. Finally, the stop cylinder on the AB-1 model was replaced by a readily available unit using Taskmaster® Cylinder components.

When replacement of the main diaphragm body (old style) (ref. 8, pg. 4) is required, it is recommended that a main operator portion be purchased assembled. (Order part number P -060272-00000 and refer to page 4 for parts included.) New and old push rod and follower assemblies (ref 5, pg. 4) are completely interchangeable. The new and old vernier follower (ref. 20, pg. 6) will function with the new or old lever arm, the old stop cylinder will function with the new lever arm provided the old connecting link (ref. 18, pg. 7) is used, and the new stop cylinder will function with the new or old lever arm.

Fulcrum pins with grease fittings located at one end are no longer available, if replacement ever becomes necessary it is recommended that lever arm conversion kit, part number P -063382-00000 or P -063383-00000 be purchased. Old bearings, part numbers P -050175-00000 and P -050175-00001 (ref 4, pg. 4) are recommended spare parts and should be retained in stock.

In AB models, rubber parts in the stop cylinder should be lubricated with Dow Corning No. 55 Pneumatic Grease.

Reassemble the positioner using the exploded and assembly views as references. No special tools are required. To maintain the same preload on the spring (ref. 6, pg. 4), shims (7A, B & C) must be included. Apply No. 107 Lubriplate, or its equivalent, to all grease fittings.

## OPERATION

The positioner has a usual pressure range of 10-60 psi within a temperature range of -40° F to 165° F. Pressure is supplied by a pressure control valve such as the Rexroth CONTROLAIR®, Type "M" Plus™ Pressure Control or Flexair® Valves. The pressure imposed on the diaphragm (ref. 4, pg. 4) is proportional to the handle travel of the control valve. The movement of the positioner operating rod is also proportional to this movement. Finally, the position of the controlled device is proportional to the handle travel of the control valve.

When supply pressure is reduced, the force of the spring (ref. 6, pg. 4) against the push rod and follower assembly (ref. 5, pg. 4) returns the operating rod to its new position corresponding to the value of air pressure remaining. Supply pressure of 10 psi usually provides idle position with 60 psi usually providing full travel or full fuel position.

### AA-1

The AA-1 Actuator Positioner, which is larger and more powerful than the A-2-H, is the basic configuration from which the AB-1 and BA-1 are constructed. The AA type actuators have a nominal stroke of 2" with a power rating of 1125 in-lb-degrees or a work rating of 10 lbs through 2".

### BA-1

The BA-1 Actuator Positioner is similar to the AA-1 but has a vernier feature added by the inclusion of an additional diaphragm. This diaphragm is controlled by a separate valve to provide an adjustment to a maximum of +/- 10% of full travel on the rod end. Normal air pressure on the vernier diaphragm is 35 psi, being varied between zero and 65 psi to increase or decrease the index position.

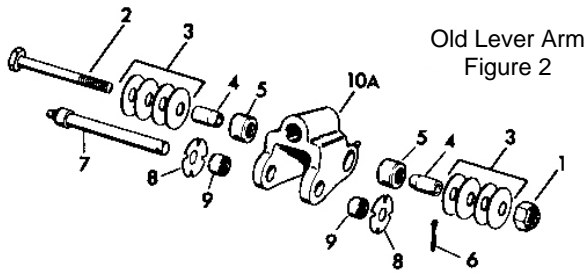
### AB-1

The AB-1 Actuator Positioner is also similar to the AA-1 except that a separately controlled stop cylinder has been added. When air is admitted to the stop cylinder, the operating lever arm is moved 2" in the opposite direction. If pressure is present on the main diaphragm, the operating rod will move to idle position and if pressure is vented from the main diaphragm, the arm moves to the stop position.

