# Boosters

***Dependable, Low cost Hydraulic Power Without Hydraulic Pumps***

**AIR TO HYDRAULIC**
**AIR TO AIR**
**HYDRAULIC TO HYDRAULIC**
**TANDEM UNITS**

Miller FLUID POWER

# What is a Booster?

## A Booster is a device for converting Air into Higher Hydraulic Pressure. For Operating Hydraulic Work Cylinders . . . and many other hydraulically operated devices

Boosters cut costs, save space, air, and weight, increase efficiency, and reduce maintenance in many applications such as pressing, shearing, punching, welding, riveting, crimping, embossing, feeding, laminating, compressing, stamping, marking, blanking, clamping, bending, molding, testing and others.

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# When should Boosters be used?

## When should Booster-Driven Cylinders be used in place of Large Bore Air Cylinders?

**ANSWER**

- **TO SAVE SPACE AND WEIGHT**
- **TO OBTAIN CONVENIENT PORTABILITY**
- **TO SAVE ON AIR CONSUMPTION**
- **TO OBTAIN SMOOTH HYDRAULIC POWER AND CONTROL**

A single booster-driven hydraulic cylinder can do the work of an air cylinder ten times larger and heavier and provides the greater efficiency, smoothness and control of hydraulic operation. The booster itself operates from your regular shop air pressure. No pumps or high-pressure valving are needed. Since space and weight are saved where the work is actually accomplished (at point of cylinder thrust), the overall design of machines and equipment can often be made more compact and less costly. The booster itself can be mounted most anywhere, either on or off the machine or equipment.

The great savings in space and weight obtained with boosters make them ideal for powering many types of portable equipment, such as spot welders, gun riveters, clamping fixtures, small presses, testing equipment, etc.

The Miller "Air Miser" Dual Pressure Booster Circuit uses as little as 10% of the air required for direct air cylinder operation.

## When should Boosters be used instead of Pumps?

- **TO OBTAIN HYDRAULIC POWER FROM SHOP AIR . . .**
  (a) For operating cylinders in simple circuits requiring small to medium volumes of high pressure oil.
  (b) For pressure-testing and metal-expanding operations.

**ANSWER**

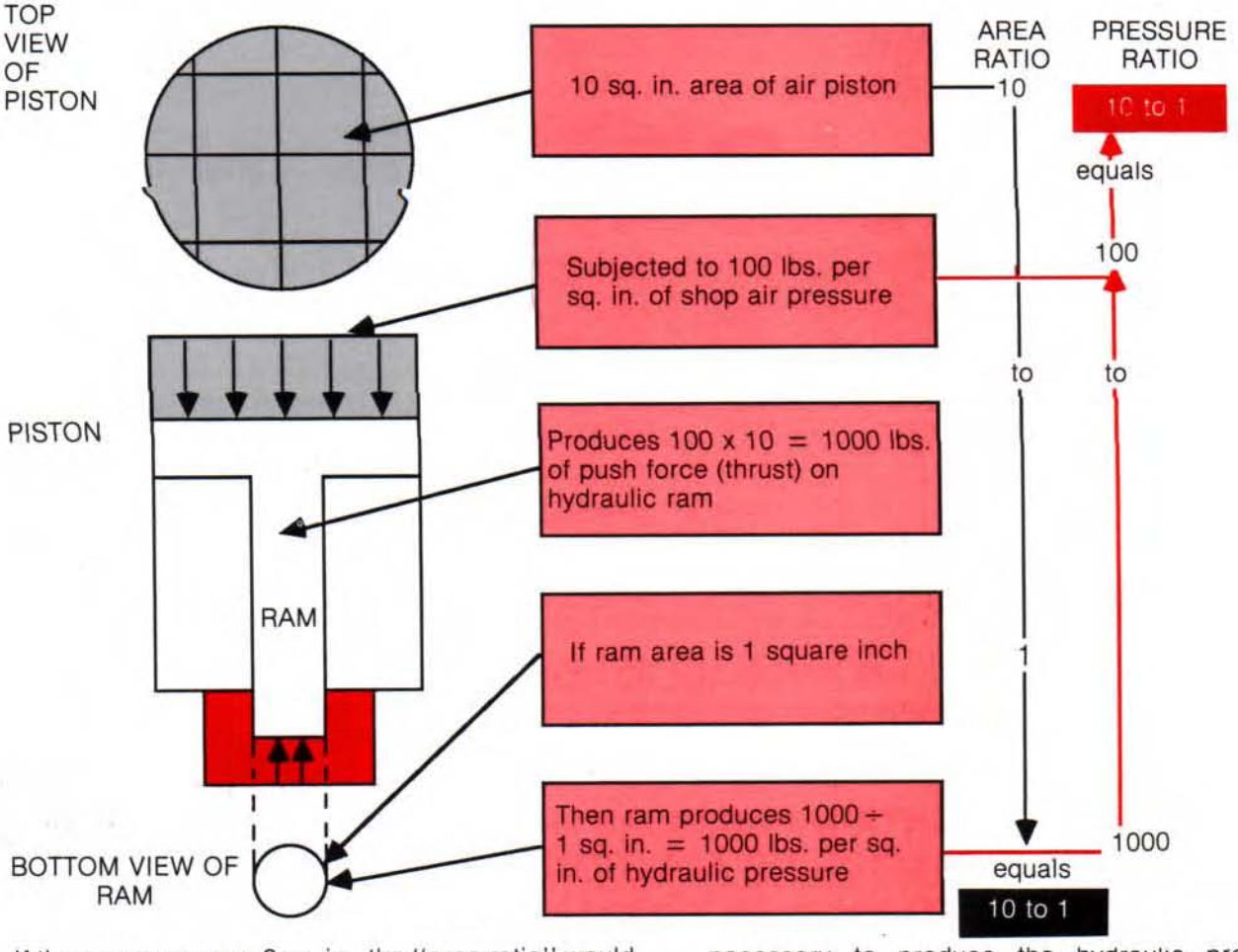
- **TO MAINTAIN PRESSURE INDEFINITELY WITHOUT HEAT GENERATION OR ADDITIONAL POWER CONSUMPTION**
- **TO ECONOMICALLY OBTAIN HDYRAULIC PRESSURES UP TO 10,000 PSI AND MORE**

Any shop equipped with an air line can obtain smooth, efficient hydraulic power from an air-hydraulic booster hooked into the air line. The alternative would be a complete hydraulic installation, with pumps, directional control, check, pressure relief, unloading valves, fluid tank, etc. A booster can maintain its pressure indefinitely — for minutes or hours as desired — without the constant motion, heat generation, and additional power consumption of pumps which, with the exception of the expensive variable delivery type, must generally continue to pump and by-pass oil to maintain "holding" pressure. A high cost alternative to this constant pumping would be the installation of an automatic "kick-off" pump along with an accumulator, necessary control valves, etc. In general, the use of boosters is limited to simple circuits requiring small to medium oil volumes of high pressure oil. Somewhat larger volumes can be obtained from Miller Reciprocating Boosters. For volumes larger than these, pumps are recommended. Where very high hydraulic pressures are required, a booster is generally much more economical. For example, 10,000 psi is obtained from a 100 to 1 ratio Miller Air-Hydraulic Booster operating from only 100 psi air input. Compare this to a 10,000 psi pump system.

# How A Booster Works . . .

How does a booster work in "converting shop air pressure into *Higher* hydraulic pressure"?

Suppose we take an air cylinder and enclose the end of its piston rod with an oil-filled pressure chamber . We now have created an air hydraulic booster because the piston rod now becomes a hydraulic ram which transmits the total air cylinder thrust to the confined oil, thus, in effect, converting the shop air pressure exerted against the air piston into higher hydraulic pressure . The simple factors involved in this pressure boost are more clearly indicated by the following.




If the ram area were 2 sq. in., the "area ratio" would be 10 sq. in. divided by 2 sq. in. or 5 to 1 ratio. The "pressure ratio" would be 500 lbs. per sq. in. output (1000 lbs. divided by 2 sq. in.) over 100 lbs. per sq. in. input or 5 to 1 ratio. In other words, in any booster, the area ratio is identical to the pressure ratio.

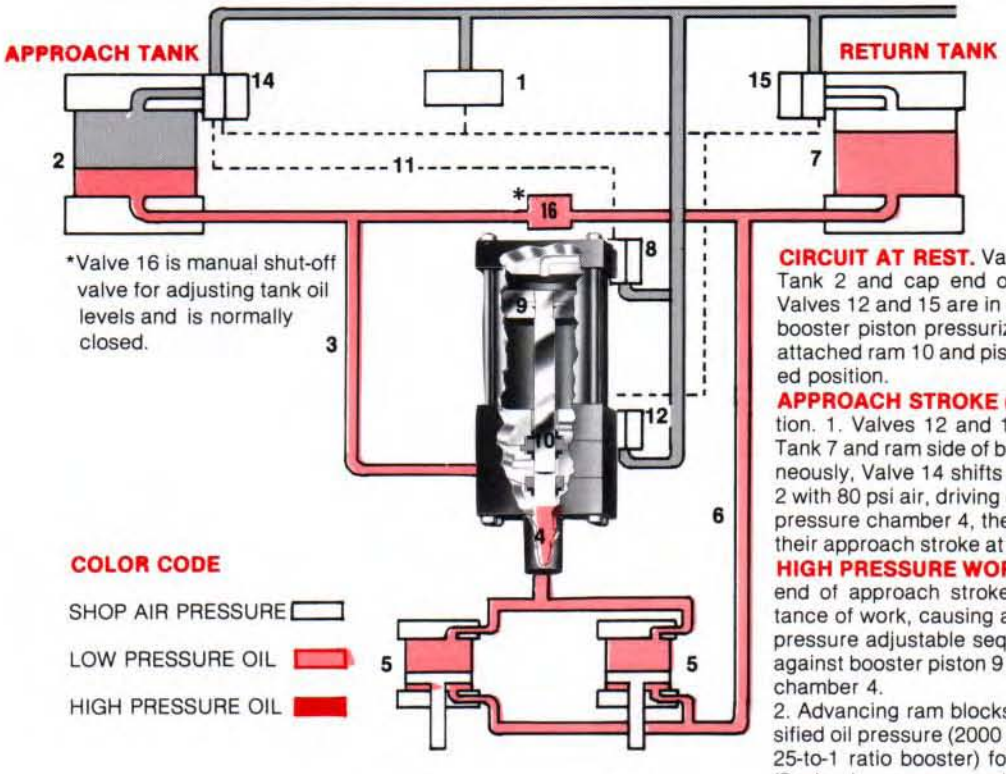
This common ratio is called the "booster ratio" and tells us for example, that any 10 to 1 ratio booster produces hydraulic output pressure 10 times that of its air input pressure; likewise, any 25 to 1 ratio booster produces hydraulic pressure 25 times its air input pressure; and so forth. Conversely, by dividing your desired hyraulic pressure by your available shop air pressure, you get the booster ratio necessary to produce the hydraulic pressure desired. Miller Boosters are available in up to 100 to 1 ratios. See pages 8 and 9 for additional information and table of conveniently available booster ratios, piston and ram areas and diameters.

**Booster Circuits —** In general, booster circuits are either single pressure — or dual pressure circuits.

In a single pressure circuit, the booster produces *high pressure oil* for operation of the *entire* cylinder stroke. This circuit is recommended where the cylinder *approach stroke is short* in comparison to its high pressure working stroke.

# "Air Miser" Dual Pressure Circuit

## AIR-OIL FLOW FOR LOW PRESSURE APPROACH STROKE OF CYLINDERS




*Valve 16 is manual shut-off valve for adjusting tank oil levels and is normally closed.

**COLOR CODE**

SHOP AIR PRESSURE

LOW PRESSURE OIL

HIGH PRESSURE OIL

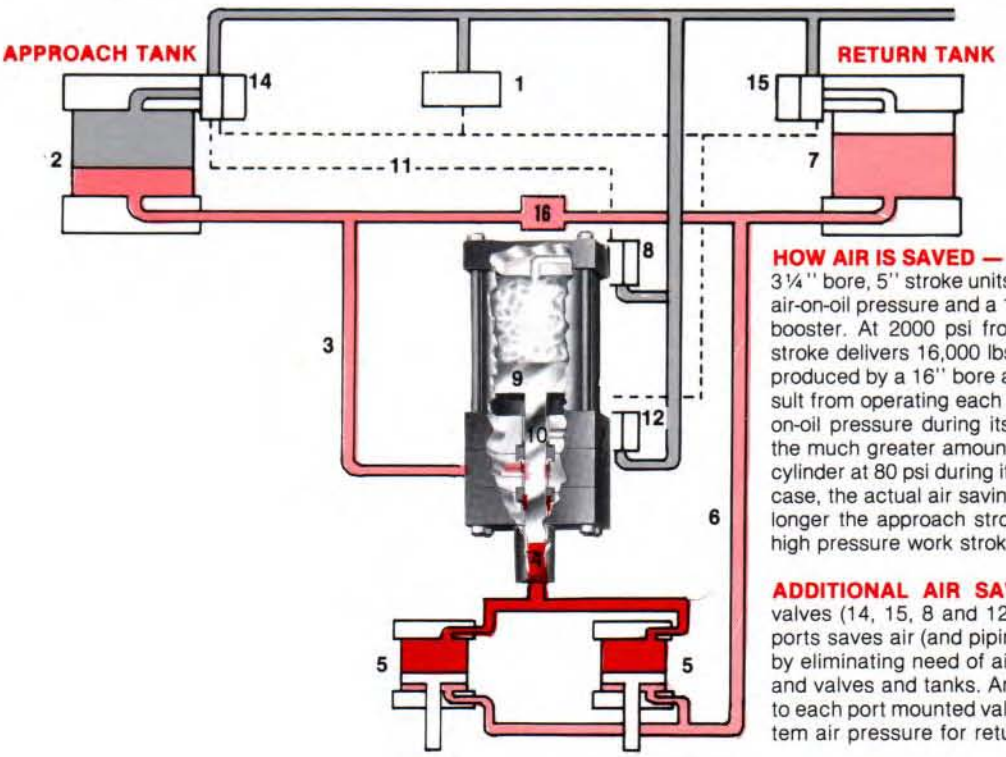
**CIRCUIT AT REST.** Valves 8 and 14 are in closed position with Tank 2 and cap end of booster piston vented to atmosphere. Valves 12 and 15 are in open position with Tank 7 and ram side of booster piston pressurized with 80 psi air. Booster piston 9 with attached ram 10 and piston rods of work cylinders 5 are in retracted position.

**APPROACH STROKE (TOP DIAGRAM) —** Sequence of Operation. 1. Valves 12 and 15 are shifted to closed position, venting Tank 7 and ram side of booster piston 9 to atmosphere. 2. Simultaneously, Valve 14 shifts to open position, which pressurizes Tank 2 with 80 psi air, driving oil from Tank 2 through line 3 into booster pressure chamber 4, then on into hydraulic cylinders 5, operating their approach stroke at low pressure oil (slightly less than 80 psi).

**HIGH PRESSURE WORK STROKE (BOTTOM DIAGRAM):** 1. At end of approach stroke, work cylinder piston rods meet resistance of work, causing air in line 11 to build up to 80 psi at which pressure adjustable sequence valve 8 opens, directing 80 psi air against booster piston 9 to drive its attached ram 10 into pressure chamber 4.

2. Advancing ram blocks off 80 psi oil in line 3 and creates intensified oil pressure (2000 psi from 80 psi air input in standard Miller 25-to-1 ratio booster) for completing work stroke of cylinders 5. (During low pressure advance and high pressure work stroke, oil forced from work cylinders flows through line 6 into Tank 7.)

## AIR-FLOW FOR HIGH PRESSURE WORK STROKE OF CYLINDER




**HOW AIR IS SAVED —** Suppose the hydraulic cylinders are each 3¼" bore, 5" stroke units with a 4-15/16" approach stroke at 80 psi air-on-oil pressure and a 1/16" work stroke at the 2000 psi from the booster. At 2000 psi from the booster, the 1/16" high pressure stroke delivers 16,000 lbs. of thrust — the same amount of thrust produced by a 16" bore air cylinder at 80 psi. The savings in air result from operating each 3¼" bore hydraulic cylinder at 80 psi air-on-oil pressure during its 4-15/16" approach stroke compared to the much greater amount of air required to operate a 16" bore air cylinder at 80 psi during its first 4-15/16" of approach stroke. In this case, the actual air savings amounts to about 90%. Obviously, the longer the approach stroke, and the longer it is in relation to the high pressure work stroke, the greater is the air savings.

**ADDITIONAL AIR SAVINGS.** The use of PORT MOUNTED valves (14, 15, 8 and 12) mounted directly to booster and tanks ports saves air (and piping) and speeds circuit action and control by eliminating need of air filled lines between valves and booster and valves and tanks. And the use of air regulators in supply line to each port mounted valve permits the use of much less than system air pressure for returning cylinders and booster piston.

# Handy Chart For Quick, Economical

## INSTRUCTIONS

STEP 1. These three requirements must be known:

a. Cylinder Thrust

b. Total Cylinder Stroke

c. Cylinder High Pressure Work Stroke (This is either a portion or all of the Total Cylinder Stroke, depending on whether a dual or single pressure circuit is used).

STEP 2. Determine ADJUSTED High Pressure Cylinder Work Stroke (adjusted for oil compression in cylinder calculated at about 2% of total cylinder oil volume) as follows:

a. Read across top of table below to the FIRST NUMBER that is equal to or greater than your Total Cylinder Stroke (Step 1, b. above).

b. Add the fraction shown below this number to the required High Pressure Work Stroke (Step 1, c. above). This sum is the ADJUSTED High Pressure Work Stroke of the cylinder.

