310G-350 CRAWLER

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CASE CORPORATION

C.E. Div. 9-99774
310G-350 Crawler
December 1975

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Reprinted

DETAILED ENGINE SPECIFICATIONS

Cylinder Sleeves

	U.S. Value	Metric Value
Type	Replaceable Wet	
Material	Cast Iron	
I.D. of sleeve	3.8125 to 3.8115"	96.838 to 96.812mm
Maximum Serviceable Limit	3.8165"	96.939mm
Sleeve out-of-round (installed in block)	.001" max.	.025mm
Maximum Serviceable Limit	.004"	.102mm
Taper (installed in block)	.001"	.025mm
Maximum Serviceable Limit	.004"	.102mm
Clearance to bottom of piston skirt, 90° to piston pin	.0035 to .0055"	.090 to .140mm
Maximum Serviceable Limit	.0100"	.254mm
Sleeve Protrusion above cylinder block (Max.)	.005"	.127mm

Piston

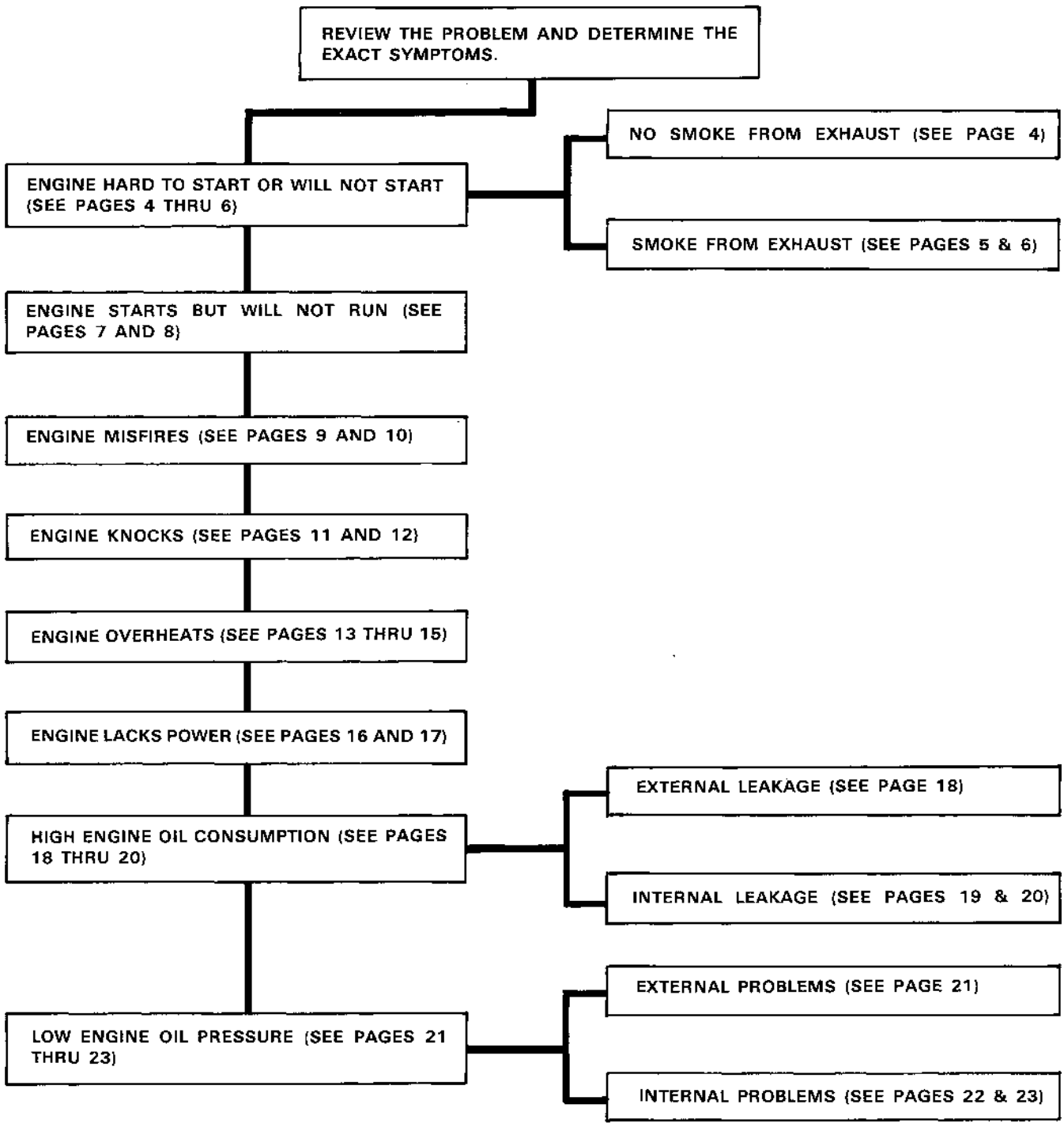
Type	Cam ground	
Material	Aluminum Alloy	
O.D. at bottom of skirt, 90° to piston pin	3.807 to 3.808"	96.698 to 96.723mm
Minimum Serviceable Limit	3.806"	96.672mm
I.D. of piston pin bore including wear	1.2500 to 1.2508"	31.750 to 31.770mm
Width of 2nd ring groove	.097 to .098"	2.464 to 2.489mm
Maximum Serviceable Limit	.100"	2.540mm
Width of 3rd ring groove	.1885 to .1895"	4.788 to 4.813mm
Maximum Serviceable Limit	.1915"	4.864mm

Piston Rings

No. 1 Compression	Chrome Grooved Keystone	
End gap in 3.8125 I.D. (96.838mm I.D.) sleeve	.015 to .025"	.381 to .635mm
Maximum Serviceable Limit	.035"	.889mm
No. 2 Compression	Rectangular Grooved Back	
End gap in 3.8125 I.D. (96.838mm I.D.) sleeve	.015 to .025"	.381 to .635mm
Maximum Serviceable Limit	.035"	.899mm
Side Clearance	.0035 to .0055"	.090 to .140mm
Maximum Serviceable Limit	.008"	.203mm

INTERVAL	SERVICE	INSTRUCTIONS
Every 50 Hours (Cont'd)	Check transmission/differential oil level. Check final drives oil level. Check fan belt tension. Check battery electrolyte level. Grease PTO output shaft.	
Every 100 Hours	Drain and refill engine crankcase. Oil generator.	
Every 200 Hours	Replace hydraulic oil filter. Replace engine oil filter.	
Every 500 Hours	Drain and refill transmission/differential. Drain and refill final drives. Drain and refill power shuttle transmission. Clean power shuttle transmission suction line screen. Replace power shuttle transmission pressure line filter. Drain and refill hydraulic oil reservoir. Inspect ROPS system. Drain and refill winch oil.	

ENGINE DIAGNOSIS CHART



ENGINE OVERHEATS

1. Fan Belt Loose

Check fan belt for proper tension. Check that the belt is not covered with oil or worn badly and riding very deep in pulley groove. Check for pulley groove wear.

2. Low Coolant Level

Check coolant level in radiator and refill if necessary.

3. Water Pump Malfunction

Remove the radiator cap and observe the coolant to see if there is movement which indicates the water pump is pumping. Move the fan back and forth to check for any defective bearings. Check around the water pump for any signs of coolant leakage indicating a bad water pump seal. Remove water pump and rebuild or replace.

4. Thermostat Inoperative

If there is high coolant temperature and boiling coolant, remove thermostat and test it.

5. Engine Timing Incorrect

Combustion will not occur in the cylinder at the correct moment (degrees BTDC) if the engine timing is incorrect. This can cause pre-combustion and serious damage to the engine. Check for proper engine timing.

6. Tractor Mechanical Drag

A mechanical drag on a unit can cause low horsepower and engine overheating. Causes of some mechanical drags are defective brakes, bad bearings or gears in transmission.

7. Radiator Cap Inoperative

Test radiator cap to see that it relieves at the correct pressure. Inspect cap gasket for proper sealing. An inoperative cap can cause water pump cavitation and lower coolant boiling points.

8. Radiator Fins Bent

Bent or damaged fins can cause a cooling system to overheat because of restricted air flow through the radiator core. All of the fin area is needed to dissipate the engine heat from the radiator.

9. Radiator Fins Plugged With Dirt

Radiator fins must be clean so air can flow through the radiator fins and help dissipate the heat of the coolant. Items that affect radiator cooling are: oil and grease on fins, leaves, and attachments covering radiator air inlet.

10. Cylinder Head Gasket Blown

A blown cylinder head gasket will cause one or two cylinders to loose power and cause an engine to miss. Compression leaking into the water system can also cause the cooling system pressure to rise and blow engine coolant out the radiator overflow. Take a compression test to help determine a defective head gasket, or remove radiator cap, run engine and check for gas bubbles rising in coolant at radiator opening.

11. Injection Pump Malfunction

A malfunctioning injection pump will usually under-fuel the engine. A common cause is a sheared key on the injection pump drive, preventing fuel to be delivered to injectors. Adjust or replace the injection pump or parts as required.

12. Radiator Baffling Missing

The removal of or non-reinstalling of radiator baffling, whether foam rubber or sheet metal, will cause cooling air flow to escape around the radiator instead of drawing in cool external air through the radiator.

13. Engine Low On Oil

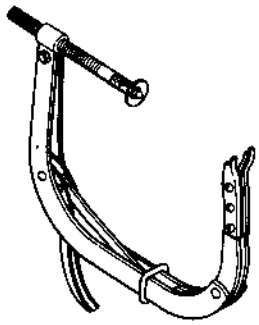
An engine low on oil could lose lubrication to internal parts and start scoring pistons, sleeves and damage engine bearings. Proper oil level is required to help dissipate some of the engine heat. Check engine oil level every eight hours of operation. Low engine oil can also give low oil pressure readings.

INSTALLATION INSTRUCTIONS FOR M20611 TEFLON VALVE SEAL KIT

Special Tools Required

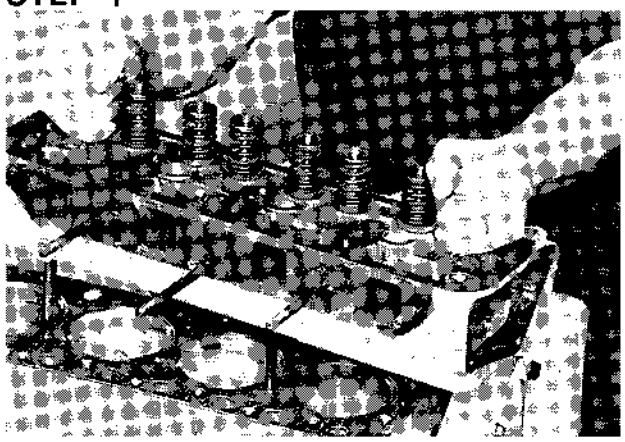
M20624 SEAL INSTALLATION TOOL

M20615 VALVE GUIDE CUTTING TOOL



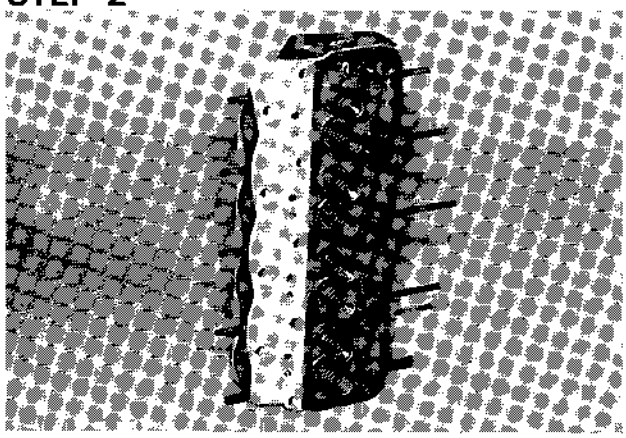
VALVE SPRING COMPRESSOR

STEP 1



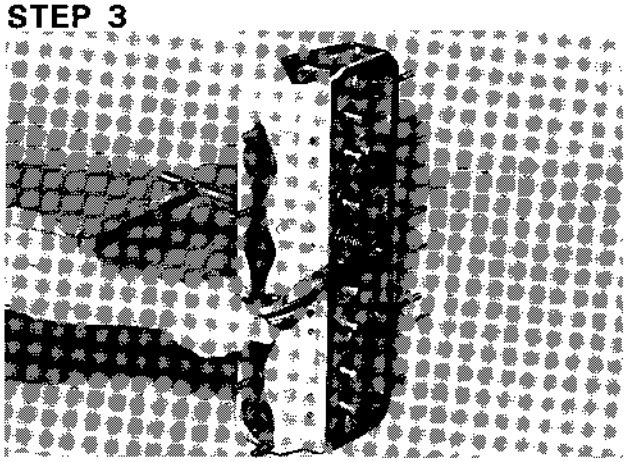
Remove the cylinder head from the engine block. Refer to section 2015 for head removal. *NOTE:* This cylinder head requires two M20611 Kits.

STEP 2



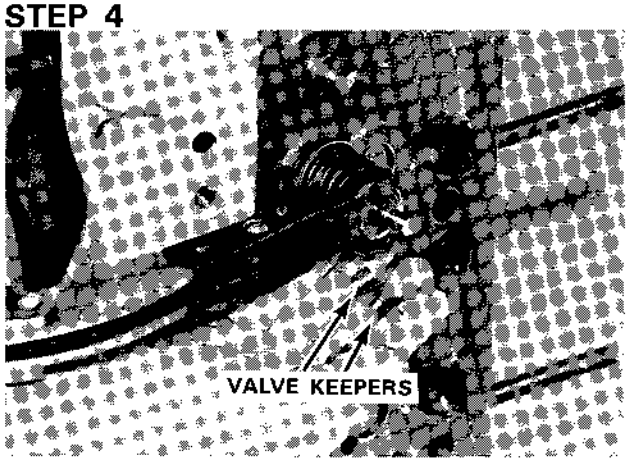
Place cylinder head on work bench.

STEP 3



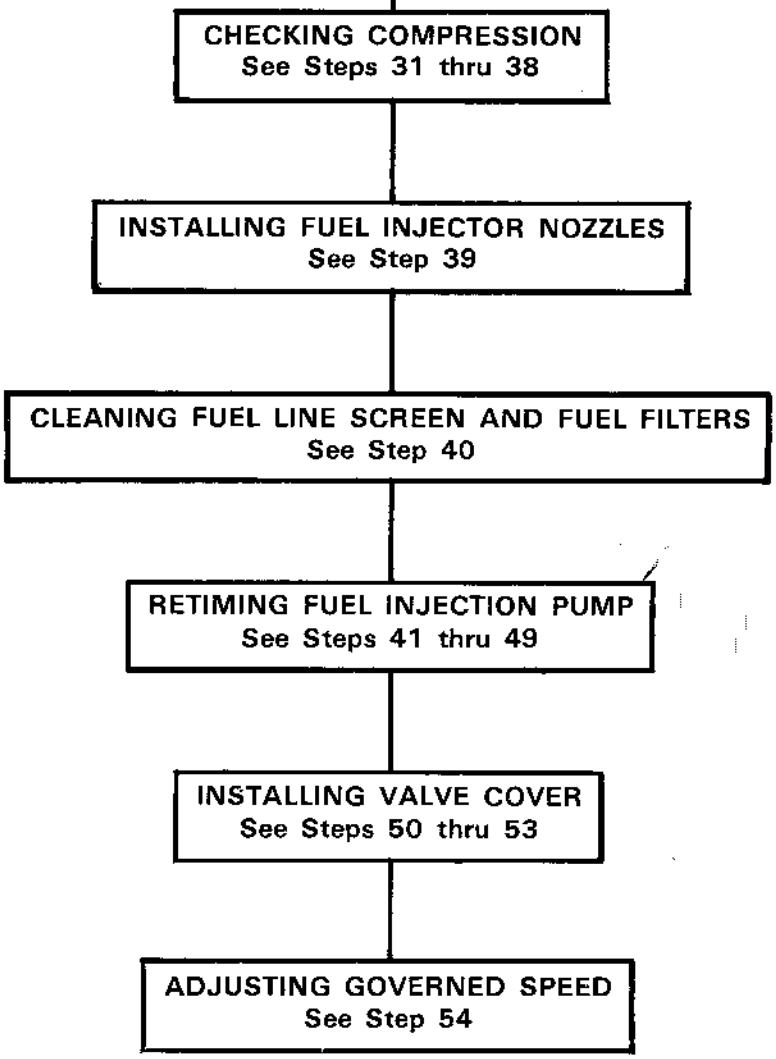
Install a valve spring compressor.

STEP 4

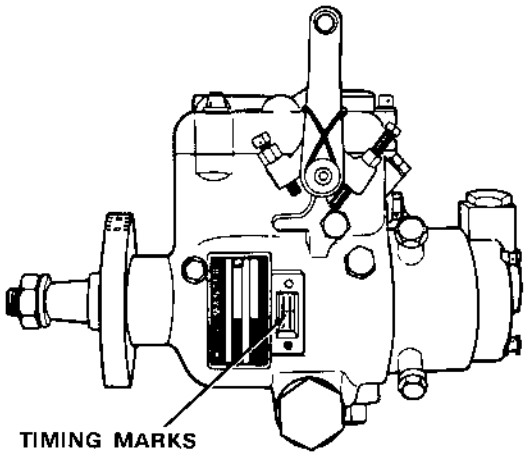


Compress valve spring and remove valve keepers. *IMPORTANT:* Valves and valve keepers should be marked when removed to insure that they will be reinstated in their original location.

ENGINE TUNE-UP CONTINUED



STEP 45

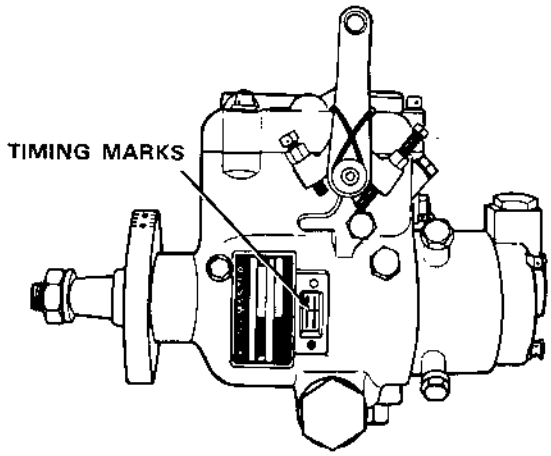


Check timing marks in timing window of injection pump. If marks are not aligned, proceed to next step. If marks are in line, the pump is in time.

STEP 46

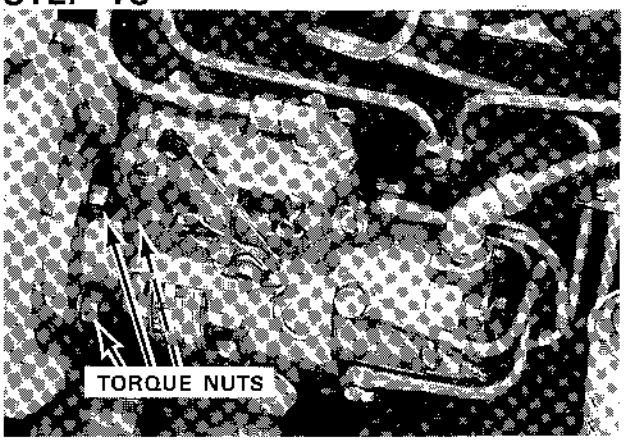
Loosen pump mounting nuts. Move pump toward or away from engine until timing marks are aligned. *NOTE:* To advance timing, move top of pump away from engine. To retard pump timing, move top of pump toward engine.

STEP 47



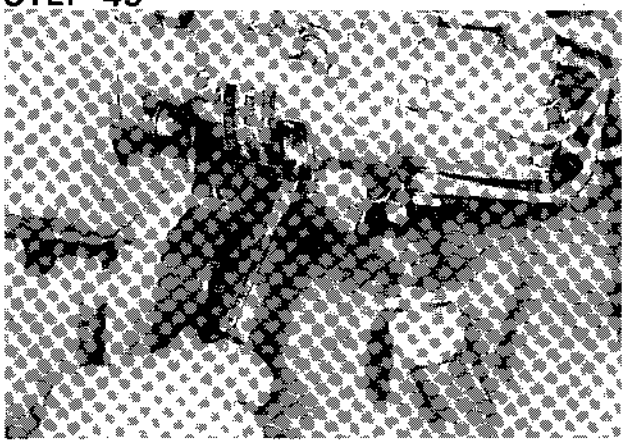
Timing marks aligned for proper timing.

STEP 48



Torque pump mounting nuts 35 to 42 ft. lbs.

STEP 49



Install timing window cover on injection pump.

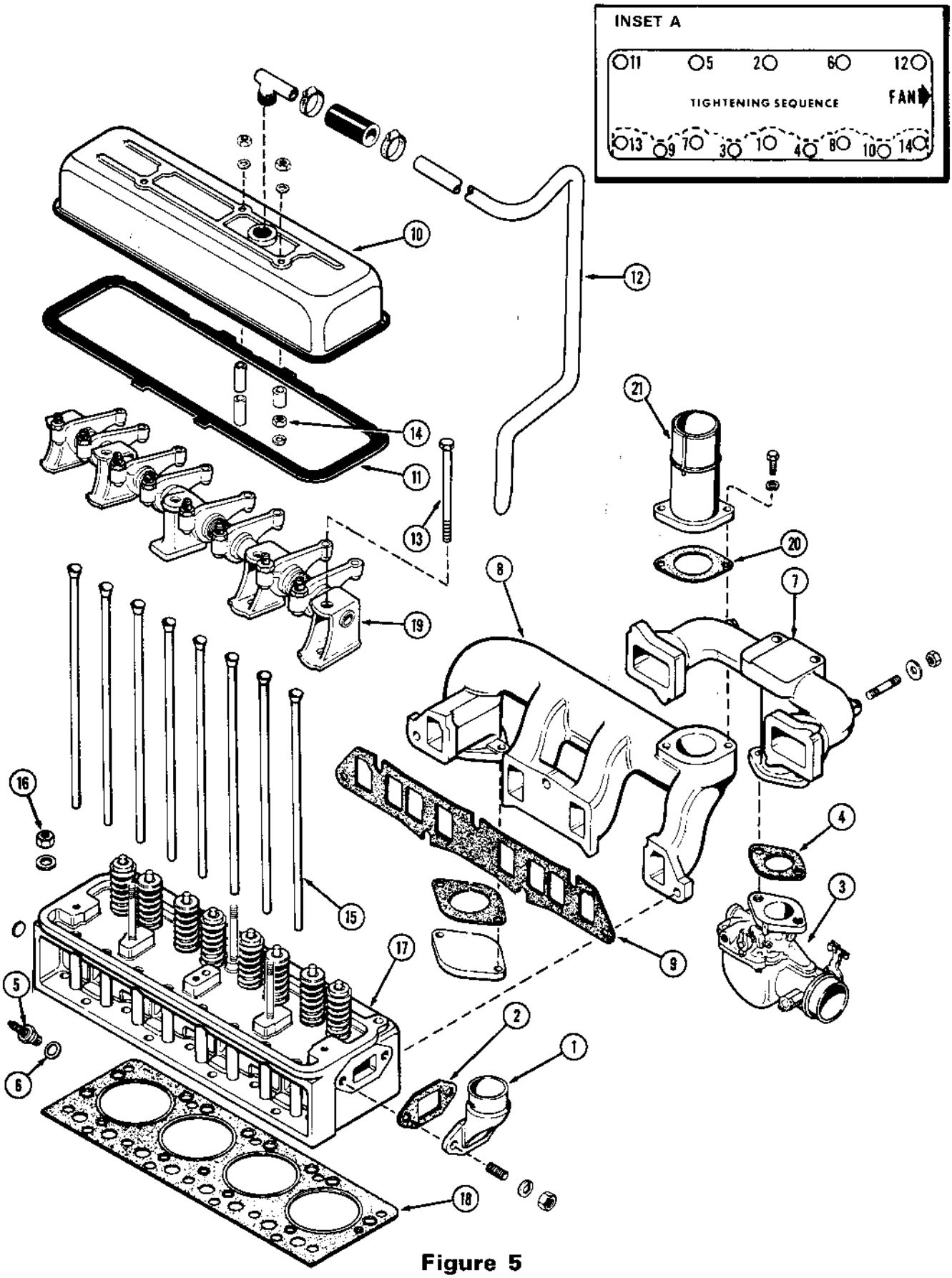

INSET A
11
5
2
6
12
TIGHTENING SEQUENCE
FAN
13
9
7
3
1
4
8
10
14
11
13
19
12
21
20
8
7
16
15
4
3
17
9
5
2
1
6
18

Figure 5

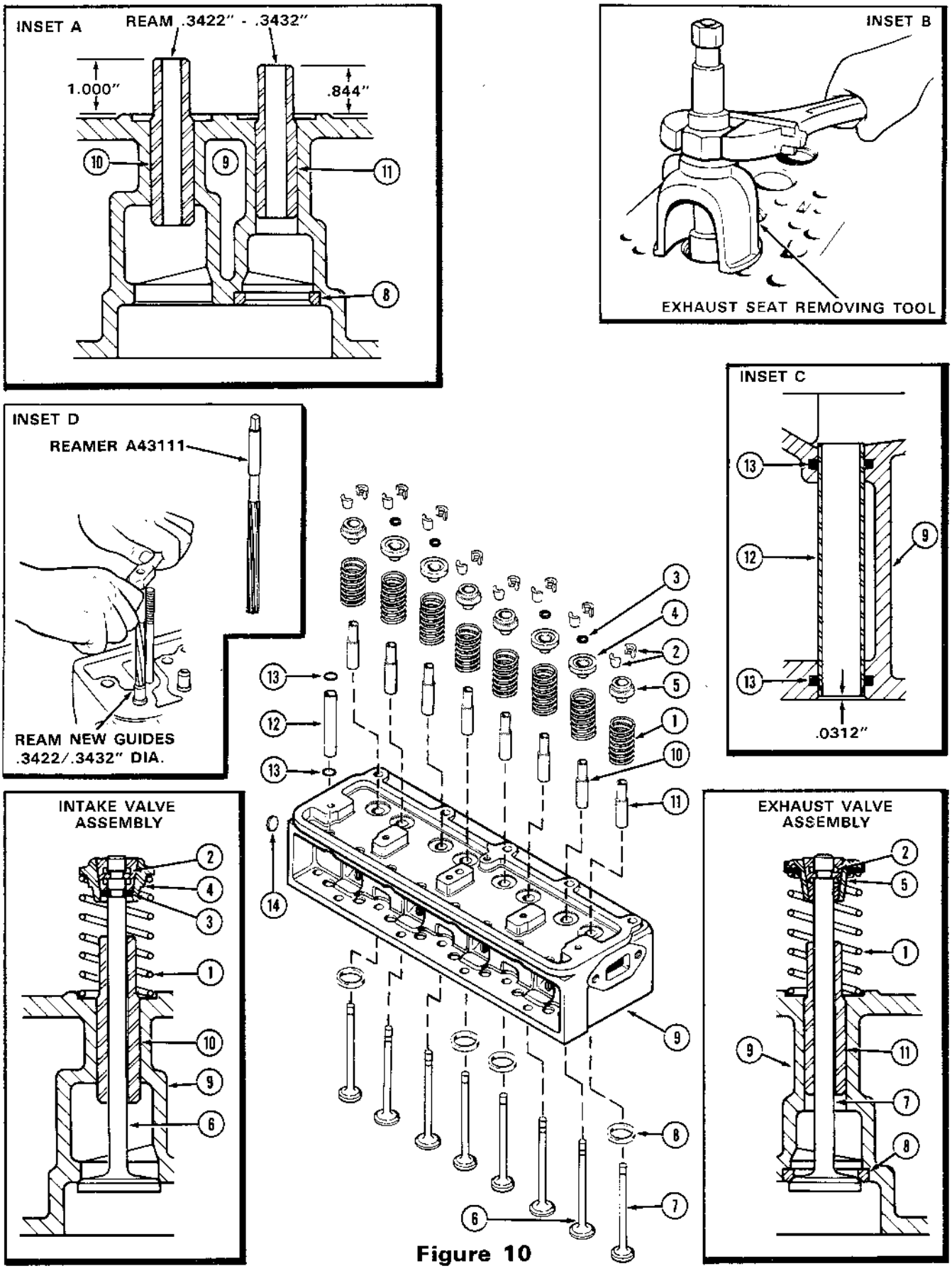
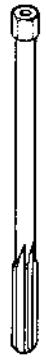

INSET A
REAM .3422" - .3432"
1.000"
.844"
10
9
11
8
INSET B
EXHAUST SEAT REMOVING TOOL
INSET C
13
12
9
13
.0312"
INSET D
REAMER A43111
REAM NEW GUIDES
.3422/.3432" DIA.
INTAKE VALVE
ASSEMBLY
2
4
3
1
10
9
6
EXHAUST VALVE
ASSEMBLY
2
5
1
9
11
7
8
3
4
2
5
1
10
11
13
12
13
14
9
8
7
6

Figure 10

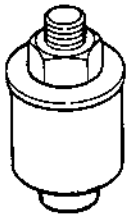
SPECIAL TOOLS



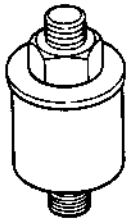
A43277 INJECTOR REAMER

A43278 INJECTOR
REMOVAL TOOL

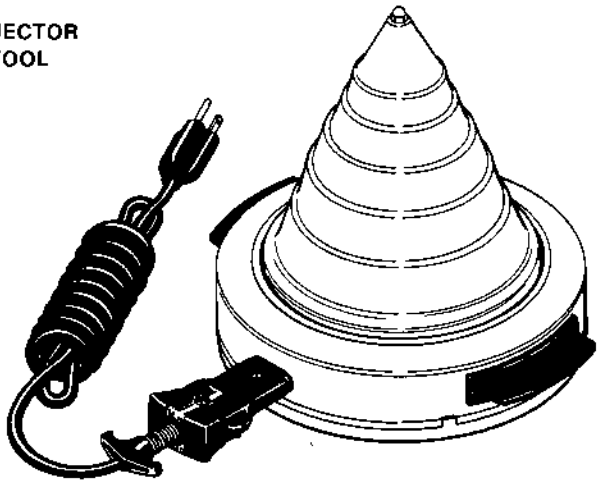
A43112 VALVE
GUIDE REAMER



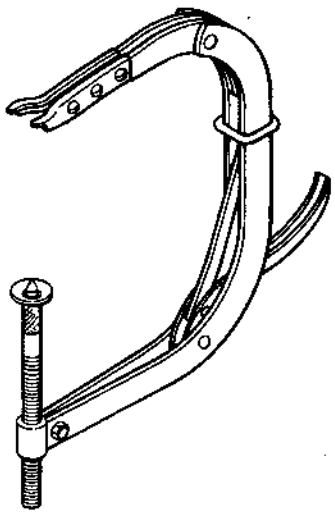
ASAE TACHOMETER
DRIVE REMOVAL TOOL
(SEE PAGE 5)



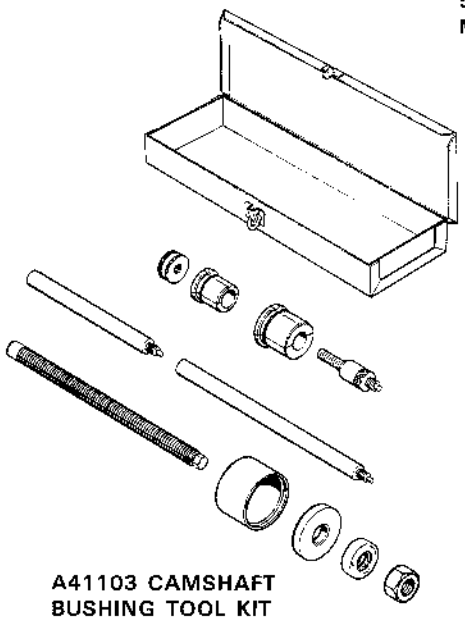
NON ASAE TACHOMETER
DRIVE REMOVAL TOOL
(SEE PAGE 5)



THERMO MOUNTER - MODEL "C"
ELECTRONIC DESIGNS, INC.
5164 N. 62ND STREET
MILWAUKEE, WIS. 53218



VALVE SPRING COMPRESSOR

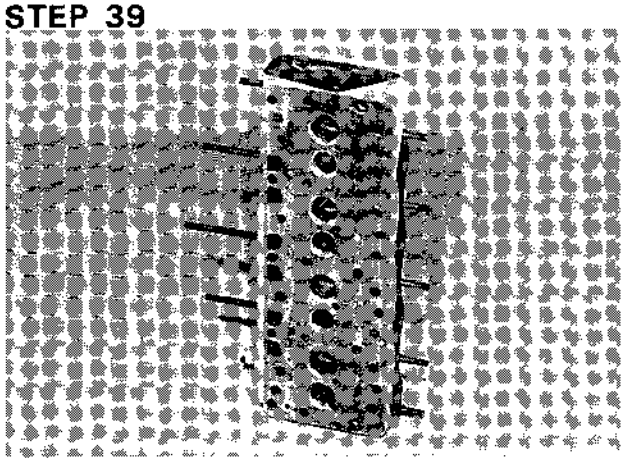


A41103 CAMSHAFT
BUSHING TOOL KIT

M20419 CYLINDER
HEAD WRENCH

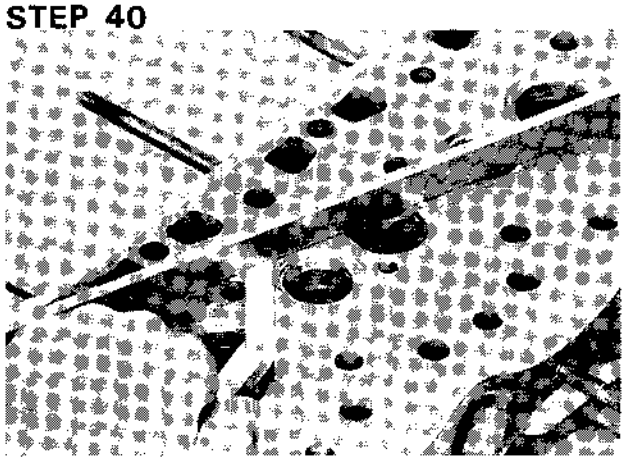
Cylinder Head Inspection

STEP 39



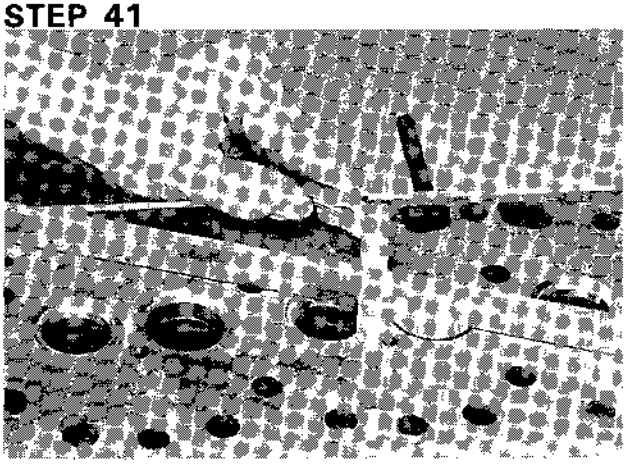
Wash, clean and inspect cylinder head. Use rotary wire brush to clean around and down into the valve ports. Clean carefully all machined surface areas with emery cloth, removing all gasket material, carbon and rust from cylinder head.

STEP 40



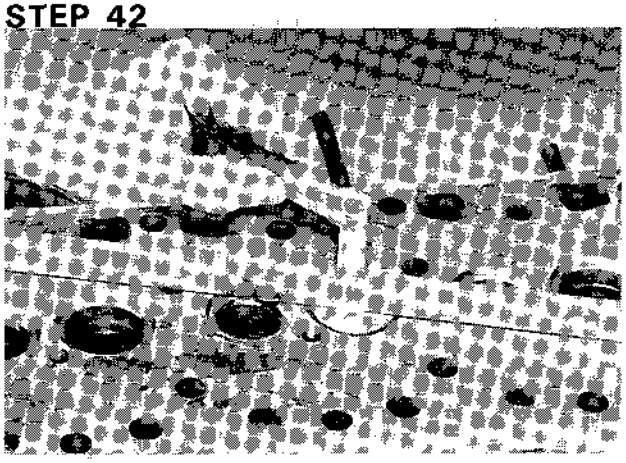
Lay a straight edge across the bottom of the cylinder head from corner to corner. Try to get a .006" feeler gauge under the straight edge. The maximum limit for head warpage is .006". If warpage is greater than .006", the cylinder head must be replaced or resurfaced. A minimum head thickness of 3.968" must be maintained if cylinder head is resurfaced.

STEP 41



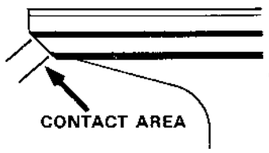
IMPORTANT: If the cylinder head has been resurfaced, the valve protrusion must be checked so as to prevent piston and valve contact. Refer to Steps 65 and 66.

STEP 42

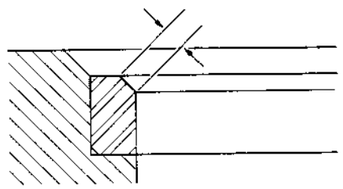


IMPORTANT: If the cylinder head has been resurfaced, the valve recession must be checked also. Refer to Steps 65 and 66.

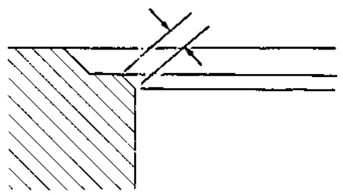
THIS IS THE CORRECT SEAT CONTACT AREA ON VALVE



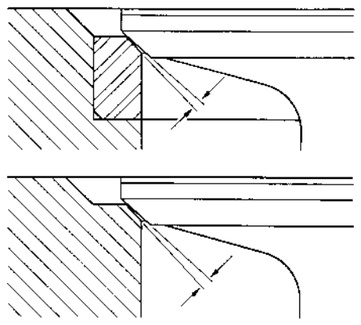
The correct exhaust valve contact area on seat will provide a seat width of .0608" to .0962"



The correct intake valve contact area will provide a seat width of .0704" to .1057"

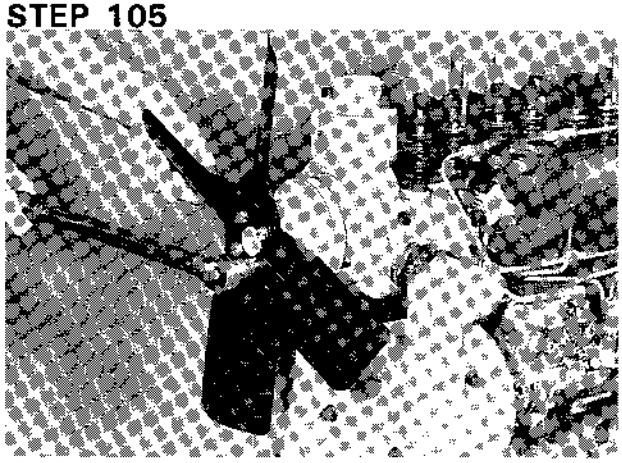


1° interference angle



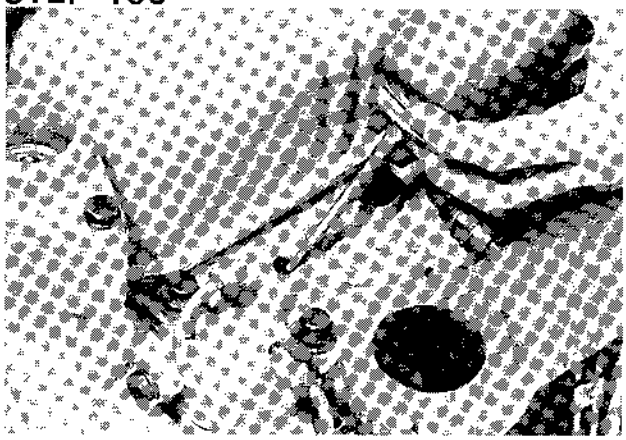
Correct refacing of intake and exhaust valves and valve seats will provide a 1° interference angle. This angle is important since it aids in cutting carbon and helps seat the valves.

STEP 105



Install water pump, pulley, spacer (if equipped) and fan. Refer to Section 2055 for installation.