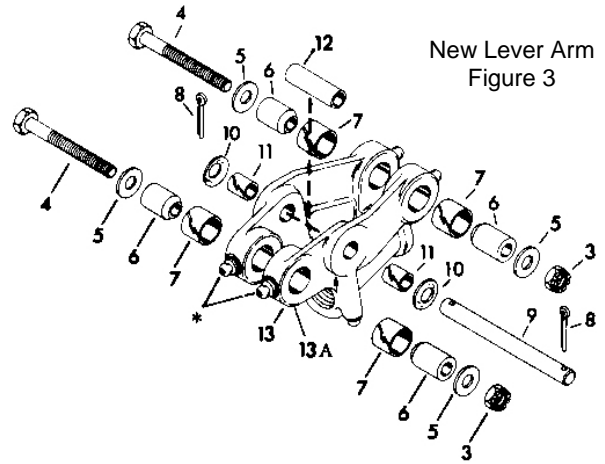
## IDENTITY SCHEDULE

DESIGNATION	DESCRIPTION	OBSOLETE PART NO.	SUPERSEDING PART NO.
AA-1	1/4" Rod Eye	P -050000-00001	P -060263-00001
AA-1	1/4" Rod Eye	P -050645-00000	P -060263-00001
AA-1	1/4" Rod Eye	P -050646-00000	P -060263-00001
AA-1	5/16" Rod Eye	P -050646-00001	P -060263-00002
AA-1	3/8" Rod Eye	P -050000-00000	P -060263-00003
AA-1	3/8" Rod Eye	P -050000-00002	P -060263-00003
AA-1	3/8" Rod Eye	P -050645-00001	P -060263-00003
AA-1	3/8" Rod Eye	P -050646-00002	P -060263-00003
AB-1	1/4" Rod Eye	P -050631-00000	P -060266-00001
AB-1	5/16" Rod Eye	P -050631-00001	P -060266-00002
AB-1	3/8" Rod Eye	P -050631-00002	P -060266-00003
BA-1	1/4" Rod Eye	P -050452-00001	P -060269-00001
BA-1	1/4" Rod Eye	P -050647-00000	P -060269-00001
BA-1	1/4" Rod Eye	P -058908-00000	P -060269-00001
BA-1	5/16" Rod Eye	P -050452-00000	P -060269-00002
BA-1	5/16" Rod Eye	P -050647-00001	P -060269-00002
BA-1	3/8" Rod Eye	P -050452-00002	P -060269-00003
BA-1	3/8" Rod Eye	P -050647-00002	P -060269-00003

### LEVER ARM CONVERSION



Old Lever Arm  
Figure 2



New Lever Arm  
Figure 3

**BA-1 MODELS ONLY**

Note: Shaded areas of Parts List designate BA-1 parts only.

### CONVERSION KITS

AA-1, AB-1	P -063382-00000
BA-1	P -063383-00000

### PARTS LIST

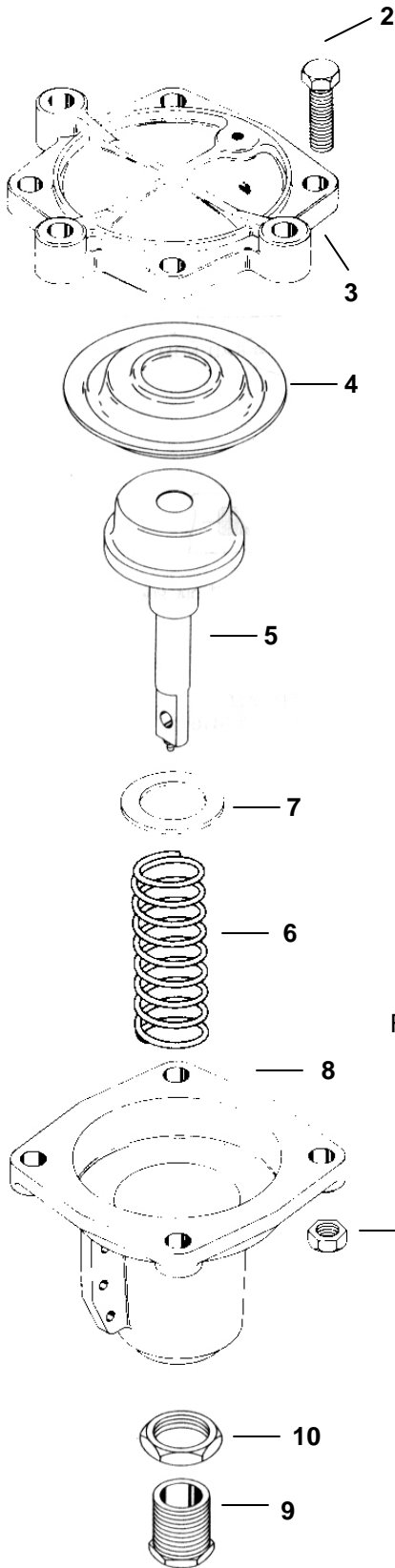
REF	QTY	DESCRIPTION	OBSOLETE PART NOS.
1	1	NUT, 1/4" Elastic Stop	521909, P -049891-00000
2	1	BOLT, 1/4-20 x 2-3/4 Hex	P -049900-00012, P -049900-00005
3	8	WASHER, Spring	P -050232-00000
4	2	RACE, Inner Bearing	P -050175-00000, P -050175-00001
5	2	BEARING, Needle	537898
6	1	COTTER, 3/32 x 5/8	93260, 2958
7	1	PIN, Fulcrum w/Grease Fitting	850513, 850820, 851094
8	2	WASHER, Spring	534274
9	2	BEARING, Needle	543124
10A	1	ARM, Lever (AA & AB Models)	P -050749-00000
10B	1	ARM, Lever (BA Models)	P -050751-00000
11	1	NUT, 5/16"-24 Elastic Stop	P -049605-00011, 523714
12	1	NUT, Anchor	850545
13	1	PIN, Fulcrum w/Grease Fitting	850556

