BECKER
PRECISION EQUIPMENT INC.

Instruction Manual for the HPP-SB High Pressure Single-Acting Positioner

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Introduction

The Becker HPP-SB series balanced seat design, single acting positioner represents a breakthrough in valve control technology for the natural gas industry. Built to exacting specifications, this easily maintained unit offers highly accurate control characteristics over a wide range of operating environments. The HPP-SB eliminates atmospheric emissions when the control valve is in a full closed standby position; when it is in a full open monitor position; or when it is controlling in a steady-state condition. Furthermore, the HPP-SB series positioner is designed to allow bleed gas to be routed to a lower pressure system, or downstream, for complete elimination of bleed gas. The elimination of this expensive bleed gas ultimately saves a significant amount of money for the operating company and reduces the environmental impact of atmospheric hydrocarbons and diminishing natural resources.

Description

The Becker HPP-SB positioner is used to provide extremely accurate pressure control in control valve assemblies utilizing a controller or I/P transducer and single-acting actuator. The HPP-SB is designed for use with ball valves 16”* in diameter or smaller (when used with Becker single-acting control valves).

*Valves over 16” in diameter require the use of volume boosters.

Scope of Manual

This manual provides information on the installation, operation, adjustment, and maintenance of the HPP-SB positioner. For information concerning actuators, valves, and accessories, refer to the instruction manuals provided with the specific product.

Note: *Only those qualified through training or experience should install, operate, or maintain Becker positioners. If there are any questions concerning these instructions, contact your Becker sales representative, sales office, or manufacturer before proceeding.*

Technical Assistance

Should you have any questions, contact your local Becker Precision sales representative or Becker Precision technical assistance at:

Becker Precision Equipment, Inc.
Attn: Technical Assistance
950 Pratt Boulevard
Elk Grove Village, IL 60007 USA

Toll Free: (800) 323-8844
Tel: (847) 437-5940
Fax: (847) 437-2549
E-mail: Becker@bpe950.com
Website: www.bpe950.com

Technical Specifications

Input Signal:	*Standard:* 3-15 psi or 6-30 psi. *Adjustable:* Zero is adjustable from 2-30
Output Signal:	Pneumatic pressure as required by the
Loss of Signal:	*Reverse Acting:* Open on loss of signal.
Connections:	*P1, P2, P3, P4:* ½" N.P.T.
Action:	*Direct and Reverse Acting:*. Field-reversible
Performance:	*Resolution:* 0.4%*
Flow Capacity:	C_V = 1.5
Steady State	Zero.
Power Gas Requirement:	Use clean, dry filtered (100 micron) gas. *Discharging to Atmosphere:* 150 psig maximum. *Discharging to Pressure System:* 400
Operative Temperature Limits:	-20 to 160°F (-28 to 70°C).
Housing:	Meets NEMA 3 classification (weather tight).
Installation Orientation:	Vertical or horizontal position allowable.
Approximate Weight:	15 pounds.

*Performance figures for resolution and repeatability reflect those of a positioner adjusted with a minimum deadband for reduction of bleed gas. If the deadband is eliminated, bleed gas will increase slightly and resolution and repeatability will improve.

Materials of Construction

External Parts:	Anodized 2024 Aluminum
Internal Parts:	316 Stainless Steel and 2024 Anodized Aluminum
Feedback Lever:	316 Stainless Steel
Range Spring:	Plated Music Wire
Diaphragms:	Buna-N with Nylon Reinforcement
Seats and O-Rings:	Buna-N
Tubing:	316 Stainless Steel
Fittings:	316 Stainless Steel
Gauges:	2 ½" Dial Liquid filled Brass Connection with Stainless Steel Case. (Stainless Steel connection op-

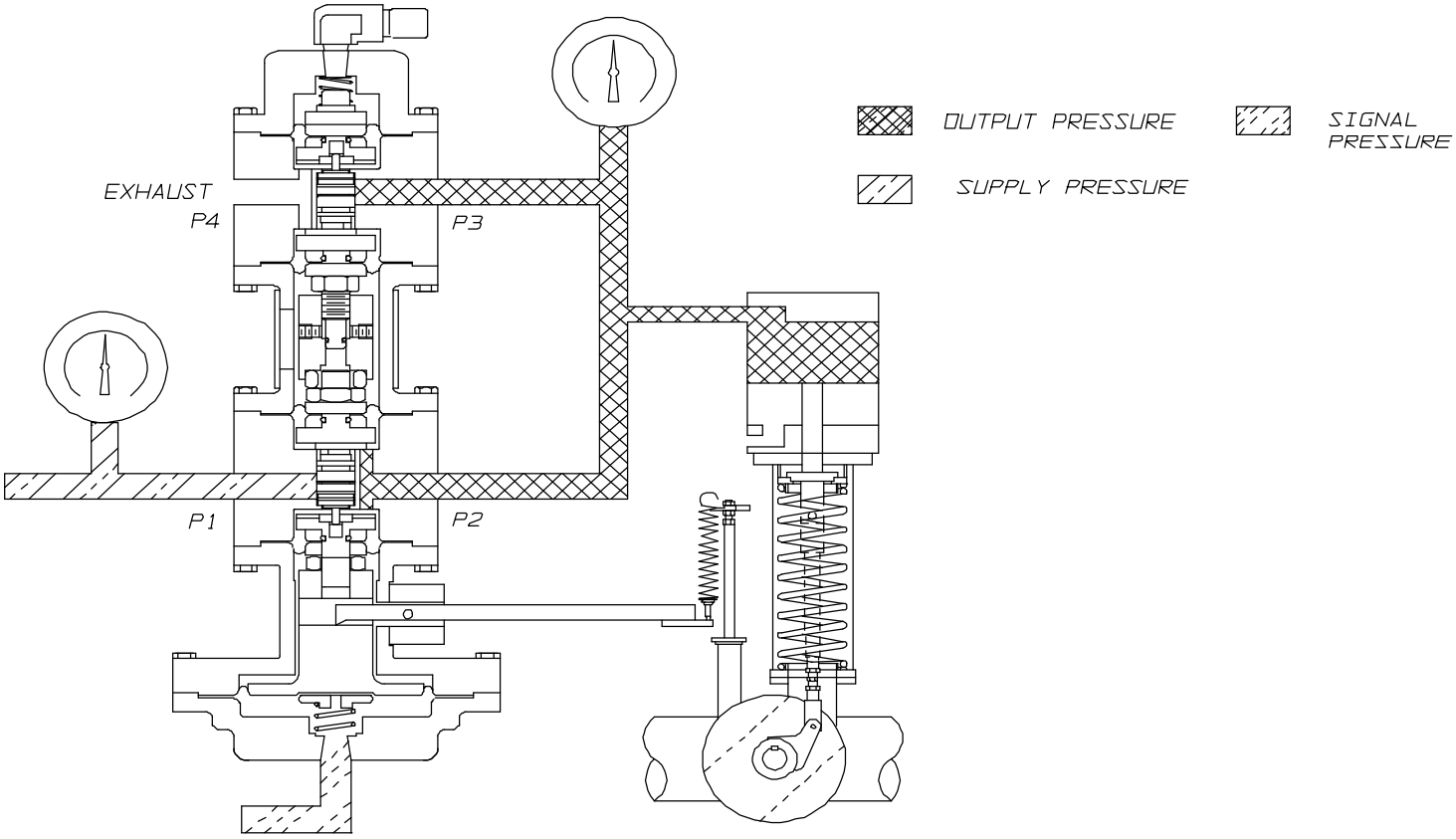
Maximum Supply Regulator Capacity

$$Q = 312.86 \times P_1 \times C_V \times \sqrt{\frac{1}{G \times (T + 460)}}$$

Q = Min. Supply Regulator Capacity (scfh)
G = Specific Gravity of Gas
T = 460 + Operative Temperature (°F)
Cv = Flow Factor (1.5 for HPP-SB)
P_1 = Supply Pressure to Positioner (psig)

Accessories

- *Atmospheric Bleed Control (**AB Control**)*: maintains minimum pressure differential across the cylinder. The AB Control is required in order to provide the necessary output to operate the control valve under all design conditions.
- *Quick Exhaust Valve*: purges high volumes of gas from the actuator when there is a need for an unusually quick response.

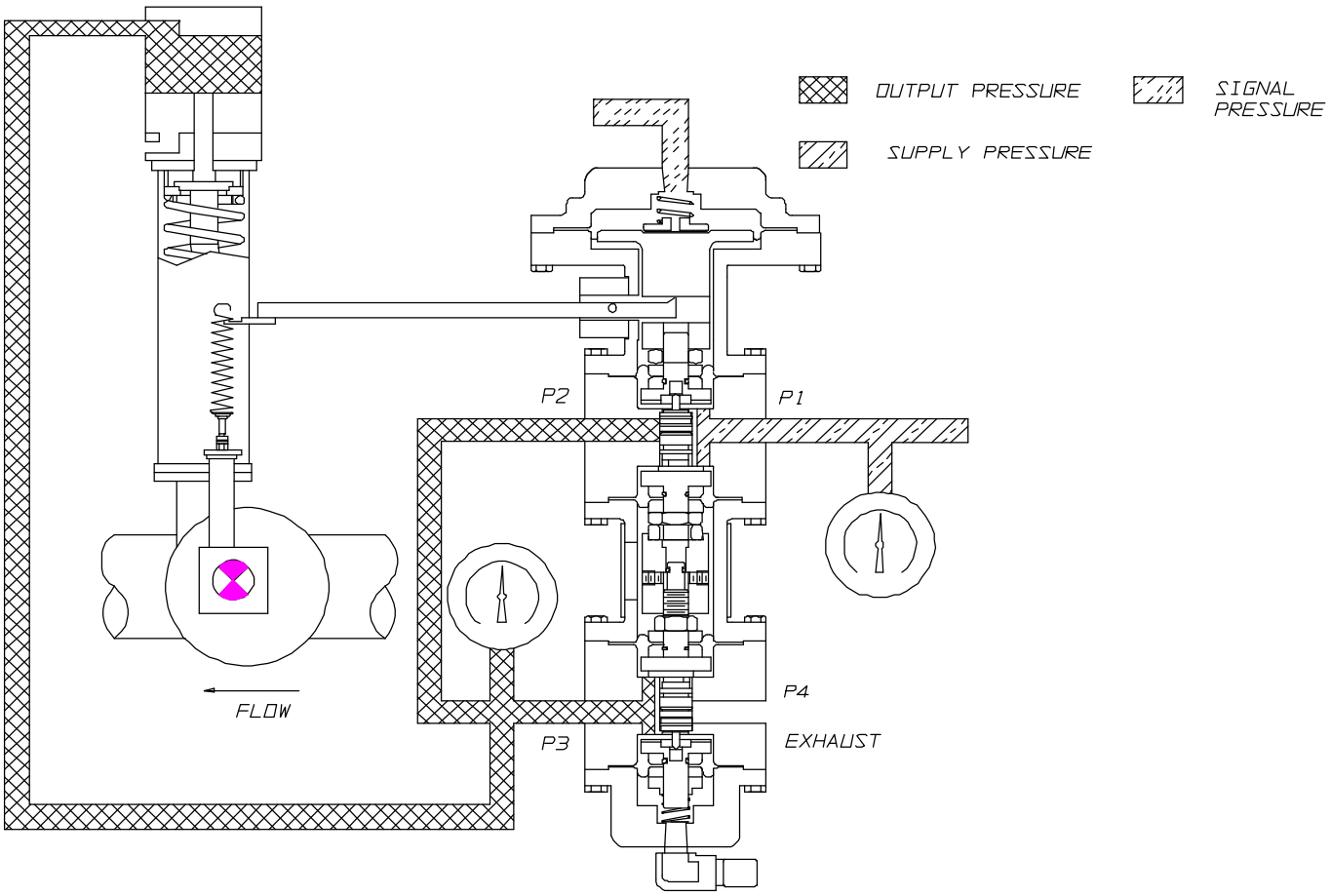


Principles of Operation

Close on Increasing Signal – Actuator Fails Open

The positioner is a force-balanced instrument that provides a control valve position proportional to a pneumatic input signal. The control valve will *open on loss of input signal*. The energy to operate the control valve is obtained from the differential between the force created by the pneumatic loading of one side of the cylinder and the opposing spring (encapsulated in the actuator spring cartridge). In steady-state, the force imposed on the balance beam by the input signal diaphragm and the range spring are equal. Therefore, the top and bottom balance valves of the positioner will be at their closed positions. The positioner does not feed gas to the cylinder or exhaust the loading pressures from the cylinder. When the spring force and cylinder force are equal, the control valve remains stationary.

