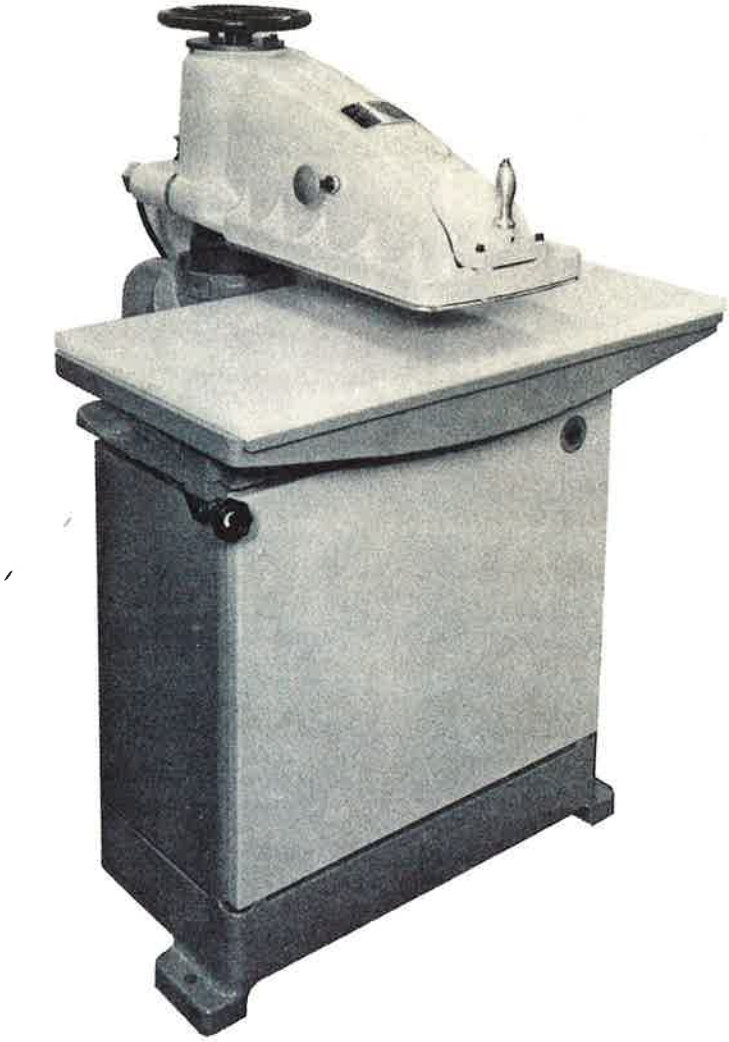
HCM-B2/M3

HCM-B2

USM HYDRAULIC CUTTING MACHINE - MODEL B2



OPERATING/SERVICE INSTRUCTIONS AND PARTS MANUAL

Machinery Division
USM Corporation

An EMHART Unit
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OPERATING/SERVICE INSTRUCTIONS

AND

PARTS CATALOG

USM HYDRAULIC CUTTING MACHINE - MODEL B2

(SYMBOL HCM-B2)

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HYTRONIC® CUTTING SYSTEMS
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USM Hydraulic Cutting Machine - Model B2

SECTION I GENERAL DESCRIPTION AND FUNCTION

A. General Description

The USM Hydraulic Cutting Machine - Model B2 is a motor driven, hydraulically powered, floor model machine used for forcing a cutting die through sheet materials such as leather, fabric, paper, plastic and other various kinds of flat materials.

The HCM-B2 is designed to be manually controlled by a stroke control mechanism.

B. Functional Description

1. Cutting Depth Control (Figure 1, Key 1)

   The cutting depth control, operating handle located on left front of the machine, is designed to regulate the downward travel of the beam. Turning the handle counterclockwise increases the amount of downward travel of the beam and clockwise decreases the downward travel of the beam.

2. Beam Height Adjusting Rod Handwheel (Figure 1, Key 3)

   This handwheel functions to raise and/or lower the beam to the proper height before operation of the machine. Turning the wheel clockwise raises the beam and counterclockwise lowers the beam.

3. Beam Tripping Switch (Figures 1 and 5) 1PB

   The function of the front trip switch (the switch actuating rod is located on the top of the beam handle) is to initiate the machine cycle in conjunction with the Side Trip Switch.

4. Beam Side Trip Switch (Figures 2, 5) 2PB

   The Side Trip Switch is normally located on the left side of the beam. This switch must be pressed simultaneously with the front trip switch in order to initiate a machine cycle.

5. Pressure Relief Valve (Figures 6, 7)

   The function of the pressure relief valve is to relieve the hydraulic system of pressure in excess of 2,600 pounds and to return the hydraulic fluid to the sump.

6. Hydraulic Pump (Figures 7, 10)

   This is a vane-type pump coupled directly to the motor which pressurizes the hydraulic system through the pressure relief valve.

7. Swinging Beam (Figures 1, 2, 5, 12)

The function of the swinging beam is to force the cutting die through the material being cut. It is designed to provide maximum use of the cutting surface area. There are several sizes of beams and it is recommended that Section VIII - Parts Catalog be consulted when ordering.

8. Cutting Surfaces

There are several types of cutting surfaces available for use on the HCM-B2. The following charts list the types, hardness, characteristics and suggested uses for the many cutting surfaces available. When ordering, contact your local USM representative for further information.

a. Cutting Blocks

Cutting blocks are made by vertically laminating sections of pads cut to size to produce the desired overall dimensions. The exposed edges of the 1" thick sections form a firm, long-wearing surface. Side and end irons which rigidly enclose the perimeter can be lowered as the block wears in order to eliminate wasted cutting life.

b. Cutting Pads - Composition Rubber

USM cutting pads are molded surfaces made from composition rubber (1" or 2" thick) or plastic materials (3/8" to 2" thick). Pads are usually securely cemented to base blocks to provide necessary height on the machine bed and to prevent warping or distortion during actual use.

TYPE	THICKNESS	MATERIAL	DUROMETER (HARDNESS) SHORE D SCALE	CHARACTERISTICS AND SUGGESTED USES
PL66	3/8"	Grey Polyvinyl-chloride	72	General cutting - particularly good for paper - Good healing qualities. Max. Size 96" X 48".
PL20	1"	White Polypropylene (Un-Backed)	78	General cutting on leather fabric and synthetic materials - excellent die release even with high pressure has hard surface - must be resurfaced carefully to avoid chipping edge. Max.size 96" X 48" PL20 or 80" X 40" (PL 40 and 41) Also available in cutting blocks.
PL40	1",2"	White Polypropylene (Jute-Backed)	76	
PL41	1",2"	Red Polypropylene (Jute-Backed)	67	
Nylon	3/8" & 1"		82	High quality hard nylon with unusual toughness. Ideal for multi-ply textile and synthetic cutting. Minimum die penetration required for long life. Outlasts conventional cutting surfaces up to ten to one. Available in 74 X 19 1/2 & 74 X 25 1/2.

Metric Equivalents for dimensions listed in the charts on Pages 1-3 and 1-4.

Inches	Centimeters	Inches	Centimeters
3/8	0.9525	40	101.60
1	2.540	48	121.92
2	5.080	72	182.88
19 1/2	49.53	74	187.96
25 1/2	64.77	80	203.20
36	91.44	96	243.84

TYPE	DUROMETER (HARDNESS) SHORE D SCALE	CHARACTERISTICS AND SUGGESTED USES
200 Black	70	General cutting on dark-colored materials - handles the toughest work with minimal wear or dust shedding - extra long life. Available in blocks, 1" or 2" thick pads.
370 Blonde	70	General cutting on light-colored materials - cutting life about the same as type 200. Available in blocks, 1" or 2" thick pads.
400 Green	70	General cutting - durable pad made from a special formulation - sheds less under most cutting conditions. Available blocks, 1" or 2" thick pads.

Note: Largest size available in composition rubber is 36" x 72".

SECTION II TECHNICAL DATA

A. Machine Data

1. Overall Dimensions

   Length----------36-1/4" base, 57-1/4" including beam swing (92.08cm and 145.42cm)

   Depth----------40" (101.6cm)

   Height----------55-1/4" to 59-3/4" (140.3cm to 151.8cm)

2. Motor - Horsepower, Speed and Rotation

   Horsepower----------1-1/2

   Speed----------1725 rpm

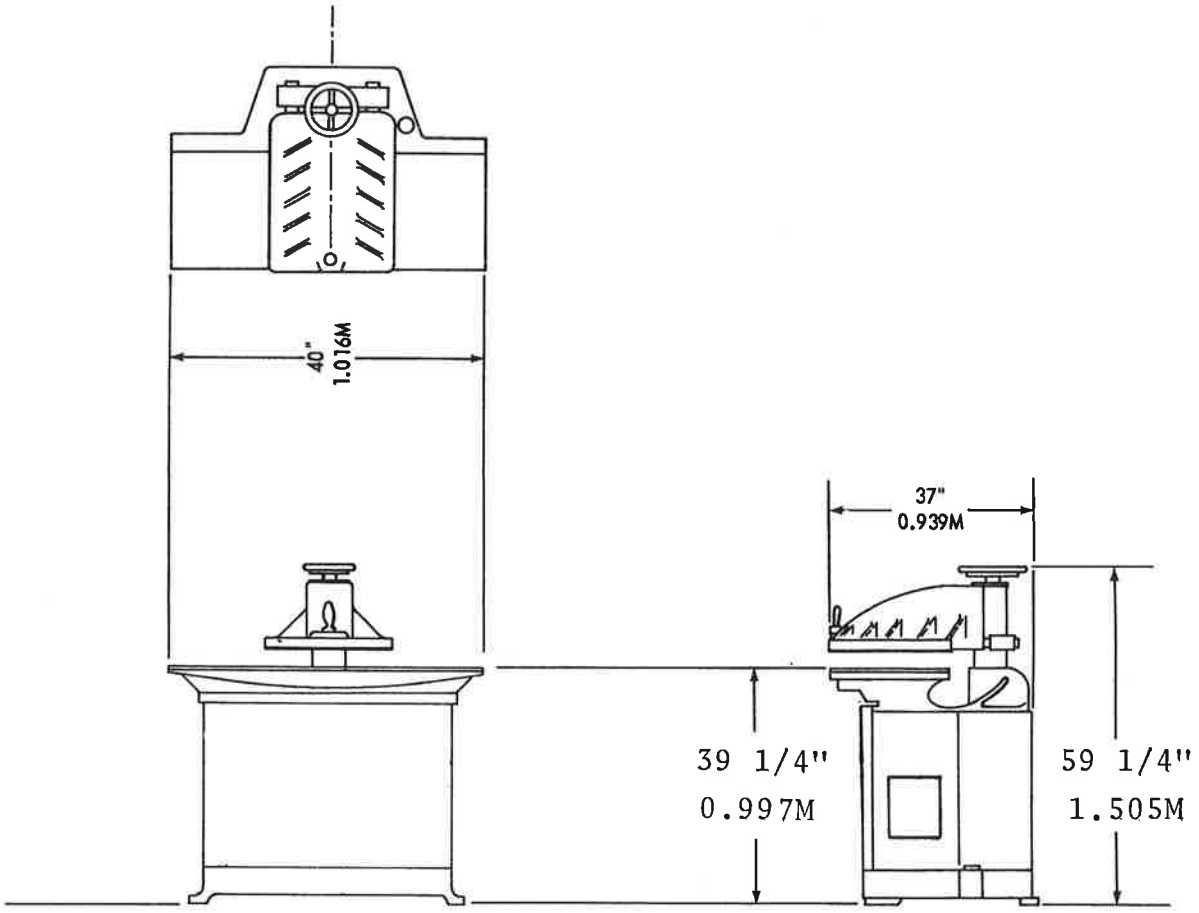
   Rotation----------Counterclockwise

3. Electrical Power Supply

   The electrical requirements of the machine and the electrical services at the planned installation location must correspond. Standard available services for the HCM-B2 are 208/230/460V, 3 phase, 60 Hz, AC service. The following services are available on a made-to-order basis only: 575V, 3 phase, 60 Hz; 220V and 380V, 3 phase, 50 Hz; 230/460V, 2 phase, 60 Hz.

4. Machine Weight

   Approximate gross weight of machine-------1968 lbs. (885.6kg)



Installation Sketch

SECTION III INSTALLATION

A. Location

The location chosen for the installation of the USM Hydraulic Cutting Machine - Model B2 must have the space of at least the dimensions given in Section II, Paragraph A.

B. Installation And Starting

1. Read Section II - Technical Data, Section IV - Lubrication and Maintenance and Section V - Operating Instructions before starting this machine.

2. Uncrate and place machine in desired location.

3. Check and be sure the reservoir has been filled before starting the motor and pump. Reservoir requires 6 gallons USM Spec. No. 225 BCW oil. (22.712 liters)

4. Have a competent electrician wire the machine to the power source. It is important that the HCM-B2 be properly grounded to insure proper performance. Also, it is recommended that a disconnect switch be installed to provide a cutoff of the power to the machine. Check the local electrical code for exact requirements.

5. The direction of rotation of the motor and pump is important since the pump will operate in one direction only. Check the arrow cast on the pump body for proper rotation.

6. Raise the beam with the spindle rod adjusting handwheel and then swing the beam to one side.

7. Remove the cutting surface from the table.

8. Accurately level the machine with a spirit level placed on the table from front to back and side to side. Place a felt pad, cemented to the floor, under each foot of the machine. This will eliminate the need for further anchoring.

9. Replace the cutting surface on the table.

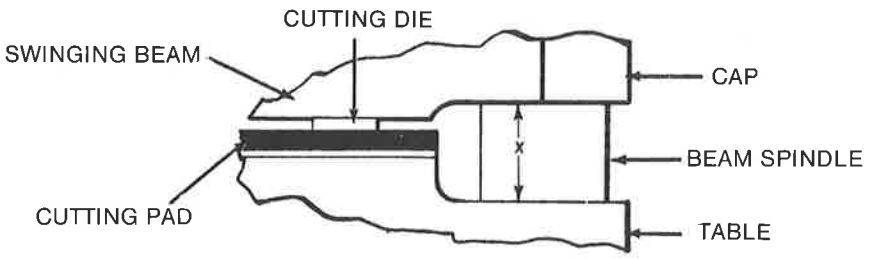
10. Lubricate the machine as instructed in Section IV, Paragraph A.

11. Adjust the positive stop spacers as instructed in Section III, Paragraph C.

C. Positive Stop Spacers (Figure 2)

The positive stop spacers are available in varying thicknesses. They are installed around the periphery of the beam spindle on top of the frame. A locating pin holds the spacers in place after they are installed. The number and thickness of the spacers required will vary with the height of the cutting pad and die.

To determine the number and thickness of spacers required, place the lowest height die to be used on the cutting surface and turn the rod handwheel (Figure 1) until the striking face just touches the top of the die as shown below:



Metric equivalents of dimensions given in Paragraphs C through E are listed on Page 3-4.

Measure distance "X" and subtract 1/4 inch. This value will give the total thickness of spacers required for this setup. (Round off the value obtained for "X" to the nearest 1/16 inch.) Now raise the swinging beam with the rod handwheel and insert spacers.

As the cutting surface wears and is serviced or a smaller die is used, the thickness of the stop spacers must be readjusted as described above to obtain the necessary clearance. This is necessary because the reduction of the cutting surface thickness will decrease the clearance between the spacers and the base of the beam. This is especially true of the pad. If the spacers are not readjusted, no cutting will result because the beam will strike the spacers before contacting the cutting die.

D. Adjusting Beam Operation (Figure 1)

1. Beam High Limit Adjustment

   a. Place the material and die to be used on the cutting surface.

b. Swing the beam over next to the die and, using the Spindle Rod Adjusting Handwheel (Figure 1, Key 3), adjust the beam height to 1/4 inch (6.35mm) above the die.

2. Stroke Adjustment (Beam Low Limit)

a. Turn the Cutting Depth Control clockwise to lower the Trip Rod Stop (Figure 6, Key 12) all the way down.

b. Turn power on.

CAUTION

NEVER LEAVE THIS MACHINE RUNNING UNATTENDED

c. Turn the Cutting Depth Control counterclockwise one full turn at a time. Trip the machine after each full turn of the Cutting Depth Control. Continue this procedure until the beam nears the height of the die to be used in cutting when the beam is at the bottom of its downward travel.

d. Swing the beam over the die and turn the Cutting Depth Control one-quarter turn at a time and trip the beam each time. Continue this procedure until the die penetrates the cutting surface lightly.

e. The machine is now ready for operation. Additional Fine Adjustments for cutting depth can be made as required.

E. Combining Two HCM-B2 Machines

To improve the handling of cloth lining or similar material, particularly wide fabric, two HCM - Model B2 machines are installed with the front of one table against the front of the second table.

With two machines installed in this manner, wide material can be drawn across the cutting surface from a laying-up table on the opposite side of the machines from the operator.

Machines installed in this manner are equipped with tables having 20-inch by 40-inch cutting surface. With the machine tables butted together, the cutting surface covers half of each table. Complete coverage of the cutting surface can be accomplished when the cutting surface is placed 4 to 5 inches in from the front edge of the machine table (operator's side).

The machines should be equipped with beams 31 inches long with the width being determined by the size of the dies to be used.

The following steps should be observed when installing two machines to obtain a simulated twin:

1. Select a location with a minimum width equal to the depth of two HCM-B2 machines and with sufficient room for a suitable laying-up table in back of the machines opposite the operator.

2. Locate one machine in its proper location, then level this machine with a spirit level placed on the table from front to back, and side to side.

3. Install the second machine with the front of its table butting against the front of table of the machine previously positioned.

4. Level the table on this second machine until it coincides with the level of the first machine table.

5. Lag both machines securely to the floor.

6. Check the level of the tables by placing a spirit level across both tables. If either table is not level, make necessary adjustments until it is. The tables on these machines must be absolutely level with respect to each other.

7. Place cutting surface across tables. The front edge of the cutting surface should be located 4 or 5 inches in from the front edge of the machine table.

8. Have each machine wired to the power source with a wall switch installed to cut off the power to the machines.

Metric equivalents of dimensions given in Section III, Paragraphs C,D, and E.

1/16 inch	=	1.588mm
1/4 inch	=	6.350mm
4 inches	=	10.16cm
5 inches	=	12.70cm
20 inches	=	50.80cm
31 inches	=	78.74cm
40 inches	=	101.6cm

SECTION IV LUBRICATION AND MAINTENANCE

A. Lubrication

- For general lubrication, use USM Specification No. X100CP oil.
- For oil reservoir (6 gallons), use USM Specification No. 225 BCW oil.
- For elevating screw, use USM Specification No. X100CP oil. (Apply once each week.)
- For beam spindle chamfer, use USM Specification No. X100CP oil. Fill the beam spindle chamfer with oil at the start of each 8-hour shift or more often especially when cutting with little beam rotation.
- Motor lubrication, as per motor vendor.
- Piston thrust bearing - use USM No. 2GPT8R Grease.