STEP 3. To find Cylinder Bore and Booster Size, use the Selector Chart on next page as follows:

a. In Line 5a of Chart, read to right to first "thrust" figure that is equal to or greater than your Cylinder Thrust (Step 1, a. above).

b. In Line 6a, the figure directly below this "thrust" figure is the Maximum Permissible Adjusted High Pressure Cylinder Work Stroke. If your Adjusted High Pressure Cylinder Work Stroke (found in Step 2, b.) does not exceed this Maximum, you find your Cylinder Bore in same vertical column in Line 4 above. If your Adjusted Work Stroke does exceed this Maximum, check thrusts in Lines 5b, 5c, etc. in that order, until you find your thrust or the next higher thrust which has below it the Maximum Permissible stroke figure that is equal to or larger than your Adjusted High Pressure Cylinder Work Stroke. Required Cylinder Bore is found in same vertical column in Line 4 above.

c. Go back to your thrust (in Line 5a or 5b or 5c, etc.) and read to extreme right hand "Booster" Column containing all information on required Booster except stroke length.

d. Booster stroke length is determined as follows: Multiply your Adjusted High Pressure Cylinder Work Stroke by the figure shown (in Line 7a or 7b or 7c, etc.) below the thrust you have selected. Add 2" to the result. This sum rounded out to the next higher whole number is your Booster Stroke based upon close connection of Booster to work cylinder (approx. one to three ft. — for longer lines, use Method on pages 8 and 9).

## VARIABLE THRUSTS FROM THE SAME BOOSTER-CYLINDER COMBINATION

The hydraulic output psi of the boosters in chart at right are based upon 80 psi air input into the boosters.

By increasing or decreasing the shop air input, the output thrust of your booster-driven cylinder can be varied as desired.

The amount of variation can be determined quickly by this simple arithmetic. For example, if your original cylinder thrust (found in Line 5 of Chart) were 6200 lbs. and booster shop air input is increased from 80 to 100 psi, the corrected cylinder thrust is:

$$6200 \times \frac{100}{80} = 7750 \text{ lbs. of thrust}$$

If shop air input were decreased from 80 to 60 psi, the corrected cylinder thrust would be:

$$6200 \times \frac{60}{80} = 4650 \text{ lbs. of thrust}$$

In this way, the booster-cylinder combinations available from this chart can be adapted to fit a large majority of thrust requirements. Other boosters are available for selection from the selector chart and formula on pages 8 and 9.

ALL DIMENSIONS IN INCHES

| LOCATE TOTAL CYL. STROKE | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 15 | 18 | 21 | 24 | 29 | 30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADD THIS FRACTION TO HIGH PRESSURE STROKE | 1/32 | 1/16 | 1/16 | 3/32 | 1/8 | 1/8 | 5/32 | 3/16 | 3/16 | 3/16 | 1/4 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 9/16 | 5/8 |

## EXAMPLE

**STEP 1.** Assuming:

Cylinder Thrust . . . . . 25,000 lbs.
Total Cylinder Stroke . . . . . 12"
High Pressure Cylinder Work Stroke . . . . . 1½"

**STEP 2.** Adding the ¼" (found under the "12" in table) to the 1½" Work Stroke gives an Adjusted High Pressure Work Stroke of . . . 1¾".

**STEP 3a.** In Line 5a in Chart on next page, the cylinder thrust nearest (equal to or larger than) your desired thrust is . . . 25,100 lbs. Since your 1¼" Adjusted Work Stroke exceeds the 1½" Maximum shown in Line 6a, go to the 29,900 lbs. of thrust in Line 5b with the 2" Maximum Stroke shown below it in Line 6b.

**b.** Required Cylinder Bore (from Line 4) is . . . 5".

**c.** Since your 1¾" Adjusted High Pressure Work Stroke is less than the 2" Maximum in Line 6b, the 6" bore x 1⅜" dia. ram Booster shown at extreme right of Lines 5, 6, and 7b is a proper choice for your cylinder.

**d.** As per line 7b, your Booster Stroke is determined by multiplying your 1¾" Adjusted Work Stroke by the "14" figure shown in Line 7b below the 29,900 lbs. of thrust, plus 2". Thus . . . 1¾" x 14 = 24½", plus 2" = 26½". Booster fractional strokes should be rounded out to next higher whole number, in this case . . . 27".

Summation. Cylinder is: 5" bore x 12" stroke.

Booster is: 6" bore x 1⅜" dia. ram x 27" stroke.

## PRICING NOTE

More than one booster-cylinder combination in Chart may fit your needs. Smaller bore boosters are generally more economical but, in some cases, a slightly larger bore booster of higher output pressure that permits the use of a smaller bore cylinder may result in a lower combined booster-cylinder price So, for maximum economy, check the cost of the various booster-cylinder combinations that fit the requirements of your application. For quotation on any size booster-cylinder combination, call Miller at numbers on back of this bulletin.

# Selection of Boosters, Cylinders Tanks

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Cylinder Models | Select "J" or "H" Models (From Bulletins 4907 and 4908) based on operating pressures. | | | | | | | | BOOSTERS (Model A77-B4) |
| 2. | Standard Piston Rod Dias. (Model H) | 5/8" | 1" | 1" | 1 3/8" | 1 3/4" | 2" | 2 1/2" | 3" | 3 1/2" | |
| 3. | Piston Rod End Styles | 3 styles available. See Bulletin 4908. | | | | | | | | |
| 4. | Cylinder Bore | 1 1/2" | 2" | 2 1/2" | 3 1/4" | 4" | 5" | 6" | 7" | 8" | |
| 5a. | Cylinder Thrust in lbs. | 3500 | 6200 | 9800 | 16,500 | 25,100 | 39,200 | 56,500 | 76,900 | 100,500 | **5 Inch Bore, 1 Inch Diameter Ram** |
| 6a. | Maximum Permissible Adjusted High Pressure Cylinder Work Stroke | 8" | 6" | 3 3/8" | 2 1/8" | 1 1/2" | 1" | 5/8" | 1/2" | 3/8" | Air Input 80 psi |
| 7a. | Multiply Adjusted High Pressure Cyl. Work Stroke By → Then Add 2" to Obtain Booster Stroke | 3 | 4 | 7 | 11 | 16 | 25 | 36 | 49 | 64 | Oil Output 2000 psi |
| 5b. | Cylinder Thrust in lbs. | 2968 | 4780 | 7470 | 12,600 | 19,100 | 29,200 | 43,000 | 58,600 | 76,500 | **6 Inch Bore, 1 3/8 Inch Diameter Ram** |
| 6b. | Maximum Permissible Adjusted High Pressure Cylinder Work Stroke | 14" | 9 3/8" | 7" | 4 5/8" | 3 1/8" | 2" | 1 1/2" | 1" | 7/8" | Air Input 80 psi |
| 7b. | Multiply Adjusted High Pressure Cyl. Work Stroke By → Then Add 2" to Obtain Booster Stroke | 2 | 3 | 4 | 6 | 9 | 14 | 19 | 27 | 33 | Oil Output 1520 psi |
| 5c. | Cylinder Thrust in lbs. | 4700 | 8500 | 13,200 | 22,400 | 34,000 | 53,100 | 76,500 | 104,200 | 136,000 | **8 Inch Bore, 1 3/8 Inch Diameter Ram** |
| 6c. | Maximum Permissible Adjusted High Pressure Cylinder Work Stroke | 15" | 10" | 7 1/2" | 5" | 3 3/8" | 2 1/8" | 1 5/8" | 1 1/8" | 7/8" | Air Input 80 psi |
| 7c. | Multiply Adjusted High Pressure Cyl. Work Stroke By → Then Add 2" to Obtain Booster Stroke | 2 | 3 | 4 | 6 | 9 | 14 | 19 | 27 | 33 | Oil Output 2700 psi |
| 5d. | Cylinder Thrust in lbs. | 2950 | 5250 | 8200 | 13,800 | 21,000 | 32,800 | 47,200 | 64,300 | 84,000 | **8 Inch Bore, 1 3/4 Inch Diameter Ram** |
| 6d. | Maximum Permissible Adjusted High Pressure Cylinder Work Stroke | 32" | 16" | 10 1/2" | 8" | 5 1/4" | 4 1/2" | 2 5/8" | 2" | 1 1/2" | Air Input 80 psi |
| 7d. | Multiply Adjusted High Pressure Cyl. Work Stroke By → Then Add 2" to Obtain Booster Stroke | 1 | 2 | 3 | 4 | 6 | 9 | 12 | 16 | 21 | Oil Output 1670 psi |
| 5e. | Cylinder Thrust in lbs. | 4600 | 8200 | 12,800 | 21,600 | 32,800 | 51,300 | 73,800 | 100,500 | 131,300 | **10 Inch Bore, 1 3/4 Inch Diameter Ram** |
| 6e. | Maximum Permissible Adjusted High Pressure Cylinder Work Stroke | 40" | 20" | 13 3/8" | 10" | 6 3/4" | 4 3/8" | 3 3/8" | 2 1/2" | 2" | Air Input 80 psi |
| 7e. | Multiply Adjusted High Pressure Cyl. Work Stroke By → Then Add 2" to Obtain Booster Stroke | 1 | 2 | 3 | 4 | 6 | 9 | 12 | 16 | 21 | Oil Output 2600 psi |
| 5f. | Cylinder Thrust in lbs. | 3500 | 6200 | 9800 | 16,500 | 25,100 | 39,200 | 56,500 | 76,900 | 100,500 | **10 Inch Bore, 2 Inch Diameter Ram** |
| 6f. | Maximum Permissible Adjusted High Pressure Cylinder Work Stroke | 48" | 48" | 24" | 16" | 14" | 6 7/8" | 5 3/8" | 3 3/4" | 3" | Air Input 80 psi |
| 7f. | Multiply Adjusted High Pressure Cyl. Work Stroke By Then Add 2" to Obtain Booster Stroke | 1 | 1 | 2 | 3 | 4 | 7 | 9 | 13 | 16 | Oil Output 2000 psi |

## HOW TO SELECT PROPER TANK SIZE

The bore and stroke of the hydraulic cylinder are known. Then —

1. Determine the cubic inch oil displacement of the cylinder piston by multiplying the square inch area of the piston by the inches of stroke.
2. Locate, on selector chart at right, the volumes closest to the volume obtained and read up to tank diameters and to the left for tank lengths. In general, tanks of smaller diameters and greater lengths are less costly than larger diameter, shorter tanks of approximately equal volume.

**EXAMPLE:** To find the tank size needed for a 6" bore, 4" stroke hydraulic cylinder (according to formula above): The oil displacement of the piston is 113.09 cu. in. From the selector chart at right, select a volume higher than 113 and that gives you the tank size that best fits the available space. Thus, a 3 – %|" bore x 19" long tank, or a 4" bore x 14" long tank, or a 5" bore x 10" long tank could be selected.

**USABLE TANKS VOLUMES IN CUBIC INCHES**

| | Tank Length (Inches) | Tank Bore Diameters (Inches) 3 1/4 | 4 | 5 | 6 | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|---|---|---|
| TANK SELECTOR CHART | 4 | 8. | 12. | 19. | 28. | 50. | 78. | 113. | 153. |
| | 5 | 15. | 23. | 36. | 53. | 94. | 147. | 212. | 288. |
| | 6 | 22. | 34. | 54. | 77. | 138. | 216. | 311. | 423. |
| | 7 | 30. | 45. | 71. | 102. | 182. | 284. | 410. | 558. |
| | 8 | 37. | 56. | 88. | 127. | 226. | 353. | 509. | 692. |
| | 9 | 44. | 67. | 105. | 152. | 270. | 422. | 607. | 827. |
| | 10 | 51. | 78. | 122. | 176. | 314. | 490. | 706. | 962. |
| | 11 | 59. | 89. | 139. | 201. | 358. | 559. | 805. | 1096. |
| | 12 | 66. | 100. | 157. | 226. | 402. | 628. | 904. | 1231. |
| | 13 | 73. | 111. | 174. | 250. | 446. | 697. | 1003. | 1366. |
| | 14 | 80. | 122. | 191. | 275. | 490. | 765. | 1102. | 1500. |
| | 15 | 88. | 133. | 208. | 300. | 534. | 834. | 1201. | 1635. |
| | 16 | 95. | 144. | 225. | 325. | 578. | 903. | 1300. | 1770. |
| | 17 | 102. | 155. | 243. | 349. | 622. | 971. | 1399. | 1905. |
| | 18 | 109. | 166. | 260. | 374. | 666. | 1040. | 1498. | 2039. |
| | 19 | 117. | 177. | 277. | 399. | 710. | 1109. | 1597. | 2174. |
| | 20 | 124. | 188. | 294. | 424. | 754. | 1178. | 1696. | 2309. |
| | 21 | 131. | 199. | 311. | 448. | 798. | 1246. | 1795. | 2443. |
| | 22 | 139. | 210. | 328. | 473. | 841. | 1315. | 1894. | 2578. |
| | 23 | 146. | 221. | 346. | 498. | 885. | 1384. | 1993. | 2713. |
| | 24 | 153. | 232. | 363. | 523. | 929. | 1453. | 2092. | 2847. |

# Simplified Method of Calculating Boosters

***(For Boosters Not Covered By Handy Chart on Page 9)***

## BOOSTER RATIO

Select a Booster Ratio that provides, from your known shop air booster input, the operating pressure required for your selected hydraulic work cylinder. Find your Booster Ratio from this simple formula:

$$\frac{\text{Booster Output Pressure}}{\text{Booster Input Pressure}} = \text{Booster Ratio}$$

## BOOSTER BORE AND RAM SIZE

Locate your Booster Ratio in Column 6 in Selector Chart on next page and note the Booster Piston and Ram Diameters given for this ratio in Columns 7 and 9. You may find more than one booster piston-and-ram combination with the same (or slightly higher) booster ratio. Since ram area and stroke determine oil volume displacement from the booster, select larger ram areas for larger hydraulic work cylinder volumes.

## BOOSTER STROKE In Single Pressure Circuits (For Miller BA8 & BA9 Boosters)

In Single Pressure Circuits, the Booster Stroke provides H.P. (high pressure) oil for the ENTIRE cylinder stroke. The H.P. oil volume required is determined as follows:

Cyl. Piston Area _____ sq. ins. x Total Cyl. Stroke _____" = Cyl. Oil Volume _____ cu. ins.

Allow for Oil Compressibility as follows:

1% per 1000 psi x Oil Volume* in H.P. Circuit = Compressibility Volume _____ cu. ins.

Then . . .

$$\frac{\text{Cyl. Oil Volume} + \text{Compressibility Volume}}{\text{Booster Ram Area}} = \text{Booster Stroke}$$

Note: Fractional Booster Strokes should be increased to next higher whole number.

## BOOSTER STROKE In Single Pressure or Dual Pressure Circuits (For Miller B4 Boosters)

In Dual Pressure Circuits, the Booster Stroke provides H.P. oil for only the final (high pressure work stroke) portion of the cylinder stroke. The H.P. oil volume required is determined as follows:

Cyl. Piston Area _____ sq. in. x H.P. Work Stroke _____" = Cyl. H.P. Stroke Volume _____ cu. ins.

Allow for Oil Compressibility as follows:

1% per 1000 psi x Oil Vol.* in H.P. Circuit = Compressibility Volume _____ cu. ins.

Then:

$$\frac{\text{Cyl. H.P. Stroke Volume} + \text{Compressibility Volume}}{\text{Booster Ram Area}} + 2'' = \text{Booster Stroke}$$

*Oil Volume in cylinder (or cylinders if more than one) plus oil in line(s) connecting cylinder(s) to booster.
Note: Fractional Booster Strokes should be increased to next higher whole number.

## GENERAL NOTES

**Strokes.** If your Booster Stroke is extremely long or extremely short, select another booster ram area that will allow a more practical booster stroke.

***Column Strength.*** *Check long stroke Boosters for column strength as follows. Determine thrust on* booster ram by multiplying sq. in. area of booster piston by the booster shop air input psi or use Thrust Chart, page 4, Hydraulic Cylinder Bulletin 7552. Then refer to table, page 10 in Bulletin 7552. Booster Strokes up to the values shown are permissible.

**Pricing.** In selecting boosters, consider that smaller bore, longer stroke boosters generally cost less than larger bore, shorter stroke boosters.

**Air-Oil Tanks.** As shown on page 5, two tanks are recommended in both Single Pressure and Dual Pressure Circuits. In a Single Pressure Circuit, a Fill-and-Bleed Tank and Return Tank are used. In a Dual Pressure Circuit, a Fill-and-Advance-Tank and a Return Tank are used. Tanks should be a minimum height of 4".

