

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 pump-

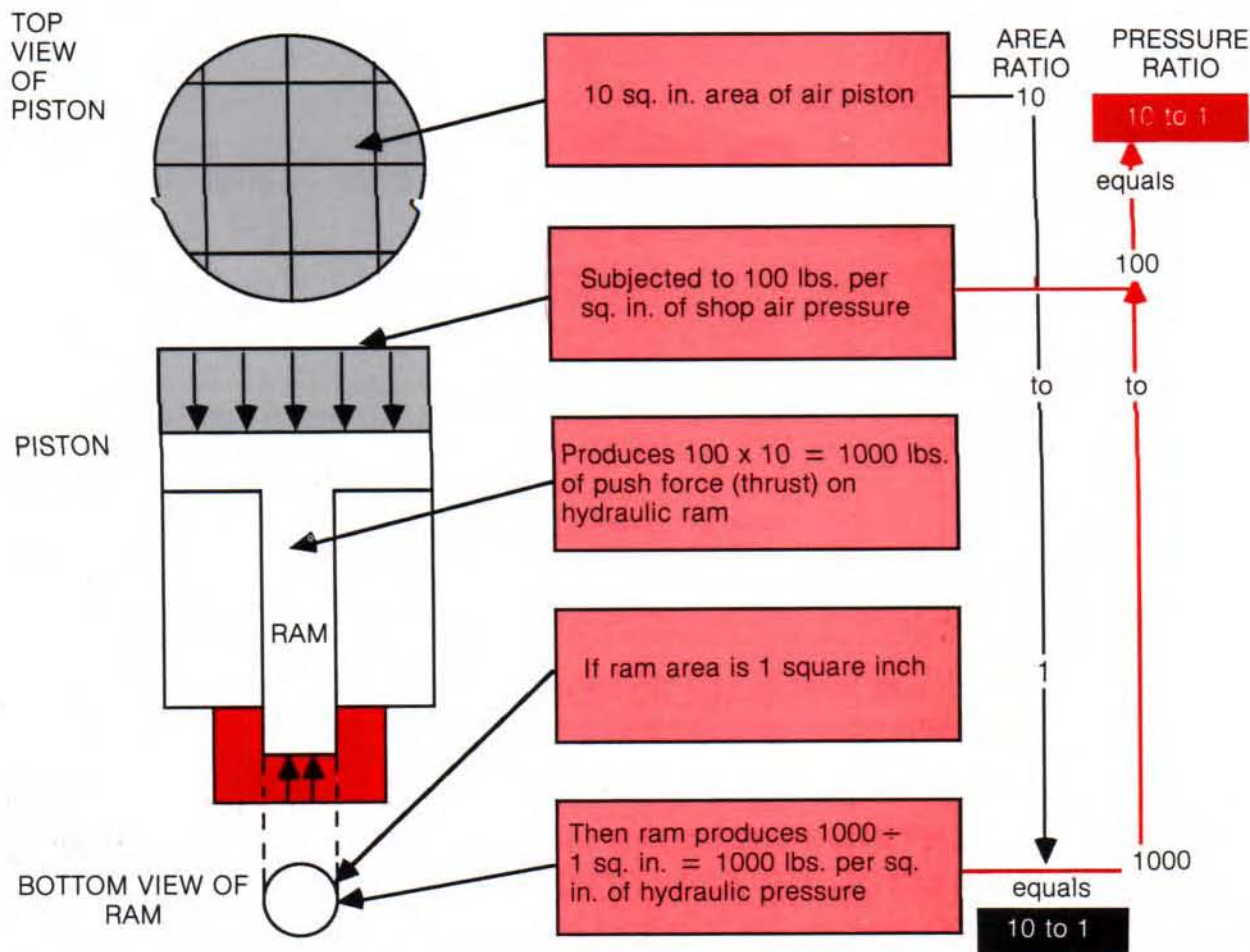
ing would be the installation of an automatic "kick-off" pump along with an accumulator, necessary control valves, etc. In general, the use of boosters is limited to simple circuits requiring small to medium oil volumes of high pressure oil. Somewhat larger volumes can be obtained from Miller Reciprocating 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 hydraulic pressure by your available shop air pressure, you get the booster ratio

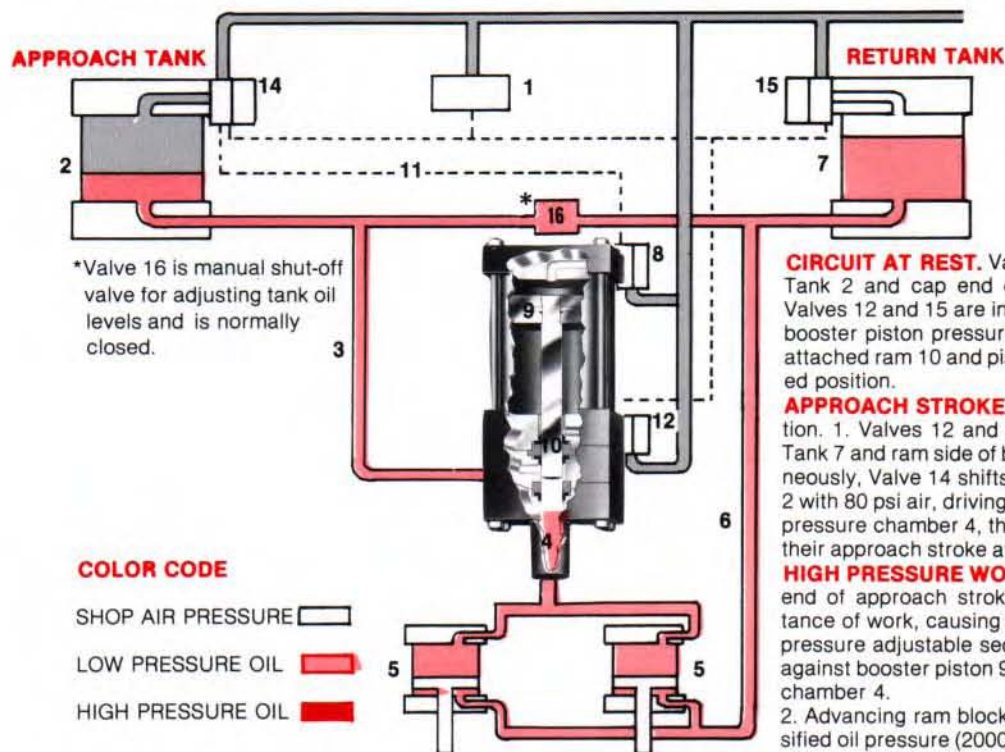
necessary to produce the hydraulic pressure desired. Miller Boosters are available in up to 100 to 1 ratios. See pages 8 and 9 for additional information and table of conveniently available booster ratios, piston and ram areas and diameters.

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



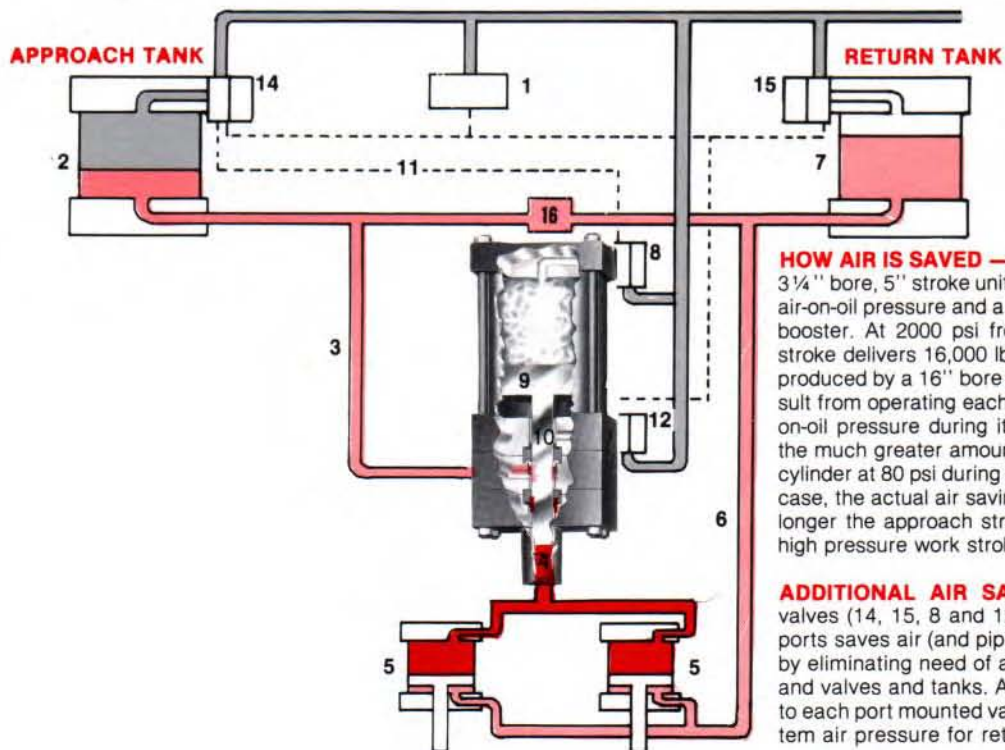
CIRCUIT AT REST. Valves 8 and 14 are in closed position with Tank 2 and cap end of booster piston vented to atmosphere. Valves 12 and 15 are in open position with Tank 7 and ram side of booster piston pressurized with 80 psi air. Booster piston 9 with attached ram 10 and piston rods of work cylinders 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 $3\frac{1}{4}$ " 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 $3\frac{1}{4}$ " 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 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:

