

Multicyl User Manual

****BE SURE TO READ THIS ENTIRE MANUAL PRIOR TO USING ANY MULTICYL PRODUCTS****

Section 1: Frequently Asked Questions

- [1\) How do I set up the cylinder for operation?...section 3](#)
- [2\) What air pressure is required to use a Multicyl?...section 4](#)
- [3\) What air volume does the cylinder use?...section 17](#)
- [4\) What size of hole can a Multicyl punch?...section 2](#)
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- [7\) Can multiple Multicyls be 'ganged' together in one system?...section 10](#)
- [8\) Can a Multicyl be used horizontally or inverted? ...section 11](#)
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Section 2: Pre-installation:

Before getting started, double check that the Multicyl meets the following two criteria:

Does the Multicyl fulfill the tonnage requirements of the tool/application?

- shear length x material thickness x tensile strength = force (for shaped holes)
- PI x diameter x material thickness x tensile strength = force (for round holes)
- shear length x thickness x 3500 = stripping force (approx)
- Mutlicyls are rated at 120 PSI, the force output adjusts proportionately with the incoming air pressure level

Does the Multicyl fulfill the stroke requirements of the tool/application?

- the advance portion of the stroke (overall stroke - power stroke) must be long enough to position the tool in place
- the power stroke must be long enough to do the work

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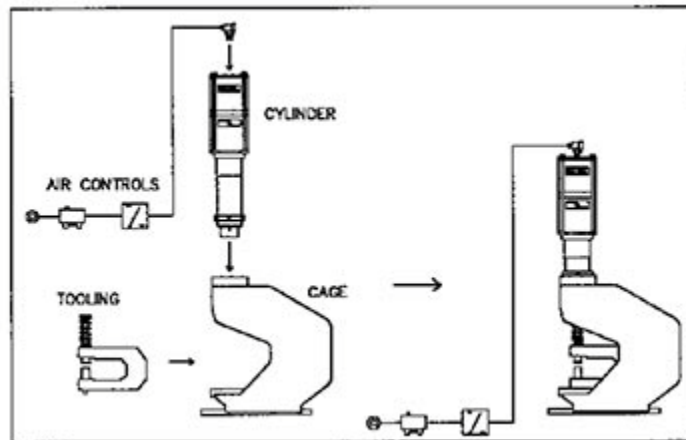
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In order to account for application variables (air pressure, material conditions, punch sharpness, tool and/or frame deflection, etc.), and to ensure a longer machine life (no machine should consistently run at 100% output), a safety margin of 25% should be applied to both stroke and tonnage requirement calculations.

Section 3: Set-up:

- 1) - Locate the tooling in the appropriate position inside the cage and screw the Multicyl into the threads of the mounting plate. Note that punch position within the punch assembly should be noted in case its height involves extra punch movement which would require additional Multicyl Power stroke. It is usually necessary to have the tool height recessed within the guide in order to strip the stock from the punch, however, this height should be minimized for power stroke reasons.
- 2) - Position the ram cap of the Multicyl above the punch or tool threading the cylinder down until there is just enough feed clearance for the part. The patented self-adjusting stroke of the Multicyl will eliminate any excess advance stroke length. Use the locking ring supplied with the Multicyl to secure the cylinder in the desired position.
- 3) - Make sure all caps and plugs are removed from the air cylinder head and divider plate. Connect the air control package according to the appropriate diagram.
- 4) - Cycle the self bleeding Multicyl a few times to evacuate air from the hydraulic system, then test with a work piece.

Note: this procedure is for standard hole punching applications only;



MultiLoc and other special applications will have a special set of set-up instructions supplied with the machine.

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Section 4: General User Notes:

- Inlet air pressure must be between 40 and 120 PSI. The cylinders are rated at 120 PSI. The tonnage output is directly proportional to the incoming air pressure, ie. if the incoming air pressure is lowered by 20%, the force the cylinder exerts will also go down by 20%. NOTE: It is dangerous to operate a Multicyl above 120PSI.
- When using Multicyl, as with any air/hydraulic cylinder, it is important to keep the incoming air free from contamination. It is important to use a filter, regulator, lubricator unit to ensure a supply of clean lubricated air. Without the use of a properly installed filter, regulator, lubricator within 10 feet from the Multicyl cylinder, all warranties are void.
- When considering air consumption for a Multicyl system it is important to remember that some compressors are designed to produce full air pressure for only 50% of their running time.

