



# OPERATORS MANUAL

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It is the policy of Hydraulic Machines ,Inc. to improve its products whenever it is possible and practicle to do so. We reserve the right to make changes or add improvements at any time without incurring any obligation to make such changes on products sold previously.

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Machine Serial No. \_\_\_\_\_

Machine Model No. \_\_\_\_\_

Date Purchased \_\_\_\_\_ 19 \_\_\_\_\_

Purchased From \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

## SPECIFICATIONS

MODEL	SEP 4214.
CAPACITY -TONS	42
HEIGHT OF THROAT	14"
LENGTH OF STROKE	11"
MOTOR BALDOR	10 H.P.
OPERATING PRESSURE	3,000 P.S.I.
PRESS BED AREA	17.5" X 34"
PRESS HOLE	2.5" X 10.5"
COLOR	GREEN

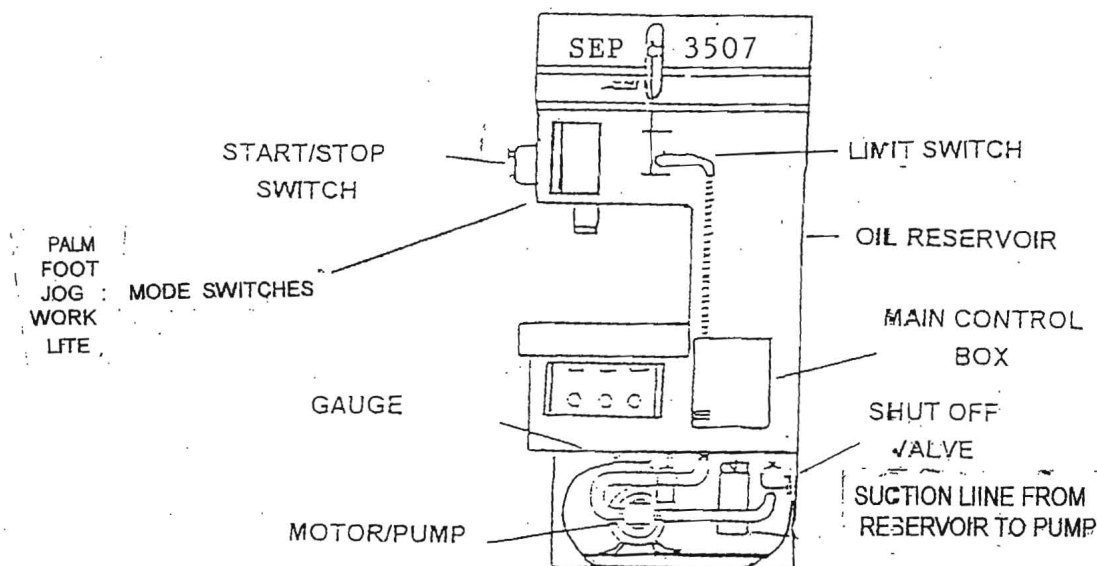
THROAT DEPTH IS MEASURED FROM THE CENTER  
LINE OF PRESS SHAFT TO REAR OF THROAT.

ALL SPECIFICATIONS SUBJECT TO CHANGE  
WITHOUT NOTICE.

The purpose of this manual is to assist you in realizing the benefits you anticipated when you purchased this HMI product. Many people have contributed to the design and production of this product and its delivery to you. They have an interest in its successful performance and have provided this manual to give you the benefit of the experience they have realized through years of field testing and normal usage of this and similar products. The way you use and the care you give this press will have much to do with its successful operation. This manual has been diligently prepared and carefully arranged to enable you to quickly find the information you desire. Before operating read this manual. It can help you you have an enjoyable and profitable experience with your HMI press.

## SAFETY

As are all manufacturers and even more particularly those building machine tools, we have paramount concern for the operators safety and those who may be adjacent to him. We feel the first step to safe operation is to know the press and where the controls are. To this end we have included the following drawing.



### MOTOR SWITCH

The motor switch will be located either on the secondary control box on the front of the press or on top of the main control box on the left press side. The legend plate on the switch reads "PULL TO START-PUSH TO STOP" A light is contained in the switch and will be lit when the motor is on.

### MOTOR AND CONTROL VOLTAGE

Motor phase and voltage is indicated by legend decals on the front of the main control box. A step-down transformer in the control box provides 120 VAC current to the controls and starter coil. Should it be desired to change motor voltage the transformer input wires must be changed as well as the motor lead wires. The front of the transformer shows the wiring it requires for 208/220VAC or 440 VAC. The motor name plate shows the wiring required for 208/230/460 VAC.

### ELECTRICAL HOOK UP

should be made in accordance with national and local electrical codes. Should you be wiring our unit a chart in the electrical section shows the proper wire size to use for the amperage and voltage involved. Too small a wire can cause motor failure and erratic operation on the starter. Be certain-not sorry. Read electrical section prior to making electrical hook up.

**AFTER STARTING** immediately check pump rotation. Rotation must be clockwise when viewing shaft end of pump. To best view rotation through pump mounting bracket, remove skirt around pump and motor. This only involves two bolts. Pull skirt forward. The pump is marked with an arrow for correct rotation. Just "JOG" motor with switch and check rotation. If rotation is wrong, change wires on L1 and L2 starter terminals for 3 phase.

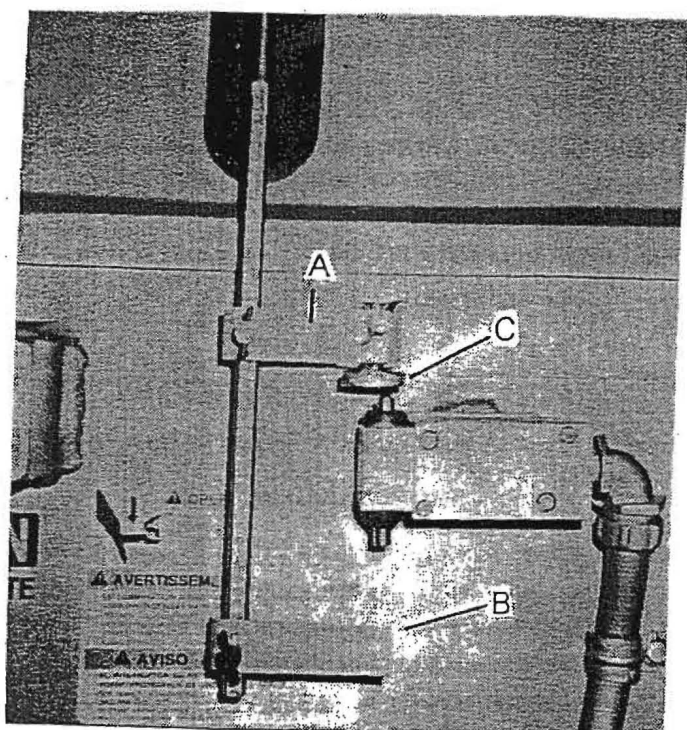


Fig. 4

### LIMIT SWITCH OPERATIONS

The limit switch controls the travel of the press shaft. See Fig. 4. The position of the two trip tabs "A" & "B" control this movement. Setting tab "A" controls the "down" movement. Tab "B" controls the "up" movement.

Raising tab "A" allows the press shaft to travel further down; lowering tab "A" stops the press shaft at a higher position.

In a punching operation, adjust tab "A" so punch slug is just pushed into the die completely. Adjust tab "B" so punch is withdrawn from material just sufficiently to move stock under punch. At this point it should be mentioned that the stripper should be adjusted to a low position where material will just easily pass under it.

"C" is an elevating screw to provide a fine adjustment. One revolution of it will change elevation .050". Its total travel is in excess of the .250" hole spacings in the trip rod.

The adjustment rod for the trip tabs is ultimately mounted to the press cylinder guide shaft which in turn is mounted to its clamping bar.

When making any major adjustments to the trip tabs, make certain that the clamp bar in its travel, does not interfere with press or any other parts. Any interference could cause the clamp bar to slide on the press shaft, cutting oil seals and cause replacement of the shaft, seals and cylinder head.

### GUARDING PRESS AREA

The press area and tooling must be equipped with guarding as prescribed by OSHA. As a manufacturer, it is impossible for HMI to provide adequate guarding to provide protection for every conceivable application users will find. As a manufacturer HMI assumes no responsibility for guarding the press area. This is solely a responsibility of the user and their employees.

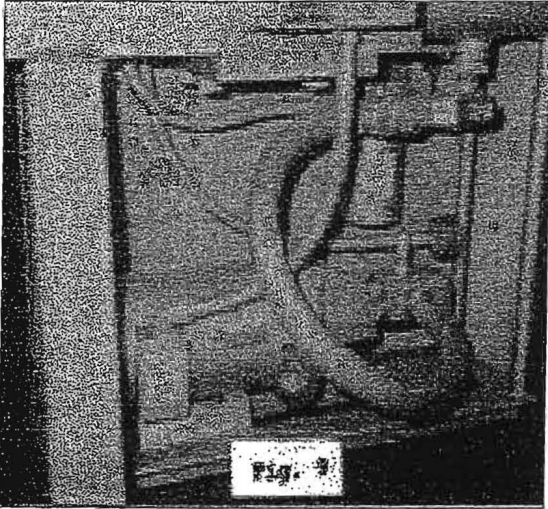
### FOOT SWITCH OPERATION

When the foot switch is depressed, and initiating a new cycle, trip "A" travels down and depresses the top plunger, as shown in Fig. 4. The ram then reverses direction with finger "B" depressing the lower plunger on the limit switch. Ram travel then stops. Ram will not initiate a new cycle until the foot switch is released and again depressed. Any time the foot switch is released during a cycle the ram will stop, when the foot is again depressed the ram will continue through the cycle. Foot switch can be tapped quickly to "jog" a punch or tooling down for "spotting" or alignment.

### REVERSING STROKE

At times it is desirable to reverse the stroke before the down cycle is completed. This can be accomplished by pushing the upper limit switch plunger down. The ram will travel up until finger "B" pushes up the lower plunger. Use a suitable object to depress the plunger. A finger is not considered a suitable object.

The hydraulic pump is a 9 gallon per minute variable volume pressure compensated type pump powered by a 3 H.P. 1725 R.P.M. Baldor motor.



The hydraulic system has three ball shut off valves. One in the suction line, one in the return line and one in the drain port. When changing the filter or servicing the pump the suction line and return line valves should be closed. Before restarting the motor valves MUST be opened or pump may be ruined by lack of oil.

An oil filter is provided in the return line. This cleans foreign material from the hydraulic system. The filter element is a 10 micron unit. A 10 micron particle is equal in size to a speck of talcum powder or .0004 of an inch. The filter head has a by pass valve in it. Should the filter become plugged, oil will by pass to prevent ruining the pump.

A 65 mesh tank mounted strainer is located in the oil reservoir at the suction line. When oil is changed the strainer should be removed and cleaned.

At the end of the first 500 hours of operation (twelve 40 hour weeks = 480 hours) it is recommended the filter be changed. While every effort is made to keep the hydraulic system clean before shipment, particles from welding slivers apt to escape and get into the system. The filter should be changed every 12 months or oftener depending on usage and amount of out-

side foreign material that has been allowed to enter the system.

Hydraulic oil for the system should be a good hydraulic oil having anti-rust and anti-foam inhibitors. Generally any hydraulic oil used in industrial systems or farm equipment is suitable. A 10 W non-detergent engine oil is satisfactory. The proper oil is an AW32 hydraulic oil

#### DRAINING RESERVOIR

Drain port is closed off with a 3/4" ball valve. The outlet port is plugged with a 3/4" NPT pipe plug. The plug prevents oil loss, should the valve be mistakenly or other wise opened. The ball valve is closed when the valve handle is 90 degrees to the valve body, open when handle is inline with valve body.