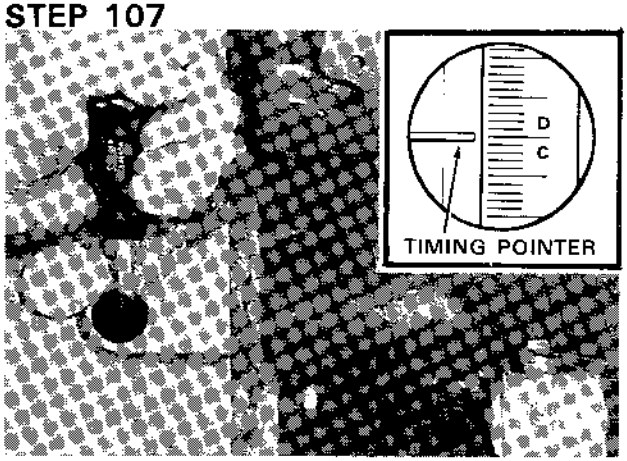
STEP 106



Install the fuel injectors. Refer to section 3013 for injector installation. *NOTE:* Squirt a few drops of HDM #30 oil in each cylinder head injector hole to provide lubricant for carbon dam at lower end of injector.

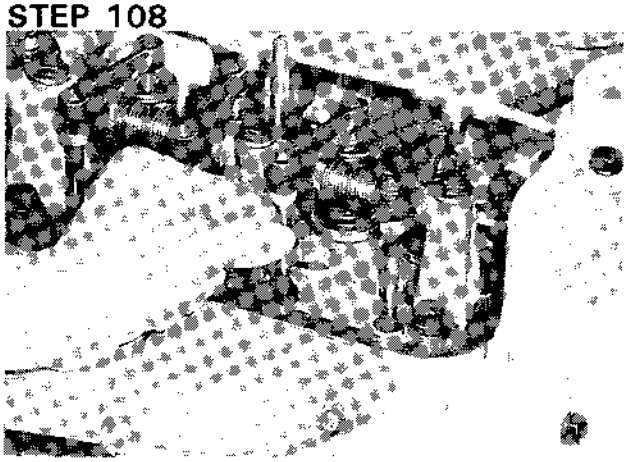
Locating Top Dead Center

STEP 107



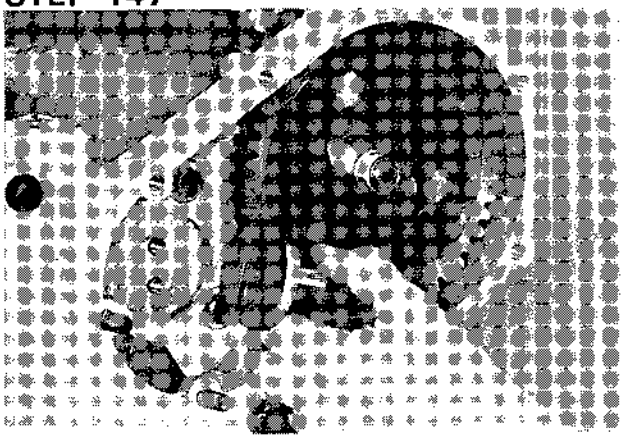
Crank the engine by inserting a screwdriver into the timing hole in the flywheel housing or torque tube and by engaging the ring gear teeth with the screwdriver, align the timing pointer with the TDC timing mark on the flywheel.

STEP 108



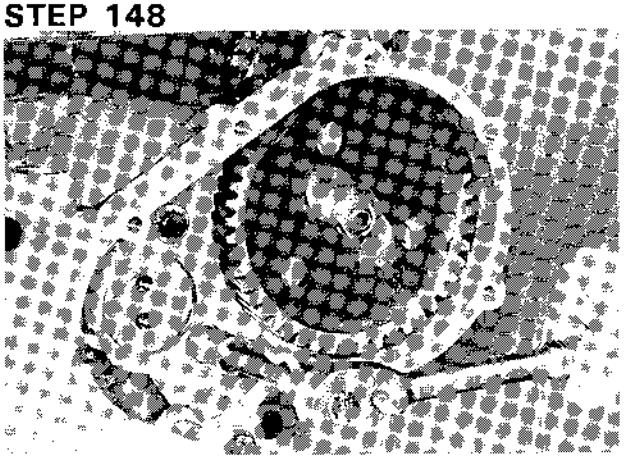
Check push rods on the number one cylinder for looseness. If push rods are loose, the number one cylinder is at TDC on the compression stroke. If push rods are tight, crank engine one complete revolution and align timing pointer with TDC mark on the flywheel.

STEP 147



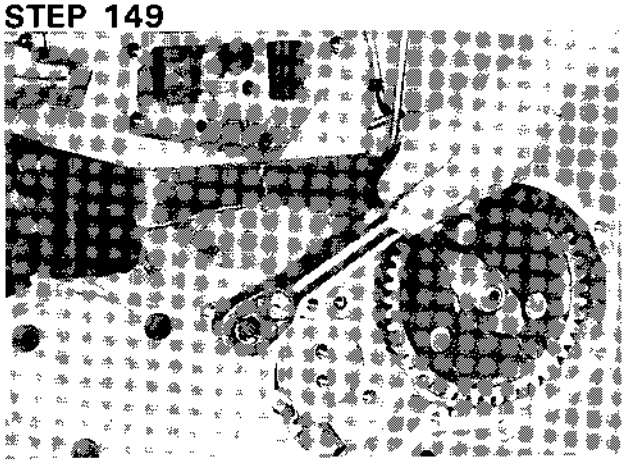
Remove the idler gear hub shaft.

STEP 148



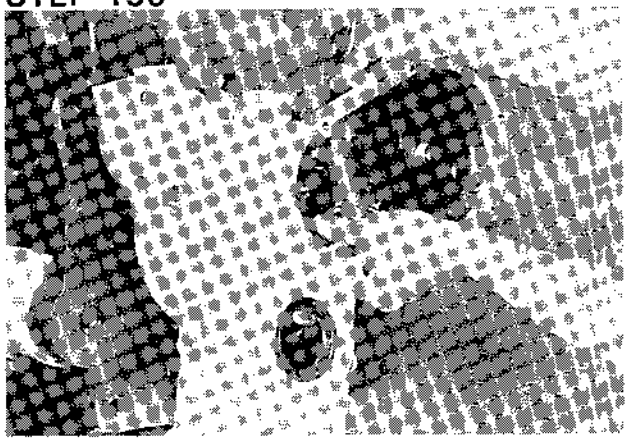
Remove two inside bolts from timing gear cover.

STEP 149

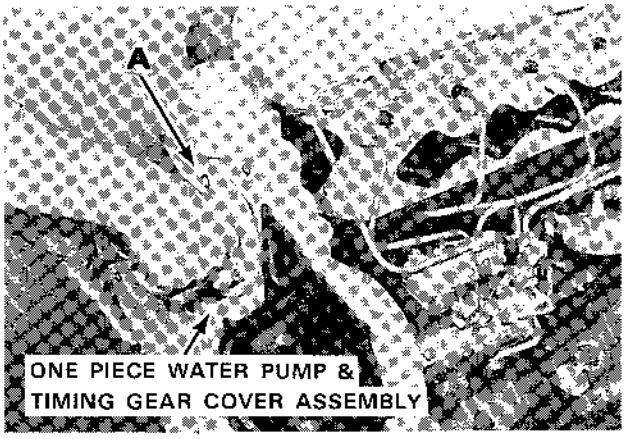


Remove timing gear cover mounting bolts.

STEP 150

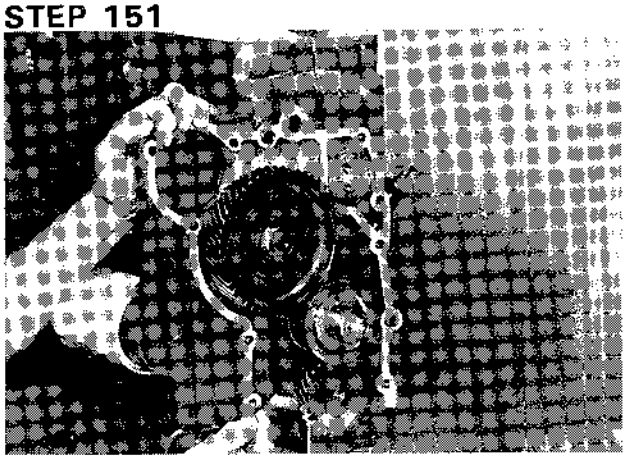


Remove timing gear cover with attached fuel pump.



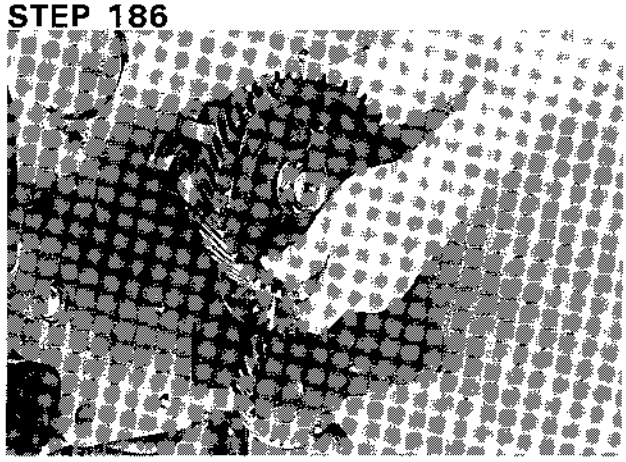
If equipped, remove the one piece water pump and timing gear housing assembly. *NOTE:* If a stud and nut is located in place of a bolt at point "A", the water pump must be removed and the inner socket hd. capscrew must be removed in order to remove the timing gear housing.

STEP 151



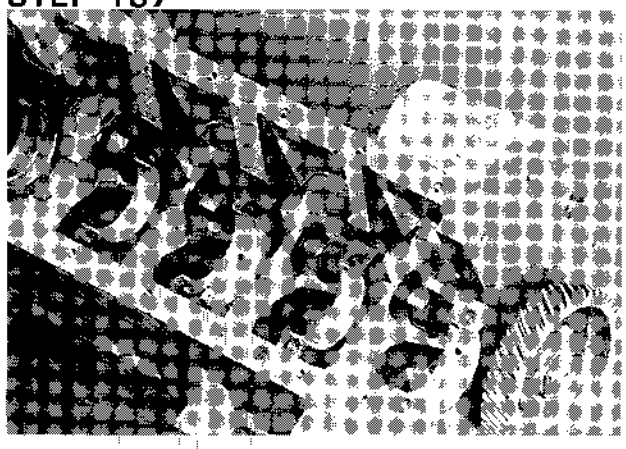
Remove timing gear housing gasket.

STEP 186



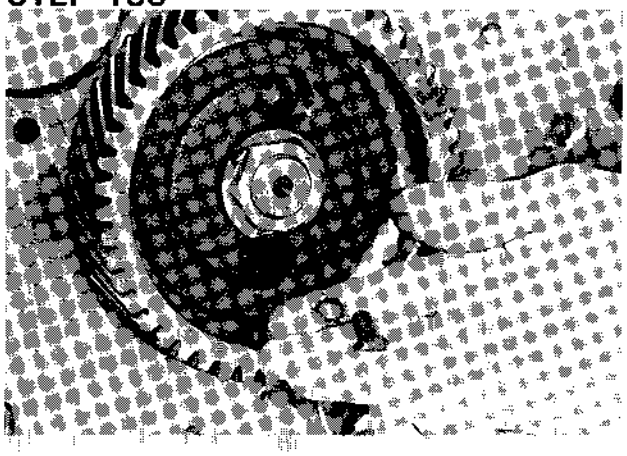
Install the camshaft part way into the engine block.

STEP 187



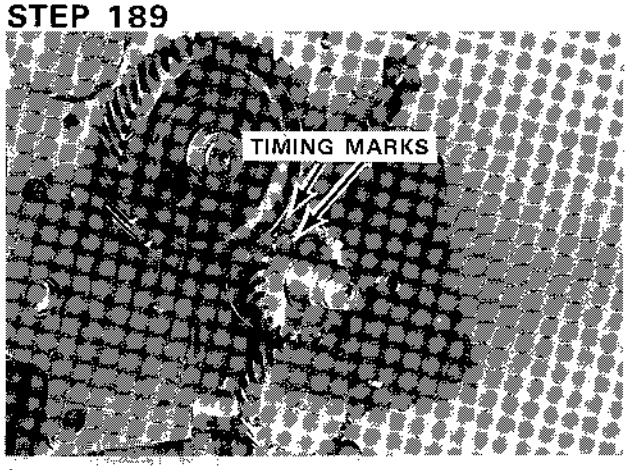
Lubricate the thrust washer, all bearing surfaces and lifter cams with HDM #30 oil.

STEP 188



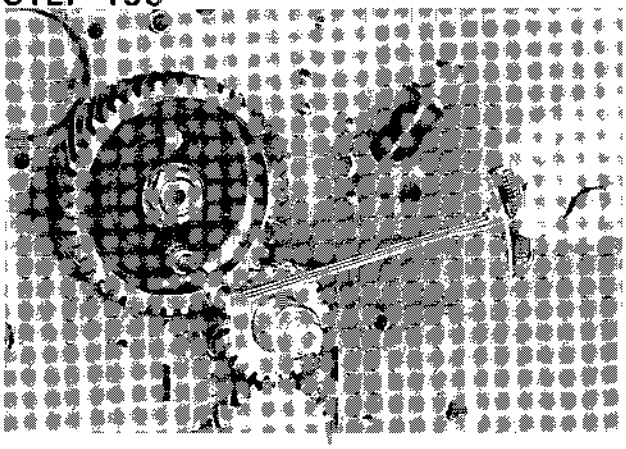
Push camshaft all the way into the engine block and align holes in camshaft gear with holes in thrust plate. Install external tooth lockwashers and bolts.

STEP 189



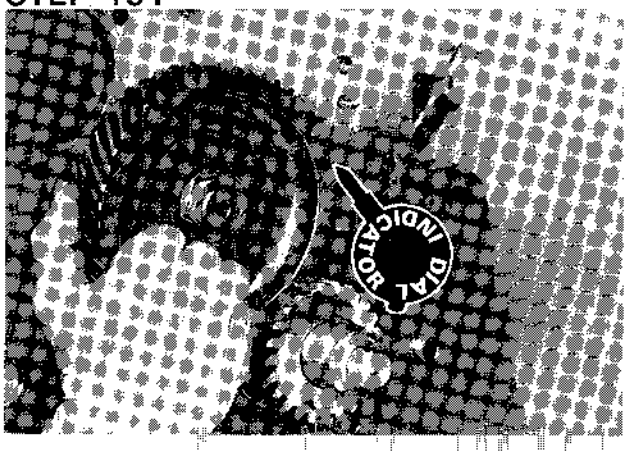
Align the timing marks on the camshaft gear with the timing mark on the crankshaft.

STEP 190



Torque bolts 17 to 20 ft. lbs.

STEP 191



Place a dial indicator on the camshaft gear and check backlash between camshaft gear and crankshaft gear. Backlash must be .0002" to .006". If backlash exceeds .006", the gears must be replaced. *NOTE:* Excess backlash could also be caused by worn camshaft bushings.

Section
2023

ENGINE BLOCK ASSEMBLIES

201G, 188G, 159G, 148G SPARK IGNITION ENGINES

TABLE OF CONTENTS

CASE CORPORATION Rec. 9-76995 PRINTED IN U.S.A.

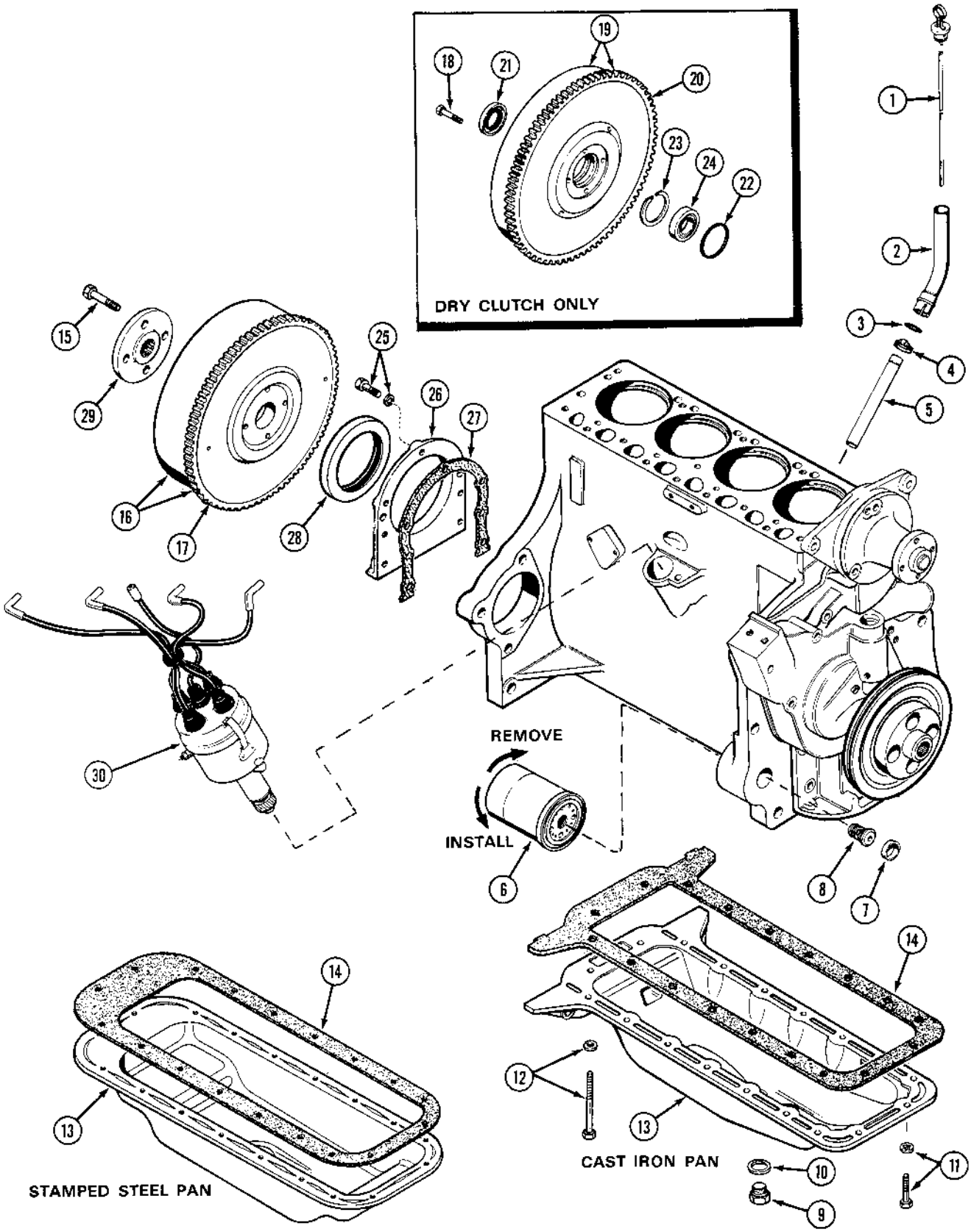

DRY CLUTCH ONLY
REMOVE
INSTALL
STAMPED STEEL PAN
CAST IRON PAN

Figure 4

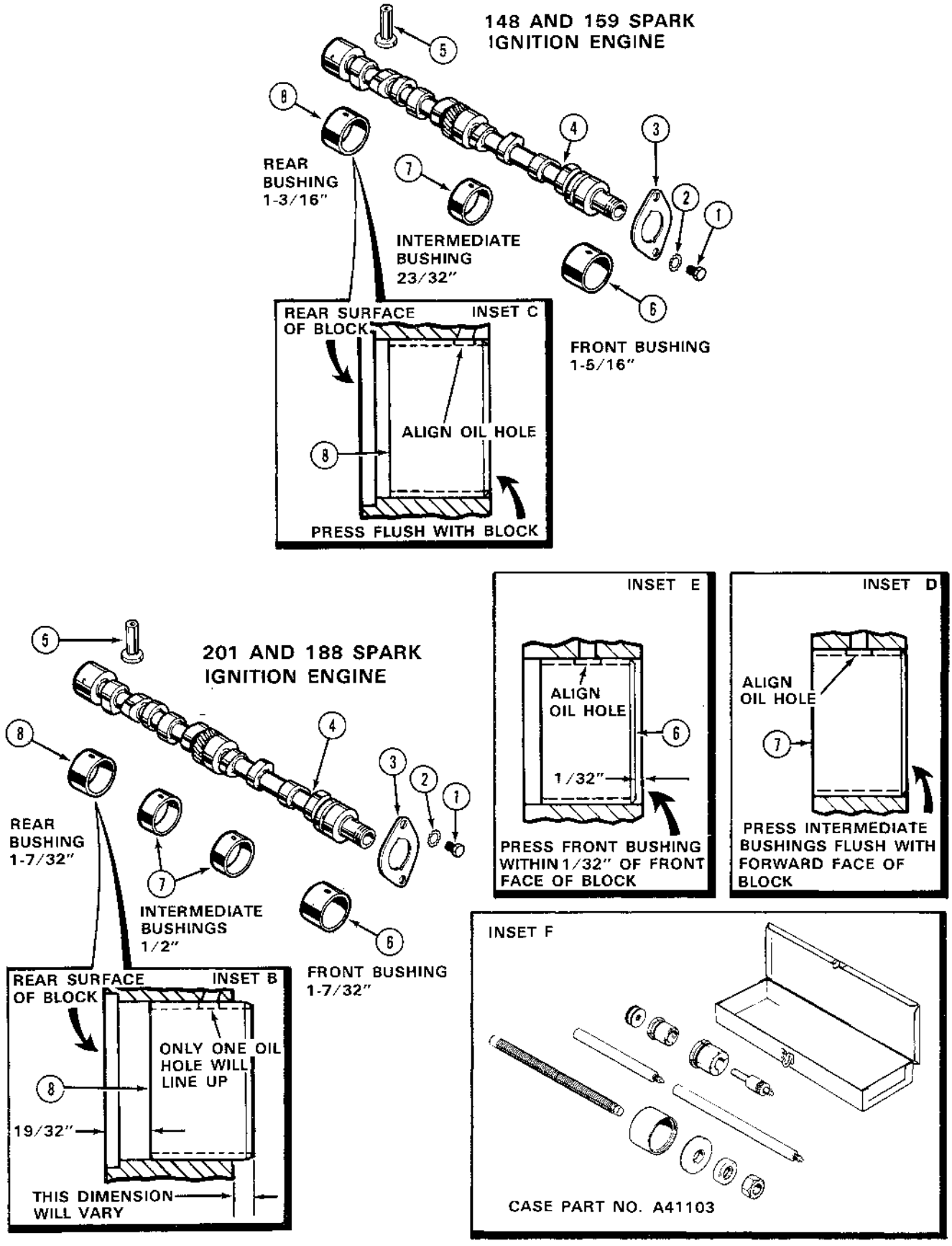
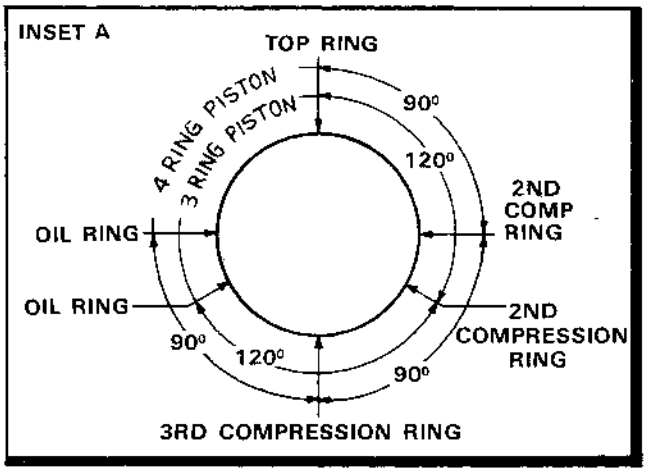
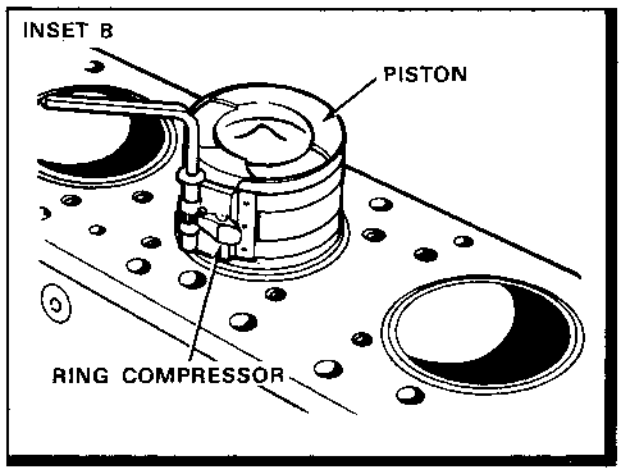
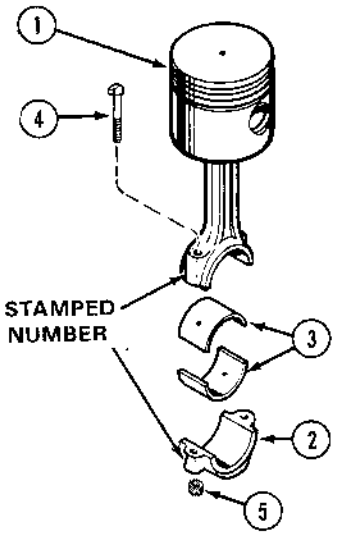
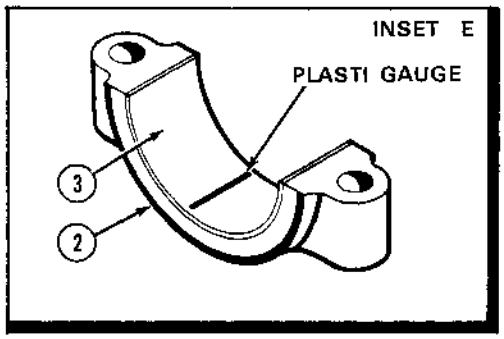

148 AND 159 SPARK IGNITION ENGINE
REAR BUSHING 1-3/16"
INTERMEDIATE BUSHING 23/32"
FRONT BUSHING 1-5/16"
INSET C
REAR SURFACE OF BLOCK
ALIGN OIL HOLE
PRESS FLUSH WITH BLOCK
201 AND 188 SPARK IGNITION ENGINE
REAR BUSHING 1-7/32"
INTERMEDIATE BUSHINGS 1/2"
FRONT BUSHING 1-7/32"
INSET B
REAR SURFACE OF BLOCK
ONLY ONE OIL HOLE WILL LINE UP
19/32"
THIS DIMENSION WILL VARY
INSET E
ALIGN OIL HOLE
1/32"
PRESS FRONT BUSHING WITHIN 1/32" OF FRONT FACE OF BLOCK
INSET D
ALIGN OIL HOLE
PRESS INTERMEDIATE BUSHINGS FLUSH WITH FORWARD FACE OF BLOCK
INSET F
CASE PART NO. A41103

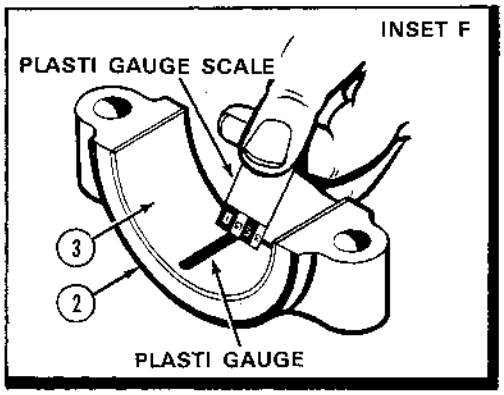
Figure 9

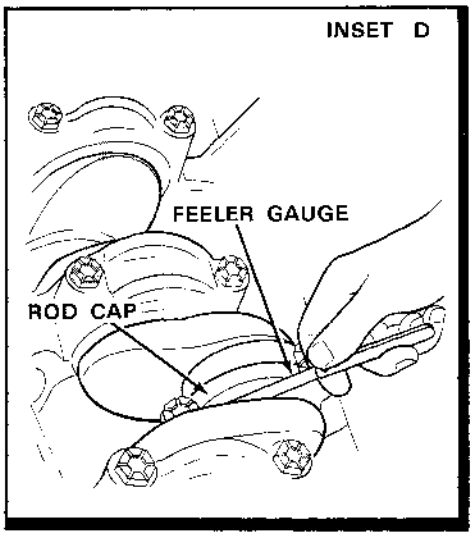

INSET A
TOP RING
4 RING PISTON
3 RING PISTON
90°
120°
2ND COMP RING
OIL RING
OIL RING
2ND COMPRESSION RING
90°
120°
90°
3RD COMPRESSION RING


INSET B
PISTON
RING COMPRESSOR


1
4
STAMPED NUMBER
3
2
5


INSET E
PLASTI GAUGE
3
2


INSET F
PLASTI GAUGE SCALE
3
2
PLASTI GAUGE


INSET D
FEELER GAUGE
ROD CAP

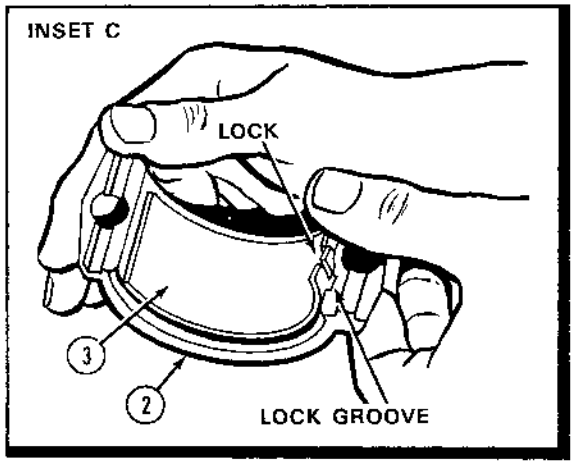

INSET C
LOCK
3
2
LOCK GROOVE

Figure 22

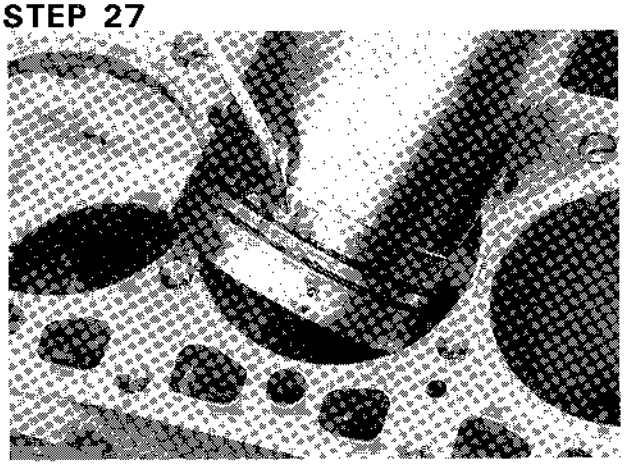
Section 2025

CYLINDER BLOCK, SLEEVES, PISTONS AND RODS

188 Diesel Engines

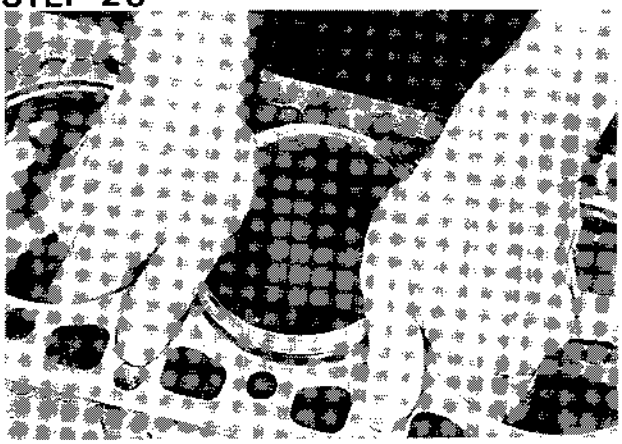
CASE CORPORATION Rac. 9-78855 PRINTED IN U.S.A.

STEP 27



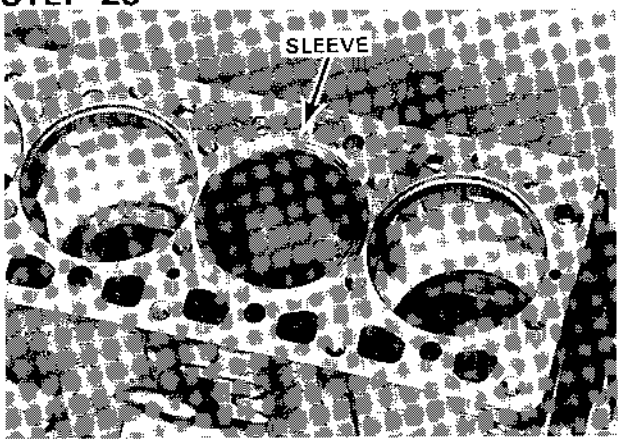
Lubricate the "O" ring with HDM No. 30 oil before installing into engine block.

STEP 28



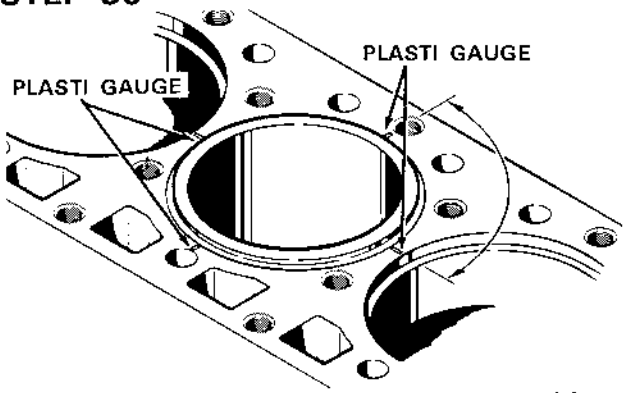
Press the sleeves into the block being careful not to damage the "O" rings. Do not rotate the sleeves while they are being installed. Old sleeves must be installed in the same position and location they were in before removal.

STEP 29



Cylinder sleeve installed.

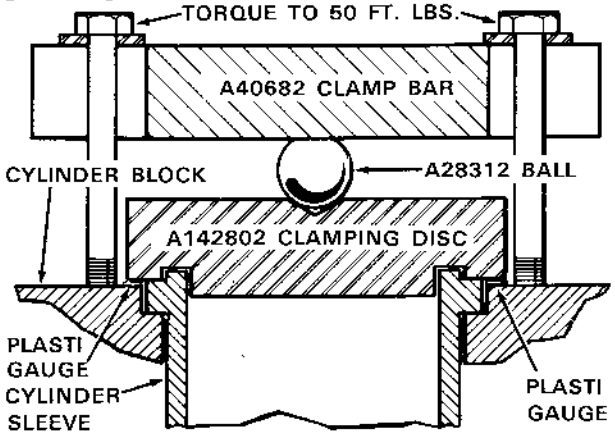
STEP 30



Measure sleeve protrusion at four positions on cylinder block using .001" to .003" plasti gauge.

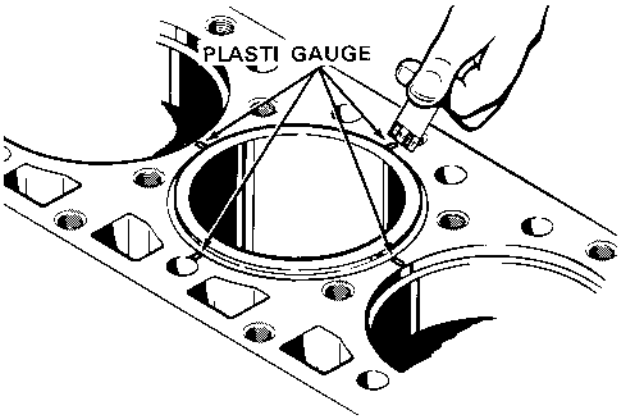
NOTE: The plasti gauge must not protrude onto the cylinder sleeve flange.

STEP 31



Install clamping disc A142802, ball A28312, and clamp bar A40682. Torque clamp bar mounting bolts 50 ft. lbs.

STEP 32



Remove protrusion tool and measure the flattened plasti gauge. Sleeve protrusion must not exceed .005". If protrusion exceeds .005", remove sleeve and install another sleeve until protrusion is below .005".

Section 2035

CRANKSHAFT, MAIN BEARINGS, FLYWHEEL AND OIL SEAL REPLACEMENT

188 and 207 Diesel Engines

CASE CORPORATION

Rac 9-78866

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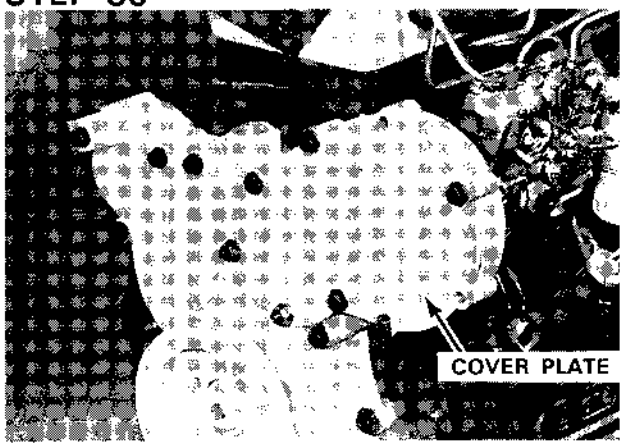
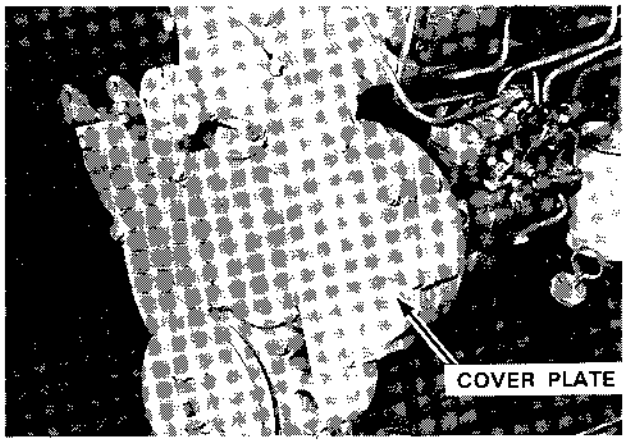
STEP 36

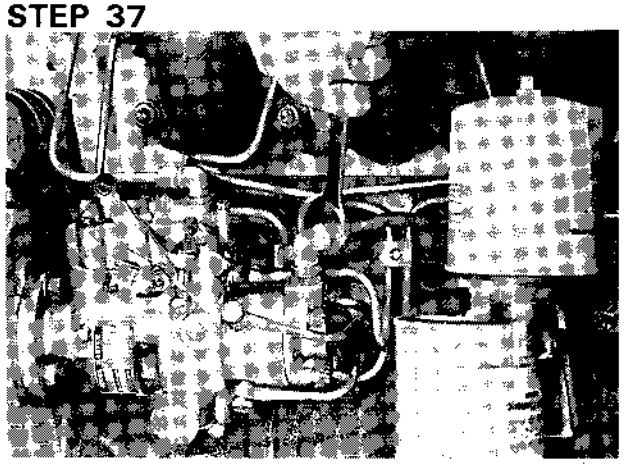


Remove cover plate from timing gear cover.



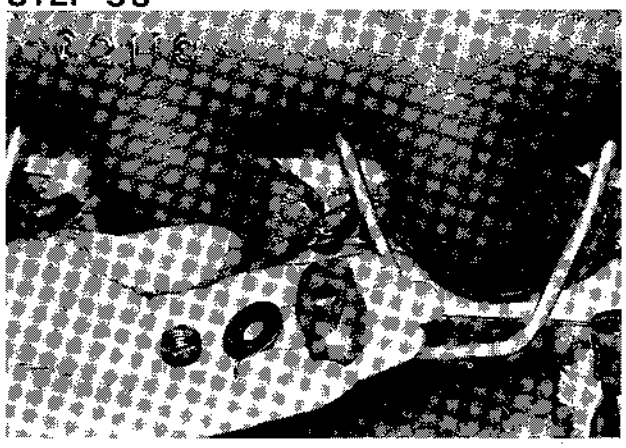
If equipped, remove timing gear cover plate with integral water tube.

STEP 37



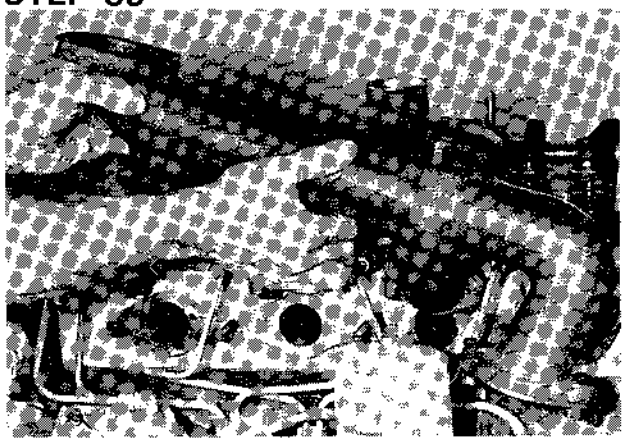
Disconnect the inlet fitting, leakoff line, throttle control and governor control from fuel injection pump. Disconnect the high pressure lines from the fuel injectors.