### PARTS LIST

REF	AA-1, AB-1 QTY	BA-1 QTY	DESCRIPTION	PART NO.
3	1	2	NUT, 1/4"-28	P -049819-00017
4	1	2	BOLT, 1/4-28 x 2-1/4"	P -049902-00037
5	2	4	WASHER	P -049904-00061
6	2	4	BEARING, Sleeve	P -060262-00000
7	2	4	BEARING, Nylon	P -049688-00002
8	2	2	PIN, Cotter	P -049913-00002
9	1	1	PIN, Fulcrum	P -060261-00000
10	2	2	WASHER, Spring	534274
11	2	2	BEARING, Nylon	P -049688-00001
12	1	1	SPACER	P -060260-00000
13	-	1	ARM, Lever	P -060274-00000
13A	1	-	ARM, Lever	P -060274-00001*

\*Does not contain rear grease fittings.

# EXPLODED VIEW STANDARD BODY



## STANDARD BODY CONFIGURATION P -060272-00000 FOR COMPLETE ASSEMBLY (Items 1 thru 10, Assembled at Factory)

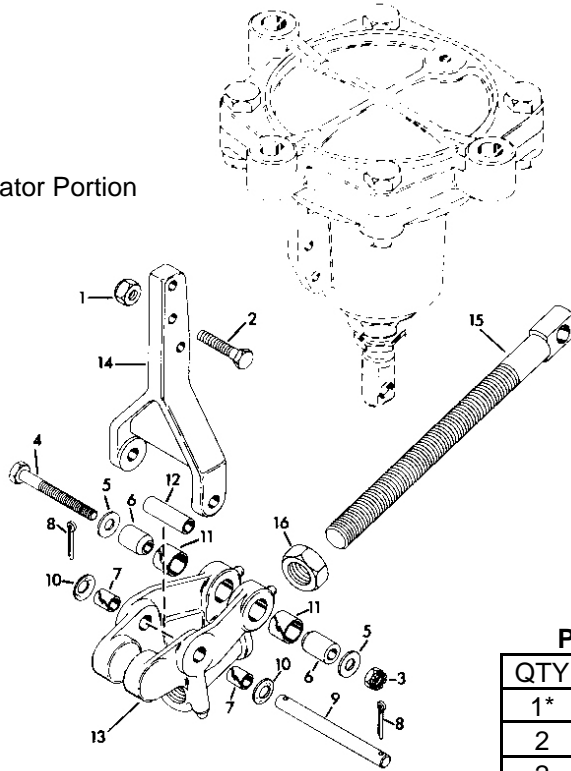
REF	QTY	DESCRIPTION	PART NO.	NOTES
1	4	NUT, 1/2"-20	P -049901-00033	
2	4	BOLT, 1/2-20 x 2"	P -049910-00018	
3	1	COVER, Diaphragm	P -064328-00000	
4	1	DIAPHRAGM	See Repair Kits	See note 1.
5	1	PUSH ROD & FOLLOWER Assy	P -060257-00000	
6	1	SPRING	520964	
7A	2	SHIM, .010 Spring	P -060255-00000	See note 2.
7B	1	SHIM, .031 Spring	P -060255-00002	See note 2.
7C	1	SHIM, .125 Spring	P -060255-00003	See note 2.
8	1	BODY	P -060248-00000	See note 3.
9	1	ADJUSTING SCREW	P -060256-00000	See note 3.
10	1	LOCKNUT	P -049903-00038	See note 3.

- NOTES 1. Recommended spare parts to be retained in stock at all times.  
 2. Parts not interchangeable with old lever arm design.  
 3. Maximum quantity required; actual quantity installed at factory.

Figure 4 - Standard Body

# EXPLODED VIEW AA-1 OPERATOR PORTION

Figure 5 - AA-1 Operator Portion



### AA-1 REPAIR KIT PART NO. P -063381-00000

QTY	DESCRIPTION	REF. NO.
1*	DIAPHRAGM	4 (Page 4)
2	BEARING, Sleeve	6
2	BEARING, Nylon	4
2	BEARING, Nylon	11

\*Not shown here, refer to pg 4, ref. 4.