As a suggestion for draining, obtain a straight fitting that has a 3/4" male pipe thread one end with garden hose male fitting other end. A 6' to 8' length of garden hose can then be used to drain oil into a container.

If it is desirable to pump the oil out, a small inexpensive pump to be powered with an electric drill can usually be obtained form hardware stores.

Should oil be reused drain into a clean container. If oil is to be discarded make certain it goes to a registered recycling center.

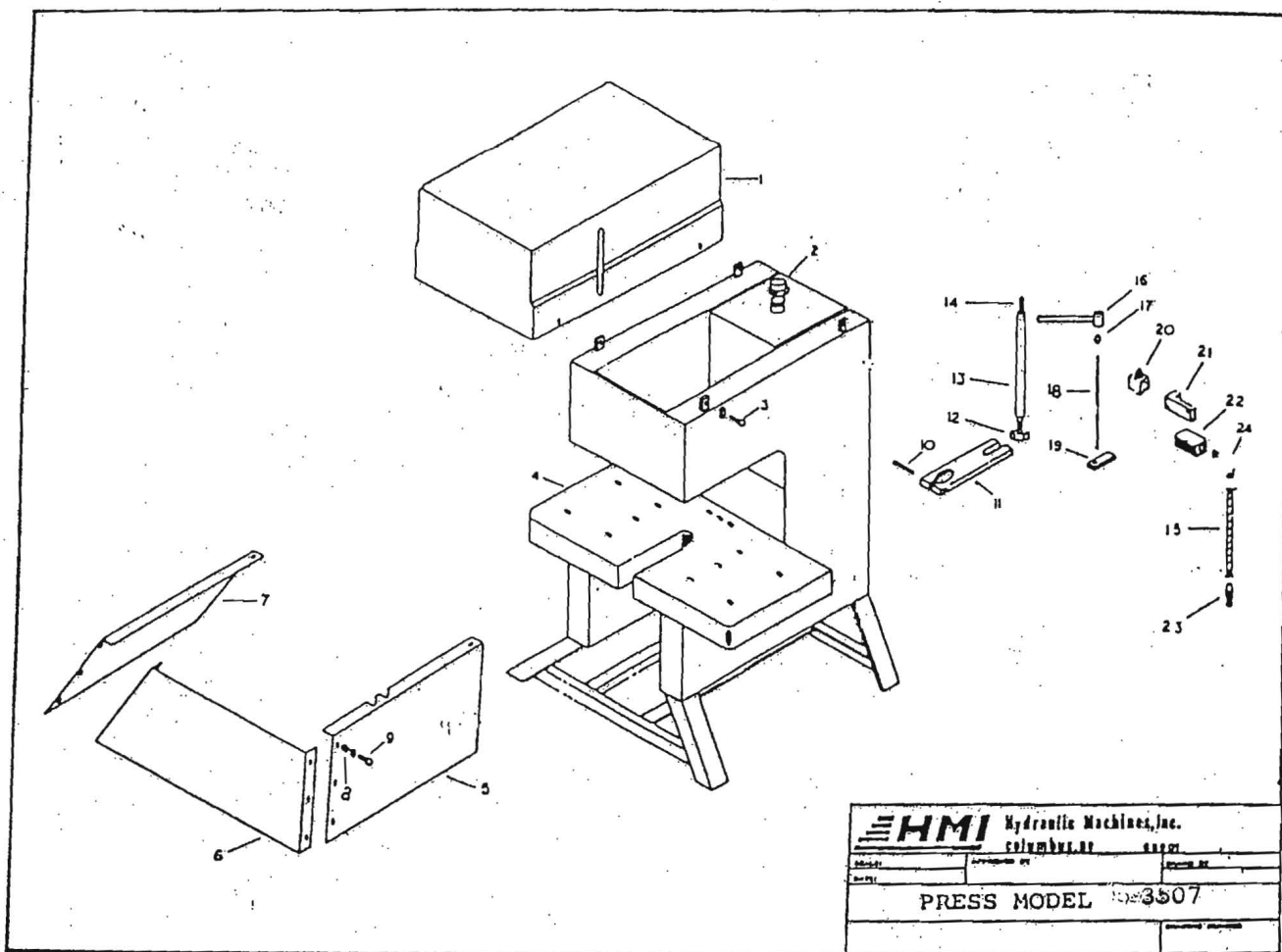
#### CHANGING HYDRAULIC OIL

All hydraulic oil has a definite, useful life span, and when it has deteriorated to near the danger point, it should be discarded.

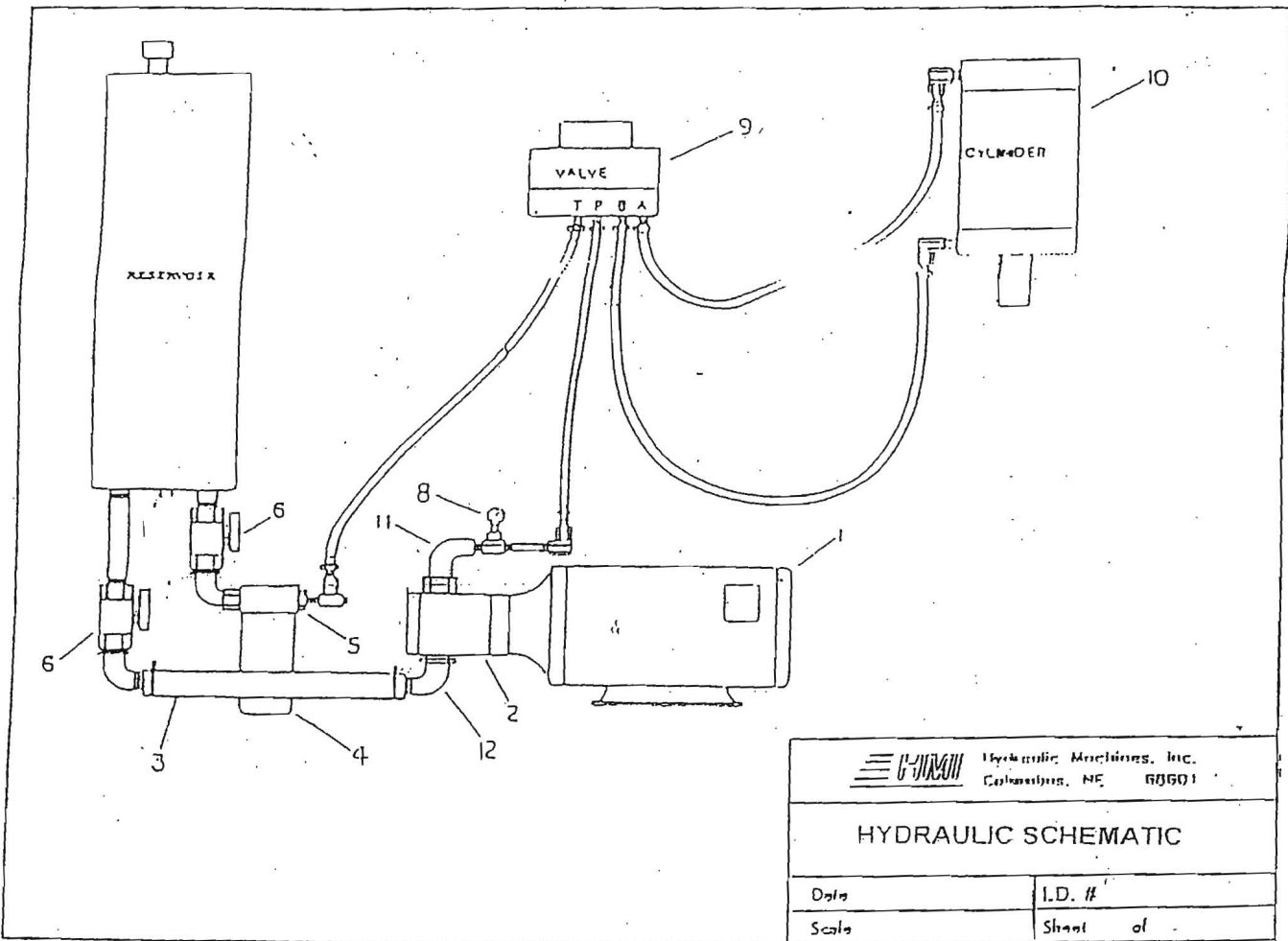
An oil temperature from 120 to 130 degree F., is ideal for a hydraulic system. At 120 degree F., it is uncomfortable to leave your hand on the tank for more than a few seconds.

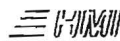
Make a visual inspection of your oil once in awhile. Compare the color and body with an unused sample of the same oil. A slight darkening is usually not serious, but a deep, dark color or a noticeable thickening may indicate a serious deterioration. Feel a smudge of oil between your fingers to detect small pieces of grit.

Discard the used oil if there is any doubt about its purity of cleanliness.



REF. NO.	PART NO.	DESCRIPTION	NO. REQ'D	REF. NO.	PART NO.	DESCRIPTION	NO. REQ'D
1.	10314M	Press hood	1	12.	10057F	3/4"-10 hex nut	1
2.	10027H	Oil reservoir cap	1	13.	10320H	Guide shaft	1
3.	1005F	1/4"-20x1/4" cap screw	4	14.	10002F	1/2"-13 set screw	1
4.	10315M	Press platen	1	15.	10297E	1/2" flex conduit	1
5.	10316M	Right panel, motor/pump shield	1	16.	10298M	Trip rod arm	1
6.	10317M	Center panel, motor/pump shield	1	17.	10076F	1/2"-13 hex nut	6
7.	10318M	Left panel, motor/pump shield	1	18.	10299F	1/2"-13 trip rod	1
	10319M	Shield ass. complete	1	19.	10300M	Trip bar	2
8.	10053F	1/4"-20 hex nut	6	20.	10301E	Limit switch head	1
9.	10055F	1/4"-20 cap screw	6	21.	10302E	Limit switch body	1
10.	10058F	1/4"-13x3/4" cap screw	1	22.	10303E	Limit switch receptacle	1
11.	10060M	Clamp bar, guide shaft	1	23.	10304E	1/2" straight conduit fitting	1
				24.	10305E	1/2" 90 conduit fitting	1

