

SLEW MOTOR

SERVICE MANUAL

M 31

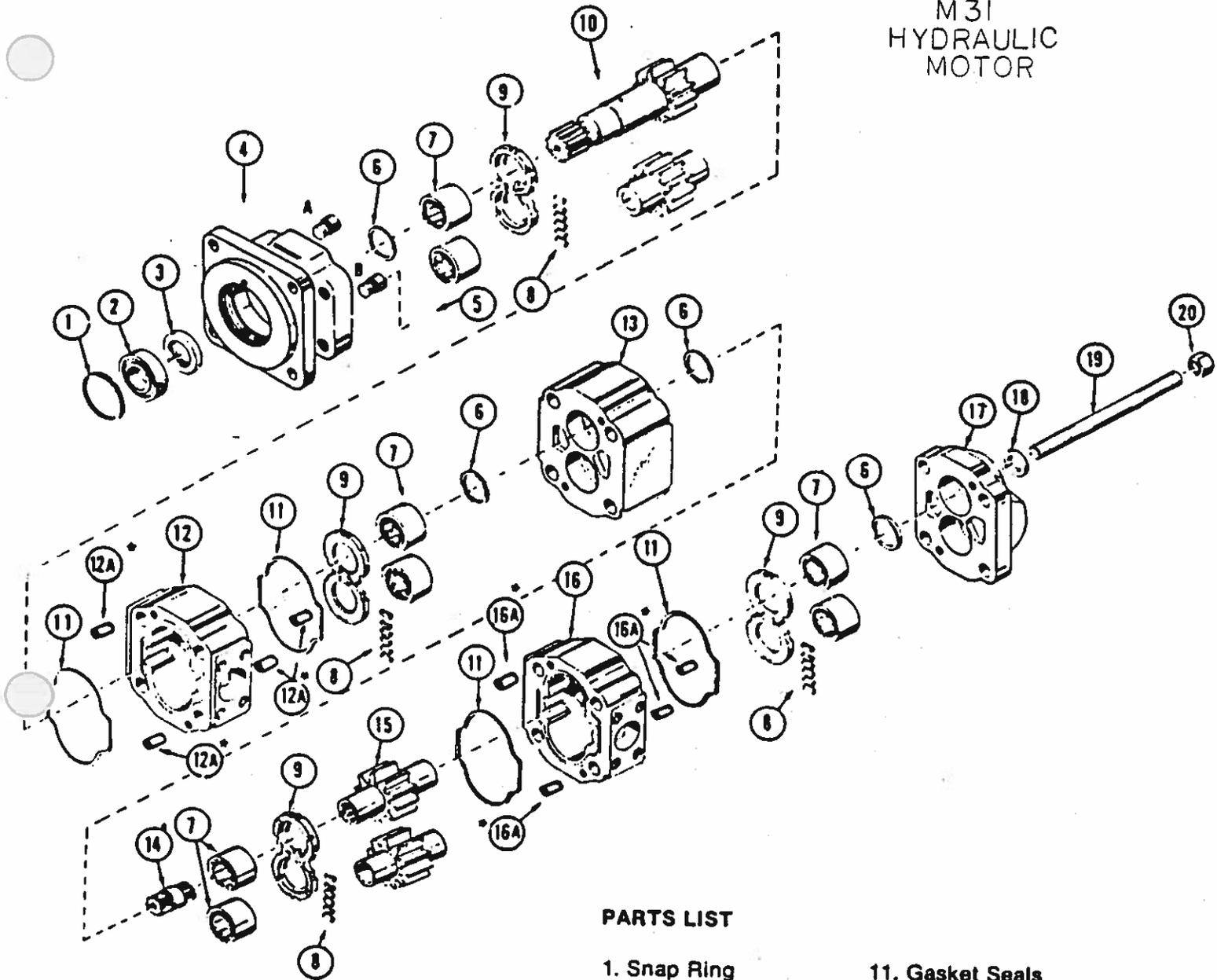
single motor

12856



COMMERCIAL SHEARING, INC.
Use Genuine Commercial Replacement Parts

M 31
HYDRAULIC
MOTOR



SEAL KIT ARVA 13011

PARTS LIST

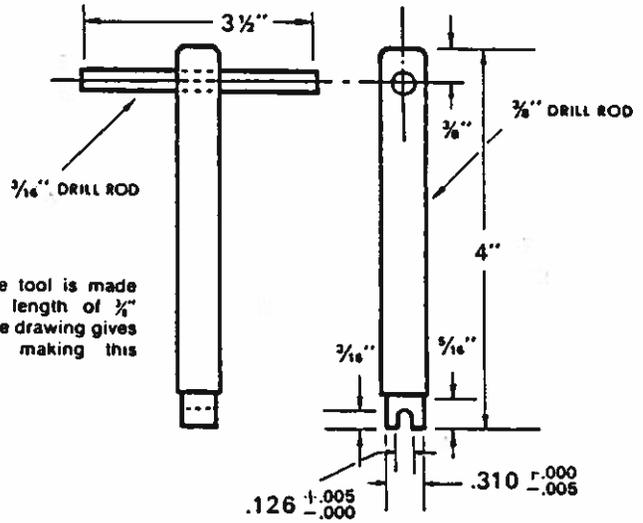
- | | |
|---------------------------------------|----------------------------------|
| 1. Snap Ring | 11. Gasket Seals |
| 2. Outboard Bearing | 12. Gear Housing |
| 3. Seal | * 12A. Dowel Pins (P31/P51 only) |
| 4. Shaft End Cover | 13. Bearing Carrier |
| 5. Check Assemblies or Plug | 14. Connecting Shaft |
| 6. Ring Seals | 15. Matched Gear Set |
| 7. Roller Bearings | 16. Gear Housing |
| 8. Pocket Seals | * 16A. Dowel Pins (P31/P51 only) |
| 9. Thrust Plates | 17. Port End Cover |
| 10. Integral Drive Shaft and Gear Set | 18. Washers |
| | 19. Studs or Cap Screws |
| | 20. Nuts |