Consult Appendix A for commercial equivalents of USM Specification Number Lubricants.

LUBRICATION SCHEDULE			
MECHANISM	8 HR.	50 HR.	2000 HR.
Beam Spindle	USM-X100CP		
Elevating Screw		USM-X100CP	
Oil Reservoir			USM-225BCW
Piston Thrust Bearing			USM-2GPT8R
Motor, Pump Drive	Lubricate motor in accordance with the manufacturer's instructions.		

B. Maintenance

1. General Information

The following instructions are directed to personnel who will be responsible for the care and maintenance of the machine. The intervals at which these instructions will be carried out are somewhat dependent upon the amount of use of the machine and the existing factory conditions.

2. Striking Face

The time interval between replacement of Striking Face will be determined by the amount of usage it receives. The life of the striking face may be extended considerably by rotating the plate 180° periodically; however, no attempt should be made to turn the plate over.

The striking face should be replaced when it has received an amount of wear equivalent to 1/32" (0.794mm). This may be determined by stretching a piece of string or flat bar on edge across the face from the front to the rear and measuring the amount of wear.

3. Cutting Surfaces

a. Composition Pad

Die penetration into the cutting surface causes some surface strains to be set up in the pad. To minimize the possibility of bowing, the cutting surface should be rotated. Systematic rotating of the cutting surface will tend to decrease its upkeep. For best results, rotate the cutting surface 180° at noontime each day. A system should be set up and followed to prevent overlooking this change. Servicing of the cutting surface may be accomplished with a 3- or 4-inch belt sander. When using a belt sander, be careful that only the high, outer perimeter is removed.

If a die is driven into the cutting surface, all that need be done is to remove the die, correct the cause for overdrive, and continue cutting. The impression of the die will not be deep because the stop spacers will prevent excessive penetration in the event of maladjustment or failure. The impression will disappear in a day or two and cause no inconvenience in future cutting. Closure can be hastened by using a ball peen hammer and tapping lightly all around the impression. Pounding must be avoided as this will cause low spots.

4. Cutting Dies

The condition of the cutting dies has a most important effect on the life of the cutting surface. This is reflected in: (1) the depth of penetration of the die into the cutting surface which increases the time to make a cut and decreases the life of the cutting surface; (2) the pressure setting required to perform cutting because a dull or nicked die requires more pressure to make a complete cut, hence deeper penetration into cutting surface, and a greater pressure must be exerted to accomplish cutting; (3) strains or deflection back into the machine with related wear and breakage.

Dies to be used on the HCM-B2 must be parallel between the striking side and the cutting edge, and the cutting edge must be sharp, for best results. Good die manufacturing practice requires no more than 0.004" (0.10mm) tolerance in height. Nicked or wavy cutting edges require higher pressure settings with resultant, greater die penetration into the cutting surface.

Upper leather dies with increased height in deep inward features, dies with high corners, or with stabs protruding beyond the cutting edge tend to cause poor cutting results. It is recommended dies be even, that the stabs be reduced and the dies kept sharp.

CAUTION: Handle all cutting dies carefully to avoid nicking or dulling the cutting edges.

5. Pump Intake Filter (Figure 7)

From time to time (at least yearly), it may become necessary to remove the pump intake filter for cleaning. To remove, clean or replace the filter, proceed as follows:

- Remove the tubing clamp.
- Remove intake seal ring screws.
- Disconnect pump intake nipple from pump. The intake nipple seal and adapter grommet will remain attached to the nipple.
- Remove the pump intake filter from the nipple.
- Immerse the filter in a bath of kerosene or equivalent cleaning solvent and dry with compressed air.
- Reverse procedure to reassemble.

6. Changing Hydraulic Oil In Sump (Figure 3, Key 7)

Once a year it is recommended that the oil in the sump of the machine be changed. To change the oil, proceed as follows:

a. Disconnect exhaust hose from hose elbow and place the hose in a container capable of holding six gallons of liquid or more.

b. Start the pump and the fluid will be drawn out of the sump and into the container.

c. Remove base oil filler and fill sump with six gallons of USM Specification 225 BCW oil or commercial equivalent (See Appendix A).

d. Reconnect exhaust hose to hose elbow and reassemble base oil filler to the machine.

SECTION V OPERATION

A. Safety Instructions

CAUTION

As with every production machine, safety must be considered and practiced at all times. OBSERVE THE FOLLOWING SAFETY RULES.

1. Machine Setup

   a. Before operating machine, make sure that all covers are securely attached and that all operating personnel are thoroughly familiar with the instructions contained in this manual.

   b. Ground machine in accordance with all applicable Federal and local electrical codes, and be sure the machine is connected to the required electrical supply by a competent electrician.

   c. Be sure the oil reservoir is full before starting the machine.

2. Machine Operation

   a. Make no attempt to use this machine for other than its intended purpose.

   b. The two-hand control is provided for your protection. Make no attempt to alter or otherwise defeat its purpose.

   c. In the event of a power failure, be sure to press the red stop button in order to prevent machine start on power return.

   d. Make no attempt to tamper with setting of the preset and locked pressure relief valve of hydraulic system.

   e. Keep cutting table clear of all tools or objects except the required cutting die.

   f. Be sure the die height is not changed without readjusting the cutting depth control.

   g. NEVER PUT HANDS, OR FINGERS, UNDER THE CUTTING AREA OF THE BEAM.

   h. Always be sure the fingers are not between the striking plate and the cutting surface.

3. Machine Service

a. Always disconnect power from machine before attempting repairs or entering enclosures for any reason unless it is necessary to have power available for testing, etc.

b. Only qualified personnel should attempt electrical or mechanical repairs or adjustments.

c. Removing or replacement of flywheel should only be done by qualified personnel to ensure proper tightening of taper lock mount with flywheel properly aligned in all planes.

d. Be sure electrical enclosures are never opened except by qualified electricians.

e. If repairs are made to hydraulics, make sure no obstruction exists in relief valve vent tube. Otherwise, starting of the pump motor may cause the beam to cycle.

f. Do not leave the machine unattended with the covers removed.

g. To disassemble the exhaust cylinder, the HCM-B2 must be raised approximately 2 1/2 inches (6.35cm). Extreme care must be taken when raising the machine to keep it level thus preventing it tipping over.

The recommended method of lifting the HCM-B2 is to use a fork-lift truck. The fork is inserted from the FRONT of the machine with the forks at the widest setting that will go under the machine base. If any other method is used, qualified millwrights should perform the task.

4. Machine Safety Parts

Front Panel	HCM-787
Side Panel (Right)	HCM-777
Side Panel (Left)	HCM-776
Warning Decal	HCM-789
Warning Plate	HCM-803
Beam Side Safety Switch	HCM-627
	or HCM-629
Caution Decal	HCM-298

Beam Safety Stop		HCM-327
	or	HCM-329
	or	HCM-331
	or	HCM-394
Relief Valve		HCM-748
Ground Plate		XE315C3
Danger Plate		XE315C4
Motor Flywheel		HCM-655
Ground Wire Terminal		ED-4256

B. Operation (Figure 1)

1. When the motor is started, electric energy is transferred into the control panel through a transformer reducing it to 110 volts AC.

CAUTION

Before starting this machine, check and be sure the motor plate and transformer ratings are correct in accordance with the service available at the location of installation.

2. The machine cycle is initiated by pressing the thumb-operated trip switch, located on top of the beam handle, with one hand while simultaneously pressing the trip button, located on the side of the beam, with the other hand.

3. When the trip switches are operated, the beam moves downward until stroke limit switch is contacted. The beam automatically returns to its elevated position and will remain there until the trip switches are operated again.

4. Both trip switches MUST be held until cycle is completed. They must then be released before another cycle can be initiated.

C. Hydraulic System

1. Operation

The vane pump directs the hydraulic fluid to the relief valve. In the idle condition, the fluid passes through the relief valve back to the sump.

When the trip switches are depressed, the solenoid-operated vent valve is shifted closing the relief valve. The flow of fluid is then directed to the rod end of the hydraulic cylinder piston. As the pressure in the cylinder builds up, the piston is moved downward, thus driving the cutting beam down to force the cutting die through the material being cut.

When the stroke limit switch is contacted, the current to the solenoid-operated vent valve is shut off and the valve is returned to its idle position by a spring. The pump flow is now directed back to the sump through the relief valve. The hydraulic fluid in the cylinder is also directed back to the sump through the relief valve and the piston is returned to its idle position by two springs located on the head end of the piston.

2. Pump (Figures 7, 10)

The operation of the hydraulic pump used on the machine is as follows: a slotted rotor containing twelve vanes is driven by the driveshaft of the electric motor. The rotation of the rotor sets up a centrifugal action on the vanes which causes them to be thrown outward from the center of the rotor to follow the inside cam-shaped contour of a hardened ring. As the pressure builds up in the system, the vanes are held to this contour by fluid under pressure in the rotor slots behind the vanes. The hardened ring is so shaped that two opposing pumping chambers are formed in conjunction with a pressure plate.

The inlet flow through the ports in the pump body is created by a partial vacuum produced by a radial movement of the vanes on the pumping chambers. This action causes oil to be drawn from the sump and into the pumping chambers where it becomes trapped between the rotating vanes. Each volume of fluid passes through the porting in the pressure plate and out through the discharge port in the cover.

3. Pressure Relief Valve (Figures 6, 7, 11)

The pressure relief valve found in the hydraulic system of the machine is set at manufacture to relieve the system of pressure exceeding 2,600 pounds and return the fluid to the sump as described below. (2600 lbs = 1,170kg.)

a. Closed Position (Ref. Figure 11)

In the closed position, oil flows through the inlet port, around the valve piston (1) and out the outlet port. It should be noted that the inlet and outlet ports may be used interchangeably. By means of passage (Y) in valve piston (1), oil also flows into chamber (X) and onto valve (2), which is held on its seat by spring (3). The size of spring (3) and the position of adjusting screw (4) are set at manufacture at 2,600 pounds and should not be tampered with.

b. Open Position (Ref. Figure 11)

Piston (1) will remain in the closed position by the action of spring (5) as long as the pressure in chambers (Z) and (X) remain equal. It will continue to remain closed until the pressure in chamber (X) is reduced below the pressure in chamber (Z) so that the difference in pressure is great enough to overcome the light spring (5) (approximately 20 psig (1.4 Bar) difference). When this differential pressure is reached, the piston (1) will lift opening the return post to direct the fluid to the reservoir.

The differential pressure is caused by a flow of oil through the passage (Y) in the piston (1). This condition will occur if the vent port (W) is opened or if the valve (2) is unseated by the pressure in chamber (X).

When the differential pressure is caused by the unseating of valve (2), the system pressure will be determined by the pressure required to unseat valve (2). This is determined by the amount of compression in spring (3) plus the approximately 20 psig pressure difference necessary to overcome the light spring (5). This would be the high pressure setting of the valve.

When the differential pressure is the result of flow through the vent port (W), when the solenoid-operated vent valve is deenergized as during the idle condition, the system pressure will be the approximately 20 psig (1.4 Bar) difference necessary to overcome the light spring (5).

D. Electrical System (Ref. Figure 15)

1. Sequence Of Operation

The Stroke Switch (1SW) is set for the desired cut depth.

Pushing the Manual Motor Start Switch (M) energizes the Control Transformer (T1) and starts the Pump Motor (1MTR).

The number three Control Relay (3CR) is energized which opens the 3CR closed contacts. This prevents machine operation until the Pump Motor (1MTR) is up to speed.

When the motor is up to speed, the centrifugal switch (25W) opens deenergizing 3CR allowing the normally closed 3CR contacts to close. (The machine can now be operated.)

The closing of the 3CR contacts energizes 1CR through the normally closed Stroke Switch (1SW), the normally closed contacts of the Front Switch (1PB) and the Side Switch 2PB and through the 2CR normally closed contacts. 1CR locks in through its contact.

The machine is operated by depressing and holding both the Front Switch 1PB and the Side Switch 2PB. This energizes the Cut Solenoid (1SOL) through the previously closed 1CR contact.

The 2CR relay is also energized and locked through its contact until the Stroke Switch (1SW) opens at the end of the cutting stroke.1CR is deenergized when the Front and Side Switches (1PB and 2PB) are depressed. Both switches must be released to reenergize 1CR allowing the cycle to be repeated.

SECTION VI DISASSEMBLY AND ASSEMBLY

A. Beam (Figures 1,12)

The procedure which follows is applicable for replacing a damaged beam or if the size of the beam is to be changed to suit a particular application.

1. Disassembly (Figures 5, 12)

   a. Disconnect the power supply to the machine.

   b. Raise the beam by turning Handwheel and remove the beam safety stop, then lower the beam until it rests on the cutting surface.

   c. Remove Post Bracket Screw and Washers and tilt Post Bracket outward to disconnect the electrical connections.

   d. Remove Handwheel Nut and Washer and remove Rod Handwheel.

   e. Remove five Screws from Spindle Cap and remove spindle cap.

   f. Remove Beam Screw and Washer from the inside of Beam Spindle.

   g. Remove Beam Cap Retaining Nuts, Washers, Beam Cap - Lower and Beam Cap Studs - Lower from the beam.

   h. Pull the beam forward to clear the beam spindle and turn the beam to permit easy access to the insulation nuts and striking face screws.

NOTE

If the present beam is being replaced with a beam of a different size, steps (h) and (i) are not applicable.

   i. Remove Striking Face Screws and Nuts.

2. Assembly

The assembly of the beam is the reverse of the disassembly procedures outlined above. Make sure that copper contact strip of the trip switch is clean and that it is engaged by Bracket Screw when Post Bracket is secured in place.

NOTE

When tightening Beam Cap Retaining Nuts, set torque wrench at a setting of 325. The light of the torque wrench will light when 325 is reached. The setting of 325 is equivalent to 1300 ft-lbs of torque due to a 4 to 1 differential in the torque tool.

B. Spindle (Figure 13)

1. Disassembly

a. Shut off the power supply to the machine.

b. Place a steel block approximately 2 inches square by 3-1/4 inches long on top of Bumper Block and turn Handwheel to lower Spindle Adjusting Screw until Piston Connecting Nut is fully exposed at the bottom of Spindle.

c. Remove Screw, Washers and Piston Connecting Nut (both halves).

d. Turn Handwheel to raise the spindle and remove the steel block, Bumper Block and Screws.

e. Lower the beam until it rests on the cutting surface.

f. Remove Handwheel Nut, Washer, Rod Handwheel, Screw and Spindle Cap.

g. Remove Beam Screw and Washer from the inside of Beam Spindle.

h. Remove Beam Cap Retaining Nut, Washer, Beam Cap - Lower and Beam Cap Studs - Lower.

i. Insert two Screws into the upper end of Beam Spindle and hoist the spindle out of the machine.

2. Assembly

The assembly of the beam spindle is essentially the reverse of disassembly; however, if Cylinder has been removed for some reason, it will be necessary to install the spindle first and then the cylinder. The reason for this is that the spindle serves as the alignment means for the cylinder in attaching the cylinder to the machine base.

C. Pump (Figures 7, 10)

1. Disassembly

If, during the process of repairing the machine, all the possible sources of the trouble have been checked and it becomes imperative to disassemble the pump, proceed as follows:

CAUTION

The pump should only be disassembled as a last resort and not arbitrarily since some of the parts contained in the pump must be replaced when disassembled. If these parts are not readily available, do not attempt to disassemble the pump but replace the unit entirely.

a. Remove the four cover screws.

b. Remove cover noting position of outlet port for reassembly purposes.

CAUTION

Cover will be forced out by spring so care should be taken in removal.

c. Remove pressure plate and O-ring.

d. Remove ring and O-ring noting position of ring for reassembly.

e. Remove rotor and vanes from driveshaft of electric motor.

f. Remove body from motor by removing fastening screws.

g. Remove oil seal by pulling it out with a hooked tool by catching the underside of the seal. Seal must be replaced once removed.

h. Remove bearing by tapping it out with a drift punch from the ring end of the pump.

2. Inspection

a. Inspect bearing and seal for wear and replace if necessary.

b. Check ring, rotor and vanes for wear.

c. Check elliptical surface of the ring for scoring marks.

d. Check vanes for corresponding scoring marks.

e. Check rotor for wear at shaft engagement and vane slots.

f. Check pressure plate opposite spring seal for scoring marks.

3. Assembly

Assembly is essentially the reverse of disassembly; however, care must be taken to make sure that the cover and pressure plate are installed exactly as they were originally. Secondly, the spring between the pressure plate and cover must be seated correctly to produce correct pumping results.

D. Cylinder (Figure 14)

1. Disassembly

To disassemble the exhaust cylinder, the HCM-B2 must be raised approximately 2 1/2 inches (6.35cm). Extreme care must be taken when raising the machine to keep it level thus preventing it tipping over.

The recommended method of lifting the HCM-B2 is to use a fork-lift truck. The fork is inserted from the FRONT of the machine with the forks at the widest setting that will go under the machine base.

a. Place wooden blocks under the beam and turn Rod Handwheel until Beam Spindle clears Cylinder.

b. Remove Cylinder Screws, Cylinder Drain Elbow and Hose Elbow from cylinder. Remove Stroke Device.

c. Remove top Screws of Piston Connecting Nut.

d. Turn Rod Handwheel until cylinder reaches bottom of frame.

e. Remove bottom Screws and Piston Connecting Nut.

f. Slide cylinder to one side of the machine base and tip to remove.

NOTE

The cylinder must be tipped in such a manner as to take advantage of the beveled surface in the upper flange of the cylinder.

g. Once the cylinder has been removed, it should be disassembled to the point to correct any trouble encountered; i.e., seal leakage, etc.

NOTE

The disassembly from this point is shown on Figure 14; however, extreme caution must be exercised in removing Piston Return Spring Cap. The reason is that the Piston Return Springs are preloaded at manufacture. By backing off the Screws evenly on all sides, Spring Cap can be loosened to a point where the springs are in a state of rest (nonloaded).

2. Assembly

Assembly is the reverse of disassembly. To insure a good seal with Piston Packing, special care must be taken to make sure that the lips of the seal rings are oriented downward toward Piston. The shaft is chamfered as indicated in Figure 14 to facilitate the assembly of the packing.