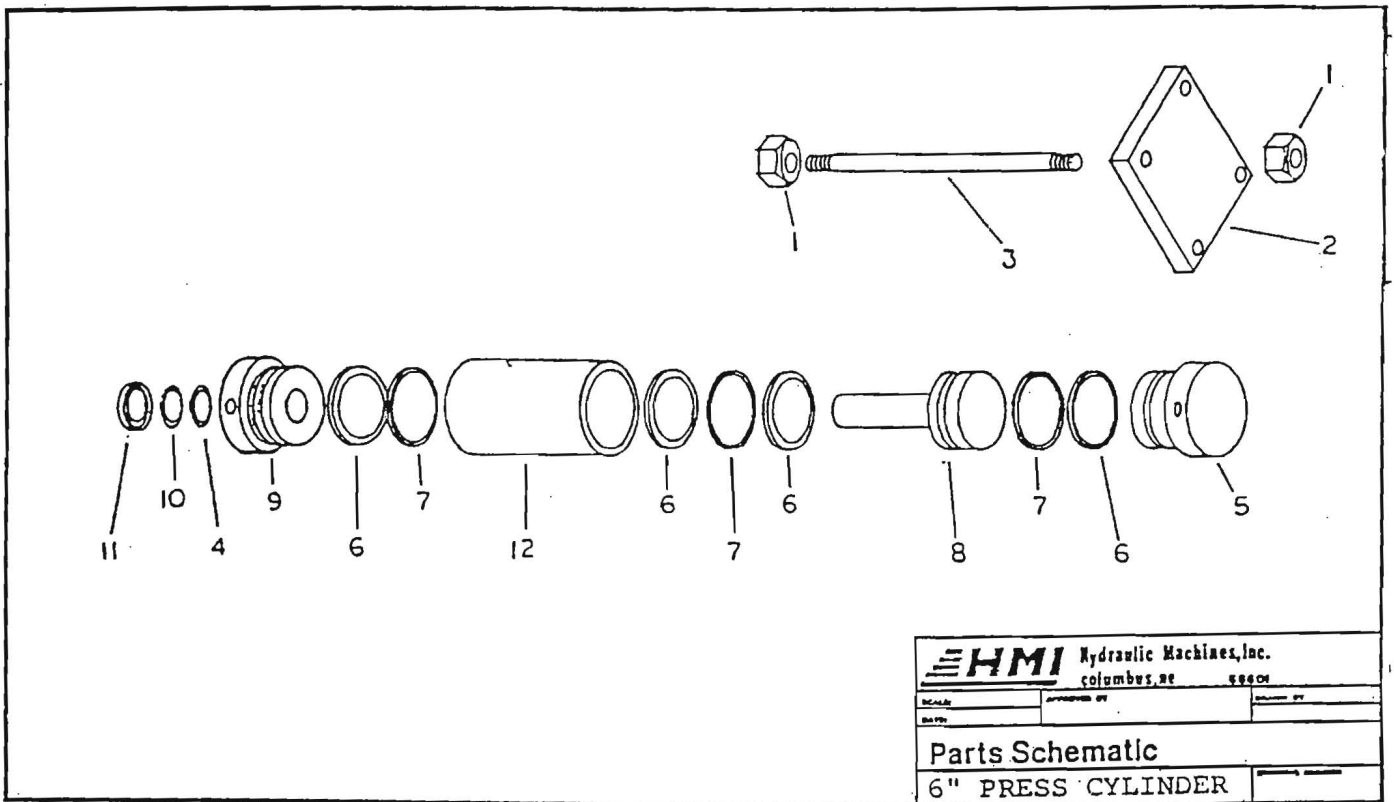


 Hydraulic Machines, Inc. Columbus, NE 68601	
<b>HYDRAULIC SCHEMATIC</b>	
Date	I.D. #
Scale	Sheet of

### HYDRAULIC SCHEMATIC

REF.#	PART #	DESCRIPTION	# REQ'D
1.	10232F	3 H.P. 3 PHASE "C" MOTOR	1
2.	10336H	HYDRAULIC PUMP	1
3.	10200H	SUCTION LINE	1
4.	10337H	10 MICRON FILTER ELEMENT	1
5.	10203H	FILTER HEAD	1
6.	10102H	1 - 1/4" SHUT OFF VALVE	2
8.	10128H	PRESSURE GAUGE	1
9.	10275H	DIRECTIONAL CONTROL VALVE	1
10.	10328C	PRESS CYLINDER	1
11.	1-287H	PUMP DISCHARGE FITTING	1





<b>HMI</b> Hydraulic Machines, Inc.		88004
columbus, ne		
SCALE:	APPROVED BY:	DATE:
<b>Parts Schematic</b>		
6" PRESS CYLINDER		

## 6" PRESS CYLINDER PARTS

REF. NO.	PARTS NO.	DESCRIPTION	NO. REQ'D.
1.	10067F	7/8"-9 hex nut	8
2.	10144C	Top tie plate	1
3.	10145F	Tie stud bolt	4
4.	10135C	"O" ring shaft seal	1
5.	10141C	Plug	1
6.	10137C	Back up ring, piston, head, plug	4
7.	10138C	"O" ring, piston, head, plug	3
8.	10146C	Piston and shaft assembly	1
9.	10136C	Cylinder head	1
10.	10135C	"O" ring, shaft seal	1
11.	10133C	Wiper seal, shaft	1
12.	10139C	Cylinder barrel	1
13.	10069C	Cylinder assembly	1
14.	10143C	Seal kit, all seals	1

## MOTOR HOOK UP

Before wiring motor make certain power is shut off

### SINGLE PHASE

In the event your unit is supplied with a single phase motor the rotation for the pump will be correct.

Inbound power will connect to contactor terminals L1 & L2. The starter is an IEC type which requires all 3 heaters in the overload relay to be energized. In single phase a "jumper" wire is used from T2 to L3. The motor is wired to T1 & T3. This is factory wired. See diagram on this page.

### THREE PHASE 208-230/440/460/480

Wiring the motor for 208 or 230 volts is identical. 208 volts will draw slightly more amps than 230 volts. The control box contains a step down transformer to give 115 volt power to the controls and starter coil. All three phase voltages are wired to starter terminals L1, L2 & L3. Some 230 volt 3 phase systems may have one leg with up to 195 volts, This is often referred to as a "wild leg". Usually this is wired to L3. Check you lines for voltage. Do not have the transformer wired to the "wild leg". The transformer could be damaged.

### TRANSFORMER

The transformer is sized for the requirements of the unit. Do not use the transformer for trouble lights, drills or other tools. This overload will burn up the transformer.

### ELECTRIC VALVE CLATTER

This may occur if your electrical system is 208 volts & being used with a 230 volt transformer. The transformer may not always provide enough voltage to shift the spool. CHECK LINE VOLTAGE!! If on 208 volts install 208 volt transformer !!!!!

SINGLE PHASE MOTOR STARTERS	3 H.P.		5 H.P.		10 H.P.
	VOLTAGE		VOLTAGE		
FULL LOAD CURRENT	115	230	115	230	230
MAXIMUM FUSE AMPS STD. N.E.C.	34	17	56	28	54
DUAL ELEMENT	50	25	90	45	100
MINIMUM WIRE SIZE T, TW	6	10	4	8	4
MAXIMUM 3 WIRES CONDUIT SIZE, INCHES	3/4(4)	1/2	1	3/4(4)	1

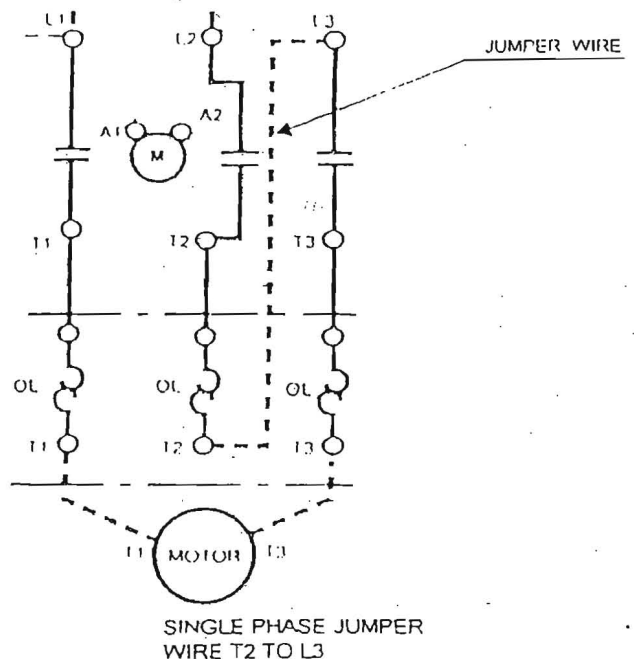
3-PHASE STARTERS	3		5		7.5		10		15		20		25	
MOTOR H.P. 3 PHASE	3		5		7.5		10		15		20		25	
VOLTAGE	115	230	230	460	230	460	230	460	230	460	230	460	230	460
FULL LOAD CURRENT	9.6	4.8	15.2	7.6	22	11	28	14	42	21	54	27	68	34
FUSES-AMPS STD. NEC	25	15	45	20	60	30	80	40	125	60	150	80	200	100
DUAL ELEMENT	15	6	25	10	35	15	45	25	70	35	90	45	100	50
CIRCUIT BREAKER MAX. AMPS.	25	15	40	20	60	30	70	40	110	60	150	70	175	90
MIN. WIRE SIZES (R, RW, T, TW, RH)	14	14	12	14	10	14	8	12	6(3)	10	6	8	4	8
MINIMUM 3 WIRES, CONDUIT SIZES	1/2	1/2	1/2	1/2	1/2	1/2	3/4(4)	1/2	1(5)	1/2	1(5)	1/2	1	3/4(4)

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CHANGING MOTOR VOLTAGE ON 3 PHASE IEC starters are matched to motor size, voltage and amperage load. A change of voltage will require other changes. Going from 208-230 volts to 440/460/480 can use the same contactor but will require a lower rated overload relay to give the motor overload protection.

When changing from 440/460/480 voltage to 208/230 voltage both contactor and overload relay must be replaced as the lower voltage doubles the amperage.

### REMOVING CONTACTOR, DISCONNECT POWER

The contactor snaps on to a "DIN" rail. There are no screws holding the contactor on. Loosen screws at L1, L2, and L3 at bottom of contactor. Tip relay down. At bottom of contactor a slot will be visible. Insert a flat blade screwdriver in this slot, pull down on the slot and this should release the contactor from the "DIN" rail. You may wish to remove most wires going to it and the relay before removing the contactor. Before reassembly it will be best to refasten wires to terminals L1 & A2. Reinstall relay to contactor prior to putting contactor on din rail. To reinstall contactor, get it hooked to upper edge of rail, pull down and push contactor against lower part of rail.



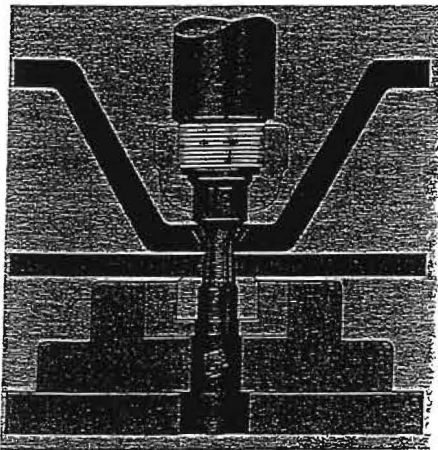
Additional notes or references at the bottom of the page.

### CLEARANCE CHART FOR STEEL

Gauge	Approx. Thickness	Clearance Add to Punch Size	Gauge	Approx. Thickness	Clearance Add to Punch Size
30	.0120	Slip fit	17	.0538	.005
29	.0135	Slip fit	16	.0598	.005
28	.0149	Slip fit	15	.0673	.007
27	.0164	Slip fit	14	.0747	.007
26	.0179	Slip fit	13	.0897	.010
25	.0209	.002	12	.1046	.010
24	.0239	.002	11	.1196	.010
23	.0269	.002	10	.1345	1/4
22	.0299	.003	9	.1494	1/4
21	.0329	.003	8	.1644	1/4
20	.0359	.003	7	.1793	1/4
19	.0418	.003	1/4 to 1/2" plate	—	1/2
18	.0478	.005	1/2" plate and over	—	1/6

Note: Stainless steel and non-ferrous materials require one-half the above clearances.

