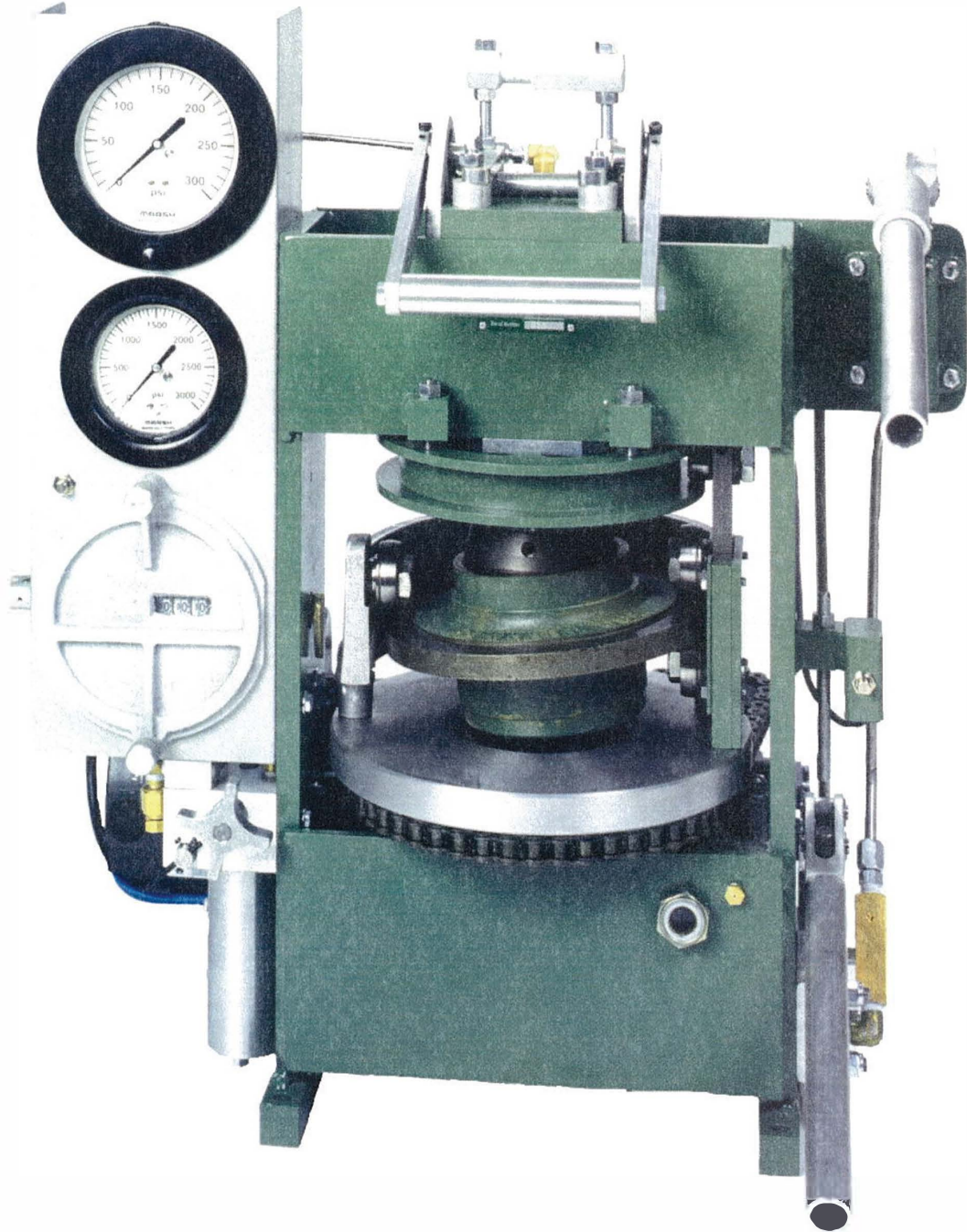


Cat. No. 140

Gyratory-Shear Molding Press

Instruction Manual

ASTM Designation: D-4013
Tex-206-F
Eighth Edition January 2000



RAINHART Co. *Testing Equipment*

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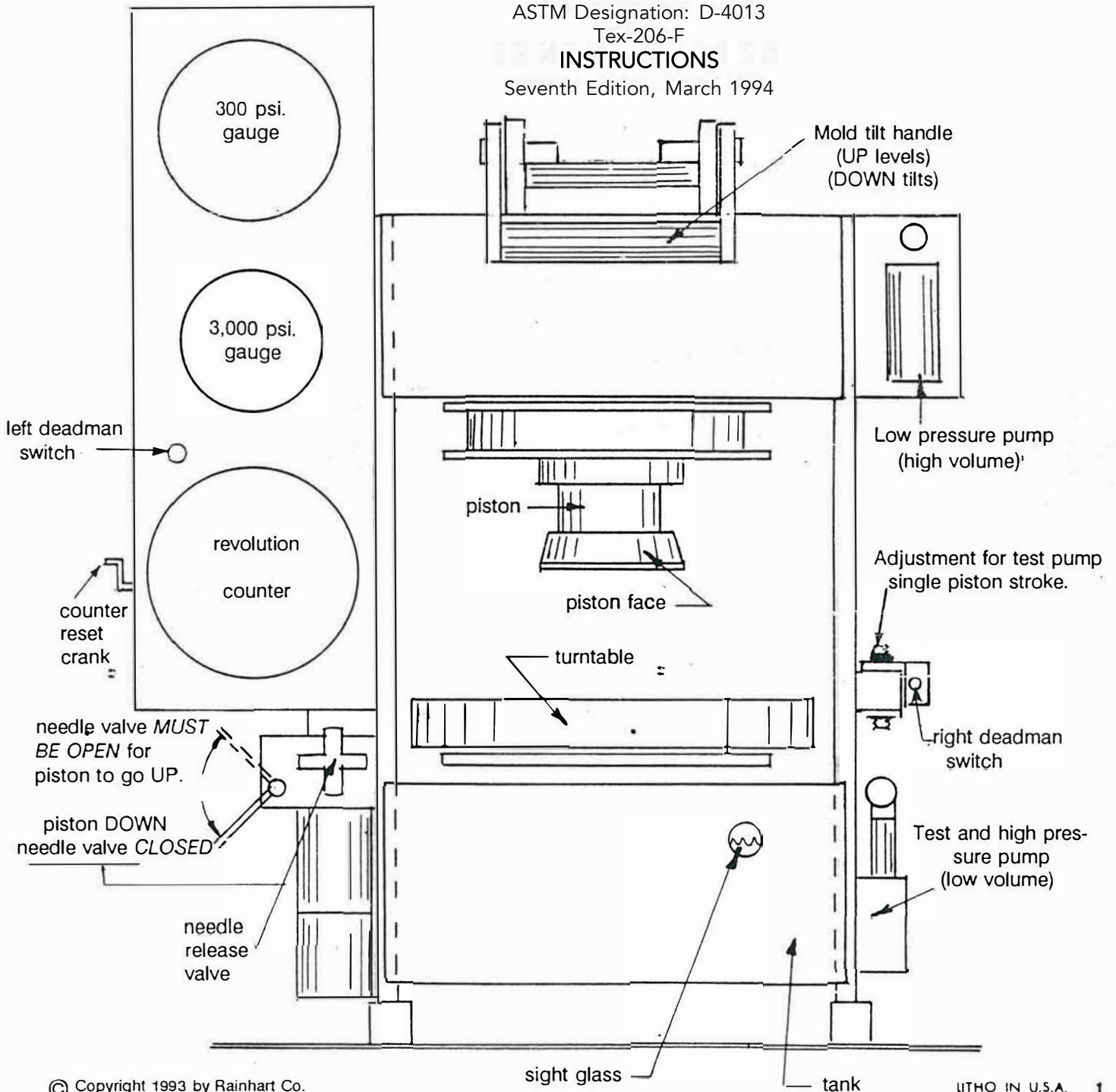
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Gyratory-Shear Molding Press