An increase in the input signal pressure results in the opening of the lower balanced valve due to an imbalance in the beam forces. This increases the pressure in the cylinder, further closing the valve and compressing the actuator spring. The actuator feedback rod stretches the range spring, increasing its tension. This force, which opposes the force on the balanced beam (caused by the increasing input signal) continues to increase until the balance beam forces are in equilibrium. At this point the valve is in the correct position for the applied input signal when the actuator spring and cylinder forces again balance. The sensitivity adjustment of the positioner changes the positioner's deadband (the change in input signal necessary to create a certain amount of change in output signal).



Open on Increasing Signal – Actuator Fails Closed

The control valve will *close on loss of input signal*. The energy to operate the control valve is obtained from the differential between the force created by the pneumatic loading of one side of the cylinder and the opposing spring (encapsulated in the actuator spring cartridge). In steady-state, the forces imposed on the balance beam by the input signal diaphragm and the range spring are equal. Therefore, the top and bottom balance valves of the positioner will be in their closed positions. The positioner does not feed gas to the cylinder or exhaust loading pressures from the cylinder. When the spring force and cylinder force are equal, the control valve remains stationary.

An increase in the input signal pressure results in the opening of the upper balanced valve (due to an imbalance in the beam forces). This increases the cylinder pressure, further opening the valve and compressing the actuator spring. The actuator feedback rod retracts, stretching the range spring, and increasing its tension. This force, which opposes the force on the balanced beam (caused by the increasing input signal) continues to increase until the balance beam forces are in equilibrium. The valve is in the correct position for the applied input signal when the actuator spring and cylinder forces balance.

The sensitivity adjustment of the positioner changes the positioner's deadband (the change in input signal necessary to create a certain amount of change in output signal).

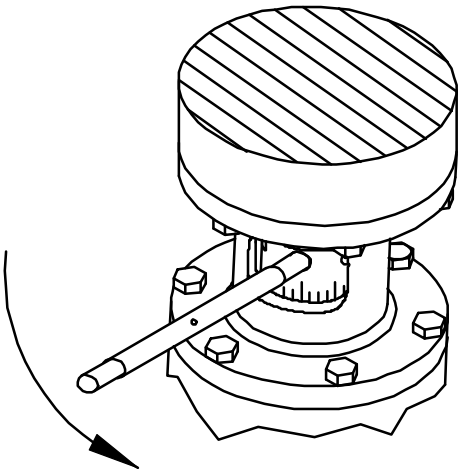
Your HPP-SB series positioner will arrive factory adjusted for your particular application. The use of the following adjustment procedures will only be necessary once a rubber goods replacement kit is installed or any other time the positioner is disassembled.

Adjustment Procedure

The Becker HPP-SB Positioner has three (3) adjustment devices:

- The *adjustment drum* adjusts the deadband.
- The *range spring* adjusts the span.
- The *adjustment screw* adjusts the bias.

Note: Before making any adjustments, be sure the positioner supply pressure and discharge pressure are at the designated settings.

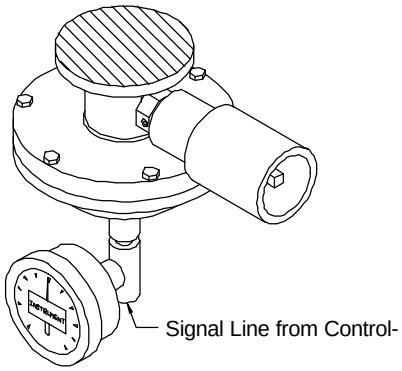


Deadband Setting

1. Remove the set screw from the drum and turn the deadband *adjustment drum* (increasing the numbers) until the drum can no longer turn. Then turn the *adjustment drum* one full turn in the opposite direction (use the numbers on the drum as a guide).

2. If not already attached, wind 3-4 coils of the *range spring* onto the retainer.

3. If not already adjusted, set the bias *adjustment screw* in the middle of its travel range.
4. Set the instrument signal pressure at the midpoint of its range (e.g.. 9 psig for a 3-15 psig range, 18 psig for a 6-30 psig range). Stroke the actuator to an intermediate position.



5. If the actuator is equipped with an MCV-3 Manual Control Valve), place the left MCV-3 handle in the manual position. If the actuator is not equipped with an MCV-3, use the block valve (1/4 " ball valve) installed between the positioner output and the actuator. Once the actuator has reached its desired position (based on the mid-signal applied to the instrument port – Step 4), place the block valve in the closed position.
6. Check the exhaust port of the positioner (remove any tubing if necessary). If exhaust port bleeds gas, turn the *adjustment drum* (decreasing numbers) until the exhaust port stops bleeding gas. If the exhaust port does not bleed gas, turn the *adjustment drum* (increasing numbers) until the exhaust port starts to bleed gas and then back the drum off slightly until the point in which it just stops bleeding. After each adjustment, fluctuate the input signal to allow output pressure to swing in both directions.

7. The unit is properly adjusted if an increase or decrease in the input signal by .1 psig causes the output gauge to swing in either direction.

If there is no gauge response, the deadband must be decreased by turning the *adjustment drum* slightly (increasing numbers). Re-check the deadband.

Note: When increasing or decreasing the instrument signal, the output pressure should swing up and down. When changing direction of the false instrument signal, the output pressure should immediately reverse direction. Any "bump" or initial reaction of the gauge in the wrong direction indicates friction (requiring the unit be rebuilt to eliminate the friction).

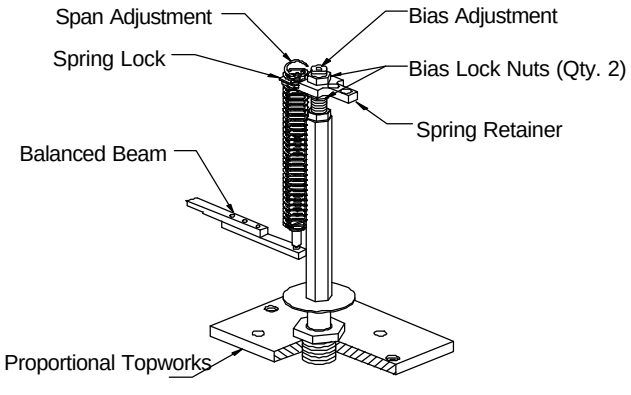
8. Replace the exhaust port fitting.

Step 9 for units bleeding to a pressure system ONLY:

9. Turn the *adjustment drum* one division (¼ of a number, NOT one full number) in the direction of increasing numbers. Re-attach exhaust port to pressure system.

Bias Adjustment

The bias, or offset, determines the input signal at which the positioner begins to stroke the valve. Give the positioner an input signal equal to the low value of the input range (usually 3 or 6 psig). The bias lock nut(s) must be loosened before adjustment.



For Standard (Non-split range) Systems:

1. To *increase* the bias setting, increase tension on the *range spring*. This is accomplished by either raising the spring retainer or screwing the bias adjustment stud into the indicator bar or tail rod. Note the two jam nuts tightened against one another to adjust the length of the stud. When properly adjusted, tighten the bias lock nut(s).

2. In order to *decrease* the bias setting, decrease tension on the *range spring* by either lowering the spring retainer or screwing the bias adjustment stud out of the indicator bar or tail rod. Note the two jam nuts tightened against one another to adjust the length of the stud. When properly adjusted, tighten the bias lock nut(s).

For Split Range Systems (see Table 1 below):

3. Find the bias *adjustment screw* (1/2-20 thread with 3/8 flats) on the end of the positioner opposite the pneumatic signal input port. Loosen the jam nut located on the *adjustment screw*.

4. To *increase* the bias setting, tighten the *adjustment screw*.

5. To decrease the bias setting, loosen the *adjustment screw*.

6. Holding the *adjustment screw* in place, tighten the jam nut against the positioner body.

Spring	**Range**
Green (20-2592)	1-6
Silver (25-1038)	2-11
Blue (25-1036)	4-20
Red (25-1037)	8-30

Table 1: Adjustable Bias Springs

Range Adjustment

Note: *There will be some interaction between range and bias adjustments. It may therefore be necessary to readjust the bias and re-check the range after completing the following steps.*

The range, or the amount of travel between the lower and upper limits of the input signal, is set with the *range spring***.** This range will typically be 12 psi for a 3-15 psi system or 24 psi for a 6-30 psi system. The limits of the range can be defined as the initial point at which the instrument signal to the **HPP-SB** creates full (equal to the power gas pressure) or zero (depending on the positioner and actuator action) output pressure.

1. After setting the bias for the start of the valve travel, continue increasing the instrument signal until full stroke of the valve is achieved.

2. The upper end of the range will be found when the valve travel indicator reaches the end of stroke AND the output pressure gauges read full power gas or zero (depending on the positioner and actuator action). Be sure not to overshoot at this point as any signal level above this upper limit will show the same reading on the cylinder gauges. This point is the highest end of the range and the value may not necessarily be equal to the desired upper range

3. If the range is less than desired (i.e. the actuator reaches its full travel in less than the specified input range), strengthen the *range spring* by winding it counterclockwise onto the *spring retainer***.** If the range is greater than desired, weaken the *range spring* by winding it clockwise. Repeat adjustments until the desired range provides full or zero output pressure.
4. If the desired range is not achieved after making the above adjustments, readjust the bias (per the previous instructions) to allow proper range adjustment.
5. It may be necessary to change the range *spring retainer* for some non-standard ranges (refer to **Table 3**).

Type	Typical Use
Short (01-2509)	8” and 12” Stroke
Intermediate (11-2572)	6” Stroke
Long (01-2042)	4” Stroke

Table 3: Range Spring Retainer

Spring Range (psi)	Stroke (Part Number)			
	4	**6**	**8**	**12**
6	01-6288	01-6287	01-6287	01-6801
12	25-1151	25-1152	25-1153	25-1154
18	25-1599	25-1600	25-1601	25-1602
24	25-1218	25-1219	25-1220	25-1221

Table 2: Range Spring Configurations

Note: For intermediate ranges, use the next size range spring.

Changing Action of Positioner

To change the positioner from *open on increasing signal* to *close on increasing signal*, or vice versa, the following parts kits must be ordered:

To change *open on increasing* to *close on increasing*: Part #25-1444 plus an Extension Rod (item #13 in drawing 35-0516, see **Table 4**). The serial number of the actuator must be specified. The exact part number of the extension rod will vary based on the actuator stroke.