### TONS OF PRESSURE REQUIRED FOR PUNCHING MILD STEEL



This table shows the tons of pressure required for single punching mild steel derived by the formula: Tons of pressure required = hole size x material thickness x constant 80. All figures shown are tons or percentages of tons. For intermediate sizes interpolations can be made.

By use of the table, the tons of pressure required for multiple punching can also be figured.

Example: Can eight holes 1/4" round and two holes 1/2" round be punched in 16 gauge material on a 10 ton press? Yes.  
 Tons pressure required for one hole 1/4" round in 16 ga. = .60 tons  
 Tons pressure required for one hole 1/2" round in 16 ga. = .90 tons  
 8 holes x .60 tons = 4.80 tons  
 2 holes x .90 tons = 1.80 tons  
 Total = 6.60 tons

Tons of pressure for punch sizes over 1" round can also be computed.

Example: What pressure is required to punch a 2 1/4" round hole in 1/4" thick material? Since a 1" round hole in 1/4" thick material requires 70 tons pressure, a 2 1/4" round hole in 1/4" thick material requires 157.50 tons.

2.25 round hole x 70 tons = 157.50.

Stock Thickness	PUNCH SIZE															
	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	1"
26 ga. .0179	.18	.27	.36	.45	.54	.63	.72	.81	.90	.99	1.07	1.16	1.25	1.34	1.43	
24 ga. .0239	.24	.36	.48	.60	.72	.84	.96	1.08	1.20	1.31	1.43	1.55	1.67	1.89	1.91	
22 ga. .0299	.30	.45	.60	.75	.90	1.05	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.24	2.39	
20 ga. .0359	.36	.54	.72	.90	1.08	1.26	1.44	1.62	1.80	1.98	2.15	2.33	2.51	2.69	2.87	
18 ga. .0478	.48	.72	.96	1.20	1.43	1.67	1.91	2.15	2.39	2.63	2.87	3.11	3.34	3.58	3.82	
16 ga. .0598	.60	.90	1.20	1.50	1.79	2.09	2.39	2.69	2.99	3.29	3.59	3.89	4.19	4.49	4.78	
14 ga. .0747	.75	1.12	1.49	1.87	2.24	2.61	2.99	3.36	3.73	4.11	4.48	4.86	5.23	5.60	5.97	
12 ga. .1046	1.05	1.57	2.09	2.62	3.14	3.66	4.18	4.71	5.23	5.75	6.28	6.80	7.32	7.85	8.57	
10 ga. .1345		2.02	2.69	3.36	4.04	4.71	5.38	6.05	6.73	7.40	8.07	8.74	9.42	10.09	10.76	
3/16	.187		2.81	3.74	4.68	5.61	6.55	7.48	8.42	9.35	10.29	11.22	12.16	13.09	14.03	14.96
1/4	.250			5.00	6.25	7.50	8.75	10.00	11.25	12.50	13.75	15.00	16.25	17.50	18.75	20.00
3/8	.375				11.25	13.13	15.00	16.88	18.75	20.63	22.50	24.38	26.25	28.13	30.00	
1/2	.500					20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50	40.00		
5/8	.625							31.25	34.38	37.50	40.63	43.75	46.88	50.00		
3/4	.750								45.00	48.75	52.50	56.25	60.00			
7/8	.875										61.25	65.63	70.00			
1"	1.000															80.00

PRESSURES ABOVE ARE REDUCED BY SHEAR ON PUNCH END OR STAGGERING PUNCHES

**MOTOR TROUBLE SHOOTING CHART**  
 SINCE ANY NUMBER OF REASONS COULD BE RESPONSIBLE FOR FAILURE, THE FOLLOWING CHART LIST USUAL CONDITIONS THAT CAN LEAD TO DIFFICULTIES WITH A MOTOR. SHOULD THERE BE ANY INDICATION OF A PREMATURE FAILURE, CARE MUST BE TAKEN TO MAKE CERTIAN THAT:

1. THE ORIGINAL MOTOR SELECTION WAS THE PROPER ONE.
2. THE MOTOR WAS INSTALLED CORRECTLY, PARTICULARY THE ELECTRICAL CONNECTIONS.
3. THE POWER SUPPLY WAS CORRECT.
4. THE MOTOR WAS OF THE PRGPER SIZE (SPEED AND HORSE POWER) TO DO THE JOB.

ASSUMING ALL OF THE ABOVE CONDITIONS HAVE BEEN COMPLETE SATISFACTION.

TROUBLE	CAUSE	WHAT TO DO
MOTOR FAILS TO START	BLOWN FUSES	REPLACE FUSES AT LEAST 125% NAMEPLATE AMPERES.
	OVERLOAD TRIPS	CHECK AND RESET OVERLOAD
	IMPROPER CURRENT SUPPLY.	IN STARTER. CHECK TO SEE THAT POWER SUPPLIED AGREES WITH MOTOR NAME PLATE AND LOAD FACTOR.
	OPEN CIRCUIT IN WINDING OR STARTING SWITCH	INDICATED BY HUMMING SOUND WHEN SWITCH IS CLOSED. CHECK FOR LOOSE WIRING CONNECTIONS; ALSO SEE IF STARTING SWITCH INSIDE MOTOR IS CLOSED.
	MECHANICAL FAILURE	CHECK TO SEE IF MOTOR AND DRIVE TURN FREELY. CHECK BEARINGS AND LUBRICATION.
	SHORT CIRCUITED STATOR	INDICATED BY BLOWN FUSES. MOTOR MUST BE REWOUND.
	POOR STATOR COIL CONNECTION	REMOVE END BELLS, LOCATE WITH TEST LAMP.
	ROTOR DEFECTIVE MOTOR MAY BE OVER-LOADED	LOOK FOR BROKEN BARS OR END RINGS. REDUCE LOAD.
	IF 3 PAHSE, ONE PHASE MAY BE OPEN.	CHECK LINES FOR OPEN PHASE
	DEFECTIVE CAPACITOR	CHECK FOR SHORT CIRCUIT, GROUNDED OR OPEN CAPACITOR, OR CONNECTION, REPLACE IF NECESSARY.
MOTOR VIBRATES AFTER CORRECTIONS HAVE BEEN MADE CONT'D.	POLYPHASE MOTOR RUNNING SINGLE PHASE	CHECK FOR OPEN CIRCUIT.
	EXCESSIVE AND PLAY	ADJUST BEARING OR ADD WASHER.
UNBALANCED LINE CURRENT ON POLYPHASE MOTORS DURING NORMAL OPERATION	UNEQUAL TERMINAL VOLTS	CHECK LEADS AND CONNECTIONS.
	SINGLE PHASE OPERATION	CHECK FOR OPEN CONTACTS.
SCRAPING NOISE	FAN RUBBING AIR SHIELD	REMOVE INTERFERENCE.
	FAN STRIKING INSULATION	CLEAR FAN.
NOISY OPERATION	LOOSE ON BED PLATE	TIGHTEN HOLIDING BOLTS.
	AIRGAP NOT UNIFORM	CHECK AND CORRECT BRACKET FITS OR BEARING.
	ROTOR UNBALANCE	REBALANCE.
HOT BEARINGS GENERAL	BENT OR SPRUNG SHAFT	STRAIGHTEN OR REPLACE SHAFT.
	EXCESSIVE BELT PULL	DECREASE BELT TENSION.
	PULLEYS TOO FAR AWAY	MOVE PULLEY CLOSER TO MOTOR BEARING.
	PULLEY DIAMETER TOO SMALL	USE LARGER PULLEYS.
HOT BEARINGS SLEEVE	MISALIGNMENT	CORRECT BY ALIGNMENT OF DRIVE.
	OIL WINDOW IN BEARING OBSTRUCTED BY DIRT.	REMOVE BRACKET WITH BEARING AND CLEAN BEARING HOUSING & OIL WINDOW GROOVES; RENEW OIL.
	OIL TOO HEAVY	USE RECOMMENDED LIGHTER OIL
HOT BEARINGS SLEEVE CONT'D.	OIL TOO LIGHT	USE RECOMMENDED HEAVIER OIL
	TOO MUCH END THRUST	REDUCE THRUST INDUCED BY DRIVE, OR SUPPLY EXTERNAL MEANS TO CARRY THRUST.
	BADLY WORN BEARING	REPLACE BEARING.
HOT BEARING BALL	INSUFFICIENT GREASE	MAINTAIN PROPER QUANTITY OF GREASE IN BEARING
	DETERIORATION OF GREASE OR LUBRICANT CONTANIMATED	REMOVE OLD GREASE, WASH BEARINGS THOROUGHLY IN KEROSENE AND REPLACE WITH NEW GREASE.
	EXCESS LUBRICANT	REDUCE QUANTITY OF GREASE, BEARING SHOULD NOT BE MORE THAN 1/2 FILLED.
	OVERLOADED BEARING	CHECK ALINGMENT, SIDE & END THRUST
	BROKEN BALL OR ROUGH RACES	REPLACE BEARING, FIRST CLEAN HOUSING THOROUGHLY.

TROUBLE	CAUSE	WHAT TO DO
MOTOR STALLS	WRONG APPLICATION	CHANGE TYPE OR SIZE, CONSULT MFG.
	OVERLOADED MOTOR	REDUCE LOAD.
	LOW MOTOR VOLTAGE	SEE THAT NAMEPLATE VOLTAGE IS MAINTAINED. CHECK CONNECTION
	OPEN CIRCUIT	FUSES BLOWN, CHECK OVERLOAD RELAY, STATOR AND PUSHBUTTONS.
MOTOR RUNS & THEN DIES DOWN	POWER FAILURE	CHECK FOR LOOSE CONNECTIONS TO LINE, TO FUSED SMD TO CONTROL.
MOTOR TAKES TOO LONG TO ACCELERATE	EXCESS LOADING	REDUCE LOAD.
	POOR CIRCUIT	CHECK FOR HIGH RESISTANCE.
	DEFECTIVE SQUIRREL CAGE ROTOR	REPLACE WITH NEW ROTOR.
	APPLIED VOLTAGE TOO LOW	GET POWER COMPANY TO INCREASE POWER TAP.
MOTOR OVERHEATS WHILE RUNNING UNDER LOAD.	OVERLOAD	REDUCE LOAD.
	FRAME OR BRACKET VENTS MAY BE CLOGGED WITH DIRT AND PREVENT PROPER VENTILATION OF MOTOR.	OPEN VENT HOLES AND CHECK FOR A CONTINUOUS STREAM OF AIR FROM THE MOTOR.
	MOTOR MAY HAVE ONE PHASE OPEN	CHECK TO MAKE SURE THAT ALL LEADS ARE WELL CONNECTED.
	GROUNDING COIL	LOCATE AND REPAIR.
	UNBALANCED TERMINAL VOLTAGE	CHECK TO MAKE SURE THAT ALL LEADS ARE WELL CONNECTED.
	SHORTED STATOR COIL	REPAIR AND THEN CHECK WATTMETER READING.
	FAULTY CONNECTION	INDICATED BY HIGH RESISTANCE.
	HIGH VOLTAGE. EXCEEDS -10% OF NAMEPLATE VOLTS.	CHECK TERMINALS OF MOTOR WITH A VOLTMETER.
	ROTOR RUBS STATOR BORE	IF NOT POOR MACHINING ON BRACKETS, REPLACE WORN BEARINGS.
MOTOR VIBRATES AFTER CORRECTIONS HAVE BEEN MADE	MOTOR MISALIGNED	REALIGN.
	WEAK SUPPORT	STRENGTHEN BASE
	COUPLING OUT OF BALANCE	BALANCE COUPLING.
	DRIVEN EQUIPMENT UNBALANCED	REBALANCE DRIVEN EQUIPMENT.
	DEFECTIVE BALL BEARING	REPLACE BEARING.
	BEARINGS NOT IN LINE	LINE UP PROPERLY.
	BALANCING WEIGHTS SHIFTED.	REBALANCE ROTOR.
MOTOR DOES NOT COME UP TO SPEED.	NOT APPLIED PROPERLY	CONSULT SUPPLIER FOR PROPER TYPE.
	VOLTAGE TOO LOW AT MOTOR TERMINALS BECAUSE OF LINE DROP.	USE HIGHER VOLTAGE ON TRANSFORMER TERMINALS OR REDUCE LOAD CHECK CONNECTIONS.
	STARTING LOAD TOO HIGH	CHECK LOAD MOTOR IS SUPPOSED TO CARRY AT START.
	BROKEN ROTOR BARS OR LOOSE ROTOR.	LOOK FOR CRACKS NEAR THE RINGS. A NEW ROTOR MAY BE REQUIRED AS REPAIRS ARE USUALLY TEMPORARY.
	OPEN PRIMARY CIRCUIT	LOCATE FAULT WITH TESTING DEVICE AND REPAIR.
WRONG ROTATION	WRONG SEQUENCE OF PHASES	REVERSE CONNECTIONS AT MOTOR OR AT SWITCH BOARD.