SECTION VII TROUBLESHOOTING

TROUBLE	PROBABLE CAUSE	REMEDY
A. Motor won't start with switch on.	1. Wall fuses burned out or loose connections.	1. Check fuses and all wiring connections.
	2. Motor burned out.	2. Replace motor.
B. No downward movement of beam when switch is tripped.	1. Trip plunger not contacting micro-switch.	1. Check switch operation and replace if defective.
	2. Solenoid vent valve not actuated.	2. Valve stuck or broken. Repair or replace.
	3. No current reaching solenoid of vent valve.	3. Check voltage readings at panel terminals 8, 12 and at solenoid with volt ohmmeter.
	4. Oil level in sump too low.	4. Check oil and add as required.
	5. Strainer in sump clogged.	5. Remove strainer and clean. Replace if defective.
C. Erratic cutting.	1. Loose wiring connection.	1. Check all wiring connections.
	2. Pump intake strainer partially clogged.	2. Remove and clean thoroughly.
	3. Faulty function of control circuit.	3. Check out control panel as described in Section V, Para. D.
	4. Safety stop spacers too high.	4. Check and readjust for heaviest cutting and lowest die.
D. Stiff swinging beam.	1. Dry spindle.	1. Lubricate spindle. See Section IV, Paragraph A.
	2. Machine not level.	2. Accurately level machine.
	3. Connecting nut halves out of alignment.	3. Realign connecting nut.

TROUBLE	PROBABLE CAUSE	REMEDY
	4. Dry thrust bearing.	4. Remove, wash and pack with grease.
	5. Thrust bearing damage.	5. Remove and replace.
E. Stalling or cutting out.	1. Overload heaters of improper rating.	1. Replace with correct heaters for motor amperage rating.
	2. Pump intake strainer partially clogged.	2. Remove and clean thoroughly.
F. Machine noisy.	1. Loose cover panels.	1. Tighten all cover panel screws.
	2. Loose beam spindle cap and/or handwheel.	2. Tighten all screws and nuts.
	3. Pump airbound.	3. Check oil level in sump and all hydraulic connections for tightness.

SECTION VIII PARTS CATALOG

TABLE OF CONTENTS AND PARTS CATALOG USAGE

CONTENTS

PARTS CATALOG USAGE

The parts catalog is in a computerized format.

The Part(s) Ordering Instructions should be read BEFORE attempting to order parts.

The List of Mechanisms is used to find the correct catalog area in which a part is listed.

The catalog format is: The Mechanism Title which is underlined. The title is followed by individual parts or a subassembly number and then the individual parts within the subassembly. The next subassembly and its parts, etc. until all parts in the particular mechanism are listed.

The Manufacturers Listing is a cross-reference listing between USM Part Numbers and the Manufacturer and Manufacturer's Part Number of purchased items.

The Numerical Index is the last listing in the catalog. It includes the Figure Number in the manual in which a part is shown and called out.

USM HYDRAULIC CUTTING MACHINE - MODEL B2 (SYMBOL HCM)

READ THESE SPECIAL INSTRUCTIONS BEFORE ORDERING PARTS

AS IT IS NOT PRACTICABLE, OWING TO THE SMALL SIZE OF SOME OF THE PARTS, TO MARK THE INITIAL LETTERS ON THEM, IT IS BEST TO ALWAYS CONSULT YOUR CATALOG AND OBTAIN THE FULL NUMBER BEFORE ORDERING DUPLICATE PARTS --- THE NUMBER MARKED UPON THE BROKEN PART SERVING TO IDENTIFY IT IN THE CATALOG. COIL SPRINGS HAVE NO NUMBERS STAMPED ON THEM.

WRITING THE ORDER

WHEN THE PART HAS THE SAME SYMBOL AS THE MACHINE FOR WHICH IT IS ORDERED, THE SYMBOL SHALL BE USED AS A PREFIX.

EXAMPLE: 1-ORL-523A+

IF THE PART IS "BORROWED" FROM ANOTHER MACHINE, THEN THE SYMBOL OF THE MACHINE FROM WHICH IT IS BORROWED SHALL BE USED AS A PREFIX AND THE SYMBOL OF THE MACHINE IT IS TO BE USED ON SHALL FOLLOW THE PART NUMBER.

EXAMPLE: 3-GUS-53 USL

LETTER SUFFIXES FOR STANDARDIZED PARTS MUST BE INCLUDED AS A PART OF THE STANDARDIZED PART NUMBER. IN SOME INSTANCES THE PART NUMBER WILL NOT INCLUDE A SUFFIX IN THE PART NUMBER DESIGNATION.

EXAMPLE: 1-SPGL-1301S OR 1-SL-7K17

NOTE

PARTS WITH THE DESIGNATION "DO NOT SHIP" MAY BE PURCHASED FOR REPLACEMENT PURPOSES BY ORDERING THE BASE NUMBER.

EXAMPLE: HCM-554 UNIT, TRIP SLIDE - UNIT ASSEMBLY
HCM-503 MOUNT, TRIP SLIDE (DO NOT SHIP)
HCM-555 COVER, TRIP SLIDE (DO NOT SHIP)

USM HYDRAULIC CUTTING MACHINE - MODEL B2 (SYMBOL HCM)

INDEX OF MECHANISMS

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
						USM HYDRAULIC CUTTING MACHINE - MODEL B2 (SYMBOL HCM)	
						BASE AND TABLE PARTS	
03		HCM-	772			BASE	1
03		HCM-	779			PAN, CYLINDER DRIP	1
03		HCM-	531	A		TABLE (FOR 40" X 20" PAD)	1
03		HCM-	530	A		TABLE (FOR 36" X 18" PAD) *	1
03		HCM-	560			TABLE (FOR 40" X 20" PAD) *	1
03		HCM-	559			TABLE (FOR 36" X 18" PAD) *	1
03		HCM-	796			LEG, TABLE (FRONT)	2
03		NL-	34M	3		NUT, TABLE LEG - FRONT (HEX., 1"-14UNF X 7/8")	2
03		WL-	515	T		LOCKWASHER, NUT (POSITIVE,1"X1-5/8")	2
03		SL-	21H	31		SCREW, TABLE LEG (HEX. SOC. HD. CAP, 1/2"-13UNC X 3")	4
03		WL-	6099	T		WASHER, TABLE LEG SCREW	4
03		WL-	1862	T		LOCKWASHER, SCREW (POSITIVE,1/2"X11/64"X1/8")	4
03		HCM-	774			LEG, REAR	1
03		HCM-	778			ROD, REAR LEG	1
03		HCM-	648			SPACER, REAR LEG	1
03		NL-	30M	3		NUT, TABLE LEG (HEX., 3/4"-16UNF X 7/8")	4
03		WL-	513	T		LOCKWASHER, TABLE (POSITIVE,3/4"X1-1/4")	2
03		HCM-	621			COVER, SUMP	1
03		HCM-	564	A		GASKET, BASE COVER (SET)	1
03		HCM-	785			BRACKET, CONTROL ENCLOSURE	1
03		XH200	C23			SCREW, BASE COVER (HEX. HD. CAP, 5/16"-18UNC X 3/4")	6
03		WL-	3007	T		WASHER, ENCLOSURE BRACKET	3
03		SL-	19H	11		SCREW, BASE COVER (UNDERNEATH REAR MOTOR BRACKET) (HEX. SOC. HD. CAP, 7/16"-14UNC X 3/4")	2
03		SL-	19H	13		SCREW, BASE COVER (HEX. HD. CAP, 7/16"-14UNC X 7/8")	5
						* NOT SENT UNLESS ORDERED	

USM HYDRAULIC CUTTING MACHINE - MODEL B2 (SYMBOL HCM)

LEVEL 1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
03	HCM-691				ADAPTER, FILLER	1
03	THCM-67				FILLER, BREATHER	1
03	UAL-363				GASKET, OIL FILLER	2
03	SL-11H7				SCREW, OIL FILLER (HEX. HD. CAP, #10-24UNC X 1/2")	3
03	HCM-624				RING, INTAKE SEAL	1
03	SL-13D15				SCREW, RING (RD. HD. MACH., #10-24UNC X 1/2")	8
03	HCM-515				SPACER, PANEL	6
03	HCM-787				PANEL, FRONT (MACHINE SAFETY PART)	1
03	HCM-777				PANEL, SIDE (RIGHT) (MACHINE SAFETY PART)	1
03	HCM-776				PANEL, SIDE (LEFT) (MACHINE SAFETY PART)	1
03	SL-19D15				SCREW, PANEL (RD. HD. MACH., 5/16"-18UNC X 1/2")	6
03	WL-509T				LOCKWASHER, PANEL SCREW (POSITIVE,5/16"X9/16")	6
					CYLINDER PARTS	
03	HCM-645				CYLINDER	1
03	SL-25H23				SCREW, CYLINDER (HEX. SOC. HD. CAP, 3/4"-10UNC X 2")	4
03	WL-2022T				LOCKWASHER, CYLINDER SCREW (LOCK,3/4"X.981"X.188")	4
03	HCM-527A				PISTON	1
03	HCM-526				RING, PISTON	3
03	HCM-566				BUFFER, PISTON	1
03	HCM-533				PACKING, PISTON	1
03	HCM-507				RETAINER, PISTON PACKING	1
03	SL-15H13				SCREW, RETAINER (HEX. SOC. HD. CAP, 5/16"-18UNC X 7/8")	4
03	WL-1941T				LOCKWASHER, RETAINER SCREW (LOCK,5/16"X27/64"X.078")	4
03	SPGL-4026S				SPRING, PISTON RETURN - INSIDE	1
03	SPGL-4025S				SPRING, PISTON RETURN - OUTSIDE	1
03	HCM-721				CAP, PISTON RETURN SPRING	1
03	HCM-789				DECAL, WARNING (MACHINE SAFETY PART)	1
03	SL-9016V				SCREW, PISTON CAP - LONG	2
03	SL-15H17				SCREW, PISTON CAP - SHORT (HEX. SOC. HD. CAP, 5/16" 18UNC X 1-1/4")	6

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
03		WL-	19	41T		LOCKWASHER, CAP SCREW (LOCK,5/16"X27/64"X.078")	8
03						SCREW, SPINDLE ADJUSTING (SEE HCM-183A)	
03		AE	TA-	225		SHIM, SPINDLE ADJUSTING SCREW (QUANTITY AS REQUIRED)	
03		HCM-	60			BEARING, PISTON THRUST	1
03		HCM-	388	+		NUT, PISTON CONNECTING - ASSEMBLED	1
04			SL-	14H	18	SCREW, NUT (HEX. SOC. HD. CAP, 5/16"-24UNF X 1-1/2")	4
04			WL-	19	41T	LOCKWASHER, NUT SCREW (LOCK,5/16"X27/64"X.078")	4
						STROKE CONTROL PARTS	
03		HCM-	554			UNIT, TRIP SLIDE - UNIT ASSEMBLY	1
04			HCM-	503		MOUNT, TRIP SLIDE (DO NOT SHIP)	1
04			HCM-	555		COVER, TRIP SLIDE (DO NOT SHIP)	1
03		XH	200	E1		SCREW, TRIP SLIDE UNIT (HEX. HD. CAP, 1/4"-20UNC X 1/2")	2
03		WL-	13	96T		LOCKWASHER, TRIP SLIDE SCREW (POSITIVE,1/4"X15/32")	2
03		HCM-	556			BAR, TRIP SLIDE - UNIT ASSEMBLY	1
04			HCM-	506		BAR, TRIP SLIDE (DO NOT SHIP)	1
04			HCM-	505		ACTUATOR, TRIP SLIDE BAR (DO NOT SHIP)	1
04			HCM-	557		GUIDE, TRIP ROD (DO NOT SHIP)	1
03		HCM-	558			COVER, TRIP SLIDE (ADJUSTABLE)	1
03		SL-	13H	7		SCREW, COVER (HEX. SOC. HD. CAP, 1/4"-20UNC X 1/2")	2
03		WL-	300	6T		WASHER, COVER SCREW	2
03		WL-	13	96T		LOCKWASHER, COVER SCREW (POSITIVE,1/4"X15?32")	2
03		NL-	17M	1		NUT, COVER SCREW (HEX., 1/4"-20UNC X 7/16")	2
03		SPGL-	38	S		SPRING, TRIP ROD (TENSION,3/8"X4-5/8")	1
03		HCM-	276			ROD, TRIP - UNIT ASSEMBLY	1
04			HCM-	277		COLLAR, ROD (DO NOT SHIP)	1
03		NL-	16U	1		STOP, TRIP ROD (HEX., 1/4"-28UNF X 5/32")	2
03		HCM-	278			END, TRIP SLIDE CABLE	1
03		HCM-	279			CABLE, FLEXIBLE	1

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
03		SL-	1	1	S5	SCREW, CABLE (HEX. SOC. SET, FLAT PT., #10-24UNC X 3/16")	1
03		NL-	1	6	U1	LOCKNUT, CABLE END (HEX., 1/4"-28UNF X 5/32")	2
03		HCM-	2	8	0	TUBE, CABLE	1
03		HCM-	2	8	1	FERRULE, CABLE TUBE	2
03		HCM-	2	8	2	HANDWHEEL, CABLE	1
04			SL-	1	0N14	SCREW, HANDWHEEL SET (HEX. SOC. SET, CUP PT., #10-32UNF X 1/2") (REPLACEMENT PART FOR HCM-282)	
03		HCM-	8	0	2	BRACKET, STROKE CONTROL CABLE	1
03						SCREW, LEG (SEE SL-21H31)	
						BEAM SPINDLE PARTS	
03		HCM-	3	1	2A	SPINDLE, BEAM - UNIT ASSEMBLY	1
04			HCM-	1	84B	BLANK, SPINDLE NUT (DO NOT SHIP)	1
03		HCM-	1	8	3A	SCREW, SPINDLE ADJUSTING	1
03						SHIM, SPINDLE ADJUSTING SCREW (SEE AETA-225)	
03		HCM-	4	8	A+	BLOCK, SPINDLE BUMPER - ASSEMBLED	1
04			HCM-	4	6	BUMPER, SPINDLE	2
03		XH	20	0	F60	SCREW, BLOCK (HEX. HD. CAP, 3/8"-24UNF X 2-1/4")	2
03		HCM-	4	0	0	CAP, SPINDLE	1
03		PLU-	5	9	2-1/4"	OILER, SPINDLE CAP	1
03		SL-	1	8	H14	SCREW, CAP (HEX. SOC. HD., 7/16"-20UNF X 1")	5
03		HCM-	1	9	9	ROD, SPINDLE ADJUSTING	1
03		HCM-	2	4	3	HANDWHEEL, ROD	1
03		USA-	7	1		KEY, HANDWHEEL	1
03		GR-	2	6	6	BALL, HANDWHEEL LOCKING	1
03		XH	60	4	B9	LOCKNUT, HANDWHEEL (HEX., 5/8"-18UNF X 3/8")	1
03		WL-	3	0	12T	WASHER, ROD HANDWHEEL SPRING	1
03		WL-	5	1	2T	LOCKWASHER, HANDWHEEL NUT (POSITIVE,5/8"X1-1/8")	1
03		SPGL-	3	5	8S	SPRING, LOCKING BALL (COMPRESSION,23/64"X1-1/16")	1
03		PCL-	4	9	4	FITTING, SPINDLE PLUG (UPPER)	1
03		PCL-	4	9	4	FITTING, SPINDLE PLUG (LOWER)	1

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
						SWINGING BEAM PARTS	
03		HCM-	80	4		BEAM, SWINGING (18" X 31") - COMPLETE	1
04			HCM-	263		BEAM, SWINGING (18" X 31") (DO NOT SHIP)	1
04			HCM-	795		PLATE, BEAM COVER	1
04			XH2	04A31		SCREW, COVER PLATE (HEX. SOC. BUTTON HD., 1/4"-20UNC X 3/8")	2
04			HCM-	216		FACE, STRIKING - COMPLETE	1
05				HCM-	215A	FACE, STRIKING	1
05				ICM-	1369A	SCREW, STRIKING FACE	22
05				HCM-	205	NUT, SCREW	22
04			HCM-	803		PLATE, BEAM WARNING (MACHINE SAFETY PART)	1
04			UPR	A/D32/ABS		RIVET, PLATE "POP"	4
03		HCM-	80	5		BEAM, SWINGING (13" X 28-1/2") - COMPLETE *	1
04			HCM-	201A		BEAM, SWINGING (13" X 28-1/2") (DO NOT SHIP)	1
04			HCM-	795		PLATE, BEAM COVER	1
04			XH2	04A31		SCREW, COVER PLATE (HEX. SOC. BUTTON HD., 1/4"-20UNC X 3/8")	2
04			HCM-	206		FACE, STRIKING - COMPLETE	1
05				HCM-	204	FACE, STRIKING	1
05				ICM-	1369A	SCREW, STRIKING FACE	10
05				HCM-	205	NUT, SCREW	10
04			HCM-	803		PLATE, BEAM WARNING (MACHINE SAFETY PART)	1
04			UPR	A/D32/ABS		RIVET, PLATE "POP"	4
03		HCM-	80	6		BEAM, SWINGING (13" X 31") - COMPLETE *	1
04			HCM-	207A		BEAM, SWINGING (13" X 31") (DO NOT SHIP)	1
04			HCM-	795		PLATE, BEAM COVER	1
04			XH2	04A31		SCREW, COVER PLATE (HEX. SOC. BUTTON HD., 1/4"-20UNC X 3/8")	2
04			HCM-	211		FACE, STRIKING - COMPLETE	1