# Selector Charts for Miller B4, BA8 and BA9 Boosters

**B4 and BA8 BOOSTER SELECTOR CHART (Theoretical values only)**

| THEORETICAL HYDRAULICRAM PSI OUTPUT AT INPUT PRESSURES OF | | | | | BOOSTER RATIO | BOOSTER HY-DRAULIC RAM | | BOOSTER PISTON | |
|---|---|---|---|---|---|---|---|---|---|
| 80psi | 100psi | 250psi | 500psi | 1000psi | (Column 10 divided by Column 8) | Dia. | Area (sq. in.) or Volume (cu. in.) per in. of stroke | Dia. | Area |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 846 | 1057 | 2642 | 5284 | 10570 | 10.57 | *1" | 0.785 | 3¼" | 8.296 |
| 447 | 559 | 1397 | 2794 | 5590 | 5.59 | 1⅜" | 1.485 | | |
| 276 | 345 | 862 | 1724 | 3450 | 3.45 | 1¾" | 2.405 | | |
| 211 | 264 | 660 | 1320 | 2640 | 2.64 | 2" | 3.142 | | |
| 1280 | 1600 | 4000 | 8000 | 16000 | 16.00 | *1" | 0.785 | 4" | 12.566 |
| 680 | 850 | 2125 | 4250 | 8500 | 8.50 | *1⅜" | 1.485 | | |
| 417 | 522 | 1305 | 2610 | 5220 | 5.22 | 1¾" | 2.405 | | |
| 320 | 400 | 1000 | 2000 | 4000 | 4.00 | 2" | 3.142 | | |
| 208 | 260 | 650 | 1300 | 2600 | 2.60 | 2½" | 4.909 | | |
| 2000 | 2500 | 6250 | 12500 | 25000 | 25.00 | *1" | 0.785 | 5" | 19.635 |
| 1058 | 1322 | 3305 | 6610 | 13220 | 13.22 | *1⅜" | 1.485 | | |
| 653 | 816 | 2040 | 4080 | 8160 | 8.16 | *1¾" | 2.405 | | |
| 500 | 625 | 1562 | 3125 | 6250 | 6.25 | 2" | 3.142 | | |
| 320 | 400 | 1000 | 2000 | 4000 | 4.00 | 2½" | 4.909 | | |
| 222 | 278 | 695 | 1390 | 2780 | 2.78 | 3" | 7.069 | | |
| 163 | 204 | 510 | 1020 | 2040 | 2.04 | 3½" | 9.621 | | |
| 1523 | 1904 | 4757 | 9514 | 19040 | 19.04 | *1¾" | 1.485 | 6" | 28.274 |
| 941 | 1176 | 2940 | 5880 | 11760 | 11.76 | *1¾" | 2.405 | | |
| 720 | 900 | 2250 | 4500 | 9000 | 9.00 | *2" | 3.142 | | |
| 462 | 577 | 1442 | 2885 | 5770 | 5.77 | 2½" | 4.909 | | |
| 320 | 400 | 1000 | 2000 | 4000 | 4.00 | 3" | 7.069 | | |
| 235 | 294 | 735 | 1470 | 2940 | 2.94 | 3½" | 9.621 | | |
| 180 | 225 | 562 | 1125 | 2250 | 2.25 | 4" | 12.566 | | |
| 2073 | 2591 | 6477 | 12955 | 25910 | 25.91 | *1¾" | 1.485 | 7" | 38.485 |
| 1280 | 1600 | 4000 | 8000 | 16000 | 16.00 | *1¾" | 2.405 | | |
| 980 | 1225 | 3062 | 6125 | 12250 | 12.25 | *2" | 3.142 | | |
| 499 | 624 | 1560 | 3120 | 6240 | 6.24 | *2½" | 4.909 | | |
| 435 | 544 | 1360 | 2720 | 5440 | 5.44 | 3" | 7.069 | | |
| 320 | 400 | 1000 | 2000 | 4000 | 4.00 | 3½" | 9.621 | | |
| 245 | 306 | 765 | 1530 | 3060 | 3.06 | 4" | 12.566 | | |
| 194 | 242 | 605 | 1210 | 2420 | 2.42 | 4½" | 15.904 | | |
| 157 | 196 | 490 | 980 | 1960 | 1.96 | 5" | 19.635 | | |
| 130 | 162 | 405 | 810 | 1620 | 1.62 | 5½" | 23.758 | | |
| 2708 | 3385 | 8362 | 16925 | | 33.85 | *1¾" | 1.485 | 8" | 50.265 |
| 1672 | 2090 | 6225 | 10450 | 20900 | 20.90 | *1¾" | 2.405 | | |
| 1280 | 1600 | 4000 | 8000 | 16000 | 16.00 | *2" | 3.142 | | |
| 821 | 1026 | 2565 | 5130 | 10260 | 10.26 | *2½" | 4.909 | | |
| 569 | 711 | 1777 | 3555 | 7110 | 7.11 | *3" | 7.069 | | |
| 418 | 522 | 1305 | 2610 | 5220 | 5.22 | 3½" | 9.621 | | |
| 320 | 400 | 1000 | 2000 | 4000 | 4.00 | 4" | 12.566 | | |
| 253 | 316 | 790 | 1580 | 3160 | 3.16 | 4½" | 15.904 | | |
| 205 | 256 | 640 | 1280 | 2560 | 2.56 | 5" | 19.635 | | |
| 170 | 212 | 530 | 1060 | 2120 | 2.12 | 5½" | 23.758 | | |
| 2613 | 3266 | 8165 | 16330 | | 32.66 | *1¾" | 2.405 | 10" | 78.54 |
| 2000 | 2500 | 6250 | 12500 | 25000 | 25.00 | *2" | 3.142 | | |
| 1282 | 1603 | 4007 | 80156 | 16030 | 16.03 | *2½" | 4.909 | | |
| 889 | 1111 | 2777 | 5555 | 11110 | 11.11 | *3" | 7.069 | | |
| 653 | 816 | 2040 | 4080 | 8160 | 8.16 | *3½" | 9.621 | | |
| 500 | 625 | 1562 | 3125 | 6250 | 6.25 | *4" | 12.566 | | |
| 395 | 494 | 1235 | 2470 | 4940 | 4.94 | *4½" | 15.904 | | |
| 320 | 400 | 1000 | 2000 | 4000 | 4.00 | 5" | 19.635 | | |
| 265 | 331 | 827 | 1655 | 3310 | 3.31 | 5½" | 23.758 | | |
| 2880 | 3600 | 9000 | 18000 | | 36.00 | *2" | 3.142 | 12" | 13.10 |
| 1846 | 2308 | 5770 | 11540 | 23080 | 23.08 | *2½" | 4.909 | | |
| 1280 | 1600 | 4000 | 8000 | 16000 | 16.00 | *3" | 7.069 | | |
| 940 | 1175 | 2937 | 5875 | 11750 | 11.75 | *3½" | 9.621 | | |
| 720 | 900 | 2250 | 4500 | 9000 | 9.00 | *4" | 12.566 | | |
| 569 | 711 | 1777 | 3555 | 7110 | 7.11 | *4½" | 15.904 | | |
| 461 | 576 | 1440 | 2880 | 5760 | 5.76 | *5" | 19.635 | | |
| 381 | 476 | 1190 | 2380 | 4760 | 4.76 | 5½" | 23.758 | | |
| 2514 | 3142 | 7855 | | | 31.42 | 2½" | 4.909 | 14" | 153.94 |
| 1742 | 2178 | 5445 | | | 21.78 | 3" | 7.069 | | |
| 1280 | 1600 | 4000 | | | 16.00 | 3½" | 9.621 | | |
| 980 | 1225 | 3062 | | | 12.25 | 4" | 12.566 | | |
| 774 | 968 | 2420 | | | 9.68 | 4½" | 15.904 | | |
| 627 | 784 | 1960 | | | 7.84 | 5" | 19.635 | | |
| 518 | 648 | 1620 | | | 6.48 | 5½" | 23.758 | | |

Boldface pressures above indicate that special pricing and engineering are required

* This is an undersized ram in Miller high pressure cylinder, which is not available. Available in low pressure cylinders only.

**BA9 BOOSTER SELECTOR CHART (Theoretical values only)**

| THEORETICAL HYDRAULIC RAM P.S.I. OUTPUT AT INPUT PRESSURES OF | | | | | BOOSTER RATIO | HYDRAULIC RAM | | BOOSTER PISTON | |
|---|---|---|---|---|---|---|---|---|---|
| 80psi | 100psi | 250psi | 500psi | 1000psi | (Column 10 divided by Column 8) | Dia. | Area (sq. in.) or Volume (cu. in.) per in. of stroke | Dia. | Area |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 375-J | 469-J | 1172-J | 2344-H | | 4.69 | 1½" | 1.767 | 3¼" | 8.296 |
| 211-J | 264-J | 660-J | 1320-J | 2640-H | 2.64 | 2" | 3.142 | | |
| 567-J | 709-J | 1772-H | | | 7.09 | 1⅜" | 1.767 | 4" | 12.566 |
| 320-J | 400-J | 1000-J | 2000-H | | 4.00 | 2" | 3.142 | | |
| 208-J | 260-J | 650-J | 1300-H | 2600-H | 2.60 | 2½" | 4.909 | | |
| 885-J | 1107-J | 2767-H | | | 11.07 | 1½" | 1.767 | 5" | 19.635 |
| 500-J | 625-J | 1562-H | | | 6.25 | 2" | 3.142 | 4" | 19.635 |
| 320-J | 400-J | 1000-J | 2000-H | | 4.00 | 2½" | 4.909 | | |
| 189-J | 237-J | 592-J | 1185-J | 2370-H | 2.37 | 3¼" | 8.296 | | |
| 720-J | 900-J | 2250-H | | | 9.00 | 2" | 3.142 | 6" | 28.274 |
| 461-J | 577-J | 1442-H | 2884-H | | 5.77 | 2½" | 4.909 | | |
| 272-J | 340-J | 850-J | 1700-H | | 3.40 | 3¼" | 8.296 | | |
| 180-J | 225-J | 562-J | 1125-H | 2250-H | 2.25 | 4" | 12.566 | | |
| 1280-J | 1600-H | | | | 16.00 | 2" | 3.142 | 8" | 50.265 |
| 820-J | 1026-H | 2565-H | | | 10.26 | 2½" | 4.909 | | |
| 484-J | 606-J | 1515-H | 3030-H | | 6.06 | 3¼" | 8.296 | | |
| 320-J | 400-J | 1000-J | 2000-H | | 4.00 | 4" | 12.566 | | |
| 204-J | 256-J | 640-J | 1280-H | 2560-H | 2.56 | 5" | 19.635 | | |
| 1282-H | 1603-H | | | | 16.03 | 2½" | 4.909 | 10" | 78.54 |
| 757-J | 947-J | 2367-H | | | 9.47 | 3¼" | 8.296 | | |
| 500-J | 625-J | 1562-H | 3124-H | | 6.25 | 4" | 12.566 | | |
| 320-J | 400-J | 1000-H | 2000-H | | 4.00 | 5" | 19.635 | | |
| 241-J | 277-J | 692-J | 1385-H | 2770-H | 2.77 | 6" | 28.274 | | |
| 1846-H | 2308-H | | | | 23.08 | 2½" | 4.909 | 12" | 113.10 |
| 1092-J | 1366-J | | | | 13.66 | 3¼" | 8.296 | | |
| 720-J | 900-J | 2250-H | | | 9.00 | 4" | 12.566 | | |
| 460-J | 576-J | 1440-H | 2880-H | | 5.76 | 5" | 19.635 | | |
| 320-J | 400-J | 1000-H | 2000-H | | 4.00 | 6" | 28.274 | | |
| 180-J | 225-J | 562-H | 1125-H | 2250-H | 2.25 | 8" | 50.265 | | |
| 1488-J | 1860-H | | | | 18.60 | 3¼" | 8.296 | 14" | 153.94 |
| 980-J | 1225-H | 3062-H | | | 12.25 | 4" | 12.566 | | |
| 627-J | 784-J | 1960-H | | | 7.84 | 5" | 19.635 | | |
| 436-J | 545-J | 1362-H | 2724-H | | 5.45 | 6" | 28.274 | | |
| 245-J | 307-J | 767-H | 1535-H | | 3.07 | 8" | 50.265 | | |
| 156-J | 196-J | 490-J | 980-H | 1960-H | 1.96 | 10" | 78.54 | | |
| 1936-H | 2421-H | | | | 24.21 | 3¼" | 8.296 | 16" | 201.06 |
| 1280-H | 1600-H | | | | 16.00 | 4" | 12.566 | | |
| 820-H | 1025-H | | | | 10.25 | 5" | 19.635 | | |
| 569-H | 712-J | | | | 7.12 | 6" | 28.274 | | |
| 320-J | 400-J | | | | 4.00 | 8" | 50.265 | | |
| 204-J | 256-J | | | | 2.56 | 10" | 78.54 | | |
| 142-J | 178-J | | | | 1.78 | 12" | 113.10 | | |
| 1620-H | 2025-H | | | | 20.25 | 4" | 12.566 | 18" | 254.47 |
| 1040-H | 1300-H | | | | 13.00 | 5" | 19.635 | | |
| 720-J | 900-H | | | | 9.00 | 6" | 28.274 | | |
| 444-J | 506-H | | | | 5.06 | 8" | 50.265 | | |
| 259-J | 324-J | | | | 3.24 | 10" | 78.54 | | |
| 180-J | 225-J | | | | 2.25 | 12" | 113.10 | | |
| 132-J | 165-J | | | | 1.65 | 14" | 153.94 | | |
| 2000-H | 2500-H | | | | 25.00 | 4" | 12.566 | 20" | 314.16 |
| 1284-H | 1605-H | | | | 16.05 | 5" | 19.635 | | |
| 888-H | 1111-H | | | | 11.11 | 6" | 28.274 | | |
| 500-H | 625-H | | | | 6.25 | 8" | 50.265 | | |
| 320-J | 400-J | | | | 4.00 | 10" | 78.54 | | |
| 222-J | 278-J | | | | 2.78 | 12" | 113.10 | | |
| 193-J | 204-J | | | | 2.04 | 14" | 153.94 | | |

J — Indicates Job Rated Hydraulic Unit at Output End.

H — Indicates Power Packed Hydraulic Unit at Output End.

### Speed Of Booster Operated Cylinders

Operating speeds of Miller Boosters range up to 450 strokes per minute depending upon stroke length, valving, piping, etc. Because they provide high pressures for the entire cylinder stroke, single pressure boosters generally give faster cylinder speeds. Other practical ways to increase speeds are: to stimulate fluid flow, have a minimum of 50 psi in air-oil lines; keep line velocities not over 5 ft. per second; use moderate size boosters with ample size ports rather than small, long stroke boosters with small ports; use welded half pipe couplings, especially on oil ports — however, standard air-inlet ports are usually adequate for booster speeds up to 100 ft. per minute; do not use oversize boosters; to pre-exhaust air, use two 3-way valves instead of a 4-way valve for energizer booster; use an air-surge tank near booster and valves to minimize pressure drop and assure ample air supply.

CAUTION: Turbulence caused by too rapid booster return can be eliminated by reducing return pressure to booster or by speed-controlling its return to same speed as cylinder.

# Miller B4 Air-Hydraulic Boosters

## *Ideal For Dual Pressure or Single Pressure Circuits — Provide up to *10,000 psi and More Hydraulic Output Pressures*

Model A77-B4
Booster With Integral Tank

| PORT IDENTIFICATION TABLE | |
|---|---|
| 5 | Booster Low Pressure Inlet (Advance) |
| 6 | Booster Low Pressure Inlet (Return) |
| 7 | Alternate High Pressure Hydraulic Outlet |
| 8 | High Pressure Hydraulic Outlet |
| 9 | Hydraulic Inlet (Supply) |
| 10 | Tank Air Inlet |
| 11 | Tank Oil Outlet |

All Ports EE Pipe Size

### SPRING-RETURN BOOSTERS

In calculating the dimensions of B4 single acting, spring return boosters (not recommended for over 8" bore not over 8" to 12" stroke boosters), use all dimensions shown in this table except use 2 x stroke plus LE instead of stroke plus LE and add an additional stroke length to all dimensions effected by stroke except the WA dimension.

**Note**

*B4 Boosters are also available for hydraulic to hydraulic operation. See pages 14 and 15 for details.*

Miller Boosters are built-up from standard Miller Air and Hydraulic Cylinder parts and are manufactured to the same high standards of quality and precision construction for which Miller Cylinders are so widely recognized. Heads, caps, and mountings are machined from solid steel bar stock; hydraulic rams are case-hardened and hard chrome plated. Cushioning available at cap end without dimension change.

**Mounting Data, Operation, Output.** Miller B4 Air-Hydraulic Boosters are for double or single acting use and are available in model 50 series, 62, 64, 72, 74 and 77 mounting styles (some restrictions in certain bore sizes). These mountings may be found in Bulletin No. 7619 or Bulletin No. 7620. The installation drawings and mounting dimensions for two popular models are presented here.

The operation of B4 Air-Hydraulic Boosters — and how they save up to 90% of air in dual pressure circuits — are explained in detail on page 5.

From up to 250 psi air input, they produce up to 10,000 and more hydraulic output pressures, depending upon booster rato. See pages 6 and 7 for output, etc, of popular B4 sizes and pages 8 and 9 for comprehensive Selector Chart covering wide selection of boosters.

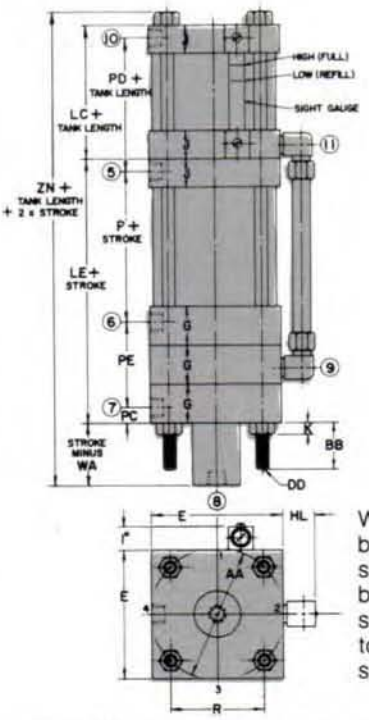
**Tanks.** Miller Air-Oil Tanks have special baffles that elminate oil surging, foaming, aeration, and slop over at all operating speeds. Tank dimensional drawing and dimensions (included in Dimensional Table) are presented here.