STEP 38



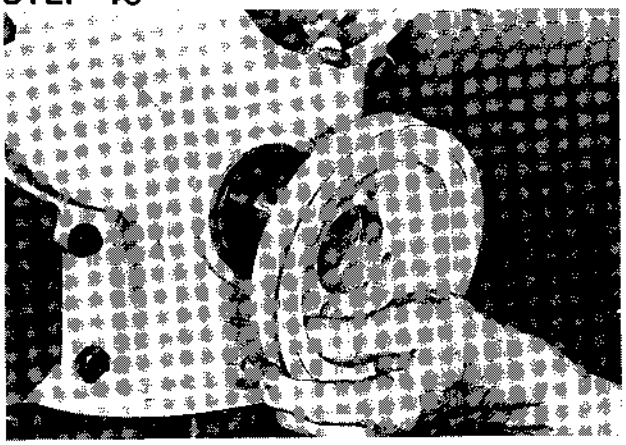
Remove the manifold stud nuts, washers and retaining clamps.

STEP 39



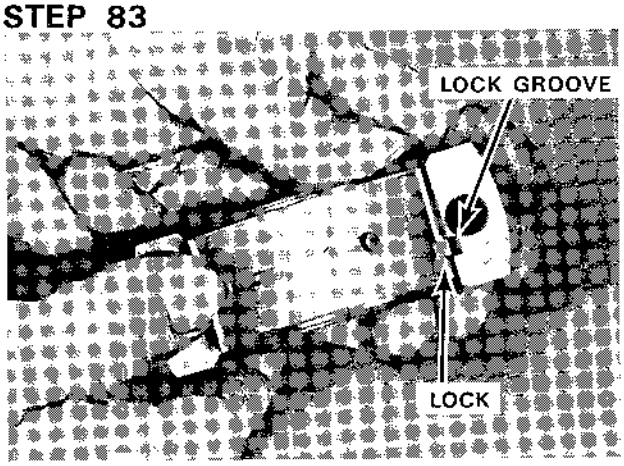
Remove the front of the manifold off of the front stud. Swing manifold upward and remove the manifold from the rear stud.

STEP 40



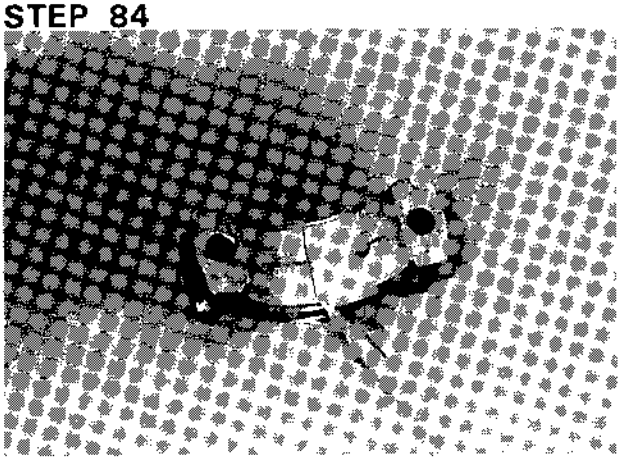
Remove crankshaft pulley.

STEP 83



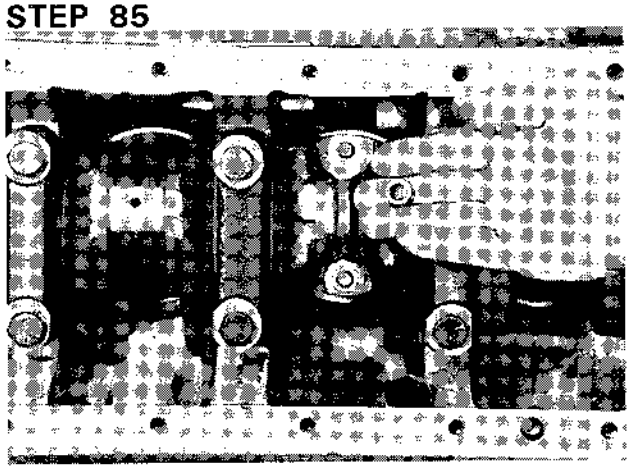
Install bearing liners into connecting rod bearing caps. *NOTE:* Make sure liner lock aligns with lock groove in bearing cap. Use a sliding movement when installing liners; never press on center of liner.

STEP 84



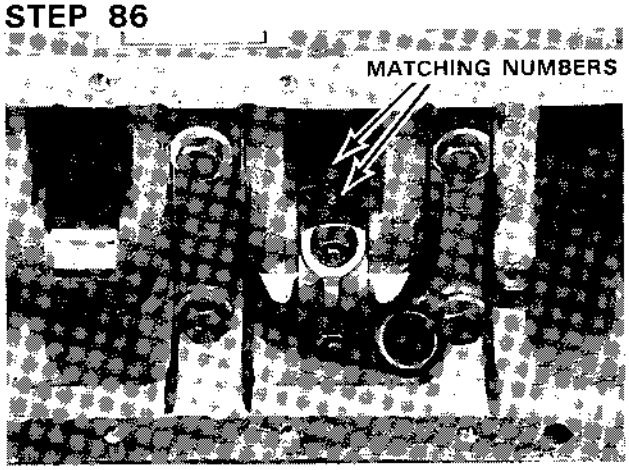
Wipe clean the connecting rod journals and bearing liners. Place a piece of plasti gauge on the connecting rod cap liner.

STEP 85



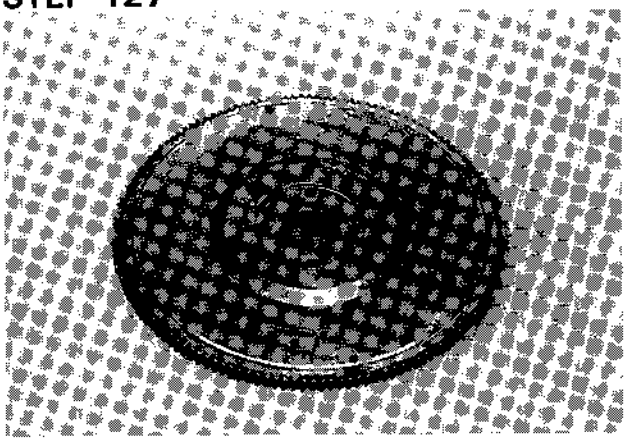
Install the connecting rod cap with corresponding number as connecting rod toward the camshaft side of engine with plasti gauge on the connecting rod. Retain in place with mounting nuts.

STEP 86



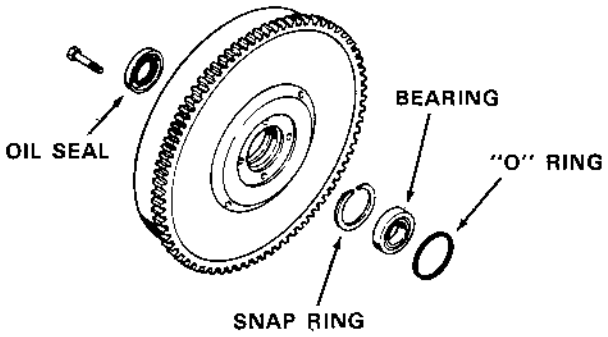
When installing connecting rod bearing caps, make sure the number matches the number on the connecting rod and is toward the camshaft side of the engine.

STEP 127



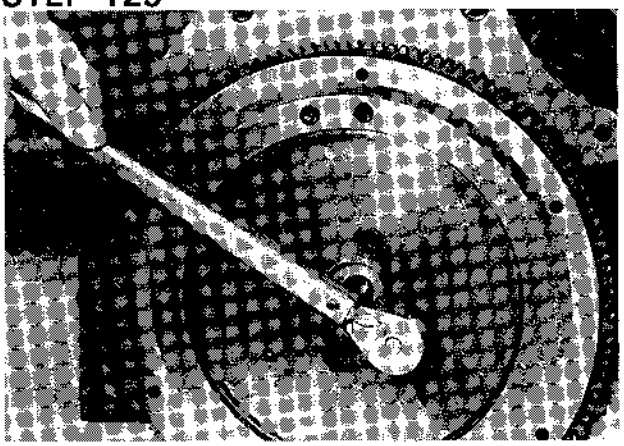
Ring gear installed on flywheel.

STEP 128



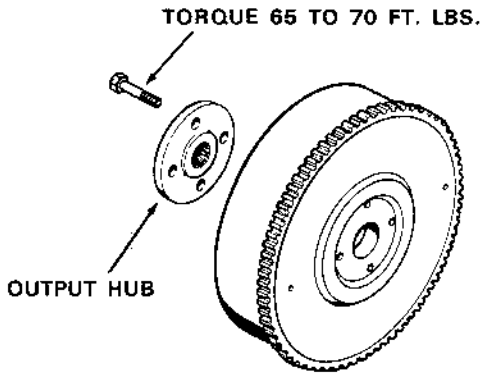
On dry clutch tractor flywheel, install snap ring in groove of flywheel. Press bearing in until seated against snap ring from the gear side of flywheel. Install new oil seal from rear side until seated against the snap ring. Install new "O"-ring. Lubricate oil seal and "O" ring with drive-away oil.

STEP 129

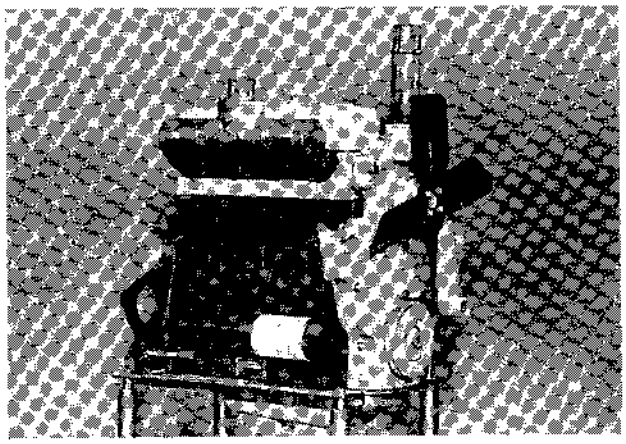


Install flywheel on end of engine crankshaft. Torque flywheel mounting bolts 65 to 70 ft.lbs.

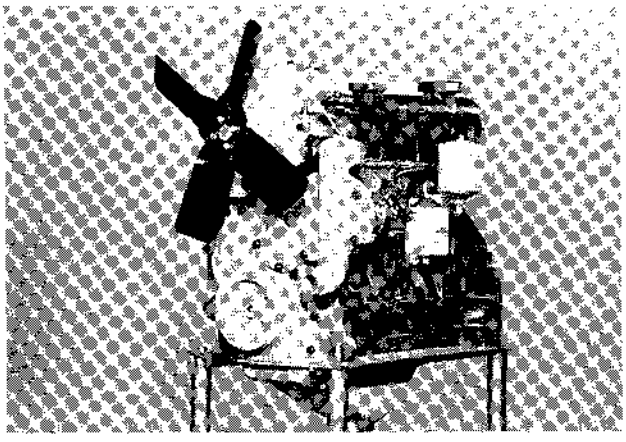
STEP 130



On hydrostatic tractors, lubricate the spline hole and face of hub liberally with No. 2 Moly Disulfide grease. Install flywheel and output hub. Torque retaining bolts 65 to 70 ft. lbs.

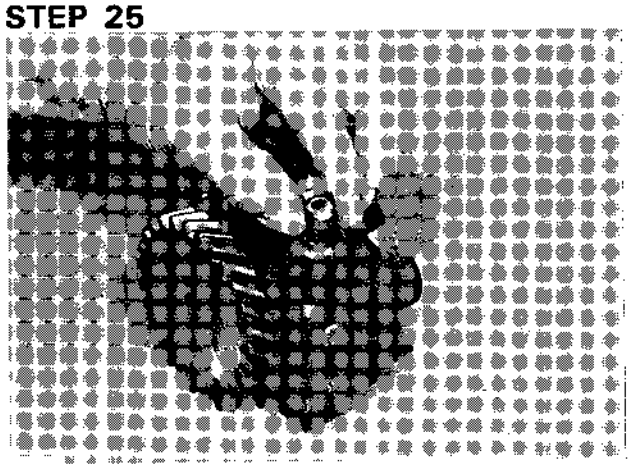


188 DIESEL ENGINE



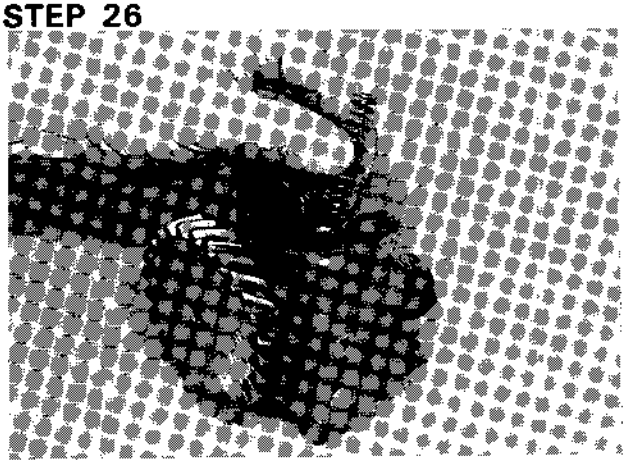
207 DIESEL ENGINE

STEP 25



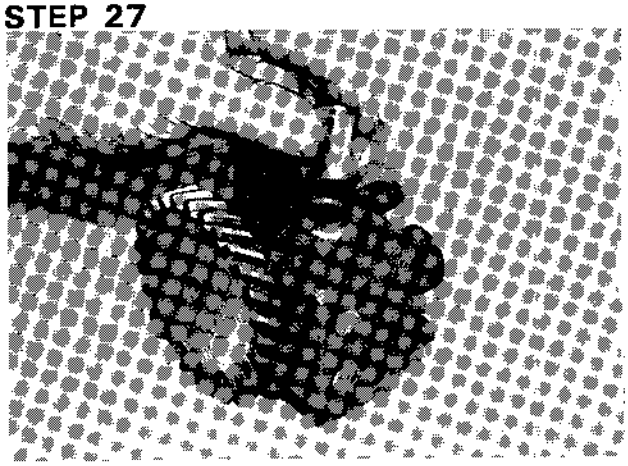
Remove cup plug from body.

STEP 26



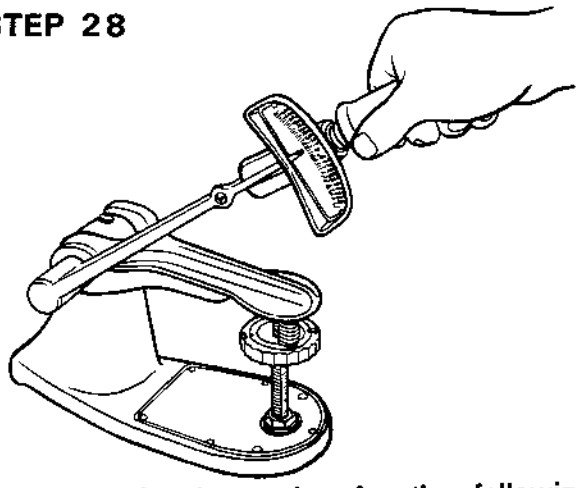
Remove relief valve spring from body.

STEP 27



Remove relief valve from body.

STEP 28

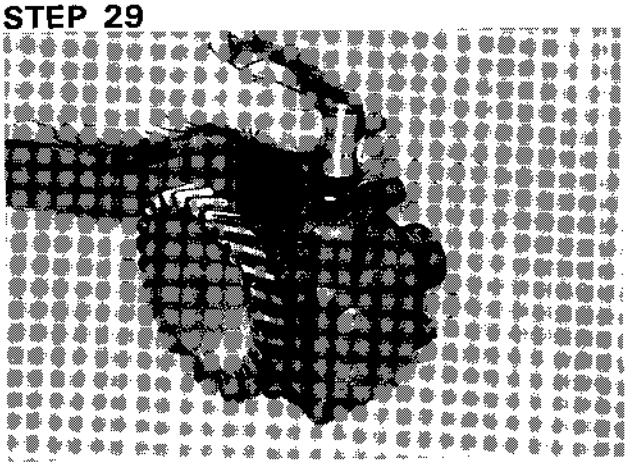


Check relief valve spring for the following:

Free length ..... 2.125"

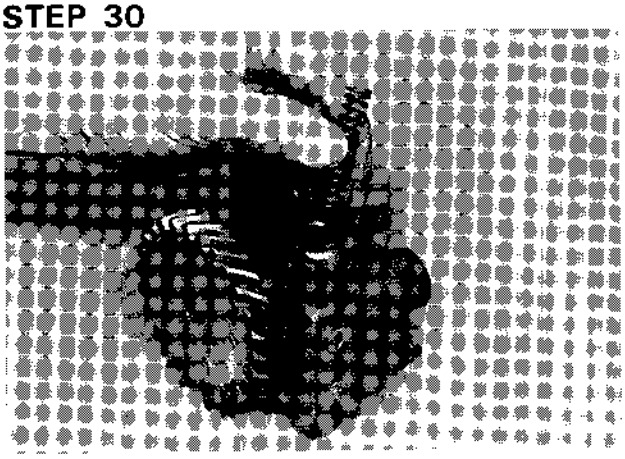
Load at 1.44" ..... 18 to 19 lbs.

STEP 29



Install relief valve in body with closed end toward pump.

STEP 30



Install relief valve spring in body.

INSTALLING ENGINE AND CLUTCH ASSEMBLY

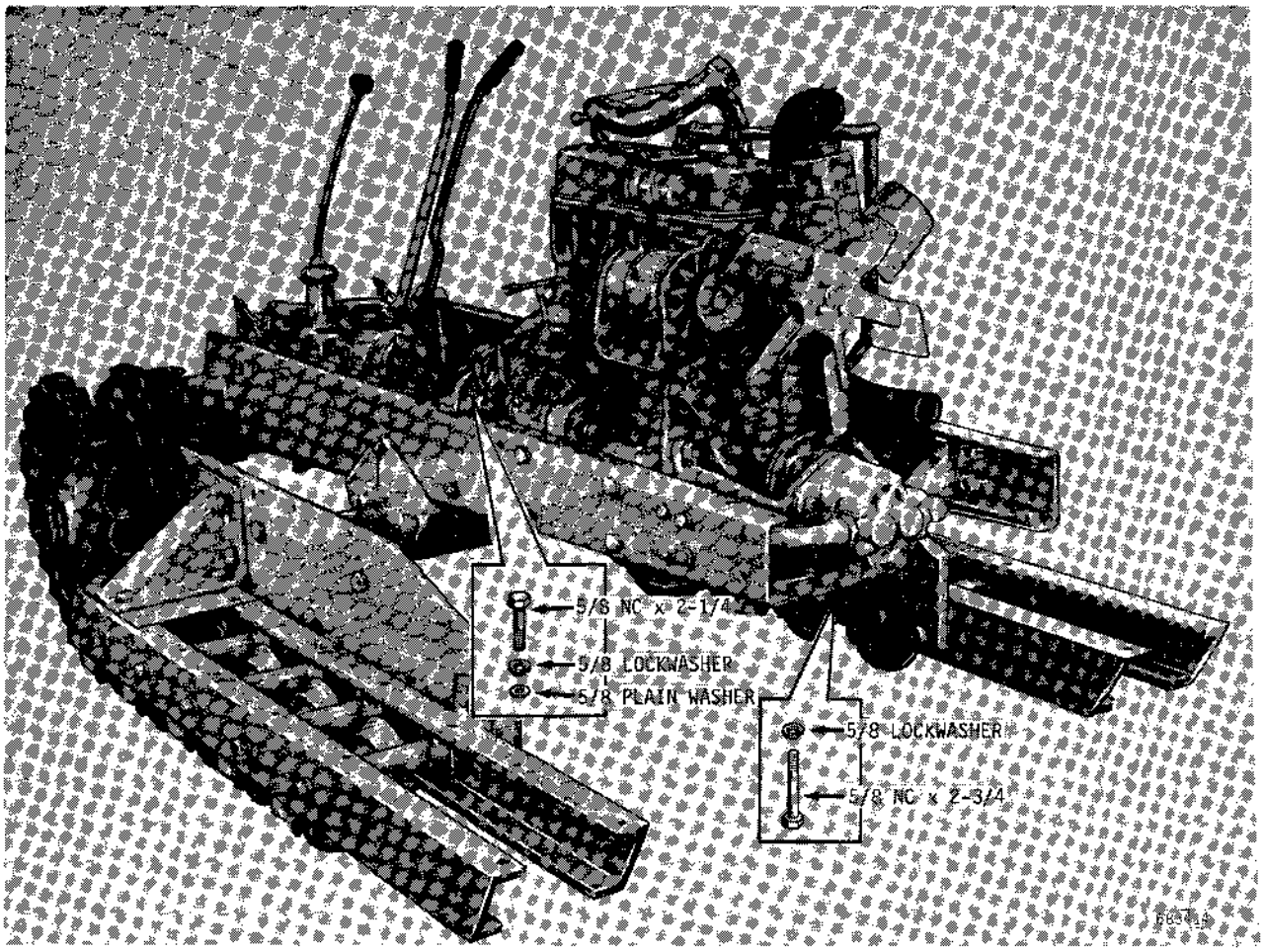


Figure 2 - Mounting the Engine

1. Using the hoist, lift the engine onto the engine frame. Work it into place so the mounting bolt holes line up. Install the engine mounting hardware shown in Figure 2. Install driveshaft.

2. Install the accelerator pivot shaft, Figure 3 or 4, if removed.

3. Lift the instrument panel-reservoir assembly into place and mount it to the side plates with 1/2" NC bolts, nuts, and lockwashers, if removed.

4. The following connections or installations now can be made:

   a. Engine oil pressure sender on L.H. side of the engine.

   b. Engine coolant temperature sender on R.H. rear of the engine.

   c. All electrical connections (connect battery ground cable last). Refer to Section 8011.

   d. Clutch pedal linkage or power shuttle control linkage.

   e. Hand and foot throttle linkage, foot pedal, and front floorboard. Refer to Figure 3 for diesel engines and Figure 4 for gasoline engines.

   f. Fuel lines.

   g. Hoses and tubes to power shuttle.

   h. Hoses and tubes to equipment pump, Figure 5.

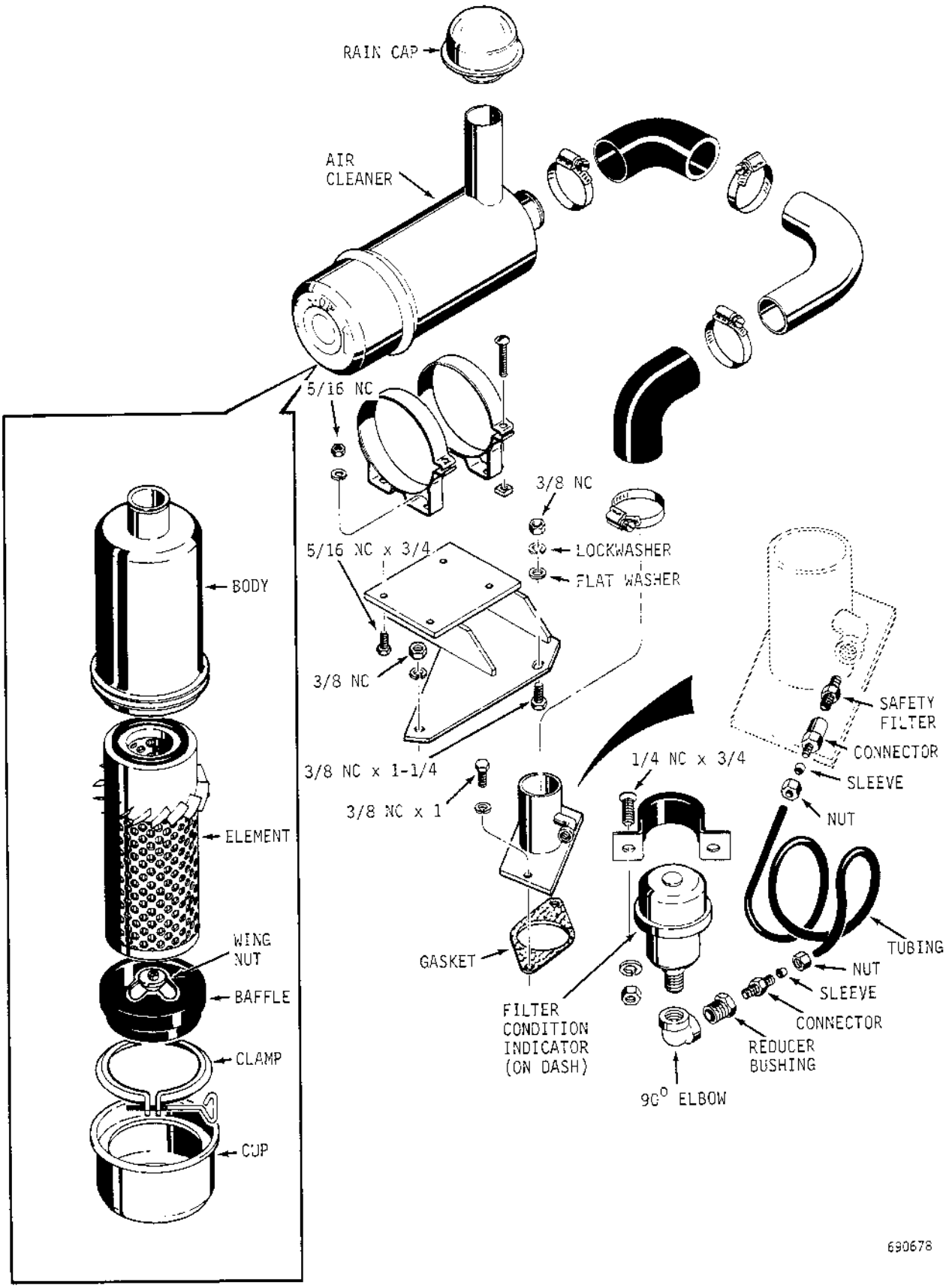


Figure 2 - Air Intake System on Diesel Models with Dry Type Air Cleaner

Section 2054

COOLING SYSTEM

CASE CORPORATION

C.E. Div. 9-99772
310G-350 Crawler
December 1975

PRINTED IN U.S.A.

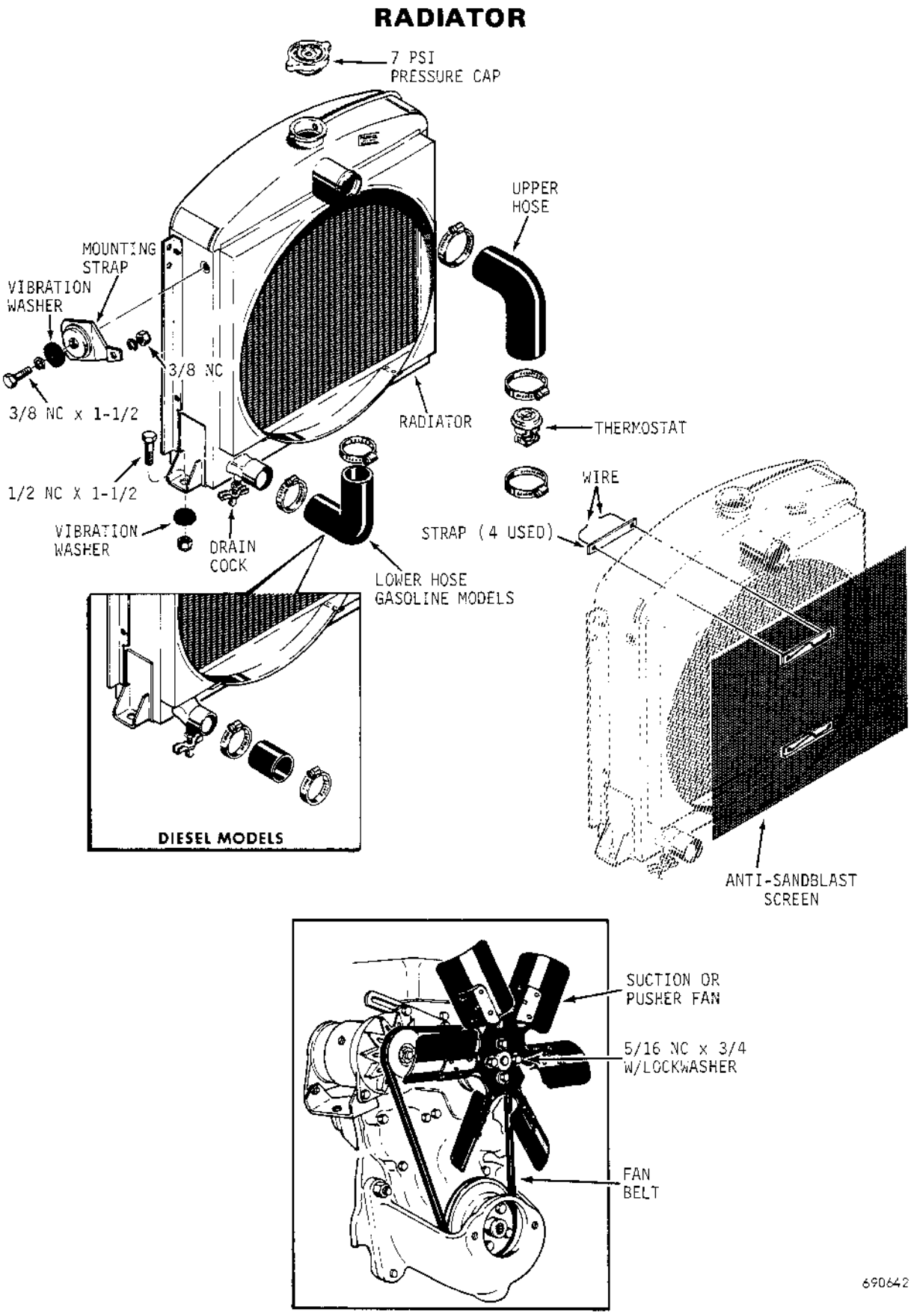


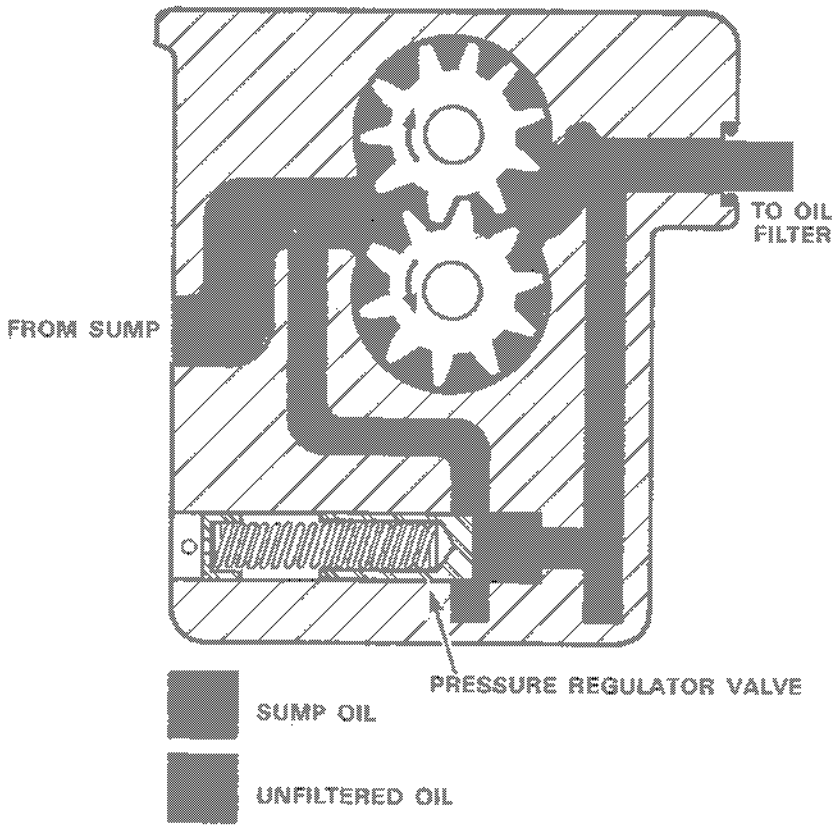
Figure 5 - Exploded View of Radiator Assembly

ENGINE OIL PUMP FLOW

STEP 3

As the oil pressure builds up within the engine oil galleries, the pressure is sensed at the pump. This pressure is then exerted on the back side of the pressure regulator sleeve. As pressure builds up to 50 to 75 PSI, the regulator sleeve is moved, opening an internal passage to the inlet side of the pump cavity.

Should the oil pressure drop below 50 to 75 PSI, the regulator spring moves the sleeve back, closing off the passage to the inlet side the pump cavity.



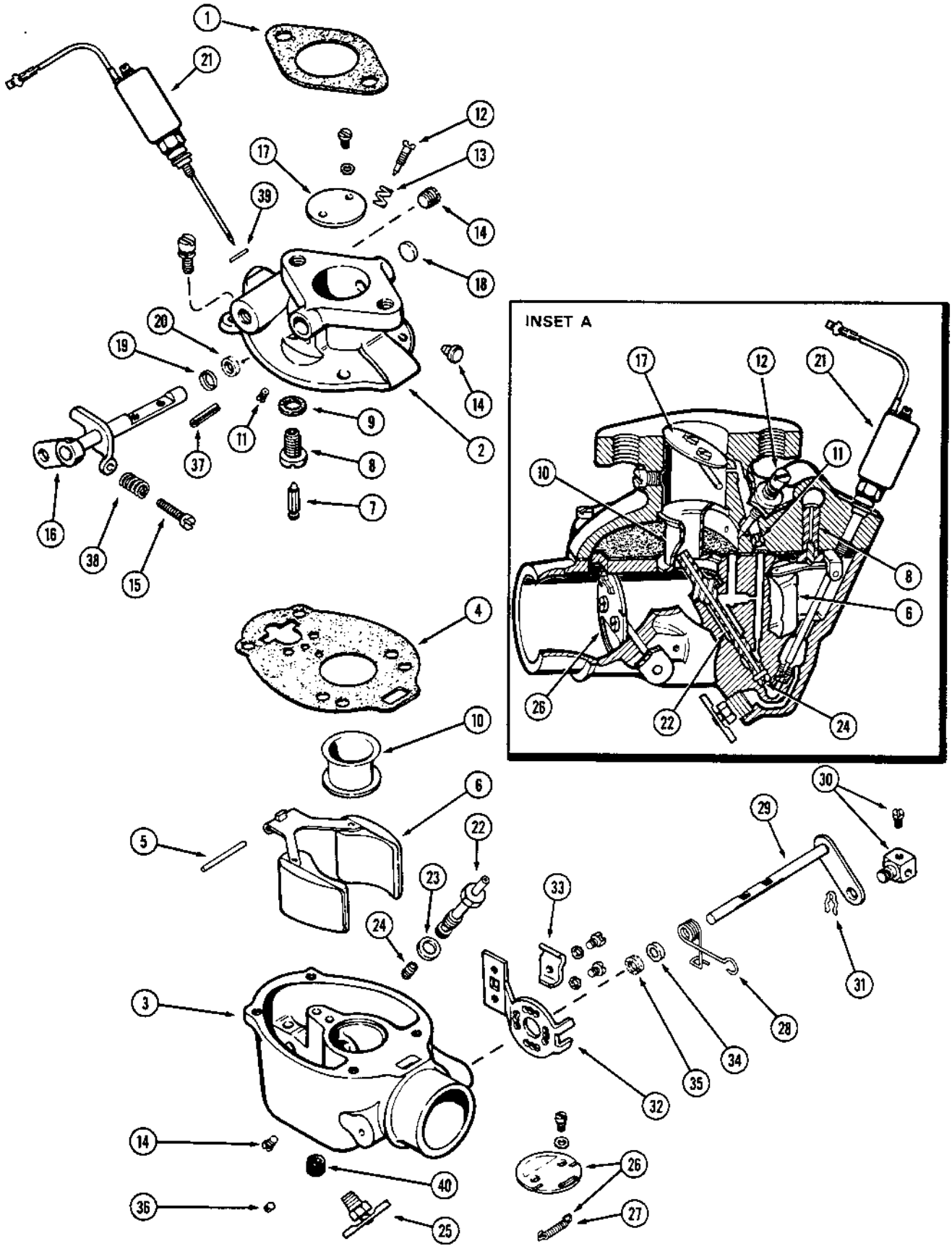
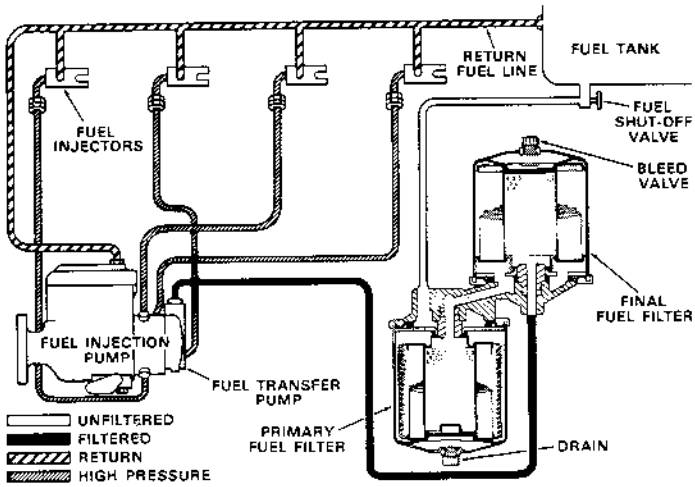
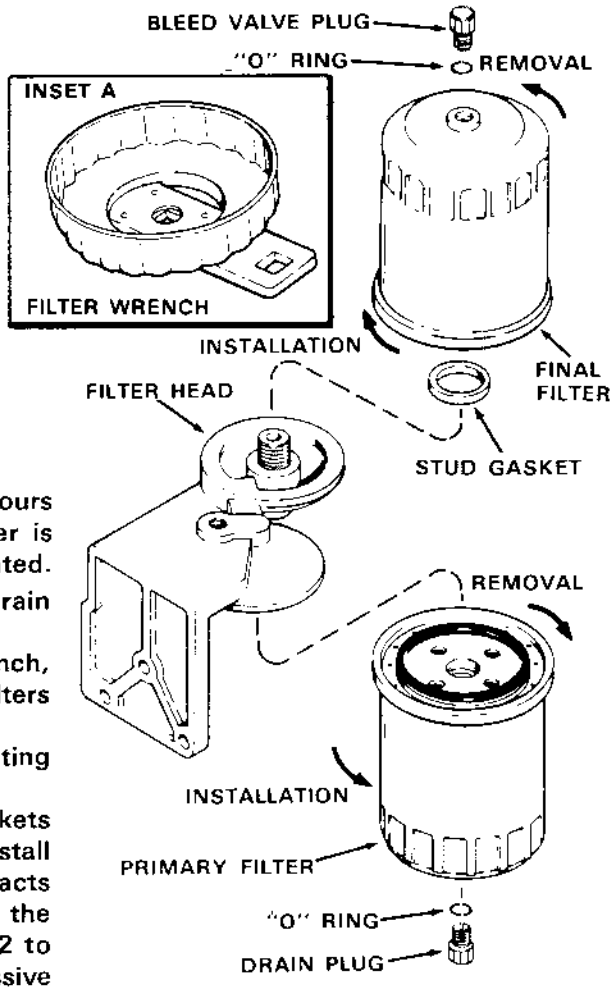


Figure 5

SERVICING THE DIESEL FUEL FILTERS

STARTING WITH ENGINE SERIAL NO. 2718490

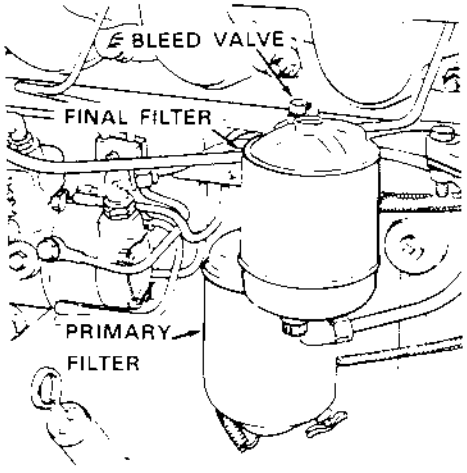




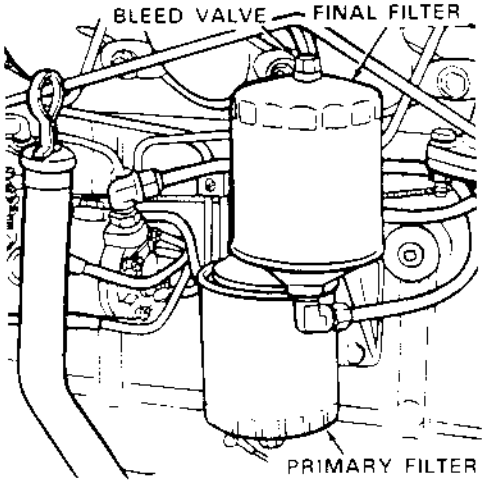
Filter Replacement (Final and Primary) - Every 500 Hours or earlier when loss of engine horsepower is indicated.