* NOT SENT UNLESS ORDERED

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
05					HCM-209A	FACE, STRIKING	1
05					ICM-1369A	SCREW, STRIKING FACE	10
05					HCM-205	NUT, SCREW	10
04			HCM-803			PLATE, BEAM WARNING (MACHINE SAFETY PART)	1
04			UPRA/D32/ABS			RIVET, PLATE "POP"	4
03		HCM-807				BEAM, SWINGING (24" X 31") - COMPLETE *	1
04			HCM-218A			BEAM, SWINGING (24" X 31") (DO NOT SHIP)	1
04			HCM-795			PLATE, BEAM COVER	1
04			XH204A31			SCREW, COVER PLATE (HEX. SOC. BUTTON HD., 1/4"-20UNC X 3/8")	2
04			HCM-221			FACE, STRIKING - COMPLETE	1
05				HCM-220		FACE, STRIKING	1
05				ICM-1369A		SCREW, STRIKING FACE	22
05				HCM-205		NUT, SCREW	22
04			HCM-563			FACE, STRIKING - LARGE - COMPLETE *	1
05				HCM-561		FACE, STRIKING - LARGE	1
05				HCM-562		SCREW, STRIKING FACE	22
05				HCM-205		NUT, SCREW	22
04			HCM-803			PLATE, BEAM WARNING (MACHINE SAFETY PART)	1
04			UPRA/D32/ABS			RIVET, PLATE "POP"	4
03		HCM-627				SWITCH, BEAM SIDE SAFETY (TWO HAND TRIP) MECHANICAL - COMPLETE (13" & 18" BEAMS) (MACHINE SAFETY PART)	1
04			HCM-596			ROD, SWITCH MOUNTING BRACKET - SHORT	1
04			THCM-24			BRACKET, SWITCH MOUNTING	1
04			NL-1284K			LOCKNUT, BRACKET POSITIONING	1
04			NL-29U2			NUT, BRACKET RETAINING (HEX., 5/8"-11UNC X 3/8")	1
04			HCM-1251			SUB-PLATE, SWITCH	1
04			SL-13D15			SCREW, SUB-PLATE (RO. HD. MACH., #10-24UNC X 1/2")	2
04			XH604A5			LOCKNUT, SUB-PLATE SCREW (HEX., #10-24UNC X 11/64")	2

* NOT SENT UNLESS ORDERED

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
04			WL-		3004T	WASHER, SUB-PLATE SCREW	2
04			XE		332C2	SWITCH, SIDE TRIP (2PB)	1
04			SL-		9D19	SCREW, SWITCH (RO. HD. MACH., #6-32UNC X 3/4")	2
04			WL-		3002T	WASHER, SWITCH SCREW	2
04			XH		604A3	LOCKNUT, SWITCH SCREW	2
04			WL-		512T	LOCKWASHER, SWITCH MOUNTING ROD (POSITIVE,5/8" X1-1/8")	1
04			NL-		29U2	NUT, SWITCH MOUNTING ROD RETAINING (HEX., 5/8"-11UNC X 3/8")	1
04			HCM-		1253	PLUNGER, SWITCH OPERATING - SHORT	1
04			TCF-		496	RING, PLUNGER RETAINING	1
04			SPGL-		1676S	SPRING, PLUNGER (COMPRESSION,.333"X1-3/16")	1
04			HCM-		1254	BUTTON, PLUNGE OPERATING - UNIT ASSEMBLY	1
05				XH	650A21	INSERT, THREADED (DO NOT SHIP)	1
04			XH		400E66	SCREW, BUTTON (HEX. SOC. SET (PATCH) 1/4"-20UNC X 1/4")	1
03		HCM-			629	SWITCH, BEAM SIDE SAFETY (TWO HAND TRIP) MECHANICAL - COMPLETE (24" BEAM) (MACHINE SAFETY PART) *	1
04			HCM-		598	ROD, SWITCH MOUNTING BRACKET	1
04			THCM-		24	BRACKET, SWITCH MOUNTING	1
04			NL-		1284K	LOCKNUT, BRACKET POSITIONING	1
04			NL-		29U2	NUT, BRACKET RETAINING (HEX., 5/8"-11UNC X 3/8")	1
04			HCM-		1251	SUB-PLATE, SWITCH	1
04			SL-		13D15	SCREW, SUB-PLATE (RO. HD. MACH., #10-24UNC X 1/2")	2
04			XH		604A5	LOCKNUT, SUB-PLATE SCREW (HEX., #10-24UNC X 11/64")	2
04			WL-		3004T	WASHER, SUB-PLATE SCREW	2
04			XE		332C2	SWITCH, SIDE TRIP (2PB)	1
04			SL-		9D19	SCREW, SWITCH (RO. HD. MACH., #6-32UNC X 3/4")	2
04			WL-		3002T	WASHER, SWITCH SCREW	2
04			XH		604A3	LOCKNUT, SWITCH SCREW	2
04			WL-		512T	LOCKWASHER, SWITCH MOUNTING ROD (POSITIVE,5/8" X1-1/8")	1
04			NL-		29U2	NUT, SWITCH MOUNTING ROD RETAINING (HEX., 5/8"-11UNC X 3/8")	1

* NOT SENT UNLESS ORDERED

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
04			HCM-		1252	PLUNGER, SWITCH OPERATING	1
04			TCF-		496	RING, PLUNGER RETAINING	1
04			SPGL-		1676S	SPRING, PLUNGER (COMPRESSION,.333"X1-3/16")	1
04			HCM-		1254	BUTTON, PLUNGER OPERATING - UNIT ASSEMBLY	1
05				XH	650A21	INSERT, THREADED (DO NOT SHIP)	1
04			XH	400	E66	SCREW, BUTTON (HEX. SOC. SET. (PATCH) 1/4"-20UNC X 1/4")	1
03		GI	S-	22	96	PLUG, BUTTON	1
03		HCM-		61	4	STUD, BEAM CLAMP	2
03		SL-		23	H23	SCREW, BEAM (UPPER) (HEX. SOC. HD. CAP, 5/8"-11UNC X 2")	1
03		HCM-		32	5	WASHER, BEAM SCREW (UPPER)	1
03		HCM-		64	2	CLAMP, BEAM	1
03		NL-		43	M4	NUT, BEAM CLAMP (HEX., 1-1/2"-6UNC X 1-15/32")	2
03		WL-		207	4T	WASHER, CLAMP NUT	2
						BEAM FRONT TRIPPING PARTS	
03		HCM-		58	2	ROD, BEAM TRIPPING - UNIT ASSEMBLY	1
04			HCM-		111	BUTTON, TRIPPING ROD (DO NOT SHIP)	1
03		SPGL-		167	6S	SPRING, TRIPPING ROD (COMPRESSION,.333"X1-3/16")	1
03		HCM-		11	2	POST, TRIPPING ROD SUPPORT	1
03		WL-		47	7T	WASHER, POST HANDLE BEARING	1
03		SL-		17	N15	SCREW, SUPPORT POST (HEX. SOC. SET CUP PT., 3/8"-16UNC X 1/2")	1
03		HCM-		11	3	HANDLE, POST	1
03		UN-		30		RING, TRIPPING ROD RETAINING	1
03		HCM-		59	3	BRACKET, POST	1
03		SL-		15	H19	SCREW, BRACKET (HEX. SOC. HD. CAP, 5/16"-18UNC X 1-1/2")	2
03		WL-		365	T	WASHER, BRACKET SCREW	2
03		HCM-		298		DECAL, CAUTION (MACHINE SAFETY PART)	1
03						APPLY TO POST BRACKET - ONE HALF FROM TOP	
03						SWITCH, FRONT TRIP (SEE ED-11125)	
03						SCREW, SWITCH (SEE SL-9D23)	

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
						BEAM SAFETY STOP PARTS	
03		HCM-	327			STOP, BEAM SAFETY - COMPLETE (1/8" TO 1-3/16" SPACING) (MACHINE SAFETY PART) **	1
04			HCM-	326		STOP, BEAM SAFETY (TOP) - UNIT ASSEMBLY	1
05				PL-	3027P	PIN, BEAM SAFETY STOP (DO NOT SHIP)	1
04			HCM-	254		STOP, BEAM SAFETY - 1/16" THICK	1
04			HCM-	255		STOP, BEAM SAFETY - 1/8" THICK	8
04			SL-	13S9		SCREW, LOCATING PIN (HEX. SOC. SET, 1/4"-20UNC X 5/16")	1
03		HCM-	329			STOP, BEAM SAFETY - COMPLETE (1/8" TO 1-13/16" SPACING) (MACHINE SAFETY PART) **	1
04			HCM-	326		STOP, BEAM SAFETY (TOP) - UNIT ASSEMBLY	1
05				PL-	3027P	PIN, BEAM SAFETY STOP (DO NOT SHIP)	1
04			HCM-	254		STOP, BEAM SAFETY - 1/16" THICK	1
04			HCM-	255		STOP, BEAM SAFETY - 1/8" THICK	8
04			HCM-	328		STOP, BEAM SAFETY - 5/8" THICK	1
04			SL-	13S9		SCREW, LOCATING PIN (HEX. SOC. SET, 1/4"-20UNC X 5/16")	1
03		HCM-	331			STOP, BEAM SAFETY - COMPLETE (1/8" TO 2-15/16" SPACING) (MACHINE SAFETY PART) **	1
04			HCM-	326		STOP, BEAM SAFETY (TOP) - UNIT ASSEMBLY	1
05				PL-	3027P	PIN, BEAM SAFETY STOP (DO NOT SHIP)	1
04			HCM-	254		STOP, BEAM SAFETY - 1/16" THICK	1
04			HCM-	255		STOP, BEAM SAFETY - 1/8" THICK	8
						**ORDER MUST SPECIFY	

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
04			HCM-		328	STOP, BEAM SAFETY - 5/8" THICK	1
04			HCM-		330	STOP, BEAM SAFETY - 1-1/8" THICK	1
04			SL-		13S9	SCREW, LOCATING PIN (HEX. SOC. SET, 1/4"-20UNC X 5/16")	1
03		HCM-			394	STOP, BEAM SAFETY - COMPLETE (1-9/16" TO 4-5/8" SPACING) (MACHINE SAFETY PART) **	1
04			HCM-		393	STOP, BEAM SAFETY (TOP) - UNIT ASSEMBLY	1
05				PL-	2832P	PIN, BEAM SAFETY STOP (DO NOT SHIP)	1
04			HCM-		254	STOP, BEAM SAFETY - 1/16" THICK	2
04			HCM-		255	STOP, BEAM SAFETY - 1/8" THICK	8
04			HCM-		330	STOP, BEAM SAFETY - 1-1/8" THICK	3
04			SL-		13S9	SCREW, LOCATING PIN (HEX. SOC. SET, 1/4"-20UNC X 5/16")	1
						ALUMINUM STRIKING PLATES	
03		HCM-			246	PLATE, ALUMINUM CUTTING (36" X 18" X 3/8" THICK) (WITHOUT TAPE) *	1
03		HCM-			247	PLATE, ALUMINUM CUTTING (40" X 20" X 3/8" THICK) (WITHOUT TAPE) *	1
						HYDRAULIC PUMP PARTS	
03		XF			511A5	PUMP (9G.P.M.)	1
04			HCM-		771	KIT, PUMP CONVERSION (TO CHANGE 6G.P.M. PUMP TO 9G.P.M.)	
03		HCM-			660	ADAPTER, PUMP	1
03		XH			200C46	SCREW, ADAPTER (HEX. HD. CAP, 3/8"-16UNC X 1-1/4")	2
03		XM			211J5	BUSHING (PUMP SHAFT)	1
03		UAES-			515	SPLINE, COUPLING	2
03		UAES-			518	COUPLING (SEE FF10033 - FOR ASSEMBLY INSTRUCTIONS)	1
03		FF			10033	INSTRUCTIONS, INSTALLATION (FOR UAES-518)	1
03		XM			211J7	BUSHING (MOTOR SHAFT)	1
03		UIM-			3172	ADAPTER, PUMP INTAKE	1

* NOT SENT UNLESS ORDERED
**ORDER MUST SPECIFY

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
03		XF	148	F9		NIPPLE, PUMP INTAKE	1
03		HCM-	625			SEAL, INTAKE NIPPLE	1
03		HCM-	1050			FILTER, PUMP INTAKE	1
03		HCM-	716			GROMMET, ADAPTER	1
03		XF	176	B6		ADAPTER, PUMP (TO VALVE)	1
03		XF	158	A12		ELBOW, PUMP	1
03		HCM-	748			VALVE, RELIEF (MACHINE SAFETY PART)	1
03		HCM-	545			ELBOW, HOSE (TO CYLINDER)	1
03		XF	234	A7		ELBOW, HOSE (ON CYLINDER)	1
03		XF	100	G3-15X375		HOSE (TO CYLINDER)	1
03		HCM-	651			ELBOW, RELIEF VALVE TUBE (TO SUMP)	1
03		HCM-	623	A		TUBE, EXHAUST - UNIT ASSEMBLY	1
04			XF	295A10		NUT, EXHAUST TUBE	1
04			XF	296A10		SLEEVE, EXHAUST TUBE	1
04			XF	295A10		NUT, EXHAUST TUBE (REPLACEMENT PART FOR HCM-623A)	
04			XF	296A10		SLEEVE, EXHAUST TUBE (REPLACEMENT PART FOR HCM-623A)	
03		HCM-	715			GROMMET, TUBE	1
03		HCM-	650			CLAMP, TUBING	2
03		SL-	13H	17		SCREW, CLAMP (HEX. HD. CAP, 1/4"-20UNC X 1-1/4")	1
03		WL-	3006	T		WASHER, CLAMP SCREW	2
03		XH	603	A6		NUT, CLAMP SCREW (HEX., 1/4"-20UNC X 1/4")	1
03		UIM-	408			NIPPLE, SOLENOID VALVE	1
03						VALVE, SOLENOID (SEE HCM-794)	
03		TLA-	1083			PLUG, SOLENOID VALVE PIPE	1
03		XF	231	A8		ELBOW (IN SOL. VALVE)	1
03		HCM-	786			TUBE, SOLENOID VALVE - UNIT ASSEMBLY	1
04			XF	295A5		NUT, TUBE (DO NOT SHIP)	2
04			XF	296A5		SLEEVE, TUBE (DO NOT SHIP)	2
03		UIM-	1247			ELBOW, TUBE (90DG. X 37DG. FLARE, 3/8NPT X 9/16-18)	1
03		UAL-	592			ELBOW, CYLINDER DRAIN	1

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
03		HCM-	514			HOSE, CYLINDER DRAIN	1
03		UAL-	592			ELBOW, CYLINDER DRAIN (IN SUMP)	1
03		FF	9090			DIAGRAM, HYDRAULIC & COMPONENT LIST	1
						ELECTRICAL PARTS	
						CONTROL ENCLOSURE PARTS	
04		HCM-	782			ENCLOSURE, CONTROL	1
04		XH	200	E2		SCREW, ENCLOSURE (HEX. HD. CAP, 1/4"-20UNC X 5/8")	2
04		WL-	3006	T		WASHER, ENCLOSURE SCREW	2
04		XH	603	A6		NUT, ENCLOSURE SCREW (HEX., 1/4"-20UNC X 1/4")	2
04		XH	200	C21		SCREW, ENCLOSURE SIDE (HEX. HD. CAP, 5/16"-18UNC X 1/2")	1
04		WL-	3007	T		WASHER, SIDE SCREW	1
04		HCM-	783			PANEL, CONTROL ENCLOSURE	1
04						TRANSFORMER, CONTROL (SEE MOTOR DRIVE ED-14910)	
04						FUSE, FIBER TUBE - 1/2AMP. (1FU)(TO FOLLOW)	1
04		SL-	13	D7		SCREW, TRANSFORMER (SLOTTED RO. HD. MACH., #10-24UNC X 1/4")	4
04		WL-	3004	T		WASHER, TRANSFORMER SCREW	4
04						STARTER, MANUAL MOTOR (SEE MOTOR DRIVE XE711F1)	
04		SL-	13	D19		SCREW, MOTOR STARTER (SLOTTED RO. HD. MACH., #10-24UNC X 3/4")	2
04		WL-	3004	T		WASHER, STARTER SCREW	2
04		NL-	13	M1		NUT, STARTER SCREW (HEX., #10-24UNC X 1/8")	2
04		HCM-	784			BRACKET, MOTOR STARTER	2
04		SL-	13	D7		SCREW, STARTER BRACKET (SLOTTED RO. HD. MACH., #10-24UNC X 1/4")	4
04		ED-	6235			SOCKET, RELAY	3
04		SL-	9	D23		SCREW, SOCKET (SLOTTED RO. HD. MACH., #6-32UNC X 1")	6
04		ED-	14841			RELAY, CONTROL (1CR, 2CR, 3CR)	3
04		ED-	2709			BLOCK, TERMINAL (1TB)	1
04		SL-	9	D15		SCREW, TERMINAL BLOCK (SLOTTED RO. HD. MACH., #6-32UNC X 1/2")	2

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
04			XE315C3			PLATE, GROUND (MACHINE SAFETY PART)	1
04			UPRA/D32/ABS			RIVET, GROUND PLATE "POP"	4
04			ED-10655			PLATE, RATING	1
04			UPRA/D32/ABS			RIVET, RATING PLATE	4
04			XE315C4			PLATE, DANGER (MACHINE SAFETY PART) (APPLY ABOVE RATING PLATE ON CONTROL ENCLOSURE COVER)	1
04			UPRA/D32/ABS			RIVET, DANGER PLATE "POP"	4
04			HCM-1123			ARROW, STROKE CONTROL DIRECTIONAL	1
						BEAM ELECTRICAL PARTS	
04			ED-11125			SWITCH, FRONT TRIP (1PB)	1
04			SL-9D23			SCREW, TRIP SWITCH (RD. HD. MACH., #6-32UNC X 1")	2
04			WL-3002T			WASHER, TRIP SWITCH SCREW	2
04			XH604A3			LOCKNUT, TRIP SWITCH SCREW	2
04			HCM-577A			BRACKET, TRIP SWITCH	1
04			SL-9D15			SCREW, BRACKET (RD. HD. MACH., #6-32UNC X 1/2")	2
04			WL-1923T			LOCKWASHER, BRACKET SCREW (LOCK,.141"X.237"X.028")	2
04			LWL-363			LIST, LEAD WIRE - EXTERNAL WIRING - ASSEMBLY	1
05				XE170C3-338		WIRE, #16AWG, COPPER STRANDED, RED P.V.C. INSULATION	1
05				XE170D1-186		WIRE, #14AWG, COPPER STRANDED, BLACK P.V.C. INSULATION	1
05				XE101F7		TERMINAL, LOCKING FORK	44
05				ED-4321		TERMINAL, RING	10
05				XE101R12		TERMINAL, RING	2
05				XE101F8		TERMINAL, LOCKING FORK	4
04			HCM-811			CABLE, BEAM - ASSEMBLY (BEAM TO CONTROL ENCLOSURE) (CODE #2, #5, #7 GRD)	1