## INSTALLATION DRAWINGS

### MAXIMUM OUTPUT PRESSURES UP TO 5000 PSI STANDARD

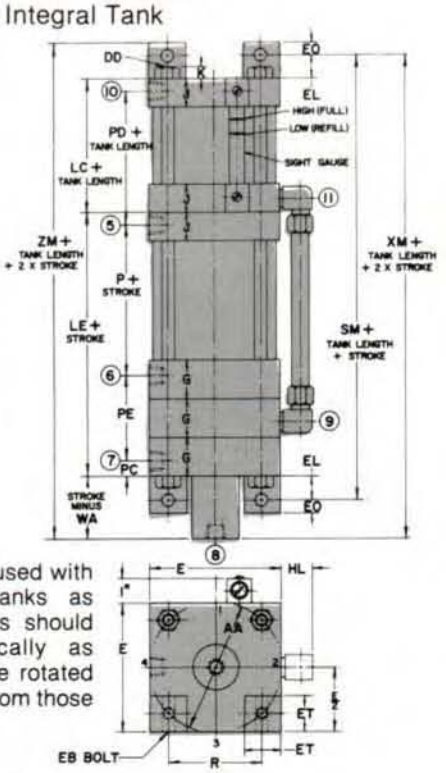
(Special Engineering Required For Over 5000 psi Output.)
For Input Pressures, See Dimension Table Headings.

Model A-53B4 Booster
With Integral Tank




ALL PORTS ARE
"EE" PIPE SIZE

Model A77-B4 Booster
With Integral Tank




When Boosters are used with built-in (integral) Tanks as shown, the Boosters should be mounted vertically as shown. Ports may be rotated to any 90° position from those shown.

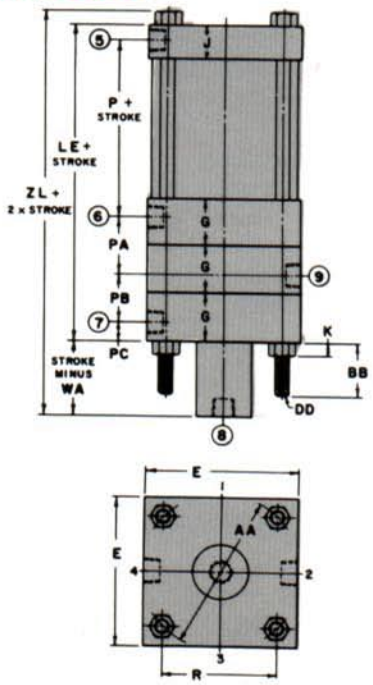
* Special Engineering Required for over 5000 psi output

# INSTALLATION DRAWINGS

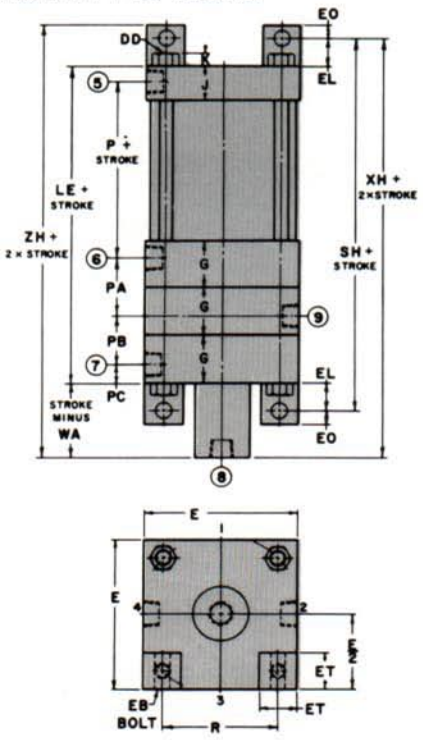
## MAXIMUM OUTPUT PRESSURES UP TO 5000 PSI STANDARD

(Special Engineering Required For Over 5000 psi Output.)
For Input Pressures, See Dimension Table Headings.

Model A53-B4




Model A77-B4 Booster




## BOOSTER POWER PANELS

Miller "B4" Boosters are available as compact, convenient PANEL MOUNTED units — completely piped, valved, and assembled with two Air Oil Tanks (as required) — ready for connection to your Shop Air Line.

## "IN-STOCK" BOOSTERS AND TANKS

The following Miller Air-Hydraulic Boosters and Tanks are available from stock for immediate shipment . . .

Models A77, A50, A52, and A53 Boosters in: 5" bore, 1" dia. ram, 6" stroke.

Models A77, A50, A52, and A53 Tanks, 5" and 8" bores in 6", 8", and 10" heights.

* Models A77 and A53 "B4" Boosters With Separate and Integral Tanks "A" Series (Air) Up to 250 psi Input

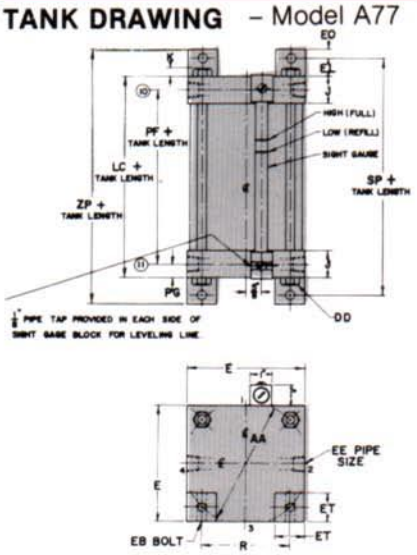
| BORE | 3¼ | 4 | 5 | 6 | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|---|---|
| AA | 3.9 | 4.7 | 5.8 | 6.9 | 9.1 | 11.2 | 13.3 | 15.4 |
| BB | 1⅜ | 1⅜ | 1 13/16 | 1 13/16 | 2⅝ | 2 11/16 | 2 11/16 | 3 5/16 |
| DD | ⅜-24 | ⅜-24 | ½-20 | ½-20 | ⅝-18 | ¾-16 | ¾-16 | ⅞-14 |
| E | 3¾ | 4½ | 5½ | 6 1/8 | 8½ | 10⅝ | 12¾ | 14 7/8 |
| EB | ⅜ | ⅜ | ½ | ½ | ⅝ | ¾ | ¾ | ⅞ |
| EE | ½ | ½ | ½ | ¾ | ¾ | 1 | 1 | 1¼ |
| EL | ⅞ | 1 | 1 1/16 | 1 | 1⅛ | 1 5/16 | 1 5/16 | 1½ |
| EO | ⅜ | ⅜ | ½ | ½ | ⅝ | ⅝ | ⅝ | ¾ |
| ET | 1 | 1 3/16 | 1⅜ | 1⅝ | 2 1/16 | 2 11/16 | 3⅝ | 3 13/16 |
| G | 1¾ | 1¾ | 1¾ | 2 | 2 | 2¼ | 2¼ | 2¾ |
| HL | 1⅝ | 1⅝ | 1⅝ | 1 27/32 | 1 27/32 | 2 5/16 | 2 5/16 | 2 55/64 |
| J | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 2 | 2 | 2¼ |
| K | ⅜ | ⅜ | 7/16 | 7/16 | 9/16 | 11/16 | 11/16 | 13/16 |
| LC | 2½ | 2½ | 2½ | 3 | 3 | 4 | 4 | 4½ |
| LE | 7¾ | 7¾ | 8 | 9 | 9⅛ | 10⅞ | 11⅜ | 13⅝ |
| P | 2⅝ | 2⅝ | 2⅞ | 3⅛ | 3¼ | 4⅛ | 4⅝ | 5½ |
| PA | 2⅛ | 2⅛ | 2⅛ | 2⅜ | 2⅜ | 2½ | 2½ | 3⅛ |
| PB | 1¾ | 1¾ | 1¾ | 2 | 2 | 2¼ | 2¼ | 2¾ |
| PC | 11/16 | 11/16 | 11/16 | 13/16 | 13/16 | 1 | 1 | 1 3/16 |
| PD | 2½ | 2½ | 2½ | 3 | 3 | 4 | 4 | 4½ |
| PE | 3⅞ | 3⅞ | 3⅞ | 4⅜ | 4⅜ | 4¾ | 4¾ | 5⅞ |
| PF | 1⅜ | 1⅜ | 1⅜ | 1⅝ | 1⅝ | 2 | 2 | 2⅜ |
| PG | 9/16 | 9/16 | 9/16 | 11/16 | 11/16 | 1 | 1 | 1 1/16 |
| R | 2.76 | 3.32 | 4.10 | 4.88 | 6.44 | 7.92 | 9.40 | 10.90 |
| SH | 9½ | 9¾ | 10⅛ | 11 | 11⅜ | 13½ | 14 | 16⅝ |
| SM | 12 | 12¼ | 12⅝ | 14 | 14⅜ | 17½ | 18 | 21⅛ |
| SP | 4¼ | 4½ | 4⅝ | 5 | 5¼ | 6⅜ | 6⅝ | 7½ |
| WA | ⅝ | ⅝ | ⅝ | ⅞ | ⅞ | 1⅛ | 1⅛ | 1⅜ |
| XH | 8 | 8⅛ | 8 7/16 | 9⅛ | 9⅜ | 11 11/16 | 11 9/16 | 13½ |
| XM | 10½ | 10⅝ | 10 15/16 | 12⅛ | 12⅜ | 15 1/16 | 15 9/16 | 18 |
| ZH | 8⅜ | 8½ | 8 15/16 | 9⅝ | 10 | 11 11/16 | 12 3/16 | 14¼ |
| ZL | 7½ | 7½ | 7 13/16 | 8 9/16 | 8 13/16 | 10 7/16 | 10 15/16 | 12 13/16 |
| ZM | 10⅞ | 11 | 11 7/16 | 12⅜ | 13 | 15 11/16 | 16 3/16 | 18¾ |
| ZN | 10 | 10 | 10 5/16 | 11 9/16 | 11 13/16 | 14 7/16 | 14 15/16 | 17 5/16 |
| ZP | 5 | 5¼ | 5⅝ | 6 | 6½ | 7⅞ | 7⅞ | 9 |

* For other mountings and their dimensions See cylinder Bulletins 7619 and 7620

Model A77-B4 Booster

When Boosters are used with separate (not integral) Tanks, the Boosters may be mounted 90° from position shown with port 9 vertically up or horizontal. Booster ports may be rotated to any 90° position from those shown. Locate Tank at highest point of hydraulic circuit.

## TANK DRAWING – Model A77







**NOTE:** Two tanks can be mounted in tandem, one above the other. Sight gauge of lower tank is off-set to left. Miller Air-Oil Tanks have baffles that eliminate oil churning, aeration, and slopover.

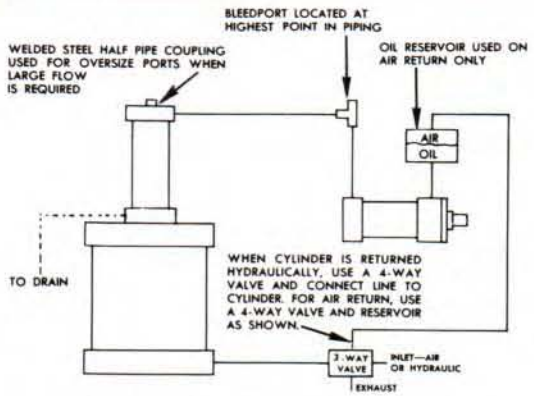
# BA9 Booster-Accumulators

## *Provide Output Pressure Up To 5000 PSI*

The Miller BA9 supplies much larger volumes of high pressure oil for operating hydraulic cylinders in single acting closed booster circuits (as illustrated below) and can also be used in double-acting circuits. Used as an accumulator, it serves as an auxiliary, large capacity source of high pressure hydraulic power derived from low pressure input. The unit consists of an air or hydraulic piston driving a smaller diameter hydraulic piston, resulting in a pressure intensification according to the ratio of the piston areas. The larger the ratio, the greater the pressure intensification.

The BA9 is lower in first cost than the B4 Booster but is not self-bleeding nor self-filling. Therefore, its use is recommended only where complete manual bleeding and filling can be easily accomplished. The fluid driving media may be air or low pressure hydraulic.

The mounting drawing and dimensions shown here cover both air-to-hydraulic and hydraulic-to-hydraulic operation. See page 14 for more data on hydraulic-to-hydraulic boosters. See page 9 for available Booster Ratios.



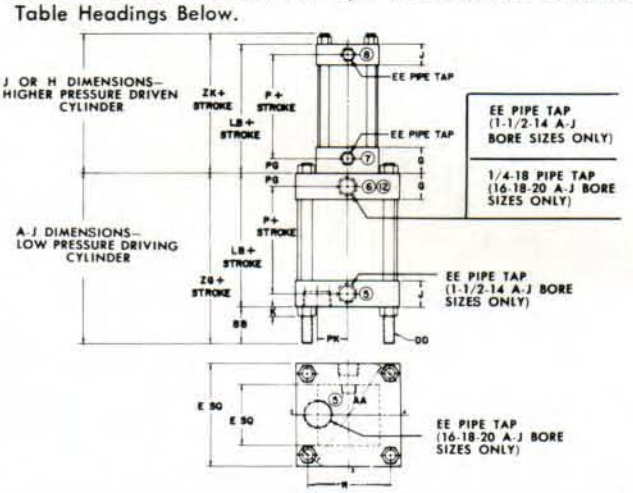

**BA9—Single Acting Circuit**

Note: A small amount of oil seepage from the hydraulic cylinder piston assembly is unavoidable because of the imperfect wiping action of hydraulic cup seals in single acting operation. Note the drain port provided.

**MODEL 64-BA9**

### INSTALLATION DRAWING

FOR OUTPUT PRESSURES TO 3000 PSI SEVERE SERVICE, 5000 PSI MODERATE SERVICE. For Input Pressures, See Dimension Table Headings Below.




## DIMENSION TABLES

Immediately below are BA9 Maximum Input Pressures.
For Output Pressures from available Booster Ratios, see page 9

**BA9 Air-To-Hydraulic Booster**

| Driving Cylinder Bore Size (inches) | Max. Air Input PSI |
|---|---|
| 3¼ | 750 |
| 4 | 500 |
| 5, 6 | 400 |
| 8 to 20 | 250 |

**BA9 Hydraulic To Hydraulic**

| Driving Cylinder Bore Size (inches) | Max. Hydraulic Input PSI | |
|---|---|---|
| | Severe | Moderate |
| 3¼ | 1500 | 2500 |
| 4 | 1000 | 1500 |
| 5, 6 | 800 | 1200 |
| 8 to 12 | 500 | 800 |

**Port Identification Table**

| | |
|---|---|
| ⑤ | LOW PRESSURE INLET (Advance) |
| ⑥ | LOW PRESSURE INLET (Return—Double Acting Operation) |
| ⑦ | HIGH PRESSURE OUTLET (Double Acting Operation) (Drain Port on Single Acting Operation) |
| ⑧ | HIGH PRESSURE OUTLET |
| ⑫ | BREATHER PORT (Single Acting Operation) |

### "A" (Air) and "J" (Hydraulic) Cylinder Dimensions

| Bore | 1½ | 2 | 2½ | 3¼ | 4 | 5 | 6 | 7 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | Bore |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AA | 2.02 | 2.60 | 3.10 | 3.90 | 4.70 | 5.80 | 6.90 | 8.10 | 9.10 | 11.20 | 13.30 | 15.40 | 17.70 | 20.00 | 22.10 | AA |
| BB | 1 | 1⅛ | 1⅛ | 1⅛ | 1⅛ | 1 13/16 | 1 15/16 | 2 5/16 | 2 5/16 | 2 11/16 | 2 13/16 | 3 5/16 | 3⅝ | 4⅛ | 4½ | BB |
| DD | ¼-28 | 5/16-24 | 5/16-24 | ⅜-24 | ⅜-24 | ½-20 | ½-20 | ⅝-18 | ⅝-18 | ¾-16 | ¾-16 | ⅞-14 | 1-14 | 1⅛-12 | 1¼-12 | DD |
| E | 2 | 2½ | 3 | 3¼ | 4½ | 5½ | 6½ | 7½ | 8½ | 10⅝ | 12¼ | 14¼ | 17 | 19 | 21 | E |
| EE | ⅜-18 | ⅜-18 | ⅜-18 | ½-14 | ½-14 | ½-14 | ¾-14 | ¾-14 | ¾-14 | 1-11½ | 1-11½ | 1¼-11½ | 2½-8 | 3-8 | 3-8 | EE |
| G | 1½ | 1½ | 1½ | 1¾ | 1¾ | 1¾ | 2 | 2 | 2 | 2¼ | 2¼ | 2¼ | 1½ | 1¾ | 2 | G |
| J | 1 | 1 | 1 | 1¼ | 1¼ | 1¼ | 1½ | 1½ | 1½ | 2 | 2 | 2¼ | 1½ | 1¾ | 2 | J |
| K | ¼ | 5/16 | 5/16 | ⅜ | ⅜ | 7/16 | 7/16 | 9/16 | 9/16 | 11/16 | 11/16 | 13/16 | ⅜ | 1 | 1¼ | K |
| LB | 3⅝ | 3⅝ | 3¾ | 4¼ | 4½ | 5 | 5½ | 5½ | 6½ | 6½ | 6¾ | 8½ | 5 5/16 | 5 15/16 | 6 11/16 | LB |
| P | 2¼ | 2¼ | 2⅜ | 2⅝ | 2⅝ | 2⅞ | 3½ | 3¼ | 3¼ | 4½ | 4⅝ | 5½ | 10 15/16 | 12 13/16 | 13 11/16 | P |
| PG | 13/16 | 13/16 | 13/16 | 1 1/16 | 1 1/16 | 1 1/16 | 1 3/16 | 1 3/16 | 1 3/16 | 1¼ | 1¼ | 1 5/16 | — | — | — | PG |
| PK | — | — | — | — | — | — | — | — | — | — | — | — | 5½ | 6¼ | 7 | PK |
| R | 1.43 | 1.84 | 2.19 | 2.76 | 3.32 | 4.10 | 4.88 | 5.73 | 6.44 | 7.92 | 9.40 | 10.90 | 12.52 | 14.14 | 15.63 | R |
| ZG | 4⅛ | 4¼ | 4⅞ | 5⅛ | 5⅝ | 6 3/16 | 6 15/16 | 7 13/16 | 7 13/16 | 9⅛ | 9⅝ | 11⅝ | 8 7/16 | 10 1/16 | 11 3/16 | ZG |
| ZK | 3⅛ | 3 15/16 | 4 1/16 | 4⅛ | 4⅝ | 4 15/16 | 5 3/16 | 5 11/16 | 5 11/16 | 7¼ | 7⅝ | 9 | — | — | — | ZK |