To change *close on increasing* to *open on increasing*: Part #25-1289. **Note:** If converting a *close on increasing signal* positioner to *open on increasing signal*, the wide end of the tube (item #9) may be shortened by 11/16" with a hack saw in place of ordering part #25-1289.

The stroke length of the actuator cylinder MUST be specified when ordering the above part numbers. If the actuator serial number cannot be found, the stroke length can be found in the regulator model number. The stroke length is the first letter after the "H" in the model number. For example model 10H12L6FG-SR-S-HSB-40/35-100-O has a stroke length of "L", or 12 inches ["L" is the 12th letter in the alphabet]).

Refer to the drawings 35-0515 and 35-0516 in the Appendix for the following:

1. Disconnect all supply lines, instrument line, and output line from the positioner.

2. Remove the range spring (item #4) at both ends and those items connecting it to the rod (item #23) and the positioner feedback arm.

3. Remove the positioner from the bracket (item #18). The tubing and fittings on each side of the positioner must be taken off and installed in the opposite corner from their original position (see piping schematic provided by Becker Precision Equipment) then reattached to the positioner. This will allow the positioner to maintain the actuator failure mode when the positioner is turned upside down.

4. Move the bracket assembly (item #18), tube assembly (items #16 and #17), and cover plate (item #11) to the positions shown on the desired drawing.

5. Install the positioner in the opposite of its original position (upside down if it was right side up, right side up if it was upside down).

6. Using parts from the factory kit, assemble the spring and surrounding hardware according to the drawing of the desired configuration. (Note: all original parts may not be used when converting from *close on increasing* to *open on increasing*).

7. The entire bracket assembly (item #18) or the outer angle may need to be turned upside down to accommodate the new spring height.

8. Reconnect the supply, instrument, and output lines according to piping schematic supplied.

Note: The flow direction must be maintained through the positioner bodies when re-piping. (I.e. the flow [supply or exhaust] moves from P1 to P2 and P3 to P4).

Stroke	With Transmitter	Without Transmitter
4	25-8265	25-8001
6	25-8136	25-1093
8	25-1402	25-1423

Table 4: Extension Rods for Positioners to Close on Increasing Signal

Conversion to Split Range

Converting a standard positioner to a split range positioner (pneumatic input other than 3-15 psi or 6-30 psi), requires ordering the proper conversion kit from the factory. This kit will include a bias spring and bias spring cartridge. If required, it will also contain a new range spring and mounting spacers.

1. *For close on increasing positioner:*
   Remove the cap on the top of the positioner along with the spring inside it.

   For open on increasing positioner:
   Remove the mounting bracket holding the cap on the bottom of the positioner. Then remove this cap along with the spring inside it.

2. Replace the cap and spring with the larger **bias spring cartridge** and **bias spring** found in the kit. Make sure the **bias adjustment screw** in the **bias spring cartridge** is snug against the **bias spring** and the spring is centered before tightening the spring cartridge.

3. *For open on increasing positioner:*
   Remove the **washer** and **jam nut** from the **adjusting screw** in the **bias spring cartridge**. Reattach the mounting bracket upside down from its original position.

   Slide the **thread spacer** (brass bushing) over the **adjusting screw** and tighten the **washer** and **jam nut** against the **thread spacer**.

4. If a range spring was sent with the kit, remove the existing range spring and replace it with the new one.

5. Adjust the unit per the Adjustment Procedures.

Stroke	Close on Increasing	Open on Increasing	Reference Drawings
4”	25-6014	25-1464	*Proportional:* 35-0513 35-0313/A 35-0511 35-0511/A *Tailrod Mount:* 35-0533
6”	25-6014	25-1465	*Proportional:* 35-0522 35-0529
8”	25-6014	25-1466	*Tailrod:*

Table 5: Split Range Conversion Kits

Note: Refer to **Table 1** and **Table 2** for Bias and Range Spring

ASSEMBLY

NOTE: Moisten all O-rings, threads, thrust bearing, and the recess in the spring seat with a light weight silicone grease.

1. Using a 7/16" socket, press seat assembly (E) with rubber seat facing downward into bottom body (F).

1a. Insert spacer (D).

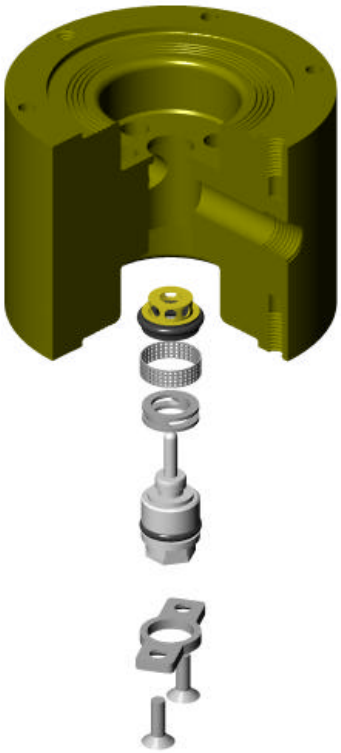
1b. Insert balanced valve assembly (C) with the stem facing downward.

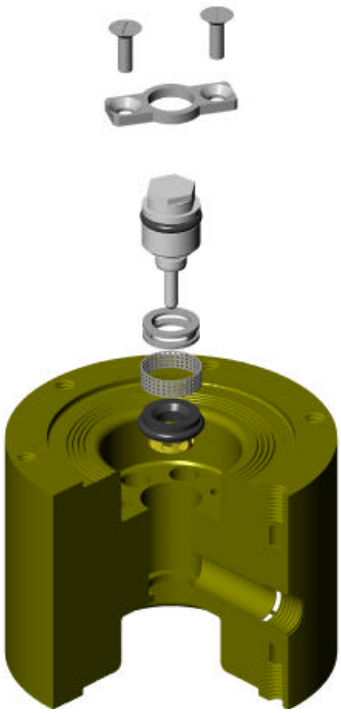
1c. Secure the assembly in bottom body (F) with seat cover (B) and two flat head machine screws (A).

2. Repeat the process by inserting second seat assembly (E) into top body (G).

2b. Insert the second spacer.

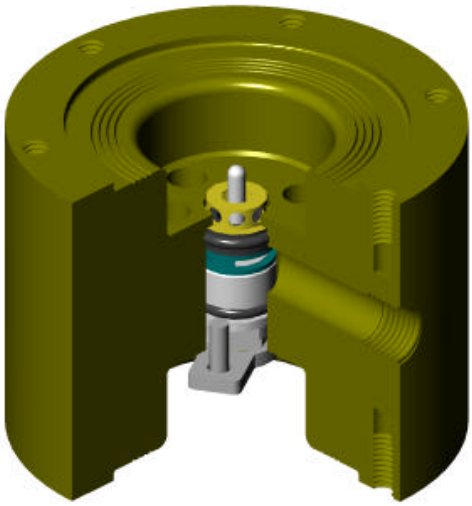
2c. Insert second balanced valve assembly(C).
2d. Secure the assembly in top body (G) with seat cover (B) and two flat head machine screws (A).

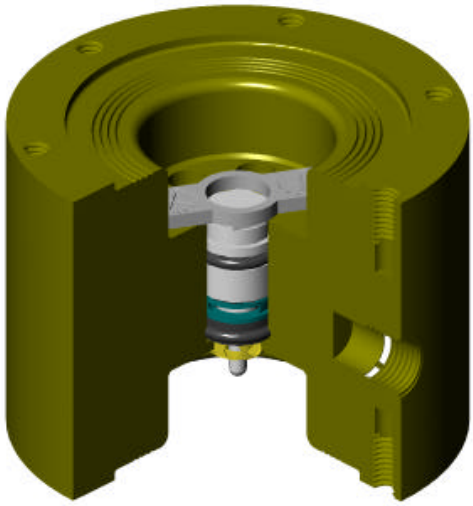




3. With the balanced valve assemblies now installed, perform a leak test of the top and bottom bodies by doing the following:

3b. Apply approximately 100 PSIG air to the supply ports of the bottom and top bodies, marked 'P1' & 'P3' respectively. Soap test around the valve seat (found on the stem side of the valve), the back end of the retainer, and ports 'P2' and 'P4'. If a leak is found, check the O-ring integrity and contamination between the balance valve and the seat.

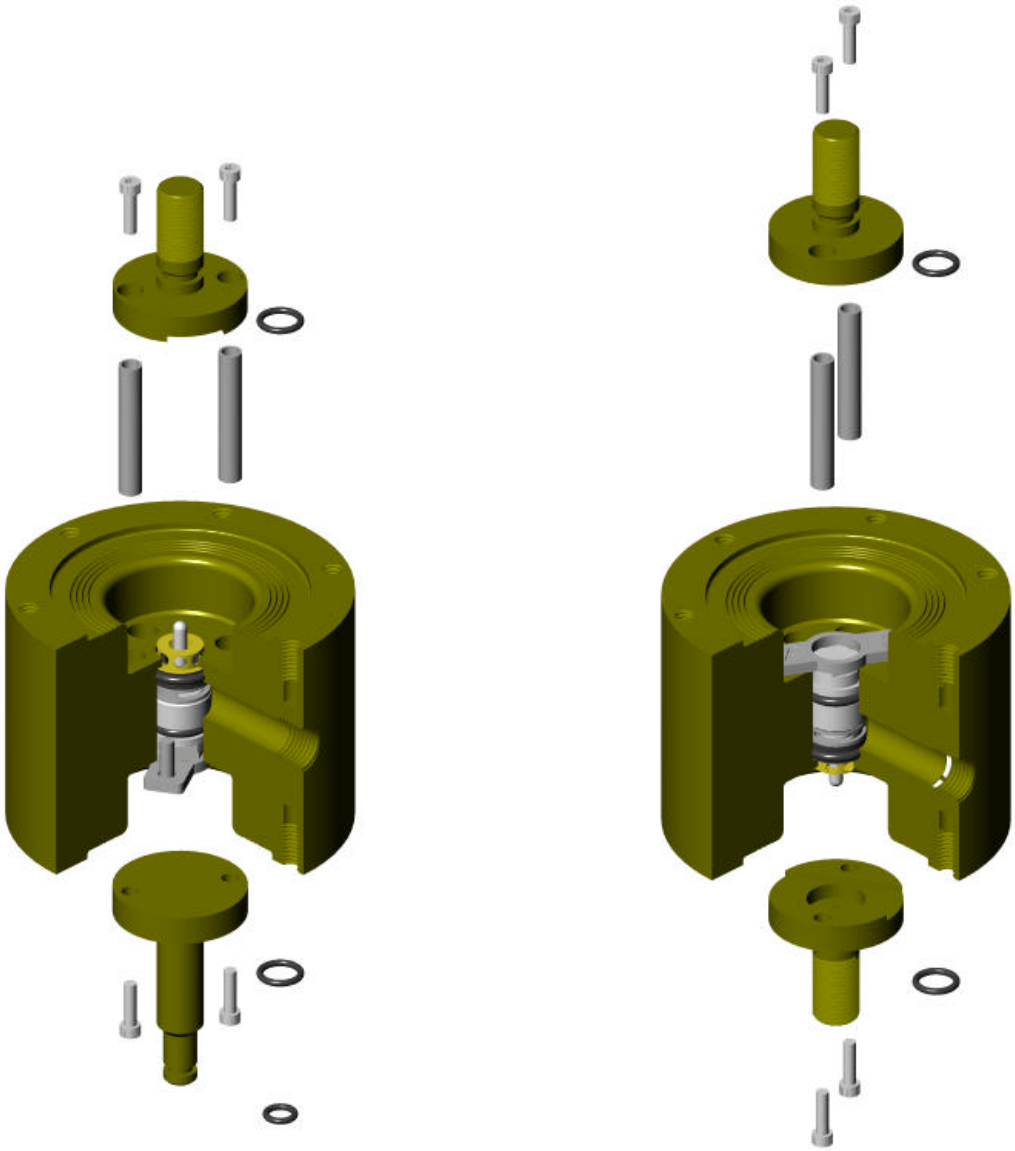




4. Install -012 O-rings (J) onto the groove on each piston and -010 O-ring (N) onto the stem of the top body's inside piston (L). DO NOT lubricate the -010 O-ring.