1. Close the fuel tank shut-off valve and remove the drain plug from the primary fuel filter.
2. Use a clamp type filter wrench or the filter wrench, A64761 Inset A, to remove the filters. Turn the filters counter-clockwise for removal.
3. Remove the stud gasket from the final filter mounting stud and install a new gasket.
4. Apply a thin film of clean oil or grease to the gaskets on the new primary and final stage Case filters. Install the filters by turning clockwise until the gasket contacts the filter head. Hand tighten 1/2 of a turn. Loosen the filters and retighten after gasket contact is made, 1/2 to 3/4 of a turn to obtain a proper seal. *NOTE:* Excessive final tightening will damage the gaskets and filters.

SEQUENCE FOR BLEEDING THE DIESEL FUEL SYSTEM



PRIOR TO ENG. SERIAL NO. 2718490

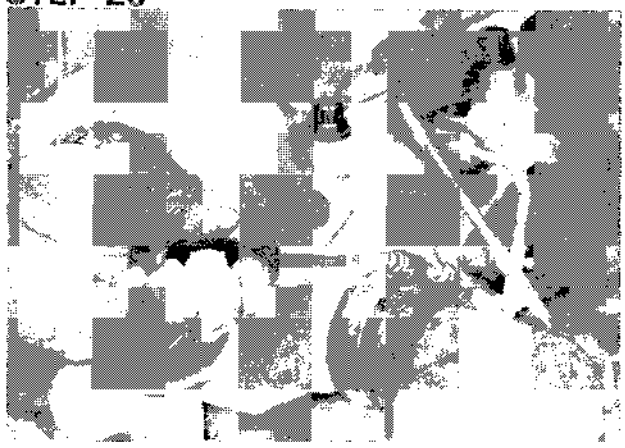


STARTING WITH ENG. SERIAL NO. 2718490

1. Fill the fuel tank and open the fuel tank shut-off valve.
2. Wipe the top of the final filter clean.
3. Open the bleed valve on the final filter allowing the air to bleed out of both of the filters. When fuel, free of bubbles, starts to flow, close the bleed valve and wipe the parts free of diesel fuel.

Pump Drive Shaft Removal

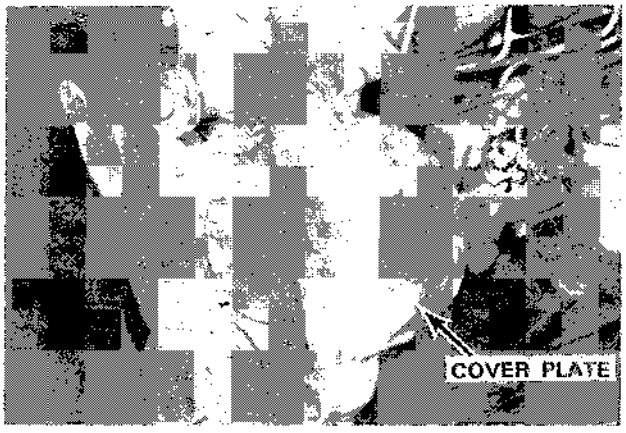
STEP 20



Drain cooling system and disconnect hose from water tube. Remove the water tube.

STEP 21

Remove cover plate mounting bolts.

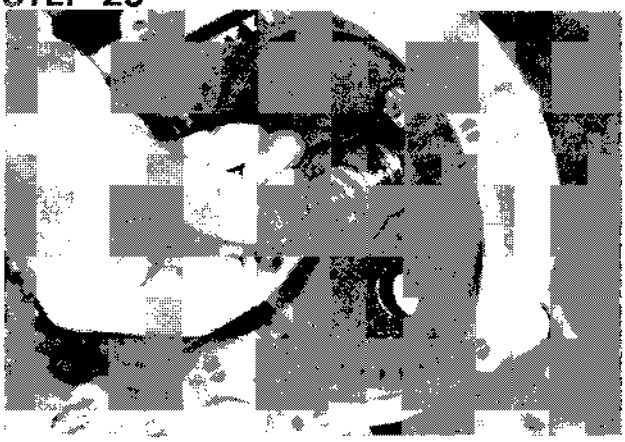


NOTE: On some engines the water tube and cover plate are one piece. Disconnect hose from cover plate and remove cover plate and gasket.

STEP 22

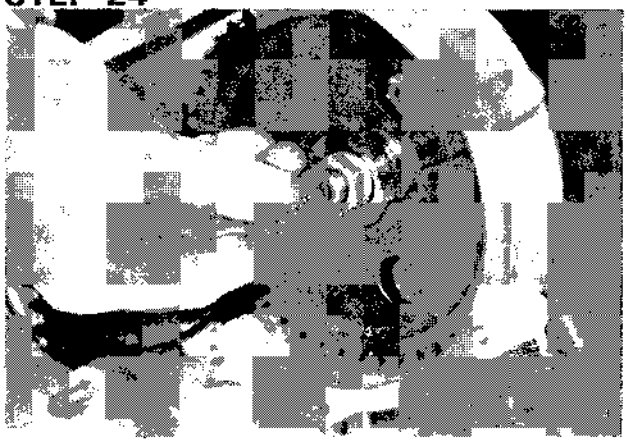
Remove the cover plate and gasket.

STEP 23



Remove thrust plunger.

STEP 24



Remove thrust plunger spring.

STEP 69

Install primary and final fuel filters on filter head. Refer to Section 3010.

STEP 70

Connect the throttle rod to the governor control lever and the fuel shutoff cable to the shutoff lever.

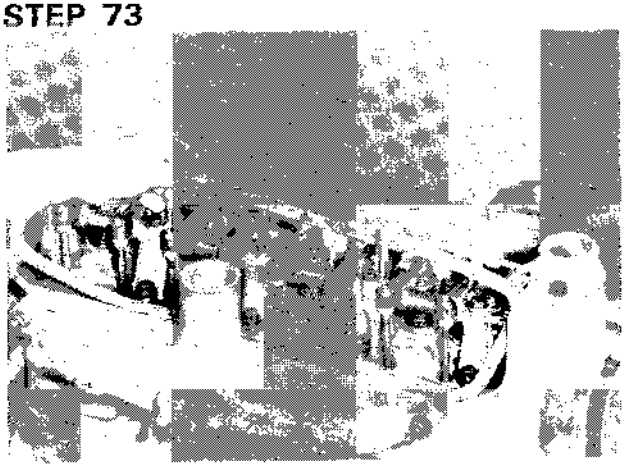
STEP 71

Install timing window cover on injection pump. Refer to Page 21 and check pump gear to idler gear backlash.

STEP 72

Fuel pump installed.

STEP 73



Install valve cover gasket.

STEP 74

Install valve cover.

Section

3013

ROOSA MASTER FUEL INJECTORS

188 and 207 Diesel Engines

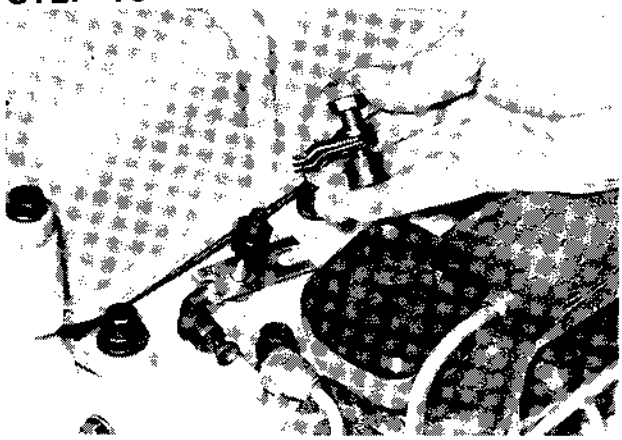
APPLICATION

Part Numbers		Color	Engine Application
Case	Roosa Master	Code Band	
A37836	17206, 18054	No Color	188
A50970	20552	No Color	207
A51234	19993,20348	No Color	188
A140827	20674	White & Blue	207
A140828	20673	White & Yellow	188
A140829	20671	White	188

SPECIFICATIONS

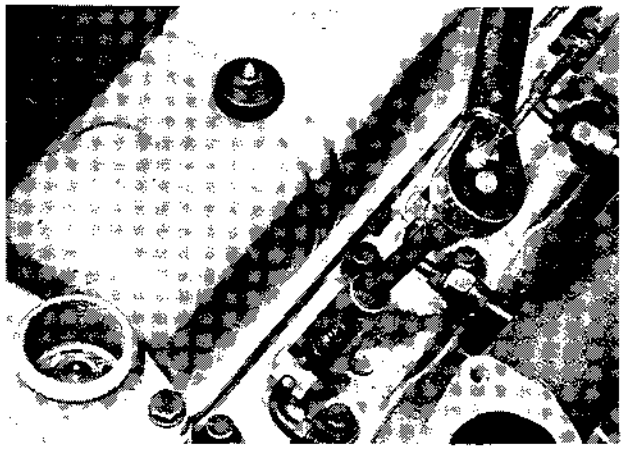
Part Numbers		Spray Angle	Spray Orifice Size	Sac Hole Length	Sac Hole Size	Opening Pressure	
Case	Roosa Master					New	Used
A37836	17206,18054	160°	.011" (.279mm)	.195" (4.953mm)	.042" (1.066mm)	2750 to 2850 (18 958.5kPa) to (19 647.9kPa)	2550 to 2650 (17 579.7kPa) to (18 269.1kPa)
A50970	20552	150°	.011" (.279mm)	.095" (2.413mm)	.042" (1.066mm)		
A140827	20674	150°	.011" (.279mm)	.095" (2.413mm)	.042" (1.066mm)		
A51234	19993,20348	160°	.011" (.279mm)	.095" (2.413mm)	.042" (1.066mm)	3150 to 3250 (21 716.1kPa) to (22 405.5kPa)	2950 to 3050 (20 337.3kPa) to (21 026.7kPa)
A140829	20671	160°	.011" (.279mm)	.095" (2.413mm)	.042" (1.066mm)		
A140828	20673	150°	.010" (.254mm)	.095" (2.413mm)	.042" (1.066mm)	2750 to 2850 (18 958.5kPa) to (19 647.9kPa)	2550 to 2650 (17 579.7kPa) to (18 269.1kPa)

STEP 16



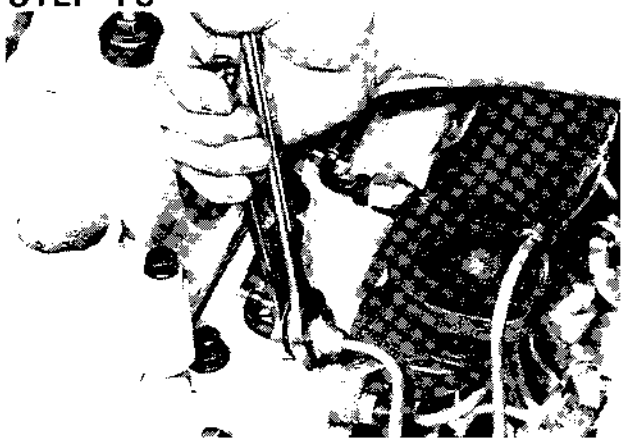
Install spacer and clamp assembly, engaging lock plate.

STEP 17



Torque clamp assembly bolt 18 to 22 ft. lbs.

STEP 18

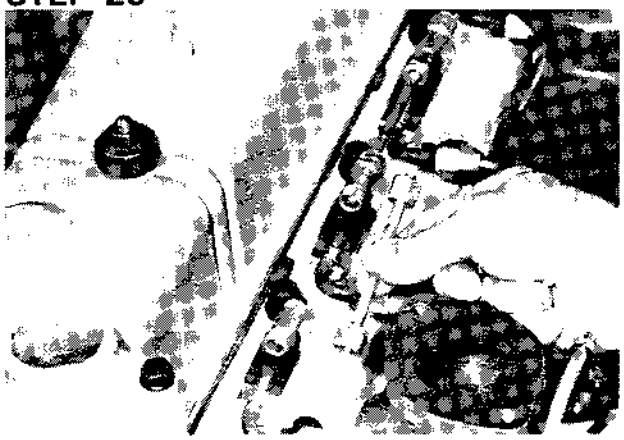


Connect and hand tighten inlet connection to tube.

STEP 19

Install injector tee.

STEP 20

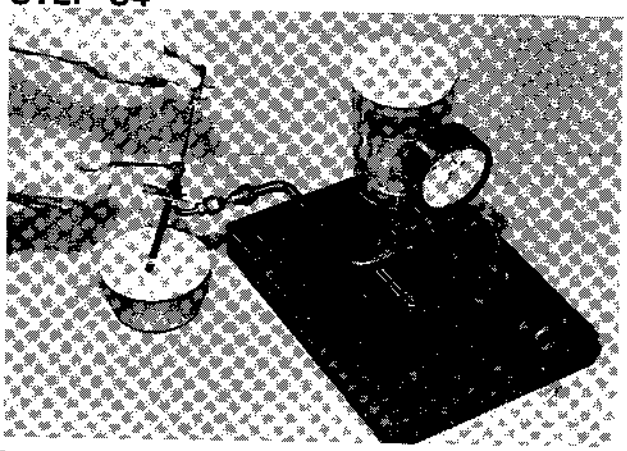


Install leak-off lines.

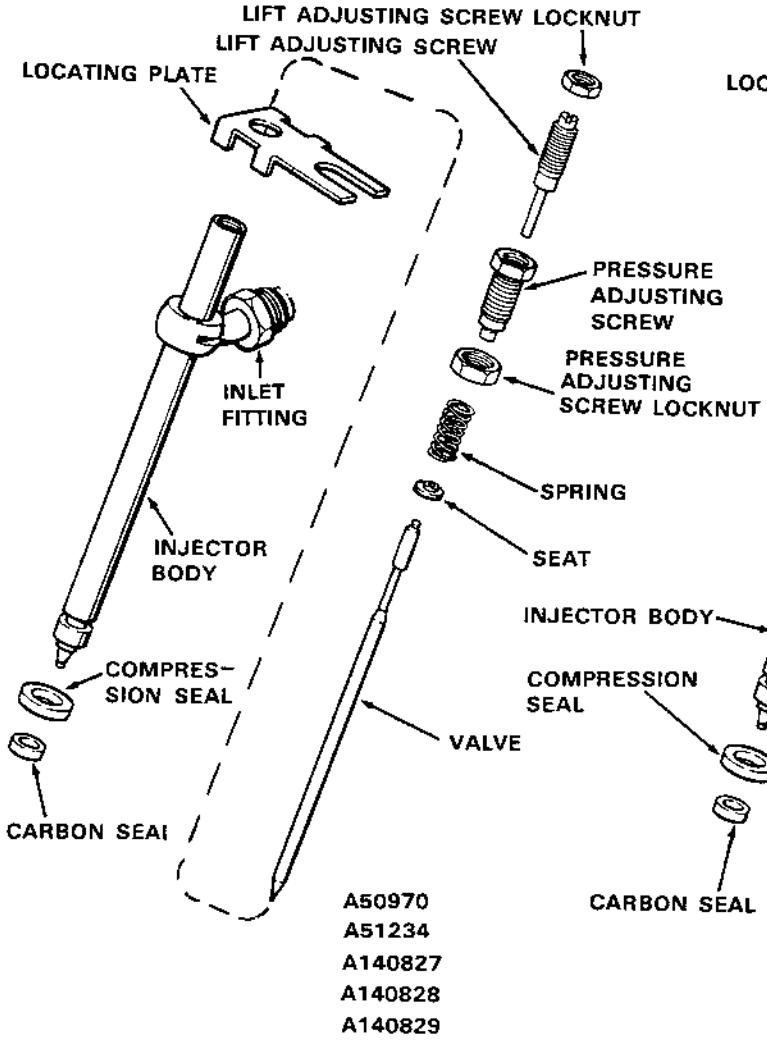
STEP 21

Tighten the leak-off line nuts.

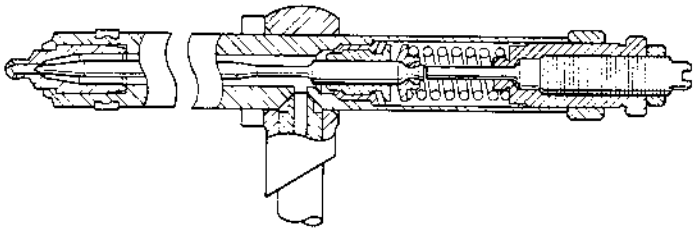
STEP 34



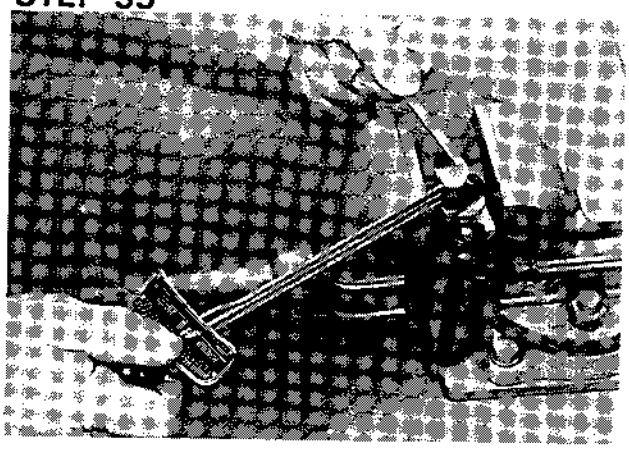
Install injector assembly on the test stand. Test and adjust opening pressure valve lift and leak-off. See Page 22 for injector adjustments.



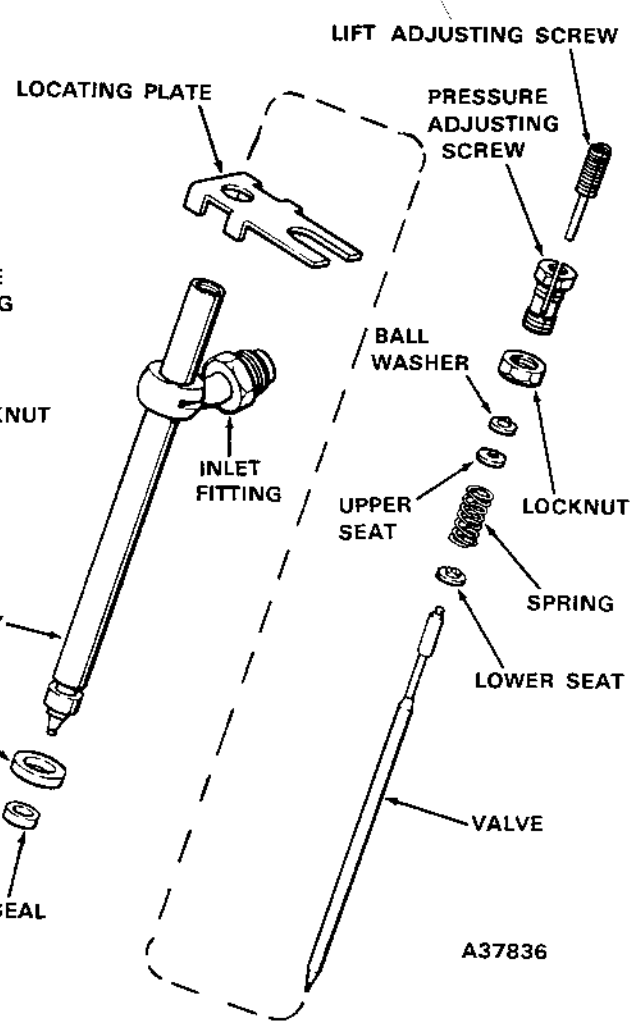
A50970
A51234
A140827
A140828
A140829



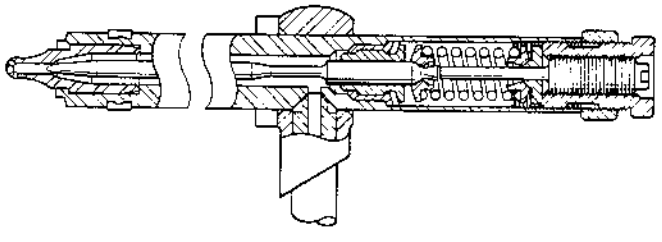
STEP 35



Tighten locknut 70 to 75 inch lbs.



A37836



9. Check the adjusting nuts on the control rod — they should touch the control rod guide at full throttle.

10. Remove the control springs and check the system for freedom of movement.

11. Start the engine and check the full governed speed with a strobotach unit. If required, readjust governor linkage until the correct speed is attained.

    NOTE: Set low idle speed on the carburetor adjusting screw.

Foot Pedal Stop Adjustment

Refer to Figure 5.

1. The 1/2" NC bolt used as a foot pedal stop should touch the underside of the foot pedal when full governed speed of 2000 RPM is reached.

2. To adjust, loosen jam nut, and raise or lower the bolt. Tighten jam nut.

Hand Throttle Adjustment

1. When the hand throttle reaches the bottom of its travel, the engine should be at full governed speed of 2000 rpm.

2. To adjust, turn the throttle control link in or out of the adjustable ball joint on the left hand side of the crawler, Figure 5.

Friction Disc Adjustment

Refer to Figure 5.

1. The friction disc controls the amount of effort required to move the hand throttle.

2. To adjust, loosen the two nuts on the friction disc mounting bolt. Tighten or loosen the inner nut until the right "feel" is reached. Tighten the outer nut.

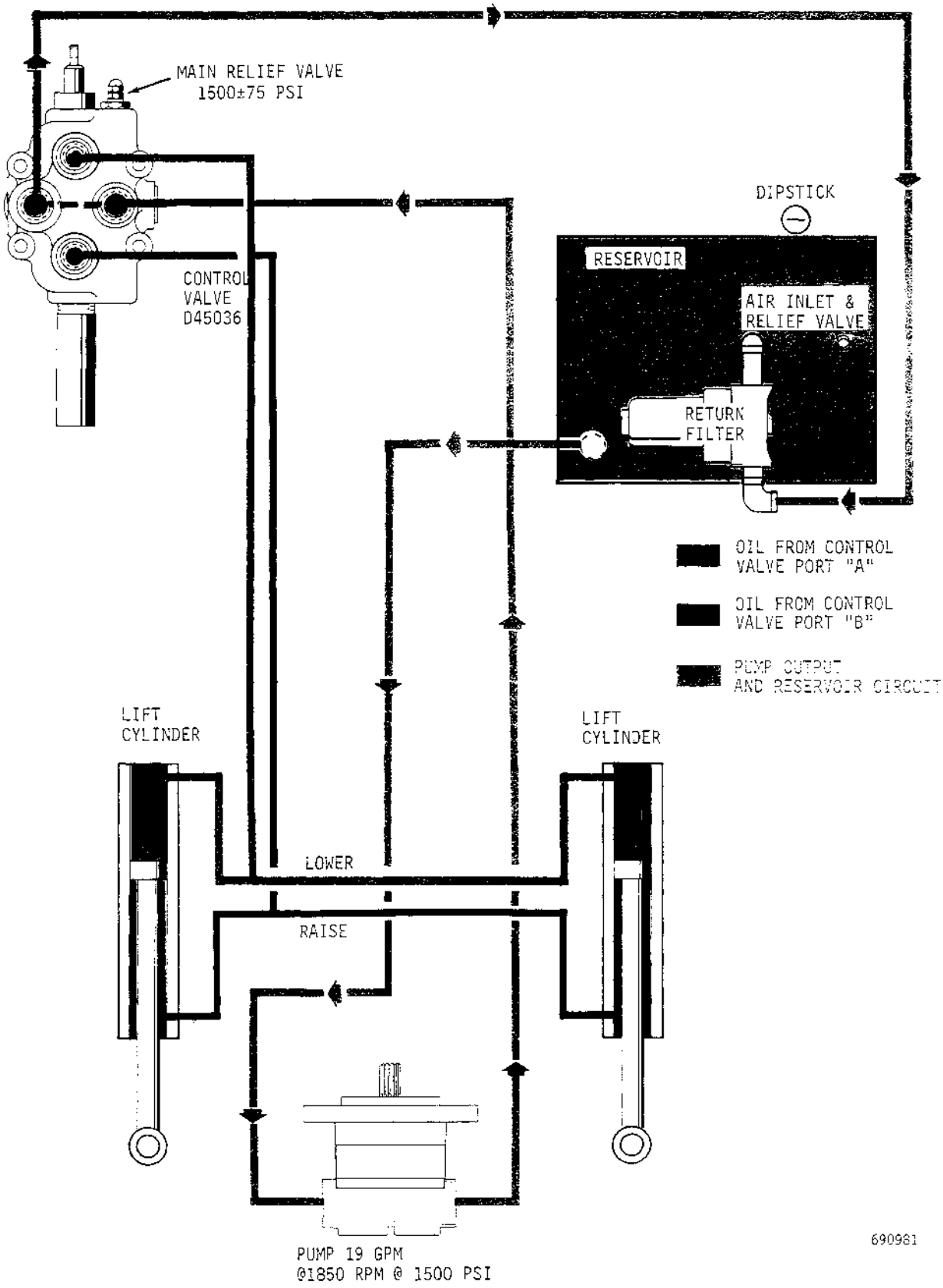


Figure 2 - Hydraulic Diagram of Mechanical Angling Dozer

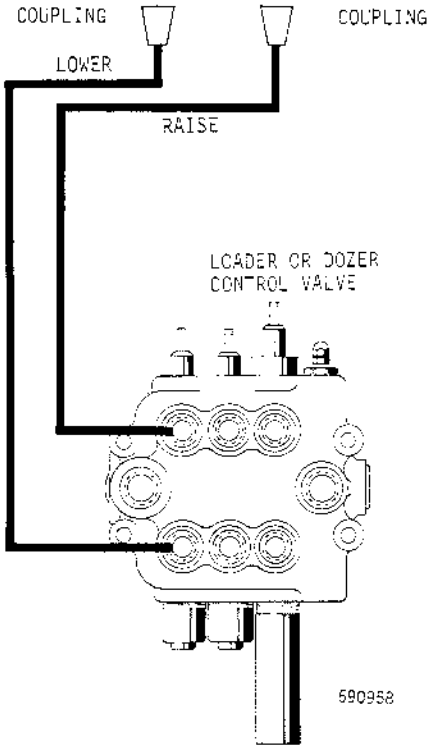


Figure 14 - Diagram of Pull Behind Hydraulics

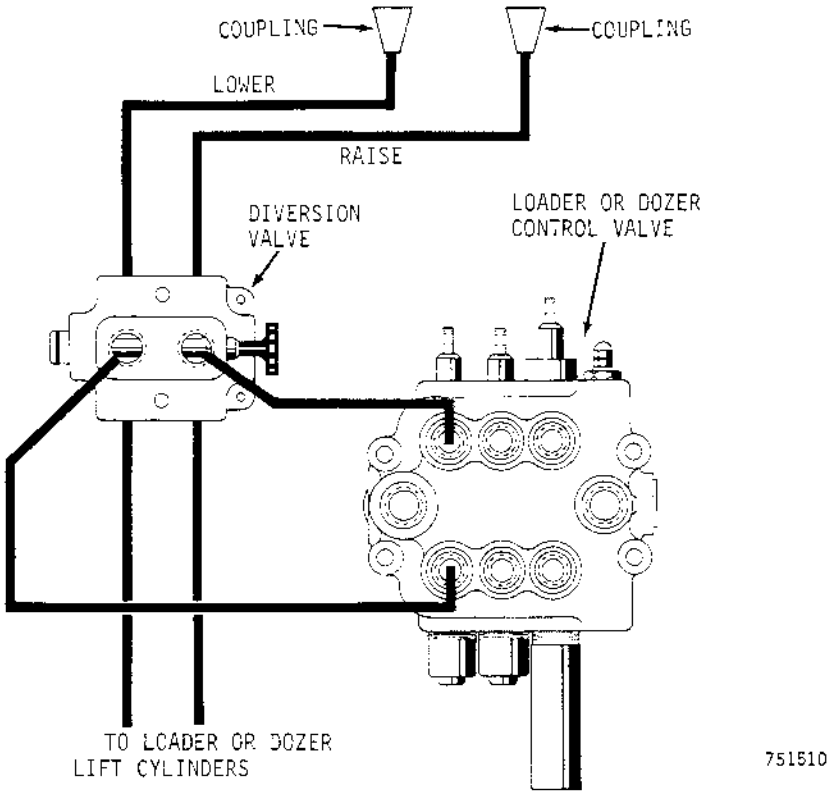


Figure 15 - Diagram of Pull Behind Hydraulics with Diversion Valve

SYMPTOM	POSSIBLE CAUSE	REMEDY
Boom Swings Normally--Stops With Jarring Impact (Cont'd)	Defective swing cushion relief valve (if equipped), spring, or restrictor pin in swing cylinder.	Check restrictor pin for proper assembly--tapered end should be outside of piston. Clean parts and reassemble.
Hydraulic Extendable Dipper Does Not Operate Properly	Diverter valve linkage out of adjustment.	Check linkage--make sure spool can be positioned properly. Adjust linkage as required.
1. Slow	Wear or damage to diverter valve housing or spool.	Remove diverter valve. Clean, repair, or replace parts as required.
	Worn cylinder packing.	Remove and rebuild cylinder
2. Dipper Does Not Maintain Position	See possible causes (above).	
3. Binding	Mechanical bind.	Inspect dipper for bind.

Problem: Failure of Pump, Valves, or Cylinders

NOTE: Also see Identifying Causes of Pump Failure, page 4011-16.

Pump is Noisy	Loose mounting bolts.	Tighten.
	Loose pump tie bolts.	Check bolts with a torque wrench. Tighten to Specifications, Section 4013.
	Worn or damaged bearings or gear.	Remove and rebuild pump. See section 4013.
Flowmeter Test Shows That Pump Output is Low Under Load	Worn or damaged pump. (Also see Pump Is Damaged on page 4011-26.	Remove pump from tractor, Replace or disassemble and rebuild. Drain reservoir and refill with specified oil. Also flush system if oil is contaminated. Service suction screen and return filter.
Flowmeter Test Shows that Pump Output is Low at No Load	Restriction or air leak between reservoir and pump inlet.	Check suction filter. If OK, disassemble line from reservoir to pump inlet and clear the restriction.
External Oil Leakage	Worn seal or pump shaft.	Remove pump and replace seal. Check shaft at sealing surface for damage.
	Shaft seal "blown" out.	Check balls in shaft end cover missing or improperly installed.

Flowmeter Check sheet for 350 Crawler
U. S. Measure

OWNER _____ DATE _____

MODEL _____ SERIAL NO. _____ HOURS _____

Test No. 1 _____ gpm @0 psi @ 2000 rpm

_____ gpm @750 (b'hoe only) psi @ 2000 rpm

_____ gpm @1000 (b'hoe only) psi @ 2000 rpm

_____ gpm @1300 (dozer) psi @ 2000 rpm

_____ gpm @1700 (loader) psi @ 2000 rpm

Efficiency Calculation (See page 4011-31 for example)

$$\text{Efficiency} = \frac{\text{gpm at 1300 (dozer) or 1700 (loader) psi}}{\text{gpm at 0 psi (no load)}}$$

Test No. 2 Crack point _____ psi at _____ 2000 rpm

Pressure setting _____ psi at _____ 2000 rpm

Test No. 3	Test psi	Extended gpm	Retracted gpm
Loader - Lift	1700		
Loader - Tilt	1700		
Loader - Clam	1700		
Ripper	1700 (loader)		
	1300 (dozers)		
Dozer - Angle	1300		
Dozer - Tilt	1300		
Dozer - Lift	1300		

Test No. 4	Test psi	Extended gpm	Retracted gpm
Bucket	1700		
Dipper	1700		
Dipper Ext.	1700		
Boom raise	1700		
Boom down	750		
Swing	1000		
R. H. Stabilizer	1700		
L. H. Stabilizer	1700		

Test No. 5 Swing right at _____ psi Swing left at _____ psi

Boom down _____ psi

5. Run the engine at 800 rpm and apply down pressure to the boom. The gauge should read 1150 - 1350 psi.

Swing Crossover Relief Valves

A crossover relief valve is located at both ports in the swing section of all backhoe control valves except late production Case valves (G34898).

1. Install a 3000 psi gauge in location shown in Figure 29.

2. Swing criss-cross valves are tested in the port OPPOSITE the side on which the valve is located. Run the engine at 800 rpm when testing.

   a. To test the valve at the top ("A") port, swing the boom all the way to the left.

   b. To test the valve at the lower ("B") port, swing the boom all the way to the right.

3. Hold the foot pedal down until a steady gauge reading is obtained. The pressure should read 1200-1400 psi. Adjust the valve(s) if necessary, see page 4011-40.

Relief Valves Loader Tilt Spool

The two secondary relief valves in the tilt circuit can be checked with a pressure gauge installed in the circuit. The gauge readings should be compared with those under "Full Flow Specifications" on page 4011-41.

1. To check the relief valve at the upper ("A") port:

   a. Have the loader bucket resting on the ground. Move the control lever back and forth to relieve hydraulic pressures.

   b. Remove the plug shown in Figure 30 and install a 3000 psi pressure gauge.

   c. With the loader bucket empty, start the engine and raise the loader to approximately 1/2 of full height. Roll the bucket all the way back.

   d. With the engine running at 800 rpm under load, lower the loader and read the gauge as it descends. The gauge should read 2400-2600 psi.

2. To check the relief valve at the lower ("B") port:

   a. Have the loader bucket resting on the ground. Move the control lever back and forth to relieve hydraulic pressures.

   b. Remove the plug shown in Figure 30 and install a 3000 psi pressure gauge.

   c. With the loader bucket empty, fully dump the bucket and lower it to the ground.

   d. With the engine running at 800 rpm under load, raise the loader and read the gauge as it ascends. The gauge should read 2400-2600 psi.

5. Slip a sharp instrument under the diaphragm on the front cover and gently pry the diaphragm loose. Figure 9. Remove the springs and balls, nylatron gasket, protector gasket, and V-seal. Discard the gaskets and seals. Figure 10.

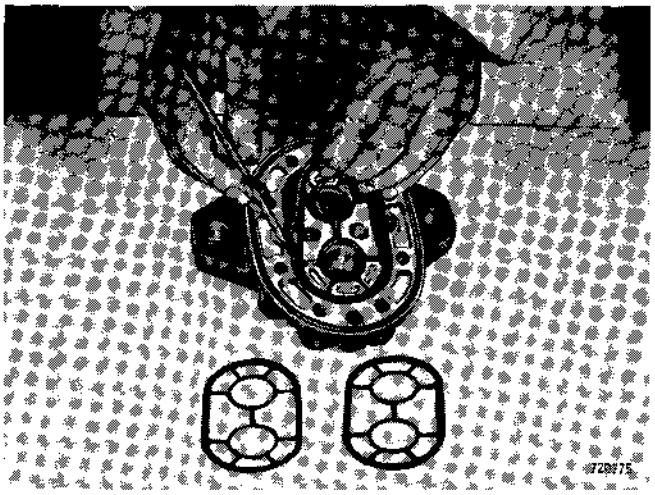


Figure 10 - Removing Seals

6. Remove and discard the shaft seal from the front cover.

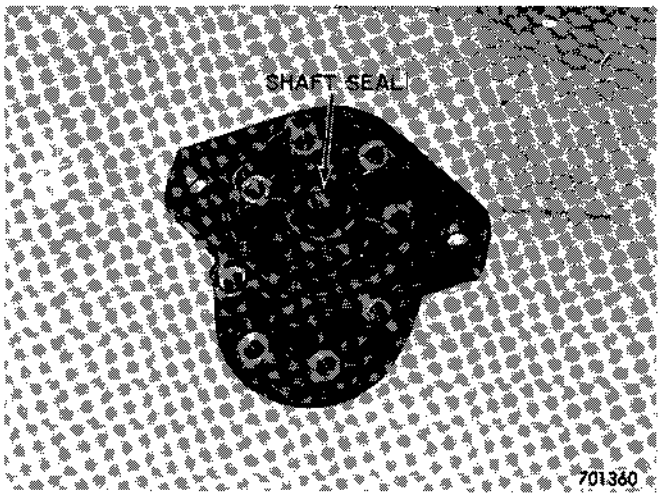


Figure 11 - Front Cover and Shaft Seal

Inspection

If, after thorough inspection of all parts, contaminated oil is determined to be the cause of the pump failure, the complete hydraulic system must be flushed.

1. Inspect the driveshaft. Check the splines for small cracks, wear at shaft seal contact area, and rough spots.

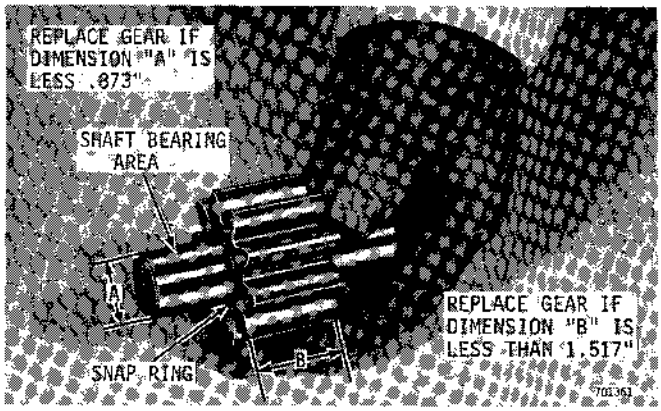


Figure 12 - Idler Gear and Shaft

2. Inspect the idler gear and shaft, Figure 12. If the bearing area of the shaft measures less than .873", the shaft and gear assemblies should be replaced. Check the gear ends for scoring, bluing due to heat, and excessive wear. Check gear width; if less than 1.517", replace gear. Make sure the snap rings are in place. If the gear teeth have sharp edges, break corners with emery cloth.

NOTE: Shafts and gears are serviced as an assembly only, and are not available separately.

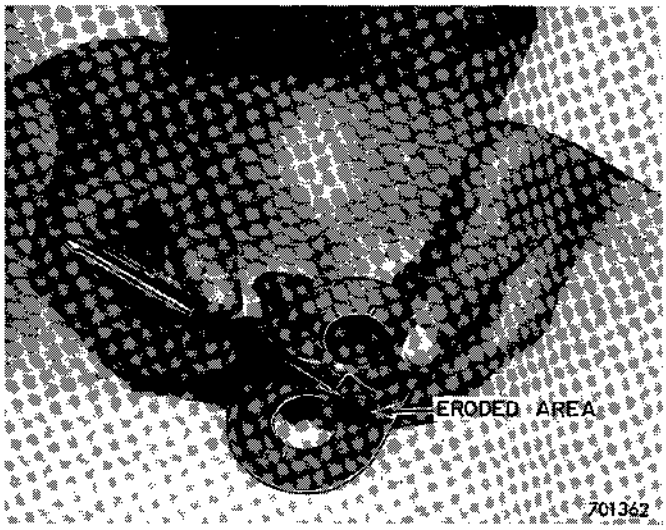


Figure 13 - Checking the Wear Plate

3. Inspect the wear plates. Check for score marks and erosion pits. If noticeably eroded in center, deeply scored or burned, replace.

6. Remove the driven gear and shaft assembly from the body. Remove snap rings and slide gear from shaft. Then remove Woodruff key.

7. Pull the drive gear from the driveshaft. Remove Woodruff key.

8. Scribe line indicating position of oil seal depth into plate.

9. Remove cap screws holding oil seal plate to body.

10. Pull shaft assembly from body.

11. Remove snap ring from front side of pump. Then pull bearing from shaft. Remove other snap ring.

12. Slide oil seal plate from shaft.

13. Press the oil seal from the plate.

14. This pump uses a cage type roller bearing. Bearings can be pulled from the cover without special precautions to keep intact.