- Cylinder Thrust
- Total Cylinder Stroke
- 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:

- 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).
- 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:

- 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).
- 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.

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	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{32}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$

EXAMPLE

STEP 1. Assuming:

Cylinder Thrust 25,000 lbs.
Total Cylinder Stroke 12"
High Pressure Cylinder
Work Stroke 1 1/2"

STEP 2. Adding the 1/4" (found under the "12" in table) to the 1 1/2" Work Stroke gives an Adjusted High Pressure Work Stroke of . . . 1 3/4".

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 1 1/4" Adjusted Work Stroke exceeds the 1 1/2" 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 1 3/4" Adjusted High Pressure Work Stroke is less than the 2" Maximum in Line 6b, the 6" bore x 1 3/4" 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 1 3/4" Adjusted Work Stroke by the "14" figure shown in Line 7b below the 29,900 lbs. of thrust, plus 2". Thus . . . 1 3/4" x 14 = 24 1/2", plus 2" = 26 1/2". 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 1 3/4" dia. ram x 27" stroke.

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.

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)	3/4"	1"	1 1/4"	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		
6a. Maximum Permissible Adjusted High Pressure Cylinder Work Stroke	8"	6"	3 3/4"	2 1/4"	1 1/2"	1"	3/4"	1/2"	3/8"		
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		
5b. Cylinder Thrust in lbs.	2968	4780	7470	12,600	19,100	29,200	43,000	58,600	76,500		
6b. Maximum Permissible Adjusted High Pressure Cylinder Work Stroke	14"	9 3/4"	7"	4 3/4"	3 1/4"	2"	1 1/2"	1"	7/8"		
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		
5c. Cylinder Thrust in lbs.	4700	8500	13,200	22,400	34,000	53,100	76,500	104,200	136,000		
6c. Maximum Permissible Adjusted High Pressure Cylinder Work Stroke	15"	10"	7 1/2"	5"	3 3/4"	2 1/4"	1 3/4"	1 1/4"	7/8"		
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		
5d. Cylinder Thrust in lbs.	2950	5250	8200	13,800	21,000	32,800	47,200	64,300	84,000		
6d. Maximum Permissible Adjusted High Pressure Cylinder Work Stroke	32"	16"	10 1/2"	8"	5 1/4"	4 1/2"	2 3/4"	2"	1 1/2"		
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		
5e. Cylinder Thrust in lbs.	4600	8200	12,800	21,600	32,800	51,300	73,800	100,500	131,300		
6e. Maximum Permissible Adjusted High Pressure Cylinder Work Stroke	40"	20"	13 3/4"	10"	6 3/4"	4 3/4"	3 3/4"	2 1/2"	2"		
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		
5f. Cylinder Thrust in lbs.	3500	6200	9800	16,500	25,100	39,200	56,500	76,900	100,500		
6f. Maximum Permissible Adjusted High Pressure Cylinder Work Stroke	48"	48"	24"	16"	14"	6 3/4"	5 3/4"	3 3/4"	3"		
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		
5 Inch Bore, 1 Inch Diameter Ram											
Air Input		80 psi									
Oil Output		2000 psi									
6 Inch Bore, 1 1/4 Inch Diameter Ram											
Air Input		80 psi									
Oil Output		1520 psi									
8 Inch Bore, 1 3/4 Inch Diameter Ram											
Air Input		80 psi									
Oil Output		2700 psi									
8 Inch Bore, 1 3/4 Inch Diameter Ram											
Air Input		80 psi									
Oil Output		1670 psi									
10 Inch Bore, 1 3/4 Inch Diameter Ram											
Air Input		80 psi									
Oil Output		2600 psi									
10 Inch Bore, 2 Inch Diameter Ram											
Air Input		80 psi									
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 — 3/4" 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 SELECTOR CHART	Tank Length (Inches)	Tank Bore Diameters (Inches)											
		3 3/4"	4"	5"	6"	8"	10"	12"	14"				
	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:

$$\text{Cyl. Piston Area} \text{ ______ sq. ins.} \times \text{Total Cyl. Stroke} \text{ ______ ''} = \text{Cyl. Oil Volume} \text{ ______ cu. ins.}$$

Allow for Oil Compressibility as follows:

$$1\% \text{ per } 1000 \text{ psi} \times \text{Oil Volume}^* \text{ in H.P. Circuit} = \text{Compressibility Volume} \text{ ______ cu. ins.}$$

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:

$$\text{Cyl. Piston Area} \text{ ______ sq. in.} \times \text{H.P. Work Stroke} \text{ ______ ''} = \text{Cyl. H.P. Stroke Volume} \text{ ______ cu. ins.}$$

Allow for Oil Compressibility as follows:

$$1\% \text{ per } 1000 \text{ psi} \times \text{Oil Vol.}^* \text{ in H.P. Circuit} = \text{Compressibility Volume} \text{ ______ cu. ins.}$$