4a. Attach posts (H) to outside pistons (K) with 8-32 x 1/2" SHCS (I).

4b. Slide the post & outside piston assemblies through the bodies and attach them to inside pistons (L&M) with 8-32 x 1/2" SHCS (I).



5. Slide one grooved washer (O) onto each piston with the grooves facing away from the valve body.

5a. Install convoluted diaphragms (R) onto the washers (O) as shown.

5b. Install another washer (O) onto each piston with grooves facing the diaphragms.

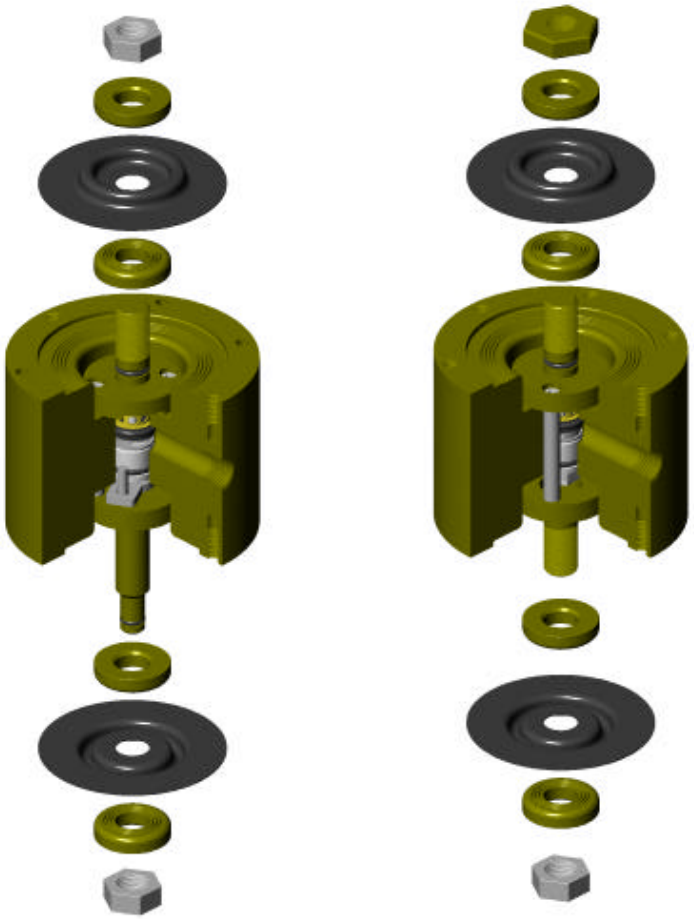
5c. Secure the diaphragm assemblies by threading the 1/2-20 hex jam nuts (S) onto the inside piston of top body (G) and the outside piston of bottom body (F).

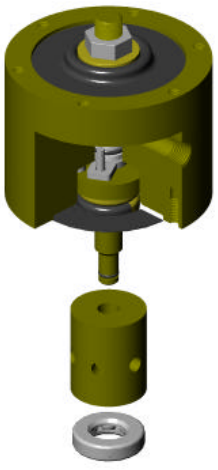
5d. Install special flat nut (Q) onto the inside piston of bottom body (F) and special spring nut (P) onto the outside piston of top body (G).

5e. Torque all nuts (S,Q,P) to 95-100 in-lbs.

6a. Press fit thrust bearing (U) into the adjusting drum with the stamped letters' side first (this will place the bearing case inside the drum with the bearing surface freely rotating).

6b. Install the adjusting drum to inside piston (L) of top body (G) by threading the drum until it touches the 1/2-20 hex jam nut.



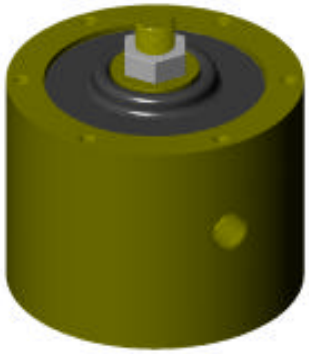


7. Center the posts in bodies (F&G) by:

   a. Rotating the diaphragm assemblies (from **Step 5**) counterclockwise until they stop (Ž) .
   b. Marking the diaphragms and bodies (F&G) with a single line.
   c. Rotating the diaphragm assemblies clockwise until they stop (ŽŽŽ).
   d. Marking bodies (F&G) with extensions from the lines on the diaphragms.
   e. Center the line on the diaphragm between the two lines on each body (ŽŽ).

8. Keeping the diaphragms securely in the center, between the inscribed lines, fasten sensitivity spacer (V) to top and bottom bodies (F&G) with twelve 1/4-20 x 3/4" HHCS (W). This will prevent the diaphragm assemblies from moving.

NOTE: Align numbers stamped on the positioner parts in numerical order.



9. Install spring (Y) and spring cartridge (X) onto top body (G) with 1/4-20 x 3/4 HHCS (W). Torque to 95-100 in. lbs.

10. Attach beam spacer (Z) to bottom body (F), so the opening in it faces the opposite direction of the opening in the sensitivity spacer. Secure with six 1/4-20 x 3/4 HHCS (W). Torque to 95-100 in-lbs.

11. Thread beam drum (AA) onto the bottom piston of the bottom body all the way and then turn back one full rotation.

NOTE: Slot in drum (AA) must line up with the beam spacer slot. To adjust the position of the drum (AA) turn it in the same direction.

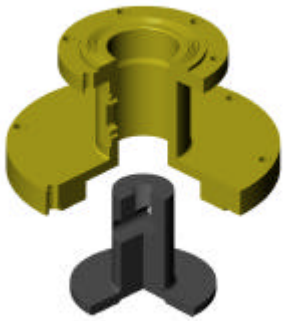
NOTE: The Following 3 steps (12,13,14) must be done with the positioner in vertical upside down position.

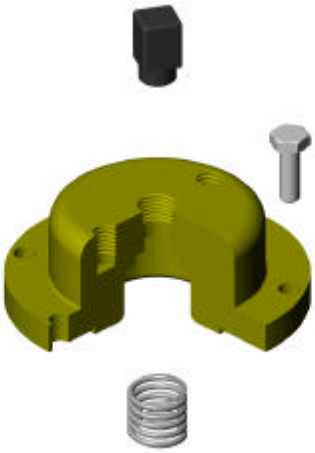
12. Place diaphragm (DD) over beam drum (AA), so convolute will slip into the gap between it and beam spacer (Z).

13. Install spring (Y) onto spring seat (EE) and place assembly onto the center of the diaphragm.

14. Install pressure cartridge (CC) and secure it with six 1/4-20 x 1" HHCS (FF). Torque to 95-100 in. lbs.

15. Connect beam (GG) and beam block (HH) with 1/8" roll pin (II). Attach this assembly to the beam





Model HPP-SB Single-Acting Positioner Annual Maintenance Checklist

(refer to back page of HPP-SB Single-Acting Positioner Instruction Manual)

1. _____ **Soap test all diaphragm mating surfaces to check for leaks.**

2. _____ **Replace rubber goods utilizing Becker Model HPP-SB Single-Acting Positioner Repair Kit if necessary.**
   Refer to Pages 12-17, HPP-SB Assembly Procedures.

3. _____ **Confirm Power Gas Supply Pressure is correct.**
   Refer to original Becker invoice paperwork for proper power gas setting.

4. _____ **Observe operation of gages and replace if defective.**

5. _____ **Confirm zero steady-state bleed gas of Model HPP-SB.**
   Refer to Procedure 1 through 9, Pages 7-8, Adjustment Procedure

6. _____ **Check sensitivity of HPP-SB positioner. Movement of output gauge should occur within ±0.1 psig change of instrument signal.**
   Refer to Procedure 6-8, pages 6-7, Adjustment Procedure

7. _____ **Check range and bias of HPP-SB positioner and adjust if necessary.**
   Refer to Procedure B.1 through C.2, Pages 2-3,.

8. _____ **Inspect and Verify Proper Operation of all HPP-SB Positioner Accessories.**
   Refer to technical manual included with each specific instrumentation accessory for further instruction.

Note: It is not necessary to replace any rubber goods in Becker Precision Equipment instrumentation or instrumentation accessories on a regular basis. However, common practice suggests that replacement of rubber goods on a 5-year cycle basis provides adequate preventative maintenance.

Parts Ordering

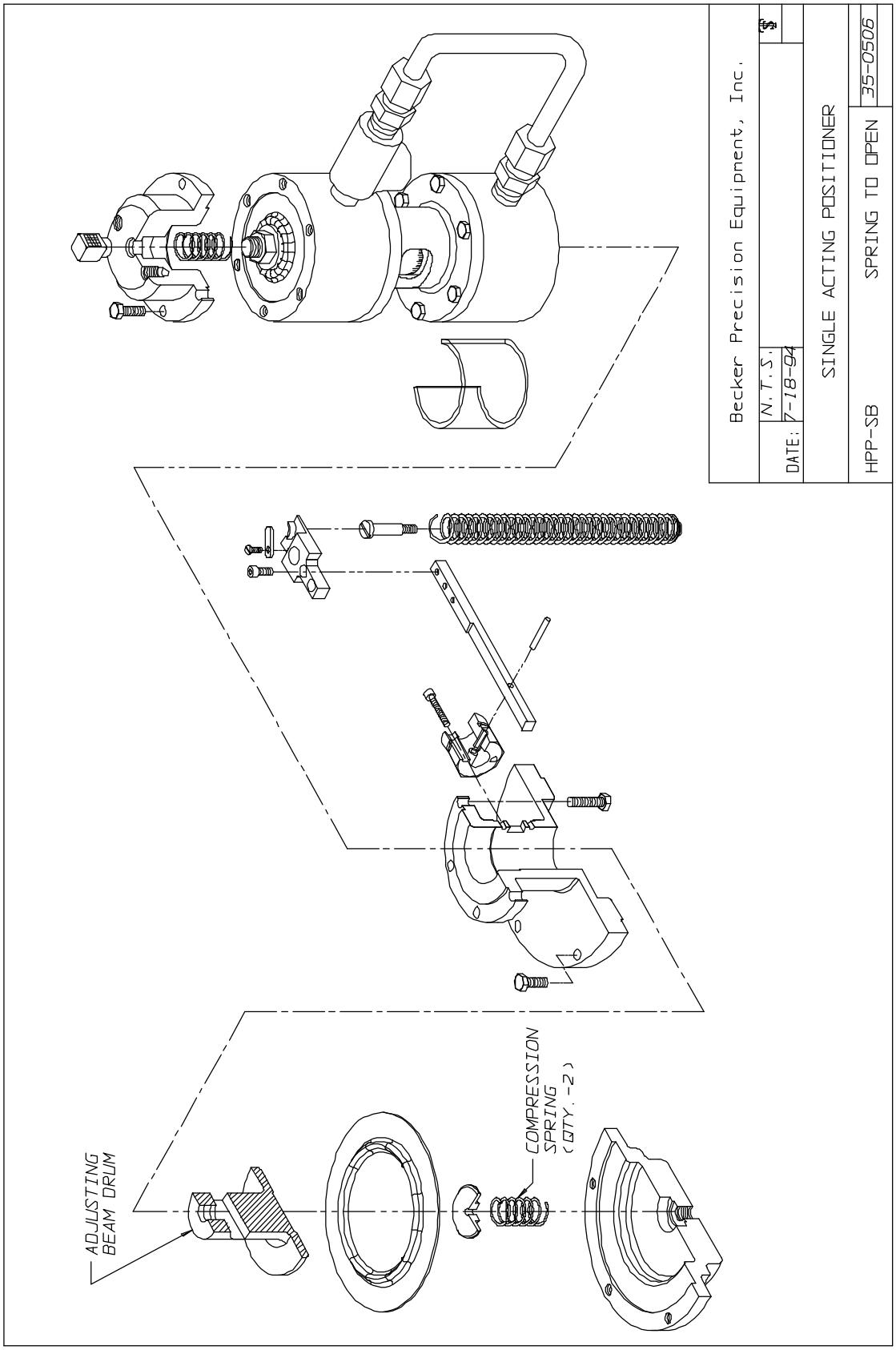
The following is provided to allow the ordering of replacement parts. Please specify the Becker valve regulator serial number when ordering parts (this can be found on the Stainless Steel attached to the positioner by on of the 7/16 hex head cap screws.