15. If required, remove dowel pins.

Inspection

1. Inspect the driveshaft for wear on the seal seat.

2. If the wear is no more than a smooth groove a few thousandths of an inch deep, it is probable that the new seal will function satisfactory.

3. If wear has roughened the seal seat, it may be possible to successfully polish with crocus cloth, if the groove is not too deep. Otherwise the shaft should be replaced.

4. Inspect the gears, shafts and bearings. A dull-rough (matte) finish on bearing surfaces of shafts, gear ends, and body indicates abrasive oil conditions. With clean oil conditions, and no cavitation the bearings will not show wear even after several thousand hours use.

5. Inspect center plate, cover, body or gears for wear. Replace if any wear is apparent.

6. Wear on surfaces can be measured with a micrometer. As the parts are machined to very close tolerances, a few thousandths wear may necessitate replacement.

Assembly

NOTE: Before assembling the pump, carefully pass a flat hone (soap stone) over body surfaces to assure freedom from burrs (especially around screw and dowel holes). Wash all parts in clean solvent to insure removal of dust particles. Air dry the parts.

1. Install bearings in cover.

2. Press seal into place. Use a disc (1/2" thick x 2" dia. with square, flat ends) as a pusher. Be careful to avoid distorting lips of seal.

3. Wrap keyway and snap ring grooves with "Scotch" tape to protect oil seal while it is being put into position according to previously placed scratch mark. Install oil seal plate, then remove "Scotch" tape from shaft.

4. Install rear snap ring.

5. Press bearing onto shaft.

6. Install front snap ring.

7. Slip shaft assembly into body and secure with cap screws. Be sure to place grease on shaft so oil seal will not be damaged.

8. Place pump assembly on bench with shaft extending through hole in work bench.

9. Install Woodruff key.

10. Lower the gear on the shaft. Make sure gear fits over key properly.

11. Place Woodruff key in position in driven shaft.

EXPLODED VIEWS OF VDP-22 CONTROL VALVES

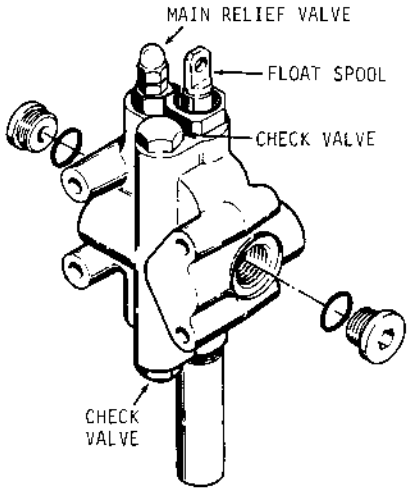


Figure 1 - Dozer Control Valve
D45036

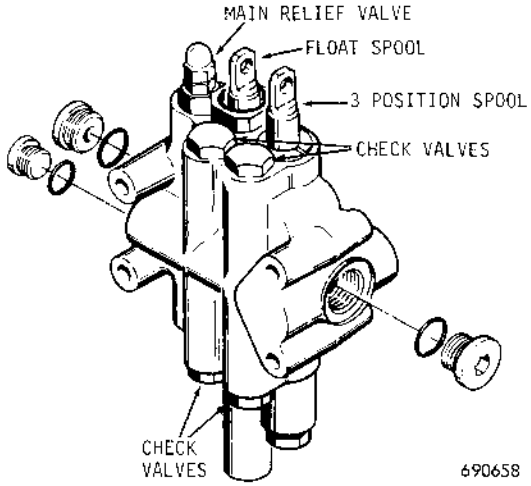


Figure 2 - Dozer Control Valve
D45037

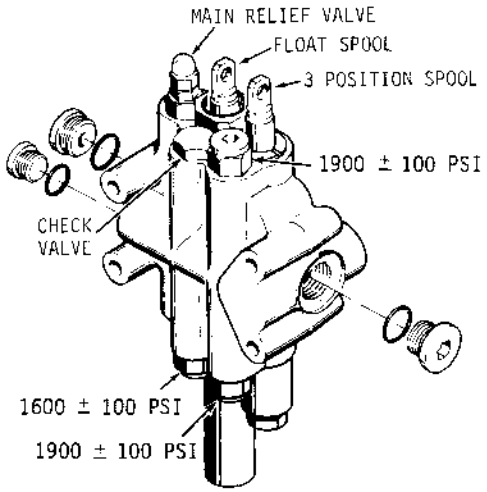


Figure 3 - Loader Control Valve
D45039

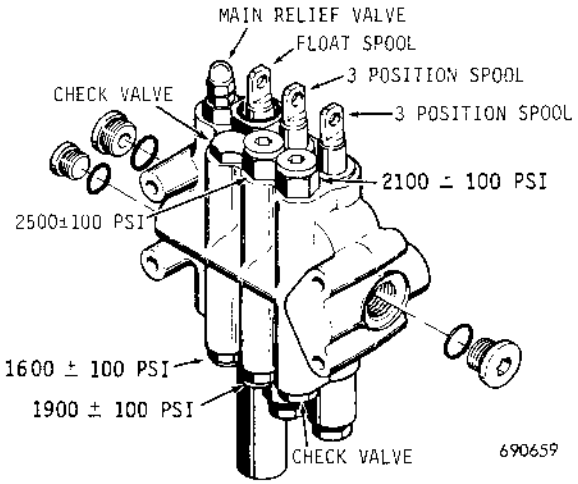


Figure 4 - Loader Control Valve
D45041

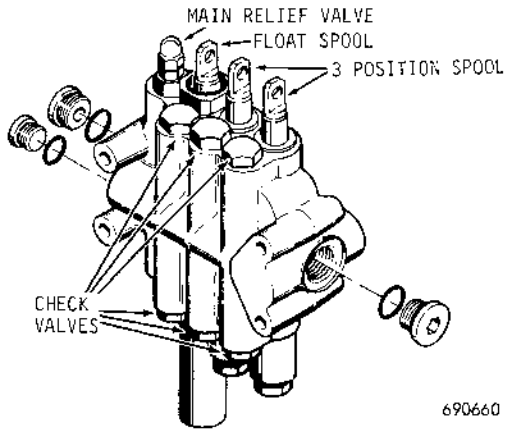


Figure 5 - Dozer Control Valve
D45044

VDP-22 Check Valves

Refer to Figure 27.

All ports not protected by a secondary relief and check valve assembly have a plug and check valve assembly. Refer to Figures 1 to 13 for locations.

1. To disassemble, simply unscrew the plug from the valve housing, then retrieve the spring and poppet.

2. Check all parts, including the O-rings, and replace as necessary.

3. The check valve seat is pressed into the bore of the valve housing and should be removed only for replacement. Use a suitable puller to remove.

   NOTE: Small nicks and grooves can be removed from the poppet setting surface by lapping the poppet in the check valve seat with a fine grain grinding compound. Lap sufficiently to remove all defects. Clean seat throughly to remove all traces of grinding compound. Be sure to keep the poppet square with the bore when lapping.

4. Press new check valve seat into valve body, if removed. Drop the check valve poppet and spring into valve body as an assembly. Install the plug and tighten securely.

VDP-12 Secondary Relief Valves

Refer to Figures 28 and 29.

For locations and pressure settings of secondary relief valves, refer to Specifications, page 4021-5.1 section.

1. With a wrench, remove the relief valve assembly from the control valve housing.

2. Retrieve the check valve poppet and spring from the bore in the housing. Do not remove the check valve seat unless it is to be replaced. Use a suitable puller to remove.

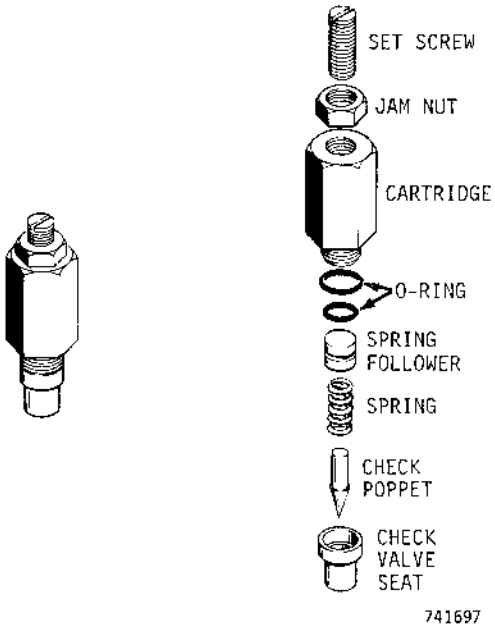


Figure 28 - Secondary Relief Valve

spring spacer. Line up holes and install bolts and nuts. Tighten nuts evenly to compress spring sufficiently to allow removal of snap ring. Caution should be exercised as spring is decompressed. Unscrew bolts slowly until all spring pressure has been released.

Snap Ring Installing Tool

To use the snap ring installation tool, compress spring, Figure 36, then position snap ring on stud end of spool. Position tool against snap ring and tap rather sharply, with a rawhide mallet, until snap ring is seated in groove.

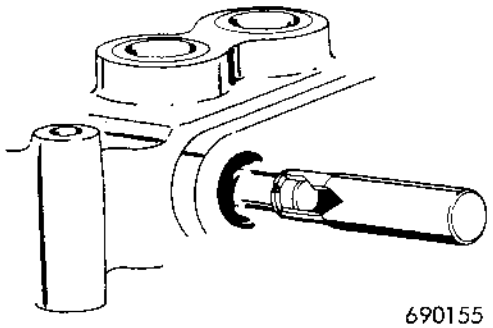


Figure 37 - Snap Ring Installing Tool

OPERATING PRINCIPLES

NOTE: All illustrations are of the VDP-22 valve.

Valve Circuits

The control valve for the loader or dozer is bolted to the front of the arm rest on the right hand side of the tractor.

The valve is an open center valve with four parallel circuits. It has a single cast body with one, two, or three spools, depending on attachments. The Parker-Hannifin series numbers are VDP-22 and VDP-12.

The open center circuit is labeled 1A in the illustration--it runs clear through the center of the valve from the inlet to the outlet. This circuit is charged with high pressure oil from the pump.

A tributary circuit (1B) joins the open center circuit at the inlet and is also charged with high pressure oil. In Figure 38, circuit 1B appears to run below circuit 1A. This is for clarity of illustration only--in the valve, circuit 1B runs to the side of circuit 1A. Circuit 1B dead ends beyond the final spool in the bank.

Two other circuits (2A and 2B) run the length of the valve and return oil from the cylinders to the outlet.

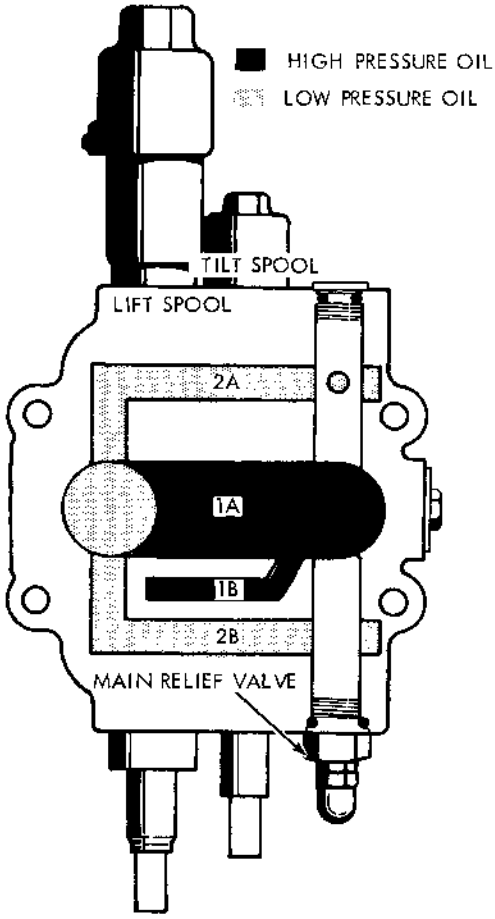


Figure 38 - Valve Circuits Schematic

Valve Spools

Valve spools are identified in Figures 1 to 21. There are two major types used on 310G and 350 crawlers:

Four Position Spools

These are identified by the large spool cap which contains the detent mechanism.

The spool has four positions--power, neutral, power, and float. On loader models,

SPECIFICATIONS

Manufacturer . . . . . Commercial-Shearing
Case part numbers, before backhoe S/N 4176351 . . . . . D39047
Backhoe S/N 4176351 and after D51303
Tie bolt torque . . . . . 30 foot-pounds (4.1 m-kg)

Relief Valves

Main relief valve (In loader control valve) . . . . . Refer to Section 4011.
Secondary relief valves
Type . . . . . Cartridge type, screw adjustable
Location . . . . . At all working ports except in the two stabilizer sections.
Setting @10 gpm, 38 l/mn. For hand pump settings, see Section 4011.
(5) At top port (A) in boom section . . . . . D51303 - 1000 ± 100 psi
6895 ± 48.3 kPa
D39047 - 1250 ± 100 psi
606.7 ± 48.3 kPa
(6) At lower port (B) in boom section . . . . . 2750 ± 250 -100 psi
18 961 ± 48.3 kPa
(4) At both ports in swing section, crossover . . . . . 1300 ± 100 psi
647.2 ± 48.3 kPa
(3) At both ports in swing section, high pressure . . . . . 2750 ± 250 -100 psi
18 961 ± 124 + 48.3 kPa
(2) At both ports in dipper section . . . . . 2750 ± 250 + 100 psi
18 961 ± 124 + 48.3 kPa
(1) At both ports in bucket section . . . . . 2750 ± 250 + 100 psi
18 961 ± 124 + 48.3 kPa
Check valves . . . . . One in all six working sections.

Ports and Spools

Spool Travel
Neutral to pressure . . . . . 13/32" in, 13/32" out
10.3 mm in, 10.3 mm out
Spool moves INTO valve body . . . . . Pressurizes work port nearest spool eye (Port A)
Spool moves OUT of valve body . . . . . Pressurizes work port nearest spool cap (Port B)

Port Sizes
Work ports . . . . . 3/4" tube, O-ring
Inlet and outlet ports . . . . . 1" tube, O-ring

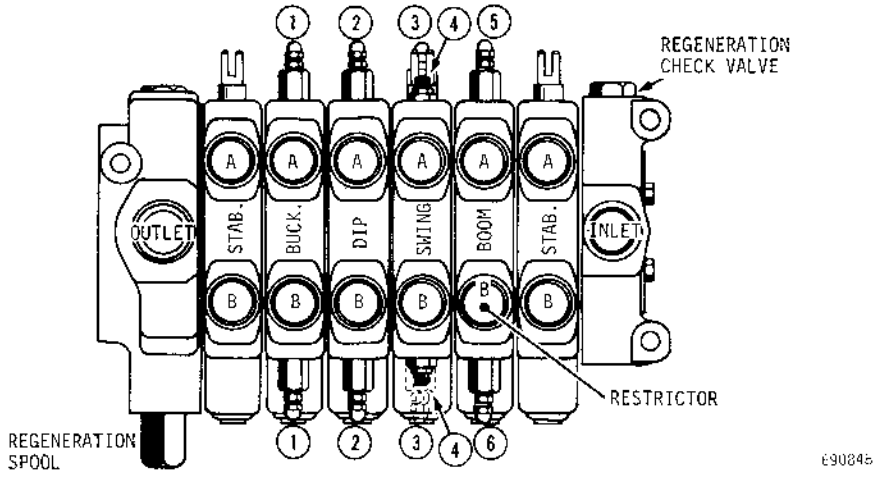


Figure 1 - Backhoe Control Valve

Regeneration

The Backhoe provides instantaneous regeneration to the high pressure circuits.

The outlet section contains a hydraulically actuated regeneration spool that is connected to circuit 1B (Figure 21). High pressure oil in circuit 1B dead ends in the spool chamber and exerts pressure on the regeneration spool. This pressure forces the spool to move and opens the passage from circuit 2B to the outlet. Oil returning from the cylinders enters circuit 2B (or inter-connected circuit 2A) and flows through this open passage to the reservoir.

When Oil Pressure Drops Off

It often happens that a cylinder moves faster than the pump can supply oil. The pump is unable to keep up with demand when a weight on the end of a cylinder moves the cylinder rather than the applied oil. Example: quickly lowering a heavy load. If the pump is running slowly, this condition is further complicated (pump output is in direct proportion to engine speed).

When oil pressure in circuits 1A and 1B drops off, the spring in the regeneration spool assembly is able to overcome the oil pressure exerted from circuit 1B. The spring moves the spool and closes the passage from circuit 2B to the outlet.

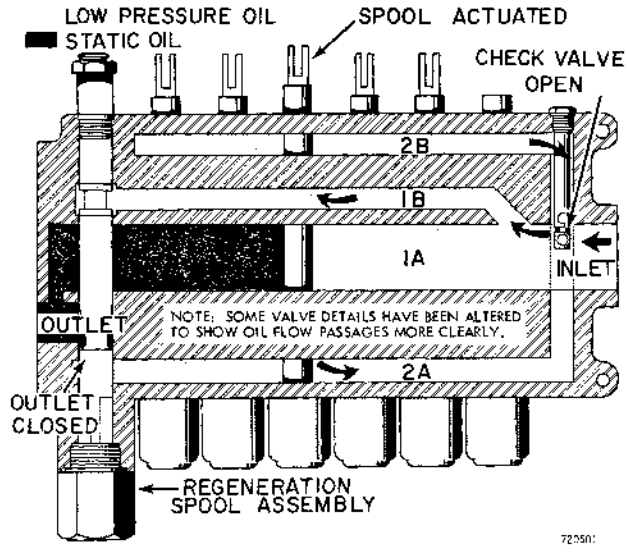


Figure 22 - Regeneration Check Valve Bypassing

Oil returning from the cylinders and flowing into circuit 2A must then seek another outlet.

Regeneration Circuit

The pressure of the return oil forces open the regeneration check valve. This valve permits oil to flow only one way - from circuit 2A to circuit 1A.

Oil from the cylinders flowing through this check valve into circuit 1A augments the pump output and "regenerates" (fills the voids) in the hydraulic system.

Actuating More Than One Cylinder

If two spools are actuated at the same time, the cylinder meeting the least resistance will move first and continue to move until it meets more resistance than the other cylinder.

Example: The stabilizer spools are at opposite ends of the valve bank. When both spools are pulled, both stabilizers will retract. However, if a man stands on one stabilizer pad, the opposite cylinder will move until it bottoms out. Then the other cylinder will retract.

Main Relief Valve

The backhoe control valve does NOT contain a main relief valve. Main relief pressures for the backhoe are controlled from the control valve used for the loader or dozer.

Check Valves

Each of the six working sections contains a load check valve. See Figure 55. This one-way valve permits oil from the pump to flow from high pressure circuit 1B into the cylinder, and prevents oil from the applied side of the cylinder from flowing back into the control valve.

High Pressure Secondary Relief Valves

When one of the digging cylinders (boom crowd, or bucket) is actuated, high pressure is often created in other circuits where the

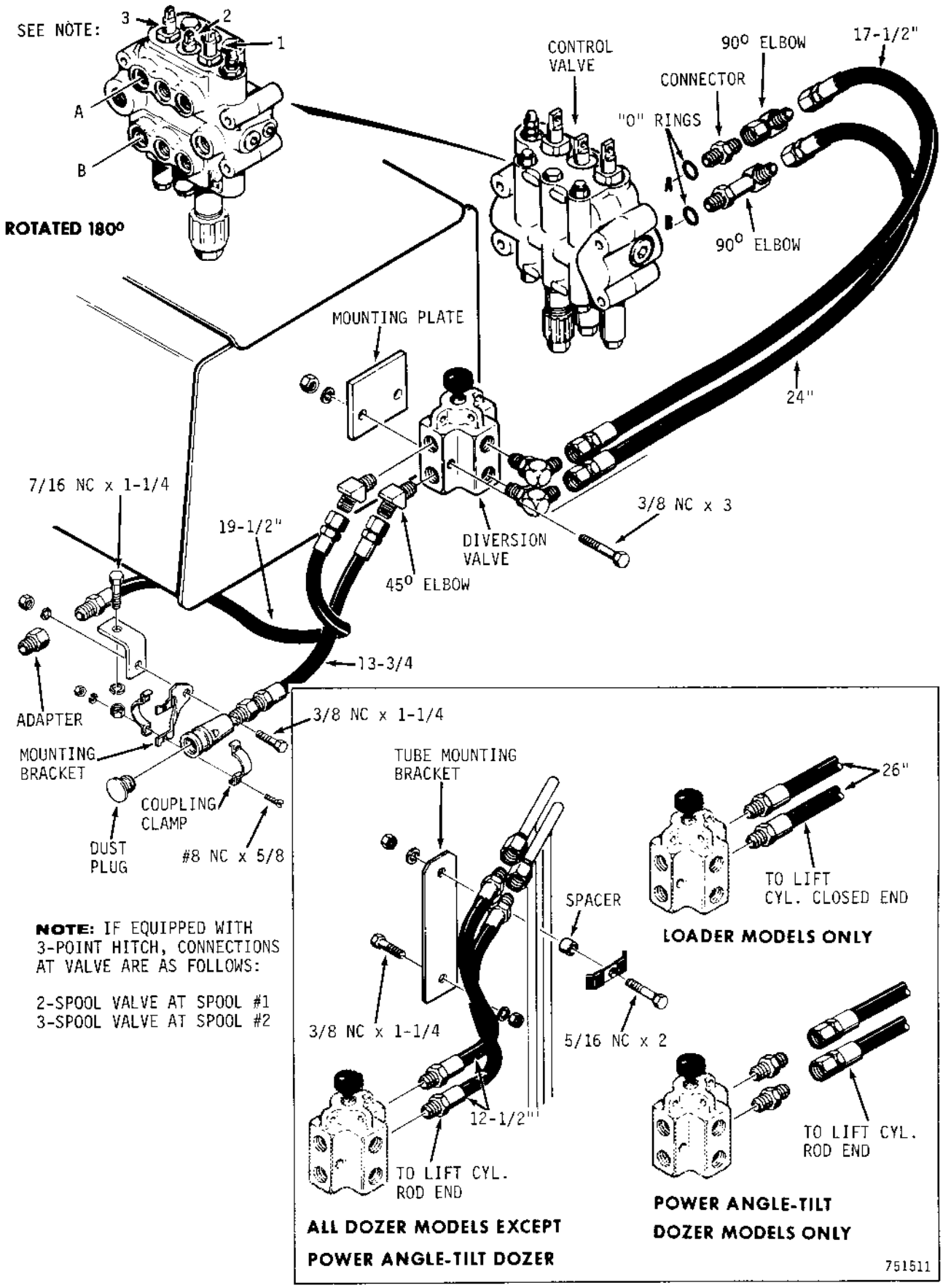


Figure 4 - Pull Behind Hydraulics Installation with Diversion Valve

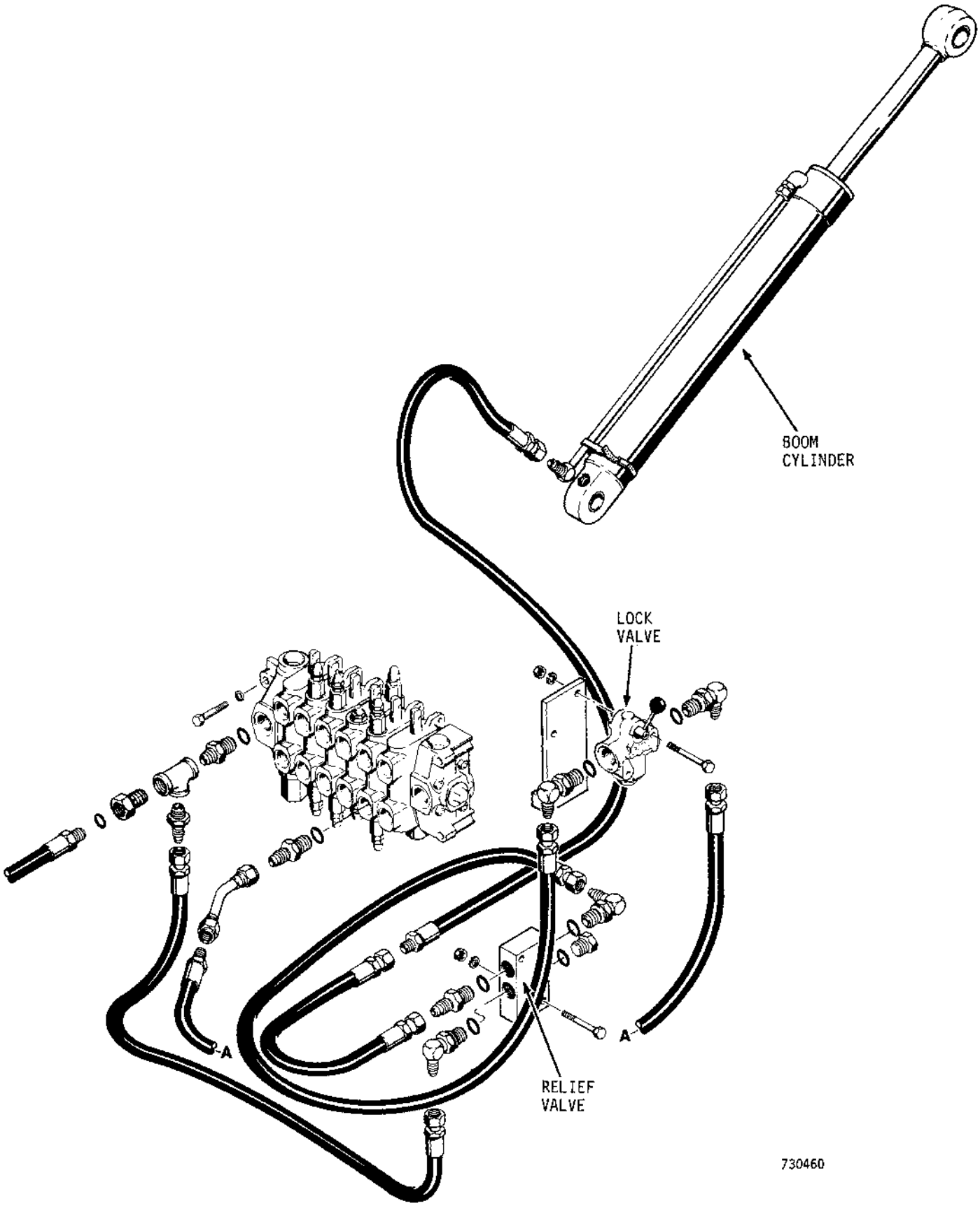


Figure 6 - Exploded View of Boom Lockout on 26 Backhoe

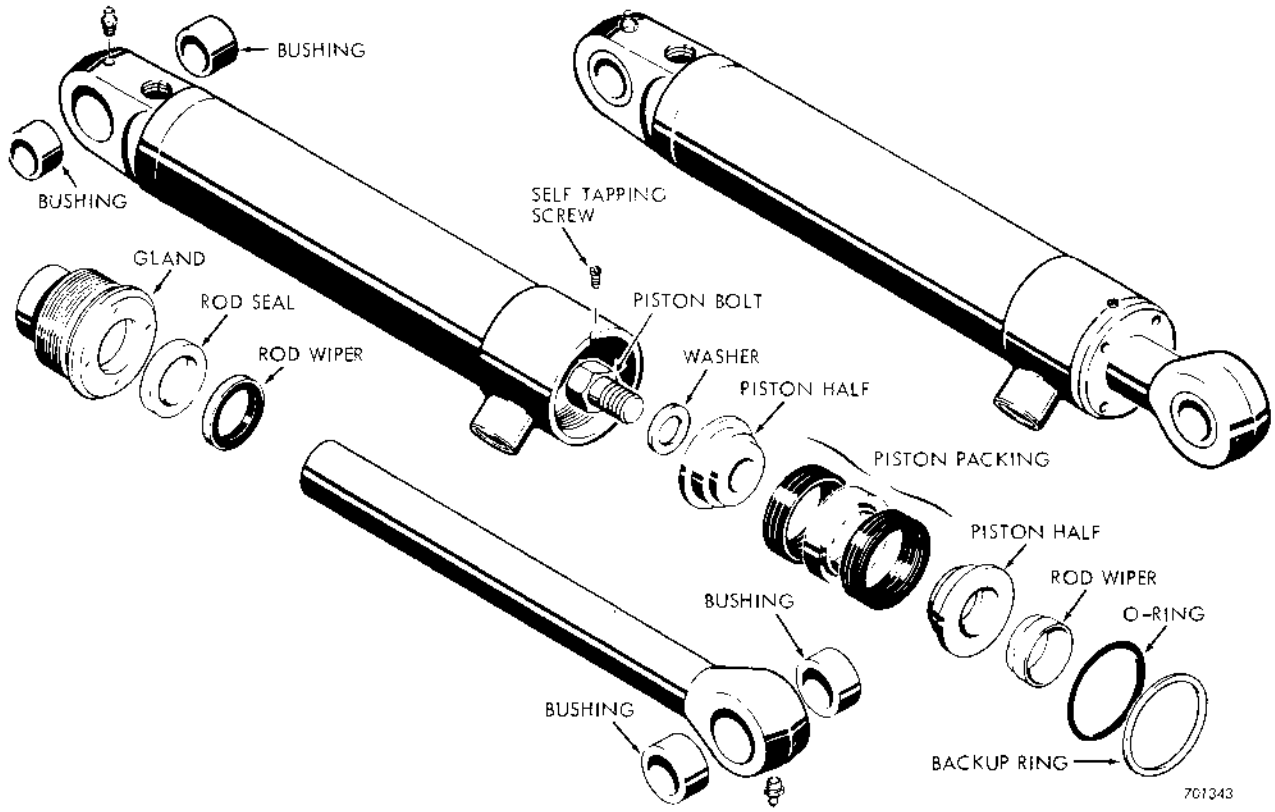


Figure 8 - Exploded View of Typical Cylinder without Center Bearing

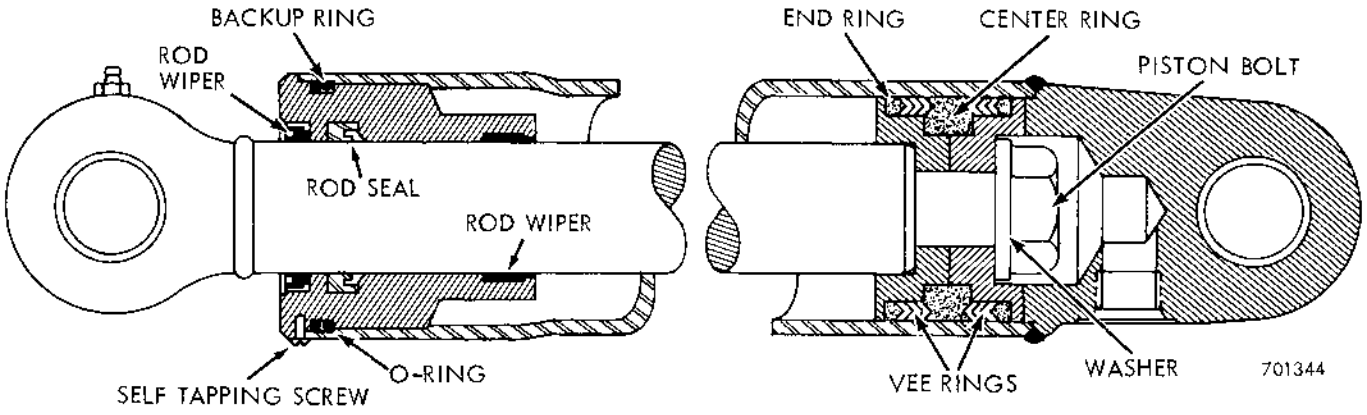


Figure 9 - Section View of Typical Cylinder without Center Bearing

Assembly

1. Refer to page 4057-5 to identify gland style and assemble gland as illustrated.

   NOTE: The U-cup rod seal may be very difficult to get seated in the groove. Use as much care as possible not to cut the seal lips.

2. Lubricate the piston rod and gland bore with hydraulic oil and install gland on piston rod. If necessary the gland may be driven onto the rod with a soft hammer.

3. Lubricate the vee rings in hydraulic oil. Position an end ring and three vee rings on each piston half. The vee of the rings must point to the center of the piston.

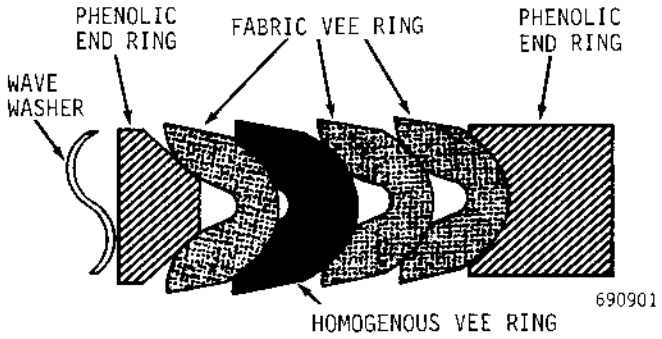


Figure 26 - Packing Assembly

GROUP 4 - CLAM BUCKET CYLINDERS

Cylinders in this group are cylinders used to operate the clam on 4-In-1 Buckets.

Removal

See page 4057-4.

Disassembly

1. Secure the tube in a vise using care not to distort the tube. Remove the self tapping screw from the gland. Use a spanner wrench and unscrew gland.

2. Secure the cylinder in a vise using care not to distort the tube.

3. Carefully pull the piston rod from the cylinder. Pull the rod straight out to prevent damage to the cylinder wall.

4. Secure the piston rod eye in a vise and remove the self-locking nut. Remove the piston assembly from the rod and remove the vee rings and wear ring from the large piston half. Remove the O-ring from the small piston half.

5. Remove gland from piston rod. If necessary, the gland may be driven off the rod with a soft hammer. Then remove the O-rings, backup rings, bearing (if equipped) and rod wiper from the gland.

Inspection

1. Wash the parts in cleaning solvent and dry with compressed air.

2. Discard piston packing, wear ring, O-rings, backup rings, rod wiper and other parts found to be defective.

3. Shine a light into the cylinder tube. If it has deep grooves, score marks, or has been severely damaged in any other way, it should be replaced.

4. Inspect the piston rod for alignment. Replace if bent; do not attempt to straighten.

5. Before reassembling, remove any minor nicks, scratches, etc. on the rod or in the cylinder. Use medium grit (or finer) emery cloth and polish with a rotary motion.

6. Scoring, pitting, etc. are signs of possible oil contamination (water, metal particles, etc.)

Assembly

1. At the small end of the gland, install a backup ring, O-ring and the remaining backup ring in the rod bore. Install the bearing (if so equipped) and rod wiper at the opposite end. Install O-ring in groove around gland.

2. Lubricate the piston rod and gland bore with hydraulic oil and install gland on piston rod. Work the gland onto the piston rod by hand.

3. Lubricate the piston packing and install on the large piston half as shown in Figure 28. Then install the O-ring and wear ring on the piston half.

Turning Pins and Bushings

The life of worn pins and bushings can be extended by repositioning them in the track links. Press the pins and bushings from the links and rotate them 180° as shown in Figure 3.

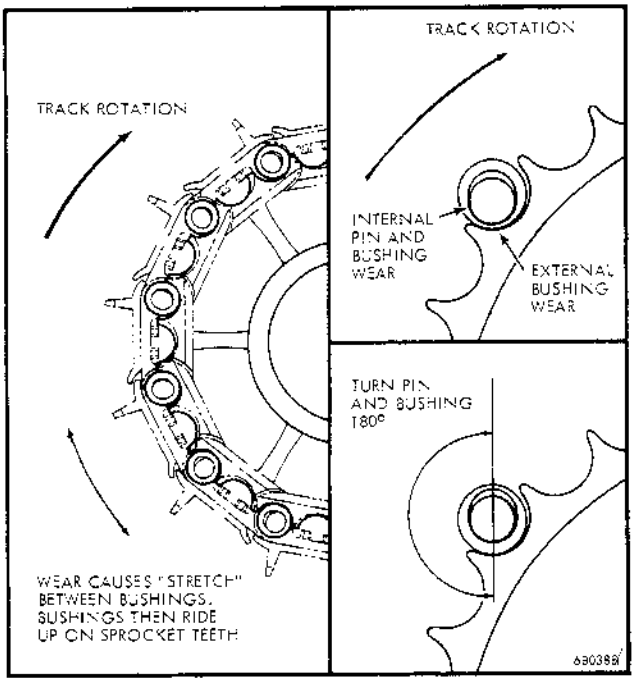


Figure 3 - Turning Pins and Bushings 180°

Determining the Time to Turn Pins and Bushings

There are basic guides to determine when the pins and bushings should be turned.

1. .120" external bushing wear. The amount of wear can be measured in any of these ways shown in Figures 4, 5, and 6.

2. .120" internal pin and bushing wear. Pull the track tight with the hydraulic track adjuster and measure across four track links (five pins) as shown in Figure 7. If the measurement is MORE than 24.00", the average amount of internal wear exceeds the .120" limit and the pins and bushings should be turned.

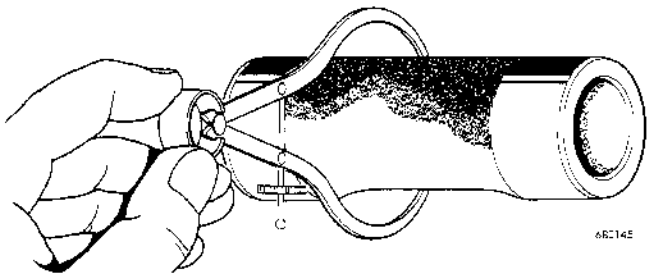


Figure 4

NOTE: The master pin should not be in the section of track being measured.

IMPORTANT: Do not allow pins and bushings to be run to destruction. This will cause rapid wear on other parts in the track system--idlers, sprockets, rollers, etc. In addition, the track may tend to "wander" or jump the sprocket wheels. Figure 3.