Section 5: Cages (Machine Frames)

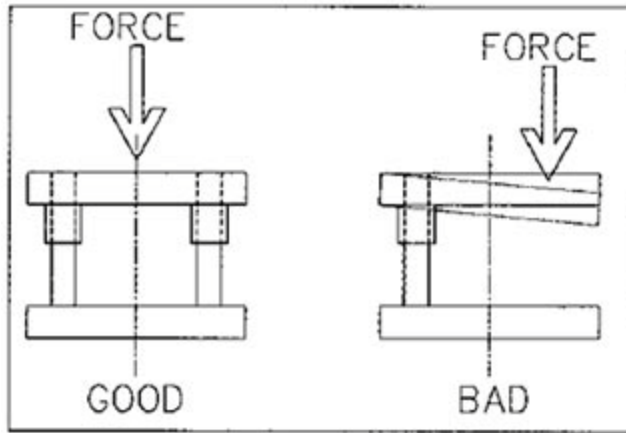
- Cages must be designed to withstand the forces and bending moments produced during operation. Remember every action produces an equal and opposite reaction. Failure to account for these reactions to punching forces in the machine design may cause application problems including loss of valuable working stroke and tool and/or cylinder damage. Standard or custom C-frames and Multicages which have been properly engineered and tested are available for all types of applications from Multicyl.

Section 6: Tooling

When using a Multicyl, tooling design features are very important. Unlike traditional presses which use gibs and slides, the ram of the Multicyl has to be sure to be protected from transverse forces that could damage the seals of the cylinder. If not accounted for, these forces can be transferred up the ram of the cylinder and cause premature wear resulting in both application and maintenance problems. In fact, the most common application problem found in a Multicyl system is improperly designed tooling. The tooling must be rigidly designed to prevent deflection and transverse forces acting on the ram of the cylinder. The tooling must have a centralized load condition. Although a 4 pin die set is ideal, 2 pin applications can be done successfully. However, with a 2 pin die set the central position is not necessarily on the center line of the punch, but may be found at any point in the triangle formed by the 2 pins and the center line of the punch.

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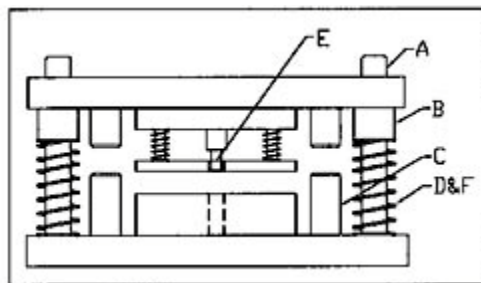


Failure to include these features in the design of the tooling may cause application problems and machine damage.

Single acting Multicyls are not designed to return tooling. Tooling should not be attached to the ram of a single acting Multicyl. Exceptions may be made when the tooling weight is less than 5 pounds and an AD10 adaptor is used.

It is possible to return tooling with a double acting Multicyl. However, it is very important to adhere to the above tooling design features when attaching the tooling to the double acting Multicyl. Failure to do so will cause application problems. An EAC-1000 flexible coupler or 6003/6004 die connector set (available from Multicyl) should be used in all applications where the tooling is attached to a double acting Multicyl.

Whenever possible all of the following features should also be included in the tooling:



- A. four guide pins where possible
- B. upgraded guide pins and bushings
- C. built in depth stop
- D. self contained tool return springs
- E. centralized working forces
- F. minimal spring resistance (excessive spring force may cause a premature power stroke in the cylinder)