### AA-1 OPERATOR & REPAIR KIT

REF	QTY	DESCRIPTION	PART NO.	NOTES
1	3	NUT, 1/4"-20	P -049891-00000	
2	3	BOLT, 1/4-20 x 1-1/4"	P -049892-00003	
3	1	NUT, 1/4"-28	P -049819-00017	See note 2.
4	1	BOLT, 1/4-28 x 2-1/4"	P -049902-00037	See note 2.
5	2	WASHER	P -049904-00061	See note 2.
6	2	BEARING, Sleeve	See Repair Kit	See note 1, 2.
7	2	BEARING, Nylon	See Repair Kit	See note 1, 2.
8	2	PIN, Cotter	P -049913-00002	See note 2.
9	1	PIN, Fulcrum	P -060261-00000	See note 2.
10	2	WASHER, Spring	534274	See note 2.
11	2	BEARING, Nylon	See Repair Kit	See note 1, 2.
12	1	SPACER	P -060260-00000	See note 2.
13	1	ARM, Lever	P -060274-00001	See note 2.
14	1	BAR, Adapter	P -027984-00000	
15A	1	ROD, Operator (1/4" Rod Eye)	P -050564-00003	
15B	1	ROD, Operator (5/16" Rod Eye)	P -050564-00004	
15C	1	ROD, Operator (3/8" Rod Eye)	P -050564-00002	
16	1	NUT, Jam	P -049903-00003	

NOTES 1. Recommended spare parts to be retained in stock at all times.  
2. Parts not interchangeable with old lever arm design.



# EXPLODED VIEW BA-1 OPERATOR PORTION

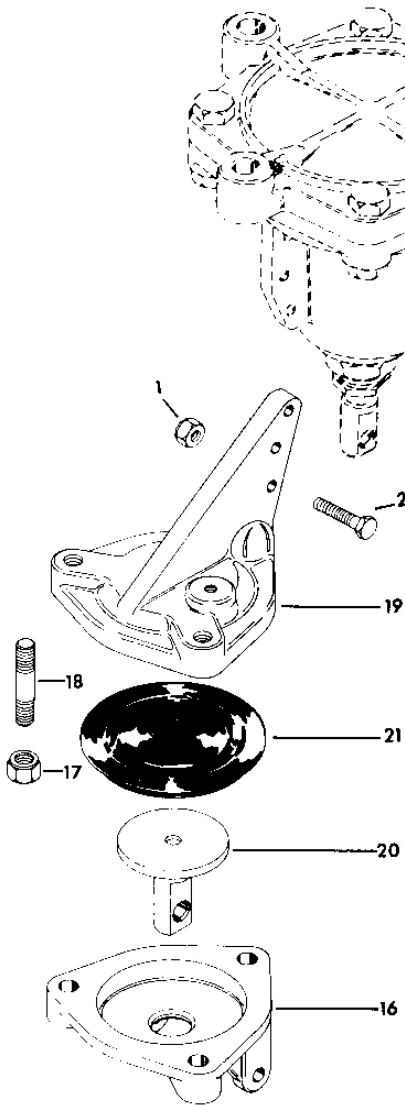
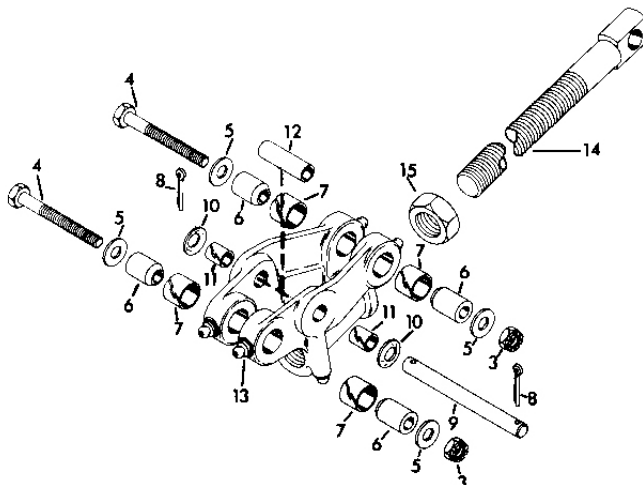


Figure 6 - BA-1 Operator Portion

## BA-1 OPERATOR & REPAIR KIT

REF	QTY	DESCRIPTION	PART NO.	NOTES
1	3	NUT, 1/4"-20	P -049891-00000	
2	3	BOLT, 1/4-20 x 1-1/4"	P -049892-00003	
3	2	NUT, 1/4"-28	P -049819-00017	See note 2.
4	2	BOLT, 1/4-28 x 2-1/4"	P -049902-00037	See note 2.
5	4	WASHER	P -049904-00061	See note 2.
6	4	BEARING, Sleeve	See Repair Kit	See note 1, 2.
7	4	BEARING, Nylon	See Repair Kit	See note 1, 2.
8	2	PIN, Cotter	P -049913-00002	See note 2.
9	1	PIN, Fulcrum	P -060261-00000	See note 2.
10	2	WASHER, Spring	534274	See note 2.
11	2	BEARING, Nylon	See Repair Kit	See note 1, 2.
12	1	SPACER	P -060260-00000	See note 2.
13	1	ARM, Lever	P -060274-00000	See note 2.
14A	1	ROD, Operator (1/4" Rod Eye)	P -050564-00003	
14B	1	ROD, Operator (5/16" Rod Eye)	P -050564-00004	
14C	1	ROD, Operator (3/8" Rod Eye)	P -050564-00002	
15	1	NUT, Jam	P -049903-00003	
16	1	BODY, Small Diaphragm	850539	
17	3	NUT, 3/8"-16	P -049901-00010	
18	3	STUD, 3/8"-16	P -049906-00025	
19	1	COVER, Small Diaphragm	850542	
20	1	FOLLOWER	P -060288-00000	
21	1	DIAPHRAGM, Small	See Repair Kit	See note 1.