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 HYDRAULIC RAM PSI OUTPUT AT INPUT PRESSURES OF					BOOSTER RATIO	BOOSTER 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
846	1057	2642	5284	10570	10.57	1"	0.785	3 1/4"	8.296
447	559	1397	2794	5590	5.59	1 1/4"	1.485		
276	345	862	1724	3450	3.45	1 3/4"	2.405		
211	264	660	1320	2640	2.64	2"	3.142		
1280	1600	4000	8000	16000	16.00	1 1/2"	0.785	4"	12.566
680	850	2125	4250	8500	8.50	1 3/4"	1.485		
417	522	1305	2610	5220	5.22	1 3/4"	2.405		
320	400	1000	2000	4000	4.00	2"	3.142		
208	260	650	1300	2600	2.60	2 1/2"	4.909		
2000	2500	6250	12500	25000	25.00	1 1/2"	0.785	5"	19.635
1058	1322	3305	6610	13220	13.22	1 3/4"	1.485		
653	816	2040	4080	8160	8.16	1 3/4"	2.405		
500	625	1562	3125	6250	6.25	2"	3.142		
320	400	1000	2000	4000	4.00	2 1/2"	4.909		
222	278	695	1390	2780	2.78	3"	7.069		
163	204	510	1020	2040	2.04	3 1/4"	9.621		
1523	1904	4757	9514	19040	19.04	1 1/2"	1.485	6"	28.274
941	1176	2940	5880	11760	11.76	1 3/4"	2.405		
720	900	2250	4500	9000	9.00	2"	3.142		
462	577	1442	2885	5770	5.77	2 1/2"	4.909		
320	400	1000	2000	4000	4.00	3"	7.069		
235	294	735	1470	2940	2.94	3 1/2"	9.621		
180	225	562	1125	2250	2.25	4"	12.566		
2073	2591	6477	12955	25910	25.91	1 1/2"	1.485	7"	38.485
1280	1600	4000	8000	16000	16.00	1 3/4"	2.405		
980	1225	3062	6125	12250	12.25	2"	3.142		
499	624	1560	3120	6240	6.24	2 1/2"	4.909		
435	544	1360	2720	5440	5.44	3"	7.069		
320	400	1000	2000	4000	4.00	3 1/2"	9.621		
245	306	765	1530	3060	3.06	4"	12.566		
194	242	605	1210	2420	2.42	4 1/2"	15.904		
157	196	490	980	1960	1.96	5"	19.635		
130	162	405	810	1620	1.62	5 1/2"	23.758		
2708	3385	8362	16925	33850	33.85	1 1/2"	1.485	8"	50.265
1672	2090	5225	10450	20900	20.90	1 3/4"	2.405		
1280	1600	4000	8000	16000	16.00	2"	3.142		
821	1026	2565	5130	10260	10.26	2 1/2"	4.909		
569	711	1777	3555	7110	7.11	3"	7.069		
418	522	1305	2610	5220	5.22	3 1/2"	9.621		
320	400	1000	2000	4000	4.00	4"	12.566		
253	316	790	1580	3160	3.16	4 1/2"	15.904		
205	256	640	1280	2560	2.56	5"	19.635		
170	212	530	1060	2120	2.12	5 1/2"	23.758		
2613	3266	8165	16330	32660	32.66	1 1/2"	2.405	10"	78.54
2000	2500	6250	12500	25000	25.00	2"	3.142		
1282	1603	4007	8015	16030	16.03	2 1/2"	4.909		
889	1111	2777	5555	11110	11.11	3"	7.069		
653	816	2040	4080	8160	8.16	3 1/2"	9.621		
500	625	1562	3125	6250	6.25	4"	12.566		
395	494	1235	2470	4940	4.94	4 1/2"	15.904		
320	400	1000	2000	4000	4.00	5"	19.635		
265	331	827	1655	3310	3.31	5 1/2"	23.758		
2880	3600	9000	18000	36000	36.00	2"	3.142	12"	13.10
1846	2308	5770	11540	23080	23.08	2 1/2"	4.909		
1280	1600	4000	8000	16000	16.00	3"	7.069		
940	1175	2937	5875	11750	11.75	3 1/2"	9.621		
720	900	2250	4500	9000	9.00	4"	12.566		
569	711	1777	3555	7110	7.11	4 1/2"	15.904		
461	576	1440	2880	5760	5.76	5"	19.635		
381	476	1190	2380	4760	4.76	5 1/2"	23.758		
2514	3142	7855	15710	31420	31.42	2 1/2"	4.909	14"	153.94
1742	2178	5445	10890	21780	21.78	3"	7.069		
1280	1600	4000	8000	16000	16.00	3 1/2"	9.621		
980	1225	3062	6125	12250	12.25	4"	12.566		
774	968	2420	4840	9680	9.68	4 1/2"	15.904		
627	784	1960	3920	7840	7.84	5"	19.635		
518	648	1620	3240	6480	6.48	5 1/2"	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	2640-H	4.69	1 1/2"	1.767	3 1/4"	8.296
211-J	264-J	660-J	1320-J		2.64	2"	3.142		
567-J	709-J	1772-H			7.09	1 1/2"	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	2 1/2"	4.909		
885-J	1107-J	2767-H			11.07	1 1/2"	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	2 1/2"	4.909		
189-J	237-J	592-J	1185-J	2370-H	2.37	3 1/2"	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	2 1/2"	4.909		
272-J	340-J	850-J	1700-H		3.40	3 1/2"	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	2 1/2"	4.909		
484-J	606-J	1515-H	3030-H		6.06	3 1/2"	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	2 1/2"	4.909	10"	78.54
757-J	947-J	2367-H			9.47	3 1/2"	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	2 1/2"	4.909	12"	113.10
1092-J	1366-J				13.66	3 1/2"	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	3 1/2"	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	3 1/2"	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

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 ratio. 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 eliminate 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

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

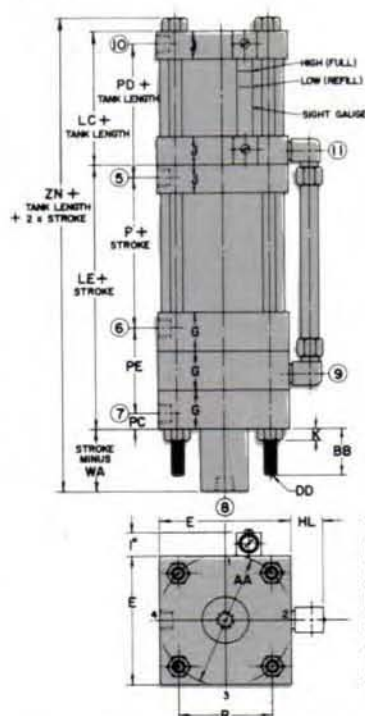
All Ports EE Pipe Size

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.

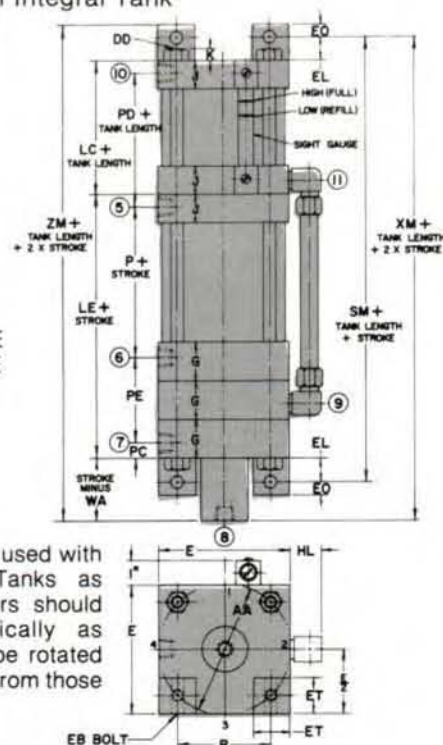
Note

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



ALL PORTS ARE
"EE" PIPE SIZE

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 and Pricing for over 5000 psi output

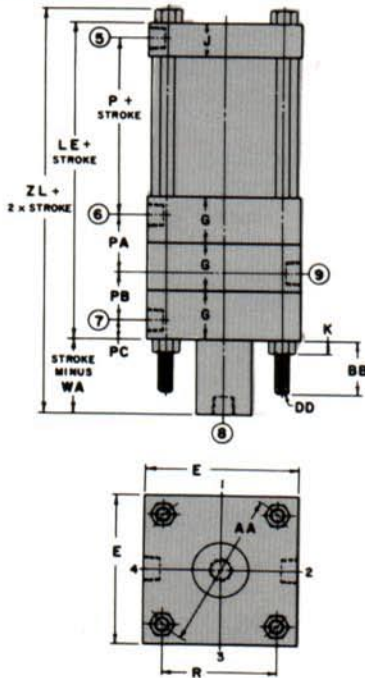
INSTALLATION DRAWINGS

MAXIMUM OUTPUT PRESSURES UP TO 5000 PSI STANDARD

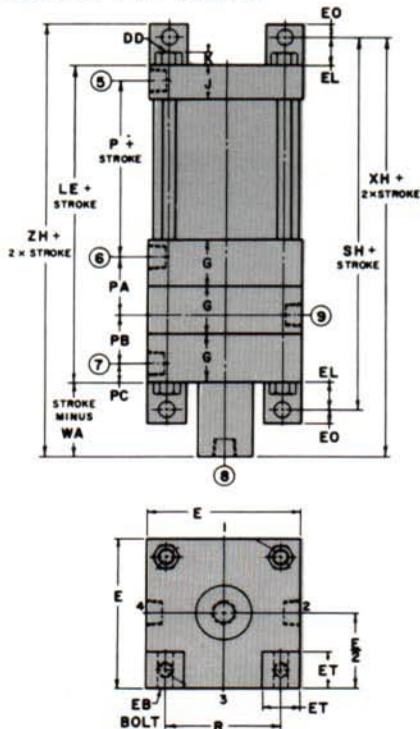
(Special Engineering Required For Over 5000 psi Output.)