Under extremely abrasive conditions, the sprocket teeth may wear deep enough into the bushings to justify turning the pins and bushings before appreciable wear shows on the inside of the bushings and on the pins. In

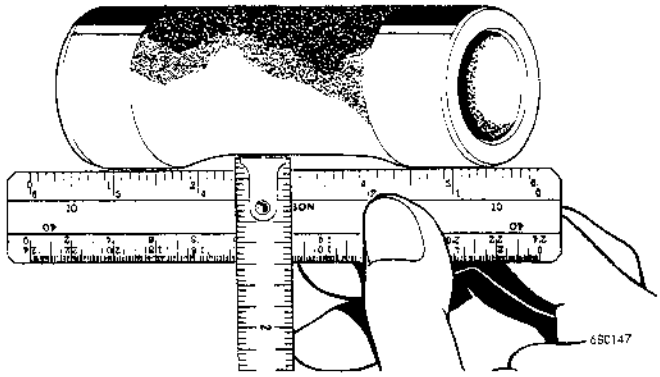


Figure 5

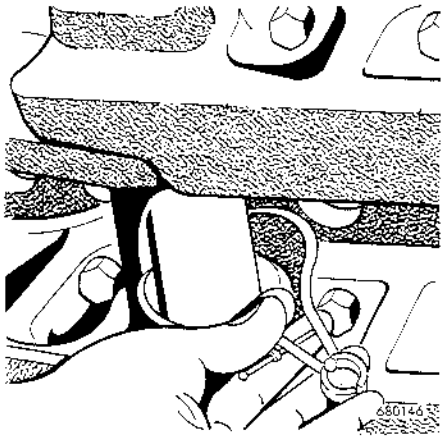


Figure 6

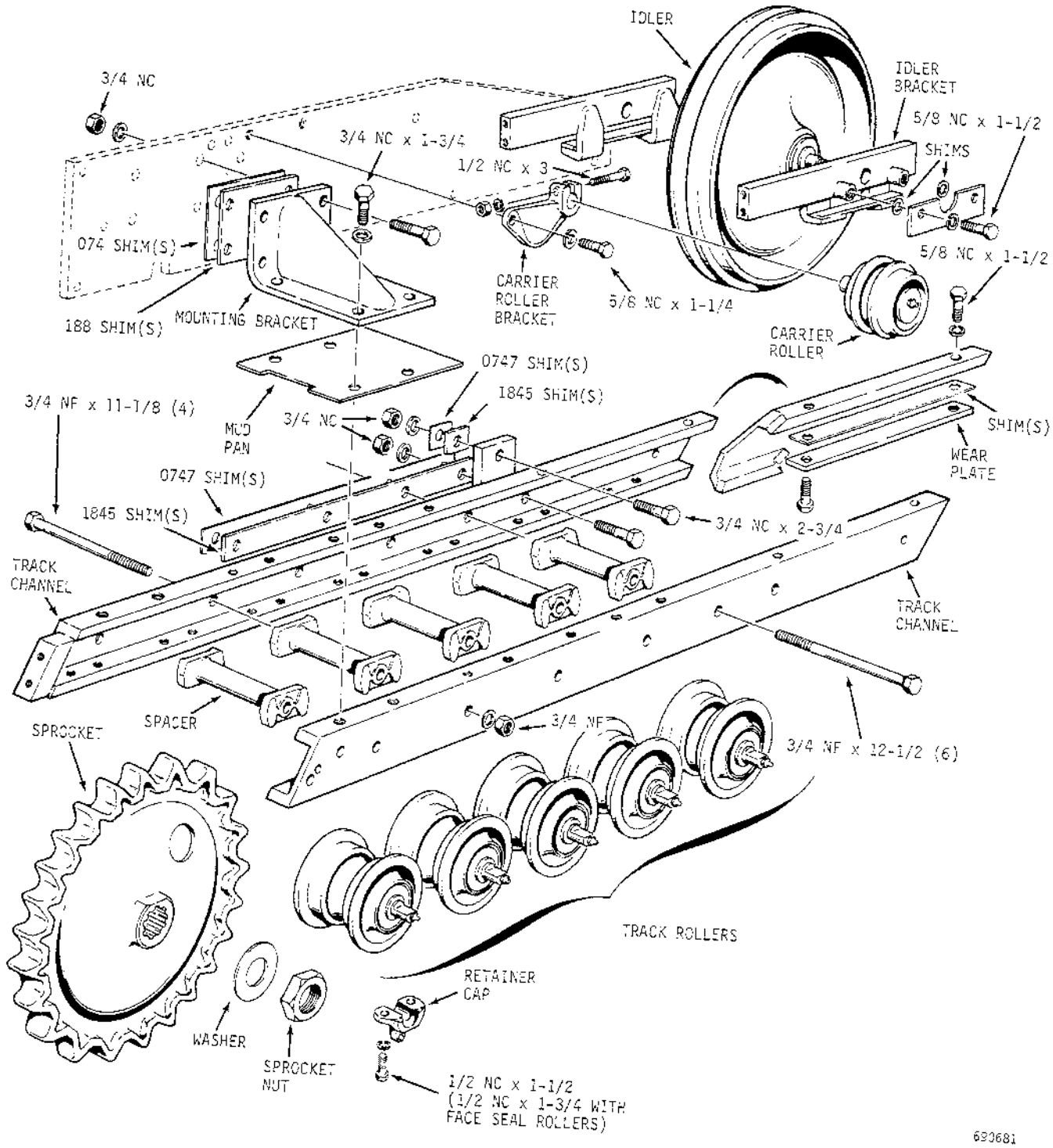


Figure 26 - Track Frame and Attached Parts

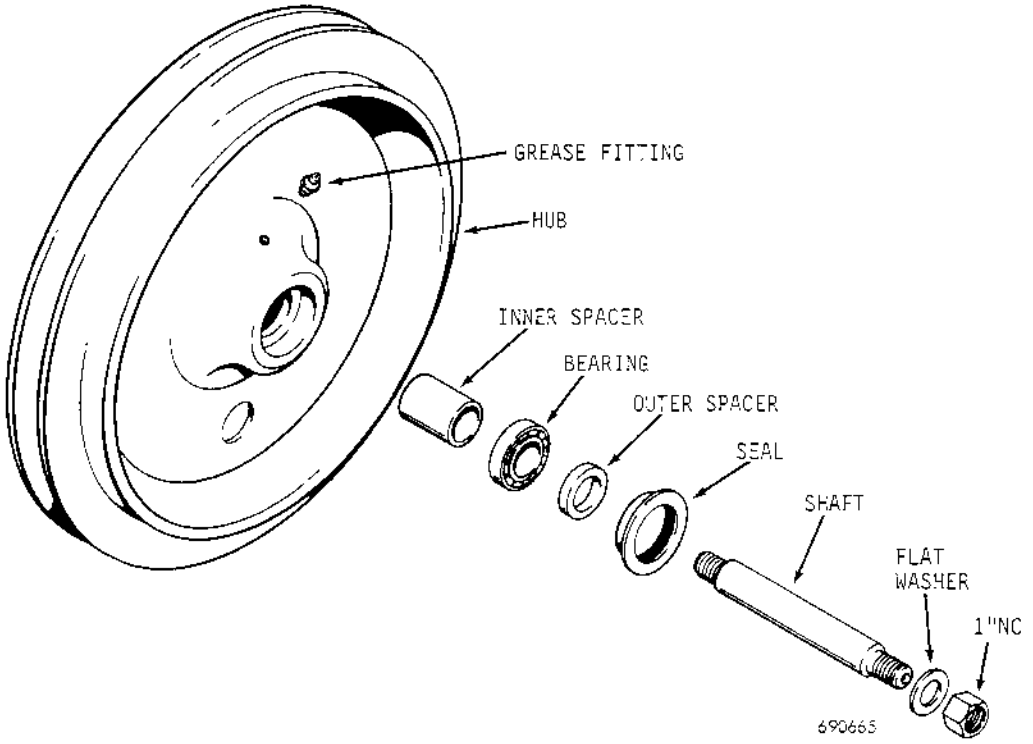


Figure 34 - Exploded View of Idler Wheel (Models 350 and 310G After S/N 3039619)

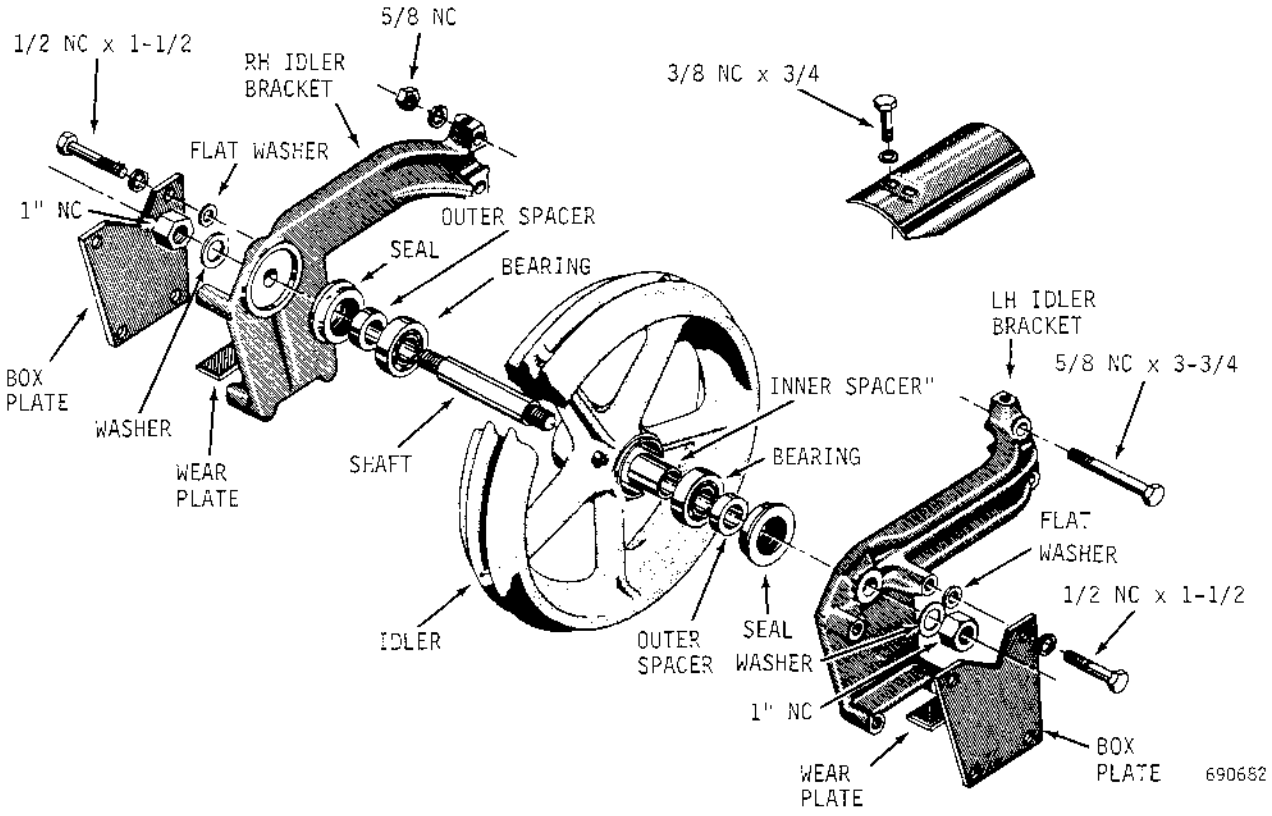


Figure 35 - Exploded View of Idler Wheel (36 Ga. and 310G Before S/N 3039620)

NOTE: This is a "flush type" installation; when new grease is pumped into the roller, the old grease is forced out.

8. Install the grease fitting.

9. Pump lithium-soap base grease into the roller with a pressure gun until grease runs out at both seals.

TRACK ROLLERS - FACE SEAL TYPE

Track rollers with metal face seals are available as optional equipment on all units excepting the 36-inch gauge.

Function, maintenance, and assembly of the face seal assembly can be found on page 5010-22.

Removal

Removal procedure for all track rollers is described on page 5010-31.

Disassembly

1. Remove the 1/4" pipe plug located in the hub of the wheel and drain the oil. The reservoir is filled with 1/3 pint oil.

2. The thrust bushings on each end of the shaft are pressed on. Place the roller in a press and press the shaft so that it travels about 5/8". This will free the shaft from one of the thrust bushings. Remove this thrust bushing.

3. Remove the roller from the press. The

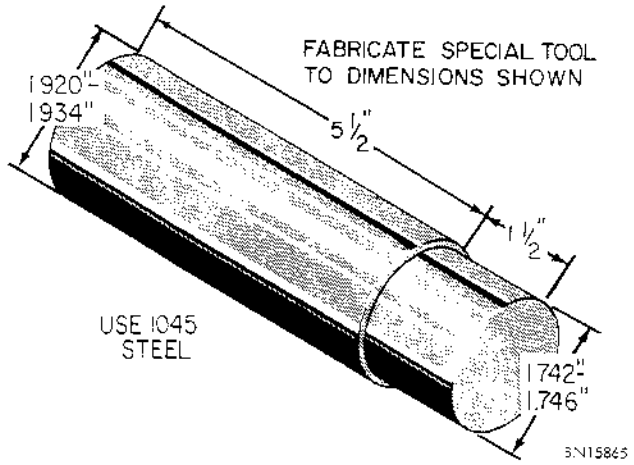


Figure 50 - Special Tool for Shaft Bushings

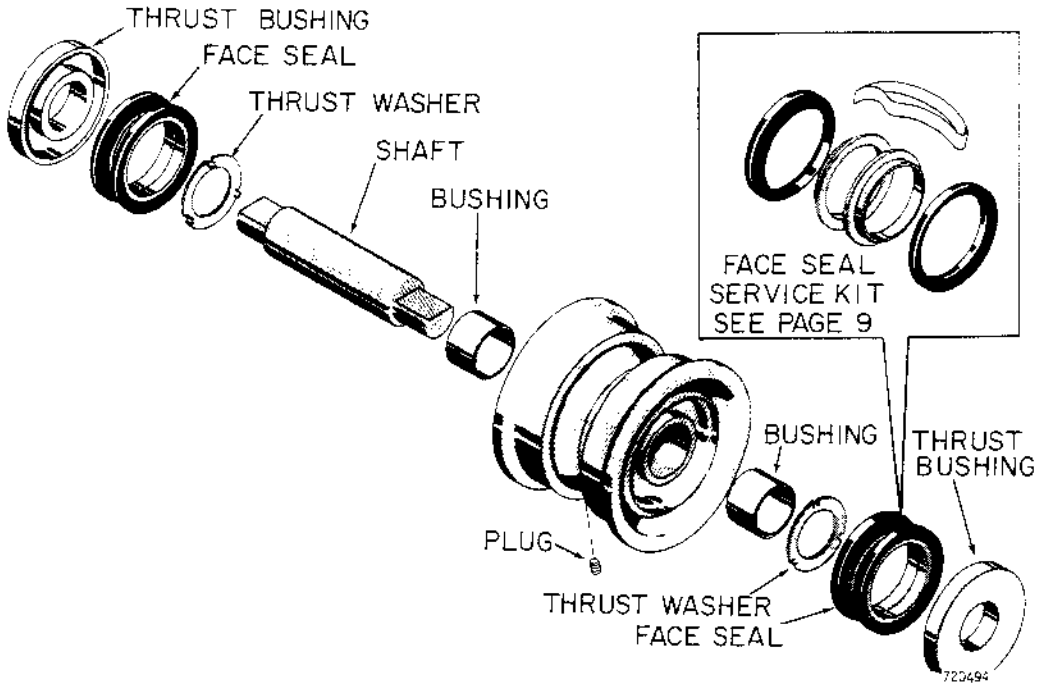


Figure 51 - Exploded View of Lower Track Roller

RECOIL SPRING ASSEMBLY

Description

The recoil spring assembly consists of a spring, housing, adjusting plate, and bolt as shown in Figures 28, 29, and 59. This assembly is bolted to the track frame.

The recoil spring has two functions:

a. Heavy shock loads on the track system are absorbed and dissipated by the spring.

b. The recoil spring serves as a "backstop" for the hydraulic track adjuster (all models except 36" gauge and 310G before S/N 3039620) which keeps the track at proper tension. On 36" gauge models and 310G models before S/N 3039620, the track tension is adjusted mechanically by an adjusting nut turned on the recoil spring bolt.

The recoil spring weighs approximately 23 pounds. In its assembled position it is compressed to approximately 17" from a free height of 20" - 20-1/2". Thus assembled, it has a preload of approximately 5730 to 7000 pounds.

Removing the Spring

Replacement of the recoil spring is seldom required. The spring preload is set at the factory and needs no adjustment. However, if the spring should break it can be replaced as follows:

1. Break the track as described on page 5010-9 and roll it forward.

2. Remove the idler wheel as described on page 5010-23.

3. Remove the hydraulic track adjuster, page 5010-43 (does not apply to 36" gauge crawlers or 310G crawlers before S/N 3039620.)

4. A spanner wrench type tool will be required to turn the adjusting plate and decompress the spring. This tool can be shop made to the dimensions shown in Figure 60. It will fit all models including the 36" gauge.

5. On all 350 models and 310G models after S/N 3039619, follow step 5a to 5d. On 36" gauge models and 310G models before S/N 3039620, proceed to step 6.

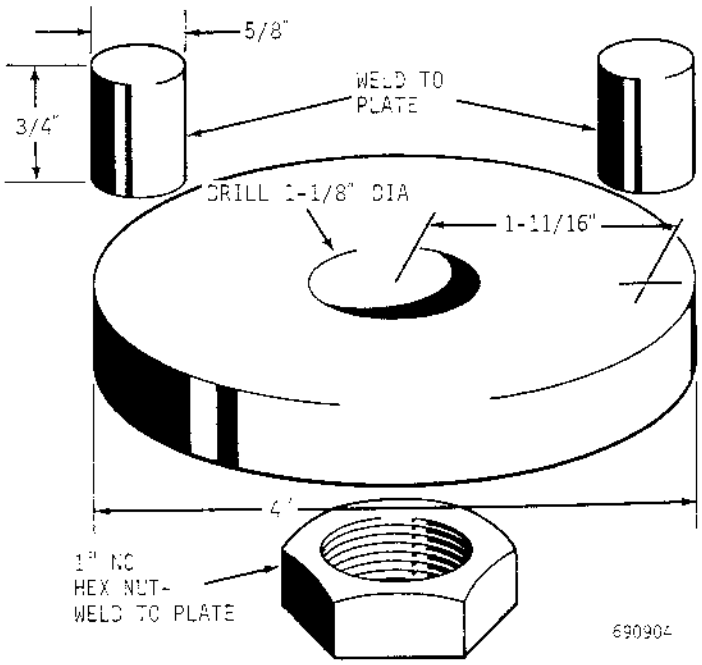


Figure 60 - Recoil Spring Tool (Fits All Models)

5. Remove end cap, Figure 8.

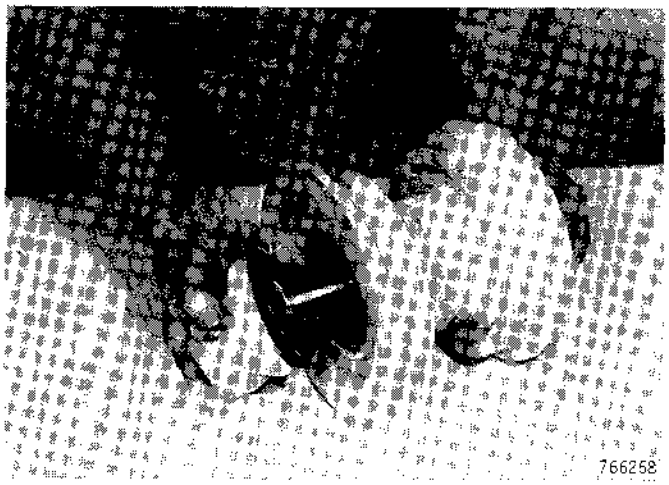


Figure 8

6. Remove both halves of the face seal (two rubber rings and two metal rings).

7. Drive out roll pin from the remaining end cap, Figure 9.

Figure 9

8. Use a soft hammer to drive the shaft free of the end cap, Figure 10.

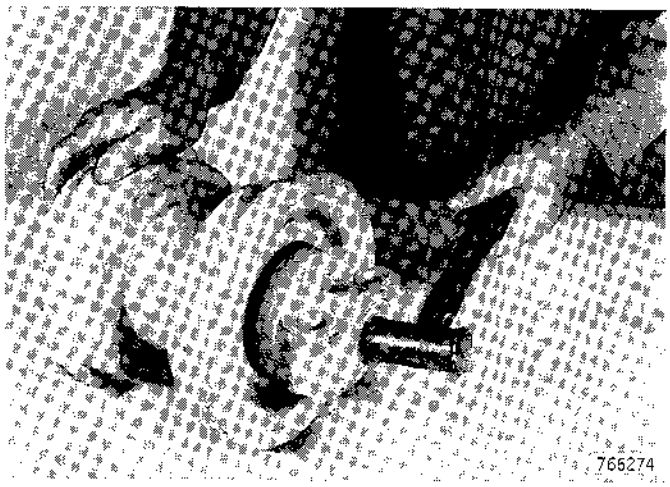


Figure 10

9. Remove the end cap from the shaft. Remove both halves of the face seal (two rubber rings and two metal rings).

10. Remove O-ring from shaft, Figure 11.

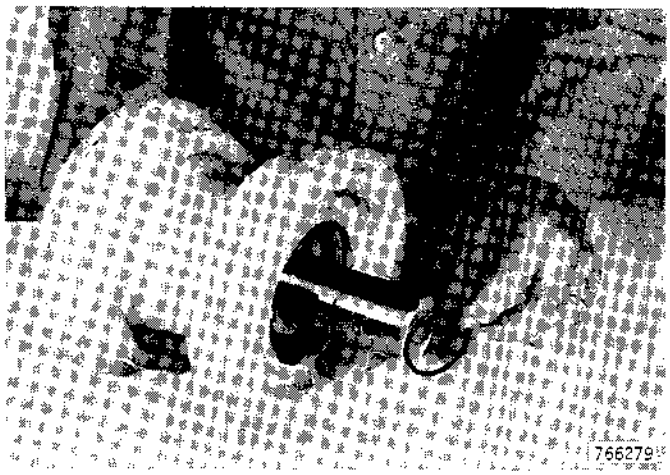


Figure 11

PROBLEM	POSSIBLE CAUSE	REMEDY
High oil temperature (Cont'd)	Low coolant level.	Add coolant as required.
	Dirty oil cooler.	Clean or replace oil cooler.
	Worn or misaligned bushings in transmission case.	Replace bushings.
	Low oil level.	Add oil as required.
	High oil level.	Drain oil to specified level.
	Wrong oil used in transmission.	Fill with recommended oil.
	Shifts made above 1000 rpm.	Reduce speed before shifting.
	Operating in too high gear.	Shift down to lower gear.
	Before unit S/N 3050472; control valve has too small orifice to converter circuit.	Replace control valve. Valve design was changed effective with this S/N.
	Before unit S/N 3050472; pump capacity is too low.	Replace pump. Pump capacity increased effective with this S/N.
Loss of power or slow clutch engagement (forward or reverse)	Worn or damaged clutch.	Disassemble and repair as required.
	Worn or damaged pump.	Replace pump. Pump is serviced as an assembly only.
	Before unit S/N 3050472; control valve orifices too small.	Replace control valve. Valve design change effective with this S/N.
Control lever does not remain in position	Control lever detent spring broken.	Replace spring.
	Control lever detent ball corroded and sticking.	Clean and lubricate ball.
High stall speed with tinny sound	Converter blades damaged.	Replace converter.

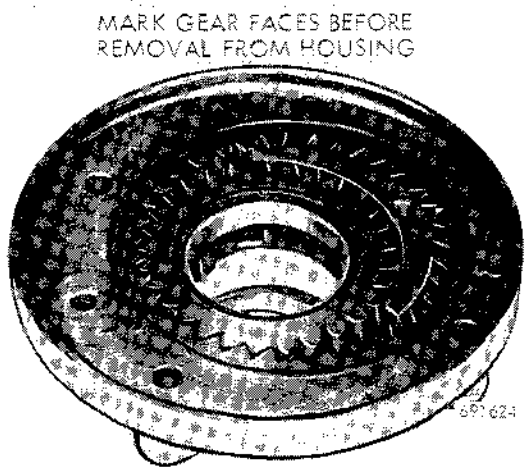


Figure 8

3. Remove the seal from pump housing and discard.

4. Remove the four cap screws which secure the adapter to the shuttle case, Figure 9. Then remove the adapter and reverse piston assembly from the shuttle case, Figure 10. Use care when removing the adapter as the reverse clutch pressure plate may stick to reverse piston. Prevent the pressure plate from dropping and causing needless damage.

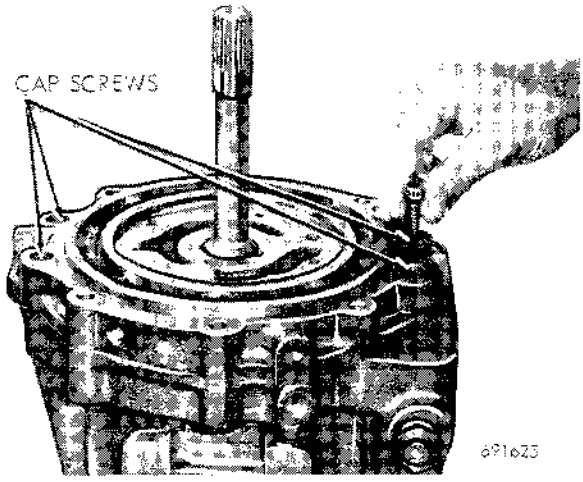


Figure 9

5. If the reverse clutch pressure plate remained in place, remove the pressure plate at this time.

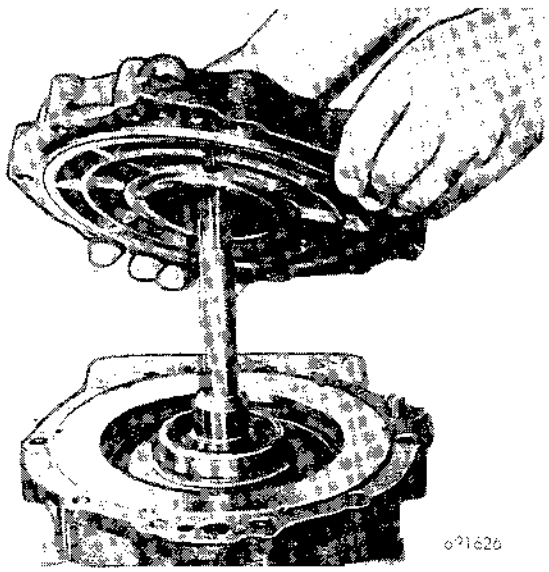


Figure 10

6. Force compressed air into the reverse clutch oil supply hole in the adapter to remove the clutch piston, Figure 11. Then remove the "O"ring from the inner hub of the adapter and the clutch piston.

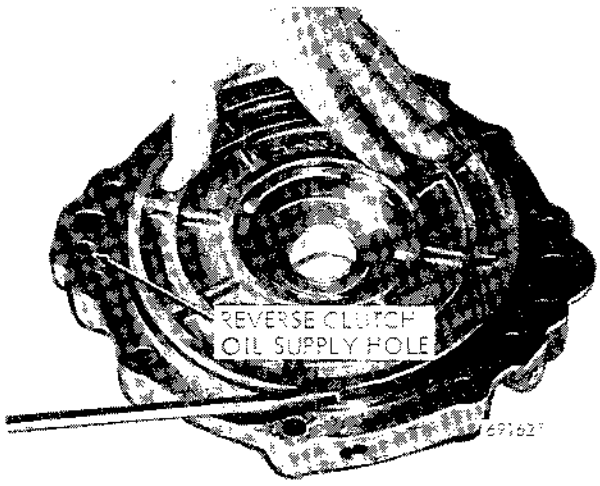


Figure 11

7. Remove the reverse clutch disks, three dowel pins and twelve springs from the shuttle housing, Figure 12.

8. Depress the converter check valve to determine that the valve has been operating freely, then remove the valve and valve spring from the housing, Figure 13. (Early production only).

e. Position the left hand pinion gears (plain teeth) between the thrust washers in the pinion cage.

f. Press pinion shafts into the pinion cage. Make sure retaining pin hole in pinion shaft lines up with the hole in the pinion cage, Figure 31. Then install retaining pin.

g. Position the oil collector ring on the rear of the pinion cage, Figure 31. Then place the pinion cage assembly in a lathe and form the oil collector ring against the pinion cage to form an oil tight seal.

NOTE: DO NOT attempt step 10g unless the proper equipment and a qualified machinist are available.

11. If the bushings in the front end of the output shaft were removed, press new bushings in at this time. Refer to Figure 31 for proper positioning and installation.

12. Place the pinion cage and output shaft assembly on a fixture 5 inches in diameter and 2-7/8 inches high. Then place fixture and pinion cage assembly on an arbor press.

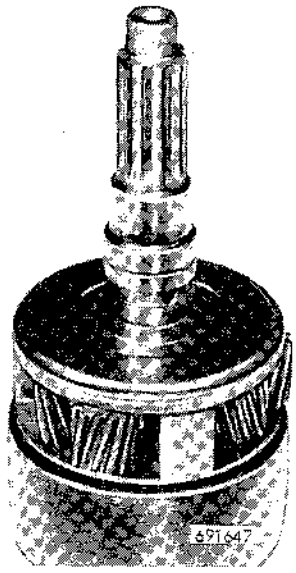


Figure 32

13. Lower shuttle housing over output shaft so the housing rests squarely on the press.

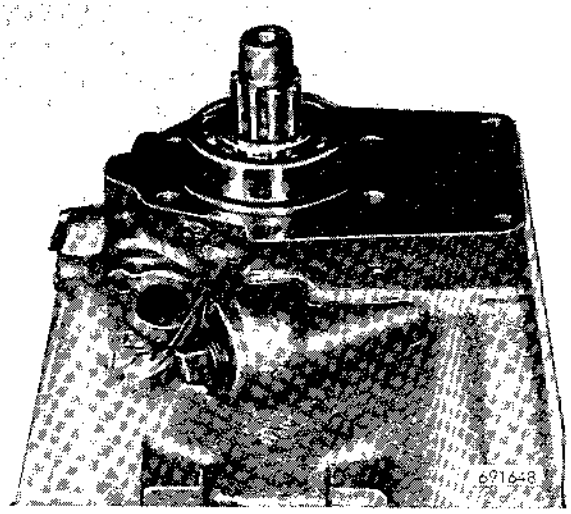


Figure 33

14. Position the rear bearing over the output shaft. Using a suitable tool, one that presses against both the inner and outer bearing races, press the bearing in until the bearing is seated against the sleeve.

15. Press a new seal into the rear bearing retainer and place retainer gasket and retainer on shuttle case. Secure with bolts and lockwashers. Torque the bolts to 40-45 foot-pounds.

16. Place the output flange and the nut on the output shaft. Attach a suitable tool to the flange and torque the nut to 100-200 foot-pounds.

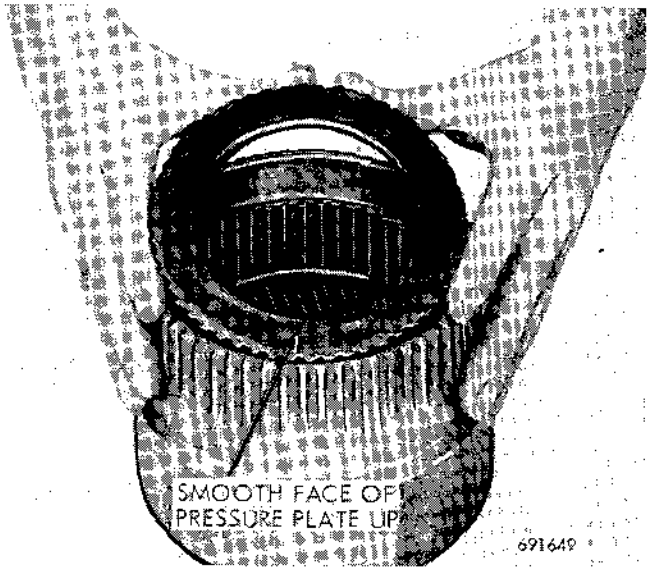


Figure 34

Section

6016

TORQUE CONVERTER

AND

UNIVERSAL JOINT COUPLING

CASE CORPORATION

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310G-350 Crawler
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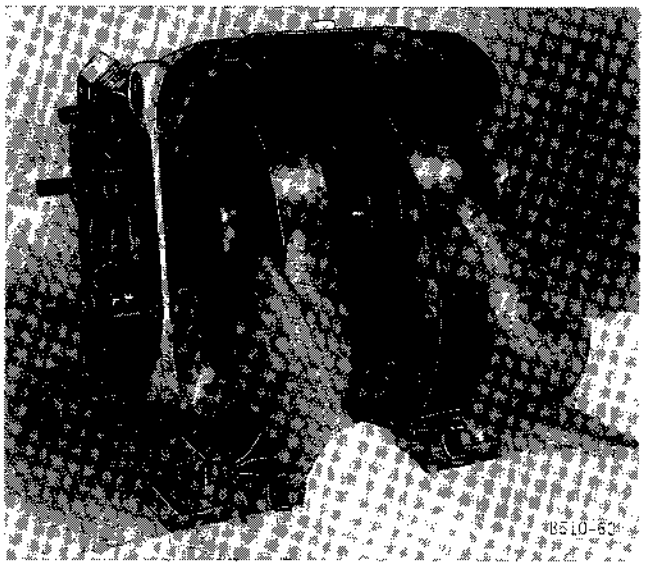

Figure 6 - Removing Brake Bands

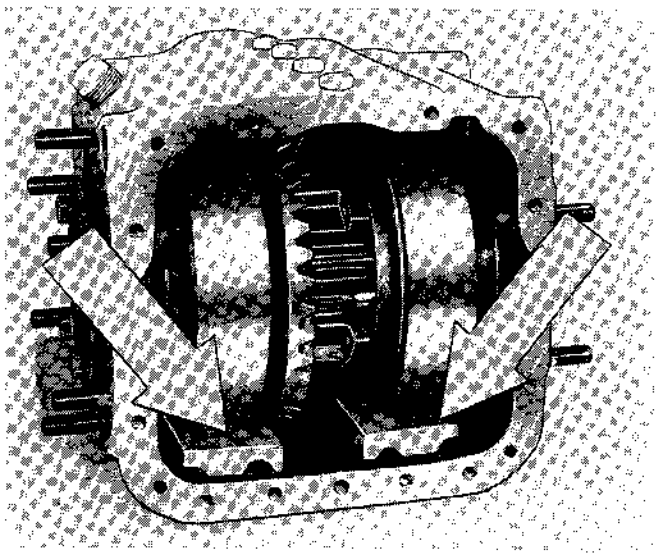

Figure 7 - Supporting Brake Drums

8. Punch matching reference marks on the bearing carrier and on the case to insure correct reassembly. Use two punch marks on one side, or in some other manner differentiate between carriers so that you do not mix the two when reassembling.

9. If a bearing carrier bearing requires servicing, remove bearing cup from carrier by using a puller; see Figure 8. The strings at the bolt holes in Figure 8 are used to keep shims with carrier to help in reassembly. Remove bearing carrier oil seal if it is to be replaced.

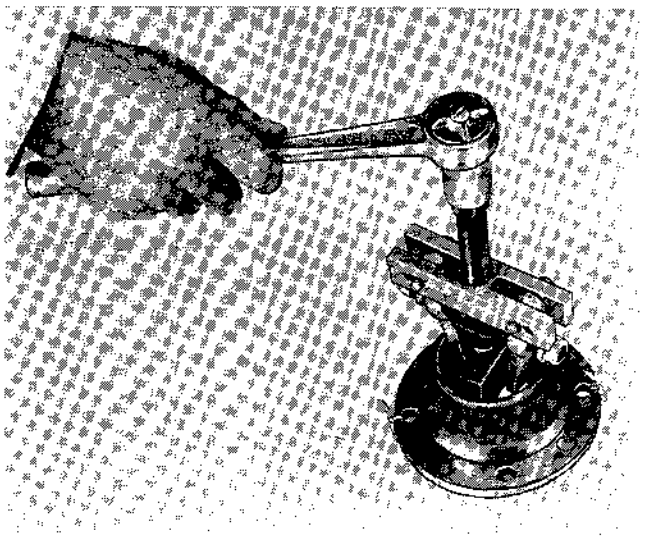

Figure 8 - Removing Bearing Cup

10. Roll differential gear assembly from case, taking care to not nick the brake drums. If drums are nicked or scored they should be replaced. Use puller; this will also remove bearing cone, Figure 9.

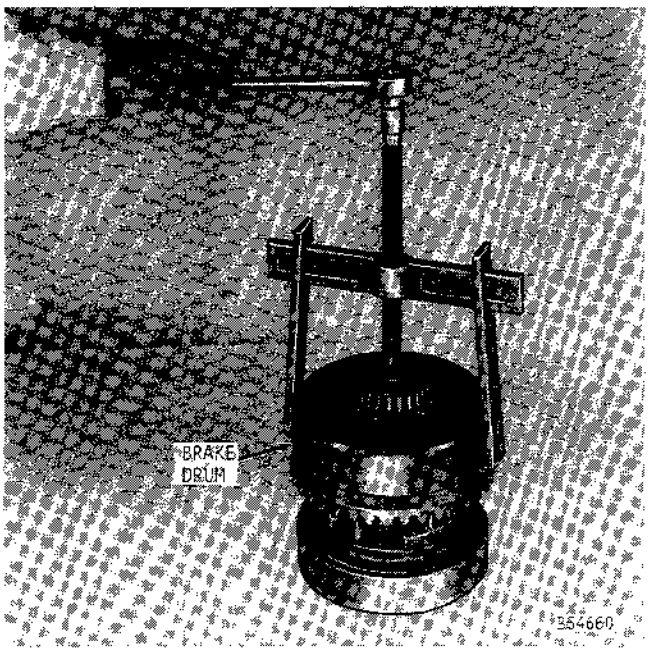

Figure 9 - Removing Drum

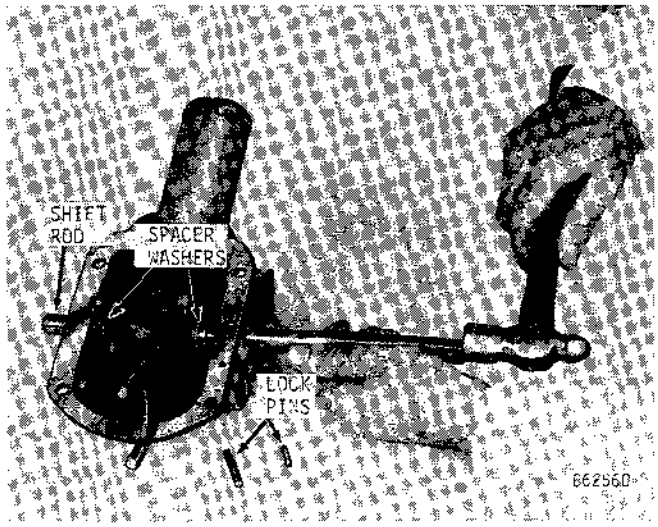

Figure 36 - Removing Shift Rods

Assembly

1. Install mesh lock spring in shift fork, together with ball. Temporarily hold ball in place by inserting a 5/8" rod about 3" long partially through shift fork.

2. Install proper spacer washers on either side of the shift fork and slide shift rod part way into case. Position shift rod in case, drive shift rod into shift fork - pushing temporary rod out of fork as you do so, Figure 37.

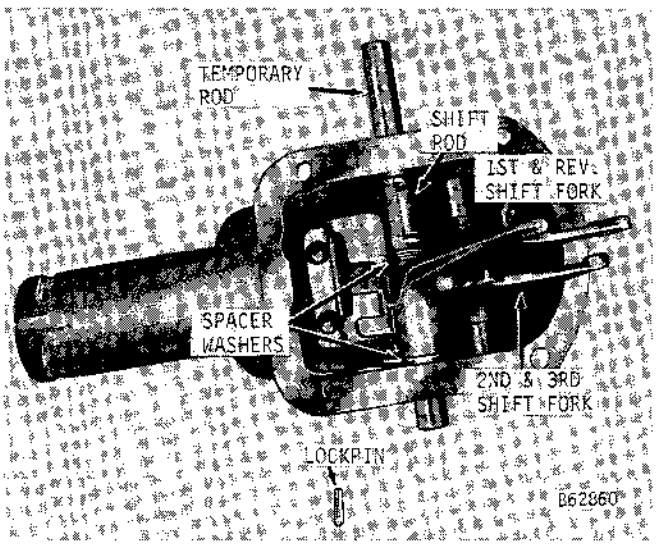

Figure 37 - Installing Shift Rod

3. Secure the shift rod in place by drifting the small lock pin into place through the control cover and the rod. The shortest lock pin secures the first and reverse rod. Peen both ends of lock pins to prevent them from working out; see Figure 38.

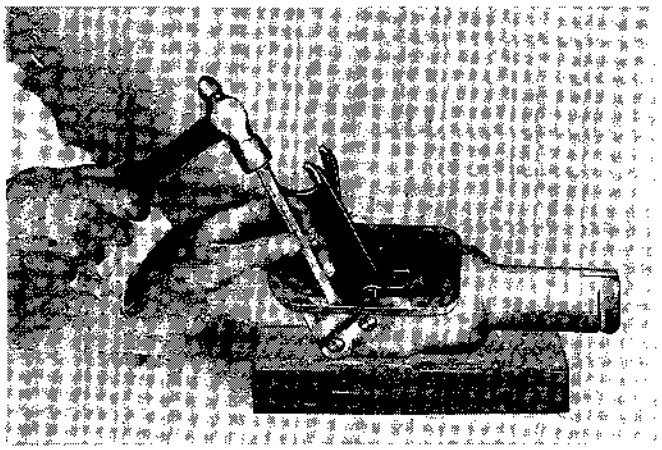

Figure 38 - Peening Lock Pin

4. Replace the housing gasket. Attach to housing with non-hardening Permatex.

5. Be sure transmission housing is clean before replacing gear shift assembly.

6. Put Permatex on gasket and install the housing on the transmission, using 3/8" NC bolts and lockwashers. Be sure forks are in neutral and fit them into the shifting collars on the gears.

7. Check the bearing on the clutch shaft. If replacement is necessary, remove the snap ring and press the bearing from the shaft. The throwout bearing carrier slides on the spindle, therefore the spindle must be free of nicks, burrs, or imperfections. Install new bearing and reassemble, Figure 7.