PART NO. REQUIRED - M31A - 942 - BE - OF15 - 25

ARVA CRANE # 12858

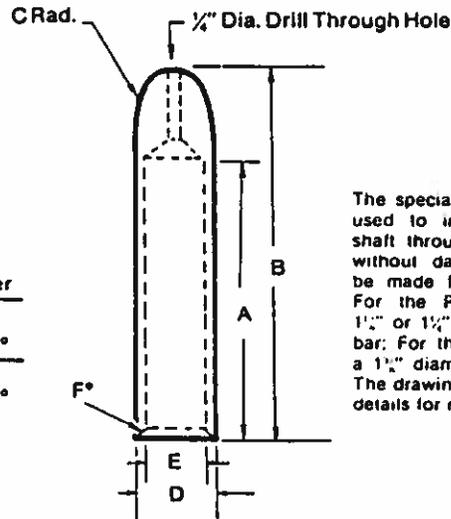
tool list

- Arbor Press
- Awl
- 1½" Dia. Steel Ball
- Bearing Puller (Owatonna Tool Co. MD-956 or equivalent)
- Clean Lintless Cloths
- Deburring Tool (an old file with the cutting teeth ground off)
- Machinist's Hammer
- Soft Hammer
- Permatex Aviation Form-A-Gasket No. 3 Non-hardening Sealant or Equivalent
- Medium Grit Carborundum Stone
- Oil and Grease
- Snap Ring Pliers
- Prick Punch
- Sharp Razor Blade
- Scale (½" or ¼" graduations)
- Small Screwdriver
- Torque Wrench
- Vise with 6" Minimum Open Spread
- Bar for Lip Seal Installation
Note: For P30/P31, use 1½" dia. by 2" bar.
For P50/P51, use 2½" dia. by 2" bar.
- Special Steel Sleeve



Check valve tool is made from a 4" length of 3/8" drill rod. The drawing gives details for making this handy tool.

Seal removal tool can be easily made from an old screwdriver. Heat the tip and bend as shown. Grind off the tip to fit the notch behind the shaft seal.



The special steel sleeve is used to insert the drive shaft through the lip seal without damage and can be made from bar stock: For the P30/P31, use a 1½" or 1¼" diameter x 4½" bar; For the P50/P51, use a 1½" diameter x 5½" bar. The drawing and chart give details for making this tool.

	A	B	C Radius	D Dia.	E Dia.	F° chamfer
P30/P31	3½"	4½"	¾"	1.065 +.000 -.002	1.002 +.002 -.000	.015" x 45°
P50/P51	4¼"	5½"	¾"	1.290 +.000 -.002	1.250 +.002 -.000	.015" x 60°

All external surfaces must be free of scratches and burrs.

disassembly

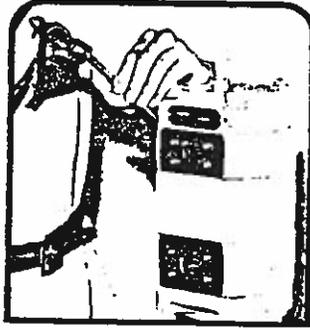
CAUTION:

1. If prying off sections becomes necessary, take extreme care not to mar or damage machined surfaces. Excessive force while prying can result in misalignment and seriously damage parts.

2. If parts are stubborn during assembly, do not force them and never employ an iron hammer.

3. Gears are closely matched, therefore they must be kept together as sets when removed from a unit. Handle with care to avoid damage to the journals or teeth.

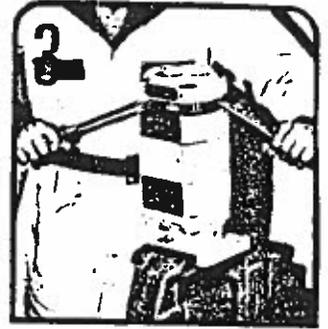
4. Never hammer roller bearings into bores. Use only an arbor press or other suitable tool.



Mount the pump in a vise with the shaft and pointing down. Index mark all sections with a punch. Be sure to align these marks when reassembling.

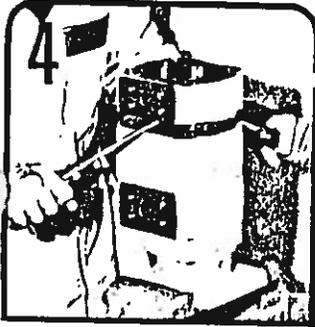


Remove the 4 cap screws on single units or the 4 hex nuts, studs, and washers on multiple units with a socket wrench.



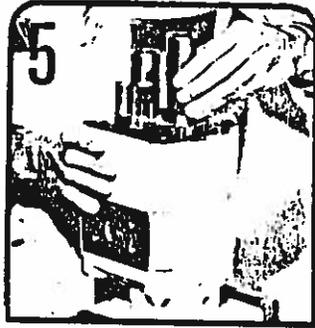
Lift off the port end cover. If necessary to pry loose, refer to caution note.

If the thrust plate remains in the gear housing, it can be tapped out later with a wooden hammer handle. Be careful not to distort the thrust plate.



Lift the gear housing from the gears. Take care not to damage machined surfaces.

For P31/P51 — Pry the gear housing from the gears and off the dowels from opposite sides taking care not to damage machined surfaces.



Carefully remove the drive and driven gears, not letting the teeth come into rough handling contact. Keep these gears together because they are a matched set. Examine and replace if necessary. See below.*



Remove the drive gear connecting shaft.



Lift or pry off the bearing carrier carefully to prevent damage to contact face and edges.

For P31/P51, pry the bearing carrier off the dowels from opposite sides. Take care not to damage the machined surfaces. Lift off the bearing carrier.



Lift or pry off the first section gear housing. Be careful not to damage machined surfaces. If the thrust plate remains in the gear housing, remove as described in Step 3.

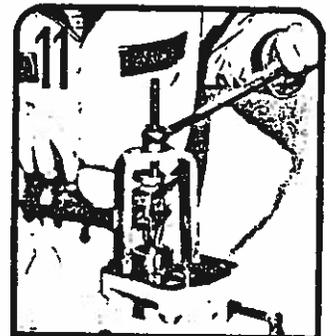
For P31/P51, pry loose the first gear housing section. Be careful not to damage machined surfaces.



Remove the driven gear and the integral gear and drive shaft. Keep these together as they are a matched set. Examine and replace if necessary. See below.* Be careful not to damage the machined surfaces of the gears.



Pry the thrust plates from the shaft end cover, port end cover, or bearing carrier with a screwdriver or similar tool. Avoid distorting the thrust plates. Visually inspect thrust plates for wear or damage. Replace if necessary. See below.* Remove and discard all rubber pocket seals and gasket seals.