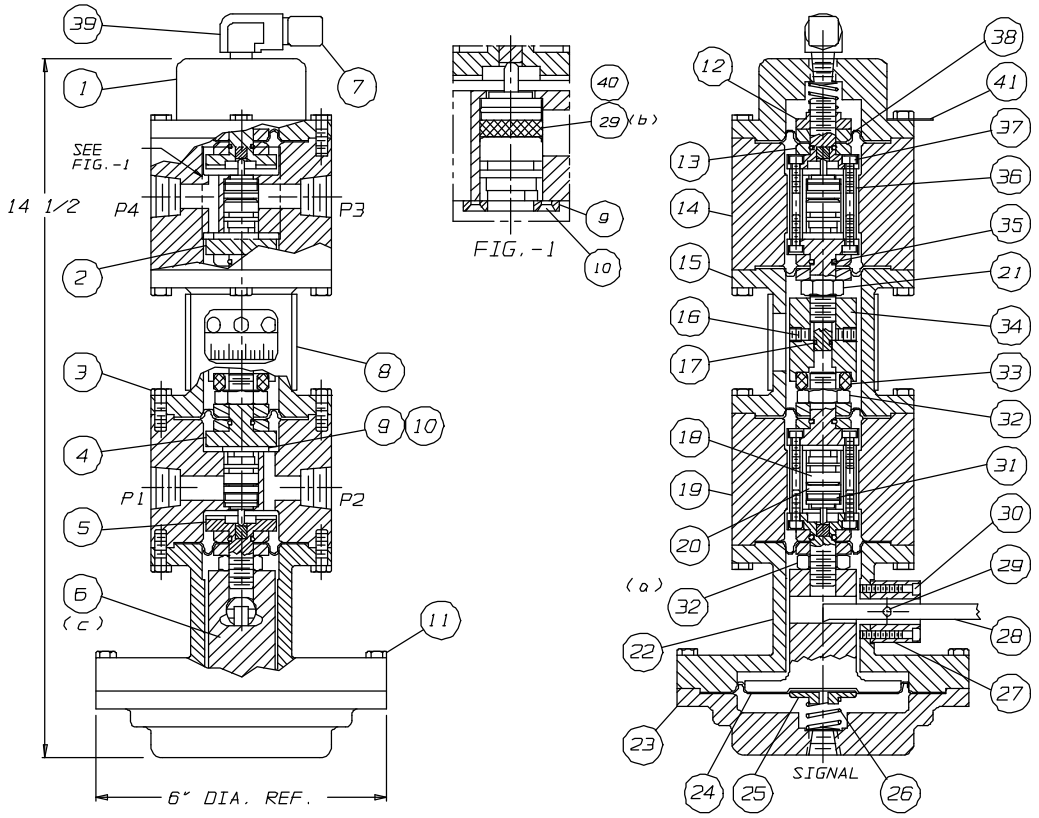
Drawing #35-0501

Key	Description	Part No.
1	Spring Cartridge	25-1094
2	Top Inside Piston	35-1528
3	¼-20 x ¾" HHCS S.S.	98-3137
4	Bottom Inside Piston	35-1529
5	Outside Piston	35-1506
6	Beam Adjustment Drum	25-1124
7	¼ NPT Vent Elbow	01-2572
8	Lexan Cover	25-1034
9	Seat Cover	35-1519
10	10-32 x 3/8" FHMS S.S.	98-2684
11	¼-20 x 1" SHCS S.S.	98-3149
12	Spring Nut	25-1076
13	Washer	25-1016
14	Single Top Body	35-1536
15	Sensitivity Spacer	25-1015
16	¼-20 x ½" S.S.S.	98-2761
17	O-Ring –010	95-2609
18	Balance Valve Assembly	35-1510
19	Single Bottom Body	35-1537
20	Seat Cover	35-1526
21	½-20 Hex Nut S.S.	98-3056
22	Beam Spacer	25-1081
23	0-30 Pressure Cartridge	25-1082
24	Diaphragm	25-1213
25	Spring Retainer	25-1123
26	Spring	25-1217
27	Beam Block	25-1086
28	Pivoted Beam	25-1084
29	1/8 Roll Pin	98-2950
30	8-32 x 1" SHCS S.S.	98-3144
31	Seat Assembly	01-7082
32	½-20 Aluminum Nut	25-1065
33	Thrust Bearing	25-1062
34	Adjusting Drum	35-1534
35	O-Ring -012	95-2615
36	Pilot Post	35-1535
37	8-32 x ½ SHCS	98-2614
38	Diaphragm w/ Convolute	25-1027
39	¼ NPT S.S ST. Elbow	94-2511
40	Strainer for B.V.	35-1559
41	S.S. Control Tag	25-1060

Seal Kit

A seal kit containing diaphragms, o-rings, seats, and balance valve assemblies for the HPP-SB positioner is available directly from Becker. Simply contact Becker Precision Equipment and refer to the following part number:


Becker Precision Equipment, Inc.
N.T.S.
DATE: 7-18-94
SINGLE ACTING POSITIONER
35-0506
HPP-SB
SPRING TO OPEN
COMPRESSION SPRING (QTY. -2)
ADJUSTING BEAM DRUM



ITEM	QTY.	PART NO.	DESCRIPTION	ITEM	QTY.	PART NO.	DESCRIPTION
1.	1	25-1094	SPRING CARTRIDGE	21.	1	98-3056	1/2-20 HEX NUT S.S.
2.	1	35-1528	TOP INSIDE PISTON	22.	1	25-1081	BEAM SPACER
3.	24	98-3137	1/4-20 X 3/4 WHCS 316 S.S.	23.	1	25-1082	3-15 PRESSURE CARTRIDGE
4.	1	35-1529	BOTTOM INSIDE PISTON	24.	1	25-1213	DIAPHRAGM
5.	2	35-1506	OUTSIDE PISTON	25.	1	25-1123	SPRING RETAINER
6.	1	25-1124	BEAM ADJUSTING DRUM	26.	2	25-1217	SPRING
7.	1	01-2572	1/4 NPT VENT ELBOW	27.	1	25-1086	BEAM BLOCK
8.	1	25-1034	LEXAN COVER	28.	1	25-1084	PIVOTED BEAM
9.	2	35-1519	SEAT COVER	29.	1	98-2950	1/8 ROLL PIN
10.	4	98-2684	10-32 X 3/8 FHSHMS S.S.	30.	2	98-3144	8-32 X 1" SHCS 316 S.S.
11.	6	98-3149	1/4-20 X 1" SHCS 316 S.S.	31.	2	01-7082	SEAT ASSY.
12.	1	25-1076	SPRING NUT	32.	2	25-1065	1/2-20 ALUMINUM NUT
13.	8	25-1016	WASHER	33.	1	25-1062	THRUST BEARING
14.	1	35-1536	SINGLE TOP BODY	34.	1	35-1534	ADJUSTING DRUM
15.	1	25-1015	SENSITIVITY SPACER	35.	4	95-2615	O-RING -012
16.	1	98-2761	1/4-20 X 1/2 S.S.S.	36.	4	35-1535	PILOT POST
17.	1	95-2609	O-RING -010	37.	8	98-2614	8-32 X 1/2 SHCS
18.	2	35-1510	BALANCE VALVE ASSY.	38.	4	25-1027	DIAPHRAGM W/CONVOLUTE
19.	1	35-1537	SINGLE BOTTOM BODY	39.	1	94-2511	1/4 NPT S.S. ST. ELBOW
20.	2	35-1526	SEAT SPACER	40.	2	35-1559	STRAINER FOR B.V.
				41.	1	25-1060	S.S. CONTROL TAG

NOTES:

1) ITEMS NO. 3, 11, 12, 21 AND 32 ARE TORQUED TO 95-100 in.lbs.

2) FOR SOFT GOOD KIT REF. TO #35-0210.

REP#	BY	DATE	REVISION
N/A	TS	10-15-98	(c) ITEM 6 HARD ANODIZED
E797	TS	10-9-97	(b) STRAINER WAS ADDED
N/A	TS	9-15-97	(a) NUT WAS STANDARD #32

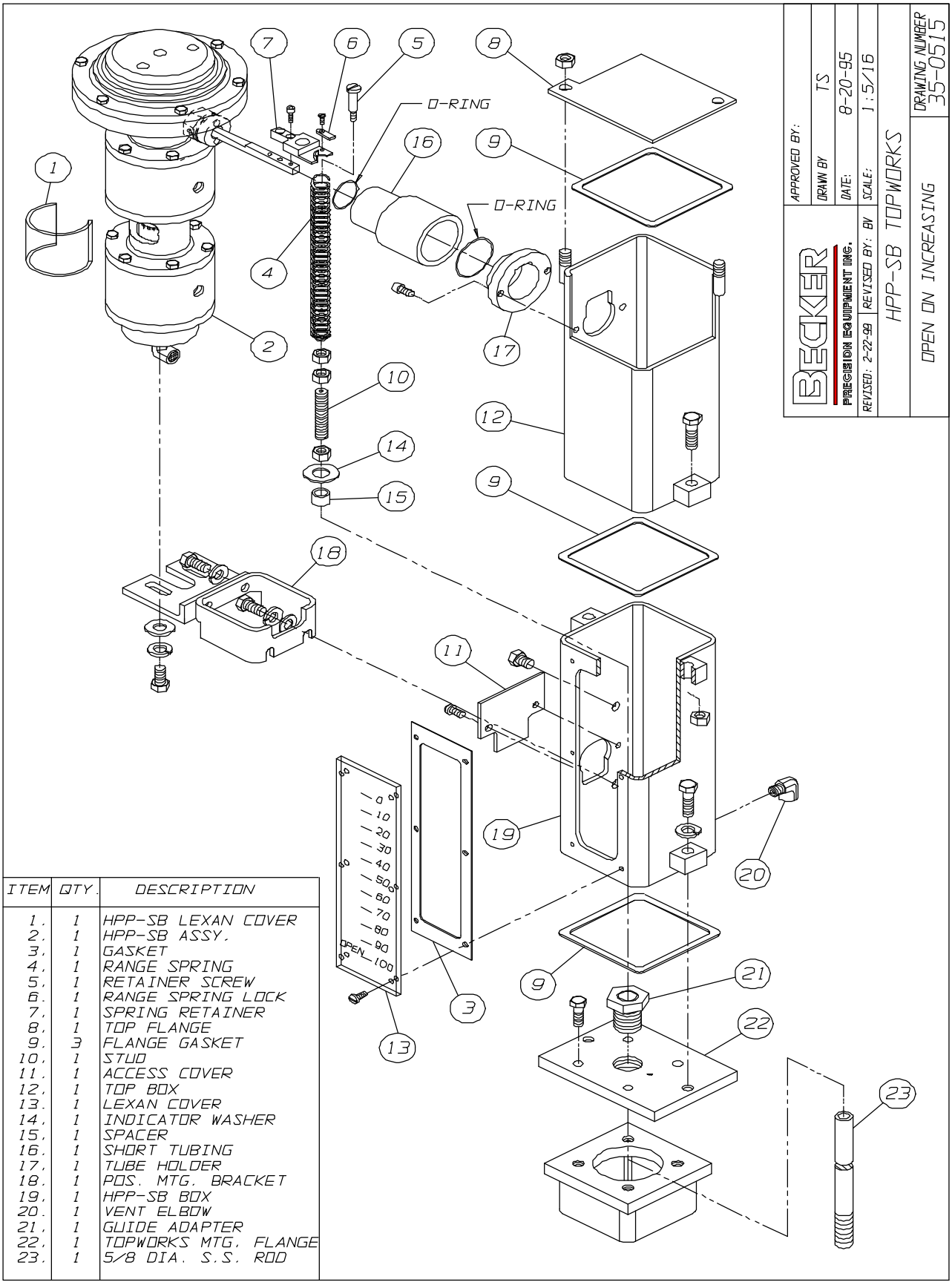
BECKER PRECISION EQUIPMENT INC.