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INSTRUCTIONS

Seventh Edition, March 1994



Cat. No. 140

Gyratory-Shear Molding Press

ASTM Designation: D-4013

Tex-206-F

I N S T R U C T I O N S

6th Edition 1993

This apparatus will compact 4-in. diameter specimens of bituminous concrete mixtures from 1½ to 2½-in. high, suitable for Hveem or Marshall testing. The specimens may also be used to determine stability, density, strength, permeability, etc. of bituminous mixtures by specified test methods.

Gyratory-shear action of the mixture is employed at low initial pressures, allowing orientation of the aggregate particles to aid compaction, followed by non-gyratory high-pressure compression to establish final shaping and compacting. Specimens thus compacted simulate the density, aggregate degradation and structural characteristics possible in the actual road surface when the proper procedure is used in the placement of the material.

The design of this compactor is based on the 4-in. dia. Texas State Department of Highways and Public Transportation's motorized equipment (Tex-206-F, Part II), which in turn was based on their manual gyratory "body beautiful" apparatus utilizing a Blackhawk Model FA-11 jack. The leveling geometry, test pump dimensions, hydraulic cylinder, specimen diameter and height capability, are identical in all three versions. In addition Rainhart has modified the Texas' motorized gyratory-shear molding press for greater convenience and safety together with many other improvements.

Procedure for performing "Test Method Tex-206-F, Part II"¹ using Rainhart Cat. No. 140 Gyratory-Shear Molding Press—

¹See ASTM Designation: D 4013-81: *Standard Practice for Preparing of Test Specimens of Bituminous Mixtures by Means of Gyratory Shear Compactor.*

1) Press preparation

Bolt the press on a stout rigid bench so that it will not overturn onto the operator when pumping high molding pressure.

Plug the motor-brake cord into the back of the program counter, and the counter's cord into a 115V 60C outlet.

Safety feature—Two normally open, spring return, "deadman" switches are wired in series, see cover. Both must be pushed closed and manually restrained for the duration of turntable running.

Check out the program. With hands off the deadmen switches, turn the reset counter crank (left side of the control panel) one full turn counter-clockwise into level detent—away from the operator. If incorrect, see *Programming the Counter*, p. 4.

Note: The deadmen switches can be used to stop or jog the turntable provided the counter's internal switch is reset or closed (program is in progress). The automatic brake is always applied except when the motor is running.

Squirt a few drops of oil on the center platen (center portion of the turntable) and on all five of the tilt bearings.

Lift the cam lever (tilt control, at the top of the press), against its end stop, to allow mold insertion between the rollers.

Retract the piston high enough to allow mold to pass under it.

A) *Open the needle valve two full turns for full flow to tank during retraction.*

B) Lift the left end of the rotary control valve lever all the way up (in the direction of desired piston travel). This is located below the revolution counter, to the left of the needle valve, (front cover).

C) Move the piston upward using the top or (high-speed) pump.

Note—A 600 psi relief valve will dribble if *retraction* pressure gets dangerously high; this protects the rotary direction valve from locking and prevents serious damage.

2) Load the press

Prepare the mixture and weigh out the specimen, (perhaps following Test Method Tex-205-F).

Preheat the mold and base plate “in an oven 140F to 200F.” For premixes, heat the mold to 100F (Tex-206-F).

Remove the mold and base plate from the oven, with glove-protected hands.

Coat the inside of mold with kerosene or lube oil.

Place the base plate, large diameter side up, on a bench and cover with a paper disk separator.

Lower the flanged mold over the base plate, with “Rainhart” up.

Place the mixture in two approx. equal layers. Use a spatula to move any large aggregates away from the surface of the mold. Level each layer and press down with the bowl of a bent spoon, and cover with a paper separator. Be careful to avoid losing material or segregating particles.

Slide the hot mold and contents to the edge of the work bench onto a glove-protected hand (to retain the base plate in place).

Place the mold assembly in the press. Center the mold carefully with the piston face.

Advance the piston into the mold.

A) Close the needle valve.

B) Press the end of the rotary control valve handle all the way *down* (in direction of desired piston travel).

Apply load. Gently operate the upper (low pressure) pump until the pounds per square inch (psi.), specified by the governing test method, is displayed by the upper (low pressure) gauge.

“Ready” the lower pump handle by lifting it up against its screw-adjusted stop; this will completely fill it.

3) Gyrate

Tilt the mold. Pull the cam lever all the way *down* against its stop.

Gyrate three revolutions. Manually push and hold both deadmen switches closed for the three-turn turntable revolutions. The turntable will stop with the loading side toward the front when the program is completed.

4) Test for initial compaction.

[a] As soon as the mold stops gyrating, square it by lifting the cam lever all the way against its end stop with the left-hand.

[b] Immediately pump one full stroke using the test pump (lower) with the right-hand while observing the upper (low pressure) gauge. This checks for the end point of gyratory-shear compaction.

Note: [a] Squaring the mold by lifting the cam handle and [b] a smooth downward test pump stroke must be two complete consecutive motions.

5) Gyrotory end point

If the end point required by the governing test is *not* achieved, gently bleed off the pressure with needle valve to well below the specified starting pressure and then pump it back up to the starting psi. Repeat the gyration cycle and end point test as many times as necessary until the end point has been established.

Ready the test pump again—lift the handle all the way up against its stop.

Repeat the 3) 4) 5) sequence until 150 psi. (min.) gyratory end point has been reached with a single smooth (not violent) downward stroke of the test pump. There is no limit on the number of repetitions.

Note: Do not expect this pressure reading to hold because the specimen will creep considerably before stabilizing.

6) **Shaping and compacting.** With the mold (already) squared (tilt handle up) against its end stop—

- cut the low pressure gauge out of the system (pointer will stop) by gently stroking the lower pump until the automatic gauge protector has closed.