### "H" (Hydraulic) Cylinder Dimensions

| Bore | 1½ | 2 | 2½ | 3¼ | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| AA | 2.30 | 2.90 | 3.60 | 4.60 | 5.40 | 7.00 | 8.10 | 9.30 | 10.60 |
| BB | 1⅛ | 1 13/16 | 1 15/16 | 2 5/16 | 2 5/16 | 3 5/16 | 3⅝ | 4⅛ | 4½ |
| DD | ⅜-24 | ½-20 | ½-20 | ⅝-18 | ⅝-18 | ⅞-14 | 1-14 | 1⅛-12 | 1¼-12 |
| E | 2½ | 3 | 3½ | 4½ | 5 | 6½ | 7½ | 8½ | 9½ |
| EE | ½-14 | ½-14 | ½-14 | ¾-14 | ¾-14 | ¾-14 | 1-11½ | 1¼-11½ | 1½-11½ |
| G | 1¾ | 1¾ | 1¾ | 2 | 2 | 2 | 2¼ | 2¾ | 3 |
| J | 1½ | 1½ | 1½ | 1¾ | 1¾ | 1¾ | 2¼ | 2¾ | 3 |
| K | ⅜ | 7/16 | 7/16 | 9/16 | 9/16 | 11/16 | 13/16 | 1 | 1¼ |
| LB | 4⅜ | 4⅜ | 4¾ | 5½ | 5¾ | 6¼ | 8⅜ | 8½ | 9½ |
| P | 2⅞ | 2⅞ | 3 | 3½ | 3¾ | 4¼ | 4⅞ | 5⅜ | 6⅛ |
| PG | 1 | 1 | 1 | 1⅛ | 1⅛ | 1⅛ | 1⅛ | 1 13/16 | 1 11/16 |
| R | 1.63 | 2.05 | 2.55 | 3.25 | 3.82 | 4.95 | 5.73 | 6.58 | 7.50 |
| ZK | 5 | 5 1/16 | 5 9/16 | 6 1/16 | 6 9/16 | 7 1/16 | 9 9/16 | 9½ | 10⅜ |

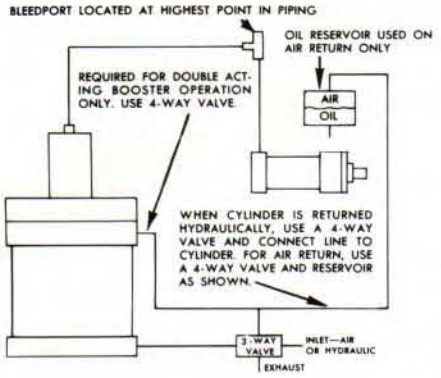
# BA8 Boosters

## *Provide Output Pressures Up To *10,000 PSI And More*

The Model BA8 is a ram type double-acting booster lower in first cost than the Model B4 but is neither self-bleeding nor self-filling. It is therefore recommended for use only where complete manual bleeding and filling can be easily effected and maintained. It utilizes the Miller self-adjusting, leakproof seal that permits no oil seepage. The BA8 can also be operated by hydraulic input. Mounting data on both air to hydraulic and hydraulic to hydraulic models are presented here. For booster ratios, see BA8 Selector Chart, page 9.

## INSTALLATION DRAWINGS

**FOR OUTPUT PRESSURES TO 5000 PSI STANDARD (Special Engineering For Over 5000 psi Output) For Input Pressures, See Dimension Table Headings**



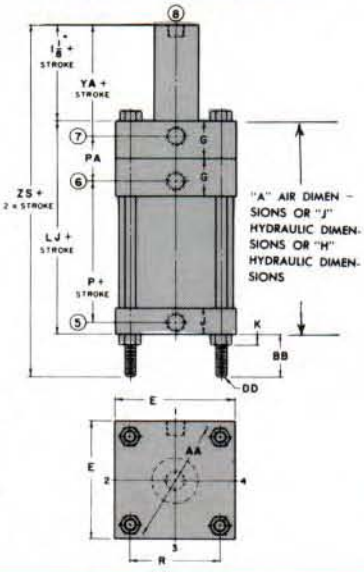

**Mount vertically as shown or 90° from vertical. Fill system with oil when booster and hydraulic cylinder are in retracted position as shown.**

**Model 62BA8**

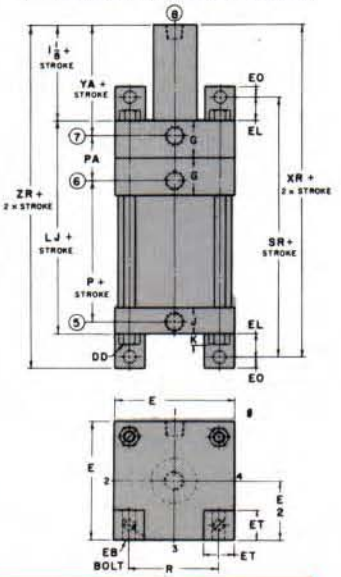
**PORT IDENTIFICATION TABLE**

| | |
|---|---|
| 5 | Booster Low Pressure Inlet (Advance) |
| 6 | Booster Low Pressure Inlet (Return) |
| 7 | Alternate High Pressure Hydraulic Outlet |
| 8 | High Pressure Hydraulic Outlet |
| All Ports EE Pipe Size | |

**A52-BA8 J52-BA8 H52-BA8**




**A77-BA8 J77-BA8 H77-BA8**



## DIMENSION TABLES

**"A" (Air) For Up To 250 psi Input "J" (Hydraulic) Input:**

| Bore | Severe Service | Moderate Service |
|---|---|---|
| 3¼" | 1500 psi | 2500 psi |
| 4" | 1000 psi | 1500 psi |
| 5" and 6" | 800 psi | 1200 psi |
| 8", 10", 12", 14" | 500 psi | 800 psi |

| BORE | 3¼ | 4 | 5 | 6 | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|---|---|
| AA | 3.9 | 4.7 | 5.8 | 6.9 | 9.1 | 11.2 | 13.3 | 15.4 |
| BB | 1 3/8 | 1 3/8 | 1 13/16 | 1 13/16 | 2 5/16 | 2 11/16 | 2 11/16 | 3 3/16 |
| DD | 3/8-24 | 3/8-24 | 1/2-20 | 1/2-20 | 5/8-18 | 3/4-16 | 3/4-16 | 7/8-14 |
| E | 3 3/4 | 4 1/2 | 5 1/2 | 6 1/2 | 8 1/2 | 10 5/8 | 12 3/4 | 14 3/4 |
| EB | 3/8 | 3/8 | 1/2 | 1/2 | 5/8 | 3/4 | 3/4 | 7/8 |
| EE | 1/2 | 1/2 | 1/2 | 3/4 | 3/4 | 1 | 1 | 1 1/4 |
| EL | 7/8 | 1 | 1 1/16 | 1 | 1 1/8 | 1 5/16 | 1 5/16 | 1 1/2 |
| EO | 3/8 | 3/8 | 1/2 | 1/2 | 5/8 | 5/8 | 5/8 | 3/4 |
| ET | 1 | 1 3/16 | 1 3/8 | 1 5/8 | 2 1/16 | 2 11/16 | 3 5/16 | 3 13/16 |
| G | 1 3/4 | 1 3/4 | 1 3/4 | 2 | 2 | 2 1/4 | 2 1/4 | 2 3/4 |
| J | 1 1/4 | 1 1/4 | 1 1/4 | 1 1/2 | 1 1/2 | 2 | 2 | 2 1/4 |
| K | 3/8 | 3/8 | 7/16 | 7/16 | 9/16 | 11/16 | 11/16 | 13/16 |
| LJ | 6 | 6 | 6 1/4 | 7 | 7 1/8 | 8 5/8 | 9 1/8 | 10 7/8 |
| P | 2 5/8 | 2 5/8 | 2 7/8 | 3 1/8 | 3 1/4 | 4 1/8 | 4 5/8 | 5 1/2 |
| PA | 2 1/8 | 2 1/8 | 2 1/8 | 2 3/8 | 2 3/8 | 2 1/2 | 2 1/2 | 3 1/8 |
| R | 2.76 | 3.32 | 4.10 | 4.88 | 6.44 | 7.92 | 9.40 | 10.90 |
| SR | 7 3/4 | 8 | 8 3/8 | 9 | 9 3/8 | 11 1/4 | 11 3/4 | 13 7/8 |
| XR | 8 | 8 1/8 | 8 7/16 | 9 1/8 | 9 3/8 | 11 1/16 | 11 9/16 | 13 1/2 |
| YA | 1 13/16 | 1 13/16 | 1 13/16 | 1 15/16 | 1 15/16 | 2 1/8 | 2 1/8 | 2 5/16 |
| ZR | 8 3/8 | 8 1/2 | 8 15/16 | 9 5/8 | 10 | 1 11/16 | 12 3/16 | 14 1/4 |
| ZS | 8 1/2 | 8 1/2 | 9 3/16 | 9 15/16 | 10 9/16 | 12 7/16 | 12 15/16 | 15 3/16 |

**"H" (Hydraulic) Input 3000 psi Severe Service 5000 psi Moderate Service**

| BORE | 3¼ | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|
| AA | 4.6 | 5.4 | 7.0 | 8.1 | 9.3 | 10.6 |
| BB | 2 5/16 | 2 5/16 | 3 3/16 | 3 5/8 | 4 1/8 | 4 1/2 |
| DD | 5/8-18 | 5/8-18 | 7/8-14 | 1-14 | 1 1/8-12 | 1 1/4-12 |
| E | 4 1/2 | 5 | 6 1/2 | 7 1/2 | 8 1/2 | 9 1/2 |
| EB | 5/8 | 5/8 | 7/8 | 1 | 1 1/8 | 1 1/4 |
| EE | 3/4 | 3/4 | 3/4 | 1 | 1 1/4 | 1 1/2 |
| EL | 1 1/8 | 1 1/8 | 1 1/2 | 1 11/16 | 1 13/16 | 2 |
| EO | 5/8 | 5/8 | 3/4 | 7/8 | 1 | 1 1/8 |
| ET | 1 1/4 | 1 3/16 | 1 9/16 | 1 3/4 | 1 15/16 | 2 |
| G | 2 | 2 | 2 | 2 1/4 | 2 3/4 | 3 |
| J | 1 3/4 | 1 3/4 | 1 3/4 | 2 1/4 | 2 3/4 | 3 |
| K | 9/16 | 9/16 | 13/16 | 15/16 | 1 | 1 1/4 |
| LJ | 7 1/2 | 7 3/4 | 8 1/4 | 9 5/8 | 11 1/4 | 12 1/2 |
| P | 3 1/2 | 3 3/4 | 4 1/4 | 4 7/8 | 5 3/8 | 6 1/8 |
| PA | 2 1/4 | 2 1/4 | 2 1/4 | 2 1/2 | 3 1/8 | 3 3/8 |
| R | 3.25 | 3.82 | 4.95 | 5.73 | 6.58 | 7.50 |
| SR | 9 3/4 | 10 | 11 1/4 | 13 | 14 7/8 | 16 1/2 |
| XR | 9 3/4 | 10 | 10 7/8 | 12 7/16 | 14 3/16 | 15 5/8 |
| YA | 2 | 2 | 2 | 2 1/8 | 2 5/16 | 2 7/16 |
| ZR | 10 3/8 | 10 5/8 | 11 5/8 | 13 5/16 | 15 3/16 | 16 3/4 |
| ZS | 10 15/16 | 11 3/16 | 12 7/16 | 14 3/8 | 16 1/2 | 18 1/8 |

* Special Engineering and Pricing for over 5000 psi output.

# HYDRAULIC TO HYDRAULIC BOOSTERS

Hydraulic to hydraulic boosters offer a convenient, economical method of converting low to medium hydraulic pump systems into higher pressure systems without the additional expense and maintenance problems involved in the high pressure and valving otherwise required.

Another advantage is that the booster can be used to supply high pressure only in that part of the system where the high pressure is actually needed. And a hydraulic booster is especially economical for holding high pressures for long periods of time — with only low pressure pump oil as its input operating medium.

Built up from standard Miller Hydraulic Cylinder parts, Miller Hydraulic To Hydraulic Boosters are exceptionally rugged, dependable, and precision-engineered to the high quality standards for which Miller has become famous.

Heads, caps and mountings are solid steel bar stock. Hydraulic rams are case-hardened and hard chrome plated. Fluid-and-heat resisting Teflon hydraulic ram seals are standard on most models and are available on all other models at small extra cost. Teflon piston cup seals are also available in all models at small extra cost. All seals are of the "pressure sealing" type specified by N.F.P.A. Standards. And these boosters meet N.F.P.A. Standards in all other respects.

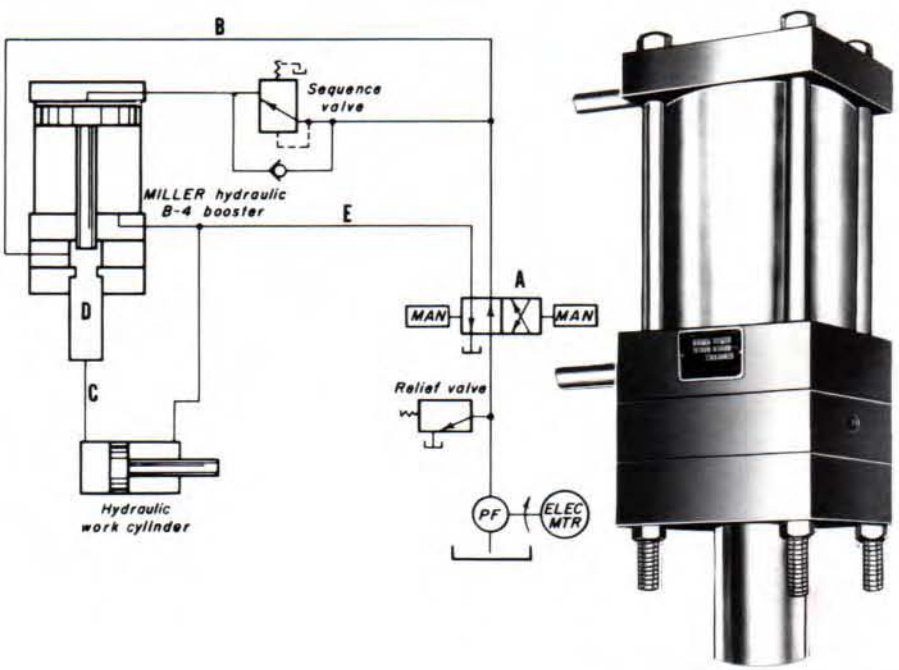
They are available in a wide variety of bores, strokes, booster ratios, and output capacities and are included in the Selector Charts on page 9. Mounting dimensions and circuits of Models BA9 and BA8 Hydraulic To Hydraulic Boosters are given on pages 12 and 13.

## MILLER HYDRAULIC TO HYDRAULIC "B4" BOOSTERS

Miller B4 Hydraulic Boosters are specially recommended for use in dual pressure circuits in which the low pressure pump oil is used for operation of the approach stroke of the work cylinder and the booster high pressure oil output is used to accomplish the high pressure work stroke of the cylinder. A typical circuit is shown and described below. See next page for mounting data on two popular models. See cylinder Bulletin 7622 for dimensional data on other mountings.

### Miller Hydraulic To Hydraulic "B4" Booster In Dual Pressure Circuit

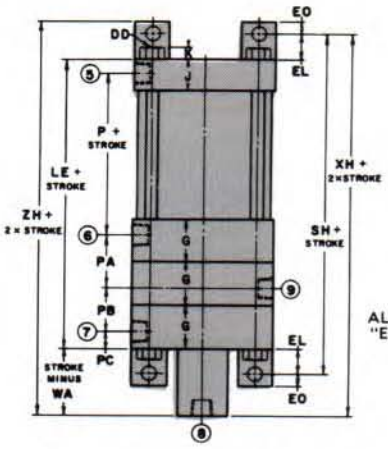
The piping up through the four-way valve A represents a more or less conventional hydraulic system. In operation, pump oil flow through Line B, through the booster pressure chamber D, then through Line C and into the work cylinder to operate its approach stroke. When the cylinder encounters resistance, the sequence valve opens to allow the low pressure oil to act on the booster piston. As the booster ram moves forward, it blocks passage of high pressure oil into low pressure oil line B and delivers intensified pressure to the work cylinder. Through line E low pressure pump oil retracts the stroke of the booster and the cylinder.