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	3 1/4	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 1/8	1 1/8	1 13/16	1 13/16	2 1/16	2 1/16	2 1/16	3 1/16
DD	3/4-24	3/4-24	1/2-20	1/2-20	3/4-18	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 1/8	12 1/4	14 1/4
EB	3/8	3/8	1/2	1/2	3/4	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 1/8	1 1/8	1 1/2
EO	3/8	3/8	1/2	1/2	3/4	3/4	3/4	7/8
ET	1	1 1/16	1 1/8	1 1/8	2 1/16	2 1/16	3 1/16	3 13/16
G	1 3/4	1 3/4	1 3/4	2	2	2 1/4	2 1/4	2 3/4
HL	1 1/8	1 1/8	1 1/8	1 7/32	1 7/32	2 1/16	2 1/16	2 55/64
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	7/16	1 1/16	1 1/16	1 1/16
LC	2 1/2	2 1/2	2 1/2	3	3	4	4	4 1/2
LE	7 3/4	7 3/4	8	9	9 1/8	10 7/8	11 3/8	13 3/8
P	2 1/8	2 1/8	2 1/8	3 1/8	3 1/4	4 1/8	4 1/8	5 1/2
PA	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	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	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1	1	1 1/16
PD	2 1/2	2 1/2	2 1/2	3	3	4	4	4 1/2
PE	3 1/8	3 1/8	3 1/8	4 3/8	4 3/8	4 3/4	4 3/4	5 7/8
PF	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	2	2	2 3/8
PG	7/16	7/16	7/16	1 1/16	1 1/16	1	1	1 1/16
R	2.76	3.32	4.10	4.88	6.44	7.92	9.40	10.90
SH	9 1/2	9 3/4	10 1/8	11	11 3/8	13 1/2	14	16 3/8
SM	12	12 1/4	12 3/8	14	14 3/8	17 1/2	18	21 1/8
SP	4 1/4	4 1/2	4 3/8	5	5 1/4	6 3/8	6 3/8	7 1/2
WA	3/8	3/8	3/8	7/8	7/8	1 1/8	1 1/8	1 3/8
XH	8	8 1/8	8 13/16	9 1/8	9 3/8	11 1/16	11 1/8	13 1/2
XM	10 1/2	10 3/8	10 13/16	12 1/8	12 3/8	15 1/16	15 1/8	18
ZH	8 1/2	8 1/2	8 13/16	9 3/8	10	11 1/16	12 3/16	14 1/4
ZL	7 1/2	7 1/2	7 13/16	8 1/8	8 13/16	10 1/16	10 1/8	12 13/16
ZM	10 3/8	11	11 1/16	12 3/8	13	15 1/16	16 3/16	18 3/8
ZN	10	10	10 1/16	11 1/16	11 13/16	14 1/16	14 13/16	17 1/16
ZP	5	5 1/4	5 3/8	6	6 1/2	7 1/8	7 3/8	9

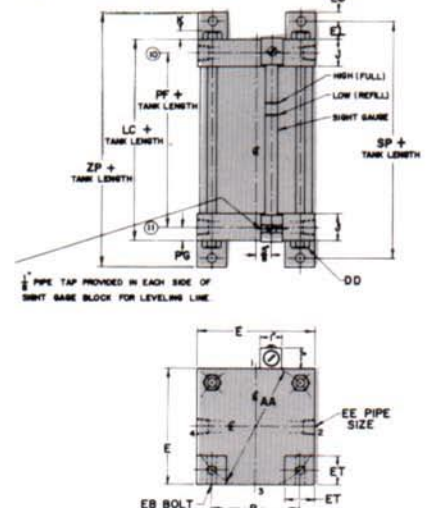
* For other mountings and their dimensions See cylinder Bulletins 7619 and 7620



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

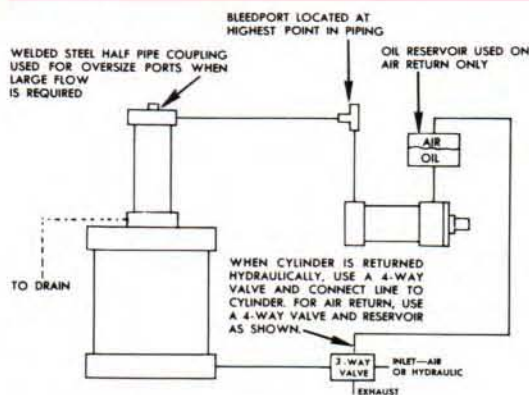


NOTE: Two tanks can be mounted in tandem, one above the other. Sight gauge of lower tank is off-set to left. Miller Air-Oil Tanks have baffles that eliminate oil churning, aeration, and slopover.

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.



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.



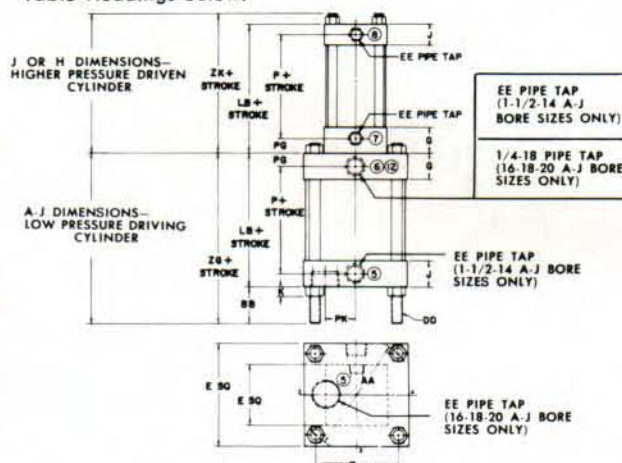
MODEL 64-BA9

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.

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		BA9 Hydraulic To Hydraulic			
Driving Cylinder Bore Size (inches)	Max. Air Input PSI	Driving Cylinder Bore Size (inches)	Max. Hydraulic Input PSI		
3 1/4	750	3 1/4	Severe	Moderate	
4	500		1500	2500	
5, 6	400	4	1000	1500	
8 to 20	250	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	BREATHING PORT (Single Acting Operation)

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

Bore	1 1/2	2	2 1/2	3 1/4	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	1 1/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	BB
DD	1/4-28	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	3/4-24	DD
E	2	2 1/2	3	3 3/4	4 1/2	5 1/2	6 1/2	7 1/2	8 1/2	10 1/2	12 1/2	14 1/2	17	19	21	E
EE	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	3/4-18	EE
G	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	G
J	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	2	2	2 1/2	1 1/2	1 1/2	2	J
K	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	K
LB	3 1/2	3 1/2	3 1/2	4 1/2	4 1/2	4 1/2	5	5 1/2	5 1/2	6 1/2	6 1/2	8 1/2	5 1/2	5 1/2	6 1/2	LB
P	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	P
PG	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	PG
PK	—	—	—	—	—	—	—	—	—	—	—	—	5 1/2	6 1/2	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	4 1/2	4 1/2	4 1/2	5 1/2	5 1/2	6 1/2	6 1/2	7 1/2	7 1/2	9 1/2	9 1/2	11 1/2	8 1/2	10 1/2	11 1/2	ZG
ZK	3 1/2	3 1/2	4 1/2	4 1/2	4 1/2	4 1/2	5 1/2	5 1/2	5 1/2	7 1/2	7 1/2	9	—	—	—	ZK

"H" (Hydraulic) Cylinder Dimensions

Bore	1 1/2	2	2 1/2	3 1/4	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	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
DD	3/4-24	3/4-20	3/4-20	3/4-18	3/4-18	3/4-14	1-14	1 1/4-12	1 1/4-12
E	2 1/2	3	3 1/2	4 1/2	5	6 1/2	7 1/2	8 1/2	9 1/2
EE	3/4-14	3/4-14	3/4-14	3/4-14	3/4-14	3/4-14	3/4-14	1-11 1/2	1 1/4-11 1/2
G	1 1/4	1 1/4	1 1/4	2	2	2	2 1/4	2 1/4	3
J	1 1/2	1 1/2	1 1/2	1 1/4	1 1/4	1 1/4	2 1/4	2 1/4	3
K	3/4	3/4	3/4	3/4	3/4	3/4	1 1/4	1 1/4	1 1/4
LB	4 1/2	4 1/2	4 1/2	5 1/2	5 1/2	6 1/2	8 1/2	8 1/2	9 1/2
P	2 1/2	2 1/2	3	3 1/2	3 1/2	4 1/4	4 1/2	5 1/2	6 1/2
PG	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
R	1.63	2.05	2.55	3.25	3.82	4.95	5.73	6.58	7.50
ZK	5	5 1/4	5 1/4	6 1/4	6 1/4	7 1/4	9 1/4	9 1/4	10 1/4