- compact by pumping approx. one stroke per second until the pressure is raised to 2500 psi. appearing on the (lower) high pressure gauge.

- bleed off the pressure slowly with the needle valve to protect the gauges from shock to near zero.

7) **Unloading the press.**

A) Open the needle valve approx. two turns.

B) Lift the end of the rotary control valve handle all the way up against its end stop.

C) Move the piston well clear of the mold, using the high speed (upper) pump.

Note—A 600 psi relief valve will dribble if retraction pressure gets dangerously high; this protects the rotary direction valve from locking and prevents serious damage.

Remove the mold. Placing a glove-protected hand under the assembly will prevent the base plate from falling out.

8) **Extract the specimen.**

- Remove the mold base plate when clear of the press; allow it to fall out.

- Place the mold (without base plate) on the extraction pedestal; its full weight is supported by the specimen. The heavy mold will

creep down off the hot specimen.

9) **When not in use—**

Pump the piston all the way up inside its cylinder for maximum protection and minimum deterioration.

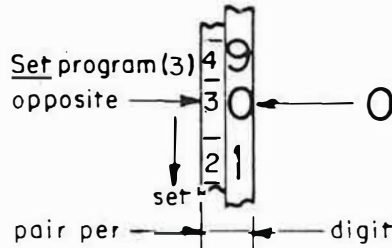
Unplug the apparatus from the outlet to prevent tampering.

Programming the Counter

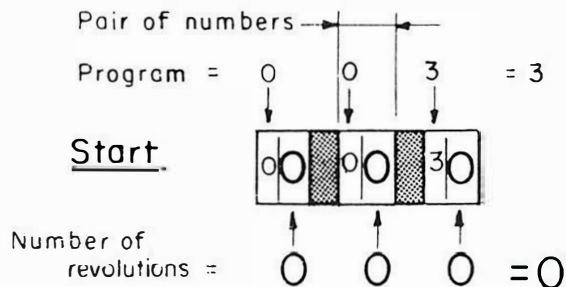
Set the desired number of turns before operating, a one-time adjustment.

Counter case door. Unscrew the upper thumb-screw until it is out of the case body (but still captive in the door); loosen the lower thumb-screw one turn and swing the cover down out of the way while setting the program.

Rotate the reset crank counter-clockwise to its 9:00 home position (crank is level and the handle is away from the operator). The right (large) numeral in each pair, (representing one digit)



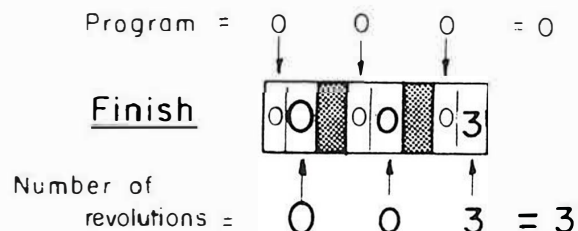
will read "0"; the preset program will appear in the small left numerals. Each program numeral wheel of its pair is individually preset by manually forcing the program wheel downward, repeating a digit at a time until the desired number appears.



Close the door by reinserting the upper thumb screw and tighten both securely before operating. This will exclude damaging dust.

To start a sequence—Depress and hold both

deadmen switches. (The turntable will automatically stop when the preset program is completed). The number of revolutions performed will be displayed with the large numbers. The program will read 00000.



To set up a new sequence—with both deadmen switches released (open), revolve the reset crank counterclockwise again one full turn back to its home 9:00 o'clock position.

To interrupt a cycle, stop the turntable by releasing one or both of the deadmen switches. The program can be completed by again depressing both deadmen switches.

M A I N T E N A N C E

Lubricate with a light machine oil: chain, trolley slide, trolley/halo, cam tilt/level mechanism (on top of crosshead), mold skirt, mold base plate, and pump linkages. All other bearings are permanently lubricated.

Hydraulic oil--use *only* Automatic Transmission Fluid w/Dexron (GM), available from filling stations, auto parts houses and supermarkets.

The **tank**, located in the right-hand end of the frame, is provided with a drain plug in its bottom and a filler plug on the rear. Correct level occurs when, *with the piston fully up*, the oil just shows in the sight-glass on the front. A fine stainless wire-gauze filter in the reservoir protects the system. To clean, drain the tank and remove the pump and attached filter.

To bleed the hydraulic system--

- With the reservoir properly filled (above item), alternately pump the main -50 piston up and down against both its end stops; this circuit will self-bleed the trapped air to the tank where it can escape.

- Remove the pipe plug on top of the -285

bleeder body (screwed on to the low pressure gauge's stem) and pump slowly until full. Reinstall and retighten. (The automatic bleeder is a check valve which normally allows trapped air to escape into the high pressure system so that it will find its way to tank).

- New gauges are factory filled and vacuum bled.

To tension the (#50) chain, move the motor back from the press frame using the two pairs of push-push nuts on the gear housing's mounting lugs.