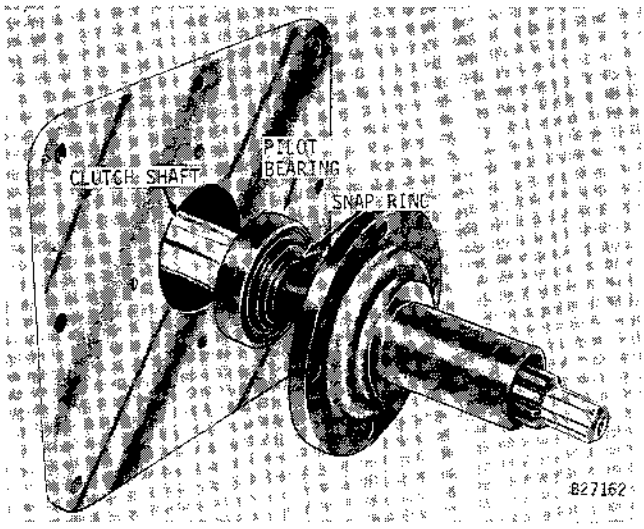

Figure 7 - Spindle, Bearing, Clutch Shaft

Inspection

1. Check the pressure plate friction surface for heat checks. If excessive, regrind or replace. Also check for warpage or elongated boss holes. .015" warpage is the maximum allowable.

2. Check the pressure springs for specified pressure of 160 lbs. when compressed to 1-9/16". Replace any spring showing over a 5% loss (8 lbs.).

3. Check throwout bearing and release levers. Replace any worn parts.

4. Check the disc assembly for worn splines, distortion of the disc, and worn facings. If only the facings must be replaced, a repair kit is available with facings and rivets. Refer to the Case Parts Catalog.

Servicing the Flywheel

Check all parts and replace as necessary —reassemble as follows:

1. To remove flywheel ring gear, use a sharp chisel and hammer. Place cutting edge of chisel between two teeth of the ring gear and hit chisel a sharp blow with the hammer. The ring gear will break. Remove ring gear.

2. To install new ring gear, lay it on a flat surface covered with asbestos material. Using a torch, heat to 600° F — use a circular motion to make sure the ring is heated to a uniform temperature at all times. If heat is not applied evenly, ring will warp.

   Quickly place heated ring gear on flywheel; make sure it is completely seated. When ring gear temperature lowers, the ring gear will shrink tight on the flywheel.

3. While flywheel is removed, inspect Welch plug and pipe plug on rear end of engine for leaks.

4. Replace crankshaft seal if defective. See Section II-M, Servicing Assemblies In The Engine Block.

5. Inspect flywheel for deep score marks.

6. If clutch shaft pilot bearing is defective, remove and replace. To properly seat bearing, press in place, with flat surface of bearing toward front of Crawler and even with bottom of counterbore on front side of flywheel. When the flywheel is installed on crankshaft, the bearing will contact the end of the crankshaft.

7. Thoroughly clean crankshaft surface and mating surface of flywheel. The most common cause of flywheel run-out being excessive is dirt or other foreign material between crankshaft and flywheel mating surfaces.

8. Install flywheel with lineup marks in proper relationship to stud (marked before flywheel was removed). Install 7/16" NF nuts and lockwashers. Torque to 70 ft. lbs.

Section 6026

FINAL DRIVES

CASE CORPORATION

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310G-350 Crawler
December 1975

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POWER TAKEOFF (LATE PRODUCTION)

Removal

Refer to Figure 1 and 2.

1. Drain the oil from the transmission.
2. Remove the universal joint guard. Disconnect the shift rod.
3. Remove six 3/8" NC bolts and lockwashers that attach the PTO housing to the adapter. There are also two dowel pins holding the PTO housing to the adapter. Pull the PTO housing and driveshaft straight back.

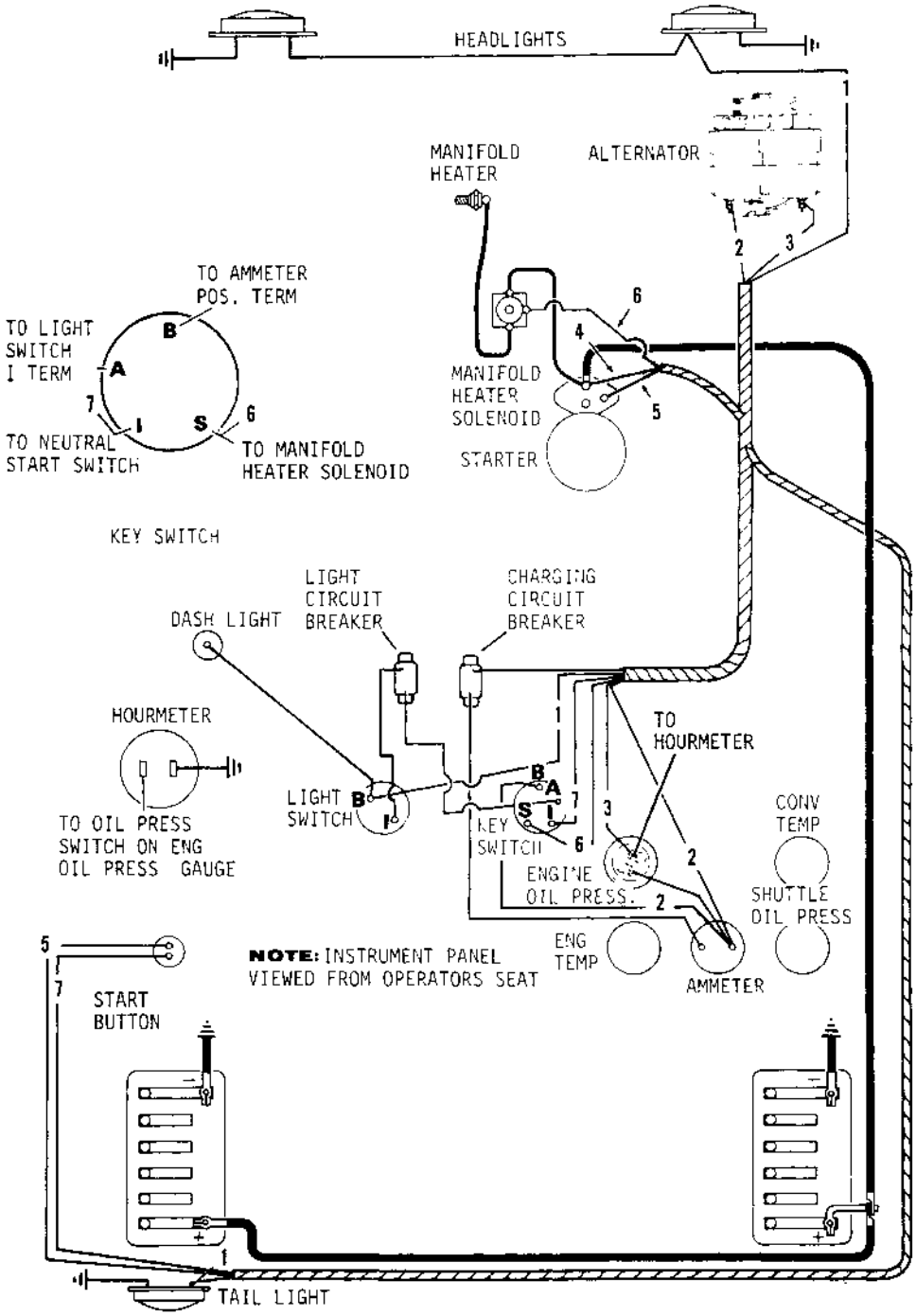
Disassembly

1. Remove the shifter shaft inner roll pin, retainer, spring, shift fork, and inner roll pin.
2. Pull the shifter shaft and lever out of the housing. Inspect the shifter shaft oil seal and remove it if it is to be replaced.
3. Remove the driven shaft seal retainer 3/8" NC bolts, lockwashers, and spacers. Remove the retainer, guard mounting plate, PTO shaft guard, gasket, and oil seal.
4. Remove the driven shaft cotter pin, jam nut, and washer.
5. Tap out the driven shaft while removing the front bearing cone, small spacer, driven gear, spring washer, and large spacer.
6. Remove the snap ring and spacer from the end of the shaft. Pull off the rear bearing cone.
7. If the bearing cups are to be replaced, remove them with a puller.
8. Remove the drive shaft front bearing snap ring. Pull out the drive shaft assembly. Remove the items assembled on the drive shaft as required.

Assembly

1. Install the driveshaft:
   a. Press a new rear bearing into the PTO housing until it bottoms.
   b. Install the spacer and snap ring on the driveshaft.
   c. Press the front bearing onto the driveshaft until it bottoms against the spacer.
   d. Install the driveshaft gear with the groove to the rear.
   e. Install this assembly into the PTO housing. Install the front bearing snap ring in the groove in the PTO housing.
2. If the driven shaft rear bearing was removed, press the bearing cone against the spacer and snap ring on the driven shaft.
3. If the bearing cups were removed, press the new cups into the PTO housing until seated against the snap rings.
4. While installing the driven shaft, slide on a large spacer, spring washer, driven gear, and small spacer.
5. Install the bearing cone, washer, and jam nut on the front end of the driven shaft. Tighten the jam nut until there is no end play and a slight drag when turning the shaft. Install the cotter pin.
6. Press a new oil seal into the seal retainer with the lip facing in.
7. Install a new seal retainer gasket. Install the seal retainer, PTO shaftguard, and mounting plate guard with three 3/8" NC bolts, lockwashers, and spacers.
8. Press or drive a new lever and shaft oil seal into the PTO housing, lip facing in.

WIRING DIAGRAMS



WIRE CODE FROM	TO	COLOR
1. LIGHT SWITCH	LIGHTS	BLACK
2. ALTERNATOR	AMMETER & IGN. SWITCH	ORANGE
3. PRESSURE SWITCH	ALT. REG. TERM.	VIOLET
4. STARTER	AMMETER	RED
5. START BUTTON	STARTER	WHITE
6. IGN. SWITCH	PREHEAT SOLENOID	YELLOW
7. IGN. SWITCH	START BUTTON	BLUE

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Figure 1 - Wiring Diagram (Model 350 With Alternator)

Section 8012

TROUBLE SHOOTING

CASE CORPORATION

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310G-350 Crawler
December 1975

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TROUBLE SHOOTING THE STARTING CIRCUIT

General Inspection

Many starting problems can be solved by making the following checks:

1. Determine battery condition. Refer to Section 8014. Charge or replace battery if required. Clean battery posts and cable connectors.

2. Inspect the wiring for frayed insulation or other damage. Replace damaged wiring. Inspect all connections at the starter, stater solenoid, starter magnetic switch if so equipped, key switch, 40 amp circuit breaker or 25 amp fuse and wiring harness plug if so equipped.

3. If the starter still fails to operate after remedying defects, check out starting circuit.

Starter Circuit Check - 350 Diesel Engine and 310G Spark Ignition Engines

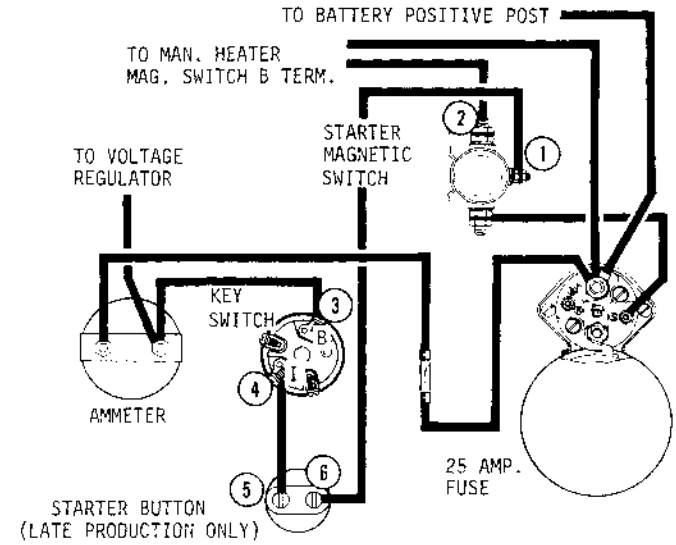
The following steps will locate defects in the starting circuit. The circuit may be checked using a 12 volt test lamp or voltmeter.

1. Apply parking brake, place all transmission controls in neutral, and pull fuel shutoff control out or remove coil wire.

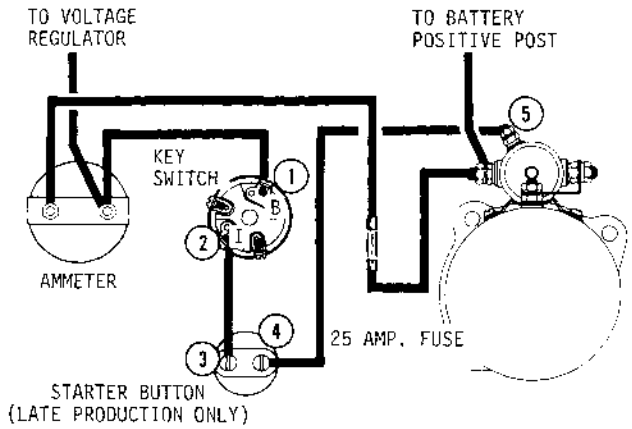
2. Refer to Figure 3. Connect a jumper cable to the starter solenoid B and S terminals.

   a. If the starter fails to operate, connect the jumper cable to the B and M terminals on the starter solenoid. If the starter operated properly, the selenoid is defective and must be replaced or repaired. If the starter still fails to operate, the starter is defective and must be repaired or replaced.

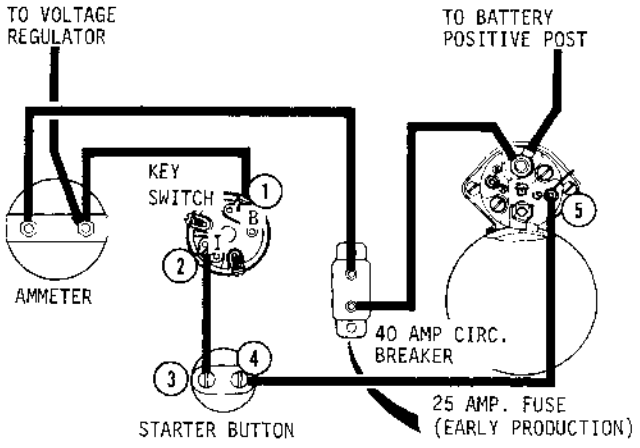
   b. If the starter operated properly, perform the following steps to locate the problem.



DIESEL STARTING CIRCUIT BEFORE 310G CRAWLER



SPARK IGNITION STARTING CIRCUIT 310G



DIESEL STARTING CIRCUIT 350 CRAWLER

741718

Figure 3 - Starting Circuits

IGNITION TIMING - STATIC

1 Crank the engine to position the No. 1 piston at 4° BTDC on its compression stroke. Refer to Figure 4.

2. Remove the distributor cap, rotor and dust shield. Note the position of the breaker points, the points should just be starting to open.

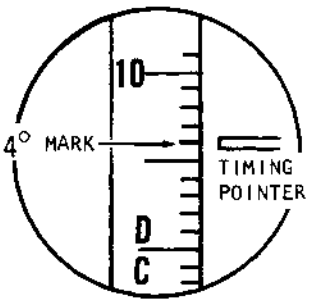


Figure 4 - Timing Marks

a. If the ignition timing is correct, the rubbing block will just be in contact with the cam lobe.

b. If the rubbing block is past the center of the cam lobe, the ignition timing will have to be retarded. Turn the distributor clockwise to retard the timing.

c. If the rubbing block has not come in contact with the cam lobe, the timing will have to be advanced. Turn the distributor counter-clockwise to advance the timing.

3. To assure proper ignition timing, connect a timing light to the No. 1 spark plug according to the test equipment manufacturer's instructions. Start the engine and run at 2000 rpm. The No. 1 spark plug should be firing at 30° BTDC. If the spark plug is not firing at 30° BTDC recheck the initial timing and if necessary, remove the distributor and check the mechanical advance mechanism for proper operation.

DISTRIBUTOR CAP

Clean the distributor cap with a soft bristle brush and mild cleaning solvent or mineral spirits. Dry the cap with compressed air. Remove dirt and/or corrosion from the spark plug and coil wire sockets with a wire brush. Replace the distributor cap if any of the following defects are found: cracks, permanent carbon paths, broken carbon button or ecessively burnt spark plug terminals.

ROTOR

Clean the rotor with a soft bristle brush and a mild cleaning solvent or mineral spirits. Dry the rotor with compressed air. Replace the rotor if any of the following defects are found: permanent carbon paths, excessively burnt electrode, or cracks. DO NOT dress the rotor electrode with a file, knife, etc. To do so will result in an increased air gap between the rotor electrode and the terminals in the distributor cap and probable reduced engine performance.

DISTRIBUTOR SPARK ADVANCE - MECHANICAL

The spark advance is checked to determine if the ignition timing advances in the proper relation to engine speed.

Prior to checking the spark advance, check the dwell and breaker point spring tension and adjust as required.

SPECIFICATIONS

NOTE: Batteries are equipped with non spill caps. See Section 9019.

Diesel Engine

Diesel Engine (R24060 and D44175)	Before S/N 3028888, positive ground system S/N 3028888 and after, negative ground system
Number and size	Two 12 volt batteries in parallel Group size 27H, SAE No. 9H5
Capacity	
300 amps at 0° F. (-17° C)	10 second voltage - 8.0 V 7.2 minutes to 1.0 volt per cell
90 second diesel rating	425 amp draw for 90 seconds at 0° F. (-17° C) to 1 volt per cell
Capacity (load) test draw	200 amps
Full charge specific gravity	1.260 ± .005 (original equipment or Case replacement batteries only).
Plates per cell	13
Slow charging rate	6 amps
Weight with electrolyte	52.3 lbs. (24 kg)

Gasoline Engine

Gas Engine (D44176 and F22631)	Before S/N 3028888, positive ground system S/N 3028888 and after, negative ground system
Number and size	Two 12 volt batteries in parallel Group size 24, SAE No. 9MJ3C
Capacity	
300 amps at 0° F. (-17° C)	10 second voltage - 6.0 V
90 second diesel rating	260 amp draw for 90 seconds at 0° F. (-17° C) to 1 volt per cell
Capacity (load) test draw	200 amps
Full charge specific gravity	1.260 ± .005 (original equipment or Case replacement batteries only).
Plates per cell	9
Slow charging rate	3-1/2 amps
Weight with electrolyte	41.1 lbs. (19 kg)

Section 8015

STARTER AND STARTER SOLENOID

CASE CORPORATION

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310G-350 Crawler
December 1975

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STARTER SOLENOID (DELCO-REMY)

Specifications

Part number ..... G44891 (DR 1114356)
Current draw
Hold-in winding ..... 14.5-16.5 amps @10 volts
Pull-in winding ..... 13-15.5 amps @5 volts

Solenoid Tests

The solenoid can be tested on or off the starter. If the solenoid remains on the starter, disconnect the field coil lead from the solenoid M terminal and insulate (tape) the field coil lead to prevent the starter from operating.

Test No. 1 - Hold-In Winding

1. Make the test connections as shown in Figure 9.
2. Close the switch and adjust the carbon pile until the voltmeter indicates 10 volts.
3. Record ammeter reading, turn carbon pile off and open the switch.
4. Compare ammeter reading with specification.
   a. A high reading indicates a shorted or grounded winding.
   b. A low reading indicates excessive resistance.

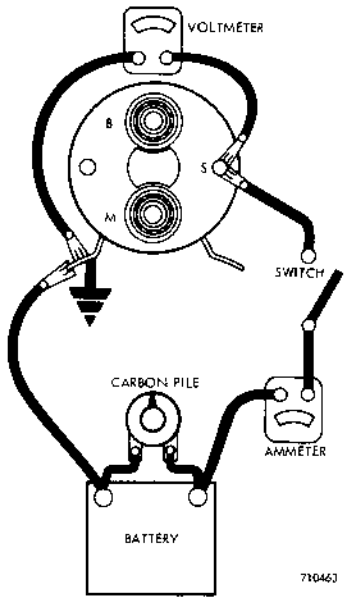

Figure 9 - Hold-in Winding Test

Test No. 2 - Pull-In Winding

1. Make the test connections as shown in Figure 10.
2. Close the switch and adjust the carbon pile until the voltmeter indicates 5 volts.

   NOTE: To prevent overheating, do not energize the pull-in winding more than 15 seconds. Current draw will decrease as the winding temperature increases.
3. Record the ammeter reading, turn the carbon pile off and open the switch.
4. Compare ammeter reading with specification.
   a. A high reading indicates a shorted or grounded winding.
   b. A low reading indicates excessive resistance.

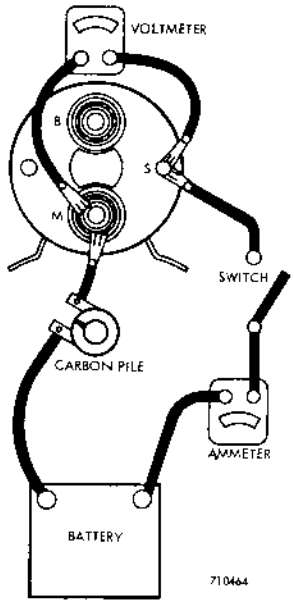

Figure 10 - Pull-in Winding Test

Section 8017

GENERATOR AND VOLTAGE REGULATOR

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310G-350 Crawler
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Armature Tests

ARMATURE GROUND TEST

1. Place armature in growler of tester. Turn on power. Figure 12.

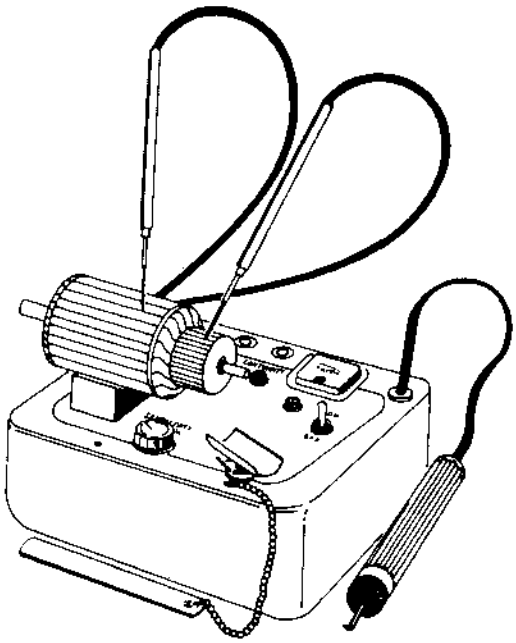

Figure 12 - Armature Ground Test

2. Touch one test probe to armature core, the other probe to commutator. If test lamp glows, the armature winding or commutator is grounded.

ARMATURE SHORT TEST

1. Have armature in same position as previous test. Turn on power. Figure 13.

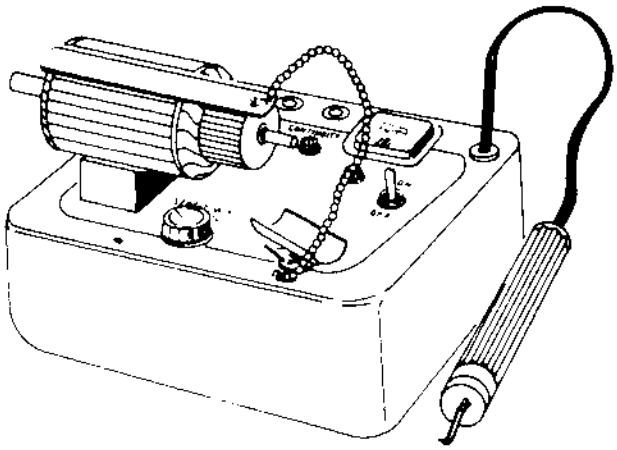

Figure 13 - Armature Short Test

2. Using steel blade provided with tester, hold the blade parallel with and touching the armature core segment.

3. Slowly rotate the armature one or more revolutions. If the armature is shorted, the steel blade will vibrate.

ARMATURE COIL BALANCE TEST

1. Have armature in growler and turn on power. Figure 14.

2. Follow directions provided with tester and test the commutator bars for abnormal readings which will indicate a short, open, or poor connection. A satisfactory commutator will give uniform readings.

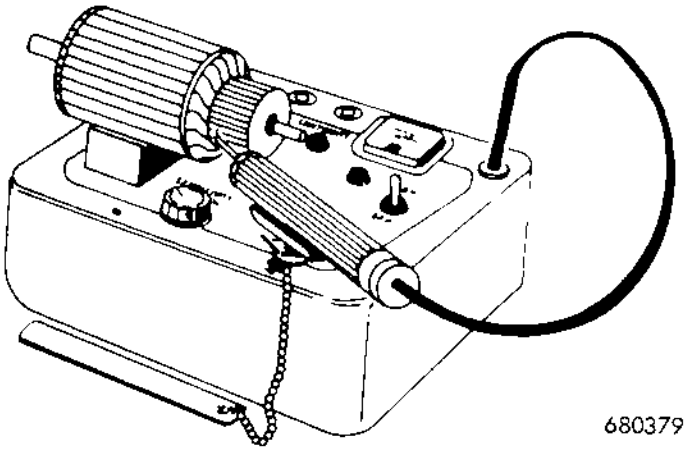

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Figure 14 - Armature Coil Balance

Field Coil Tests

Conduct the following field coil tests using a suitable test lamp.

FIELD COIL GROUND TEST

1. Disconnect field coil ground connections.

2. Connect one test probe to the field connector and the other to the field frame. If the test lamp lights, the field coils are grounded and must be replaced.

FIELD COIL CONTINUITY TEST

1. Touch the test probes to each end of the field coil windings. If the test lamp does not light, the field coils are open.

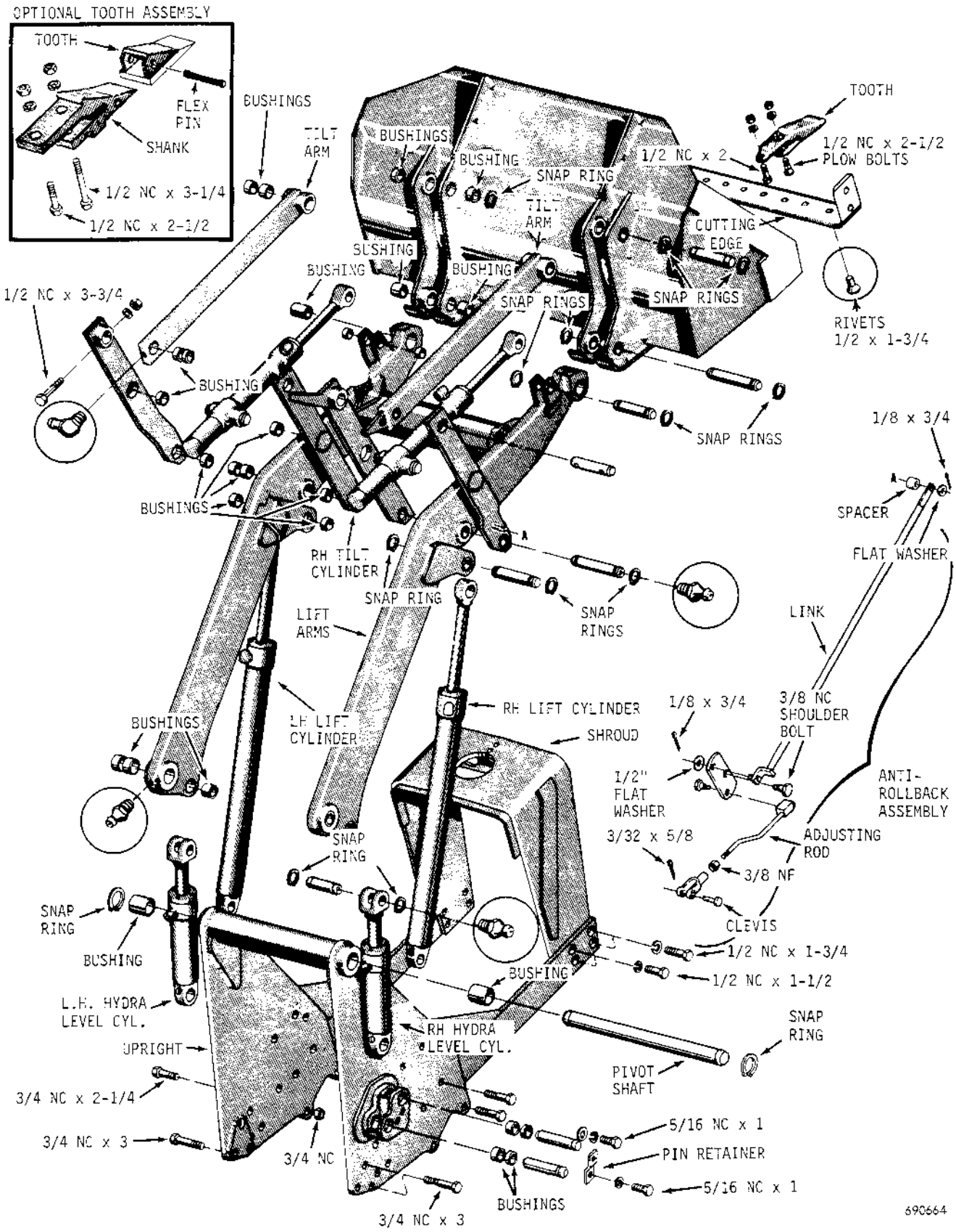

Figure 1 - Loader with Standard Bucket

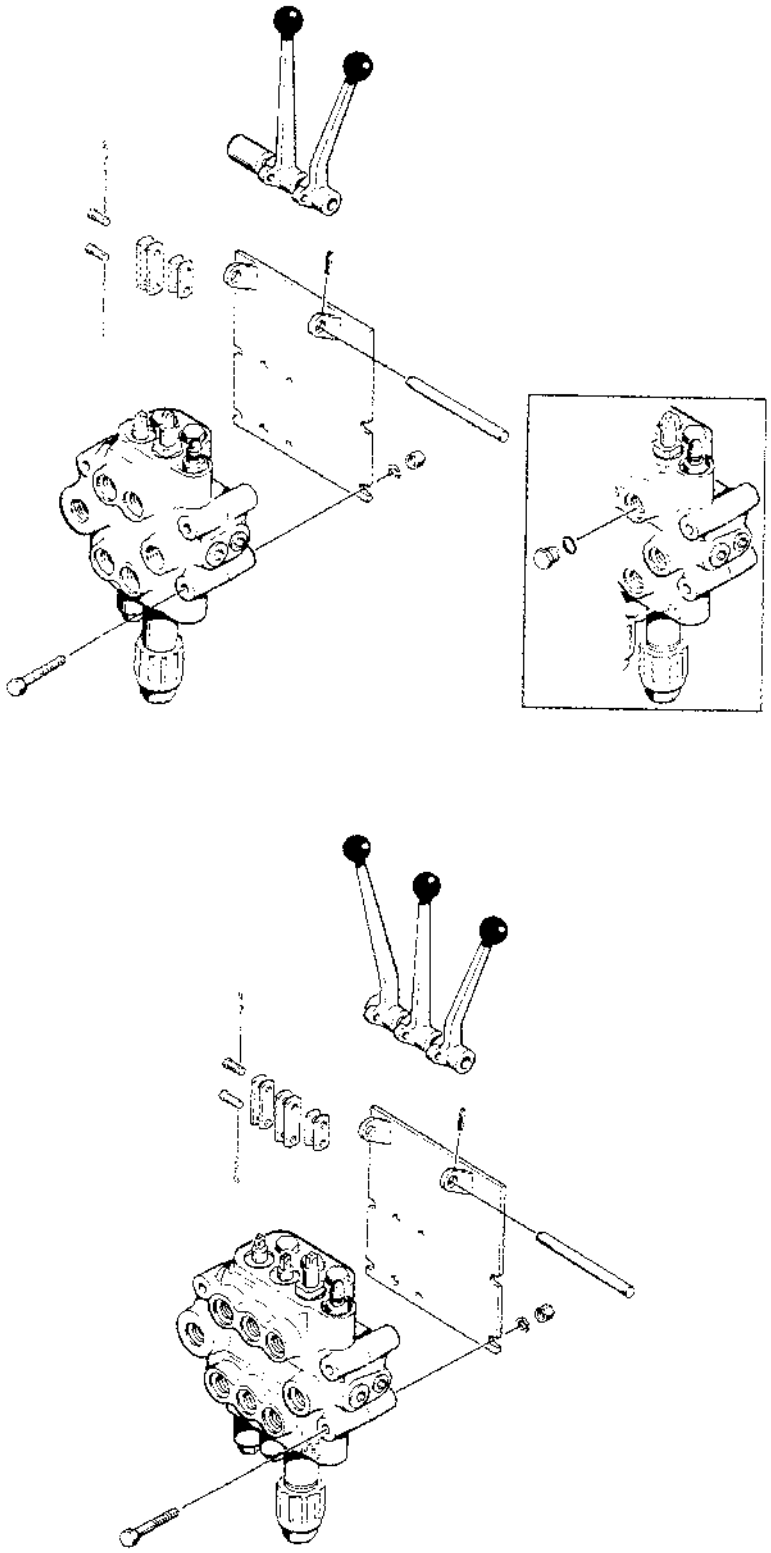

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Figure 11 - Single Lever Control

Replacing Grab Hook

The grab hook plate welded to each side of the clam assembly is replaceable.

1. Remove the worn or damaged plate and grind weld area clean and smooth.

2. Locate and weld a new grab hook plate as shown in Figure 19.

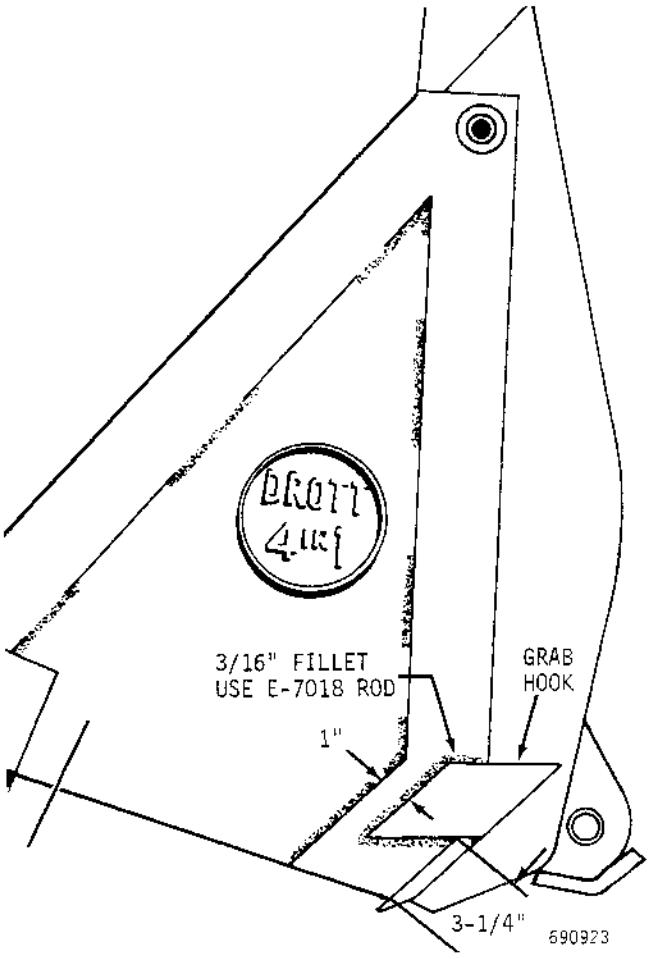

Figure 19 - Replacing Grab Hook

Decal Replacement

1. Close the clam and position bucket so that the clam cutting edge is flat on the ground.

2. Apply bucket indicator decal to indicator bank on right hand lift arm with the letter "B" opposite the pointer as viewed from

3. Apply clam depth indicator decal so that the "O" is opposite the indicator (on left hand side of blade assembly).

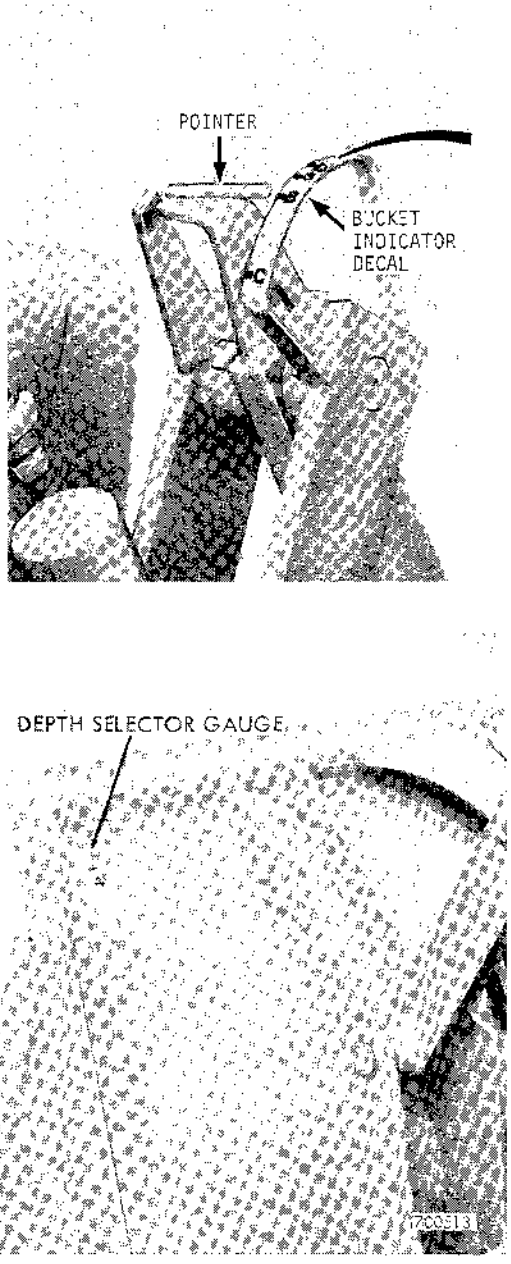

Figure 20 - Drott Bucket Decals

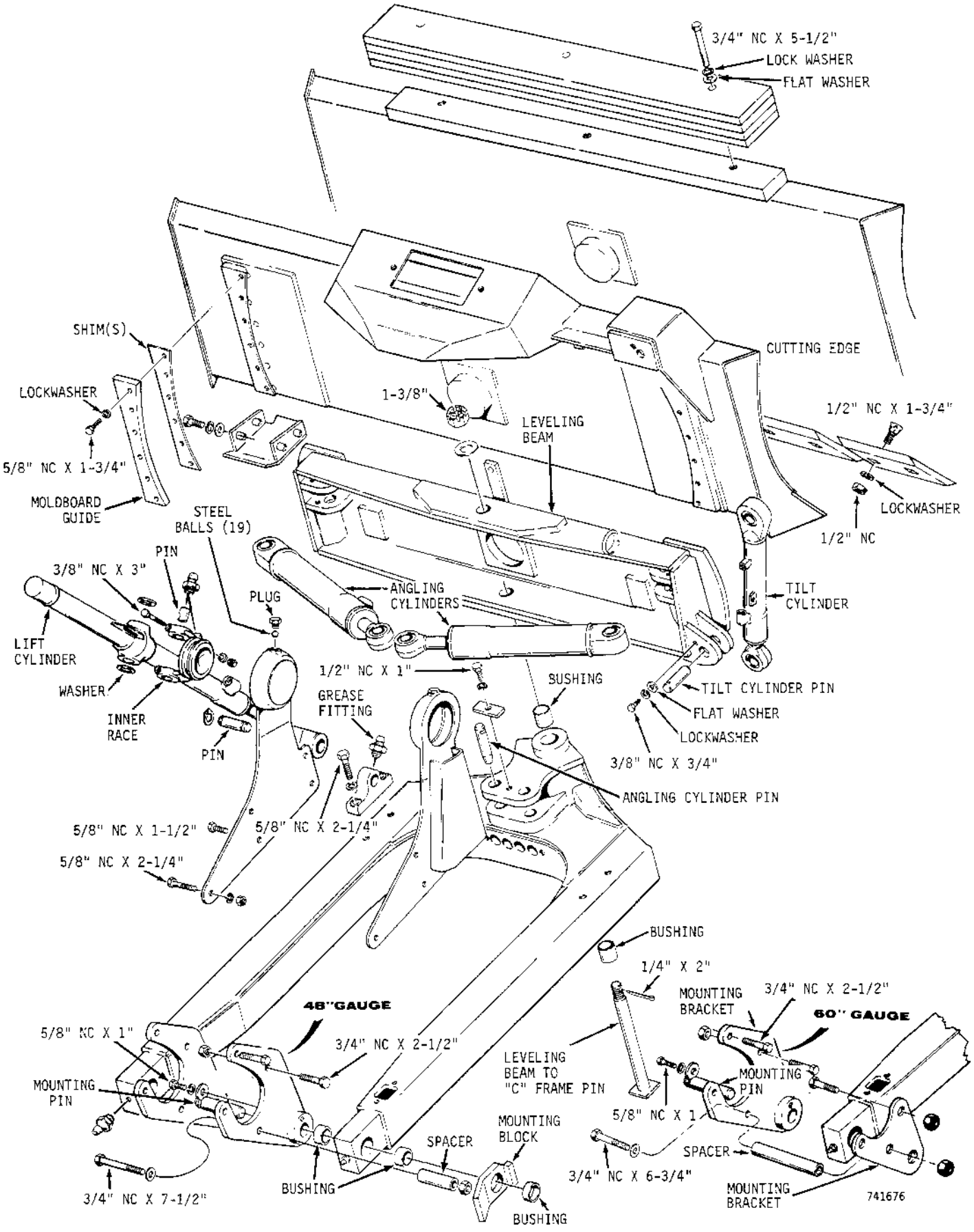

Figure 7 - Power Angle-Tilt Dozer S/N 3047966 and After

REMOVING "C" FRAME

Mechanical Angling Dozer

Refer to Figure 1.