- NOTES 1. Recommended spare parts to be retained in stock at all times.  
2. Parts not interchangeable with old lever arm design.

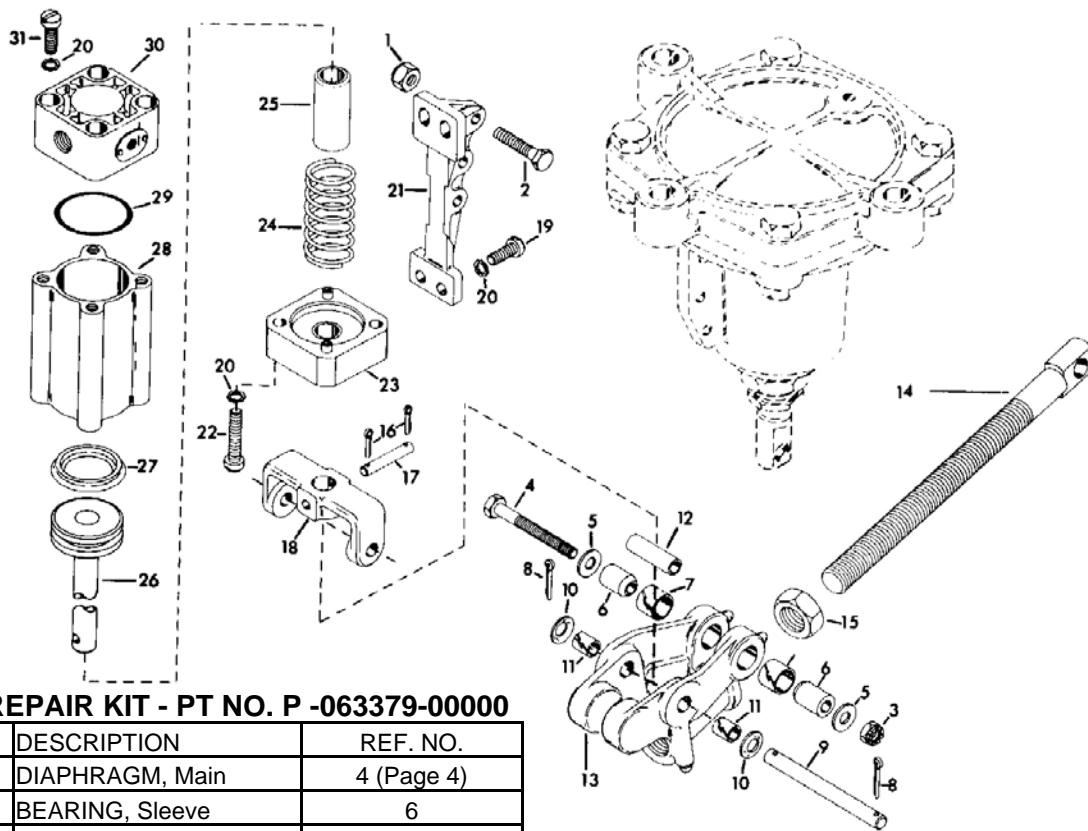


## BA-1 REPAIR KIT PART NO. P -063380-00000

QTY	DESCRIPTION	REF. NO.
1*	DIAPHRAGM, Main	4 (Page 4)
2	BEARING, Sleeve	6
2	BEARING, Nylon	7
2	BEARING, Nylon	11
1	DIAPHRAGM, Small	21

\*Not shown here, refer to pg 4, ref. 4.

# EXPLODED VIEW AB-1 OPERATOR PORTION



### AB-1 REPAIR KIT - PT NO. P -063379-00000

QTY	DESCRIPTION	REF. NO.
1*	DIAPHRAGM, Main	4 (Page 4)
2	BEARING, Sleeve	6
2	BEARING, Nylon	7
2	BEARING, Nylon	11
1	SEAL, U-Cup	27
1	O-RING	29

\*Not shown here, refer to pg 4, ref. 4.