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
05				XE121D2-116		CABLE, 4 CONDUCTOR - AWG 14	1
05				ED-4318		TERMINAL, RING	2
05				XE101F8		TERMINAL, SPRING SPADE	6
04			HCM-723			BRACKET, CABLE	1
04			SL-17011			SCREW, BRACKET MOUNTING (RD. HD. MACH., 1/4"-20UNC X 3/8")	2
04			ED-6736			FITTING, STRAIN RELIEF (TABLE & BRACKET)	2
04			ED-3107			NUT, FITTING LOCKNUT	2
04			ED-3240			BUSHING, INSULATING	2
04			XE10883			FITTING, STRAIN RELIEF - 90DG. (CONTROL ENCLOSURE)	1
04			ED-3107			NUT, FITTING LOCKNUT	1
04			ED-3240			BUSHING, INSULATING	1
						STROKE CONTROL SWITCH PARTS	
04			ED-10302			SWITCH, STROKE LIMIT (1SW)	1
04			ED-3FPC24			CONDUIT, LEAD (SWITCH TO CONTROL ENCLOSURE)	1
04			ED-STCON3			CONNECTOR (SWITCH)	1
04			ED-90CON3			CONNECTOR (CONTROL ENCLOSURE)	1
04			ED-3240			BUSHING, INSULATING	1
04						LIST, LEAD WIRE ASSEMBLY (SEE LWL-363)	
						SOLENOID VALVE PARTS	
04			HCM-794			VALVE, SOLENOID - ASSEMBLY (1 SOL.) CODE #8 & #12	1
05				ED-3178		VALVE, SOLENOID (115 VOLT, A.C.)	1
05				XE101F7		TERMINAL	2
04			ED-3FPC12			CONDUIT, LEAD - VALVE TO CONTROL ENCLOSURE	1
04			ED-STCON3			CONNECTOR - VALVE	1
04			ED-90CON3			CONNECTOR - CONTROL ENCLOSURE	1
04			ED-3240			BUSHING, INSULATING	1
04			FF9089			ELEMENTARY WIRING DIAGRAM & ELECTRICAL COMPONENT LIST	1

LEVEL	1 & 2	3	4	5	PART NUMBER	NOMENCLATURE	QTY.
04			FF	9096		DIAGRAM, CONNECTION	1
						LUBRICANTS	
03						USM NO. 225 BCW OIL - 6 GALLONS	1
03						USM NO. 2 GPT8R PASTE - 2.8 OZ. TUBE	1
03						USM NO. X100CP OIL - 1 QUART	1
						LUBRICATION	
02						FOR OIL RESERVOIR, USE USM NO. 225 BCW OIL	
02						FOR BEAM SPINDLE CHAMBER & ELEVATING SCREW, USE USM NO. X100CP OIL	
02						FOR PISTON THRUST BEARING, USE USM NO. 2 GPT8R PASTE	
						MISCELLANEOUS PARTS	
03		NP-	4C	SR		PLATE, USM CORPORATE SYMBOL	1
03		UPR	A/0	32/ABS		RIVET, PLATE "POP"	4
03		NP-	239	8D1		PLATE, NAME (DOMESTIC-LEASE)	1
03		NP-	239	8DS1		PLATE, NAME (DOMESTIC-SALE)	1
03		UPR	A/0	32/ABS		RIVET, PLATE "POP"	4
03		TAC-	223			PLUG, BUTTON	1
03		HCM-	B2	/M3		MANUAL, OPERATING/SERVICE INSTRUCTION	1

MANUFACTURERS' CATALOG LISTING

ED-2709	HOWARD B. JONES CO. CAT. NO. 9-141 OR KALKA ELECTRIC CO. CAT. NO. 601-9
ED-3223	THOMAS & BETTS CO. CAT. NO. 2523
ED-3240	THOMAS & BETTS CO. CAT. NO. 222
ED-6235	ELECTRICAL SUPPLY CORP. AMPHENOL CAT. NO. 146-103-1004
ED-6736	GEORGE H. WAHN CO. CAT. NO. 2522
ED-10302	MICROSWITCH DIVISION, HONEYWELL REGULATOR CO. CAT. NO. BZE6-2RQ8
ED-11125	MICROSWITCH DIVISION, HONEYWELL REGULATOR CO. CAT. NO. BZ-2RDT
ED-12145	GENERAL ELECTRIC CO. CAT. NO. CR1062R10A
ED-14841	POTTER & BROMFIELD CO. CAT. NO. KRP11AG
ED-14910	GENERAL ELECTRIC CO. CAT. NO. 9T55Y42G2
ED-14911	GENERAL ELECTRIC CO. CAT. NO. 9T55Y62G2
ED-14912	GENERAL ELECTRIC CO. CAT. NO. 9T55Y82G2
GIS-2296	UNITED CARR FASTENER, INC. CAT. NO. SS48165
HCM-60	ATNA CAT. NO. 1402, MRC CAT. NO. 1103U OR SKF CAT. NO. 702U
HCM-279	S. S. WHITE INDUSTRIAL DIVISION CAT. NO. 250L57
HCM-526	KOPPERS CO., INC. CAT. NO. 14022
HCM-545	FLODAR CORP. CAT. NO. A2000-C-12
HCM-715	I. B. MOORE CORP. CAT. NO. 2277 (ATSM D:735 OR SAE STD. 10R (SC615) MATERIAL SPEC.)
HCM-716	I. B. MOORE CORP. CAT. NO. 2803 (ATSM D:735 OR SAE STD. 10R (SC615) MATERIAL SPEC.)
HCM-752	ARK-LESS (SERIES 3000, TYPE 1) CAT. NO. 3000M96M
TCF-496	WALDES TRUARC CAT. NO. 5133-25
THCM-67	BENDIX-WESTINGHOUSE AUTOMOTIVE DIVISION CAT. NO. 565914

MANUFACTURERS' CATALOG LISTING - CONT'D.

UAL-592	AEROQUIP CORP. CAT. NO. 2024-4-6
UIM-408	FLODAR CORP. CAT. NO. PF10-2
UIM-1247	FLODAR CORP. CAT. NO. A2000-C-6-6
UIM-3172	FLODAR CORP. CAT. NO. PF101-20-16
UN-30	FASTEX CORP. CAT. NO. 214-060307-00-2303
USA-71	WOODRUFF CO. CAT. NO. 6
XE108B3	THOMAS & BETTS CAT. NO. 2269
XE332C2	MICROSWITCH DIVISION, HONEYWELL REGULATOR CO. CAT. NO. 3MN1
XE711F1	GENERAL ELECTRIC CO. CAT. NO. CR1062R8B
XF158A12	FLODAR CORP. CAT. NO. PF20-12
XF176B6	FLODAR CORP. CAT. NO. R1100-12
XF231A8	FLODAR CORP. CAT. NO. A2000-C-6-2
XF234A7	FLODAR CORP. CAT. NO. RA2000-C-12
XF295A5	FLODAR CORP. CAT. NO. A18-6
XF296A5	FLODAR CORP. CAT. NO. A19-6
XF296A10	FLODAR CORP. CAT. NO. A19-16

LEVEL	1 & 2	3	4	5	PART NUMBER	MOTOR DRIVE PARTS MOTOR (NOT SENT UNLESS ORDERED). SPECIFY MOTOR RATING PLATE READING WHEN ORDERING NOMENCLATURE	ALL SERVICES	3 PHASE CYCLES & VOLTS 60 200	60 230	60 460	60 575	50 220 ØØ	50 380 ØØ	2 PHASE 60 230 ØØ	60 460 ØØ	1 PHASE 60 115	60 230	50 110 ØØ	50 220 ØØ	MACHINE OPTION	ONUMBER OPTION	OPTION CODE	PART CODE L	PART CODE R	CATALOG STATUS	ADOPT
02						MOTOR DRIVE PARTS																				
02						MOTORS MUST BE MOUNTED 90DG. CLOCKWISE SO AS TO HAVE VENT SLOTS ON THE BOTTOM																			
02																										
03		HCM-	749			MOTOR - ASSEMBLY (SPECIFY VOLTAGE)	1																			
04			HCM-	766		MOTOR, SPECIAL - 1-1/2HP-1725RPM-45PG FRAME (200/230/460-3-60) (1MTR)	1																			
04			HCM-	670		MOTOR, SPECIAL - 1-1/2HP-1725RPM-45PG FRAME (575-3-60) (1MTR)																				
04			HCM-	678		MOTOR, SPECIAL - 1-1/2HP-1425RPM-45PG FRAME (220/380-3-50) (1MTR)																				
04			HCM-	658		MOTOR, SPECIAL - 1-1/2HP-1725RPM-45PG FRAME (230/460-2-60) (1MTR)																				
04						FOR MOTOR LEADS, #T1, #T2, #T3, #9, #11 (SEE LWL-363)																			
04			ED-	FPC30		CONDUIT, LEAD	1																			
04			ED-	90CON4		CONNECTOR, CONDUIT - MOTOR END	1																			
04			ED-	90CON4		CONNECTOR, CONDUIT - ENCLOSURE END	1																			
04			ED-	3240		BUSHING, INSULATING	1																			
04			ED-	4321		TERMINAL, RING (CODE #1 & #10)	2																			
03		XH	200C	47		SCREW, MOTOR (HEX. HD. CAP, 3/8"-16UNC X 1-1/2")	4																			

ØØ = MADE TO ORDER BASIS

USM HYDRAULIC CUTTING MACHINE - MODEL B2 (SYMBOL HCM)

LEVEL	1 & 2	3	4	5	PART NUMBER	MOTOR DRIVE PARTS MOTOR (NOT SENT UNLESS ORDERED). SPECIFY MOTOR RATING PLATE READING WHEN ORDERING NOMENCLATURE	ALL SERVICES	3 PHASE CYCLES & VOLTS 60 200	60 230	60 460	60 575	50 220 ØØ	50 380 ØØ	2 PHASE 60 230 ØØ	60 460 ØØ	1 PHASE 60 115	60 230	50 110 ØØ	50 220 ØØ	MACHINE OPTION	ON NUMBER OPTION	OPTION CODE	PART CODE L	PART CODE R	CATALOG STATUS	ADOPT
03		WL-	30	08	T	WASHER, MOTOR SCREW	4																			
03		HCM-	65	99		BRACKET, MOTOR FRONT	1																			
03		HCM-	66	87		BRACKET, MOTOR REAR	1																			
03		HCM-	72	22		MOUNT, MOTOR	4																			
03		XH	20	0C	28	MOUNT, SCREW (HEX. HD. (PATCH) 5/16"-18UNC X 1-3/4")	4																			
03		NL-	19	M1		NUT, MOTOR SHOCK MOUNT (HEX., 5/16"-18UNC X 19/64") (TORQUE 100-130 LB. IN.)	4																			
03		HCM-	65	55		FLYWHEEL, MOTOR - UNIT ASSEMBLY (MACHINE SAFETY PART)	1																			
04			XM	21	85	BUSHING, MOTOR FLYWHEEL (DO NOT SHIP)	1																			
04			SL-	13	H15	SCREW, BUSHING (HEX. SOC. HD. CAP, 1/4"-20UNC X 1") (DO NOT SHIP)	3																			
04			WL-	13	96T	LOCKWASHER, SCREW (DO NOT SHIP)	3																			
03		XE	71	1F	1	STARTER, MANUAL MOTOR (M)		1	1	1	1	1	1													
03		ED-	12	14	5	STARTER, MANUAL MOTOR (M)								1	1											
03						HEATER, MOTOR		3	3	3	3	3	3	2	2											
03						G.E. CO. TYPE CR123--- HEATER TO BE SELECTED FROM CURRENT RATING STAMPED ON MOTOR AND HEATER CHART																			
03		ED-	14	91	1	TRANSFORMER, CONTROL POWER (T1) (575-3-60)																				
03		ED-	14	91	2	TRANSFORMER, CONTROL POWER (T1) (380-3-50)																				

ØØ = MADE TO ORDER BASIS

SEQUENCE NO.	LEVEL	1 & 2	3	4	5	PART NUMBER	MOTOR DRIVE PARTS MOTOR (NOT SENT UNLESS ORDERED). SPECIFY MOTOR RATING PLATE READING WHEN ORDERING NOMENCLATURE	SERVICES	3 PHASE CYCLES & VOLTS 60 200	60 230	60 460	60 575	50 220 øø	50 380 øø	2 PHASE 60 230 øø	2 PHASE 60 460 øø	1 PHASE 60 115	1 PHASE 60 230	1 PHASE 50 110 øø	1 PHASE 50 220 øø	MACHINE OPTION	ON PUMBER	OPTION	PART CODE L	PART CODE R	CATALOG STATUS	ADOPT	WHITE BULLETIN NO.
	03		E0	-1	4	910	TRANSFORMER, CONTROL POWER (T1) (200/230/460-3-60) (220-3-50) (230/460-2-60)	1																			

øø = MADE TO ORDER BASIS

THE FOLLOWING IS A KEY TO VARIOUS SYMBOLS FREQUENTLY USED IN CONJUNCTION WITH INDEX.

B.B. - BLUE BULLETIN

C.N. - COMPLETE OR COLLECTIVE NUMBER

C.T. - CONSULT TEXT BEFORE ORDERING

S.N. - SERIAL NUMBER PART

NUMERICAL INDEX OF PARTS

NUMERICAL INDEX OF PARTS

NUMERICAL INDEX OF PARTS

NUMERICAL INDEX OF PARTS

PART NO.	PAGE	FIGURE	KEY
HCM-1123	13		
HCM-1251	6,7	12	19
HCM-1252	8	5	2
HCM-1253	7	12	24
HCM-1254	7,8	5	1
HCM-B2/M3	15		
ICM-1369A	5,6	12	1
LWL-363	13,14,16		
NL-13M1	12		
NL-16U1	3,4	6	12
NL-17M1	3		
NL-19M1	17	6	11
NL-29U2	6,7	12	21
NL-30M3	1		
NL-34M3	1		
NL-43M4	8	12	13
NL-1284K	6,7	12	17
NP-4CSR	15		
NP-2398D1	15		
NP-2398DS1	15		
PCL-494	4		
PL-2832P	10		
PL-3027P	9		
PLU-592-1/4"	4	3	1
SL-9D15	12,13	12	32
SL-9D19	7		
SL-9D23	8,12,13	12	27
SL-10N14	4		
SL-11H7	2		
SL-11S5	4		
SL-13D15	2,6,7	7	14
SL-13D19	12		
SL-13D7	12		
SL-13H15	17		
SL-13H17	11		
SL-13H7	3		
SL-13S9	9,10		
SL-14H18	3	13	1
SL-15H13	2	14	5
SL-15H17	2		
SL-15H19	8	12	6
SL-17D11	14		
SL-17N15	8		
SL-18H14	4	13	13
SL-19D15	2		
SL-19H11	1		
SL-19H13	1		
SL-21H31	1,4		
SL-23H23	8	12	11
SL-25H23	2		
SL-9016V	2	14	14
SPGL-38S	3		
SPGL-358S	4	13	9
SPGL-1676S	7,8	12	22

NUMERICAL INDEX OF PARTS

NUMERICAL INDEX OF PARTS

SECTION IX ILLUSTRATIONS

Legend for Figure 1

Ref. No.	Description	Part No.
1	Stroke Control Cable Handwheel	HCM-282
2	Front Beam Tripping Rod (Actuates Front Trip Switch 1PB)	HCM-582 (ED-11125)
3	Spindle Adjusting Rod Handwheel	HCM-243
4	Beam Spindle Cap	HCM-400
5	Swinging Beam - Consult Parts Catalog	
6	Striking Face - Consult Parts Catalog	
7	Cutting Surfaces - Consult Parts Catalog	
8	Base and Table - Consult Parts Catalog	
9	Electrical Enclosure - See Figures 4 and 4A For Details	

Figure 1 - HCM-B2 - Right Front View

Legend for Figure 2

Ref. No.	Description	Part No.
1	Left Side Panel	HCM-776
2	(Top) Beam Safety Stop	HCM-326
	Beam Safety Stop 1/16" Thick	HCM-254
	Beam Safety Stop 1/8" Thick	HCM-255
	Beam Safety Stop 5/8" Thick	HCM-328
	Beam Safety Stop 1-1/8" Thick	HCM-330
3	Beam Side Safety Switch Plunger Button	HCM-1254
4	Beam Front Tripping Handle Post	HCM-113
5	Front Panel	HCM-787

Figure 2 - HCM-B2 - Left Front View

Legend for Figure 3

Ref. No.	Description	Part No.
1	Spindle Cap Oiler	PLU-592-1/4"
2	Retaining Nut Washer (2)	WL-2074T
3	Beam Clamp Retaining Nut (2)	NL-43M4
4	Beam Clamp Stud Lower (2)	HCM-614
5	Beam Clamp Lower (1)	HCM-642
6	Chamfer For Oil	---
7	Breather/Filler Cap	THCM-67
8	Electrical Enclosure - See Figures 4 and 4A For Details	
9	Right Side Panel	HCM-777

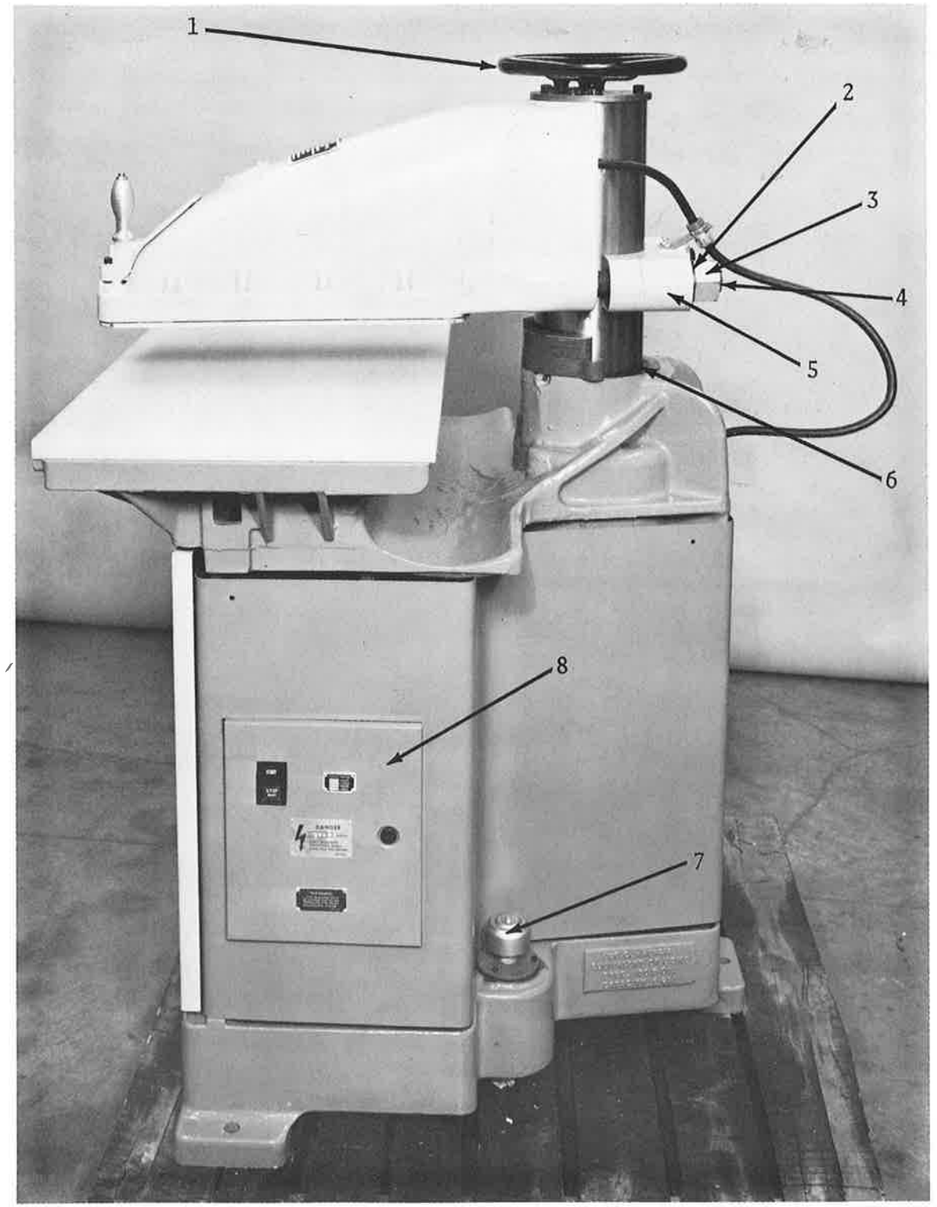


Figure 3 - HCM-B2 - Right Side View

Legend for Figures 4 and 4A

Ref. No.	Description	Part No.
1	Electrical Enclosure	HCM-782
2	Manual Motor Starter Nema Size Ø3 Pole Nema Size Ø4 Pole	XE711F1 ED-12145
3	Fuse (1FU)	To Follow
4	Terminal Block (1TB)	ED-2709
5	Control Relay (3CR)	ED-14841
6	Control Relay (2CR)	ED-14841
7	Control Relay (1CR)	ED-14841