## TROUBLE SHOOTING FOR HYDRAULICS

CAUSES	REMEDIES
<b>A-PUMP UNUSUALLY NOISY OR CAVITATION</b>	
1. Low oil supply.	1. Fill oil to proper level.
2. Oil too heavy.	2. Change to proper weight oil.
3. Dirty oil filter.	3. Clean and replace filter element.
4. Restriction or partially clogged suction line.	4. Remove restriction in suction line.
5. Clogged suction or sump filter.	5. Clean out filter or replace element.
6. Air bubbles in intake oil.	6. Use non-foaming hydraulic oil.
7. Reservoir air vent plugged.	7. Air must be allowed to breathe into reservoir. Clean out or replace breather.
8. Air leaks at pump intake piping joint or at pump shaft packing or inlet pipe opening.	8. Test by pouring oil on joints while listening for change in sound or operation. Tighten joints.
9. Worn or broken parts.	9. Replace parts.
10. Pump head too loose or faulty head gasket.	10. Test by pouring oil over pump head, and tighten head carefully or replace gasket.

**B-PUMP TAKES TOO LONG TO RESPOND OR FAILS TO RESPOND**

1. Low oil supply	1. Fill oil to proper level.
2. Relief valve pressure set too low.	2. Reset to correct pressure setting using gauge.
3. Pump worn or damaged.	3. Inspect, repair, or replace pump.
4. Oil intake pipe or suction filter plugged.	4. Clean filter or clean out intake pipe.
5. Wrong direction of shaft rotation.	5. Must be reversed immediately to prevent seizure and breakage of parts due to lack of oil.
6. Dirt in pump.	6. Dismantle and clean pump.
7. Air leak in suction line, preventing priming.	7. Repair leaks.
8. Oil too heavy to pick up prime.	8. Use lighter oil.

**C-NO PRESSURE IN THE SYSTEM**

1. Pump not delivering oil.	1. Follow remedies given above.
2. Relief valve setting not high enough.	2. Increase pressure setting of relief valve.
3. Relief valve leaking.	3. Check valve seat for scoring mark and reseal.
4. Spring in relief valve broken.	4. Replace spring and readjust valve.
5. Free circulation of oil to tank being allowed through system.	5. Control valve may be in neutral, or return line open unintentionally.
6. Internal leakage in control valves or cylinders.	6. Repair and replace.

**D-EXCESSIVE WEAR ON PUMP**

1. Oil weight too light at working conditions.	1. Check for recommended oil weight.
2. Sustained high pressure above maximum pump rating.	2. Check relief valve maximum setting.
3. Sustained high speed at PRESSURE above maximum pump rating.	3. Check maximum recommended speed.
4. Air circulation causing chatter in system.	4. Remove air from system.

**E-BREAKAGE OF PARTS INSIDE PUMP HOUSING**

1. Excessive pressure above maximum pump rating.	1. Check relief valve maximum setting.
2. Seizure of parts due to lack of oil.	2. Check reservoir level, oil filter, rotation direction and restriction in suction line.
3. Excessive tightening of head screws.	3. Follow pump makers recommendations.

## F-EXCESSIVE HEATING OF OIL

- |  |   |
|--|---|
| 1. Foreign material lodged between the relief valve plunger and relief valve seat. | 1. Inspect and remove foreign material                                      |
| 2. Using very light weight oil in hot climate.                                     | 2. Drain and refill with proper weight oil.                                 |
| 3. Using too heavy oil.  | 3. Use recommended weight oil.  |
| 4. Dirty oil.  | 4. Drain, flush, and refill with clean oil, and install new filter element. |
| 5. Oil level too low.  | 5. Fill to proper oil level.  |
| 6. Relief valve pressure too high or too low.                                      | 6. Set relief valve at correct pressure.                                    |
| 7. Pump worn and oil slips by pump.  | 7. Replace or repair pump.  |
| 8. Leaking relief valve.   | 8. Replace or repair relief valve.  |
| 9. Relief valve does not operate.  | 9. Replace or repair relief valve.  |
| 10. Pump assembled too tightly which produces rubbing friction.                    | 10. Follow instruction for assembly.  |

## G-HEATING BECAUSE OF CONDITIONS IN SYSTEM

- |                                |  |
|--------------------------------|--|
| 1. Restricted lines or piping. | 1. Reroute lines to eliminate restriction. |
| 2. Internal leaks.             | 2. Locate leaks and repair.                |

## H-OIL FOAMING

- |   |   |
|---|---|
| 1. Air leaking into suction line from tank to pump. | 1. Tighten all connections.                                 |
| 2. Wrong kind of oil.                               | 2. Drain and refill with non-foaming type of hydraulic oil. |
| 3. Oil level too low.                               | 3. Fill to proper oil level.                                |

## I-CYLINDERS CREEP WHEN STOPPED IN INTERMEDIATE POSITION

- |  |   |
|--|---|
| 1. Internal leakage in cylinder or control valves. | 1. Replace piston packing or replace cylinder if walls are scored. Replace or repair valve. |
|--|---|

## J-TIMES OF OPERATION LONGER THAN SPECIFIED

- |  |   |
|--|---|
| 1. Worn pump.  | 1. Repair or replace pump.  |
| 2. Internal leak in cylinder or control valve.   | 2. Replace piston packing or replace cylinder if walls are scored. Replace or repair valve. |
| 3. Air in system.  | 3. Bleed the system and tighten joints.   |
| 4. If action is slow on starting up, then speeds up after oil heats up; oil is too heavy weight. If action slows down after oil heats up; oil is too light weight. | 4. Use oil weight recommended by manufacturer.  |

## K-EXTERNAL OIL LEAKAGE ON CYLINDERS

- |   |  |
|---|--|
| 1. Cylinder not securely fastened to frame. | 1. Tighten if possible or replace gasket if necessary. |
| 2. Packing gland leaking.                   | 2. Tighten or replace packing if necessary.            |

## L-ABNORMAL PACKING GLAND WEAR ON CYLINDERS

- |   |  |
|---|--|
| 1. Cylinder not securely fastened to frame. | 1. Tighten cylinder to frame, check this periodically. |
| 2. Burr on piston rod tears out packing.    | 2. Remove burr and replace packing.                    |



OPERATING INSTRUCTIONS & PARTS MANUAL  
**TWO STAGE, HI-LOW  
 EXTERNAL GEAR  
 HYDRAULIC PUMPS**  
 MODELS 4F663A AND 4F664A

FORM 5S3356A

**READ CAREFULLY BEFORE ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE OR MAINTAIN THE PRODUCT DESCRIBED. PROTECT YOURSELF AND OTHERS BY OBSERVING ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE! RETAIN INSTRUCTIONS FOR FUTURE REFERENCE.**

**Description**

JSB two stage, hi-low, external gear hydraulic pumps, Models 4F663A and 4F664A, are designed to be direct-driven by gas engines or electric motors. They are suited for use in log splitters and other applications, such as: hydraulic lifts, platform lifts, die tables, automatic hoists, trash compactors, bench presses, machine tool lube systems, filter systems, clamping devices, and transfer systems, etc. They are ideal for press-type applications requiring fast approach/retract speeds and slower peak actuator work speeds because of horsepower limitations or safety constraints.

**Unpacking**

Due to cast iron construction, very little damage can occur during transit. Do not remove the plastic shipping plugs from the ports until ready for installation. This will keep dirt or foreign material from entering the system. Check carton for the following loose components: (1) 4-bolt mounting gasket, (4) 5/16-18" UNC x 3/4" mounting bolts with lockwashers, and (1) drive key should be taped to the pump drive shaft\*. If any of these components are missing or there is any noticeable damage, please contact the office where item was purchased.

\*See Specification section to determine drive key type and size.

**Specifications**

Stages	2
Max. Operating Speed	3600 RPM
Construction	Cast Iron
Max. Operating Pressure	2500 PSI
Unload Valve Setting	450 PSI
Mounting	4 Bolt 4F17 (Factory Preset)
Shaft Extension	1 1/2" (1.50")
Shaft Diameter	1/2" (.50")
Keyed Shaft	Model 4F663A - #404 Woodruff Model 4F664A - .12 square x 1.0"
Inlet Port	1" dia. tube
Outlet Port	1/2-14 NPTF
Pump Rotation	Clockwise (Facing Shaft)

**CAUTION**

These pumps are built for clockwise rotation as viewed from the shaft end of the pump. Gas engine or electric motor must turn the appropriate direction to avoid damage to the pump assembly.

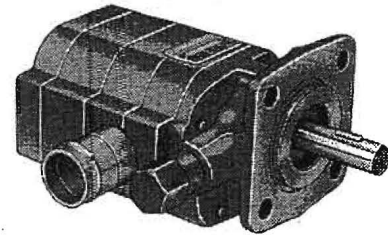


Figure 1

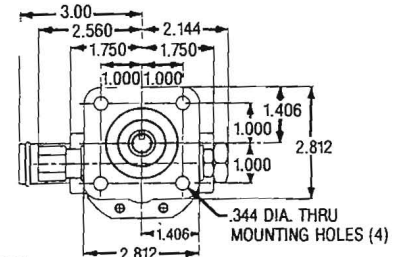
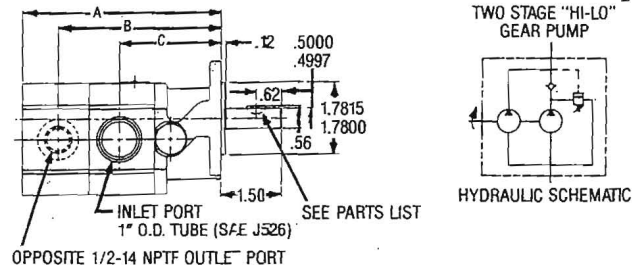


Figure 2 — Dimensions

Performance Characteristics\*

		MODEL	
		4F663A	4F664A
Minimal Displ. (cu. in./rev.)	1st Stage	.517	.776
	2nd Stage	.194	.258
	Total	.711	1.034
GPM @ 3600 RPM @ 250 PSI	1st Stage	7.95	11.94
	2nd Stage	2.98	3.97
	Total	10.93	15.91
Max. Pressure PSI	1st Stage	600	600
	2nd Stage	2500	2500
Min. HP @ 2000 PSI (3500 RPM)		5 HP	8 HP

(\* ) When outlet port pressure is under 450 PSI, both stages are working and total displacement applies. Above 450 PSI, only 2nd stage displacement applies.