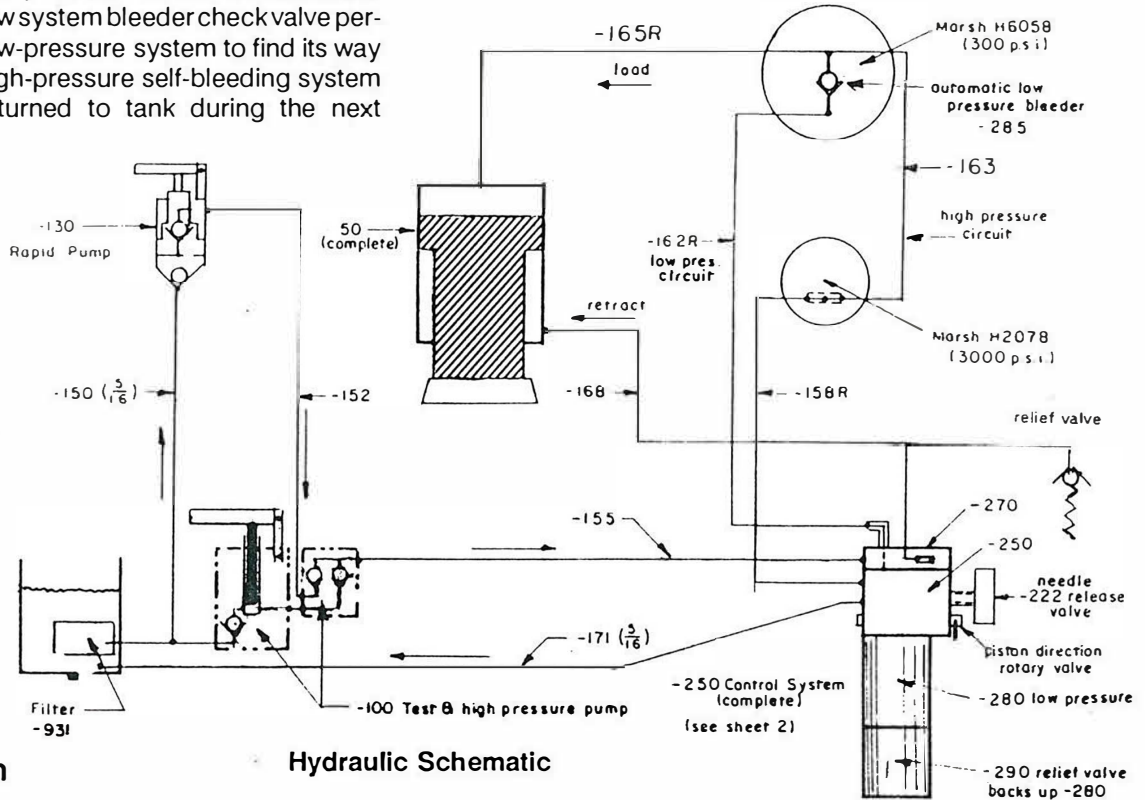
Parts List		Req'd
Part No.	140- Part	
-90	Mold	1
-94	Mold Base Plate	1
-96	Extraction Pedestal	1
Frame		
-10	Frame, complete	1
	Drain Plug 1/4NPT	1
-31	Pump Calib. Screw	1
	Nut 3/8NC24	1
Power Train		
5K435	Motor	1
3M366	Brake	1
2Z709	Gear Box	1
B516	Sprocket (small)	1
#50	Chain	5 ft.
#50	Connector Link	1
-37	Studs	2
	Nuts 3/8NC16	4
Turntable		
-38	Turntable	1
-32	Pedestal	1
217MFF	Bearing (MRC)	1
-34	Platen	1
	Capscrew 1/2NF20 x 2-3/4	1
-36	Sprocket (large)	1
	Capscrews 3/8NF24 x 3/4	4
-43	Strike Pin w/nut	1
-44	Trolley	1
-45	Eccentric, trolley	1
RA012BTT	Rollers (MRC)	4
	Capscrew 3/4NF16 x 1-3/8	4
CRHS16	Cam Follower	1
	Nut, jam, 5/8NF18	1
-126	Trolley retainers	2
-122	Trolley	1
-128	Post	1

Parts List		Req'd	Parts List		Req'd
Part No. 140-	Part		Part No. 140-	Part	
Piston & Cylinder Asm.			-116	Handle Extension	1
-50	Complete	1	-111	Pivot Pins w/snap-rings	2
-52	Cylinder	1	-115	Pumps' outlet check valve assembly	1
-54	Shear Plate (split)	1		Balls 5/16-in. dia.	3
-56	Guide Ring	1		Allen Plugs 1/4 "	3
-58	Shear Rings	2		Quad Rings	
-60	Cylinder Closure Asm.	1		Q4016	1
-64B	Piston W/-67F	1		Q4013	2
-66	Piston Face w/	1		Q4223	1
-68	set screws	3	Pump, Low Pressure (upper)		
-57	Retaining Ring	1	-180	(Complete)	1
Packings			Complete parts list with drawing on p. 9		
8146		1	Control Assembly		
Q4233		1	-250	Control Assembly:	1
Q4335		1		Consists of control block, direc-	
Gorman U-cup		1		tional and needle valve, gauge	
5000-262	Retaining Ring	1		protector and relief valve, etc.	
Tilt Mechanism				Factory repair recommended.	
-70	Circular Track & Slide w/	1	-285	Self bleeder, complete	1
-72	Cheek Plates &	1		(Screwed on to stem of low pres-	
	SocHeadCap 3/8NC16 x 1-3/4	4		sure gauge).	
9923	Bearing	2	Panel		
-71	Tilter Asm.: handle, arms,	1	-124	Panel w/bolts & nuts	1
	eccentric, etc.	1		H6058 Gauge, 300 psi.	1
-78	Stand-offs	4		H2078 Gauge, 3000 psi.	1
-79	Hold Down Bars	2		140CS Program Counter	1
-83	Studs, 3/8NF24 x 7-1/2	2	-31	Reset Shaft w/crank	1
-84	Studs, 3/8NF24 x 10	2	-33	Trigger	1
	Nuts,	8	Tubes		
-81	Pick-up Bar	1	See "Hydraulic Schematic" drawing for dash		
-74	Clamp Plate w/SocHd	1	numbers. All tubes are furnished pre-bent and		
	Capscrew 3/8NF24 x 1	1	include bodies, nuts and sleeves. These tubes		
Pump, Test (lower)			must be trimmed and fitted at installation. No		
-931	Oil Filter (in tank)	1	special tools are required except a tubing		
	1/8NPT x 1½ nipple	1	cutter. Please supply serial number of unit.		
-100	Pump complete w/-118	1	* * *		
-102	Pump Block	1			
-104	Pump Cylinder	1			
	Capscrew 1/2NF20 x 1½	1			
	½ Stat-O-Seal	1			
-108	Pump Piston	1			
-112	Link	1			
-114	Handle, Lever	1			

Hydraulic Fluid. Use any compatible GM Automatic Transmission Fluid with Dexron II, locally available (filling station, automobile parts house, supermarket). The brand is immaterial.

New gauges are factory vacuum bled of air. Automatic low-pressure low-flow system bleeder check valve permits any air in the low-pressure system to find its way into the high-flow high-pressure self-bleeding system where it will be returned to tank during the next retraction cycle.

Both gauges have been check by Rainhart using a dead-weight (piston gauge) tester and have been recalibrated if necessary. We have the equipment and skills required to recalibrate both the range and linearity.