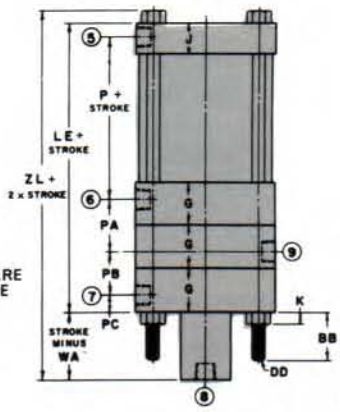



**Model J53 or H53 B4 Booster**

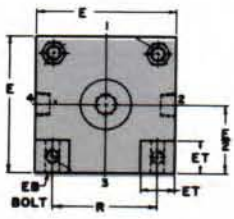
# Boost Hydraulic Pump System Pressures To Higher Pressures — Up To *10,000 PSI And More As Desired

## INSTALLATION DRAWINGS

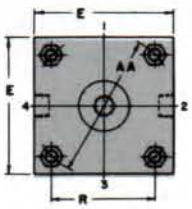



ALL PORTS ARE "EE" PIE SIZE




Mount vertically as shown — or 90° from position shown with port 9 either vertically up or horizontal. Ports may be rotated to any 90° position from those shown.




| PORT IDENTIFICATION TABLE | |
|---|---|
| All Ports EE Pipe Size | |
| 5 | Booster Low Pressure Inlet (Advance) |
| 6 | Booster Low Pressure Inlet (Return) |
| 7 | Alternate High Pressure Hydraulic Outlet |
| 8 | High Pressure Hydraulic Outlet |
| 9 | Hydraulic Inlet (Supply) |

**Model J77 or H77 B4 Booster**

## MOUNTING DIMENSIONS

**Model "J" Hydraulic Input Pressures:**

| Bore | Severe Service | Moderate Service |
|---|---|---|
| 3¼" | 1500 psi | 2500 psi |
| 4" | 1000 psi | 1500 psi |
| 5" and 6" | 800 psi | 1200 psi |
| 8", 10", 12", 14" | 500 psi | 800 psi |

| BORE | 3¼ | 4 | 5 | 6 | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|---|---|
| AA | 3.9 | 4.7 | 5.8 | 6.9 | 9.1 | 11.2 | 13.3 | 15.4 |
| BB | 1 3/8 | 1 3/8 | 1 13/16 | 1 13/16 | 2 5/16 | 2 11/16 | 2 11/16 | 3 3/16 |
| DD | 3/8-24 | 3/8-24 | 1/2-20 | 1/2-20 | 5/8-18 | 3/4-16 | 3/4-16 | 7/8-14 |
| E | 3 3/4 | 4 1/2 | 5 1/2 | 6 1/2 | 8 1/2 | 10 5/8 | 12 3/4 | 14 3/4 |
| EB | 3/8 | 3/8 | 1/2 | 1/2 | 5/8 | 3/4 | 3/4 | 7/8 |
| EE | 1/2 | 1/2 | 1/2 | 3/4 | 3/4 | 1 | 1 | 1 1/4 |
| EL | 7/8 | 1 | 1 1/16 | 1 | 1 1/8 | 1 5/16 | 1 5/16 | 1 1/2 |
| EO | 3/8 | 3/8 | 1/2 | 1/2 | 5/8 | 5/8 | 5/8 | 3/4 |
| ET | 1 | 1 3/16 | 1 3/8 | 1 5/8 | 2 1/16 | 2 11/16 | 3 5/16 | 3 13/16 |
| G | 1 3/4 | 1 3/4 | 1 3/4 | 2 | 2 | 2 1/4 | 2 1/4 | 2 3/4 |
| J | 1 1/4 | 1 1/4 | 1 1/4 | 1 1/2 | 1 1/2 | 2 | 2 | 2 1/4 |
| K | 3/8 | 3/8 | 7/16 | 7/16 | 9/16 | 11/16 | 11/16 | 13/16 |
| LE | 7 3/4 | 7 3/4 | 8 | 9 | 9 1/8 | 10 7/8 | 11 3/8 | 13 5/8 |
| P | 2 5/8 | 2 5/8 | 2 7/8 | 3 1/8 | 3 1/4 | 4 1/8 | 4 5/8 | 5 1/2 |
| PA | 2 1/8 | 2 1/8 | 2 1/8 | 2 3/8 | 2 3/8 | 2 1/2 | 2 1/2 | 3 1/8 |
| PB | 1 3/4 | 1 3/4 | 1 3/4 | 2 | 2 | 2 1/4 | 2 1/4 | 2 3/4 |
| PC | 11/16 | 11/16 | 11/16 | 13/16 | 13/16 | 1 | 1 | 1 3/16 |
| R | 2.76 | 3.32 | 4.10 | 4.88 | 6.44 | 7.92 | 9.40 | 10.90 |
| SH | 9 1/2 1 | 9 3/4 | 10 1/8 | 11 | 11 3/8 | 13 1/2 | 14 | 16 5/8 |
| WA | 5/8 | 5/8 | 5/8 | 7/8 | 7/8 | 1 1/8 | 1 1/8 | 1 5/8 |
| XH | 8 | 8 1/8 | 8 7/16 | 9 1/8 | 9 3/8 | 11 1/16 | 11 9/16 | 13 1/2 |
| ZH | 8 3/8 | 8 1/2 | 8 15/16 | 9 5/8 | 10 | 11 11/16 | 12 3/16 | 14 1/4 |
| ZL | 7 1/2 | 7 1/2 | 7 13/16 | 8 9/16 | 8 13/16 | 10 7/16 | 10 15/16 | 12 13/16 |

* Special Engineering and Pricing for over 5000 psi output

**Model "H" Hydraulic Input, 3000 psi Severe; 5000 psi Moderate**

| BORE | 3¼ | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|
| AA | 4.6 | 5.4 | 7.0 | 8.1 | 9.3 | 10.6 |
| BB | 2 5/16 | 2 5/16 | 3 3/16 | 3 5/8 | 4 1/8 | 4 1/2 |
| DD | 3/8-24 | 3/8-24 | 1/2-20 | 5/8-18 | 3/4-16 | 7/8-14 |
| E | 4 1/2 | 5 | 6 1/2 | 7 1/2 | 8 1/2 | 9 1/2 |
| EB | 5/8 | 5/8 | 7/8 | 1 | 1 1/8 | 1 1/4 |
| EE | 3/4 | 3/4 | 3/4 | 1 | 1 1/4 | 1 1/2 |
| EL | 1 1/8 | 1 1/8 | 1 1/2 | 1 11/16 | 1 13/16 | 2 |
| EO | 5/8 | 5/8 | 3/4 | 7/8 | 1 | 1 1/8 |
| ET | 1 1/4 | 1 3/16 | 1 9/16 | 1 3/4 | 1 15/16 | 2 |
| G | 2 | 2 | 2 | 2 1/4 | 2 3/4 | 3 |
| J | 1 3/4 | 1 3/4 | 1 3/4 | 2 1/4 | 2 3/4 | 3 |
| K | 9/16 | 9/16 | 13/16 | 15/16 | 1 | 1 1/4 |
| LE | 9 1/2 | 9 3/4 | 10 1/4 | 11 7/8 | 14 | 15 1/2 |
| P | 3 1/2 | 3 3/4 | 4 1/4 | 4 7/8 | 5 3/8 | 6 1/8 |
| PA | 2 1/4 | 2 1/4 | 2 1/4 | 2 1/2 | 3 1/8 | 3 3/8 |
| PB | 2 | 2 | 2 | 2 1/4 | 2 3/4 | 3 |
| PC | 7/8 | 7/8 | 7/8 | 1 | 1 3/16 | 1 5/16 |
| R | 3.25 | 3.82 | 4.95 | 5.73 | 6.58 | 7.50 |
| SH | 11 3/4 | 12 | 13 1/4 | 15 1/4 | 17 5/8 | 19 1/2 |
| WA | 7/8 | 7/8 | 7/8 | 1 1/8 | 1 5/8 | 1 7/8 |
| XH | 9 3/4 | 10 | 10 7/8 | 12 7/16 | 14 3/16 | 15 5/8 |
| ZH | 10 3/8 | 10 5/8 | 11 5/8 | 13 5/16 | 15 3/16 | 16 3/4 |
| ZL | 9 3/16 | 9 7/16 | 10 3/16 | 11 11/16 | 13 3/8 | 14 7/8 |

All Dimensions In Inches

# AIR TO HYDRAULIC Reciprocating Boosters

## Larger Volumes — output pressures up to *10,000 psi and over

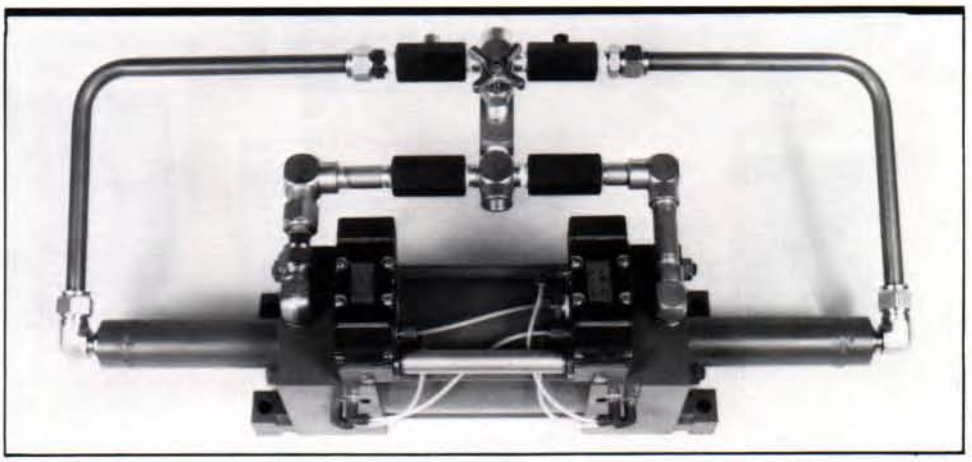
Like other Miller Boosters, Reciprocating Boosters offer the convenience of intensified hydraulic output from shop air input, but with more output volume for operation of larger cylinders or multiple cylinders.

The operation is completely automatic, supplying a continuous (though pulsating) flow during cycling until the boost ratio is attained. At that point, the booster stalls until the output pressure drops. While the booster is stalled the output pressure is maintained without heat generation or air consumption, an important feature for any holding operation.

The Reciprocating Booster consists of a double rod end air cylinder with a hydraulic pressure chamber at each end. Thus it delivers fluid output in both directions. The unit has a built-in 3-way pilot valve at each end of the cylinder. These valves are operated by the piston at the end of the stroke and provide the air signal needed to shift the power valves used to reciprocate the booster. The unit may be purchased completely piped and valved for automatic operation as shown below or without power valves and output piping as shown at the bottom of page 17.

### Miller Reciprocating Booster Model RDA77-DBA8

**Note:** Air-to-Air Reciprocating Boosters (Model RDA77-DBA9) are also available. From 80 psi air input, they provide up to 750 psi air output.



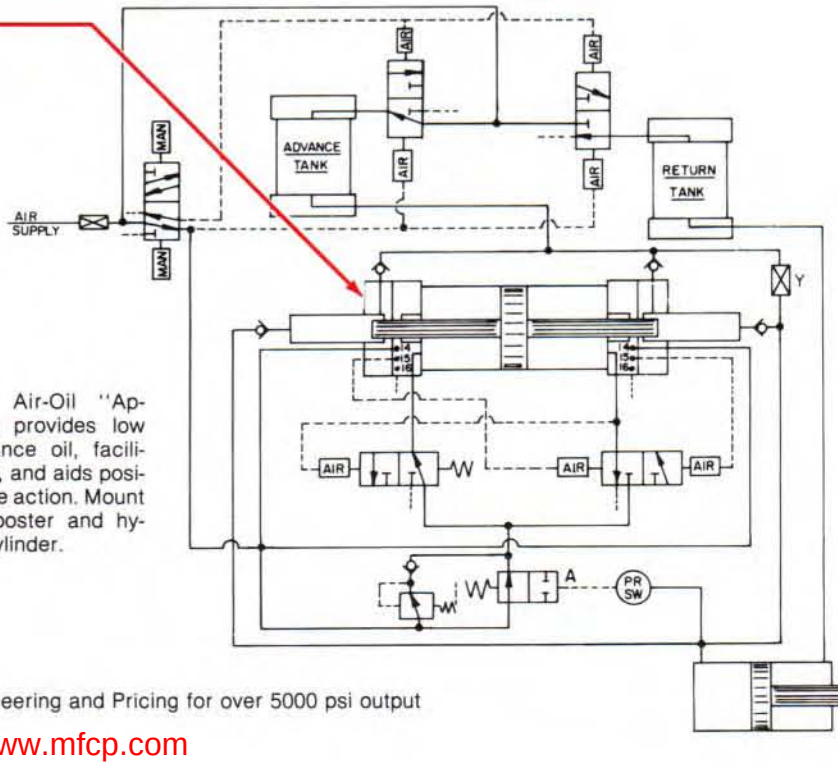
## Dual Pressure Circuit With Air-Oil Approach Stroke And Booster Operated High Pressure Work Stroke With Rapid Pressure Build-Up

Miller RDA77-DBA8 Booster with Integral Pilot Actuators for automatic reciprocation is shown. Mechanical Actuators are available for actuation of an electrical device. Chart below shows Actuator Port Identification and functions.

| PORT NUMBER | AIR PILOT ACTUATOR | MECHANICAL ACTUATOR |
|---|---|---|
| 14 | Air Inlet | Plug |
| 15 | To Cylinder Operated Valve | Plug |
| 16 | Exhaust | Exhaust |

**Valve "Y" is closed for cylinder advance and is open for cylinder return.**

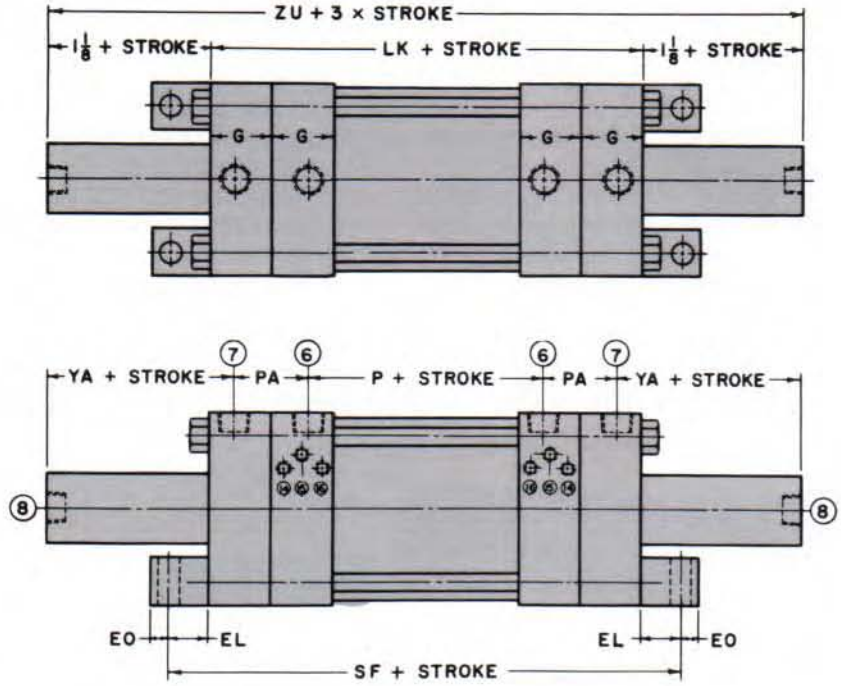
Pressure switch and 2-Way Valve required only for rapid build-up to a fixed pressure which cannot be exceeded. Under these conditions, final pressure should be about 30 to 40 psi below line pressure. If rapid pressure build-up is not desired, omit Pressure Switch and Valve "A". Then the Booster will operate until stall pressure is reached.




**Note:** Miller Air-Oil "Approach" Tank provides low pressure advance oil, facilitates fluid flow, and aids positive check valve action. Mount tank above booster and hydraulic work cylinder.