Examine all roller bearings for scoring, spalling, or pitting. If replacement is necessary, remove the bearings with a bearing puller.



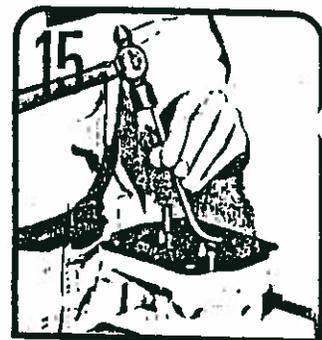
It is generally advisable to replace ring seals when rebuilding unit. To replace, remove the drive gear bearing with a bearing puller and remove ring seal from the bottom of bearing bore.



If the pump is equipped with an outboard bearing, place the shaft and cover in a vise with the mounting face up. Remove the bearing snap ring with a small screwdriver or awl.



Use a bearing puller to remove the outboard bearing.



Grip the shaft and cover in a vise with the mounting face down. Remove double lip seal by inserting the special seal removal tool (see Tool List) into the notch between the double lip seal and the shaft end cover. Tap the seal out and discard.

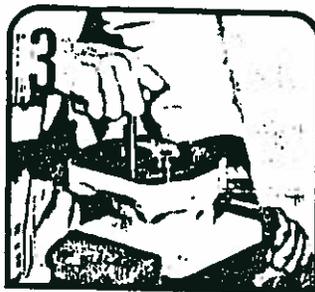
assembly



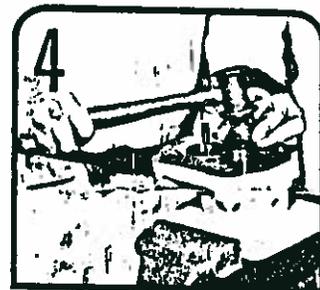
Stone off all machined surfaces with a medium grit carborundum stone.



If bearings have been removed, deburr bearing bores. Rinse parts in a solvent. Air blast all parts and wipe with a clean lintless cloth before starting assembly.



Grip shaft and cover in vise with mounting face down. Examine plug or 2 check valves to be sure they're tightly in place. Replacement is necessary only if parts are damaged. Remove with screwdriver or special check valve tool (see Tool List).



If plug or check valves are being replaced, screw in new parts tightly. Stake plug with prick punch at both ends of screwdriver slot and around edges. Screw check valves in tightly with tool. Peen edge of hole $\frac{1}{16}$ " to $\frac{1}{8}$ " with $\frac{1}{8}$ " diameter steel ball.

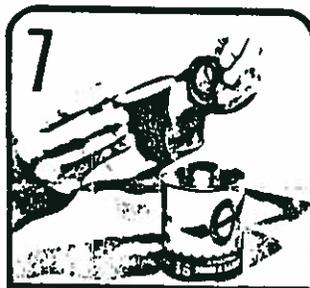


ASSEMBLY STEPS 5, 6, 7, 8 AND 11 APPLY TO SHAFT END COVER, BEARING CARRIERS, AND PORT END COVER.

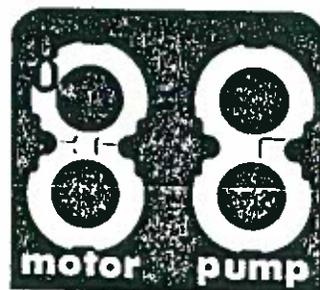
If ring seals are being replaced, insert into bottom of drive gear bearing bore. The notch in the ring seal **MUST BE VISIBLE**. This is a check to be certain the notched side is next to the bearing.



If any bearings have been removed from the shaft end cover, port end cover, or bearing carrier, replace the bearings by pressing them into the bearing bore with an arbor press.



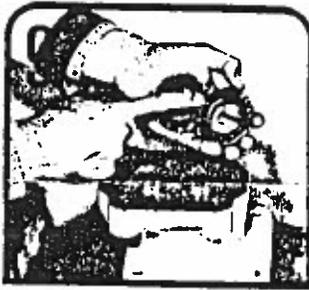
Before inserting a new lip seal in the shaft end cover, coat the outer edge of the lip seal and its recess with Permatex Aviation Form-A-Gasket No 3 Non-Hardening Sealant or equivalent. With the metal side of the lip seal up, press it into the mounting flange side of the shaft end cover with an arbor press and bar (see Tool List). On the P30/P31 series, make certain lip seal is fully seated in the recess. On the P50/P51 series, do not attempt to bottom-out seal, press in only until it is flush with the face of the recess. Wipe off surplus sealant.



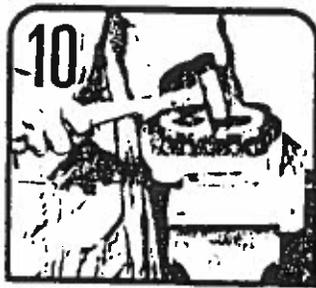
31/51 SERIES ONLY
Check all thrust plates for wear. Replace if necessary (see below). Note that the thrust plates for pumps and motors are different. Pump thrust plates have a single relief pocket and must be installed with this groove on the high pressure side. Motor thrust plates are grooved on both sides.

For P31/P51, the relief groove on all the unidirectional thrust plates must be towards the high pressure (outlet) side of the pump.

30/50 series pump and motor plates resemble the motor plate illustration.



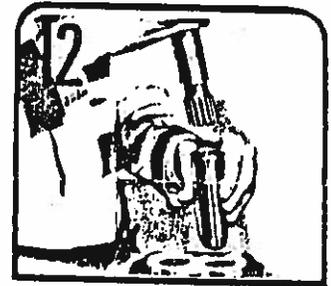
Grip the shaft end cover in a vise with the mounting face down. Cut 2 pocket seals $\frac{1}{2}$ " long from the pocket seal strip. Grease these pocket seals well and insert them into the middle slots on the reverse side of the thrust plate.



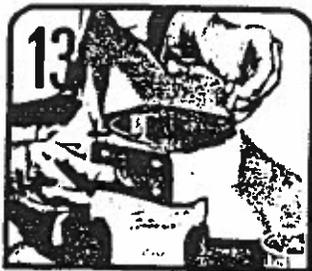
With the pocket seals facing down, place the thrust plate over the bearings in the shaft end cover. Tap thrust plate with a soft hammer to about $\frac{1}{2}$ " from the machined surface.