Hydraulic System

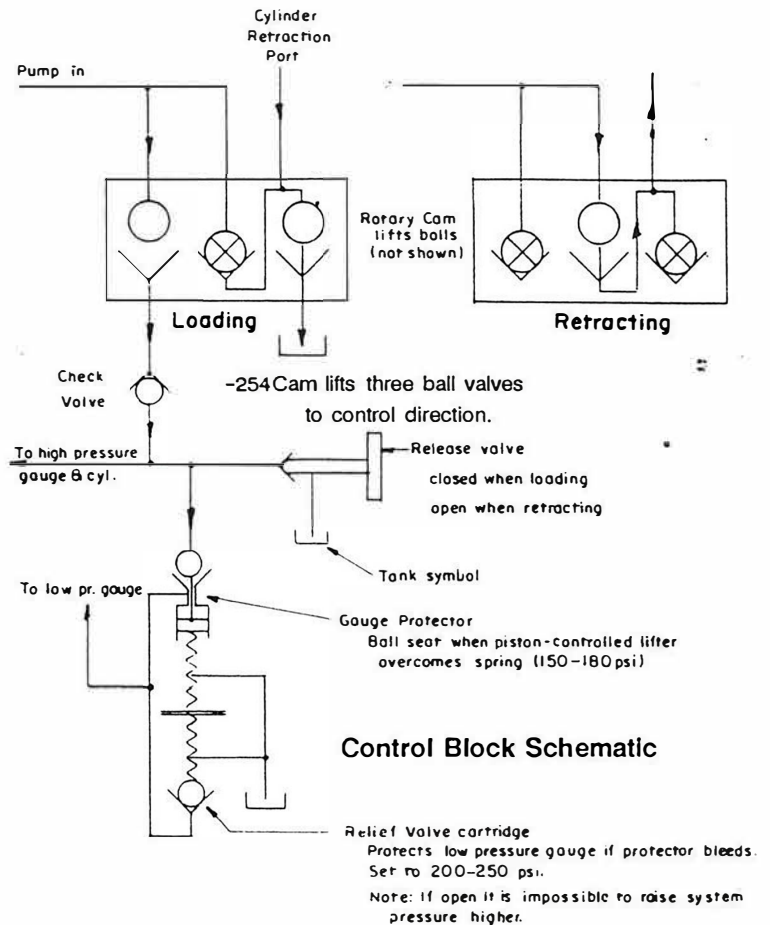
Hydraulic Schematic

◆ **Pumps.** A filter in the tank (right end of the frame) feeds both pumps and their output is combined behind two individual check valves in the -115 pumps' output check assembly and fed through -155 line to the -250 Control Cube Asm.

◆ **Loading.** The -222 Release (needle) Valve is closed so that the oil can not escape to tank.

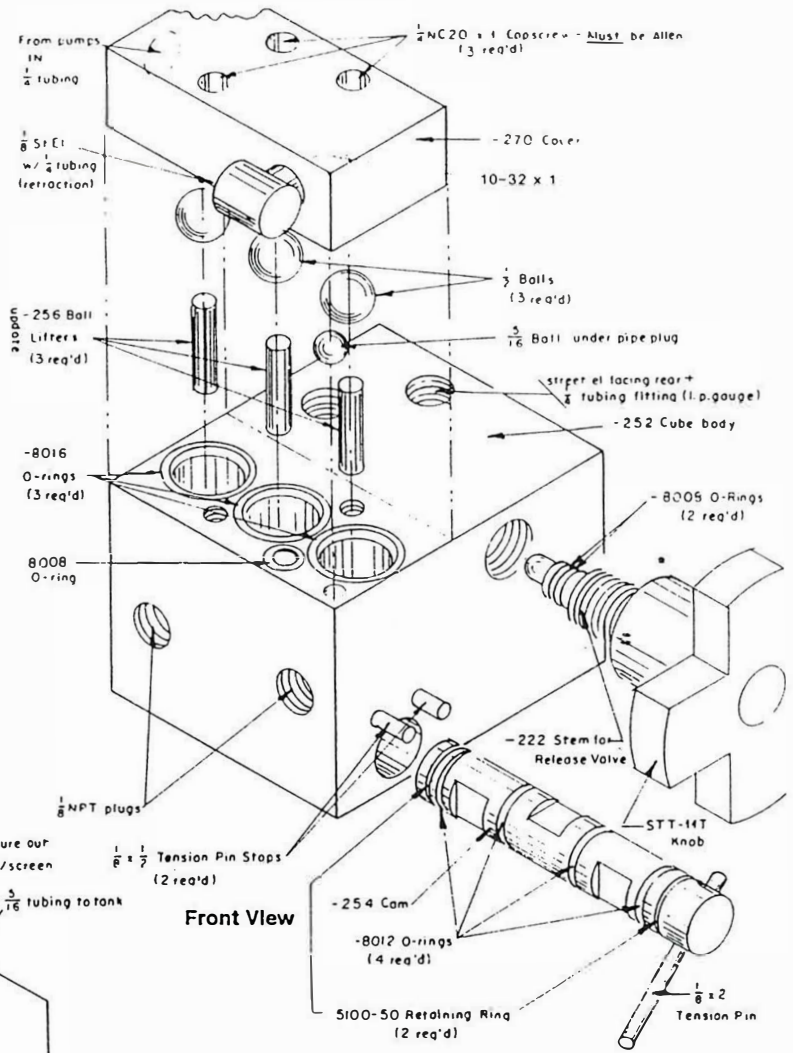
The -254 Direction Valve (handle down) sends the pumped oil through -162R line to the 300 psi. gauge and on through -165R line to the power (top) end of the -64 piston. When approx. 170 psi. is reached, the -282 (p.8) gauge protector closes as 200-16 spring is compressed by -216 piston allowing the above ball to seat. If this valve fails to seal, the below -1354 Relief Valve opens to tank to protect the low pressure gauge. After the gauge protector seals, all high-pressure oil is sent via lines -158R + -163 + -165R to the piston. The high pressure closes the -285 Bleeder Valve. As the piston moves, its retraction oil is returned via -168 line through the -250 Control Cube and -171 line to tank.

◆ **Retraction.** The -222 Release Valve is opened to allow the oil above the piston to free-flow to tank. The -254 Direction Valve (handle up), using the low-pressure high-volume (upper) pump the oil, arriving at the control cube, is directed via -168 to the lower side of the piston and presses upward to retract (raise) it. A relief valve protects the control block.



Control Block Schematic

-250 Control Cube (Asm.)