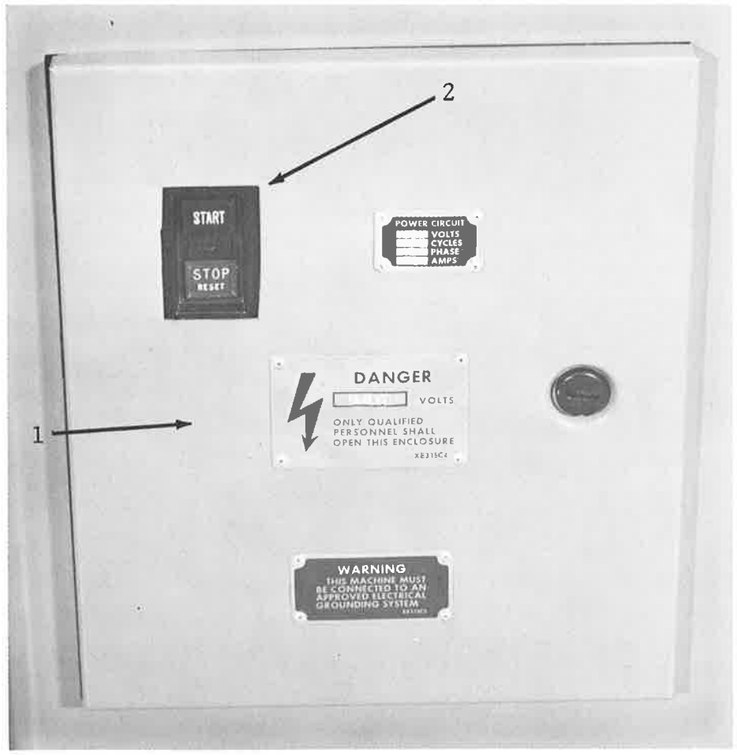


Figure 4 - HCM-B2 - Electrical Enclosure

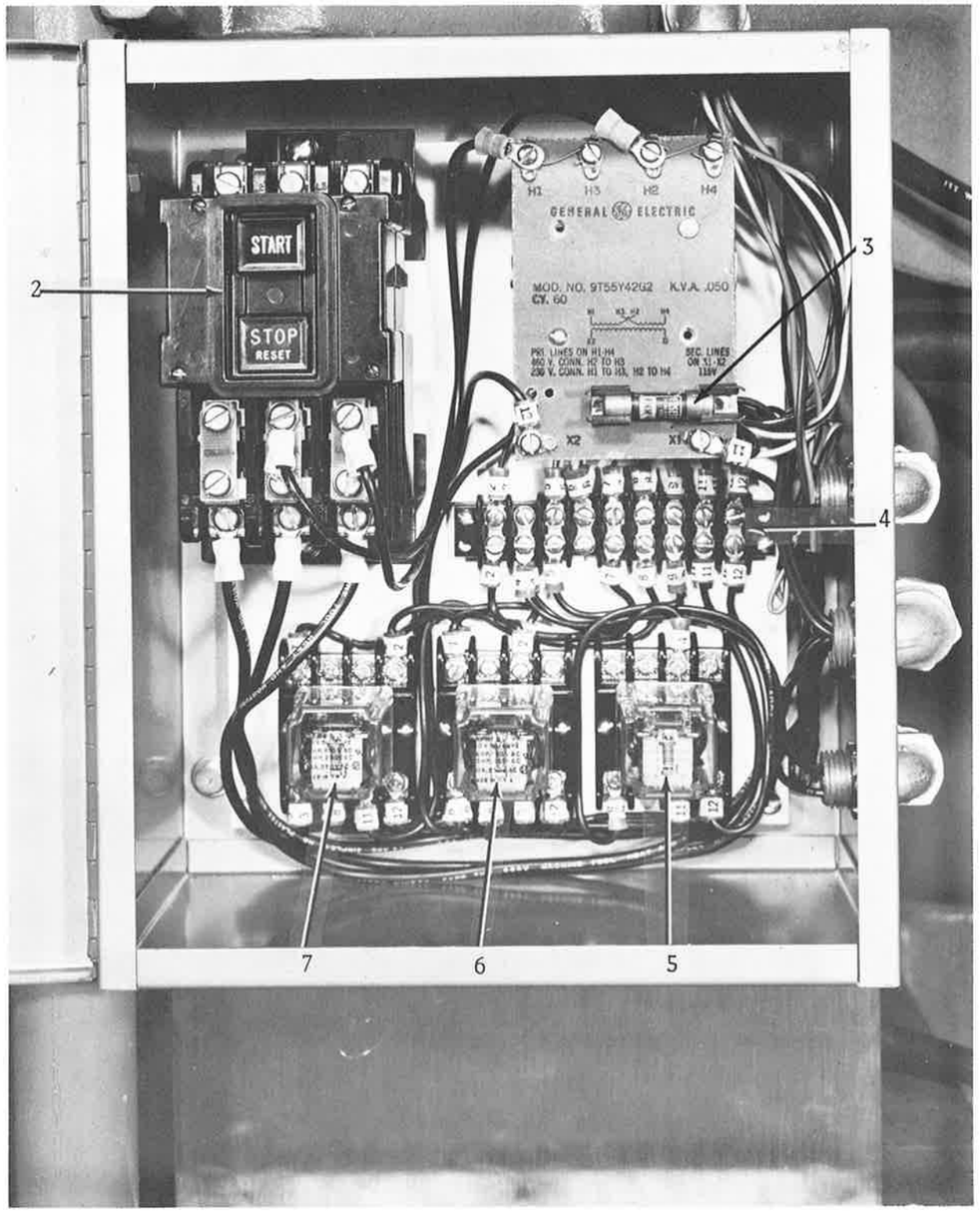


Figure 4A - HCM-B2 - Electrical Enclosure - Interior View

Legend for Figure 5

Ref. No.	Description	Part No.
1	Side Trip Switch Button	HCM-1254
2	Switch Operating Plunger	HCM-1252
	Plunger Retaining Ring	TCF-496
	Plunger Spring	SPGL-1676S
3	Side Trip Switch (2PB)	XE332C2
4	Front Tripping Rod Support Post Bracket	HCM-593
5	Front Trip Switch Bracket	HCM-577A
6	Front Trip Switch (1PB)	ED-11125
7	Striking Face - Consult Parts Catalog	

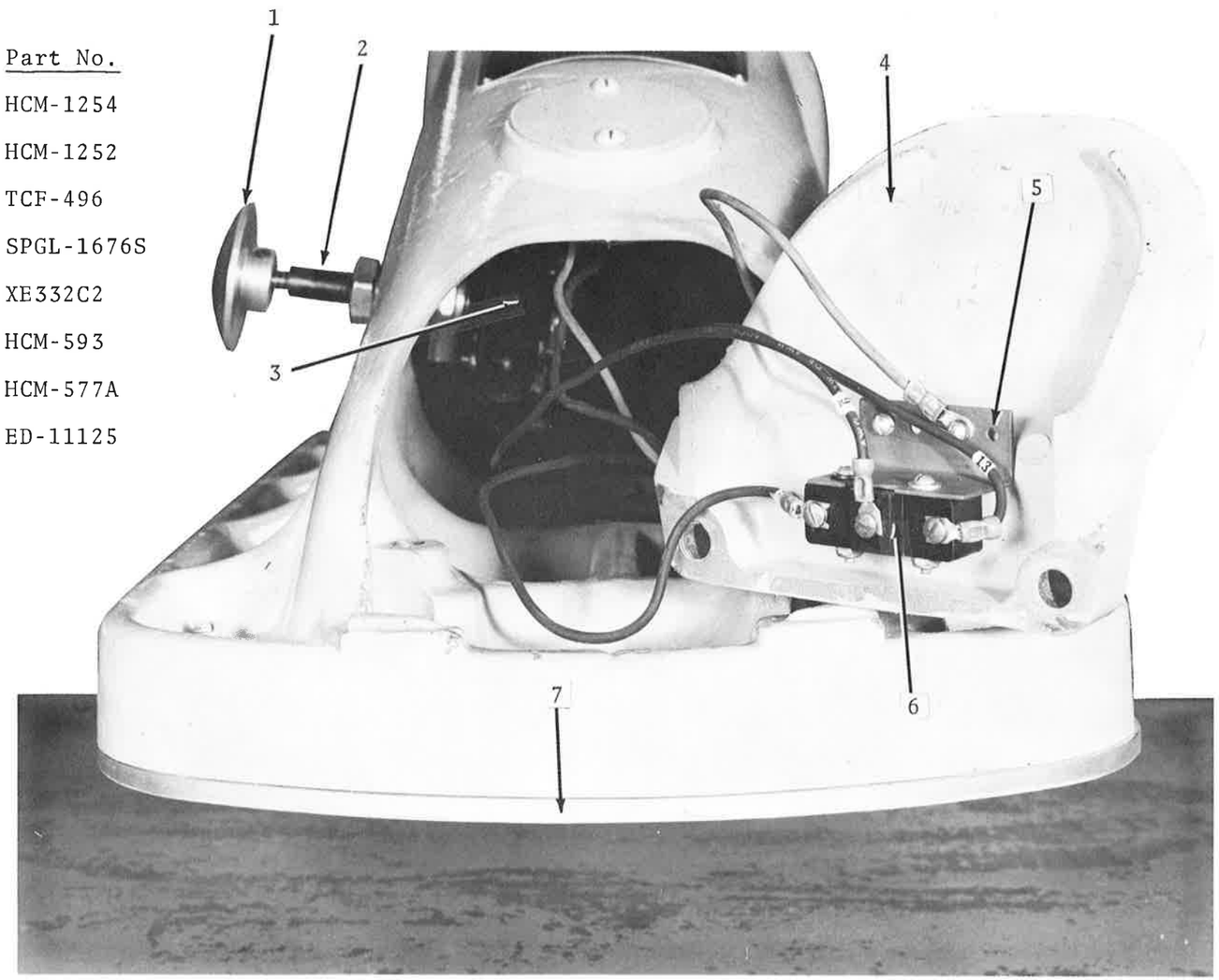


Figure 5 - HCM-B2 - Swinging Beam Components

Legend for Figure 6 - Stroke Limit Mechanism

Ref. No.	Description	Part No.
1	Stroke Limit Switch (1SW)	ED-10302
2	Trip Rod - Unit Assembly	HCM-276
3	Trip Slide Unit - Unit Assembly	HCM-554
4	Cylinder	HCM-645
5	Piston Packing Retainer	HCM-507
6	Piston Connecting Nut	HCM-388+
7	Relief Valve	HCM-748
8	Motor Flywheel - Assembled	HCM-655
	Motor Flywheel Bushing	XM211B5
9	Sump Cover	HCM-621
	Base Cover Gasket Set	HCM-564A
	Base Cover Screw (6)	XH200C23
10	Base	HCM-772
11	Motor Shock Mount Nut (Torque 100-130 inch pounds)	NL-19M1
12	Trip Rod Stop	NL-16U1

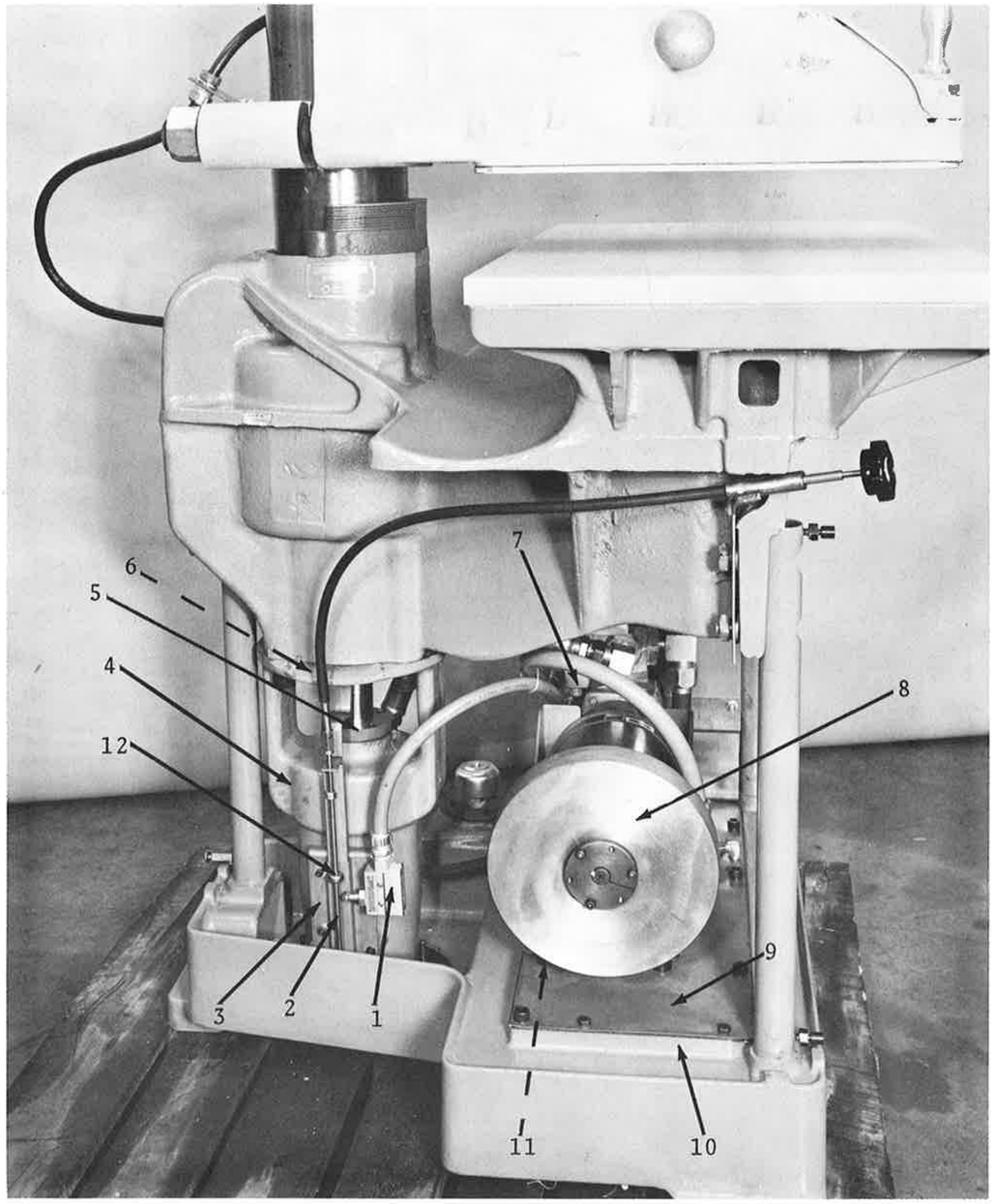


Figure 6 - HCM-B2 - Stroke Limit Mechanism

Legend for Figure 7 - Front View of Hydraulic Unit

Ref. No.	Description	Part No.
1	Exhaust Tube	HCM-623A
2	Tubing Clamp	HCM-650
3	Cylinder Drain Hose	HCM-514
4	Pump Coupling	UAES-518
5	Motor Front Bracket	HCM-659
6	Motor Shock Mount	HCM-722
7	Motor - Consult Parts Catalog	
8	Motor Flywheel - Assembled	HCM-655
9	Solenoid Valve Tube	HCM-786
10	Solenoid Valve - Assembled (1 SOL)	HCM-794
	Solenoid Valve 1 SOL	ED-3178
11	Relief Valve	HCM-748
12	Pump	XF511A5
13	Pump Intake Adapter	UIM-3172
14	Intake Seal Ring	HCM-624
	Ring Screw (8)	SL-13D15