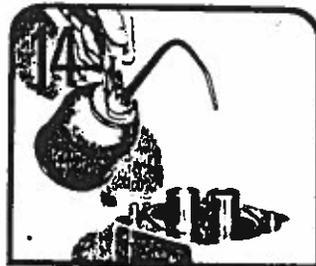
Cut 4 pocket seals approximately $\frac{1}{2}$ " long from the pocket seal strip. Insert one pocket seal into each of the slots in the thrust plate. Push each pocket seal all the way in so that it touches the roller bearings. Tap the thrust plate down firmly against the machined surface with a soft hammer. Use a sharp razor blade to trim exposed end of the pocket seal square and flush with the thrust plate.



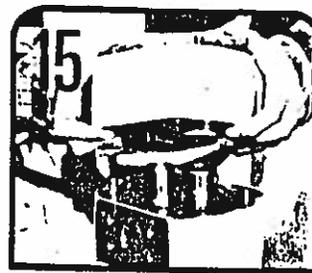
Insert the splined end of the drive shaft into the special steel sleeve (see Tool List). Lightly grease the drive shaft and sleeve. Insert the integral gear and drive shaft with sleeve into the shaft and cover with a twisting motion. Be careful not to damage the double lip seal. Push down carefully until the gear rests against the thrust plate. Remove the steel sleeve. Insert the driven gear.



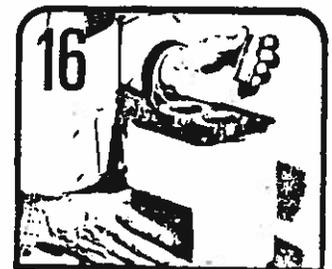
Grease the new gasket seals and insert them into the grooves in both sides of all gear housings.
For P31/PS1—Examine all dowel pins. See below. Before inserting a pin, make certain the hole is clean and free from burrs. Start pin into hole gently and straight, tapping lightly with a soft hammer.



Slide the first section gear housing over the gears and tap it with a soft hammer until it rests tightly against the shaft end cover. Be careful not to pinch the gasket seal. Squirt oil over the gears to provide initial lubrication when pump is started.
For P31/PS1—Line up the dowels with the matching holes. When parts are parallel, squeeze them together or gently tap alternately over dowels with a plastic hammer until the parts become parallel and move smoothly together. Do not force.



With the thrust plates mounted on the bearing carrier (as in steps 9, 10, 11), position it on the gear housing so that the roller bearings receive the journals of the drive and driven gears. Make sure that the drain port in the bearing carrier is on the suction or inlet side if the unit is being built as a pump. (Motors do not have drain vents in the bearing carrier.) Make sure that the index marks are properly aligned.
Insert dowel pins (P31/PS1 only).



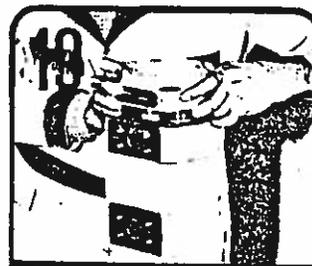
Insert the connecting shaft in the spline of the drive gear.



Insert the drive and driven gears of the second section in their respective bearings. Make certain gears are in contact with thrust plate face.



Slide the second section gear housing over the gears and tap it light against the bearing carrier with a soft hammer. Be careful not to pinch the gasket seal. Squirt oil over the gears to provide initial lubrication when pump is started.
For P31/PS1 line up the dowels and the holes in the 2 castings. When parts are parallel, squeeze them together or gently tap alternately over the dowels with a plastic hammer until parts move smoothly together. Do not force.
Insert dowel pins (P31/PS1 only).



Place the port end cover over the gear journals and tap lightly against the gear housing. Be careful not to pinch the gasket seal.

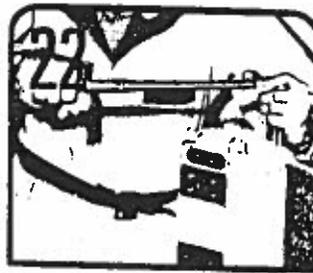
For P31/PS1 — Align the dowels with the holes in the mating casting. Be careful not to pinch the gasket seal. Tap the port end cover lightly in the center between bearing bores to engage the dowels and to move parts together in final seating.



Thread the 4 fasteners (cap screws and washers, or studs, washers, and nuts) into the shaft end cover and tighten alternately or cross-corner. Rotate the drive shaft with a 6" wrench to make certain there is no binding in the pump.



21
If the unit is equipped with an outboard bearing, guide the bearing into its recess in the shaft and cover. This is not a press fit. Insert the snapping into its groove to retain the outboard bearing.



22
After the fasteners are tight and you are sure there is no internal binding, torque the diagonally opposite fasteners to 200 ft. lbs. (2400 in. lbs.).

Lubrication and oil recommendations

All parts, with the exception of the outboard bearing, are lubricated by the hydraulic oil in the circuit. Particular attention must be paid to keep the oil in the circuit system clean. Whenever there is a pump or motor failure, and there is reason to feel that metal particles may be in the system, the oil must be drained, the entire system flushed clean, and any filter screens thoroughly cleaned or replaced. New oil should be supplied for the entire system. Oil suitable and recommended for use in circuits involving Commercial's pumps and motors should meet the following specifications:

- Viscosity:**
- 50 SSU minimum @ operating temperature
 - 7500 SSU maximum @ starting temperature
 - 150 to 225 SSU @ 100°F. (37.8°C.) (generally)
 - 44 to 48 SSU @ 210°F. (98.9°C.) (generally)

Oil Grade	Approximate SSU at . . .	
	100°F. (37.8°C.)	210°F. (98.9°C.)
SAE 10	150	43
SAE 20	330	51

Viscosity Index: .90 minimum

Aniline Point: +175°F (80°C) minimum.

Recommended Additives: Foam Depressant
Rust and Oxidation Inhibitors

Other Desirable Characteristics:

- Stability of physical and chemical characteristics.
- High demulsibility (low emulsibility) for separation of water, air, and contaminants.
- Resistant to the formation of gums, sludges, acids, tars, and varnishes.
- High lubricity and film strength.

General Recommendations:

A good quality hydraulic oil conforming to the characteristics listed above is essential to satisfactory performance and long life of any hydraulic system.