**Specifications (Continued)**

2-Stage, High/Low Pump Dimensions (Tabular)

MODEL	A	B	C
4F663A	4.906"	4.031"	2.531"
4F664A	5.468"	4.594"	3.094"

**General Safety Information****▲ WARNING ▲****DISCONNECT POWER BEFORE SERVICING THIS EQUIPMENT.**

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
2. Never exceed the maximum operating speed and pressure of the pump.
3. If using AC motors, ground the motor properly by wiring with a grounded, metal-clad raceway system, using a separate ground wire connected to bare metal of the motor frame, or other suitable means.
4. Guard all moving parts.

**▲ WARNING ▲****RELEASE SYSTEM PRESSURE BEFORE SERVICING THIS EQUIPMENT.**

5. Drain all liquids from the system before servicing.
6. Check hoses and connections for security before each use.
7. Periodically check the pump and system components.
8. Provide a means of pressure relief for pumps whose discharge line can be shut off or obstructed.
9. Wear safety glasses at all times when working with pumps.
10. Keep work area clean, uncluttered and properly lighted; replace all unused tools and equipment.
11. Keep visitors at a safe distance from the work area.
12. Make the workshop child-proof with padlocks, master switches, and by removing starter keys.
13. Do not operate an engine in an enclosed area.
14. Do not spill gasoline on hot engine surfaces.
15. Store gasoline only in an approved container.
16. Keep dirty and oily cleaning rags in a tightly closed metal container.
17. Check engine oil level before operating the engine.
18. Familiarize yourself with the controls and emergency shutdown procedures.
19. Never operate the equipment when you are fatigued.
20. All system components pressure ratings should be greater than maximum system pressure.

21. Put safety guards on all moving parts.
22. Keep all guards in place.

**Assembly**

Models 4F663A and 4F664A are packaged fully assembled and require no further assembly.

**Installation****▲ CAUTION**

**Do not overtighten fittings and bolts — this can damage the pump.**

1. Assemble one coupling half to the engine/motor and tighten the set screw.
2. Assemble the other coupling half loosely to the pump shaft. Note drive key dimensions in Specification section of this manual.

**▲ CAUTION**

**Do not force coupling onto pump shaft. A snap ring inside pump may be damaged by forcing coupling.**

3. Insert the rubber spider into engine/motor coupling half.
4. Bolt the pump and mounting gasket "A" loosely to 4-bolt foot-mounted pump adaptor.
5. Align the shafts to make sure they are on center with each other.

**▲ CAUTION**

**Misalignment with shafts may result in premature shaft seal failure.**

6. Tighten the mounting bolts.
7. Mate the coupling halves together, allowing 1/16" gap between halves.
8. Check shaft alignment again.

**▲ CAUTION**

**The gap in the coupling halves is to prevent end loading of the pump shaft.**

9. Tighten the set screw in the pump coupling half.
10. Remove plastic port protectors from the inlet and outlet ports.
11. Squirt oil into the pump for pre-lubrication for start-up.
12. Turn shaft coupling slowly to ensure proper shaft alignment and coupling installation.
13. Connect inlet line by slipping inlet hose over inlet tube and fasten with hose clamp.

NOTE: A few drops of oil on inlet tube beaded section will help ease the installation.

14. Keep inlet hose short and of adequate size to avoid pump cavitation.

NOTE: Cavitation is recognized by excessive pump noise.

**Installation (Continued)**

**▲ CAUTION**

Provide cooling for the hydraulic oil based on: duty cycle, pressure/flow, ambient temperature, oil and component maximum temperature specifications, and reservoir capacity.

- Use a 1/2" NPTF, high pressure fitting for the outlet port. Use a good quality pipe joint compound (pipe dope) on all NPTF hydraulic fittings.

**▲ CAUTION**

Flush all lines to ensure contaminants have been removed.

**▲ CAUTION**

Do not use Teflon tape on NPTF hydraulic fittings.

**▲ CAUTION**

Do not over-tighten NPTF pressure fitting in pump. This could distort or crack the pump gear housing.

**▲ CAUTION**

Never run pump without hydraulic oil.

- At initial start-up, turn the pump several times by hand to prime the pump.
- Bleed all air from the system to prevent erratic pump operation.
- After several cycles, check the reservoir oil level and refill as necessary.

NOTE: When the ambient temperature is below 32°F, allow the pump to operate at low pressure for several minutes to warm the oil in the reservoir.

**Operation**

- Check oil level before each use.

- Follow operating instructions for engine or motor.

**▲ WARNING ▲**

**DO NOT EXCEED THE PRESSURE RATINGS OF THE SYSTEM COMPONENTS. A HYDRAULIC PRESSURE GAUGE IS RECOMMENDED IN THE HYDRAULIC CIRCUIT.**

- The unloading valve is adjustable up to 600 PSI by turning the adjusting screw clockwise.

**▲ CAUTION**

Pressure gauge required when adjusting unload valve.

NOTE: Increasing the unloading valve pressure will require increasing the pump drive horsepower. The factory adjusted pressure is 450 PSI. Maximum recommended loading for 3 HP electric motors and 5 HP engines is 550 PSI.

**▲ CAUTION**

If pump has not operated for an extended period of time, manually rotate pump shaft to prime and lubricate pump.

**Maintenance**

- Keep the reservoir filled with hydraulic fluid.
- NOTE: Use a good quality automatic transmission fluid (ATF) for year round operation.
- Make frequent inspections of hydraulic oil and change if contaminated.
  - To fill the reservoir with clean oil: Use a clean funnel fitted with a fine mesh wire screen. Do not use a cloth strainer. Most pump failures, valve malfunctions, and short unit life can be traced directly or indirectly to dirt or other foreign material (water, chips, lint, etc.) entering or already in the hydraulic system.
  - Keep the unit clean of dirt and foreign materials.
  - Keep electrical connections clean.

**Troubleshooting Chart**

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Pump does not develop full pressure	<ol style="list-style-type: none"> <li>System relief valve set too low or leaking</li> <li>Oil temp. is too high</li> <li>Pump is worn out</li> <li>Double acting cylinder piston seals are cut or worn out</li> </ol>	<ol style="list-style-type: none"> <li>Check system relief valve for proper setting with pressure gauge in outlet line</li> <li>Let oil cool below 140°F</li> <li>Replace worn parts or pump</li> <li>Replace or repair cylinder</li> </ol>
Motor won't start	<ol style="list-style-type: none"> <li>Loose connection</li> <li>Circuit breaker tripped</li> <li>Voltage drop</li> <li>Seized pump</li> </ol>	<ol style="list-style-type: none"> <li>Check wiring</li> <li>Reset circuit breaker</li> <li>Use heavier gauge wire</li> <li>Replace pump</li> </ol>
Will not pump oil (Motor runs but cylinder does not move, or moves slowly)	<ol style="list-style-type: none"> <li>No oil in reservoir</li> <li>Motor operating wrong rotation</li> <li>Oil level low</li> <li>Suction strainer is clogged</li> <li>Double acting cylinder piston seals are cut or worn out</li> <li>Reservoir breather is dirty or clogged</li> </ol>	<ol style="list-style-type: none"> <li>Check oil level, refill</li> <li>Change rotation of prime mover</li> <li>Add oil as needed</li> <li>Clean suction strainer</li> <li>Replace or repair cylinder</li> <li>Clean reservoir breather and reinstall</li> </ol>
Pump motor unit is noisy	<ol style="list-style-type: none"> <li>Low oil level</li> <li>Air in system</li> <li>Suction strainer or in-line filter is clogged</li> </ol>	<ol style="list-style-type: none"> <li>Add oil as needed</li> <li>Bleed air from highest fitting in system by loosening fitting very slightly and operating unit until bubbling of air stops, then tighten</li> <li>Clean suction strainer or in-line filter</li> </ol>

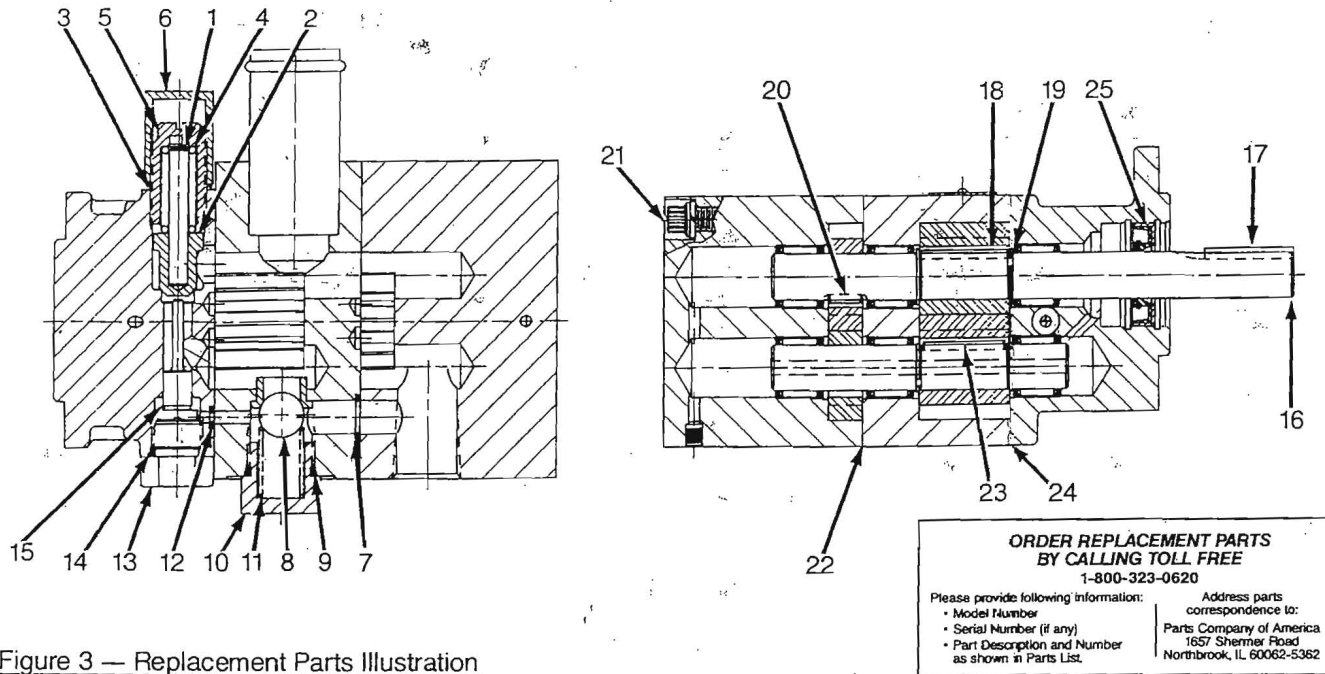


Figure 3 — Replacement Parts Illustration

**Replacement Parts List**

REF. NO.	DESCRIPTION	PART NUMBER FOR MODEL:		QTY.
		4F663A	4F664A	
1	Dowel pin	2230031	2230031	1
2	Plunger	2160206	2160206	1
3	Copper gasket	2300475	2260001	1
4	Spring	2110003	2110003	1
5	Adjustment screw	2130024	2130024	1
6	Hex cap nut (torqued to 15# ft)	2140008	2140008	1
7	O-ring (ARP 012-N-70)	2120024	2120024	1
8	Ball	2100008	2100008	1
9	O-ring (908-N-90)	2120078	2120078	1
10	Cap	2420088	2420008	1
11	Spring	2110051	2110051	1
12	O-ring (ARP 006-N-70)	2120019	2120019	1
13	Hex plug	2420106	2420106	1
14	O-ring (ARP 905-N-90)	2120077	2120077	1
15	Valve stem	2160009	2160009	1
16	Drive shaft	2350177	2350679	1
17	Drive key	2250013	2250011	1
18	Woodruff key	2250013	2250013	1
19	Snap ring 0.50	2240013	2240013	4
20	Woodruff key	2250020	2250020	1
21	† 1/4-20 x 3/4 Pump body screws (4F663)	2130078	2130080	8
22	‡ Gasket kit	2300480	2300480	1
23	Drive pin	2230021	2230021	1
24	‡ Gasket kit	2300481	2300481	1
25	Shaft seal	2120104	2120104	1
Δ	5/16-18 x 3/4 Grade 5 mounting bolts	2130107	2130107	1
Δ	4-Bolt mounting gasket (not shown)	2260064	2260064	4
Δ	5/16 Lockwasher for mounting bolts	2150042	2150042	4