Figure 7 - AB-1 Operator Portion

### AB-1 OPERATOR & REPAIR KIT

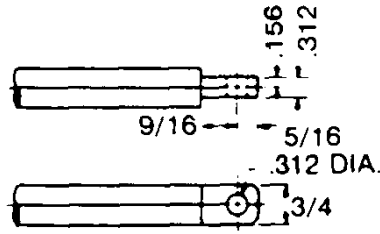
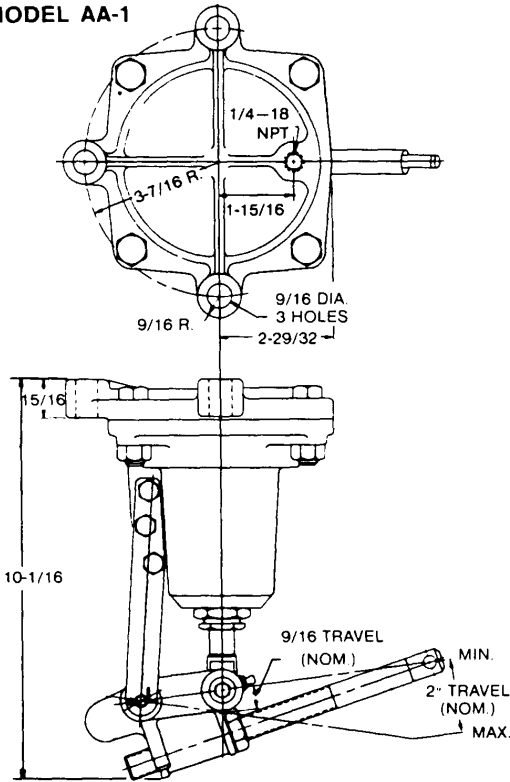
REF	QTY	DESCRIPTION	PART NO.	NOTES
1	3	NUT, 1/4"-20	P -049891-00000	
2	3	BOLT, 1/4"-20 x 1-1/4"	P -049892-00003	
3	1	NUT, 1/4"-28	P -049819-00017	See note 2.
4	1	BOLT, 1/4"-28 x 2-1/4"	P -049902-00037	See note 2.
5	2	WASHER	P -049904-00061	See note 2.
6	2	BEARING, Sleeve	See Repair Kit	See note 1, 2.
7	2	BEARING, Nylon	See Repair Kit	See note 1, 2.
8	2	PIN, Cotter	P -049913-00002	See note 2.
9	1	PIN, Fulcrum	P -060261-00000	See note 2.
10	2	WASHER, Spring	534274	See note 1, 2.
11	2	BEARING, Nylon	See Repair Kit	See note 1, 2.
12	1	SPACER	P -060260-00000	See note 2.
13	1	ARM, Lever	P -060274-00001	See note 2.
14A	1	ROD, Operator (1/4" Rod Eye)	P -050464-00003	
14B	1	ROD, Operator (5/16" Rod Eye)	P -050464-00004	
14C	1	ROD, Operator (3/8" Rod Eye)	P -050464-00002	
15	1	NUT, Jam	P -049903-00003	

### AB-1 OPERATOR & REPAIR KIT

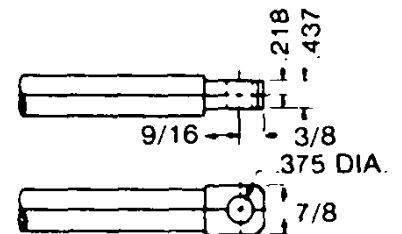
REF	QTY	DESCRIPTION	PART NO.	NOTES
16	2	PIN, Cotter	P -049913-00001	
17	1	PIN	P -060284-00000	
18	1	LINK, Connecting	P -060287-00000	
19	4	SCREW, 1/4"-20 x 5/8"	P -049908-00032	
20	10	LOCKWASHER	P -049564-00000	
21	1	BRACKET, Mounting	P -060285-00000	
22	2	SCREW, 1/4"-28 x 1-1/4"	P -049908-00031	
23	1	END, Head Complete	P -060280-00000	
24	1	SPRING	P -060283-00000	
25	1	TUBE, Stop	P -060282-00000	
26	1	PISTON & ROD, Complete	P -060276-00000	
27	1	SEAL, U-Cup	See Repair Kit	See note 1.
28	1	TUBE, Cylinder	P -060286-00000	
29	1	O-RING	See Repair Kit	See note 1.
30	1	CAP, End	P -057482-00001	
31	4	SCREW, 1/4"-28 x 7/8"	P -049908-00030	
32	1	CYLINDER, Replace	P -026712-K0000	26 thru 31

NOTES 1. Recommended spare parts to be retained in stock at all  
2. Parts not interchangeable with old lever arm design.