Oil should be changed on regular schedules in accordance with the manufacturer's recommendations, and the system periodically flushed.

Oil temperature in reservoir must not exceed 200°F., (93.3°C) with a maximum temperature of 180°F. (82.2°C.) recommended. Higher temperatures will result in rapid oil deterioration.

Reservoir capacity should equal in gallons the pump output in gpm or the total gpm of all pumps where there is more than one in the system.

Oil poured into the reservoir should pass through a 100 mesh screen. Pour only clean oil from clean containers into the reservoir. A 100 mesh screen may be used in the suction line leading to the pump. A suction filter should be of sufficient size to handle twice the pump capacity. It must be cleaned and checked regularly to avoid damage due to contamination and cavitation.

Normal Temperatures:

0°F. (-18°C.) to 100°F. (37.8°C.) Ambient

100°F. (37.8°C.) to 180°F. (82.2°C.) System

Be sure your oil is recommended for the temperatures you expect to encounter.

Cold Weather Operation

Oils for use in cold weather should have a viscosity not exceeding 7500 SSU at the minimum start-up temperature. A pour point of at least 20°F. below start-up temperature is recommended. Start-up procedures should allow for a gradual warm-up until the oil reaches a reasonably fluid state.

The Use of Other Oils

• Automatic Transmission Fluid (ATF): General experience here has been satisfactory; however, ATF oils are sometimes too expensive for normal use in hydraulic systems.

• Diesel Fuel or Kerosene (Coal Oil): Sometimes used as dilutants for cold weather operations but are not recommended as they are not sufficiently refined products.

• Fire Resistant Fluids: Of the several different types, only the inverted emulsion types may be used without changing to special seal, packing, gasket, hose, etc., compositions. Their use may materially reduce pump life. Experience indicates that the use of FR fluids can be disastrous unless certain precautions are followed. **DO NOT USE ANY FIRE RESISTANT FLUIDS OR NON-PETROLEUM OILS WITHOUT CONSULTING OUR TECHNICAL SERVICE DEPARTMENT.**

• These suggestions are intended as a guide only. **OBTAIN YOUR FINAL OIL RECOMMENDATIONS FROM YOUR OIL SUPPLIER.**

recommended start-up procedure for new or rebuilt pump or motor

Before installing a new or rebuilt pump or motor, back off the main relief valve until the spring tension on the adjusting screw is relieved. This will avoid the possibility of immediate damage to the replacement unit in the event that the relief valve setting had been increased beyond the recommended operating pressure prior to removing the old unit.

Before connecting any lines to the pump or motor, fill all ports with clean oil to provide initial lubrication. This is particularly important where the unit is located above the oil reservoir.

After connecting the lines and mounting the replacement unit, operate the pump or motor at least two minutes at zero pressure at lowest possible rpm. During this break-in period, the unit should run free and not develop an excessive amount of heat. If the unit operates properly, speed and pressure can then be increased to normal operating settings.

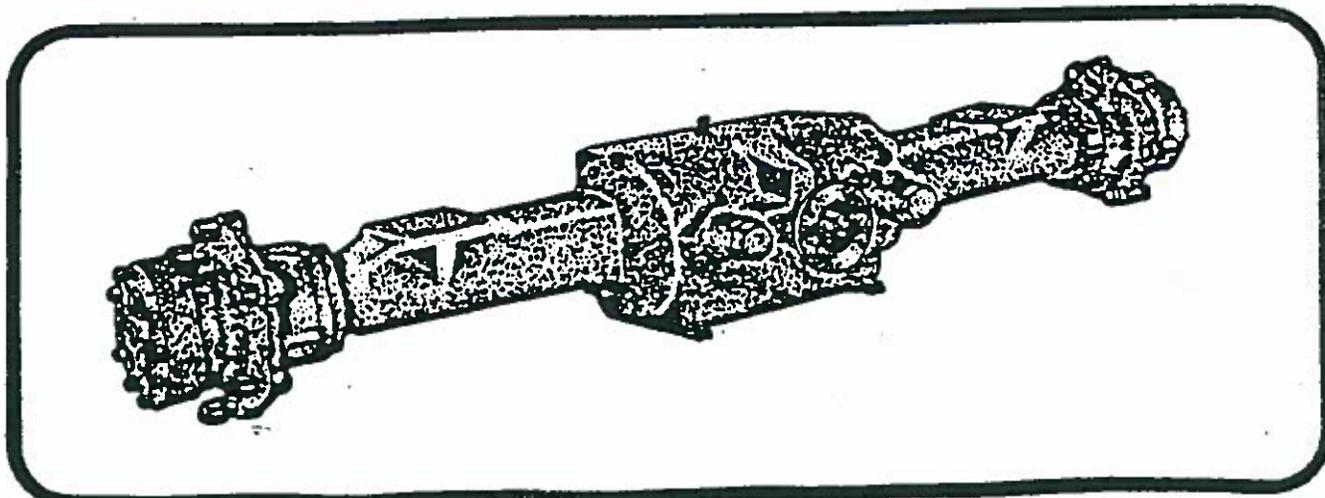
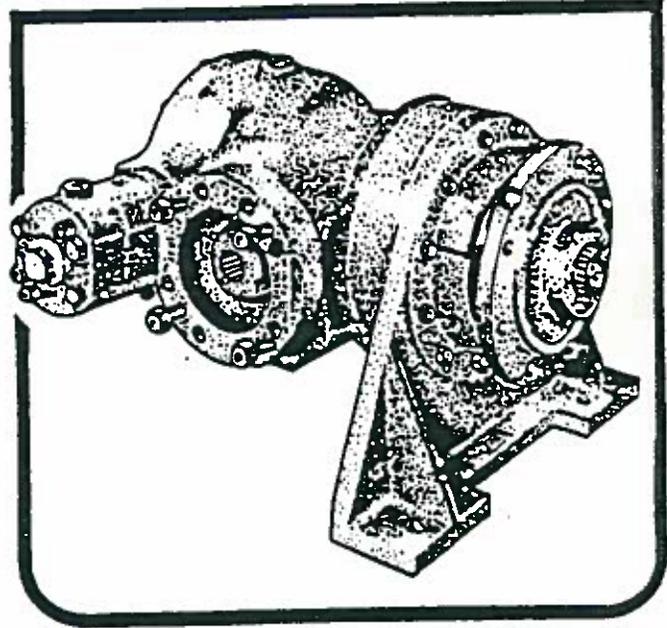
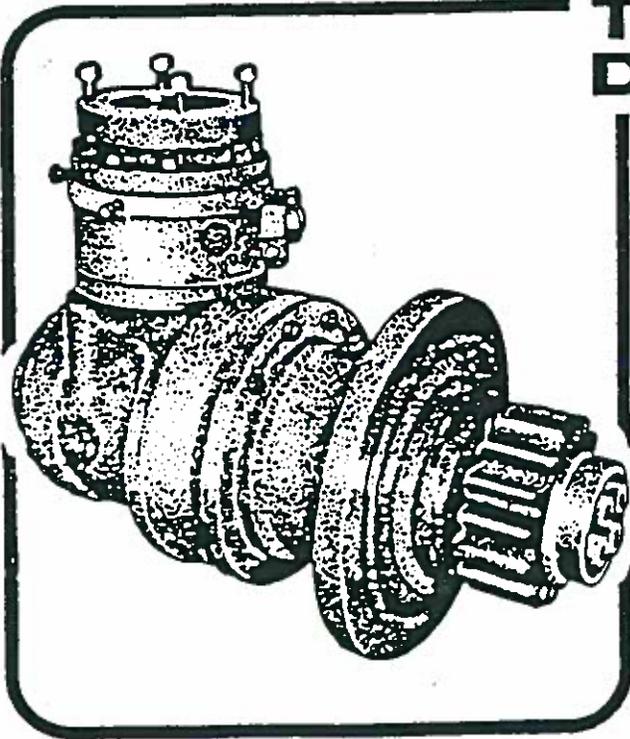
Reset the main relief valve to its proper setting while the pump is running at maximum operating engine (motor) speed for the vehicle.