APPROVED BY:	
DRAWN BY	TS
DATE:	10-8-97
SCALE:	N.T.S.
REVISED 4-15-98	REVISED BY: BV

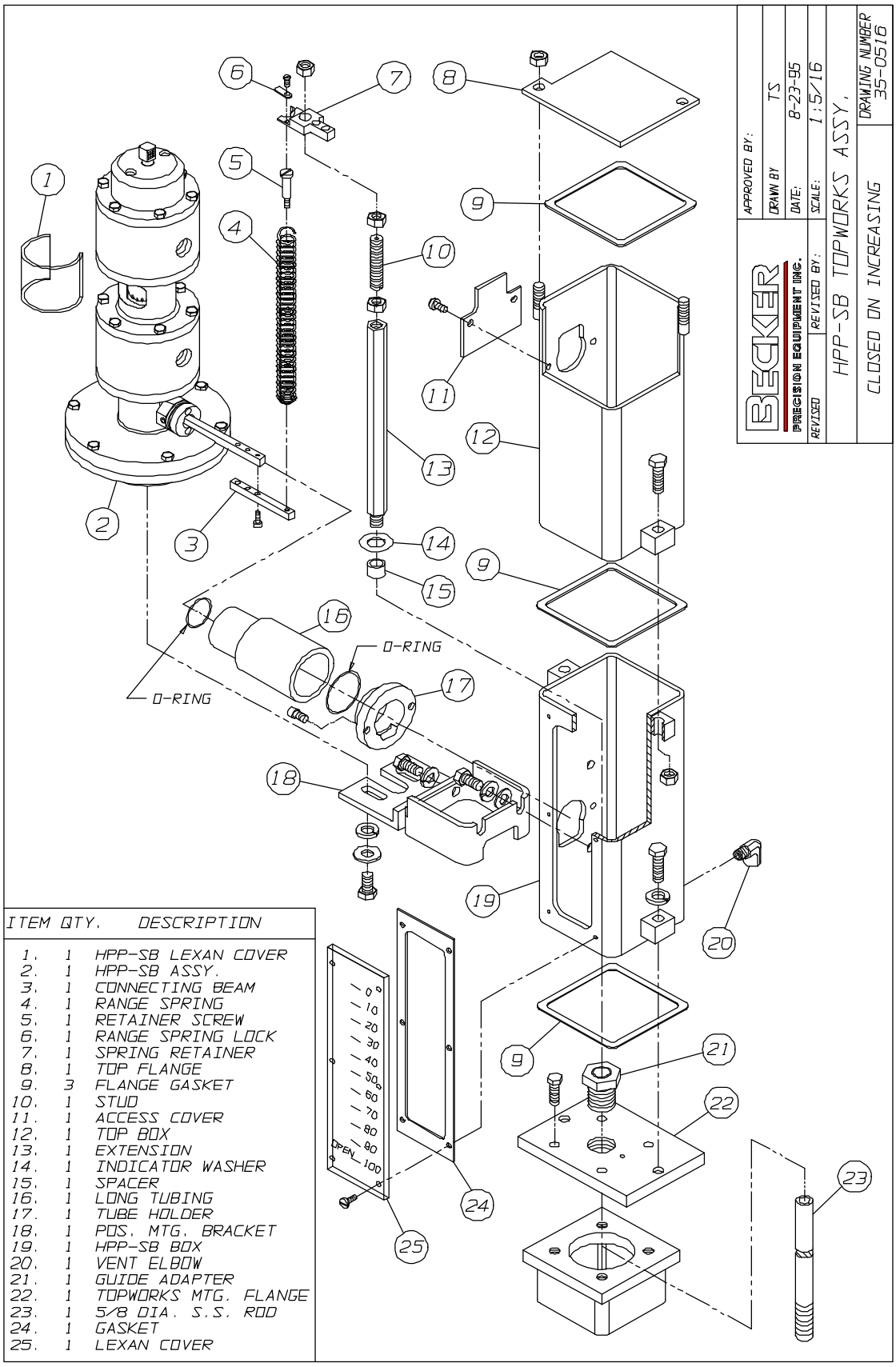
SINGLE ACTING POSITIONER

MODEL HPP-SB

DRAWING NUMBER 35-0501



ITEM	QTY.	DESCRIPTION
1.	1	HPP-SB LEXAN COVER
2.	1	HPP-SB ASSY.
3.	1	GASKET
4.	1	RANGE SPRING
5.	1	RETAINER SCREW
6.	1	RANGE SPRING LOCK
7.	1	SPRING RETAINER
8.	1	TOP FLANGE
9.	3	FLANGE GASKET
10.	1	STUD
11.	1	ACCESS COVER
12.	1	TOP BOX
13.	1	LEXAN COVER
14.	1	INDICATOR WASHER
15.	1	SPACER
16.	1	SHORT TUBING
17.	1	TUBE HOLDER
18.	1	POS. MTG. BRACKET
19.	1	HPP-SB BOX
20.	1	VENT ELBOW
21.	1	GUIDE ADAPTER
22.	1	TOPWORKS MTG. FLANGE
23.	1	5/8 DIA. S.S. ROD



ITEM	QTY.	DESCRIPTION
1.	1	HPP-SB LEXAN COVER
2.	1	HPP-SB ASSY.
3.	1	CONNECTING BEAM
4.	1	RANGE SPRING
5.	1	RETAINER SCREW
6.	1	RANGE SPRING LOCK
7.	1	SPRING RETAINER
8.	1	TOP FLANGE
9.	3	FLANGE GASKET
10.	1	STUD
11.	1	ACCESS COVER
12.	1	TOP BOX
13.	1	EXTENSION
14.	1	INDICATOR WASHER
15.	1	SPACER
16.	1	LONG TUBING
17.	1	TUBE HOLDER
18.	1	POS. MTG. BRACKET
19.	1	HPP-SB BOX
20.	1	VENT ELBOW
21.	1	GUIDE ADAPTER
22.	1	TOPWORKS MTG. FLANGE
23.	1	5/8 DIA. S.S. ROD
24.	1	GASKET
25.	1	LEXAN COVER

ITEM	QTY.	PART NO.	DESCRIPTION
1.	1	95-2644	O-RING -030
2.	1	25-1133	TUBE HOLDER
3.	1	25-1084	PIVOTED BEAM
4.	1	25-1289	SHORT TUBING
5.	1	95-2643	O-RING -024
6.	1	25-1310	ACCESS COVER
7.	2	98-2780	3/8 FLAT WASHER
8.	1	25-1311	POS. MTG. BRACKET
9.	2	98-2782	3/8 I.D. LOCKWASHER
10.	1	98-2985	3/8-16 X 1 1/2 HHCS
11.	1	98-3157	1/2" SHOULDER BOLT
12.	2	55-4259	COVER
13.	2	25-8055	GASKET
14.	1	25-1095	RANGE SPRING RETAINER
15.	1	50-1230	FLANGE
16.	1	25-1149	RANGE SPRING LOCK
17.	1	98-3171	8-32 X 3/8 SHCS
18.	1		RANGE SPRING
19.	1	01-2042	SPRING RETAINER SCREW
20.	1	50-1806	4" STK. SCREW EXTENSION
21.	1	25-1141	ZERO ADJUSTING SCREW
22.	3	98-2500	7/16-20 JAM NUT
23.	1	25-1122	INDICATOR WASHER
24.	1	50-1283	SPACER
25.	1	55-4241	S.S. ROD 5/8 X 7 3/8 LG.
26.	1	55-4205	GUIDE ADAPTER
27.	1	55-1004	ROD CLEVIS
28.	1	01-2523	ROD CLEVIS PIN
29.	1	55-1219	CONNECTING LINK
30.	1	55-4242	CONNECTING LINK BAR
31.	1	55-4255	PROP. TOPWORKS HOUSING
32.	1	98-3202	5/16-18 X 1" S.S.S.
33.	1	98-2563	5/16-18 HEX NUT
34.	3	50-1810	FLANGE GASKET
35.	1	55-4218	6" STK. TOP BOX
36.	1	55-4207	6" STK. POSITIONER BOX
37.	1	55-4203	TOPWORKS MTG. FLANGE
38.	1	98-2620	5/8-11 HEX NUT
39.	1	55-4261	BOX COVER
40.	1	55-4260	EXTENDED STEM