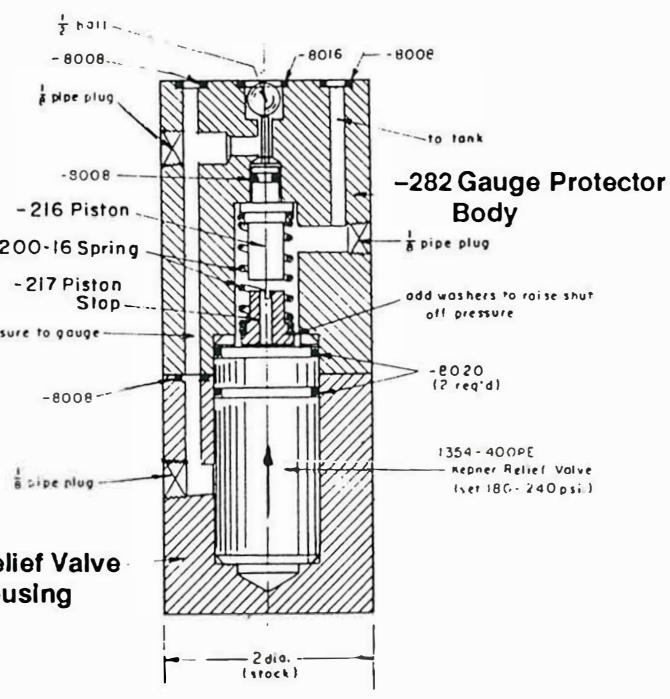
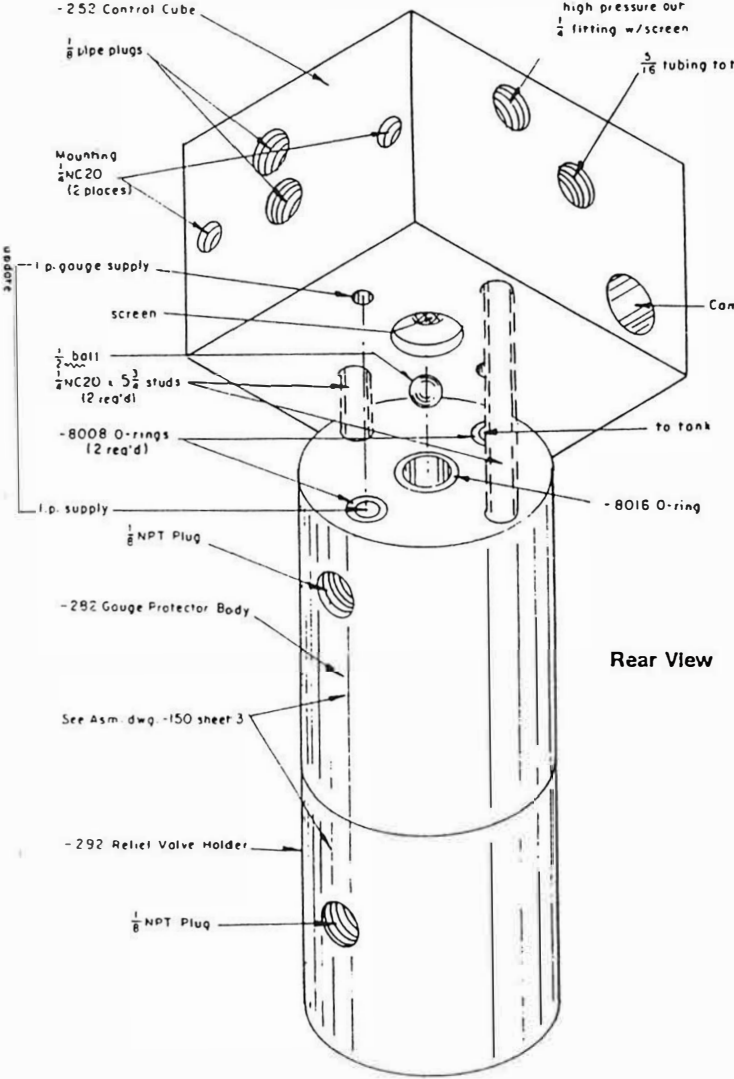