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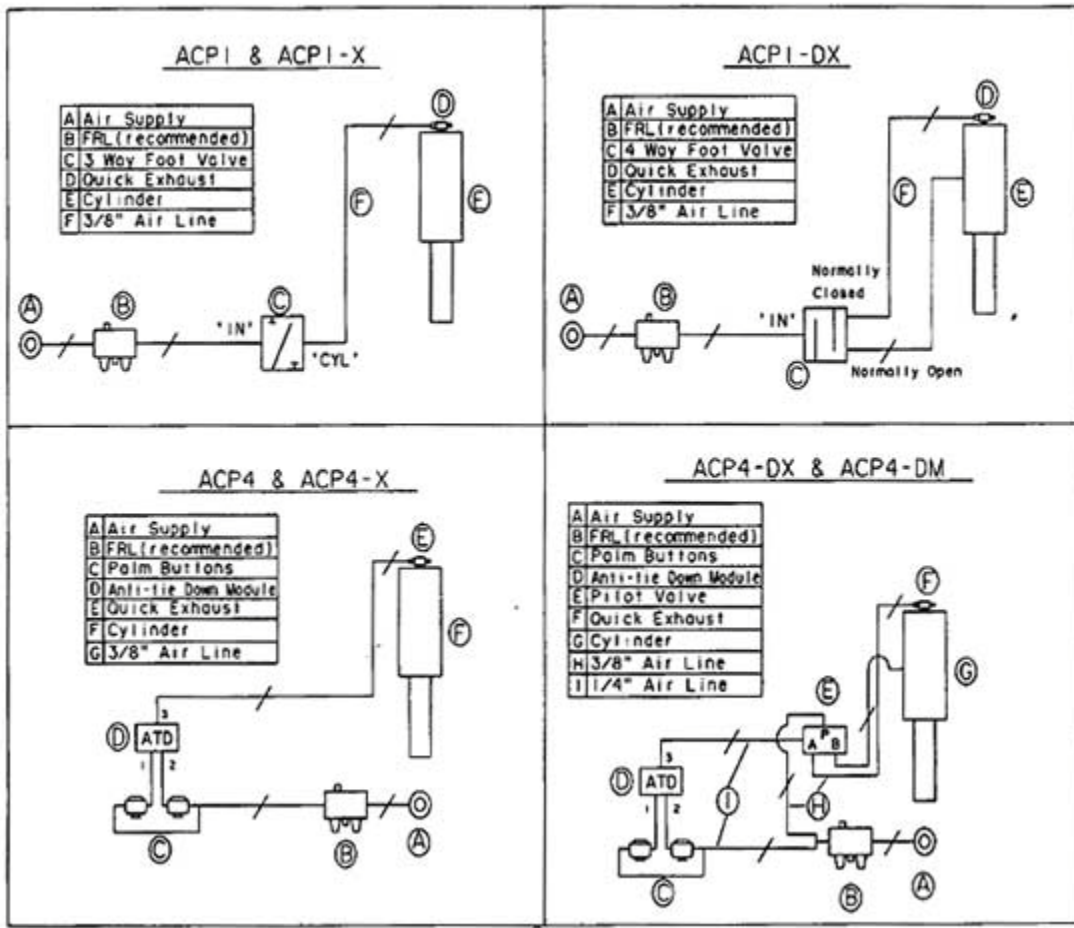
Section 7: Punching Stainless and Other Hard Materials

When working with stainless steel, or materials with similar properties, it is recommended to use high quality tool steels. Regular tool steels, such as A2, may compress or even break causing application problems.

Section 8: Air controls and air delivery

Multicyl uses only the simplest of air controls. A 3-way pilot valve and a quick exhaust (for single acting cylinders) or a 4 way pilot valve (for double acting cylinders) are all that is required. Standard foot control and palm button air control packages can be supplied from Multicyl Inc. An FRL500 filter regulator lubricator unit is recommended to be in the air line within 10' of any Multicyl in operation.