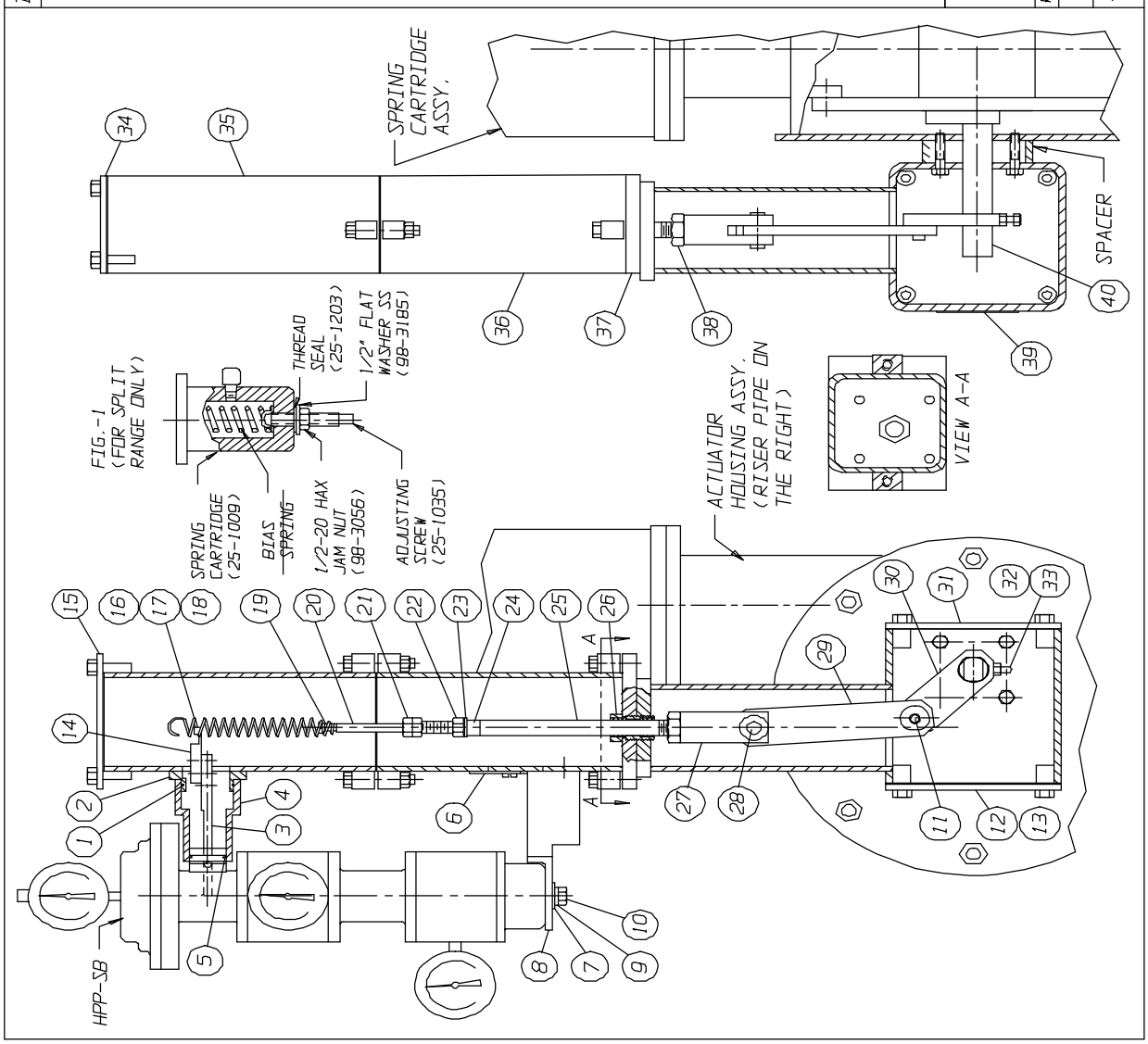
BECKER PRECISION EQUIPMENT INC.

APPROVED BY:
DRAWN BY: TS
DATE: 12-12-95
SCALE: N.T.S.
REVISED BY:
REVISED

4" STK. PROP. TOPWORKS ASSY.

SR DESIGN HSB-01-4-PT/XX
POSITIONER LEFT MTG.

DRAWING NUMBER 35-0513



ITEM	QTY.	PART NO.	DESCRIPTION
1.	1	95-2644	O-RING -030
2.	1	25-1133	TUBE HOLDER
3.	1	25-1084	PIVOTED BEAM
4.	1	25-1289	SHORT TUBING
5.	1	95-2643	O-RING -024
6.	1	25-1310	ACCESS COVER
7.	2	98-2780	3/8 FLAT WASHER
8.	1	25-1311	POS. MTG. BRACKET
9.	2	98-2782	3/8 I.D. LOCKWASHER
10.	1	98-2985	3/8-16 X 1 1/2 HHCS
11.	1	98-3157	1/2" SHOULDER BOLT
12.	2	55-4259	COVER
13.	2	25-8055	GASKET
14.	1	25-1095	RANGE SPRING RETAINER
15.	1	50-1230	FLANGE
16.	1	25-1149	RANGE SPRING LOCK
17.	1	98-3171	B-32 X 3/8 SHCS
18.	1		RANGE SPRING
19.	1	01-2042	SPRING RETAINER SCREW
20.	1	50-1806	4" STK. SCREW EXTENSION
21.	1	25-1141	ZERO ADJUSTING SCREW
22.	3	98-2500	7/16-20 JAM NUT
23.	1	25-1122	INDICATOR WASHER
24.	1	50-1283	SPACER
25.	1	55-4241	S.S. ROD 5/8 X 7 3/8 LG.
26.	1	55-4205	GUIDE ADAPTER
27.	1	55-1004	ROD CLEVIS PIN
28.	1	01-2523	ROD CLEVIS
29.	1	55-1219	CONNECTING LINK
30.	1	55-4242	CONNECTING LINK BAR
31.	1	55-4255	PROP. TOPWORKS HOUSING
32.	1	98-3202	5/16-18 X 1" S.S.S.
33.	1	98-2563	5/16-18 HEX NUT
34.	3	50-1810	FLANGE GASKET
35.	1	55-4218	6" STK. TOP BOX
36.	1	55-4207	6" STK. POSITIONER BOX
37.	1	55-4203	TOPWORKS MTG. FLANGE
38.	1	98-2620	5/8-11 HEX NUT
39.	1	55-4261	BOX COVER
40.	1	55-4260	EXTENDED STEM

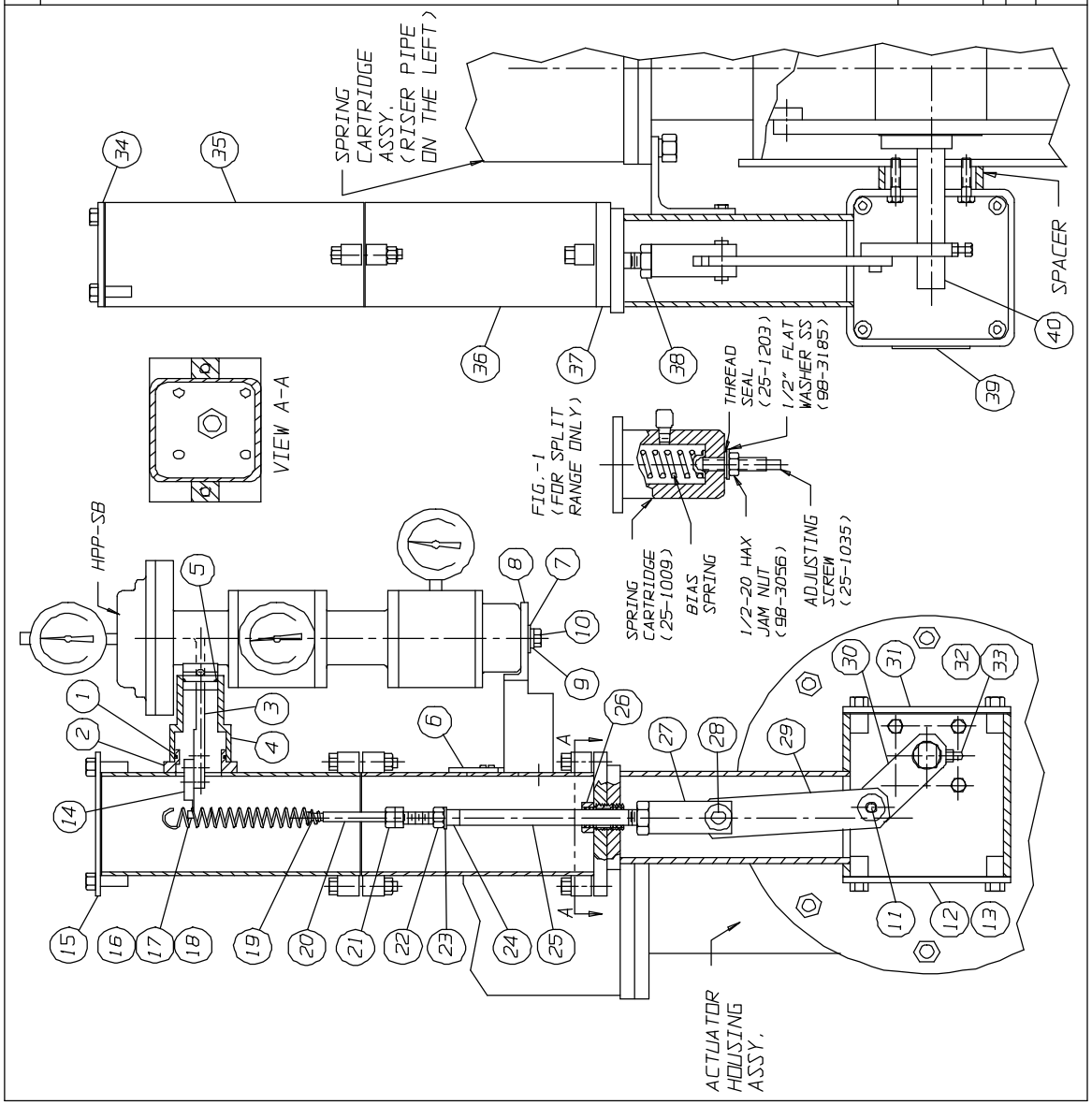
BECKER PRECISION EQUIPMENT INC.

APPROVED BY:
DRAWN BY: TS
DATE: 3-4-97
SCALE: N.T.S.
REVISED 1-5-98 | REVISED BY: TS

4" STK. PROP. TOPWORKS ASSY.

SR DESIGN HSB-01-4-PT/XX
POSITIONER RIGHT MTG.

DRAWING NUMBER
35-0513/A



ITEM	QTY.	PART NO.	DESCRIPTION
1.	1	50-1230	FLANGE
2.	1	25-1310	ACCESS COVER
3.	1		RANGE SPRING
4.	1	25-1149	RANGE SPRING LOCK
5.	1	98-3171	8-32 X 3/8 SHCS
6.	1	25-1133	TUBE HOLDER S.S.S.
7.	1	95-2643	O-RING -024
8.	1	25-1311	MTG. BRACKET
9.	1	25-1084	PIVOTED BEAM
10.	1	25-1134	LONG TUBING
11.	1	95-2644	O-RING -030
12.	1	98-3157	1/2" SHOULDER BOLT
13.	2	55-4259	6" SQ. BOX COVER
14.	2	25-8055	6" SQ. GASKET
15.	1	25-1141	7/16-20 X 2 3/4 STUD
16.	3	98-2500	7/16-20 JAM NUT
17.	1	25-1095	RANGE SPRING RETAINER
18.	1	25-8001	4" STK. EXTENSION
19.	1	25-1122	INDICATOR WASHER
20.	1	50-1283	SPACER
21.	1	11-2572	SPRING RETAINER SCREW
22.	1	25-1085	CONNECTING BEAM
23.	1	55-4241	S.S. ROD 5/8 X 7 3/8 LG.
24.	1	55-4205	GUIDE ADAPTER
25.	1	55-1004	ROD CLEVIS
26.	1	01-2523	ROD CLEVIS PIN
27.	1	55-1219	CONNECTING LINK
28.	1	55-4242	CONNECTING LINK BAR
29.	1	55-4255	PROP. TOPWORKS HOUSING
30.	1	98-3202	5/16-18 X 1 S.S.S.
31.	1	98-2563	5/16-18 HEX NUT
32.	3	50-1810	FLANGE GASKET
33.	1	55-4218	6" STK. TOP BOX
34.	1	55-4207	6" STK. POSITIONER BOX
35.	1	55-4203	TOPWORKS MTG. FLANGE
36.	1	98-2620	5/8-11 HEX NUT
37.	1	55-4261	BOX COVER
38.	1	55-4260	EXTENDED STEM