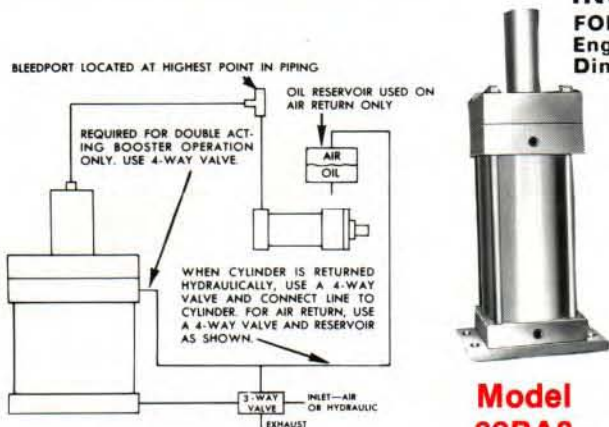
BA8 Boosters

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



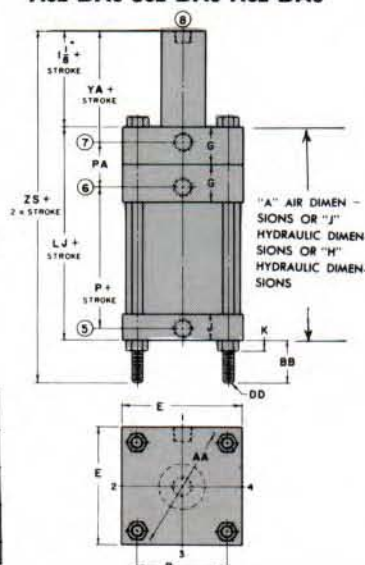
**Model
62BA8**

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

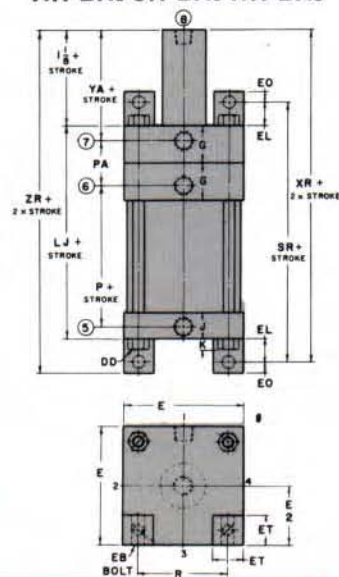
PORT IDENTIFICATION TABLE

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
3 1/4"	1500 psi	2500 psi
4"	1000 psi	1500 psi
5" and 6"	800 psi	1200 psi
8", 10", 12", 14"	500 psi	800 psi

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

BORE	3 1/4	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 1/8	1 1/8	1 13/16	1 13/16	2 3/16	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 9/8	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 9/16	1 9/16	1 1/2
EO	3/8	3/8	1/2	1/2	5/8	3/4	3/4	7/8
ET	1	1 1/16	1 3/8	1 3/8	2 1/16	2 11/16	3 3/16	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	1 1/16	1 1/16	1 3/16
LJ	6	6	6 1/4	7	7 1/8	8 3/8	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 3/8	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 13/16	1 13/16	2 1/8	2 1/8	2 3/16
ZR	8 3/8	8 1/2	8 15/16	9 1/8	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 9/16	15 3/16

BORE	3 1/4	4	5	6	7	8
AA	4.6	5.4	7.0	8.1	9.3	10.6
BB	2 9/16	2 9/16	3 3/16	3 3/8	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	1 1/16	1 1/16	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 3/16	2 7/16
ZR	10 3/8	10 9/8	11 3/8	13 3/16	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.

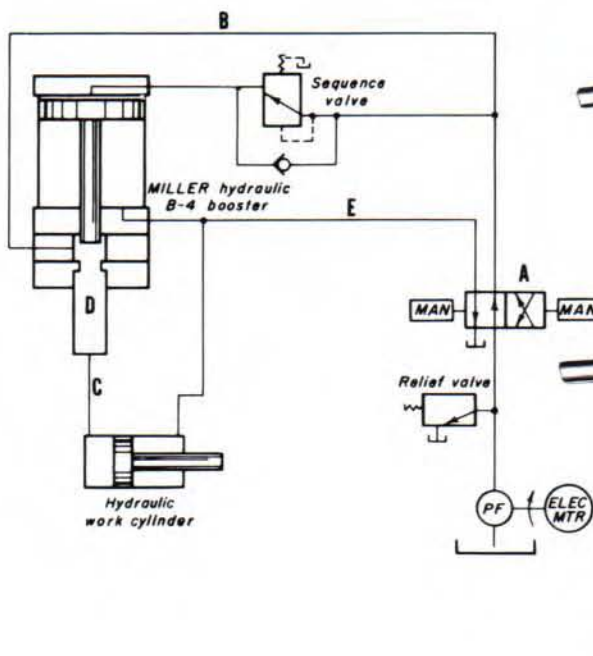
MILLER HYDRAULIC TO HYDRAULIC "B4" BOOSTERS

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 ac-

complish 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

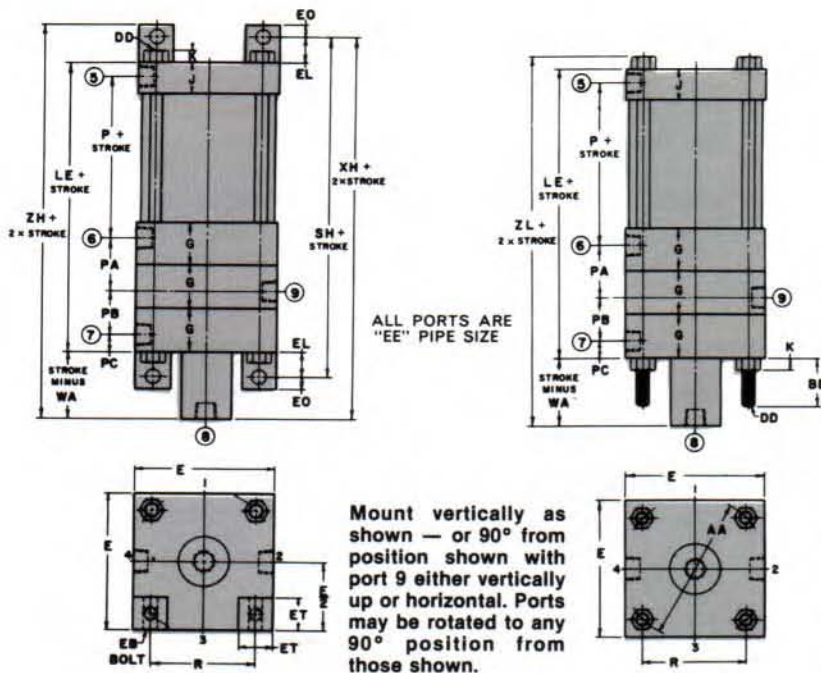
The piping up through the four-way valve A represents a more or less conventional hydraulic system. In operation, pump oil flow through Line B, through the booster pressure chamber D, then through Line C and into the work cylinder to operate its approach stroke. When the cylinder encounters resistance, 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



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
3 1/4"	1500 psi	2500 psi
4"	1000 psi	1500 psi
5" and 6"	800 psi	1200 psi
8", 10", 12", 14"	500 psi	800 psi

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

BORE	3 1/4	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	3/8	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 3/16	1 3/16	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	1 1/16	1 1/16	1 3/16
LE	7 3/4	7 3/4	8	9	9 1/8	10 7/8	11 3/8	13 3/8
P	2 5/8	2 5/8	2 7/8	3 1/8	3 1/4	4 1/8	4 1/8	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	1 1/16	1 1/16	1 1/16	1 3/16	1 3/16	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	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 13/16	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 13/16	12 13/16