Standard Air Control Packages

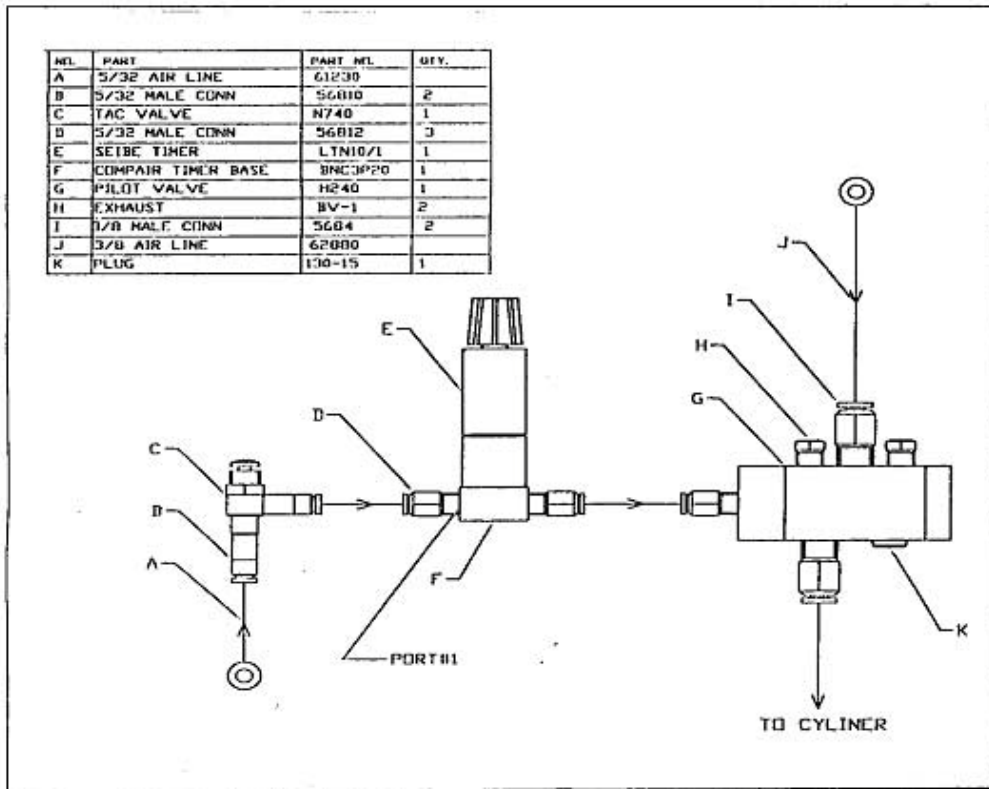


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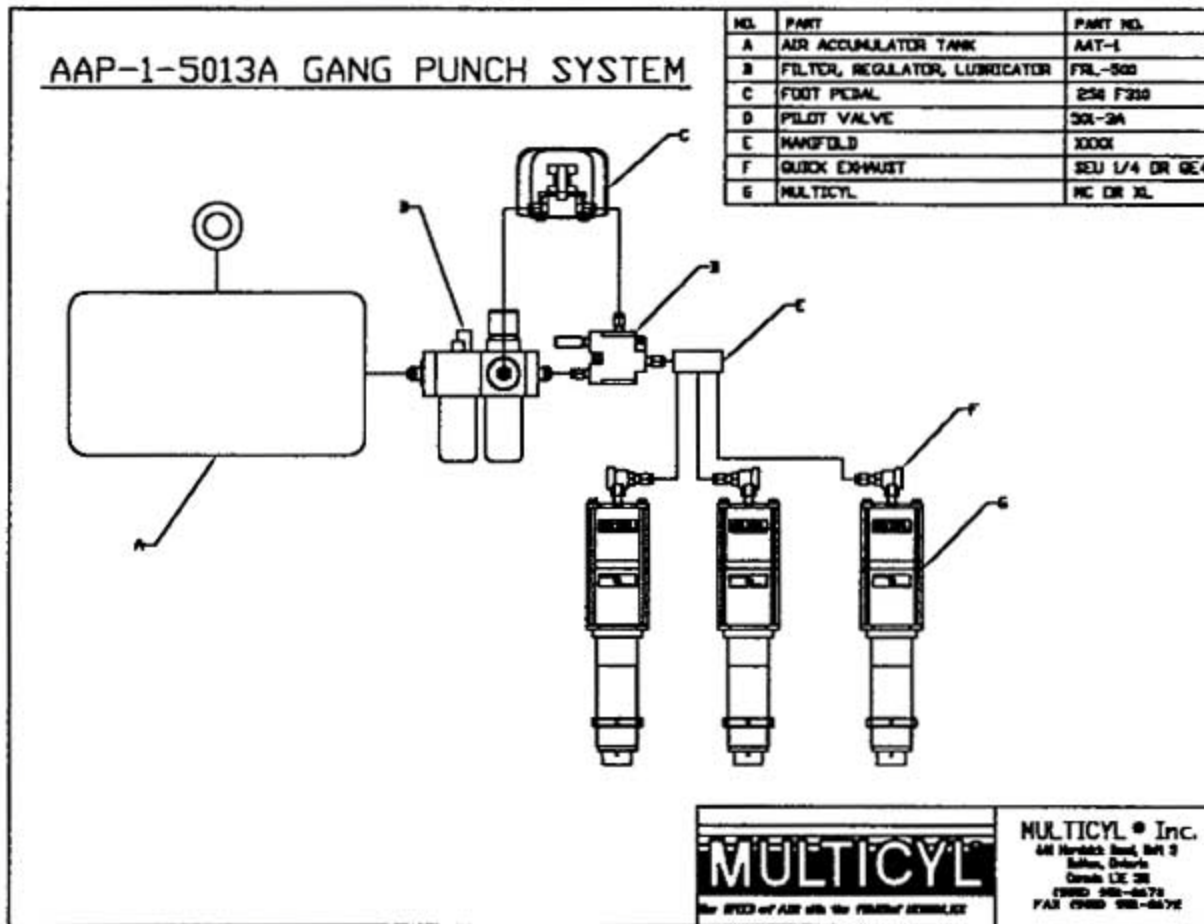
Section 9: Timed Operation