(†) Screws for item #21 (Grade 8 socket head screws are acceptable)

(‡) Gaskets are color coded to maintain specific gear clearances in pump

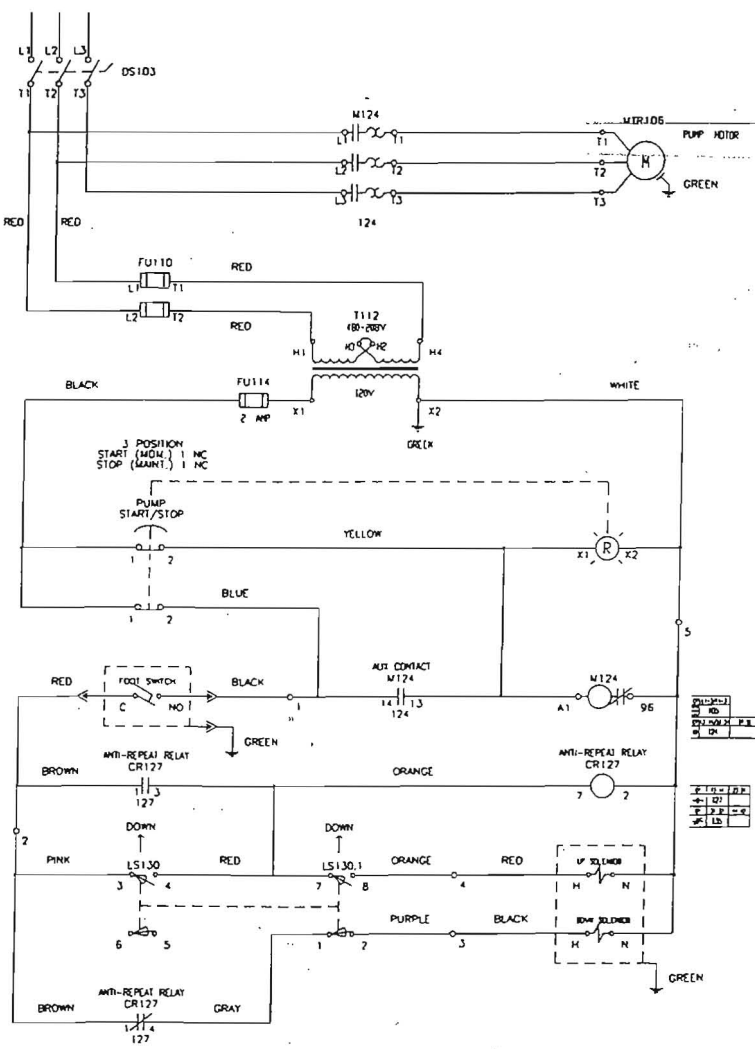
(\*) Standard hardware item

(Δ) Not shown

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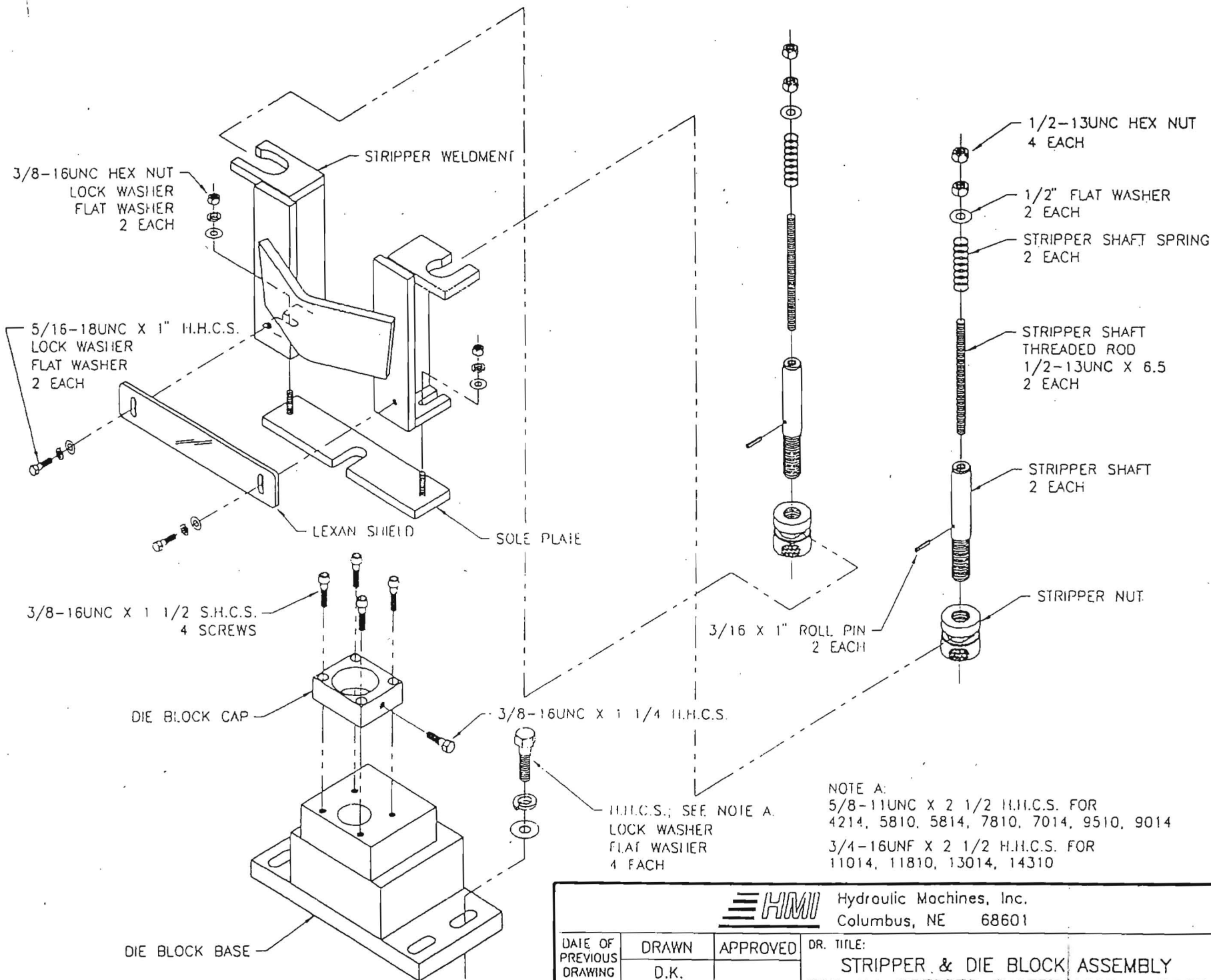


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Hydraulic Machines, Inc.  
2070 E 11th Avenue  
Columbus, NE 68601  
(402) 564-7149

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Columbus, NE 68601

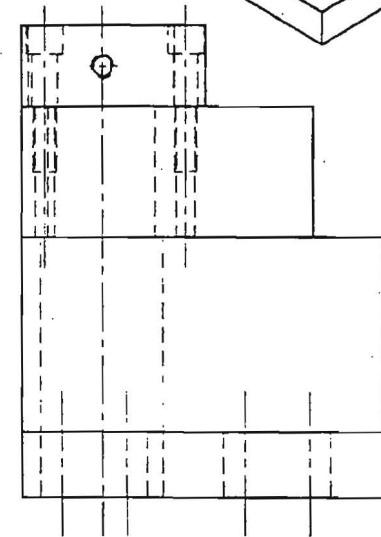
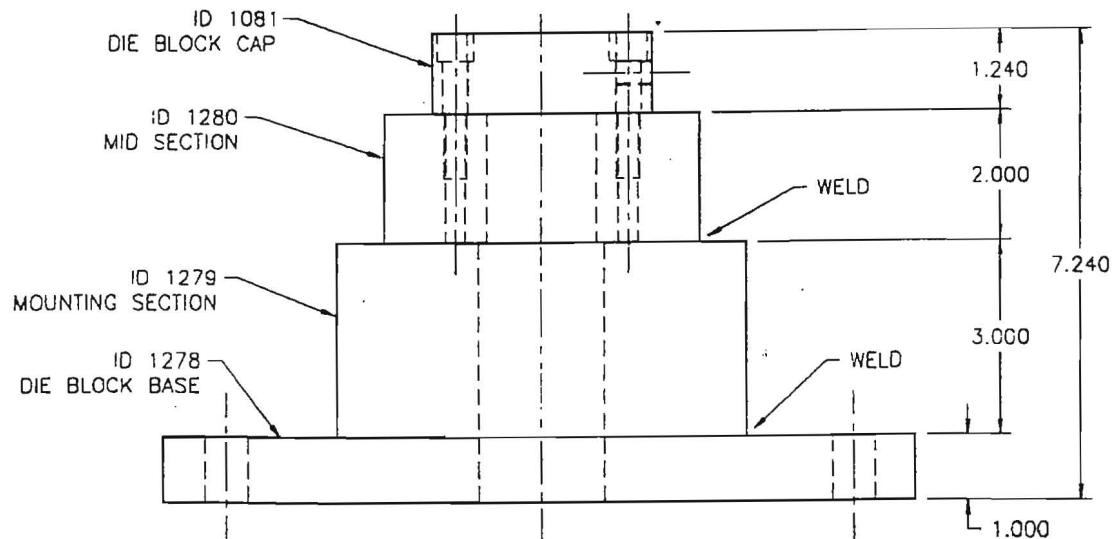
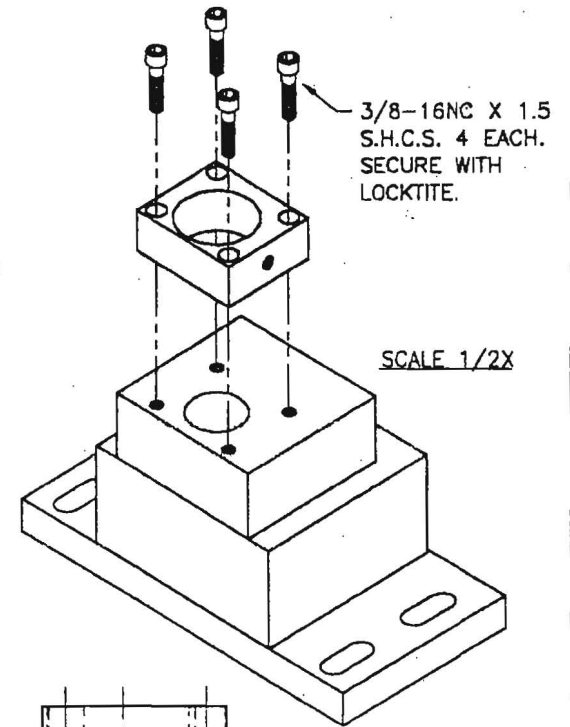
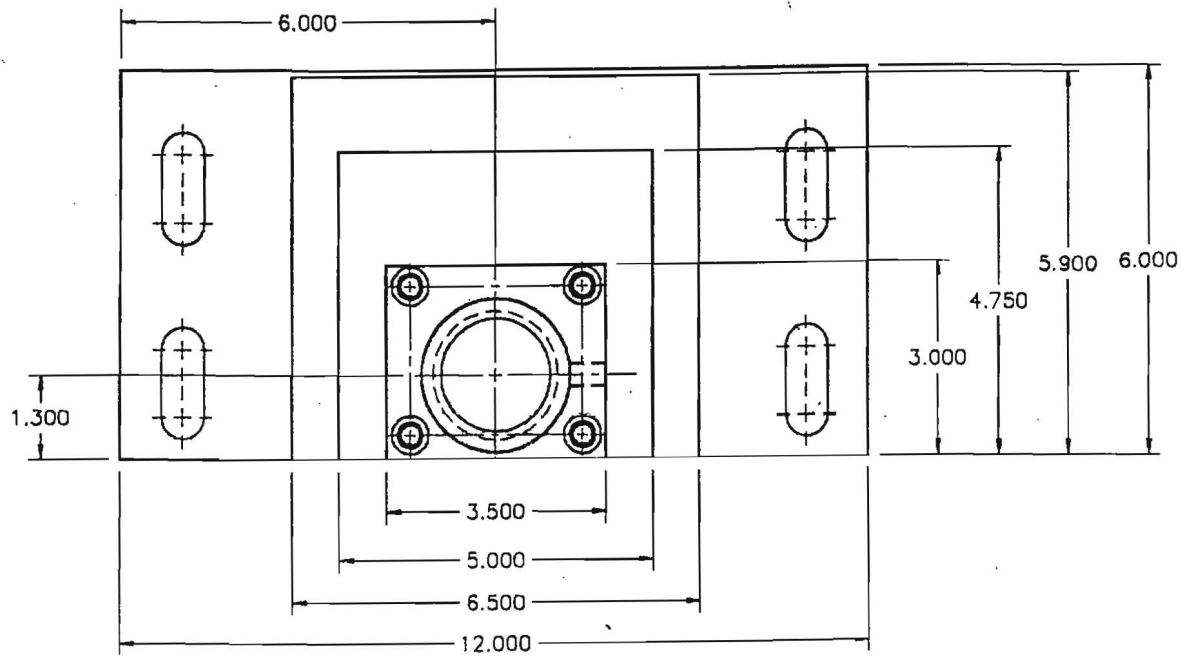
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NO.