BORE	3 1/4	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 3/8	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	3/8	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 3/8	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 3/16	14 7/8

* Special Engineering and Pricing for over 5000 psi output

All Dimensions In Inches

AIR TO HYDRAULIC Reciprocating Boosters

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

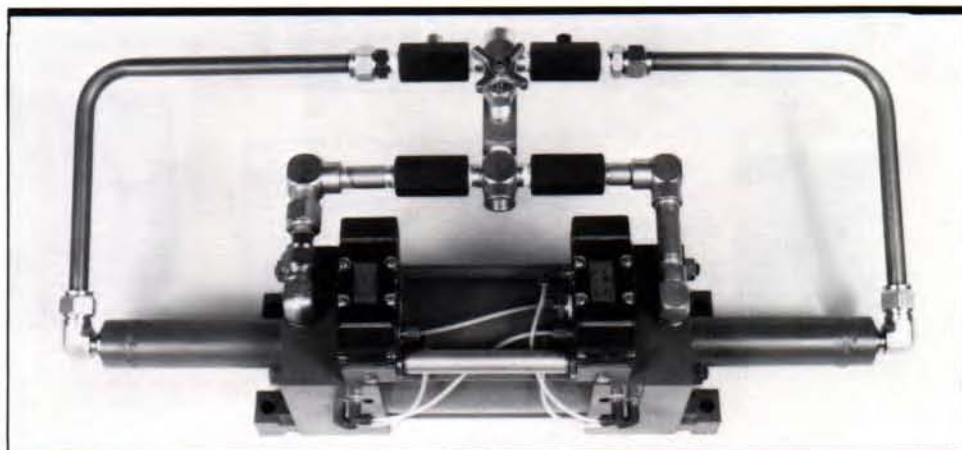
Like other Miller Boosters, Reciprocating Boosters offer the convenience of intensified hydraulic output from shop air input, but with more output volume for operation of larger cylinders or multiple cylinders.

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.



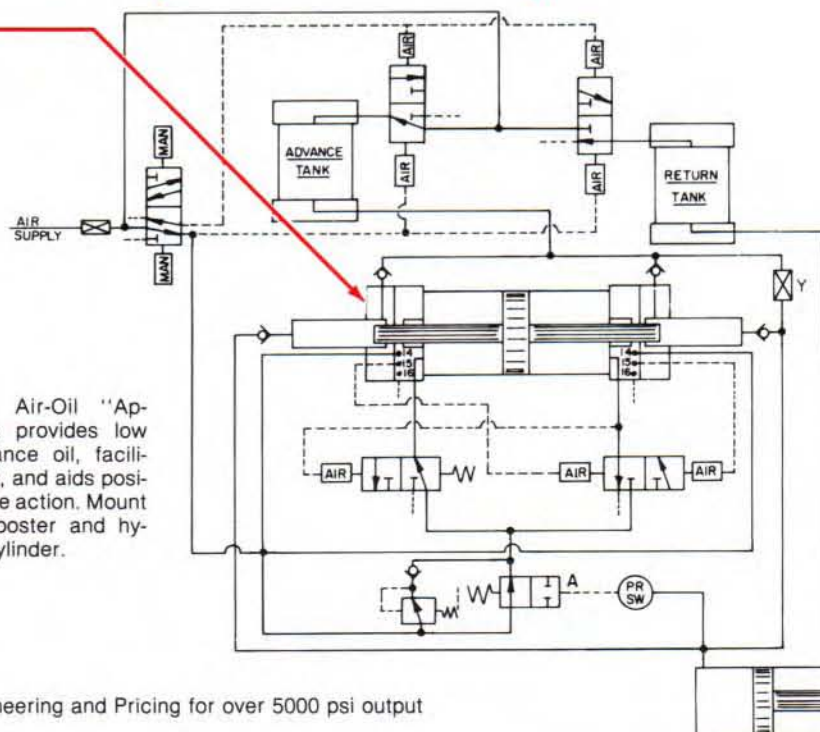
Dual Pressure Circuit With Air-Oil Approach Stroke And Booster Operated High Pressure Work Stroke With Rapid Pressure Build-Up

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.

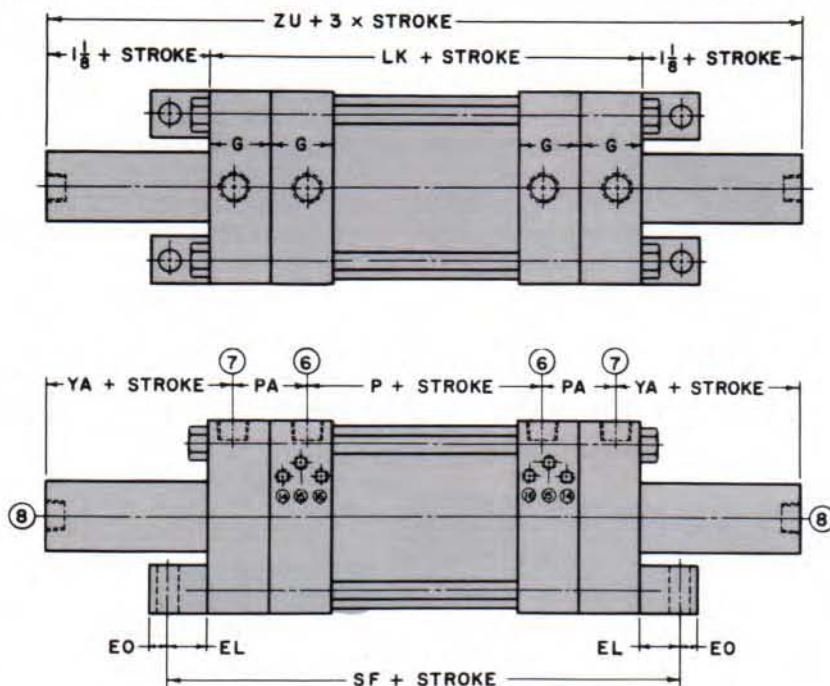
Pressure switch and 2-Way Valve required only for rapid build-up to a fixed pressure which cannot be exceeded. Under these conditions, final pressure should be about 30 to 40 psi below line pressure. If rapid pressure build-up is not desired, omit Pressure Switch and Valve "A". Then the Booster will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

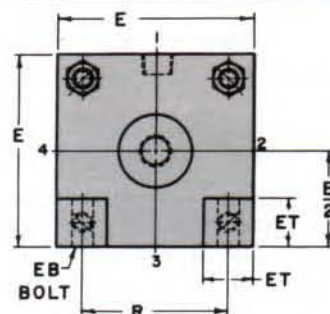
* Special Engineering and Pricing for over 5000 psi output

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 — 1/4" 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 3/8	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 3/16	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 3/16	4	4 11/16
R	3.32	4.10	4.88	6.44	7.92	9.40	10.90
SF	10 1/4	10 5/8	11 1/2	11 7/8	13 3/4	14 1/4	17 1/8
YA	1 13/16	1 13/16	1 5/8	1 13/16	2 1/8	2 1/8	2 5/8
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 regu-

lator 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

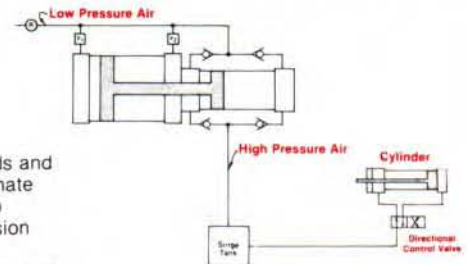
Connecting piston rod is hardened-chrome plated for better wear and surface

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?

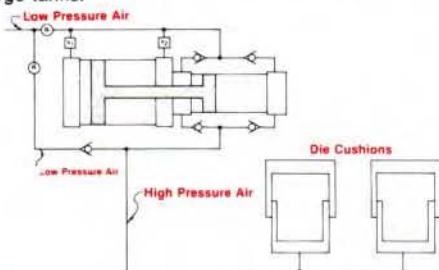
Essentially, the reciprocating booster consists of a double rod end air cylinder with a discharge pressure chamber at each end. Thus, it delivers a power stroke in both directions. At the end of the stroke, the piston assembly strikes an actuator button inside the cylinder. The movement of this button 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.