In addition to the standard air control packages, some applications may require the use of a timer which may be supplied by Multicyl Inc. Time delay and timed stroke length options are available.



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Section 10: Gang punching

Gang punching refers to a set-up of multiple cylinders operating simultaneously from a single signal. It is not possible to control fluid power devices absolutely, but adhering to the following principles a matched cycle time can be produced.

- An air accumulator tank is required to ensure a steady supply of compressed air. A minimum factor of 3 times the total machine volume is recommended for the accumulator tank.
- Short lines directly from the tank or a manifold are recommended for each cylinder. The use of 'T' connections or excessive feed lines may restrict the air flow and produce an unmatched cycle.
- Individual pilot valves for each cylinder will help in extreme cases.
- Be sure that all lines, connections, and union joints allow enough flow to feed all the cylinders.
- If there are problems with one or more of the cylinders in a gang punching system, those cylinders should be tested individually. This will determine if the problem is with the cylinder or with the air delivery.
- If the cylinders are striking the same die set to produce a higher tonnage, only short stroke (5/8" or less) cylinders are recommended, as it is more difficult to produce matched cycles in

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longer stroke cylinders. Unmatched cycles in such an application may damage the cylinder and/or tooling involved.

Section 11: Inverted or Horizontal Operation

Standard Multicyls will not operate in an inverted (upside down) position. The oil transfer system which allows oil to flow from the reservoir into the high pressure chamber is ineffective in this position. However, custom modifications may be made at our plant to overcome this problem and provide an inverted cylinder. Note: this must be requested at the time of ordering. All Multicyls can be operated from a horizontal position. When using a Multicyl in this position, be sure that the oil filler screw is facing upwards; this will properly align the bleed holes of the cylinder allowing the oil transfer system to work properly and the cylinder to function as it should.

Section 12: Maintenance

Planned periodical preventative maintenance should include seal kit replacement after extended use. The need for a new seal kit is indicated by cylinder malfunction, erratic results, or oil leakage. Seal kits for all cylinders are available through the dealer which supplied the equipment. Instructions for the replacement procedure are included with the seal kit.

Section 13: Oil

Occasionally the Multicyl oil level may have to be topped up; but generally the sealed Multicyl oil system should only be replaced when doing a seal change, or after service of one year as part of a preventative maintenance initiative.

- Multicyl uses Shell Tellus 32 hydraulic oil, or an equivalent 150 SSU high grade hydraulic oil can be substituted.

Section 14: Safety

As the simplicity of Multicyl permits non-technical personnel to be involved in machine installations, accident prevention cannot be over-emphasized. Multicyl applications should be properly guarded to comply with all applicable standards for operator safety. Do not let the small size of a Multicyl mislead you - high forces are produced and severe injury may result if proper safety procedures are not adhered to.

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- OSHA Regulations Section 1910.217 (c) states that: "It shall be the responsibility of the employer to provide and insure the usage of point of operation guards or properly applied and adjusted point of operation devices on every operation performed on mechanical power press; unless the point of operation opening is 3/16" or less."
- In many applications the patented self adjusting stroke of Multicyl allows the pinch points to be eliminated by adjusting the position of the cylinder to eliminate openings greater than 3/16". In applications where this is not possible, such as tube piercing, common methods of compliance are to use guards at the point of operation or to use two hand anti-tie down operating controls.
- In addition to pinch points, compressed air poses another potential safety hazard. All fittings and air hoses must be properly connected. Due to the high forces produced by the compressed air, these pieces, when not properly installed, can become safety hazards to the operator.