**ALWAYS USE AN ACCURATE GAGE WHEN ADJUSTING
THE RELIEF VALVE PRESSURE SETTING.**

10874

S235

**TRANSMISSIONS
DIVISION**



SPARES MANUAL

UNIT: SLEW GEARBOX

TYPE: HTLS 235

SPECIFICATIONS COVERED:

690107665 690207663 690307661

HAMWORTHY ENGINEERING LIMITED, TRANSMISSIONS DIVISION, POOLE, DORSET.

TELEPHONE: Poole 675123

STD: 0202 675123

TELEX: 41207 G

TDH. 9631

October 1984.

In the List of Parts, Item Numbers with no prefix are common parts.

Any item with a prefix indicates that item is only applicable to certain specifications.

Key

<u>Key</u>	<u>Specification Number's</u>	<u>Brake Plate Configuration</u>
A	690107665	4 working plates
B	690207663	2 working plates
C	690307661	2 working plates

When ordering Spare Parts, or in any correspondence relating to the gearbox, the number stamped on the gearbox nameplate must be quoted. Also give the Item Number, Part Number and full Description, as specified in the LIST OF PARTS.

LIST OF PARTS

<u>Key</u>	<u>Item Number</u>	<u>Description</u>	<u>Qty</u>	<u>Part Number</u>
	1	Motor Mounting Plate	1	631185275
	2	Capscrew: 1/108 108/7	16	748011076
	3	Spring Washer: 2	16	740773053
	4	Washer: 9	1	740151078
	5	Washer: 55	2	740157091
	6	Torque Pin	1	630096127
A	7	Motor Adaptor Plate	1	631172628
A	8	Brake Shaft	1	630171409
BC	8	Brake Shaft	1	630171411
	9	Bolt	1	748230718
	10	Nut: 9	1	748415053
A	11	Brake Housing	1	630068373
BC	11	Brake Housing	1	630068472
A	12	Capscrew: 46/40 (M12 x 30)	12	748011324
BC	12	Capscrew (M12 x 35)	8	748011322
BC	12	Capscrew (M12 x 40)	6	748011340
BC	12	Capscrew (M12 x 130)	2	748011480
	13	Spring Washer: 12	12	740773061
	14	Retaining Plate Setscrew: 19	6	631180052
	15	Retaining Plate: 16	3	630095228
	16	Planet Wheel: 41	3	630027502
AB	17	Planet Wheel Bush: 16	3	630044481
C	17	Needle Roller	66	660200144
	18	Link Plate Bush: 49	1	630044291
	19	Planet Pin: 41	3	630030423
AB	20	Planet Wheel Bush	3	630044481
	21	Planet Pin: 30	3	630030449
	22	Link Plate Bush: 35	1	630044283
	23	Capscrew: 24/40	12	748011332
	24	Output Shaft Bearing Housing	1	631017783
	25	Washer: 9	2	740157109
	26	Oil Seal: 24	1	660300472
	27	Oil Seal Distance Piece: 26	1	631076292
	28	Slew Pinion	1	630188924
AB	30	Planet Carrier	1	631029184
C	30	Planet Carrier	1	631029630
	31	Inner Bearing Cone: 32	1	660101714
	32	Inner Bearing Cup: 31	1	660101688
	33	Bearing Spacer Shim: 31/34	As Req'd	630042659
	33	Bearing Spacer Shim: 31/34	As Req'd	630042667
	33	Bearing Spacer Shim: 31/34	As Req'd	630042675
	34	Bearing Spacer	1	631076300
	35	Pull Rod	1	630066021
	36	Brake Cylinder Distance Piece: 56	1	630063143
	37	Planet Wheel: 30	3	630027437
	38	Sun Pinion: 41	1	
	39	Piston	1	630064166
	40	Annulus	1	630026827
	41	Planet Carrier	1	
	42	1st Stage Sun Gear (5.6)	1	631028012