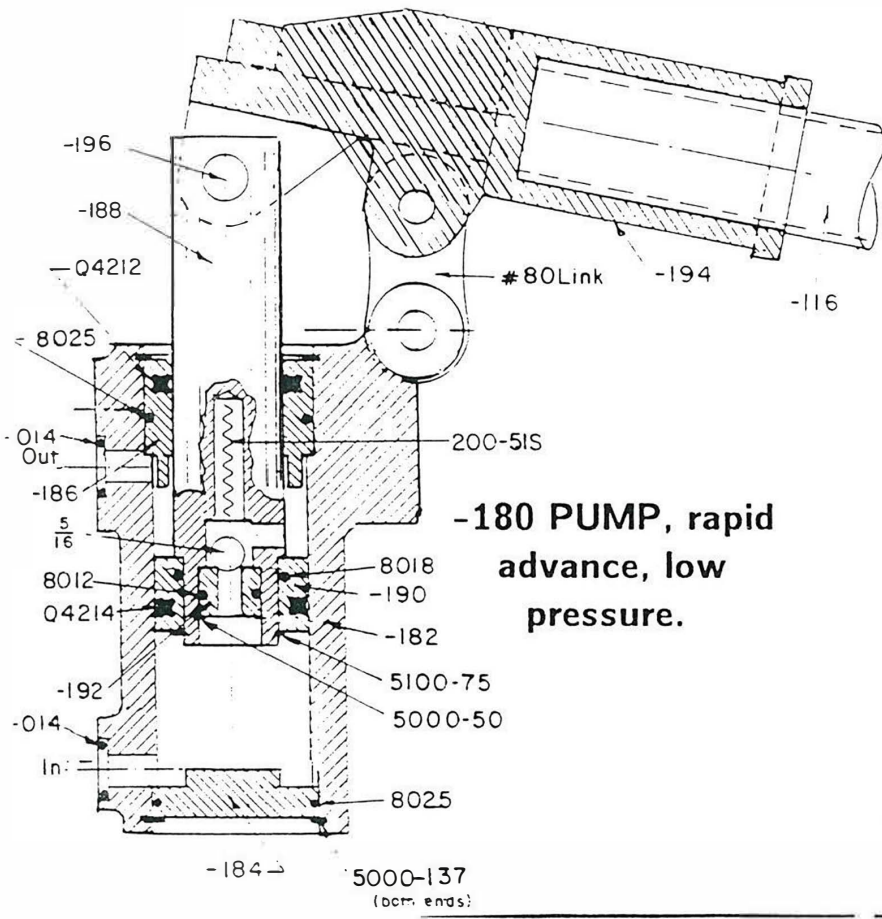
Front View

Rear View

-292 Relief Valve Housing

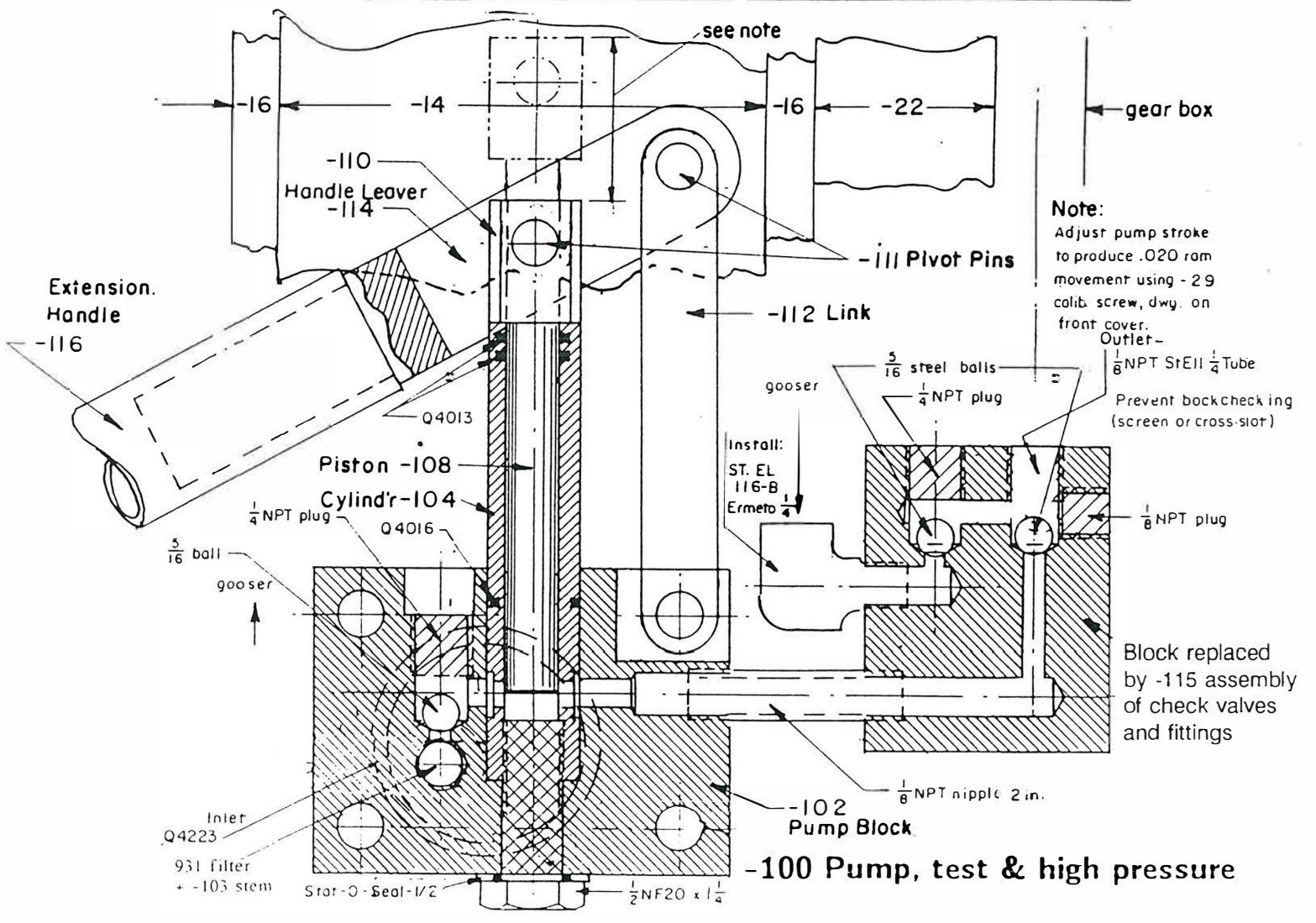
-282 Gauge Protector Body



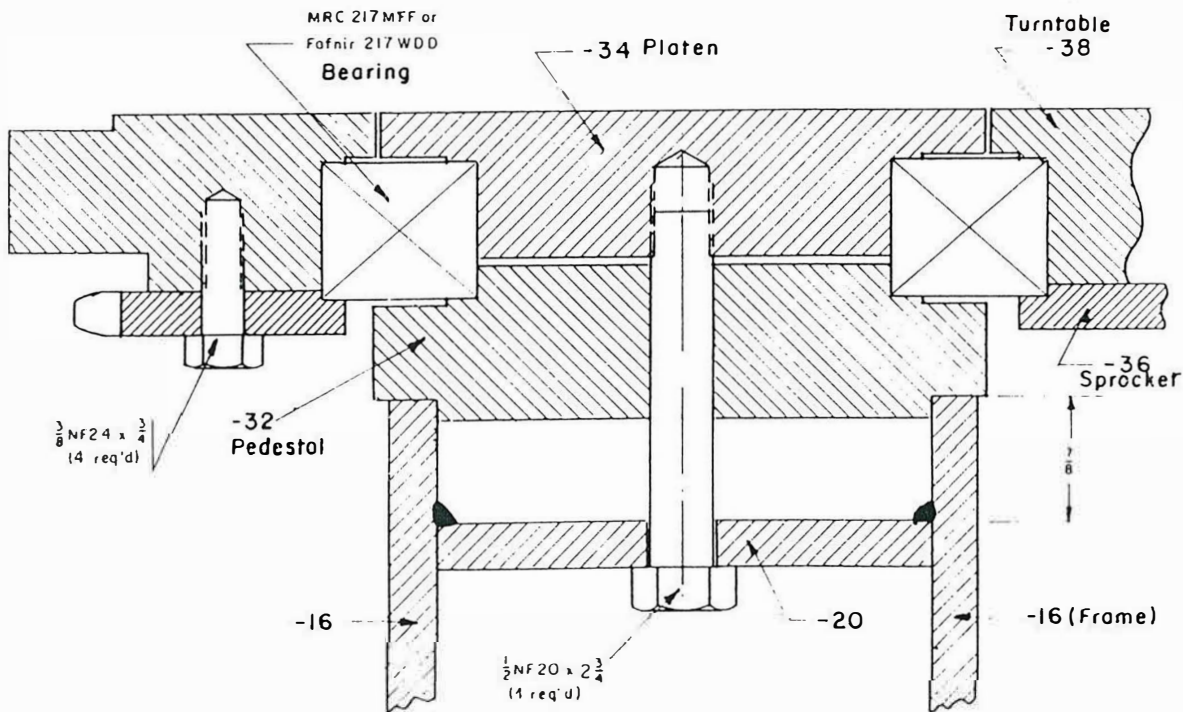
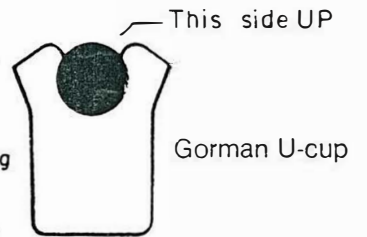
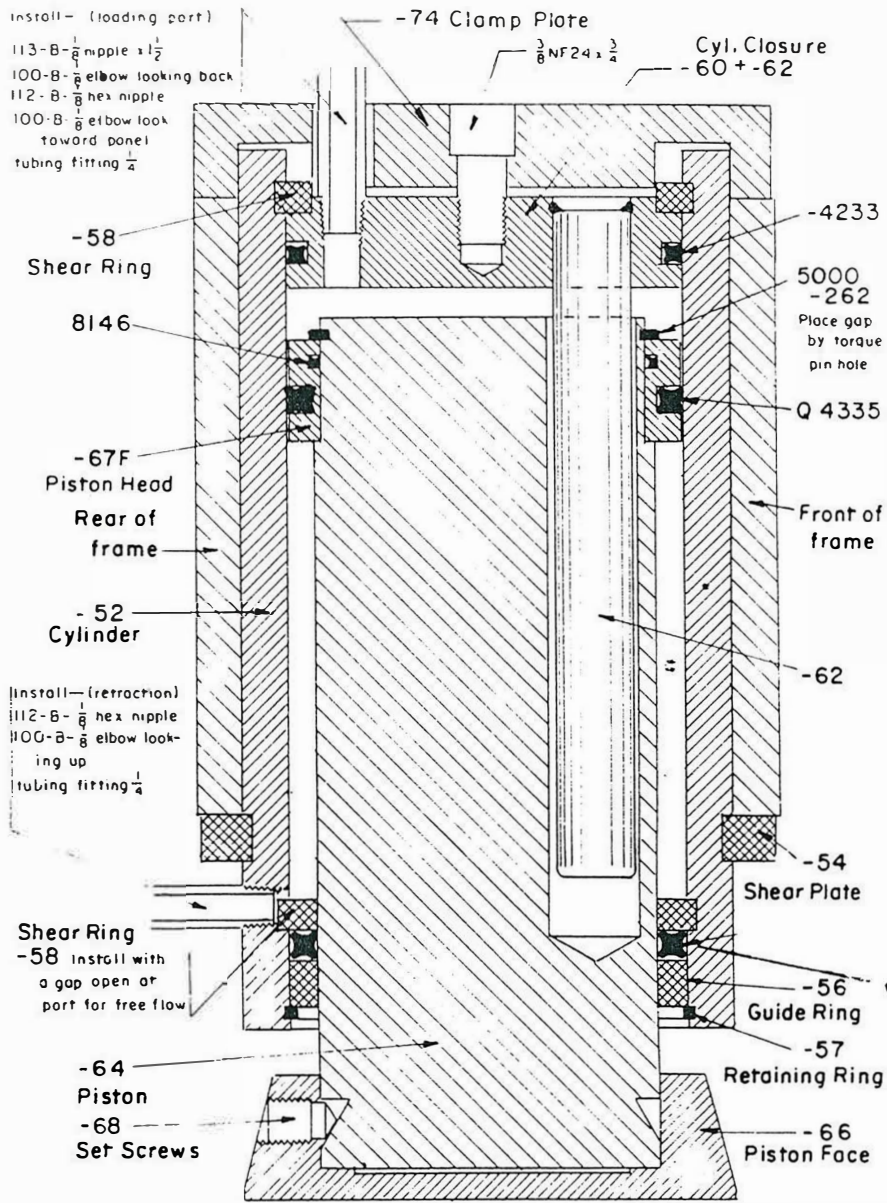