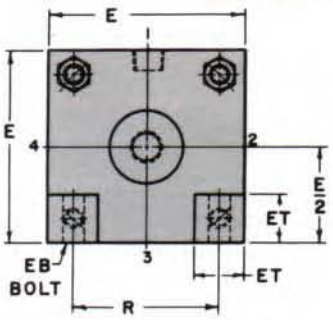
* Special Engineering and Pricing for over 5000 psi output

# INSTALLATION DRAWING - MILLER RDA77-DBA8 RECIPROCATING BOOSTER




| PORT IDENTIFICATION TABLE | |
|---|---|
| All Ports in this Table EE Pipe Size | |
| 6 | Booster Low Pressure Inlet |
| 7 | Alternate High Pressure Outlet (May be used as Inlet) |
| 8 | High Pressure Outlet (May be used as Inlet) |

| ACTUATOR PORTS — ⅛" PORT SIZE | | |
|---|---|---|
| Port | Air Pilot Actuator | Mechanical Actuator |
| 14 | Air Inlet | Plug |
| 15 | To Cylinder Operated Valve | Plug |
| 16 | Exhaust | Exhaust |




## DIMENSIONS (In Inches)

| BORE | 4 | 5 | 6 | 8 | 10 | 12 | 14 |
|---|---|---|---|---|---|---|---|
| E | 4 1/2 | 5 1/2 | 6 1/2 | 8 1/2 | 10 5/8 | 12 3/4 | 14 3/4 |
| EB | 3/8 | 1/2 | 1/2 | 5/8 | 3/4 | 3/4 | 7/8 |
| EE | 1/2 | 1/2 | 3/4 | 3/4 | 1 | 1 | 1 1/4 |
| EL | 1 | 1 1/16 | 1 | 1 1/8 | 1 5/16 | 1 5/16 | 1 1/2 |
| EO | 3/8 | 1/2 | 1/2 | 5/8 | 5/8 | 5/8 | 3/4 |
| ET | 1 3/16 | 1 3/8 | 1 5/8 | 2 1/16 | 2 11/16 | 3 5/16 | 3 13/16 |
| G | 1 3/4 | 1 3/4 | 2 | 2 | 2 1/4 | 2 1/4 | 2 3/4 |
| LK | 8 1/4 | 8 1/2 | 9 1/2 | 9 5/8 | 11 1/8 | 11 5/8 | 14 1/8 |
| P | 2 5/8 | 2 7/8 | 3 1/8 | 3 1/4 | 4 1/8 | 4 5/8 | 5 1/2 |
| PA | 2 1/8 | 2 1/8 | 2 3/8 | 2 3/8 | 2 1/2 | 2 1/2 | 3 1/8 |
| PL | 1 17/64 | 1 1/2 | 1 31/32 | 2 11/16 | 3 5/16 | 4 | 4 11/16 |
| R | 3.32 | 4.10 | 4.88 | 6.44 | 7.92 | 9.40 | 10.90 |
| SF | 10 1/4 | 10 3/8 | 11 1/2 | 11 7/8 | 13 3/4 | 14 1/4 | 17 1/8 |
| YA | 1 13/16 | 1 13/16 | 1 15/16 | 1 15/16 | 2 1/8 | 2 1/8 | 2 5/16 |
| ZU | 10 1/2 | 10 3/4 | 11 3/4 | 11 7/8 | 13 3/8 | 13 7/8 | 16 3/8 |
| Max. Ram Dia. | 1 | 1 3/8 | 2 1/2 | 4 1/2 | 5 1/2 | 5 1/2 | 5 1/2 |

## "IN STOCK" BOOSTERS

Model RDA77-DBA8 are carried in stock for immediate shipment, as follows: 5" Bore, 1" Diameter Ram (25 to 1 Ratio), 6" stroke

### G.P.M. OUTPUT OF MILLER 5" BORE, 1" DIA. RAM, 6" STROKE (STOCK) RECIPROCATING AIR-HYDRAULIC BOOSTER

| STROKES PER MINUTE | G.P.M. OUTPUT | BOOSTER OIL OUTPUT IN P.S.I. IS SHOWN IN CHART BELOW IN COLUMN UNDER BOOSTER AIR INPUT PRESSURE P.S.I. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | AIR INPUT P.S.I. | | | | | | | | |
| | | 100 PSI | 90 PSI | 80 PSI | 70 PSI | 60 PSI | 50 PSI | 40 PSI | 30 PSI | 20 PSI |
| 300.0 | 6.00 | — | — | — | — | — | — | — | — | — |
| 287.5 | 5.75 | 200 | 200 | 200 | 200 | 200 | — | — | — | — |
| 275.0 | 5.50 | 300 | 300 | 300 | 300 | 300 | 150 | — | — | — |
| 262.5 | 5.25 | 400 | 400 | 400 | 400 | 400 | 200 | 150 | — | — |
| 250.0 | 5.00 | 450 | 450 | 450 | 450 | 450 | 300 | 200 | — | — |
| 237.5 | 4.75 | 500 | 500 | 500 | 500 | 500 | 375 | 250 | 150 | — |
| 225.0 | 4.50 | 600 | 600 | 600 | 550 | 550 | 425 | 300 | 200 | — |
| 212.5 | 4.25 | 700 | 700 | 700 | 650 | 625 | 275 | 375 | 225 | — |
| 200.0 | 4.00 | 800 | 800 | 800 | 750 | 700 | 525 | 425 | 259 | — |
| 187.5 | 3.75 | 950 | 900 | 900 | 850 | 775 | 600 | 475 | 275 | — |
| 175.0 | 3.50 | 1050 | 1050 | 1050 | 1000 | 850 | 675 | 500 | 300 | 150 |
| 162.5 | 3.25 | 1250 | 1200 | 1150 | 1100 | 925 | 725 | 525 | 350 | 175 |
| 150.0 | 3.00 | 1300 | 1250 | 1250 | 1125 | 1000 | 775 | 550 | 375 | 200 |
| 137.5 | 2.75 | 1350 | 1350 | 1300 | 1175 | 1025 | 800 | 600 | 400 | 225 |
| 125.0 | 2.50 | 1500 | 1450 | 1400 | 1225 | 1075 | 825 | 625 | 425 | 250 |
| 112.5 | 2.25 | 1700 | 1550 | 1500 | 1275 | 1100 | 850 | 650 | 450 | 275 |
| 100.0 | 2.00 | 1800 | 1700 | 1550 | 1300 | 1125 | 900 | 675 | 475 | 300 |
| 87.5 | 1.75 | 1850 | 1750 | 1650 | 1350 | 1150 | 925 | 700 | 500 | 300 |
| 75.0 | 1.50 | 1900 | 1800 | 1700 | 1400 | 1175 | 950 | 725 | 525 | 310 |
| 60.0 | 1.20 | 1930 | 1850 | 1700 | 1450 | 1200 | 975 | 725 | 525 | 320 |
| 50.0 | 1.00 | 2000 | 1900 | 1725 | 1500 | 1225 | 1000 | 750 | 550 | 350 |
| 40.0 | .80 | 2050 | 1950 | 1750 | 1525 | 1275 | 1025 | 775 | 575 | 380 |
| 30.0 | .60 | 2100 | 2000 | 1775 | 1550 | 1325 | 1050 | 800 | 600 | 400 |
| 20.0 | .40 | 2150 | 2050 | 1825 | 1600 | 1350 | 1075 | 825 | 625 | 440 |
| 10.0 | .20 | 2300 | 2150 | 1875 | 1625 | 1375 | 1100 | 875 | 675 | 480 |
| 0.0 | .00 | 2500 | 2250 | 2000 | 1750 | 1500 | 1250 | 1000 | 750 | 500 |

Above figures are for full flow piping in valve and lines and with an ample size air surge tank located just ahead of the valve. A pressurized tank as shown in circuit on preceding page was used. Oil used was approximately 127 S.S.U. at 100°F.

# Air To Air Reciprocating Boosters

**For Converting Low Pressure Shop Air to Higher Pressure Air to Operate:**

- **CYLINDERS**
- **DIE CUSHIONS**
- **COUNTERBALANCE CYLINDERS**
- **AIR SPRINGS OR KNOCKOUTS**
- **Other Air Operated Devices requiring higher than normal shop air pressure.**

## Increase Shop Air Pressure 2, 3, or 4 Times

Standard air to air boosters increase air pressures two, three, and four times higher than the standard 80 to 100 PSI shop pressures. Exact high output pressure is controlled by adjusting an air line regulator on the low pressure inlet line. For example, if you had 3 to 1 ratio booster, by adjusting the regulator on the low pressure side to 80 PSI, then the high pressure output would be 240 PSI. By adjusting the regulator on the same booster to 60 PSI, then the high pressure output would be 180 PSI. As you can see an infinite variation of high pressure can be obtained for your particular application.

## MILLER FEATURES

Two large port mounted 3-way valves assures faster recovery time of booster

Exhaust mufflers provide quiet exhaust

Mechanically held dynamic seals prevent seal damage due to pull out or blow out

All dynamic seals are self-regulating and wear-compensating

Honed chrome plated cylinder minimum seal friction to maintain high efficiency of the booster and resists rusting

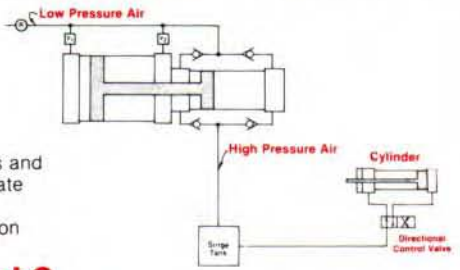
Connecting piston rod is hardened-chrome plated for better wear and surface

Snap action actuators furnish full pressure to the pilot ports in the shortest time possible to prevent the booster from stalling prematurely

Bar stock heads and caps, phosphate coated to resist corrosion

### Air Cylinder Circuit

Decrease the size of air cylinders when space limitations exist. This system would be simpler, cleaner, and less costly than a low pressure hydraulic system.



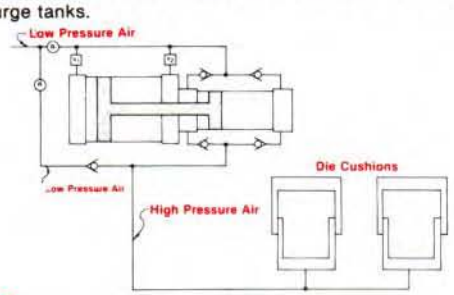

## How Does an Air to Air Booster Work?

Essentially, the reciprocating booster consists of a double rod end air cylinder with a discharge pressure chamber at each end. Thus, it delivers a power stroke in both directions. At the end of the stroke, the piston assembly strikes an actuator button inside the cylinder. The movement of this button operates the actuator, which in turn, shifts the position of the two 3-way, two position, pilot operated power valves, causing reversal of air flow and corresponding reversal of booster stroke.

The booster operates automatically. Since it operates on a "stall" basis, the moment air pressure drops in the high pressure line, the booster senses this drop and automatically begins to operate until pressure is built back to "stall" pressure again, then it stops. "Stall" pressure is two, three or four times higher than low pressure, depending of course which booster is being used. Since it operates automatically when it senses a pressure drop on the high pressure side, the booster can replenish high pressure air to the receiver tank when the system is operating or not. Thus in a standard air cylinder application the booster replenishes necessary air to the receiver tank when the cylinder is at rest between cycles. Also it will automatically replenish any lost air pressure due to leakage in a closed system such as die cushions counterbalancing, or air springs.

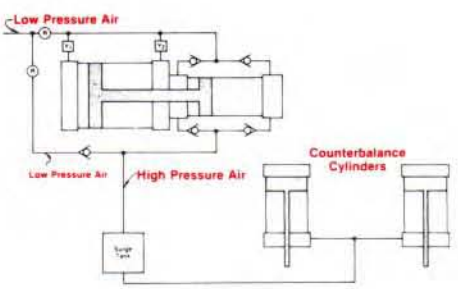
### Die Cushion Circuit

An ideal and inexpensive way to increase thrust or decrease size on die cushion. It would eliminate stacking of cushions. Eliminate costly oil cushions on some applications. It can be used with cushions which use surge tanks.



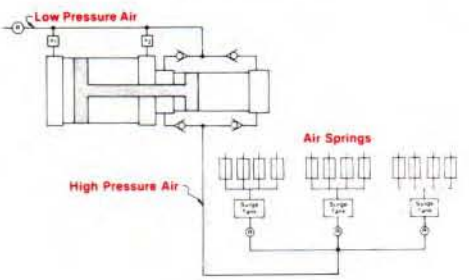

### Counterbalance Circuit

A practical way to increase thrust or decrease size of counterbalance cylinder, where space is at a premium.




### Air Spring Or Knockouts Circuit

To be used with cylinders as air springs such as "knock outs" on the transfer presses. Since you can vary your high pressure you can easily adjust your air spring force for different jobs if required.

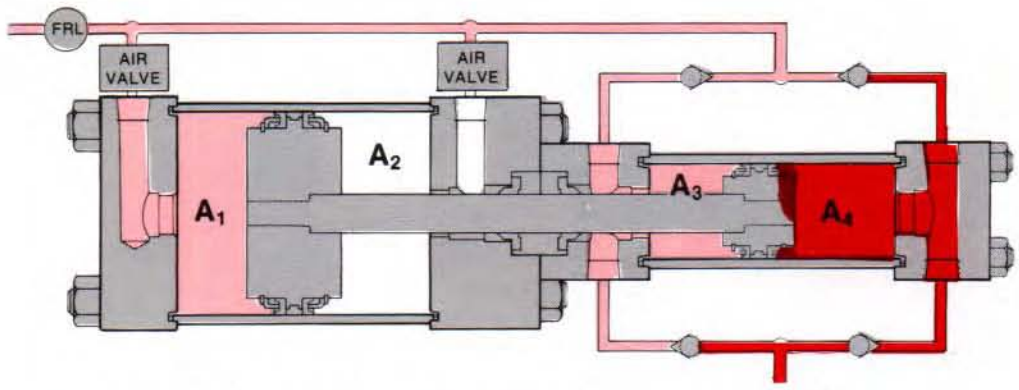


# HOW A BOOSTER RATIO IS DETERMINED

Ratio on Out Stroke = $\frac{A_1 + A_3}{A_4}$ (As shown in this example)

Ratio on In Stroke = $\frac{A_2 + A_4}{A_3}$

**INPUT**




NOTE: Booster Stalls on Low Ratio Side

**OUTPUT**

## 3 Standard Booster Sizes to Choose From

| Booster Bore Size | | Piston Rod Dia | Stroke | †Input PSI | Output PSI | *CFM Required at 12 inches per sec. Piston Speed | *Cubic Inch Displacement per min. at 12 inches per sec. Piston Speed |
|---|---|---|---|---|---|---|---|
| Driving Cyl. | Driven Cyl. | | | | | | |
| 3¼" | 3¼" | 1" | 12" | 80 | 150 | 6.59 | 3035 |
| 5" | 3¼" | 1" | 12" | 80 | 260 | 11.27 | 1750 |
| 6" | 3¼" | 1⅜" | 12" | 80 | 335 | 14.91 | 1287 |

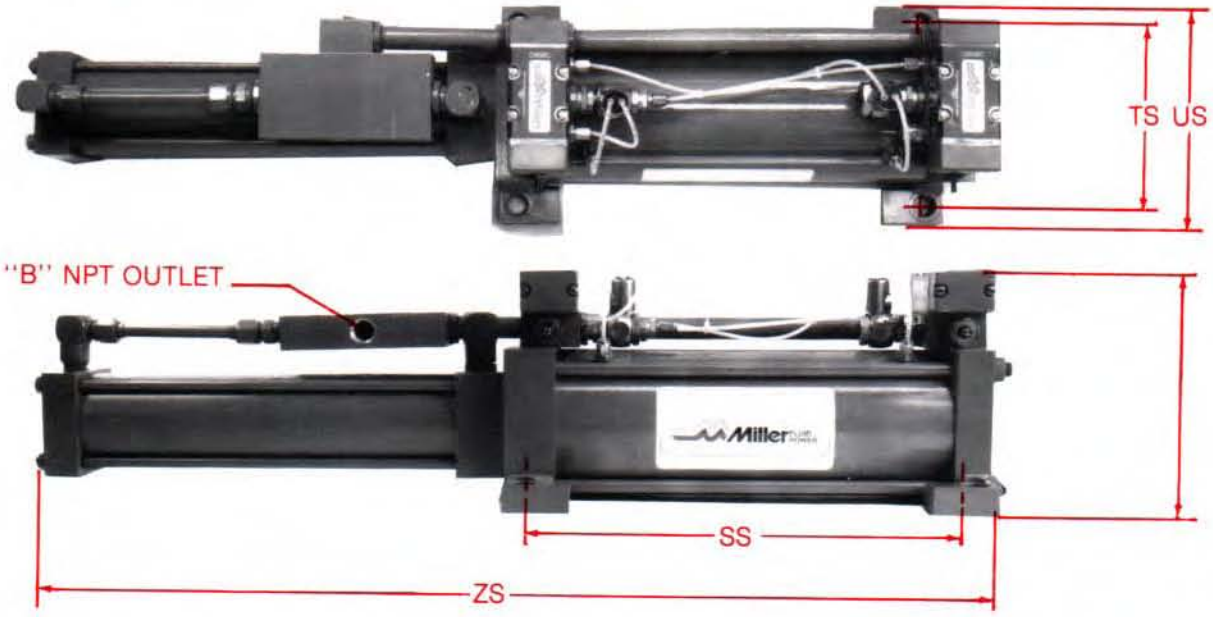
Max. Temperature 140°F
†Max. Input Pressure = 100 PSI
*Compressed Air

All Boosters give approx. 99 cu. in. swept volume per stroke.