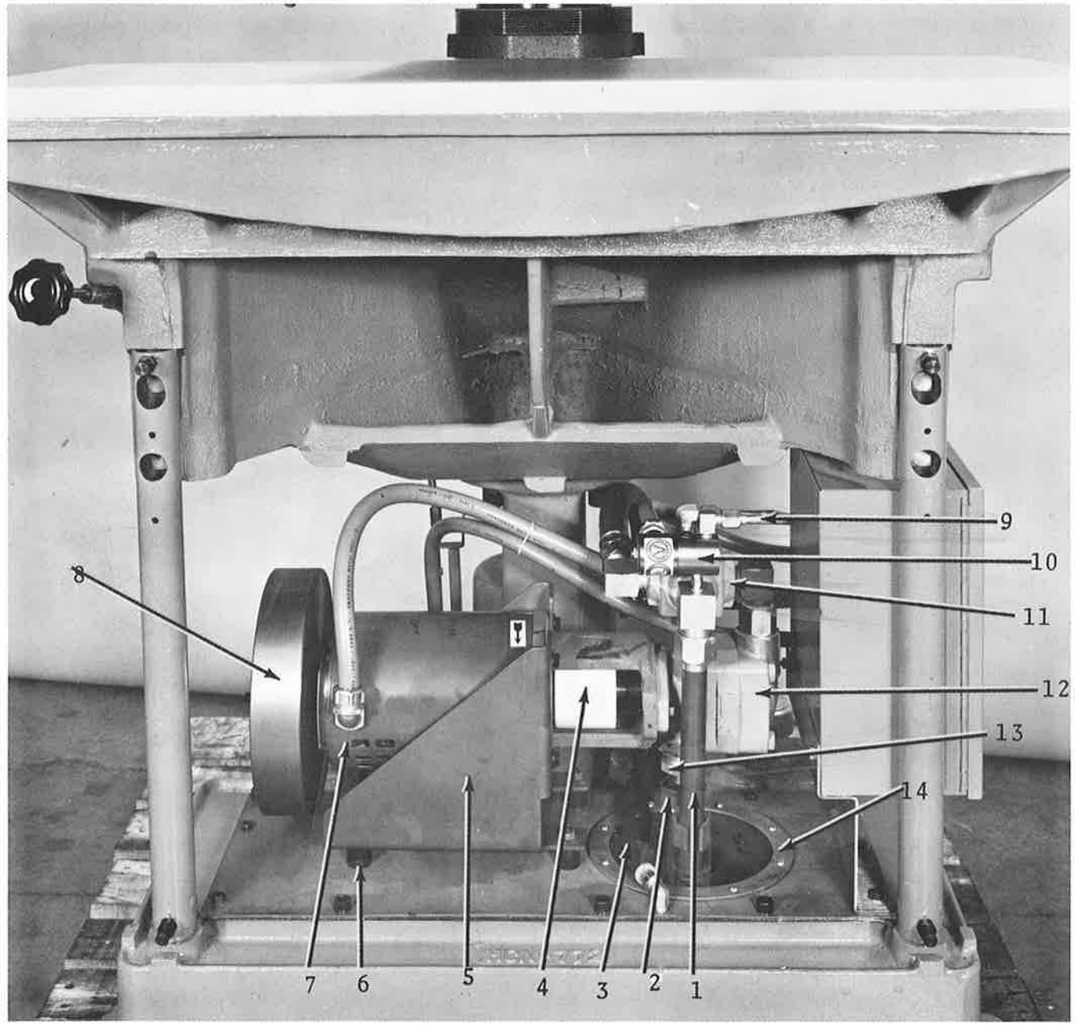


Figure 7 - HCM-B2 - Hydraulic Unit - Front View

Legend for Figure 8 - Spindle Bumper

Ref. No.	Description	Part No.
1	Spindle Bumper Block - Assembled	HCM-48A+
	Spindle Bumper	HCM-46
	Block Screw	XH200F60

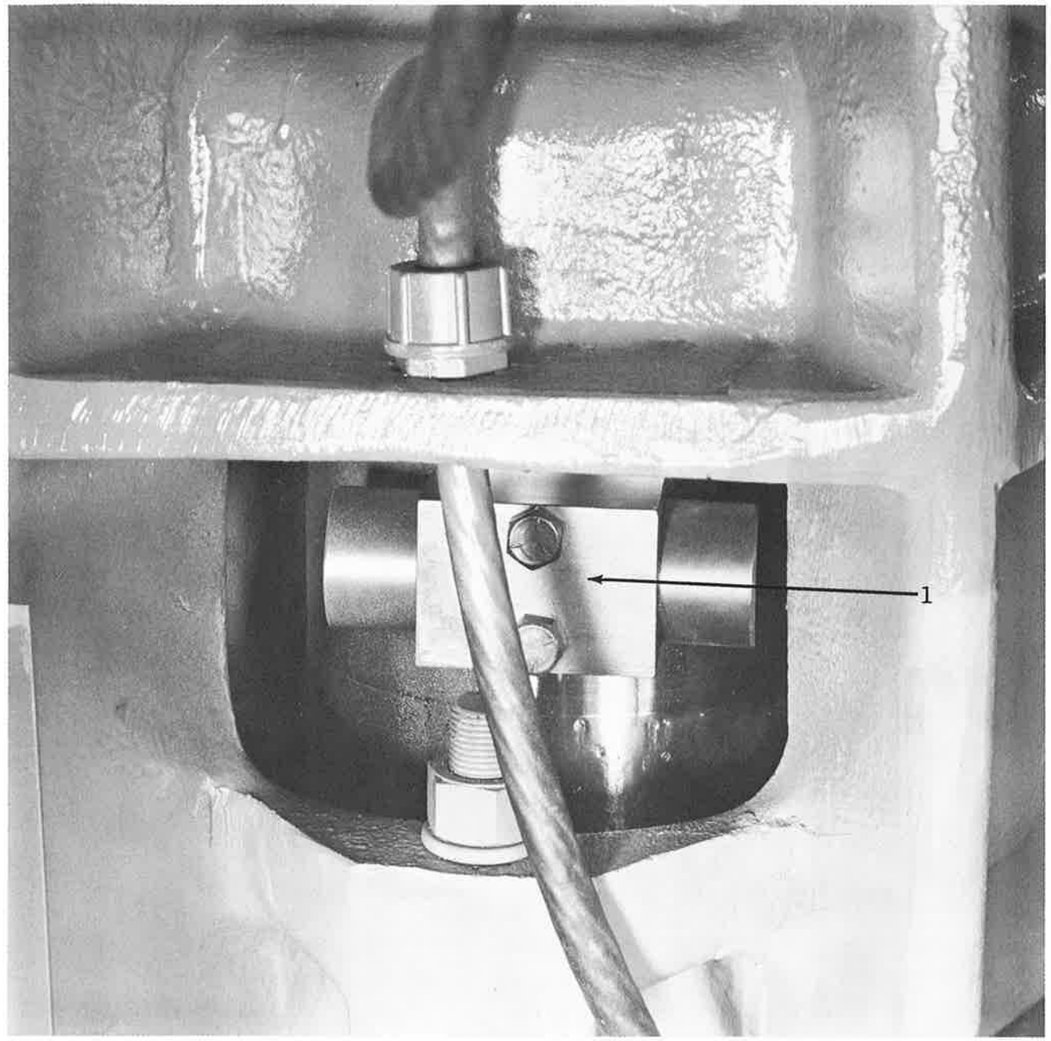
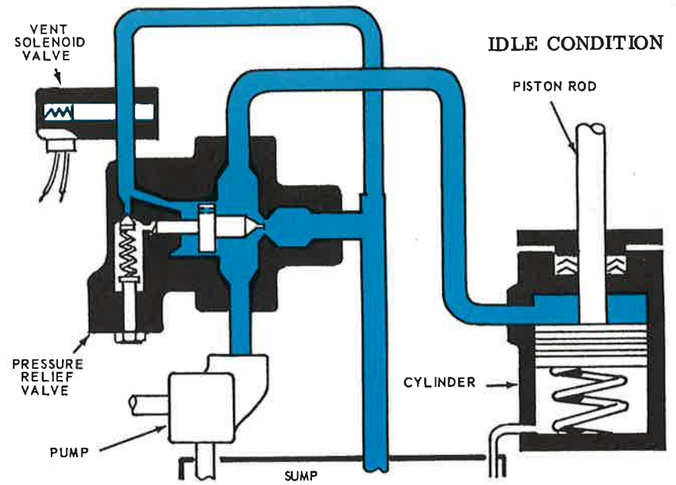


Figure 8 - HCM-B2 - Spindle Bumper Block



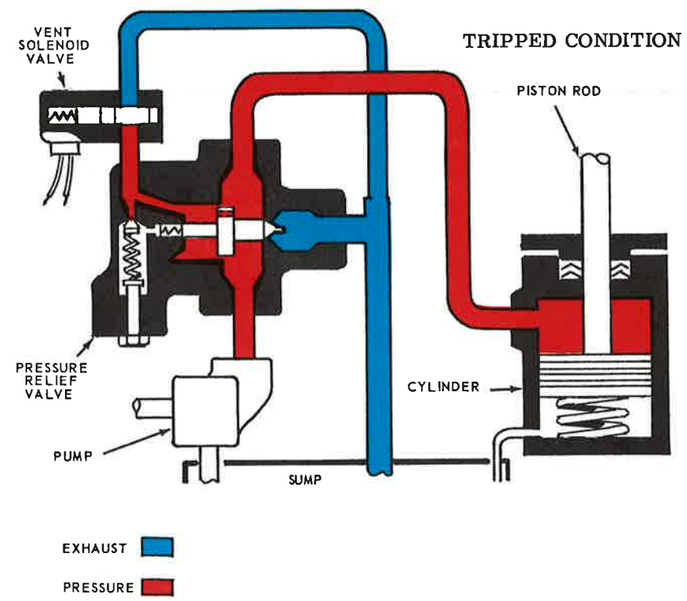


Figure 9 - Hydraulic Flow Diagram

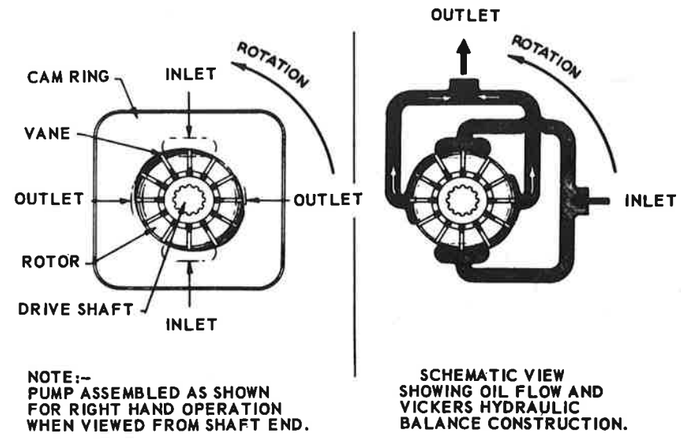


Figure 10 - HCM-B2 - Pump Flow Diagram

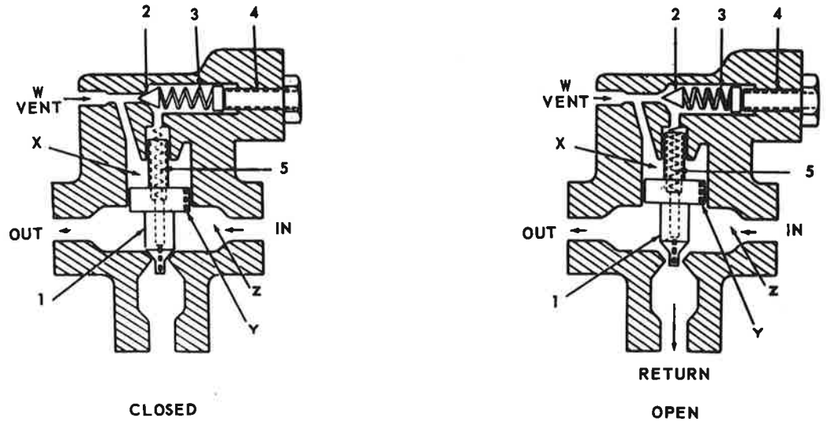


Figure 11 - HCM-B2 - Pressure Relief Valve

Legend for Figure 12

Ref. No.	Description	Part No.
1	Striking Face Screw	ICM-1369A
2	Striking Face (13"x28-1/2")	HCM-204
3	Post Bracket	HCM-593
4	Post Handle	HCM-113
5	Tripping Rod Support Post	HCM-112
6	Post Bracket Screw	SL-15H19
7	Beam Tripping Rod	HCM-582
8	Front Tripping Switch	ED-11125
9	Swinging Beam Complete (13"x28-1/2")	HCM-805
	(13"x31")	HCM-806
	(18"x31")	HCM-804
	(24"x31")	HCM-807
10	Beam Screw Washer (Upper)	HCM-325
11	Beam Screw (Upper)	SL-23H23
12	Retaining Nut Washer	WL-2074T
13	Beam Clamp Retaining Nut	NL-43M4
14	Beam Clamp Stud (Lower)	HCM-614
15	Beam Clamp (Lower)	HCM-642
16	Screw Insulating Nut	HCM-205
17	Bracket Retaining Nut	NL-1284K
18	Side Trip Switch	XE332C2
19	Switch Sub-Plate	HCM-1251
20	Switch Mounting Rod Lockwasher	WL-512T
21	Switch Mounting Rod Retaining Nut	NL-29U2
22	Plunger Spring	SPGL-1676S
23	Plunger Operating Button	HCM-1254
24	Switch Operating Plunger	HCM-1253
25	Switch Mounting Bracket Rod	HCM-598
26	Side Switch Mounting Bracket	THCM-24
27	Front Switch Mounting Screw	SL-9D23
28	Front Switch Mounting Screw Washer	WL-3002T
29	Front Tripping Switch Bracket	HCM-577A
30	Front Tripping Switch Screw Lock Nut	XH604A3
31	Front Bracket Screw Washer	WL-1923T
32	Front Bracket Screw	SL-9D15
33	Rod Retaining Ring	TCF-496

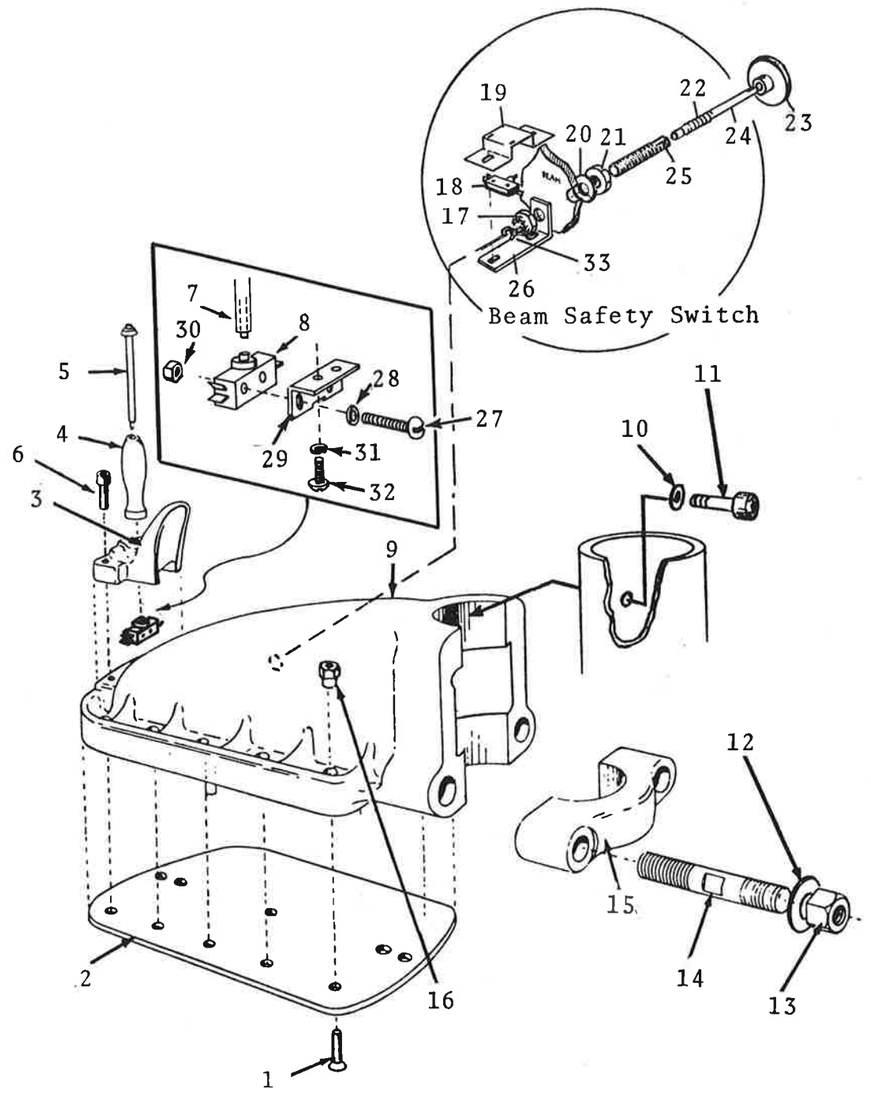


Figure 12 - HCM-B2 - Swinging Beam Components - Exploded View

Legend for Figure 13

Ref. No.	Description	Part No.
1	Piston Connecting Nut Screw (4)	SL-14H18
	Nut Screw Lockwasher (4)	WL-1941T
2	Piston Thrust Bearing	HCM-60
3	Spindle Adjusting Screw	HCM-183A
4	Spindle Adjusting Rod	HCM-199
5	Handwheel Key	USA-71
6	Beam Spindle	HCM-312A
7	Spindle Cap	HCM-400
8	Handwheel Locking Ball	GR-266
9	Locking Ball Spring	SPGL-358S
10	Rod Handwheel	HCM-243
11	Rod Handwheel Spring Washer	WL-3012T
12	Handwheel Nut	XH604B9
13	Cap Screw	SL-18H14
14	Spindle Bumper Block	HCM-48A+
15	Block Screw	XH200F60
16	Piston Connecting Nut	HCM-388+
17	Piston	HCM-527A

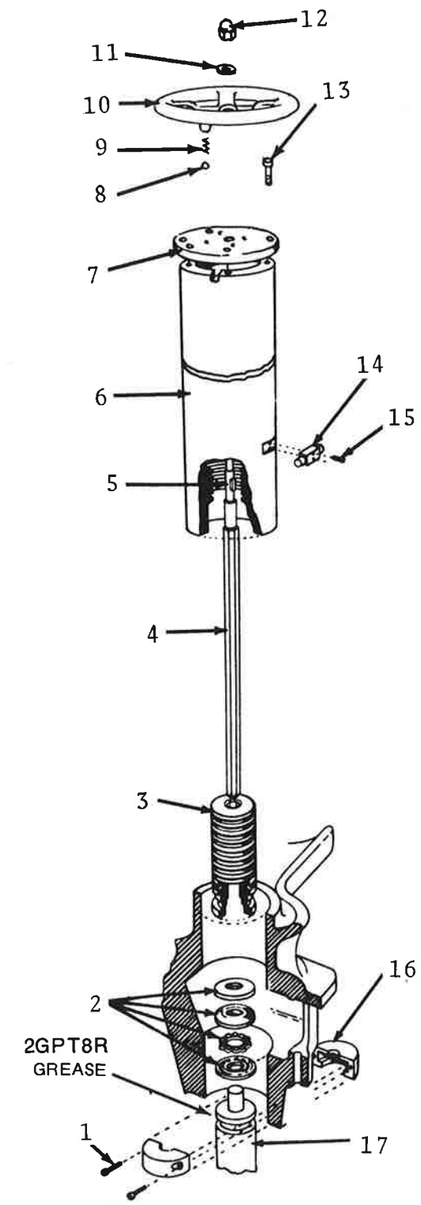


Figure 13 - HCM-B2 - Beam Spindle and Connecting Parts - Exploded View

Legend for Figure 14

Ref. No.	Description	Part No.
1	Cylinder (Exhaust)	HCM-645
2	Piston Packing	HCM-533
3	Piston Packing Retainer	HCM-507
4	Retainer Screw Lockwasher	WL-1941T
5	Retainer Screw	SL-15H13
6	Piston Buffer	HCM-566
7	Chamfers	----
8	Piston	HCM-527A
9	Piston Ring (3 Used)	HCM-526
10	Piston Return Spring - Inside	SPGL-4026S
11	Piston Return Spring - Outside	SPGL-4025S
12	Piston Return Spring - Cap	HCM-721
13	Cap Screw Lockwasher (8 Used)	WL-1941T
14	Piston Return Spring Cap Screw (8 Used)	SL-9016V