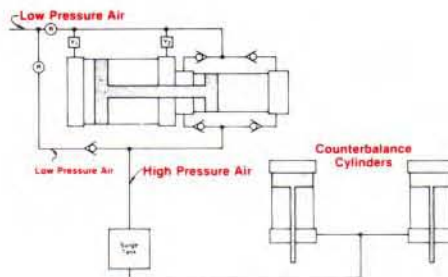
Die Cushion Circuit

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.



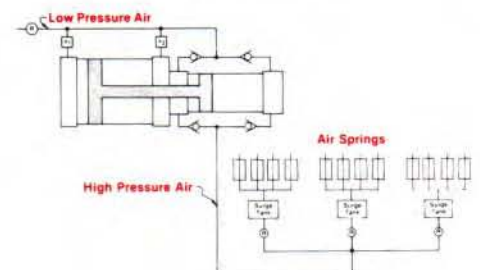
Counterbalance Circuit

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 "knockouts" on the transfer presses. Since you can vary your high pressure you can easily adjust your air spring force for different jobs if required.

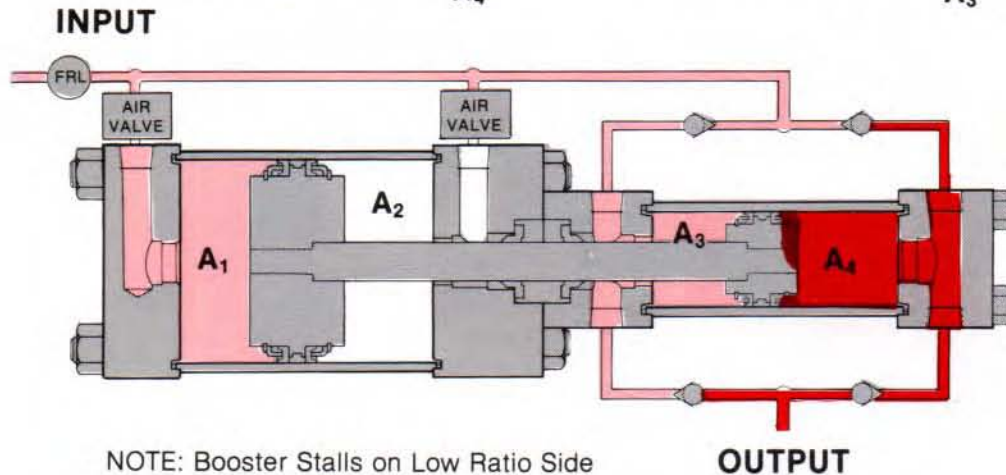


HOW A BOOSTER RATIO IS DETERMINED

$$\text{Ratio on Out Stroke} = \frac{A_1 + A_3}{A_4}$$

(As shown in this example)

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



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"	1¾"	12"	80	335	14.91	1287

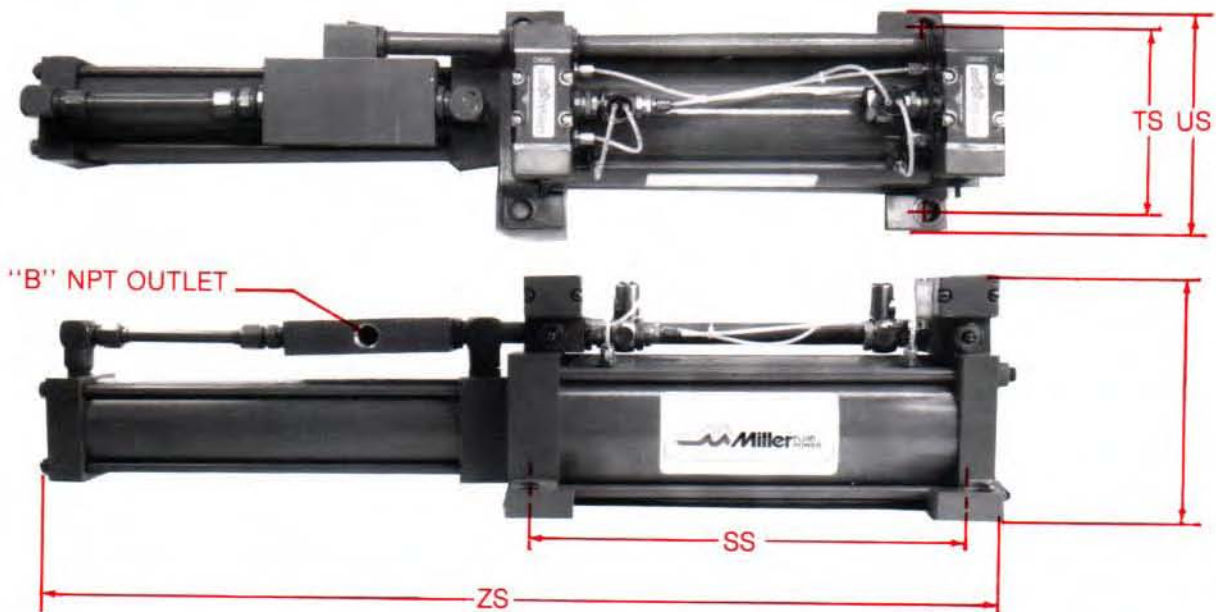
DIMENSIONS

Driving Cyl. Bore Size	Dimension						
	A	B	ES	SS	TS	US	ZS
3 1/4"	1/2"	1/2"	8"	15 1/8"	4 3/4"	5 3/4"	35 3/8"
5"	1/2"	1/2"	9"	15 1/4"	6 7/8"	8 1/4"	35 7/8"
6"	3/4"	1/2"	9 1/2"	15 1/8"	7 7/8"	9 1/4"	34 9/8"

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

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

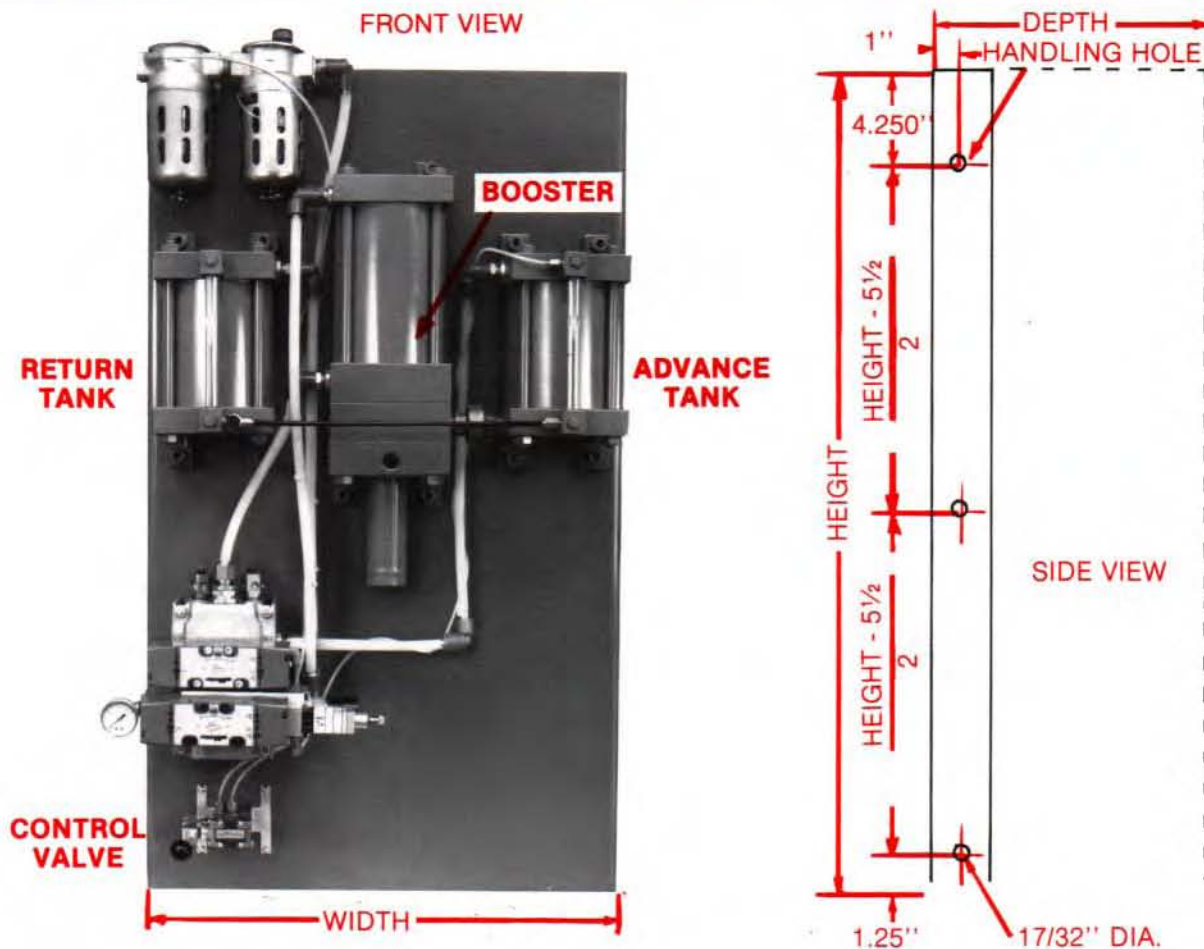
4 HOLES 1/2" FOR 3 1/4"
 3/4" FOR 5" & 6"