## DIMENSIONS

| Driving Cyl. Bore Size | Dimension | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | ES | SS | TS | US | ZS |
| 3¼" | ½" | ½" | 8" | 15⅛" | 4¾" | 5¾" | 35⅜" |
| 5" | ½" | ½" | 9" | 15¼" | 6⅞" | 8¼" | 35⅞" |
| 6" | ¾" | ½" | 9½" | 15⅛" | 7⅞" | 9¼" | 34⅝" |

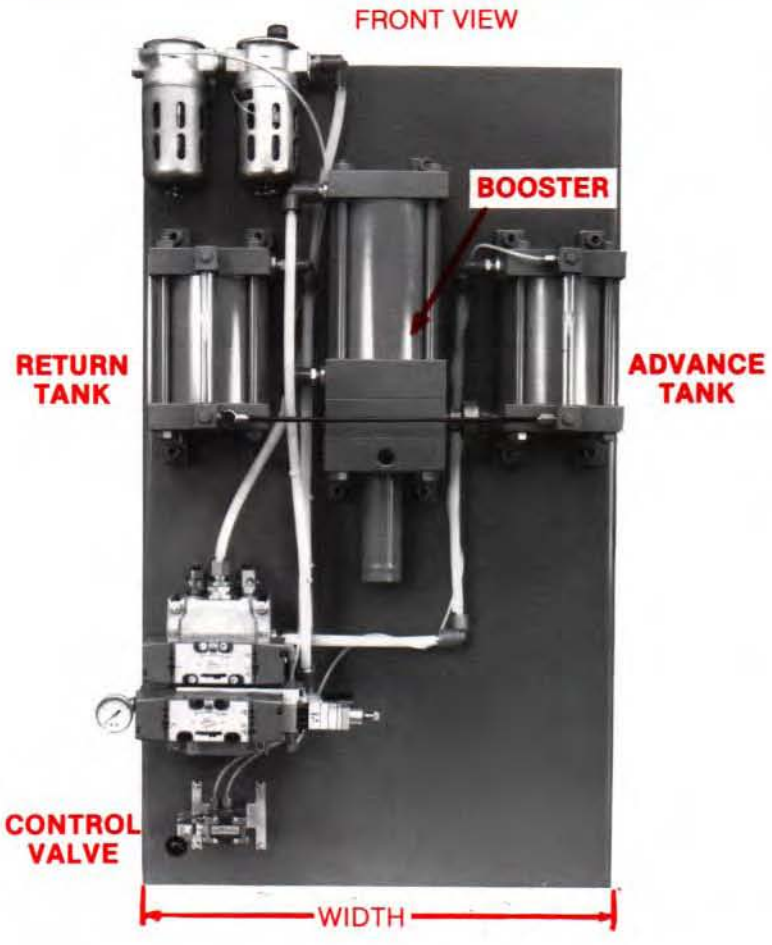
4 HOLES ½" FOR 3¼"
¾" FOR 5" & 6"

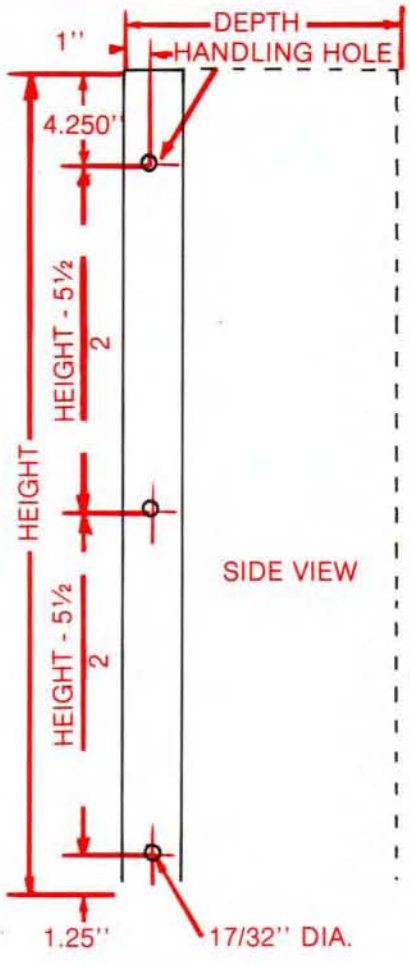



**To Order Specify**

| 1 | RA72BA9 | 5" | 3¼" | 12" |
|---|---|---|---|---|
| Quantity | Model No. | Bore Driving Cylinder | Bore Driven Cylinder | Stroke |

# B4 Booster Power Panel Units




## PANEL COMPONENTS

Each Panel is equipped with the following—priced together as a complete Power Unit:

- **One Model A77-B4 Air-Hydraulic Booster**
- **Two Model A77 Air-Oil Tanks**
- **One Air Line Filter**
- **One Air Line Lubricator**
- **Two Air Pressure Regulators (with Gauges)**
- **One Control Valve Operator — your choice of double or single solenoid, air-pilot, foot, hand lever, or palm button operator.**
- **All necessary piping and power air valves (each valve equipped with Speed Control Muffler)**

## MOUNTING AND DIMENSIONS

The height and width dimensions are given in horizontal Col. 8 in the Selector Chart, pages 22 and 23, and are exact dimensions of the steel panel on which the components are mounted. When mounting in confined areas, allow a few inches more for slight protrusions of piping, etc. beyond the panel. The depth dimension is also given in Col. 8 of the Selector Chart which also provides necessary cylinder data and other information.

## PRESSURE REGULATION WITH AIR SAVINGS

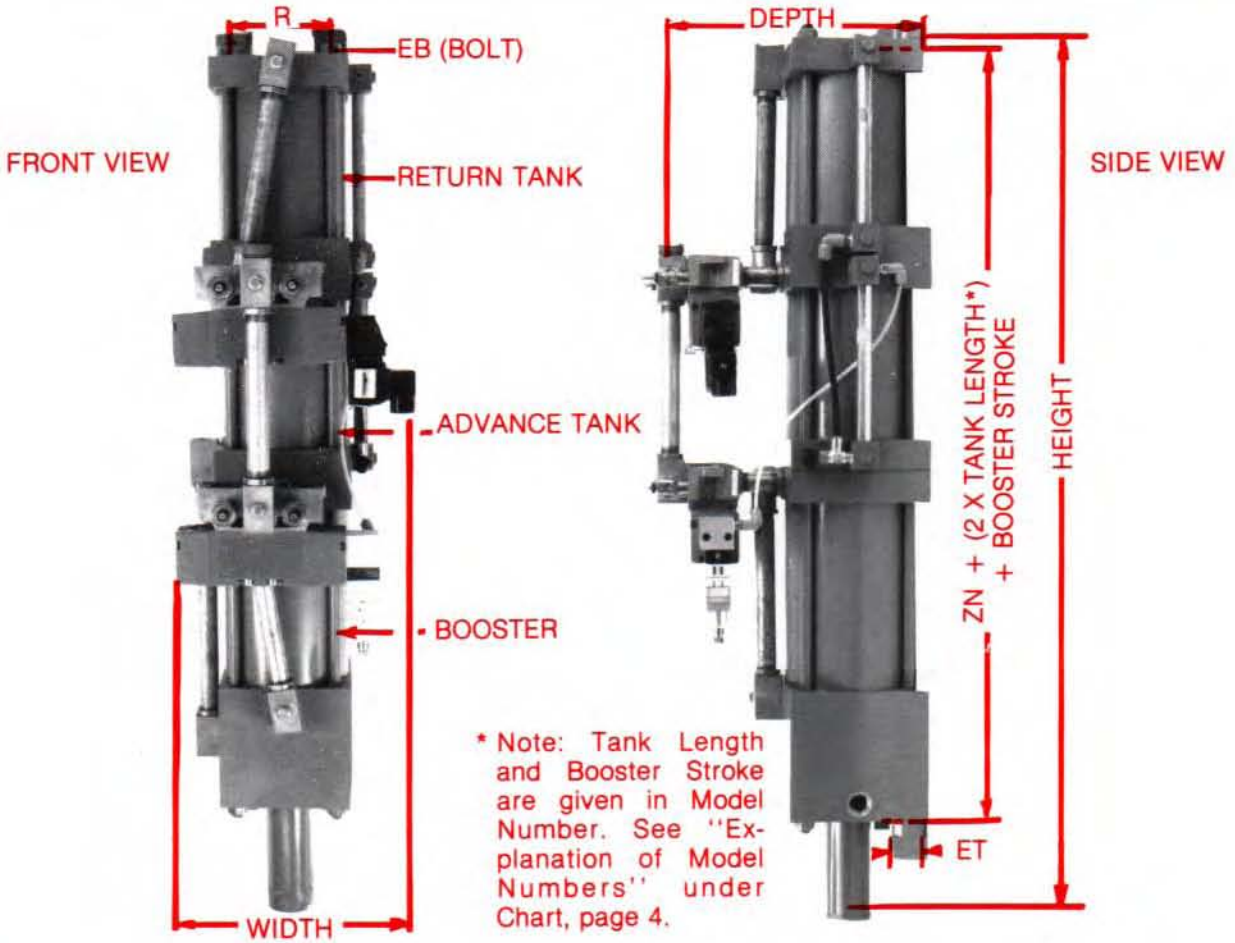
One Pressure Regulator (at top left of Front View above) regulates the booster ram forward stroke, thus also regulating the cylinder high pressure work stroke pressure. The other Regulator (at right above) can provide considerable air savings by permitting the booster return stroke to be regulated down to as little as 20 psi.

## DUAL PRESSURE CIRCUIT SAVES UP TO 90% OF AIR

Both the Panel Mounted and Tandem Units operate according to Miller's famous Air-Miser Dual Pressure Circuit in which up to 90% air savings can be obtained compared to direct air-cylinder operation. See circuit, page 5 for full explanation.

The maximum speed recommended for cylinders operated by the Panel (and Tandem) Booster Power Units shown in the Selector Chart, pages 22 and 23 is above 60 strokes (30 cycles) per minute. For maximum speed operation we recommend the installation of an Air Reserve Tank in the air line leading to the Booster Panel (or Tandem Unit). For higher speeds, consult our Engineering Dept.

# B4 Booster Power Tandem Units




## MOUNTING DIMENSIONS

in inches
(See Selector Chart for "Overall" Dimensions)

| Booster Diameter | 5 | 6 | 8 |
|---|---|---|---|
| †EB | 1/2 | 1/2 | 5/8 |
| ET | 1 11/32 | 1 9/16 | 2 |
| ZN | 15 1/8 | 17 | 17 3/8 |
| R | 4.10 | 4.88 | 6.44 |

†Mounting Holes are 1/16" larger than EB Bolt size

## TANDEM UNIT COMPONENTS

The Miller Tandem Booster Power Unit combines Booster, Tanks, Valves, and piping into one integral unit consisting of:

- **One Model A77-B4 Air-Hydraulic Booster**
- **Two Model A77 Air-Oil Tanks**
- **One Control Valve Operator — hand lever standard; single or double solenoid, air pilot, foot or palm button operators available at extra cost.**
- **Power Air Valves (each equipped with Speed Control Muffler) and connecting piping plus three 8-foot lengths of flexible air line tubing connecting the tandem unit to the Control Valve Operator.**

Note: Filter, Lubricator, and pressure regulator are not included and must be priced separately. The tandem circuit permits the use of only one pressure regulator — for regulating booster and cylinder forward and return strokes.

## MOUNTING

Mountingspace for the Tandem Units requires more height, slightly less depth, and considerably less width than for comparable Panel Mounted Units. Tandem Units must be vertically mounted as shown and come equipped with Miller standard Model 77 mounting lugs to assure the sturdiest installation.

# Selector Chart • Booster Panel an

## THRUSTS, STROKES, MODEL NUMBERS, DIMENSIONS, AND USEFUL

| | | 1A | 2A | 3A | 4A | 5A | 6A | 7A | 8A | 9A | 10A |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Locate Required Cylinder Work Stroke Thrust (Lbs.) | 3530 | 3530 | 4780 | 4780 | 6280 | 6280 | 7470 | 7470 | 9810 | 9810 |
| 2 | Maximum Cylinder High Pressure Work Stroke | 1.53" | 4.20" | 1.65" | 4.48" | 0.75" | 2.25" | 0.97" | 2.78" | 0.39' | 1.35" |
| 3 | †Total Cylinder Stroke Should Not Exceed | 30" | 69" | 17" | 38" | 17" | 38" | 11" | 24" | 11" | 24" |
| 4 | Order This Cylinder Bore | 1½" | 1½" | 2" | 2" | 2" | 2" | 2½" | 2½" | 2½" | 2½" |
| 5 | Cylinder Return Stroke Thrust (Lbs.) (Standard Rod) | 116 | 116 | 188 | 188 | 188 | 188 | 330 | 330 | 330 | 330 |
| 6 | Booster Output Pressure PSI from 80 PSI Air Input | 2000 | 2000 | 1523 | 1523 | 2000 | 2000 | 1523 | 1523 | 2000 | 2000 |
| 7 | Panel Model Number | 51006-506-P* | 51012-510-P* | 61306-506-P** | 61312-510-P** | 51006-506-P* | 51012-510-P* | 61306-506-P** | 61312-510-P** | 51006-506-P* | 51012-510-P* |
| 8 | Panel Dimensions: (Inches) Height x Width x Depth | 30x24 x 11⅛ | 42x24 x 11⅛ | 30x24 x 12¾ | 42x24 x 12¾ | 30x24 x 11⅛ | 42x24 x 11⅛ | 30x24 x 12¾ | 42x24 x 12¾ | 30x24 x 11⅛ | 42x24 x 11⅛ |
| 9 | Tandem Model No. | 51006-506-T* | 51012-510-T* | 61306-605-T** | 61312-608-T** | 51006-506-T* | 51012-510-T* | 61306-605-T** | 61312-608-T** | 51006-506-T* | 51012-510-T* |
| 10 | Tandem Dimensions: (Inches) Height x Width x Depth | 38 x 10½ x 8¼ | 58 x 10½ x 8¼ | 37⅝ x 11¼ x 9½ | 55⅝ x 11¼ x 9½ | 38 x 10½ x 8¼ | 58 x 10½ x 8¼ | 37⅝ x 11¼ x 9½ | 55⅝ x 11¼ x 9½ | 38 x 10½ x 8¼ | 58 x 10½ x 8¼ |

† To operate two or more same-size cylinders from one Panel or Tandem Unit, simply divide maximum strokes shown by number of cylinders to get maximum stroke of each cylinder.

* These Booster Power Units have "stock" components. Shipment within one week after receipt of order.

** These Booster Power Units have "custom" components. Shipment in five weeks after receipt of order.

## IMPORTANT NOTES

Cylinders must be priced and ordered as separate units as they are not included in the prices of the Panel and Tandem Booster Units. The Cylinder Thrusts shown are based on 80 psi air line pressure and will increase or decrease proportionately with increased or decreased air line pressure. The high pressure work stroke lengths shown have been calculated for a 12" stroke cylinder. Add 0.02" for each inch of stroke under 12". Deduct 0.02" for each inch of stroke over 12".

## EXPLANATION OF MODEL NUMBERS

**Example: Model 51006-506-P**

| 5 | ††10 | 06 | 5 | 06 | P |
|---|---|---|---|---|---|
| Booster Bore 5" | Ram Dia. 1" | Booster Stroke 6" | Tank Dia. 5" | Tank Length 6" | Panel Mounted |

For a Tandem Unit, replace the "P" with a "T", thus: Model 51006-506-T

††The number "13" signifies a 1⅜" dia. ram.

# d Tandem Units

## CYLINDER DATA

| | 11A | 12A | 13A | 14A | 15A | 16A | 17A | 18A | 19A | 20A | 21A | 22A | 23A | 24A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12630 | 12630 | 16590 | 16590 | 19130 | 19130 | 22460 | 25130 | 29900 | 29900 | 34020 | 43060 | 53170 | 76560 |
| | 0.47" | 1.55" | 0.13" | 0.70" | 0.23" | 0.94" | 1.55" | 0.38" | 0.06" | 0.51" | 0.94" | 0.28" | 0.51" | 0.28" |
| | 6" | 14" | 6" | 14" | 6" | 14" | 14" | 9" | 3" | 8" | 14" | 6" | 8" | 6" |
| | 3¼" | 3¼" | 3¼" | 3¼" | 4" | 4" | 3¼" | 4" | 5" | 5" | 4" | 6" | 5" | 6" |
| | 545 | 545 | 545 | 545 | 813 | 813 | 545 | 813 | 1320 | 1320 | 813 | 1870 | 1320 | 1870 |
| | 1523 | 1523 | 2000 | 2000 | 1523 | 1523 | 2708 | 2000 | 1523 | 1523 | 2708 | 1523 | 2708 | 2708 |
| | 61306-506-P** | 61312-510-P** | 51006-506-P* | 51012-510-P* | 61306-606-P** | 61312-610-P** | 813-510-P** | 51012-510-P* | 61306-606-P** | 61312-610-P** | 81312-610-P** | 61312-610-P** | 81312-610-P** | 81312-610-P** |
| | 30 x 24 x 12¾ | 42 x 24 x 12¾ | 30 x 24 x 11⅛ | 42 x 24 x 11⅛ | 30 x 24 x 12¾ | 42 x 24 x 12¾ | 42 x 30 x 15 | 42 x 24 x 11⅛ | 30 x 24 x 12¾ | 42 x 24 x 12¾ | 42 x 30 x 15 | 42 x 24 x 12¾ | 42 x 30 x 15 | 42 x 30 x 15 |
| | 61306-605-T** | 61312-608-T** | 51006-506-T* | 51012-510-T* | 61306-605-T** | 61312-610-T** | 81312-806-T** | 51012-510-T* | 61306-606-T** | 61312-610-T** | 81312-807-T** | 61312-610-T** | 81312-807-T** | 81312-807-T** |
| | 37⅝ x 11¼ x 9½ | 55⅝ x 11¼ x 9½ | 38 x 10½ x 8¼ | 58 x 10½ x 8¼ | 37⅝ x 11¼ x 9½ | 59⅝ x 11¼ x 9½ | 52 x 12¼ x 11½ | 58 x 10½ x 8¼ | 39⅝ x 11¼ x 9½ | 59⅝ x 11¼ x 9½ | 54 x 12¼ x 11½ | 59⅝ x 11¼ x 9½ | 54 x 12¼ x 11½ | 54 x 12¼ x 11¼ |

## EASY-TO-USE SELECTOR CHART

From horizontal columns 1, 2, and 3, select the vertical column combination of cylinder thrusts and strokes that is closest to but greater than your precise requirements. Reading down from the combination you select gives you the other pertinent data you need, including the bore of the hydraulic cylinder you would require, the Model Numbers of the Panel and/or Tandem Units recommended to most economically operate the hydraulic cylinder, and dimensions of the Panel and/or Tandem Units.

**Example: You desire:**

Cylinder Work-Thrust . . . . . 25,000 lbs.
Cylinder High Pressure Work Stroke . . . ¼"
Total Cylinder Stroke . . . . . 8"

These needs are best answered in vertical Column 18A, which also shows that you need a 4" bore hydraulic cylinder, and either a Model 51012-510-P Booster Panel Unit or a Model 51012-510-T Booster Tandem Unit, to operate the cylinder.

**Booster Units Not Covered By Selector Chart**

If your desired cylinder work thrust were 25,000 lbs., desired high pressure work stroke, 1½", and desired total cylinder stroke, 12", you would find these needs not covered by the Chart. In such instances not covered by the Chart, our Panel and Tandem Units can be supplied to meet your needs, based on the same economical pricing basis. Shipment would be in about five weeks from receipt of your order.

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