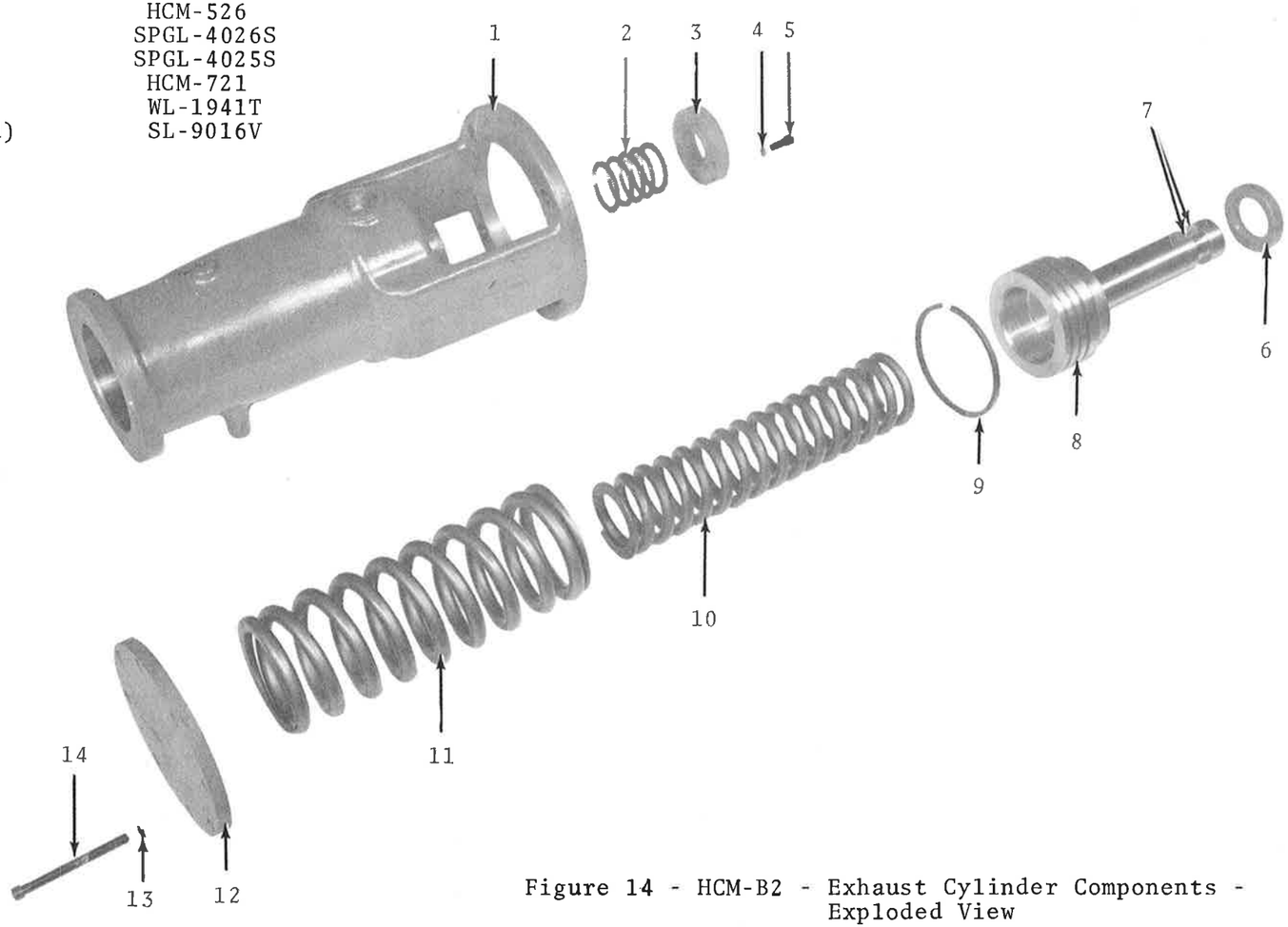
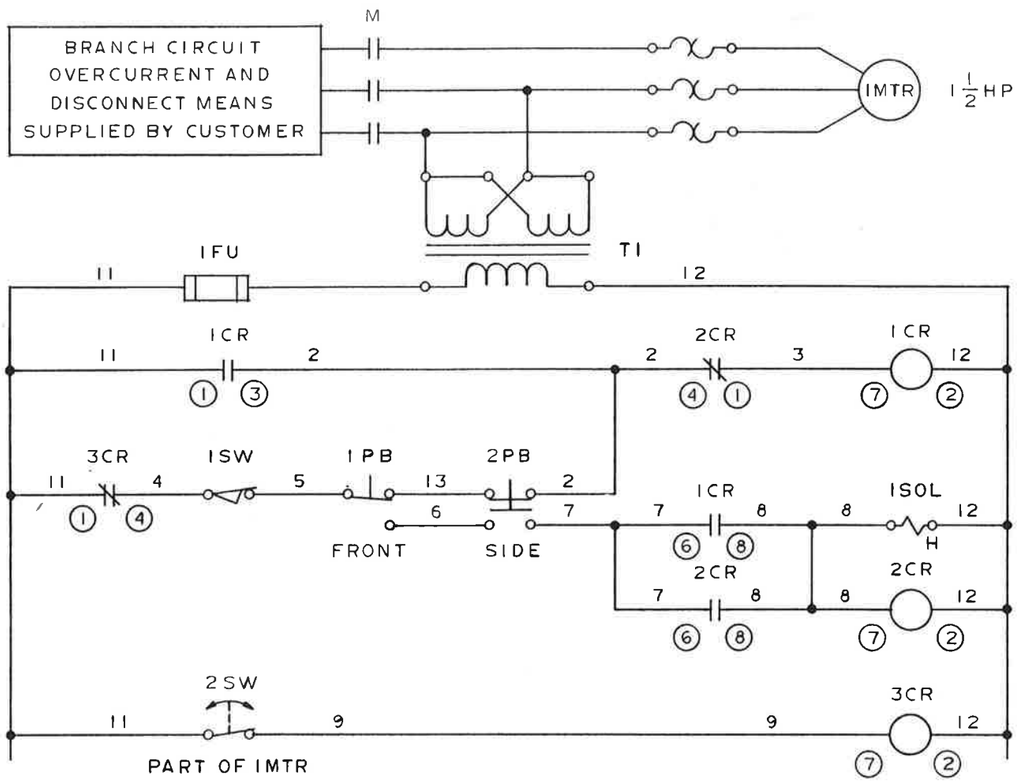


Figure 14 - HCM-B2 - Exhaust Cylinder Components - Exploded View

HCM-B2 ELECTRICAL COMPONENT LIST

SYMBOL OR ABBREV.	NAME	DESCRIPTION	FUNCTION	LOCATED	MANUFACTURER NAME	MANUFACTURER NUMBER	USM PART NO.
M	MANUAL MOTOR STARTER	NEMA SIZE Ø 3 POLE PUSH BUTTON 3 OVERLOAD RLYS.	- -	MACHINE FRAME	G.E.	CR1062R8B	XE711F1
M	MANUAL MOTOR STARTER	NEMA SIZE Ø 4 POLE	-	CONTROL ENCLOSURE	G.E.	CR1062R10A	ED-12145
*	HEATERS	OVERLOAD PROTECTORS (SELECT FOR MOTOR CURRENT)	-	MOTOR STARTER	G.E.	CR123 SERIES	-
1MTR	PUMP MOTOR	SPECIAL 1-1/2hp 1725 RPM 3 Ph 200/230/460V 60 CYCLE	-	MACHINE FRAME	USM	-	HCM-766
1MTR	PUMP MOTOR	SPECIAL 1-1/2hp 1725 RPM 2 Ph 220/440V 60 CYCLE	-	MACHINE FRAME	USM	-	HCM-658
1MTR	PUMP MOTOR	SPECIAL 1-1/2hp 1725 RPM 3 Ph 550V 60 CYCLE	-	MACHINE FRAME	USM	-	HCM-670
1MTR	PUMP MOTOR	SPECIAL 1-1/2hp 1425 RPM 3 Ph 220/380V 50 CYCLE	-	MACHINE FRAME	USM	-	HCM-678
1SW	STROKE SWITCH	SPDT MOMENTARY ROLLER PLUNGER ACTUATED	-	MACHINE FRAME	MICRO-SWITCH	BZE6-2RQ8	ED-10302
1PB	FRONT TRIP SWITCH	SPDT MOMENTARY PLUNGER ACTUATED	-	BEAM	MICRO-SWITCH	BZ-2RDT	ED-11125
2PB	SIDE TRIP SWITCH	DPST MOMENTARY PLUNGER ACTUATED	-	BEAM	MICRO-SWITCH	3MN1	XE332C2
1SOL	SOLENOID VALVE	3-WAY 115V COIL 24" LEADS	-	HYDRAULIC SYSTEM	SKINNER	V18DB11002	ED-3178
T1	CONTROL POWER TRANSFORMER	230/460 PRI 115V SEC. (FUSED) .050 KVA 60 CYCLE FRAME 611	-	CONTROL ENCLOSURE	G.E.	9T55Y42G2	ED-14910
T1	CONTROL POWER TRANSFORMER	230/460/575V PRI 115/95V SEC. (FUSED) .050 KVA 50/60 CYCLE FRAME 613	-	CONTROL ENCLOSURE	G.E.	9T55Y62G2	ED-14911
T1	CONTROL POWER TRANSFORMER	208/277/308V PRI 115/95V SEC. (FUSED) .050 KVA 50/60 CYCLE FRAME 613	-	CONTROL ENCLOSURE	G.E.	9T55Y82G2	ED-14912
1TB	TERMINAL BLOCK	1 PIECE, BLACK PHENOLIC	-	CONTROL PANEL	JONES CO.	354-11-09-001	ED-2709
1FU	TRANSFORMER FUSE	DUAL ELEMENT 1/2 AMP FIBER TUBE	-	POWER TRANSFORMER CONTROL ENCLOSURE		TO FOLLOW	
1CR, 2CR & 3CR	CONTROL RELAY	10 AMP, RATED @ 115V/60 HERTZ NONINDUCTIVE LOAD	-	CONTROL PANEL	POTTER & BRUMFIELD	KRP-11AG-115V	ED-14841

NOTE: ALL COMPONENTS SUBJECT TO MODIFICATION BY USM.



(2) RELAY SOCKET NUMBERS

Figure 15 - HCM-B2 - Elementary Diagram

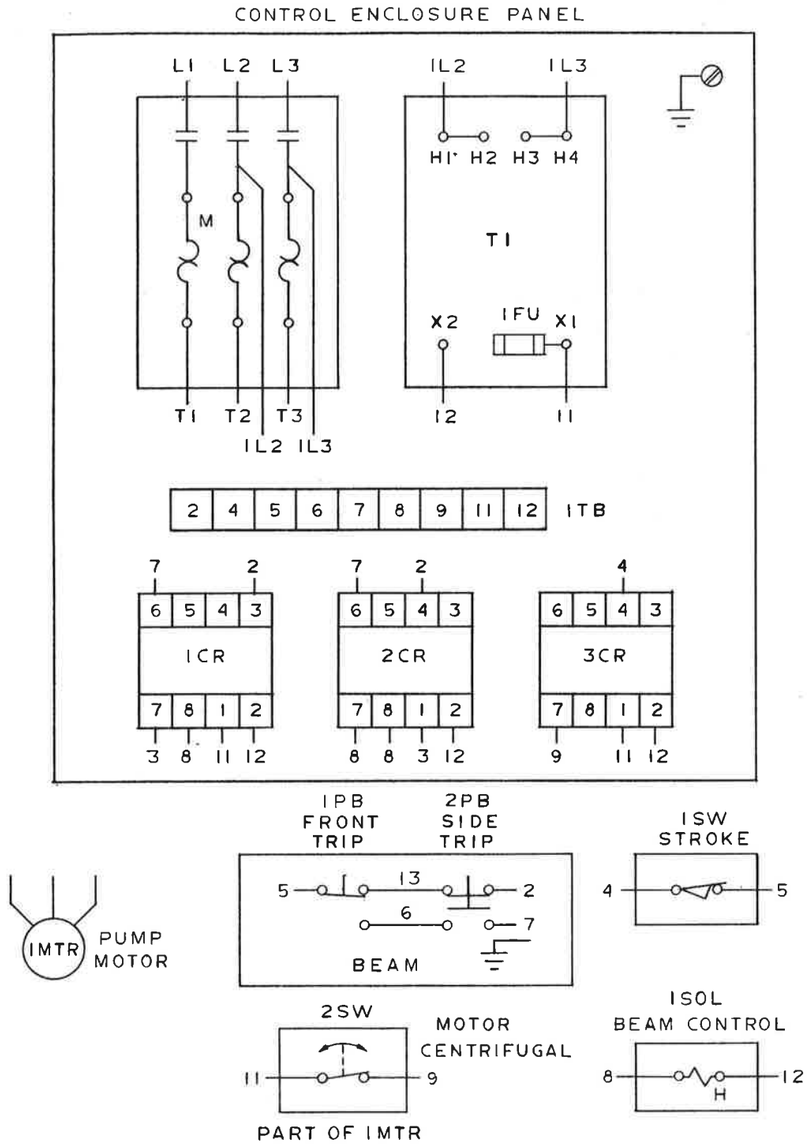


Figure 16 - HCM-B2 - Connection Diagram

Appendix A

USM SPECIFICATION NUMBERS AND COMMERCIAL EQUIVALENTS — OILS

If your regular source is unable to furnish lubricants to the above specifications, they may be currently obtained from the following oil companies under the trademarks indicated.

USM NO.	CHEVRON OIL CO.	CITIES SERVICE OIL CO.	GULF OIL CO.	EXXON CO.	MOBIL OIL CO.	SHELL OIL CO.	SUN OIL CO.	TEXACO, INC.	GETTY OIL CO.
150B	OC Turbine Oil 32	Pacemaker 15	Harmony 44	Teresstic 43	DTE Oil Light	Turbo 25	Sunvis 916	Rando Oil A	Aturbrio 50
150BCW			Harmony 43AW	Nuto H44	DTE 24				Aturbrio AW51
300B	OC Turbine Oil 68	Pacemaker 30	Harmony 53	Teresstic 52	DTE Oil Heavy-Medium	Turbo 33	Sunvis 931	Rando Oil C	Aturbrio 60
225BCW			Harmony 48AW	Nuto H48	DTE 25				Aturbrio AW59
300BCW			Harmony 54AW	Nuto H54	DTE 26				Aturbrio AW61
X100CP	Multi-Service Gear Lube 90	Premium Gear Oil (MP) SAE 90	Multi-purpose Gear Lube 90	Gear Oil GP 90	Mobilube HO-90	Spirax 90 EP Gear Lube	Multi-purpose Gear Lube SAE 90	Multigear Lube EP 90	Multigear SCL 90
X150C	Cylinder Oil 155 PX	Cylinder Oil 140-5	Senate 155	Cylesstic TK140	600W Cylinder Oil	Nassa K79	Occident Cylinder Oil	Honor Cylinder Oil	Atwater 83

USM SPECIFICATION NUMBERS AND COMMERCIAL EQUIVALENTS — GREASES

USM NO.	CHEVRON OIL CO.	CITIES SERVICE OIL CO.	GULF OIL CO.	EXXON CO.	MOBIL OIL CO.	SHELL OIL CO.	SUN OIL CO.	TEXACO, INC.	MASTER LUBRICANTS CO.
100L25	–	–	Gulf Graphite Grease No. 2	–	–	Barbatia No.2	–		–
300SL36	Dura-Lith No. 2	Citgo M-2	Precision No. 2	Unirex N2	Mobilux EP No.2	Alvania No. 2	Sun N-52X	Multifak 2	Lubriko M-21
									GETTY OIL CO.
650M32	Dura-Lith No. 1	Citgo H-1	Crown No. 1	Lidok EP No.1	Mobilux EP No.1	Alvania EP No.1	Prestige 41	Multifak EP 1	Alitho 10
750L32	RPM Chassis Grease TB Medium	–	Supreme No. 1	Estan No. 1	–	Alvania EP No.1	Sun C-891T	Novatux No. 1	Alastac 10

SPECIAL-PURPOSE OILS

USM SPEC. NO.	APPROVED COMMERCIAL EQUIVALENT	SOURCE
* 66BR	Velocite Oil No. 6	Mobil Oil Corporation
100CKR	A88/HNR Non-Fluid Oil	Non-Fluid Oil Corporation
850CPR	Roberts Gear Oil 223-SAE90	Andrew Roberts, Inc.
950CPR	Mobil Vactra No. 4	Mobil Oil Company
X120CPR	Mobil Compound EE	Mobil Oil Company
1500AAR	A-79-EPV	Non-Fluid Oil Corporation
465MR	Enmist EP #1	Exxon Company, U.S.A.
465MR	Mobil Mist Lube 27	Mobil Oil Company

* XF850A1 (USM Part No.) 40cc Tube of USM 66BR Oil

SPECIAL-PURPOSE GREASES

USM SPEC. NO.	APPROVED COMMERCIAL EQUIVALENT	SOURCE
1NT8R	Mobiltemp No. 1	Mobil Oil Company
2MT6R	Mobilux No. 2	Mobil Oil Company
2NT6R	Aeroshell No. 5	Shell Oil Company
2ST6R	Andok 260	Exxon Company, U.S.A.
2ST7R	Chevron O. H. T.	Standard Oil Company of California
2GPT8R	Molykote U Paste	Dow Corning Corporation