To Order Specify

1 Quantity
 RA72BA9 Model No.
 5" Bore Driving Cylinder
 3 1/4" Bore Driven Cylinder
 12" 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

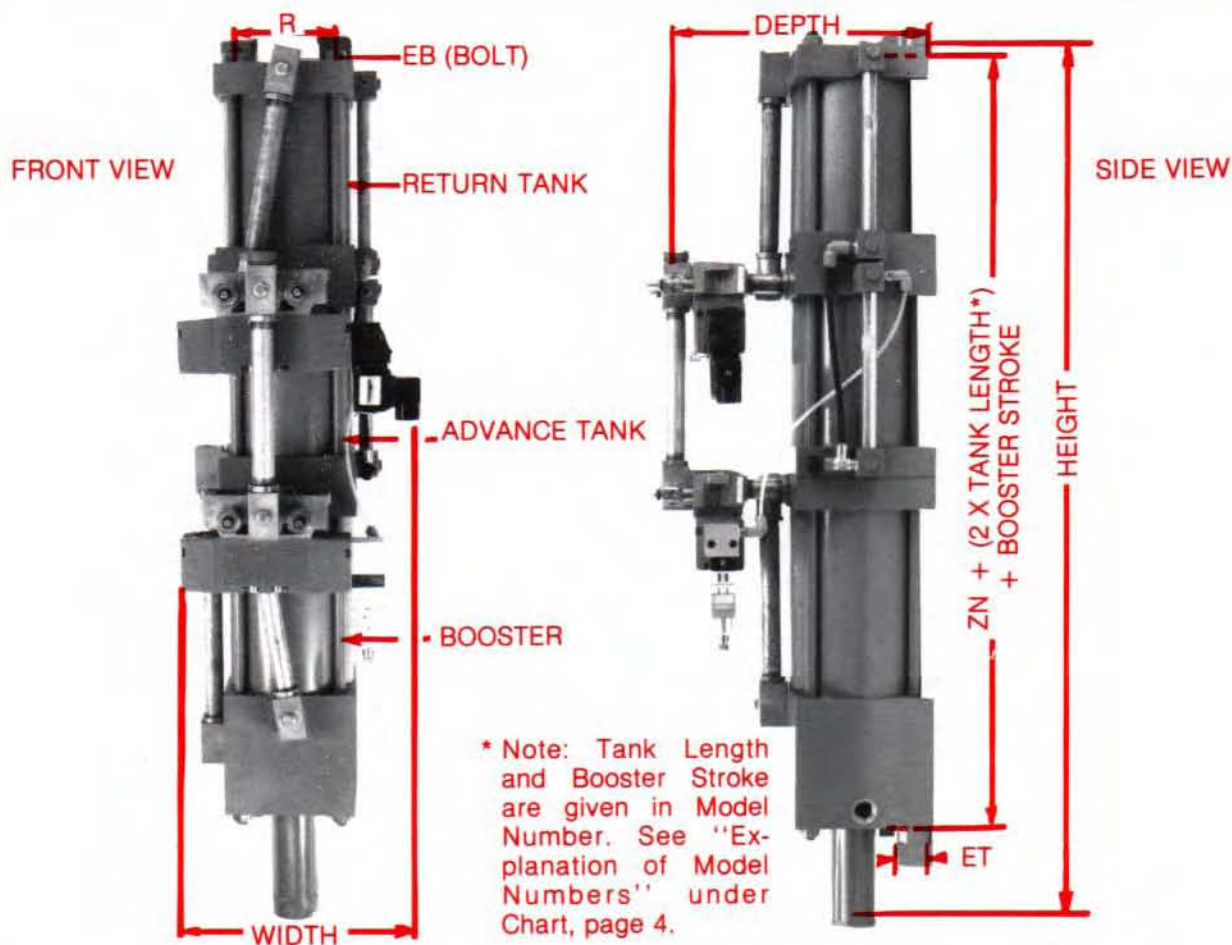
One Pressure Regulator (at top left of Front View above) regulates the booster ram forward stroke, thus also regulating the cylinder high pressure work stroke pressure. The other Regulator (at right above) can provide considerable air savings by permitting the booster return stroke to be regulated down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

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

	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	1 1/2"	1 1/2"	2"	2"	2"	2"	2 1/2"	2 1/2"	2 1/2"	2 1/2"	
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 11 1/8	42x24 x 11 1/8	30x24 x 12 3/4	42x24 x 12 3/4	30x24 x 11 1/8	42x24 x 11 1/8	30x24 x 12 3/4	42x24 x 12 3/4	30x24 x 11 1/8	42x24 x 11 1/8	
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 10 1/2 x 8 1/4	58 x 10 1/2 x 8 1/4	37 3/8 x 11 1/4 x 9 1/2	55 3/8 x 11 1/4 x 9 1/2	38 x 10 1/2 x 8 1/4	58 x 10 1/2 x 8 1/4	37 3/8 x 11 1/4 x 9 1/2	55 3/8 x 11 1/4 x 9 1/2	38 x 10 1/2 x 8 1/4	58 x 10 1/2 x 8 1/4	

† 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	Ram	Booster	Tank	Tank	Panel
Bore	Dia.	Stroke	Dia.	Length	Mounted
5"	1"	6"	5"	6"	

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

†The number "13" signifies a 1 3/8" dia. ram.

Panel and 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"
	3 1/4"	3 1/4"	3 1/4"	3 1/4"	4"	4"	3 1/4"	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 12 3/4	42 x 24 x 12 3/4	30 x 24 x 11 1/8	42 x 24 x 11 1/8	30 x 24 x 12 3/4	42 x 24 x 12 3/4	42 x 30 x 15	42 x 24 x 11 1/8	30 x 24 x 12 3/4	42 x 24 x 12 3/4	42 x 30 x 15	42 x 24 x 12 3/4	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**
	37 3/8 x 11 1/4 x 9 1/2	55 3/8 x 11 1/4 x 9 1/2	38 x 10 1/2 x 8 1/4	58 x 10 1/2 x 8 1/4	37 3/8 x 11 1/4 x 9 1/2	59 3/8 x 11 1/4 x 9 1/2	52 x 12 1/4 x 11 1/2	58 x 10 1/2 x 8 1/4	39 3/8 x 11 1/4 x 9 1/2	59 3/8 x 11 1/4 x 9 1/2	54 x 12 1/4 x 11 1/2	59 3/8 x 11 1/4 x 9 1/2	54 x 12 1/4 x 11 1/2	54 x 12 1/4 x 11 1/4

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 ... 1/4"
 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, 1 1/2", 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.

Miller Fluid Power

500 South Wolf Road
Des Plaines, IL 60016 USA
Tel.: (847) 298-2400
Fax: (800) 892-1008
E-mail: MFPCylmktg@parker.com
Website: www.millerfluidpower.com

Miller Fluid Power

160 Chisholm Drive
Milton, Ontario
Canada L9T 3G9
Tel: (905) 693-3000
Fax: (905) 876-1958

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