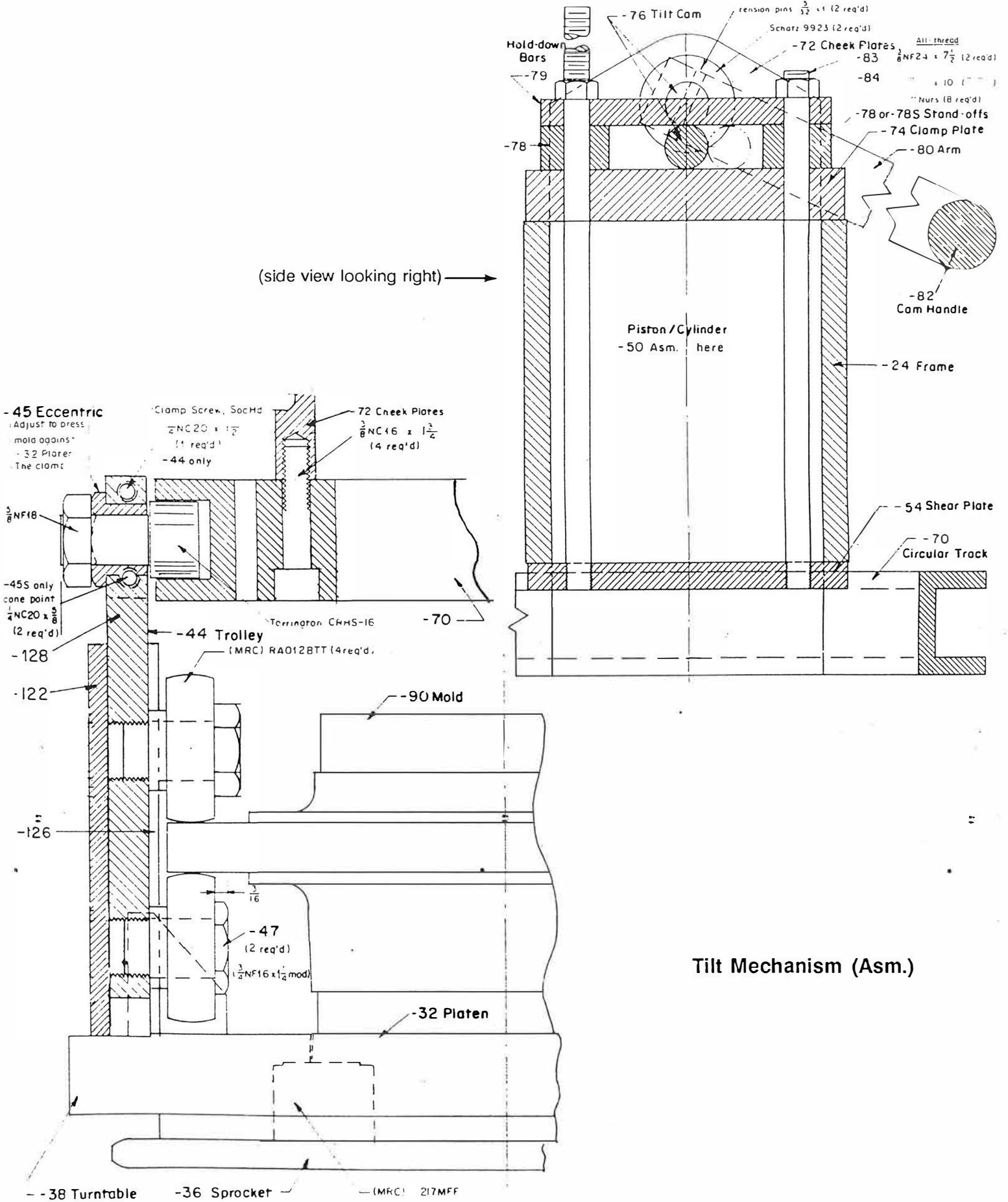
-180 PUMP, rapid advance, low pressure.

140-180	Pump, complete	140 - 9	1
140-182	Cylinder		1
140-188	Piston Rod		1
140-186	End Closure (piston rod end)		1
140-184	" " (solid end)		1
140-190	Piston Head		1
140-192	Check Valve Seat		1
	5/16-in. dia. ball		1
200-51S	Spring		1
Q4212	Quad Ring		1
Q4214	"		1
-8012	O-ring		1
-8014	"		2
-8018	"		1
-8025	"		2
5000-50	Retaining Ring (internal)		1
5000-137	" "		2
5100-37	" " (external)		2
5100-75	" "		1
	Mounting Capscrews 1/4 NC20 x 1/4		4
140-196	Pivot Pin		1
#80	Link		1
140-194	Lever (handle socket)		1
140-116	Handle Extension		1
1A858	1/4 Check Valve (in input line)		1



-100 Pump, test & high pressure





Tilt Mechanism (Asm.)

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140 Gyrotory Shear Molding Press

Rainhart Co. presets all 140 presses to calibration specifications for manufacturing purposes only. We do not certify calibration. All machines must be calibrated & certified by a Calibration Service - **especially after transport.**