<u>Key</u>	<u>Item Number</u>	<u>Description</u>	<u>Qty</u>	<u>Part Number</u>
	43	Brake Cylinder 'O' Ring: 36	1	742121111
	44	Disc Spring	15	660010048
	45	Nut: 55	1	748415061
A	46	Brake Housing Adaptor Plate	1	631172646
BC	46	Brake Housing Adaptor Plate	1	631172778
	47	Middle Plate	3	660020468
A	48	Actuator	1	660020120
BC	48	Actuator	1	660021672
	49	Intermediate Plate	1	660020138
	50	Back Up Washer: 39	1	660320082
	51	Piston 'O' Ring: 39	1	742121103
	52	Spring Washer: 54	2	660240124
	53	Oil Plug: 11	1	742223040
	54	Capscrew: 36	2	748011423
	55	Bolt: 48	1	748230536
	56	Brake Cylinder/End Cap	1	630062517
	57	Washer: 58	1	742171181
	58	Plug	1	630184113
	59	Spring Washer: 60	4	660240124
	60	Brake Cylinder Ssetscrew: 11	4	748231062
	61	Damper Cylinder	1	630062277
	62	Piston 'O' Ring: 74	1	742121103
	63	Bolt: 64	1	630193031
	64	Banjo - Valve	1	630195010
	65	Plug: 64	1	742223016
	65a	Plug - Needle Adjustment	1	660190774
	65b	Washer	1	742171041
	66	Adaptor: 64	2	741610478
	67	Seal - dowty	2	742171066
	68	Ball 9.5mm (.375") dia: 66	1	743821115
	69	Spring Pin: 64	1	740721151
	70	Spring: 72	1	630069017
	71	Seal - dowty: 63	2	742171140
	72	Ball 6.35mm (.25") dia: 63	1	743821073
	73	Screw - valve: 63	1	630194013
	74	Damper Piston	1	630064331
	75	Spring: 74	1	660010238
	76	End Cap: 61	1	630186571
	77	Seal - dowty: 61	1	742171140
	78	Dowel: 24/40	3	630048128
	79	Red Cap: 76	1	742254094
	80	Spring Washer: 23	12	740773061
	81	Backup Washer: 74	1	660320082
	82	Spirolox Rs 92: 38	1	
	85	Link Plate	2	630067078
A	90	Stud Nut: 91	12	748415061
A	91	Stud: 7/11	12	630173447
	95	Thrust Sleeve: 30	1	630034565
	96	Outer Bearing Cup: 97	1	660101706
	97	Outer Bearing Cone: 96	1	660101698
	98	Snap Ring: 30	1	660070190
	99	Lockwasher: 28	1	630023550
	100	Locknut: 28	1	630033542
	101	Thrust Washer: 30	1	630031553
	102	Oil Drain Plug: 24	1	660190097
	103	Relief Valve: 1	1	660500022
A	105	Nut: 104	12	748415079

<u>Key</u>	<u>Item Number</u>	<u>Description</u>	<u>Qty</u>	<u>Part Number</u>
	108	Supplementary Annulus	1	630026884
	109	Planet Wheel Bush: 111	3	630044390
	110	Planet Wheel: 109	3	630027692
	111	Planet Pin: 116	3	630030498
A	114	Adjusting Bolt: 116	1	748231005
BC	114	Adjusting Bolt: 116	1	748230890
	115	Adjusting Nut: 114	1	748440085
	116	Planet Carrier	1	631029465
	117	Thrust Button: 116	1	660420015
	118	Retaining Plate	1	630095277
	119	Oil Plug: 125	1	742223032
	120	Input Shaft	1	630196836
	121	Planet Wheel Spacer: 110	3	631076482
	122	Circlip: 111	3	740732133
A	123	Bolt: 11/46	12	748210957
A	125	Stand Pipe: 7	1	630151252
BC	125	Stand Pipe	1	630151286
C	126	Side Washer	9	630031637
C	127	Spacer	3	631076856

ITEMS NOT SHOWN

	Oil Plugs: 11	2	742223073
	Redcap: 66	2	742254128

NOTE:

The following items are supplied as an assembly only:-

AB	1.	Planet Carrier (41), Spirolox Ring (82) and Sun Pinion (38) As Assembly Number 670029855.
C	1.	Planet Carrier (41), Spirolox Ring (82) and Sun Pinion (38) As Assembly Number 671029110

The following may also be supplied as assemblies:-

	1.	3rd Stage Planet Carrier Assembly 687300562 comprising items 20, 21, 30, 37 and 95.
C	2.	3rd Stage Planet Carrier Assembly 687300745 comprising items 20, 21, 30, 37, 95, 126 and 127.
	3.	Brake Cylinder Assembly 687500617 comprising items 36, 39, 43, 44, 50, 51, 52, 54, 56, 57 and 58.
	4.	Restrictor Valve Assembly 688000088 comprising items 63 - 73 inclusive.
	5.	1st Stage Planet Carrier Assembly comprising items 109, 111, 116, 118, 121 and 122.

LUBRICATION

1. Only the brands of lubrication listed on the attached sheet should be used.
2. After the first 200 hours running, drain while the gearbox is warm and re-fill with fresh oil. Top up after every 50 hours running, drain and re-fill with fresh oil after every 1000 hours running.
3. Oil Capacity 5.1 litres (9.0 pt).

ROUTINE MAINTENANCE

1. Every 200 Hours

Clean the gearbox in the area of the oil seals and check for leaks. If there is any sign of leakage fit new seals as applicable. Check the gearbox.

2. Every 500 Hours

Check torque tightness of all external nuts and bolts.

3. Recommended Torque Figures

<u>Item Number</u>	<u>Torque Figure (kg.m.(lb.ft.))</u>	
2	8.0	(58)
10	4.7	(107)
12	14.8	(107)
14	0.95	(7.0)
23	14.8	(107)
45	2.3	(17)
54	14.8	(107)
60	8.8	(63)
77	5.0	(36)
105	8.8	(63)
115	8.8	(63)

RECOMMENDED SETTINGS

1. Output Shaft Bearings

The procedure for setting the bearings is as follows:-

- a. Assemble the output bearing housing assembly with the same thickness of shims (33) that were removed.
- b. Fit and tighten nut (100) to 55 Kg.m. (400 lbf.ft).
- c. Fasten a length of cord around bearing housing (24) on a mounting register.
- d. Attach a spring balance to the end of the cord. An even pull of 4.5 to 8.6 Kgf. (10 to 19 lbf.) should be obtained (ignoring the initial force required to start motion). If the figure is too high add shims (33), too low subtract shims (33).

NOTE:

The pull figure above includes the "drag" of oil seal (26).

2. First Stage Planet Carrier Assembly

See attached illustration showing setting procedure.

3. Brake Cylinder Setting Dimension

As the brake plates wear the piston (39) moves towards plug (58). To keep the correct tension on disc springs (44) the piston setting dimensions should be checked and adjusted every 1000 hours. Refer to attach illustration. The correct setting dimension is 41 mm.