1. Have the moldboard resting on the ground. Remove the counterweights, if so equipped.
2. Place blocks under the "C" frame.
3. Disconnect lift cylinders from "C" frame by removing snap ring and driving out pin at each cylinder.
4. Start engine and retract the lift cylinders. Tie or wire them to the tractor to keep them from dangling.
5. At the rear of the "C" frame, remove the cotter pin from each trunnion pin, then lift out the trunnion pins. The crawler is now free of the "C" frame.

Power Angling Dozer

Refer to Figure 3.

1. Have the moldboard resting on the ground. Remove the counterweights, if so equipped.
2. Move the angling control lever in both directions to relieve hydraulic pressure. Disconnect the angling cylinder hoses from the manifold block at the left hand rear of the "C" frame. Close openings with clean caplugs.
3. Remove the pins from the rod end of the lift cylinders. Start engine and retract the cylinders. Tie or wire the cylinders to the tractor to prevent them from dangling.
4. Place blocks under the "C" frame.
5. At the rear of the "C" frame, remove the cotter pin from each trunnion pin, then lift out the trunnion pins. The crawler is now free of the "C" frame.

NOTE: Crawler can be moved, but DO NOT move the control lever to angle the cylinders unless the hoses are closed with high pressure steel fittings.

Power Tilt Dozer

Refer to Figure 5.

1. Have the moldboard resting on the ground. Remove the counterweights, if so equipped.
2. Move the tilt control lever in both directions to relieve hydraulic pressure. Disconnect the tilt cylinder hoses at the manifold block at the left hand rear of the "C" frame. Close openings with clean caplugs.
3. Place blocks under the "C" frame.
4. Scribe a line across end cap and push beam on both sides. Remove end caps. Note the number of shims removed and tie them together.
5. Remove the roll pin and mounting pin that connects each lift cylinder to the moldboard. Start engine and retract the cylinders. Tie or wire them to the tractor to keep them from dangling.
6. The crawler is now free of the "C" frame and can be backed away. Do NOT move the tilt control lever unless the hose ends are closed with high pressure steel fittings.

Power Angle-Tilt Dozer (Case Built)

Refer to Figures 7 and 9. This describes removal of the "C" frame with moldboard and leveling beam attached.

1. Have the moldboard resting on the ground. Remove the counterweights, if so equipped.
2. Move the control levers back and forth with the engine off to relieve hydraulic pressures in the cylinder circuits.
3. Disconnect the lift cylinders at the rod eye end by removing a snap ring and driving out the pin. Turn on the engine and retract the cylinders. Tie the lift cylinders so they do not dangle.

SPECIFICATIONS

Dimensions

Height (From ground line to C/L of drums)	24-1/2" (622.3 mm)
Height (From ground line to top of winch)	33" (838.2 mm)
Ground Clearance (At bottom rear of winch)	15" (381 mm)

Line Speed

At 1850 PTO (Engine) Speed

Bare Drum	117 fpm (4.1 mpm)
Full Drum	190 fpm (6.65 mpm)

Line Pull

At 1850 PTO (Engine) Speed

Bare Drum	11 800 lbs. (5 352.4 kg)
Full Drum	7 300 lbs. (3 311.2 kg)

Cable Drum Size

Drum Diameter	6" (152.4 mm)
Drum Flange Diameter	11" (279.4 mm)
Drum Length	8" (203.2 mm)

Cable Drum Capacities

Cable Size (wire rope)	Length of Cable
3/8 Inch	260 ft (78 m)
7/16 Inch	196 ft (59 m)
1/2 Inch	153 ft (46 m)
9/16 Inch	122 ft (37 m)
5/8 Inch	100 ft (30 m)

The above capacities are based on perfectly wound cable. Allowance must be made for uneven cable winding during operation.

Recommended Lubricant

Above 0° F. (-32° C.) Average daily temperature	SAE 90 Mild Type (EP) Gear Lubricant
Below 0° F. (-32° C.) Average daily temperature	SAE 75 Mild Type (EP) Gear Lubricant
Approximate oil capacity	4 US qt (3.8 l)

Weight

Shipping	519 lbs. (235.4 kg)
Net	496 lbs. (212.7 kg)
Rear counterweight for loader models, including mounting brackets	1 095 lbs. (496.7 kg)

Optional Fairleads

Size of Horizontal Rollers	2-3/4" dia x 9" (69.85 mm dia x 228.6 mm)
Distance between Horizontal Rollers	12-1/4" (311.15 mm)
Size of Vertical Rollers	2-3/4" x 15-3/4" (69.58 mm x 400.05 mm)
Distance between Vertical Rollers	9-1/4" (234.95 mm)
Weight (3 roller fairlead)	90 lbs. (40.8 kg)
(Optional 4th roller)	11 lbs. (5.0 kg)

Installing Fairlead Assembly (Early Production Models)

1. The winch is provided with four bosses, two on top of the winch housing and two on the bottom. The fairlead assembly is fastened to these bosses with capscrews and lockwashers. Capscrews should be tightened to 100 ft. lbs. torque.

2. After installation, grease the roller assemblies. Note that the vertical roller assemblies have a grease fitting on top of the roller shaft and the horizontal roller assemblies have a grease fitting on each end of the roller shaft. Use a Lithium "soap base" grease.

NOTE: The lugs which carry the horizontal rollers may prevent the mounting holes in the fairlead assembly from lining up with the mounting holes in the winch housing. If this occurs, file or grind the lugs to proper size.

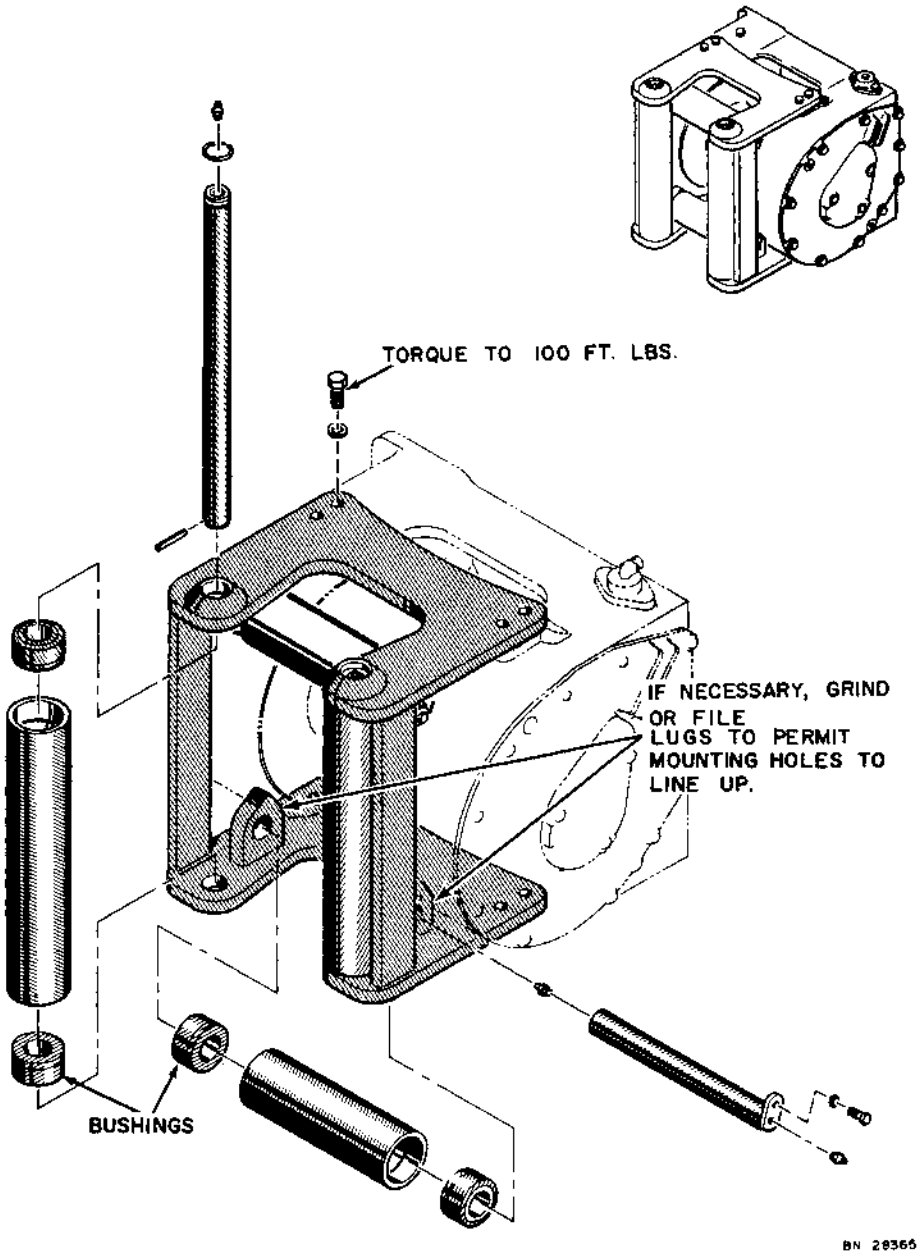

Figure 14- Fairlead Assembly

Ring Gear and Pinion

Disassembly

1. Remove the winch from the crawler.

2. Remove the brake, clutch, and drum assemblies as described on pages 9014-18 to 9014-24.

3. Remove the gear cover, using two 3/8" N.C. capscrews in the tapped holes as jacks.

4. If the drum bearing remained on the drum shaft after removing the drum, remove the snap ring from the outside of the bearing.

5. Remove the gland cap from the end of the drum shaft. Remove and discard the "U" seal and "O" ring from the gland cap. Install new parts on reassembly.

6. Protecting the end of the shaft, drive the shaft and ring gear out of the main housing.

7. Remove the cotter pin, nut, washer, and sprocket gear from the pinion gear shaft.

8. Remove the bearing housing by removing the four socket head capscrews that mount the bearing housing to the winch housing. Using two 3/8" N.F. capscrews in the tapped holes provided in the bearing housing, remove the bearing housing assembly. Remove the shims.

   NOTE: The inner race of the bearing will stay on the pinion while the roller assembly will remain in the main housing of the winch and can be removed separately.

Pre-Load Adjustment

If the pinion bearings are being replaced, it will be necessary to readjust the shims for the correct pre-load as follows:

1. Press the outer races for these two bearings into the ends of the bearing housing and check if they are perfectly parallel by measuring over the end of the outer races with a micrometer.

2. Install the inner race of the bearing next to the gear teeth on the pinion shaft.

3. Place the pinion gear in the bearing housing so that the outer and inner races of the bearing mate up.

4. Install the bearing spacer on the pinion shaft.

5. Place a piece of soft lead gauge wire on the end of the bearing spacer and press the inner race of the bearing next to the flange on the pinion shaft.

6. Install the sprocket gear previously removed, washer, and castle nut.

7. With this assembly held securely in a vise, proceed with the pre-loading. Fasten a piece of string, 12 to 18 inches long, to the bearing housing flange and wrap the excess around the bearing housing.

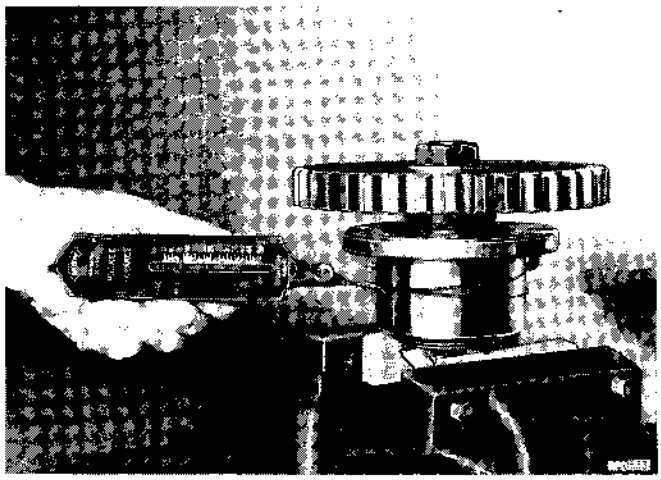

Figure 24 - Testing the Bearing Pre-Load

8. Attach the free end to a suitable spring scale. Tighten the nut until a reading of 6-1/2 to 10 pounds on the spring scale is required for continuous rotation of the bearing housing about the pinion shaft.

9. Remove the castle nut, washer, and sprocket gear.

Section 9015

RIPPER

CASE CORPORATION

C.E. Div. 9-99772
310G-350 Crawler
December 1975

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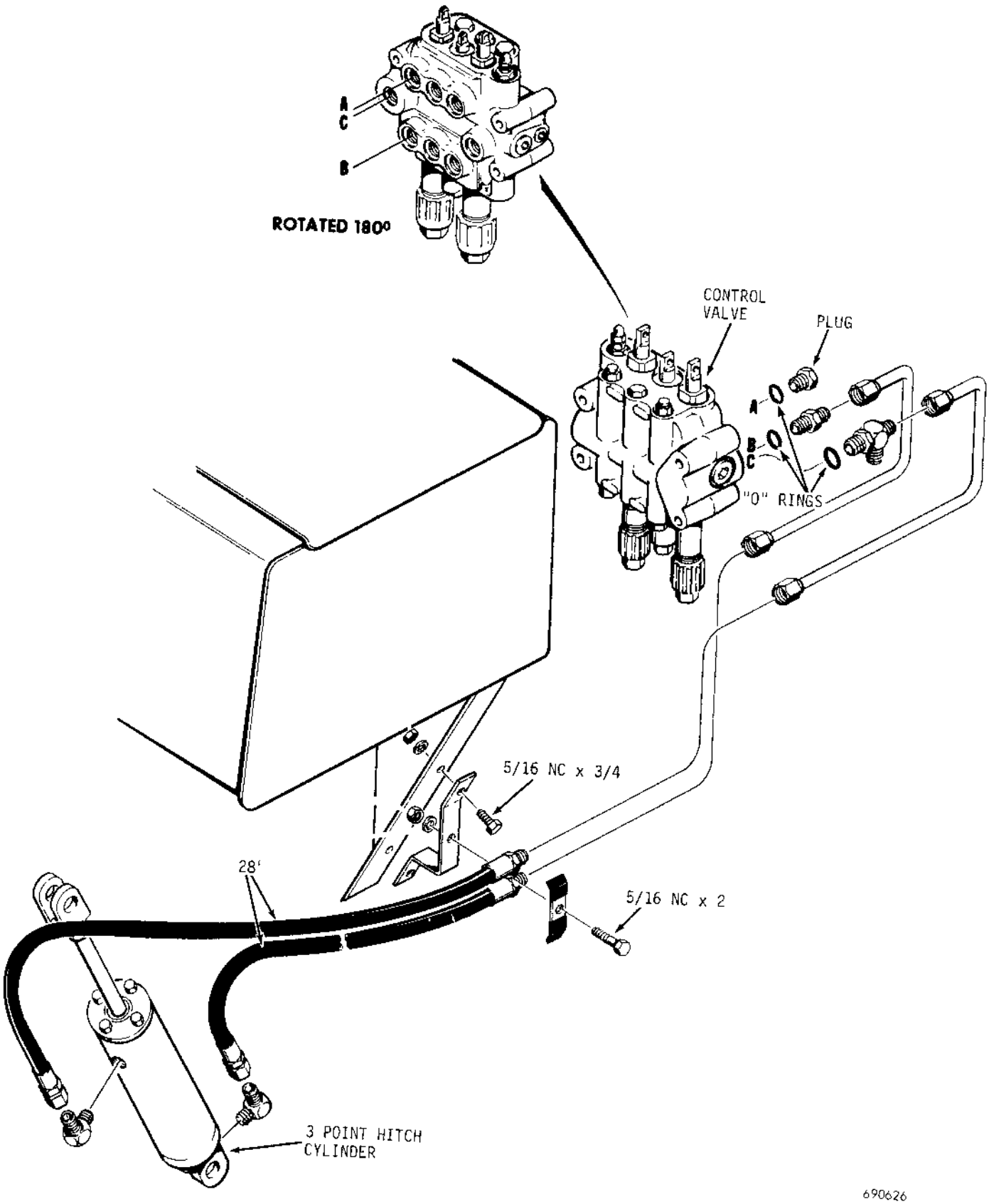

Figure 5 - Three-Point Hitch Hydraulics

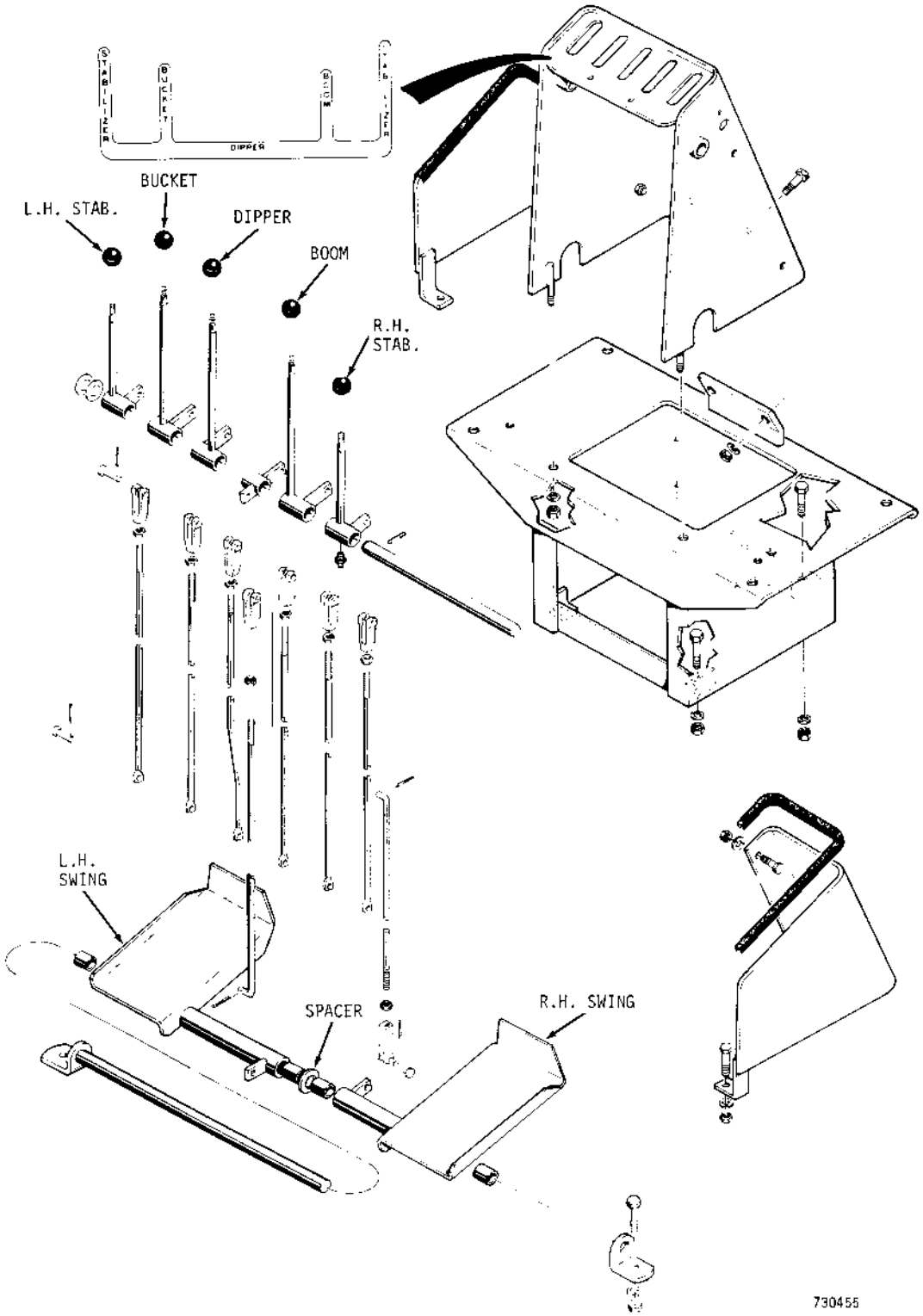

Figure 3 - Control Tower and Standard Controls

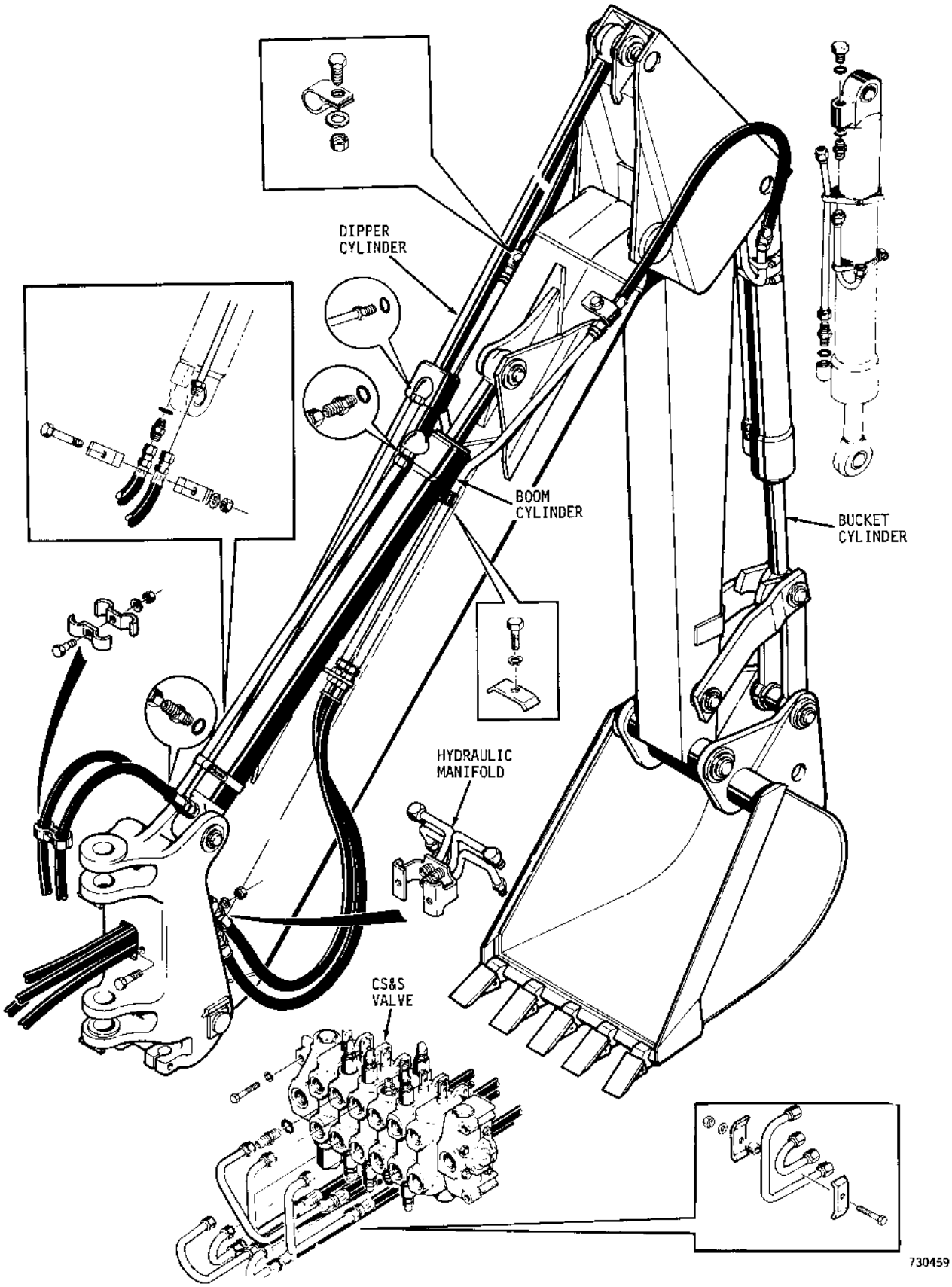

Figure 13 - Boom, Dipper And Bucket Hydraulics
(Model 26 Backhoe Before S/N 5220152 And
All Model 26 C Backhoes)

Dipper Installation

1. If the hydraulic lines have been removed from the boom, reinstall them at this time.

2. Raise the boom hydraulically into the position for attaching the dipper.

3. Install the dipper as shown in Figures 5, 6, and 22. A 1/16" to 1/8" gap must be maintained so the dipper may pivot freely without excessive play. Place an equal number of shims on each side. However, if an odd number is required, put the extra shim on the right side. Secure the dipper pivot pin with snap rings.

4. Install the dipper cylinder and its hydraulic lines. Refer to Figures 12 thru 15.

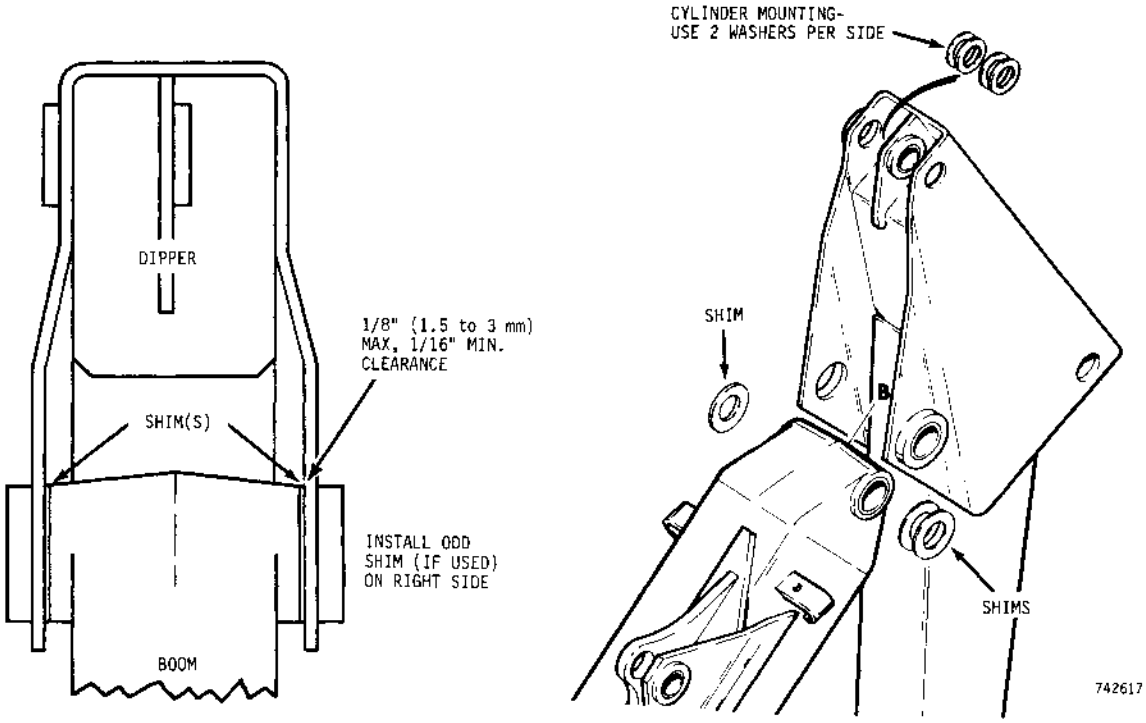

Figure 22 - Installing the Dipper

Bucket Installation

1. If the bucket cylinder was removed, reinstall as shown in Figure 5.

2. Connect the two hydraulic lines to the bucket cylinder.

3. Install the bucket links to the dipper and bucket cylinder, Figure 5, 23, and 24.

4. Position the bucket so that the teeth face the swing tower.

5. Start the engine and position the dipper over the bucket.

6. Install the bucket pivot pin and retain with snap rings. See Figures 23 and 24.

7. Lift the bucket clear of the ground and retract or extend the bucket cylinder until the bucket linkage is in the approximate mounting position.

8. The bucket can be easily connected to the linkage. Rotate the bucket by hand to align the mounting holes. Install the mounting pin and retain with snap rings.

Section 9023

MODEL 32 BACKHOE

CASE CORPORATION

C.E. Div. 9-99772
310G-350 Crawler
December 1975

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REMOVING THE BACKHOE FROM THE CRAWLER

1. Locate the crawler on a hard level surface and lower the loader bucket to the ground.

2. Form a tripod with the backhoe as shown in Figure 9. Lower the stabilizers until they just touch the ground.

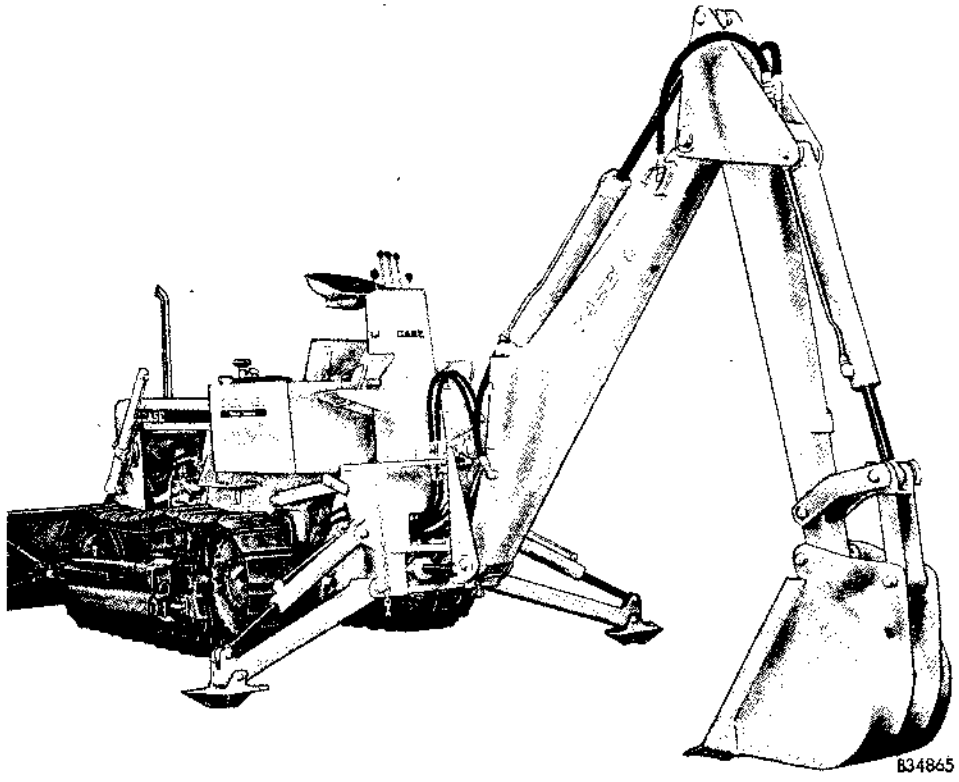

Figure 9

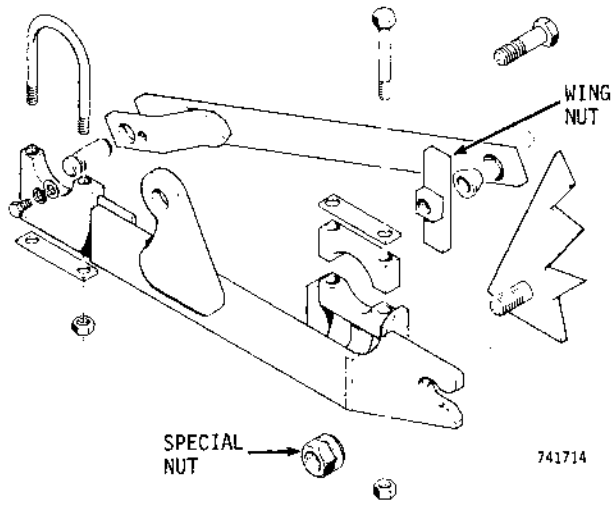

Figure 10

3. Remove the two upper wing nuts and two lower special nuts from the mounting frame.

4. Using the stabilizers and boom control, remove all weight of the backhoe from the crawler. Remove the two upper mounting bolts from the backhoe main frame.

5. Move the crawler ahead so that the backhoe is clear. Lower the backhoe to the ground or securely block up with a stand.

6. Stop the engine and carefully move each backhoe control lever several times to relieve all hydraulic pressure.

7. Disconnect the two hydraulic lines at the quick disconnects and unplug the dipper light wire if so equipped.

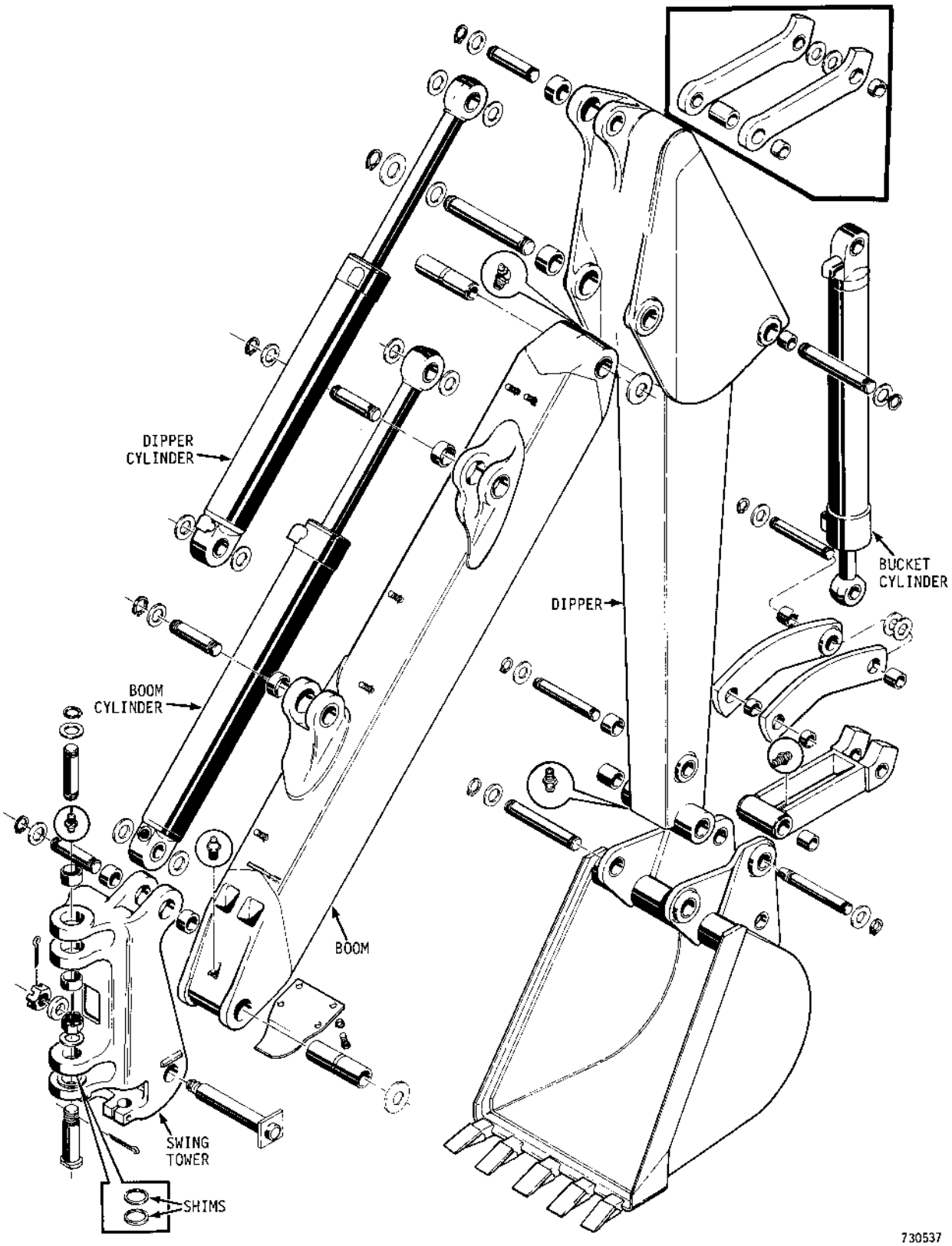

Figure 3 — Swing Tower, Boom, Dipper and Bucket
(Used Before Backhoe S/N 4160773)

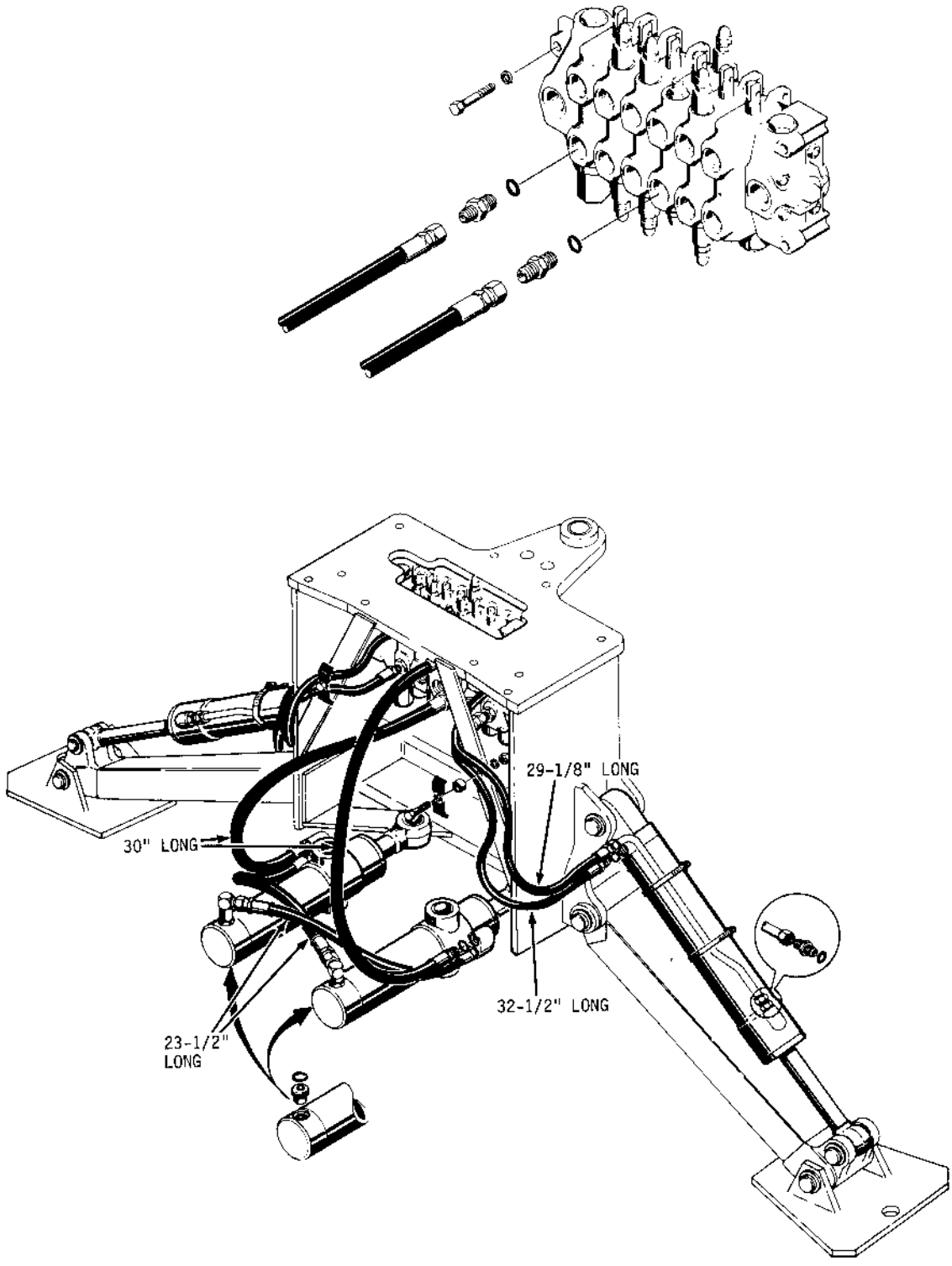

Figure 13 — Swing and Stabilizer Hydraulics
(Early Production)