I.D. # 1784A



MATERIAL: 1278, 1279, 1280, 1081

PIECES REQ.: 1 WELDMENT

NOTES:

TOLERANCE UNLESS SPECIFIED:  $\pm .005$

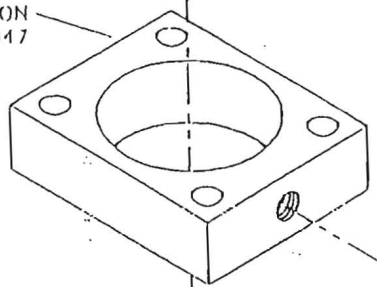
BREAK SHARP EDGES



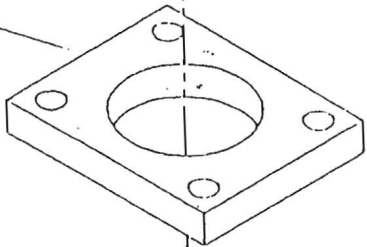
Hydraulic Machines, Inc.  
Columbus, NE 68601

DATE OF PREVIOUS DRAWING	DRAWN	APPROVED	DR. TITLE:
	D.K.		
	1/8/99		<b>DIE BLOCK ASSEMBLY</b>
			<b>ALL PRESSES EXCEPT 4207, 5807</b>
REV	DESCRIPTION	DATE	BY
SCALE: 1:3		T=3.3	NO. I.D. # 1278A

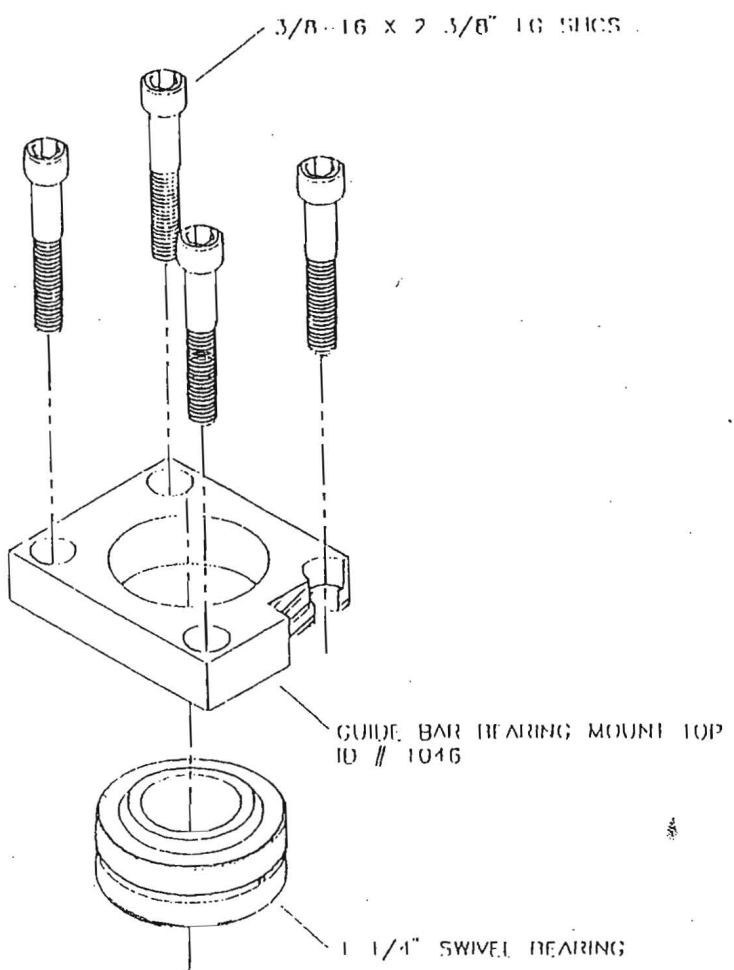
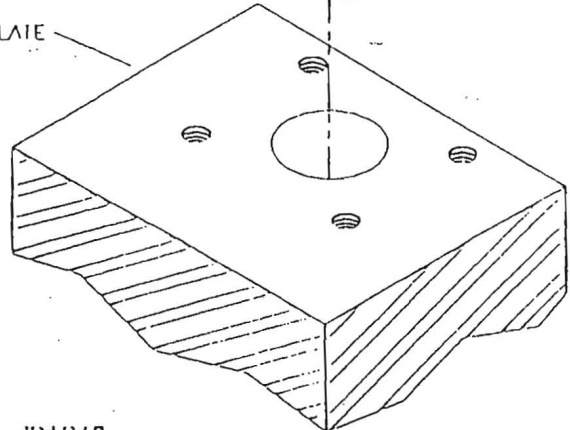
GUIDE BAR BEARING MOUNT MID. SECTION  
ID # 1017



GUIDE BAR BEARING MOUNT BOTTOM  
ID # 1018



PRESS CYLINDER CROWN PLATE



MATERIAL: ID1016, ID1017, ID1018  
1 1/4" SWIVEL BEARING  
3/8-16 X 2 3/8" LG SHCS (4)  
GREASE FITTING

PIECES REQ.: 1 ASSY.



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Columbus, NE 68601

DATE OF PREVIOUS DRAWING:	DRAWN	APPROVED	DR. TITLE:	
	D.K.		GUIDE BAR BEARING MOUNT ASSEMBLY	
	10-15-97		SCALE: 1:3	I.D. # 1016A
			1-B.25	NO.

REVISIONS			
REV	DESCRIPTION	DATE	BY

ID 1099  
ID 1299

10-32 SCREW

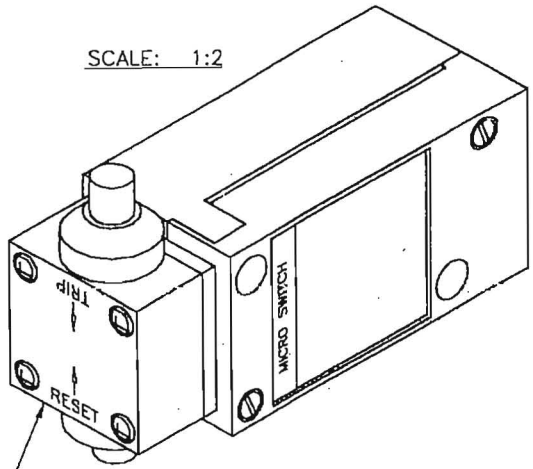
1" O.D. FENDER WASHER

ID 1065

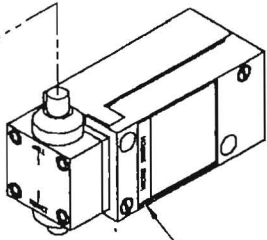
ID 1098 .36

ID 1066

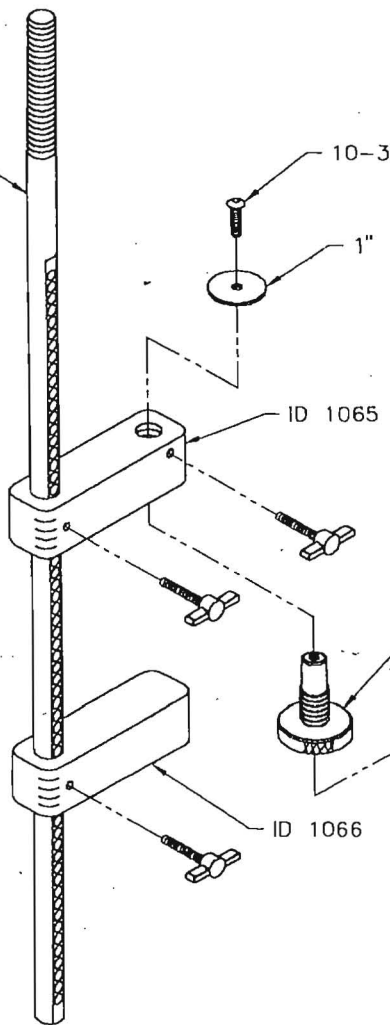
SCALE: 1:2



TO BE ASSEMBLED WITH  
"TRIP" & "RESET" AS SHOWN



MICRO SWITCH LSG6B



Hydraulic Machines, Inc.  
Columbus, NE 68601

DATE OF PREVIOUS DRAWING	DRAWN	APPROVED	DR. TITLE:
9-29-97	D.K.		
	10-1-98		

TRIP ROD ASSEMBLY  
FOR ALL IRONWORKERS

REVISIONS			
REV	DESCRIPTION	DATE	BY
A	CHANGED SWITCH	10-1-98	

SCALE: 1:4

T=1.00

NO.

ID # 1099A