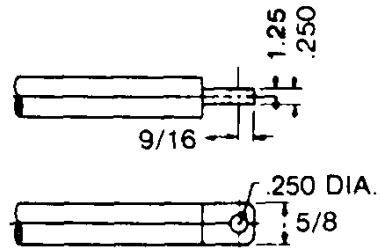
**MODEL AA-1**



**ROD END "B"**

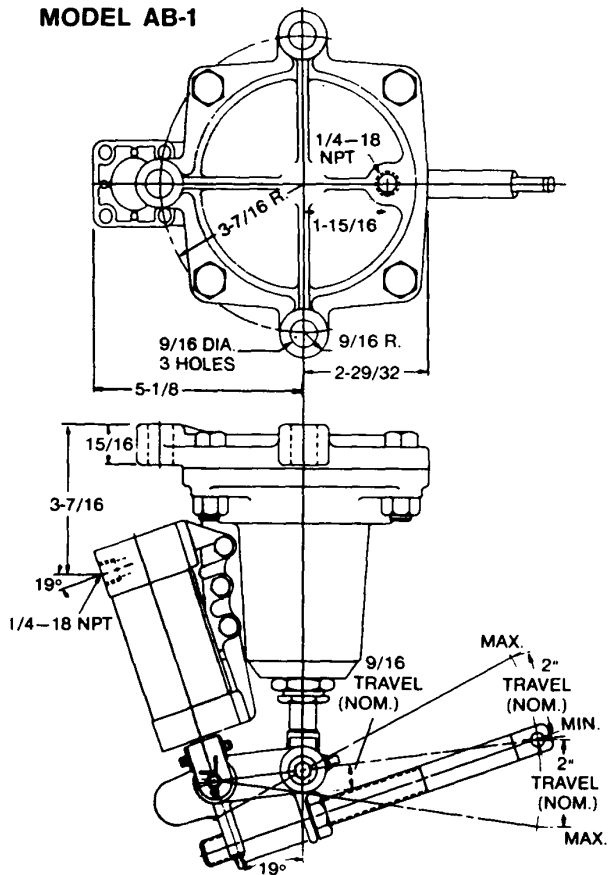


**ROD END "C"**

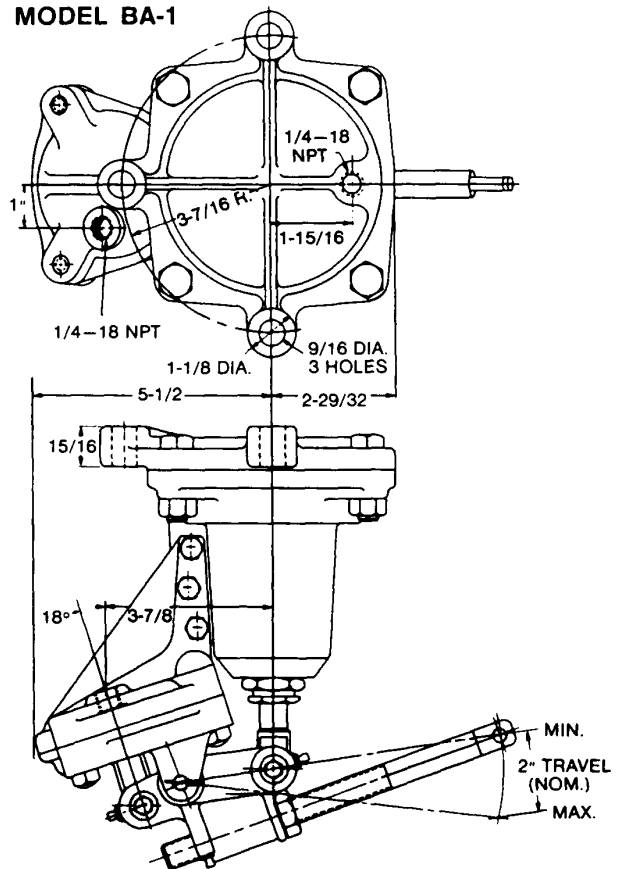


**ROD END "A"**

**MODEL AB-1**



**MODEL BA-1**





# NOTICE TO PRODUCT USERS

## 1. WARNING: FLUID MEDIA

Bosch Rexroth pneumatic devices are designed and tested for use with filtered, clean, dry, chemical free air at pressures and temperatures within the specified limits of the device. For use with media other than air or for human life support systems, Bosch Rexroth must be consulted. Hydraulic cylinders are designed for operation with filtered, clean, petroleum based hydraulic fluid; operation using fire-resistant or other special types of fluids may require special packing and seals. Consult the factory.

## 2. WARNING: MATERIAL COMPATIBILITY

Damage to product seals or other parts caused by the use of noncompatible lubricants, oil additives or synthetic lubricants in the air system compressor or line lubrication devices voids Bosch Rexroth's warranty and can result in product failure or other malfunction. See lubrication recommendations below.