The patented self adjusting stroke of Multicyl allows the point of operation opening to be adjusted to 1/4" on many applications. On applications where this is impossible or impractical, Multicyl can provide a two hand anti-tie down safety air control package.

Section 15: Warranty

Multicyl guarantees its products to be free from defect in workmanship for 1 year from date of purchase or 10,000,000 hits. Our warranty is limited to replacement or repair of defective parts at the discretion of Multicyl. This warranty is void if the cylinder is not used in conjunction with a properly maintained filter, regulator, lubricator mounted on the inlet port within 10' of the cylinder. Multicyl can not be held responsible for damage or injury caused by unsafe use or improper application of its products. All guidelines in this manual must be adhered to.

Section 16: Troubleshooting

PROBLEM	CAUSE	SOLUTION
1. CYLINDER DOES NOT PRODUCE FULL FORCE UPON INSTALLATION.	-AIR WITHIN HP HYDRAULIC CHAMBER.	
	-CYLINDER HAS NOT BEEN PROPERLY BLED.	SEE SECTION 3
	-AIR PRESSURE AND/OR DELIVERY IS INHIBITED.	SEE SECTIONS 4 & 8
	-TOOLING DOES NOT HAVE THE NECESSARY DESIGN FEATURES.	SEE SECTION 6
	-THE OIL IN THE RESERVOIR IS LOW.	SEE SECTION 1

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2.CYLINDER CYCLES SLOWLY.	-RESTRICTION IN AIR LOGIC. -AIR PRESSURE AND/OR DELIVERY IS INHIBITED. -QUICK EXHAUST IS BLOCKED OR NOT WORKING PROPERLY. -TOOLING DOES NOT HAVE THE NECESSARY DESIGN FEATURES. -THE OIL IN THE RESERVOIR IS LOW	SEE SECTION 4 & 8 SEE SECTION 6 SEE SECTION 3 THE ADDITION OF AN ACCUMULATOR TANK MAY BE REQUIRED (1)WHERE CYCLE SPEED IS CRITICAL (2)IN MULTIPLE CYLINDER APPLICATIONS.
3. RAM PISTON DOES NOT FULLY RETURN OR RETURNS SLOWLY.	-INSUFFICIENT LUBRICATION IN AIR CYLINDER. -BLOCKED QUICK EXHAUST. -MAY ALSO BE CAUSED BY SEAL (18) FAILURE DETECTED BY REMOVING OIL FILLER SCREWS (11) TO RELEASE AIR PRESSURE IN OIL RESERVOIR (INFREQUENT).	-INCREASE LUBRICATING RATE ON FILTER, REGULATOR, LUBRICATOR UNIT. -CHECK QUICK EXHAUST, PORT SIZES AND EFFICIENCY. -REPLACE SEAL KIT.
4 OIL LEAKAGE FROM AIR CYLINDER VENT HOLE WITH NO CHANGE IN OIL RESERVOIR LEVEL.	-EXCESSIVE AIR CYLINDER LUBRICATION.	-ADJUST AIR LUBRICATOR (ON FRL) TO CORRECT RATE
5.OIL LEAKAGE FROM AIR CYLINDER WITH VISIBLE CHANGE IN OIL RESERVOIR LEVEL	(A) WORN PISTON ROD SEALS(18) AND (39). (B) SCORED PISTON ROD (LESS FREQUENT).	(A) REPLACE SEAL KIT. (B) REPLACE PISTON ROD AND SEAL KIT. CHECK CLEARANCE BETWEEN PISTON ROD AND MEEHANITE BEARING
6.OIL LEAKAGE BETWEEN RAM PISTON AND STRIKER CAP.	(A) DISPERSAL OF PISTON ROD LUBRICATION GREASE. (B) SEAL (47) FAILURE.	(A) NO MAINTENANCE REQUIRED AS GREASE IS NECESSARY FOR CYLINDER LUBRICATION. (B) REPLACE SEAL KIT.
7.RAM PISTON BOUNCES BACK AT END OF STROKE.	EXCESSIVE AIR CYLINDER CYCLE SPEED.	ADD FLOW CONTROL VALVE IN ORDER TO BALANCE AIR CYLINDER SPEED WITH OIL FLOW RATE, OR CYCLE UNDER PRE-LOADED WORKING CONDITIONS.
8.RAM PISTON PRODUCES SHORTER OVERALL STROKE LENGTH.	LOW PRESSURE ADVANCE FORCE EXCEEDED, CYLINDER CHANGING INTO HIGH PRESSURE TOO SOON.	REDUCE RETURN SPRING PRESSURE IN TOOLING. MINIMUM ADVANCE FORCE OF 400LB. F (.18KN)AT 100 PSI (7 BAR) IN LOW PRESSURE STROKE
9. BROKEN ROLL-PIN (33) IN STRIKER CAP.	EXCESSIVE SIDE LOAD UPON RAM PISTON. NOTE THIS SAFETY FEATURE OF THE SPHERICAL PIVOT POINT ON RAM PISTON IS DESIGNED TO ALLOW MAXIMUM OF 3/4° OUT OF PARALLEL TOOL ACTION BEFORE SHEARING.	REPLACE ROLL-PIN(33) WITH SPRING-LOADED RAM PISTON IN ACTUATED DOWN POSITION.