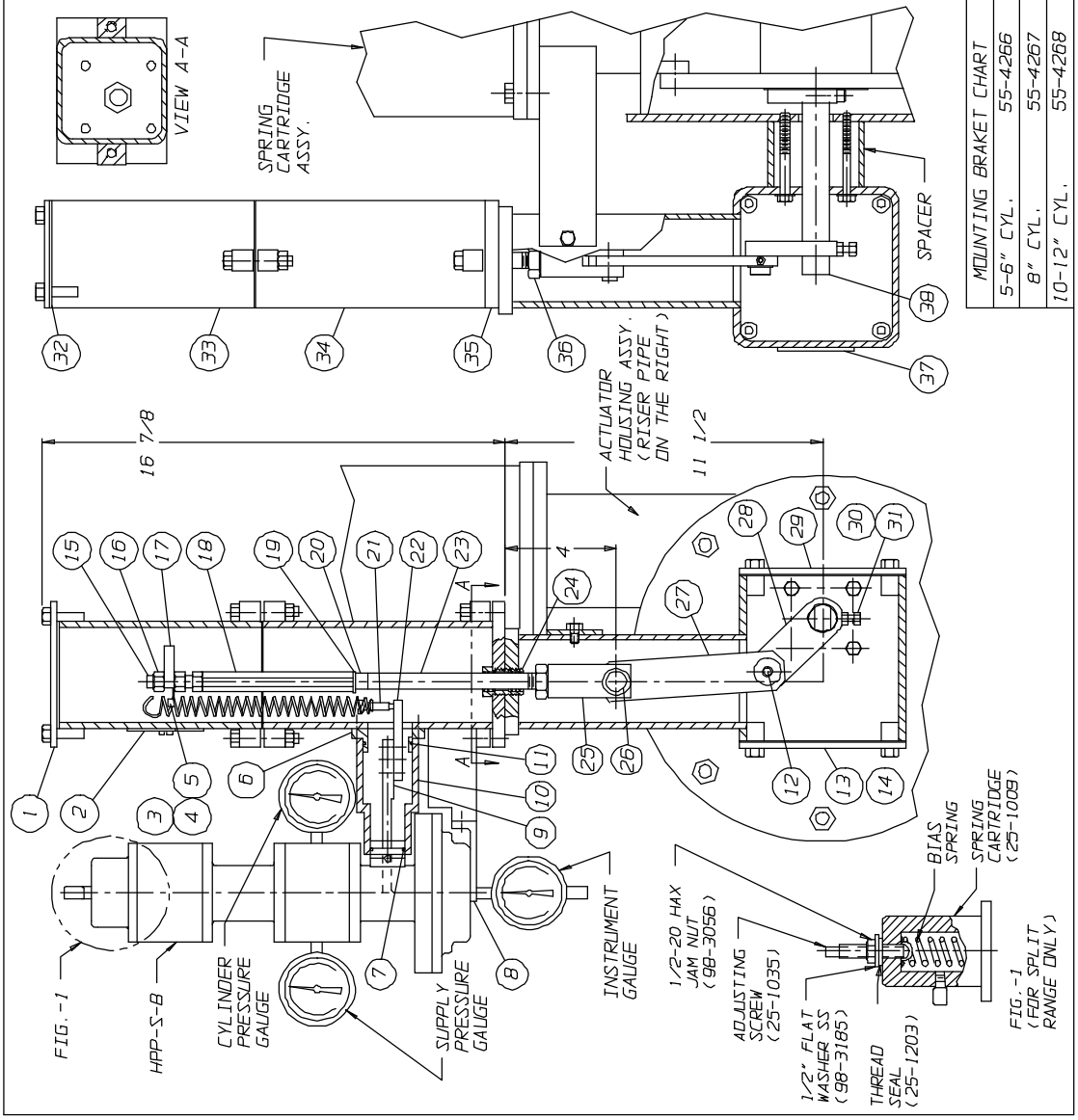
BECKER PRECISION EQUIPMENT INC.

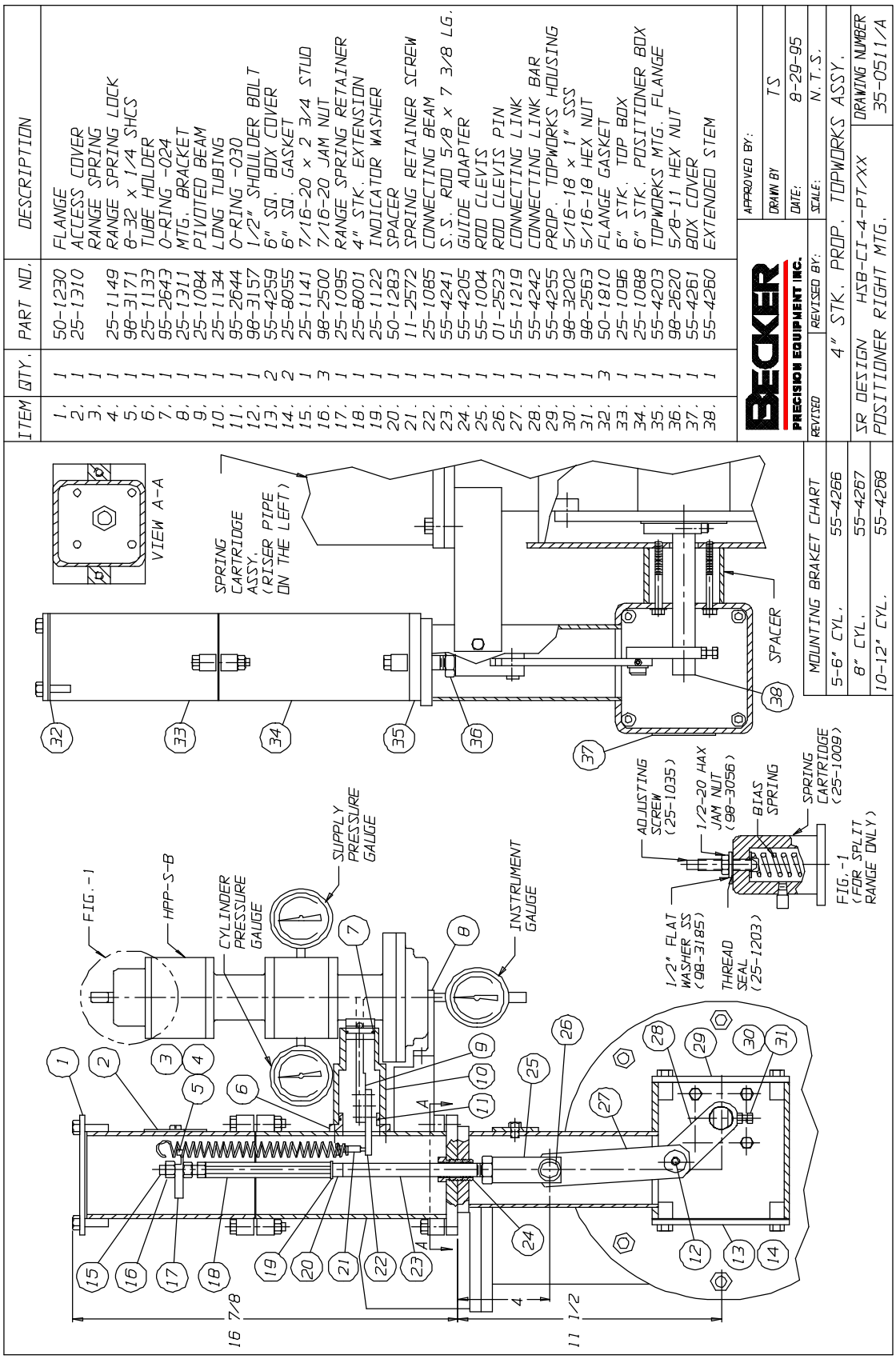
APPROVED BY:	
DRWN BY	TS
DATE:	8-29-95
SCALE:	N.T.S.
REVISED BY:	
REVISED	

4" STK. PROP. TOPWORKS ASSY.
SR DESIGN HSB-CI-4-PT/XX
POSITIONER LEFT MTG.

DRAWING NUMBER
35-0511

MOUNTING BRACKET CHART	
5-6" CYL.	55-4266
8" CYL.	55-4267
10-12" CYL.	55-4268




ITEM QTY. PART NO. DESCRIPTION
1. 1 50-1230 FLANGE
2. 1 25-1310 ACCESS COVER
3. 1 RANGE SPRING
4. 1 25-1149 RANGE SPRING LOCK
5. 1 98-3171 8-32 x 1/4 SHCS
6. 1 25-1133 TUBE HOLDER
7. 1 95-2643 O-RING -024
8. 1 25-1311 MTG. BRACKET
9. 1 25-1084 PIVOTED BEAM
10. 1 25-1134 LONG TUBING
11. 1 95-2644 O-RING -030
12. 1 98-3157 1/2" SHOULDER BOLT
13. 2 55-4259 6" SQ. BOX COVER
14. 2 25-8055 6" SQ. GASKET
15. 1 25-1141 7/16-20 x 2 3/4 STUD
16. 3 98-2500 7/16-20 JAM NUT
17. 1 25-1095 RANGE SPRING RETAINER
18. 1 25-8001 4" STK. EXTENSION
19. 1 25-1122 INDICATOR WASHER
20. 1 50-1283 SPACER
21. 1 11-2572 SPRING RETAINER SCREW
22. 1 25-1085 CONNECTING BEAM
23. 1 55-4241 S.S. ROD 5/8 x 7 3/8 LG.
24. 1 55-4205 GUIDE ADAPTER
25. 1 55-1004 ROD CLEVIS
26. 1 01-2523 ROD CLEVIS PIN
27. 1 55-1219 CONNECTING LINK
28. 1 55-4242 CONNECTING LINK BAR
29. 1 55-4255 PROP. TOPWORKS HOUSING
30. 1 98-3202 5/16-18 x 1" SSS
31. 1 98-2563 5/16-18 HEX NUT
32. 3 50-1810 FLANGE GASKET
33. 1 25-1096 6" STK. TOP BOX
34. 1 25-1088 6" STK. POSITIONER BOX
35. 1 55-4203 TOPWORKS MTG. FLANGE
36. 1 98-2620 5/8-11 HEX NUT
37. 1 55-4261 BOX COVER
38. 1 55-4260 EXTENDED STEM
BECKER PRECISION EQUIPMENT INC.
REVISED
REVISED BY:
APPROVED BY:
DRAWN BY TS
DATE: 8-29-95
SCALE: N.T.S.
4" STK. PROP. TOPWORKS ASSY.
SR DESIGN HSB-CI-4-PT/XX
POSITIONER RIGHT MTG.
DRAWING NUMBER 35-0511/A
MOUNTING BRAKET CHART
5-6" CYL. 55-4266
8" CYL. 55-4267
10-12" CYL. 55-4268
VIEW A-A
SPRING CARTRIDGE ASSY. (RISER PIPE ON THE LEFT)
SPACER
FIG.-1
HPP-S-B
CYLINDER PRESSURE GAUGE
SUPPLY PRESSURE GAUGE
INSTRUMENT GAUGE
ADJUSTING SCREW (25-1035)
1/2-20 HAX JAM NUT (98-3056)
BIAS SPRING
SPRING CARTRIDGE (25-1009)
FIG.-1 (FOR SPLIT RANGE ONLY)
1/2" FLAT WASHER SS (98-3185)
THREAD SEAL (25-1203)
16 7/8
11 1/2
4