**AIR LINE LUBRICANTS!** In service higher than 18 cycles per minute or with continuous flow of air through the device, an air line lubricator is recommended.\* (Do not use line lubrication with vacuum products.) However, the lubricator must be maintained since the oil will wash out the grease, and lack of lubrication will greatly shorten the life expectancy. The oils used in the lubricator must be compatible with the elastomers in the device. The elastomers are normally BUNA-N, NEOPRENE, VITON, SILICONE and HYTREL. Bosch Rexroth recommends the use of only petroleum based oils without synthetic additives, and with an aniline point between 180° F and 210° F.

**COMPRESSOR LUBRICANTS!** All compressors (with the exception of special "oil free" units) pass oil mist or vapor from the internal crankcase lubricating system through to the compressed air. Since even small amounts of non-compatible lubricants can cause severe seal deterioration (which could result in component and system failure) special care should be taken in selecting compatible compressor lubricants. It is recommended that users review the National Fluid Power Association "Recommended Guide Lines For Use Of Synthetic Lubricants In Pneumatic Fluid Power Systems" (NFPA T1.9.2-1978).

## 3. WARNING: INSTALLATION AND MOUNTING

The user of these devices must conform to all applicable electrical, mechanical, piping and other codes in the installation, operation or repair of these devices.

**INSTALLATION !** Do not attempt to install, operate or repair these devices without proper training in the technique of working on pneumatic or hydraulic systems and devices, unless under trained supervision. Compressed air and hydraulic systems contain high levels of stored energy. Do not attempt to connect, disconnect or repair these products when a system is under pressure. Always exhaust or drain the pressure from a system before performing any service work. Failure to do so can result in serious personal injury.

**MOUNTING!** Devices should be mounted and positioned in such a manner that they cannot be accidentally operated.

## 4. WARNING: APPLICATION AND USE OF PRODUCTS

The possibility does exist for any device or accessory to fail to operate properly through misuse, wear or malfunction. The user must consider these possibilities and should provide appropriate safe guards in the application or system design to prevent personal injury or property damage in the event of a malfunction.

## 5. WARNING: CONVERSION, MAINTENANCE AND REPAIR

When a device is disassembled for conversion to a different configuration, maintenance or repair, the device must be tested for leakage and proper operation after being reassembled and prior to installation.

**MAINTENANCE AND REPAIR!** Maintenance periods should be scheduled in accordance with frequency of use and working conditions. All Bosch Rexroth products should provide a minimum of 1,000,000 cycles of maintenance free service when used and lubricated as recommended. However, these products should be visually inspected for defects and given an "in system" operating performance and leakage test once a year. Where devices require a major repair as a result of the one million cycles, one year, or routine inspection, the device must be disassembled, cleaned, inspected, parts replaced as required, rebuilt and tested for leakage and proper operation prior to installation. See individual catalogs for specific cycle life estimates.

## 6. PRODUCT CHANGES

Product changes including specifications, features, designs and availability are subject to change at any time without notice. For critical dimensions or specifications, contact factory.

\*Many Bosch Rexroth pneumatic valves and cylinders can operate with or without air line lubrication; see individual sales catalogs for details.

## LIMITATIONS OF WARRANTIES & REMEDIES

Bosch Rexroth warrants its products sold by it to be free from defects in material and workmanship to the following:

For twelve months after shipment Bosch Rexroth will repair or replace (F.O.B. our works), at its option, any equipment which under normal conditions of use and service proves to be defective in material or workmanship at no charge to the purchaser. No charge will be made for labor with respect to defects covered by this Warranty, provided that the work is done by Bosch Rexroth or any of its authorized service facilities. However, this Warranty does not cover expenses incurred in the removal and reinstallation of any product, nor any downtime incurred, whether or not proved defective.

All repairs and replacement parts provided under this Warranty policy will assume the identity, for warranty purposes, of the part replaced, and the warranty on such replacement parts will expire when the warranty on the original part would have expired. Claims must be submitted within thirty days of the failure or be subject to rejection.

This Warranty is not transferable beyond the first using purchaser. Specifically, excluded from this Warranty are failures caused by misuse, neglect, abuse, improper operation or filtration, extreme temperatures, or unauthorized service or parts. This Warranty also excludes the use of lubricants, fluids or air line additives that are not compatible with seals or diaphragms used in the products. This Warranty sets out the purchaser's exclusive remedies with respect to products covered by it, whether for negligence or otherwise. Neither, Bosch Rexroth nor any of its affiliates will be liable for consequential or incidental damages or other losses or expenses incurred by reason of the use or sale of such products. Our liability (except as to title) arising out of the sale, use or operation of any product or parts, whether on warranty, contract or negligence (including claims for consequential or incidental damage) shall not in any event exceed the cost of replacing the defective products and, upon expiration of the warranted period as herein provided, all such liability is terminated. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER FOR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE. No attempt to alter, amend or extend this Warranty shall be effective unless authorized in writing by an officer of Bosch Rexroth Corporation. Bosch Rexroth reserves the right to discontinue manufacture of any product, or change product materials, design or specifications without notice.

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