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Section 17: Multicyl Spec Chart

MODEL #.	MAX TONNAGE	STROKE (INCHES) OVERALL/POWER		CYCLE / MIN.	AIR CONSUMPTION Cu.Ft./Stroke
MC 12-5-4	6	5/8	1/8	60	.085 @ 100 PSI
MC 15-5-9	7 1/2	5/8	9/32	45	.188 @ 100 PSI
MC 5-16-20	2 1/2	2	5/8	30	.188 @ 100 PSI
MC 12-16-7	6	2	7/32	30	.188 @ 100 PSI
XL 25-5-9	12 1/2	5/8	9/32	30	.310 @ 100 PSI
XL 5-12-48	2 1/2	1 1/2	1 1/2	45	.310 @ 100 PSI
XL 15-16-16	7 1/2	2	3/8	30	.310 @ 100 PSI
XL 20-16-7	10	2	7/32	30	.310 @ 100 PSI
DX 25-28-16	12 1/2	3 1/4	1/2	30	1.50 @ 100 PSI
DX 12-14-48	6	2 1/4	1 1/2	30	1.50 @ 100 PSI
DX 12-32-32	6	4	1	30	1.50 @ 100 PSI

Appendix

TONNAGE: ROUND HOLES IN MILD STEEL								
Hole Dia.	20 GA	18 GA	16 GA	14 GA	12 GA	11 GA	10 GA	3/16 .187
1/8"	.35	.47	.59	.74	1.0	1.2	-	-
1/4"	.71	.94	1.2	1.5	2.1	2.4	2.7	3.7
3/8"	1.1	1.4	1.8	2.2	3.1	3.5	4.0	5.5
1/2"	1.4	1.9	2.4	2.9	4.1	4.7	5.3	7.4
5/8"	1.8	2.4	2.9	3.7	5.2	5.9	6.6	9.2
3/4"	2.1	2.8	3.5	4.4	6.2	7.1	8.0	11.1
7/8"	2.5	3.3	4.1	5.2	7.2	8.3	9.3	12.9
1"	2.8	3.8	4.7	5.9	8.3	9.4	10.6	14.8

This chart is for 50,000 PSI tensile strength mild steel, use the following multipliers for other materials:

- Aluminum x .60
- Stainless Steel x 1.60

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REDUCED TONNAGE DUE TO PUNCH SHEAR					
Shear Depth	Up to 16 GA	14 GA	12 GA	10 GA	3/16
1/16	.50	.60	.75	.80	.87
3/32	.50	.50	.60	.70	.80
3/16	.50	.50	.50	.50	.5

This chart illustrates the effect of shear in punching applications. Multiply the tonnage requirement by the appropriate factor to determine the new tonnage.

Eg: A 3/4 dia hole in 16 ga mild steel requires 4.4 tons. However, if 1/16 shear is put on the punch tip, it would only take 2.2 tons ($4.4 \times .50$). Furthermore, if the material was aluminum instead of mild steel, it would only take 1.32 tons ($2.2 \times .60$).

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