SPECIAL NOTES

a. Sealing

All mating faces to have jointing compound such as Red Hermetite applied before re-assembly except for bore of spacer (27) which should be sealed with Loctite 275.

b. Brake Assembly

If the brake unit has been dismantled for any reason it is necessary before fitting the hydraulic motor to "pressurise" the brake to allow the input shaft (8) to centralise.

When dismantling the brake plates take note how they have been assembled. It is important that they are re-assembled in the same order to ensure the same braking performance is retained.

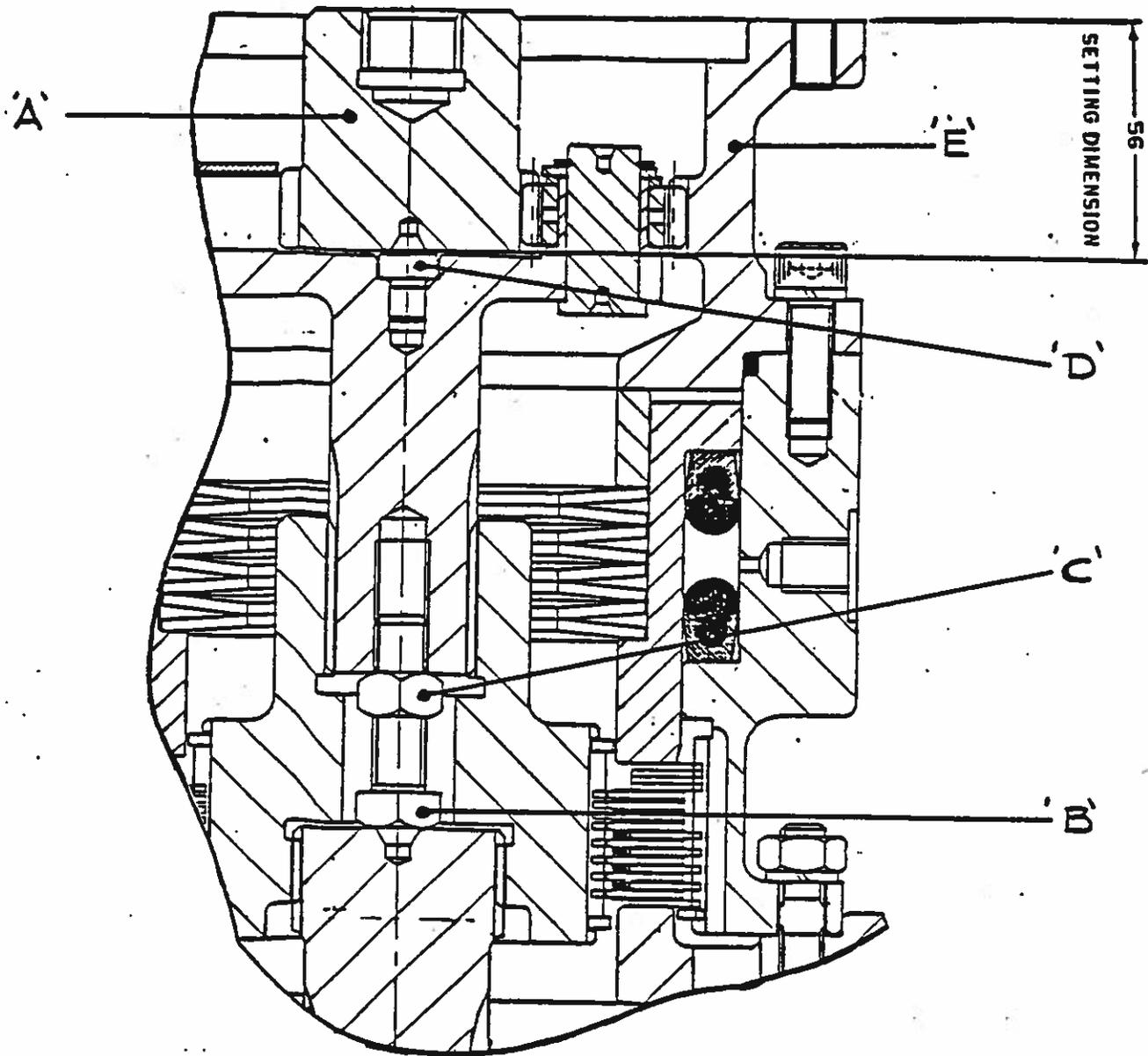
RECOMMENDED LUBRICANTS - AXLES WITH OIL IMMERSSED MULTI-PLATE BRAKES

Ambient Temperature Range

<u>Oil Company</u>	<u>From - 25°C to - 10°C</u>	<u>From - 10°C to - 30°C</u>	<u>Above 30°C</u>
B.P.	B.P. Tractran - (Top Up only)	B.P. Hydraulic TF-8*	B.P. Hydraulic TF-8*
CASTROL	Agricastrol MD	Agricastrol AS	Agricastrol AS or Castrol MP
DALTONS	No suitable grade available	No suitable grade available	No suitable grade available
DUCKHAMS	Hydrolube 303	Hydrolube	Hydrolube
ESSO	IL 2082	IL 2082	No suitable grade
FINA	Agrifina Oil FT*	Agrifina Oil Ft*	Agrifina Oil Ft*
GULF	Gulf Universal Tractor Fluid	Gulf Multi-purpose Tractor Oil 20W/30	Gulf Multi-purpose Tractor Oil 20W/30
Mobil	Mobilfluid 427	Mobilfluid 422	Mobilfluid 422
SHELL	Donax T.T.	Donax T.T.	Donax T.T.
TEXACO	No suitable grade available	*ETL 2039	ETL 2039
CENTURY OILS	Centlube E 76 Compound	Centlube F 76 Compound	Centlube F 76 Compound

NOTE: 1. All the oils are Extreme Pressure Lubricants containing Limited slip and anti-squawk additives for the brake plates. Oils marked * meet the specification MIL-L-2105B. API-GL5 CLASS.

2. Should the climatic conditions vary from those listed above, please consult our more detailed Lubrication Book.



PLANET CARRIER END FLOAT SETTING

1. Support the gearbox vertically so that input shaft 'A' is in the uppermost position.
2. Adjust setscrew 'B' until a dimension of 56 mm is obtained from the end face of thrust button 'D' to end face of annulus 'E'. When this dimension has been achieved lock nut 'C' to a torque figure of 8.8 Kg.m.

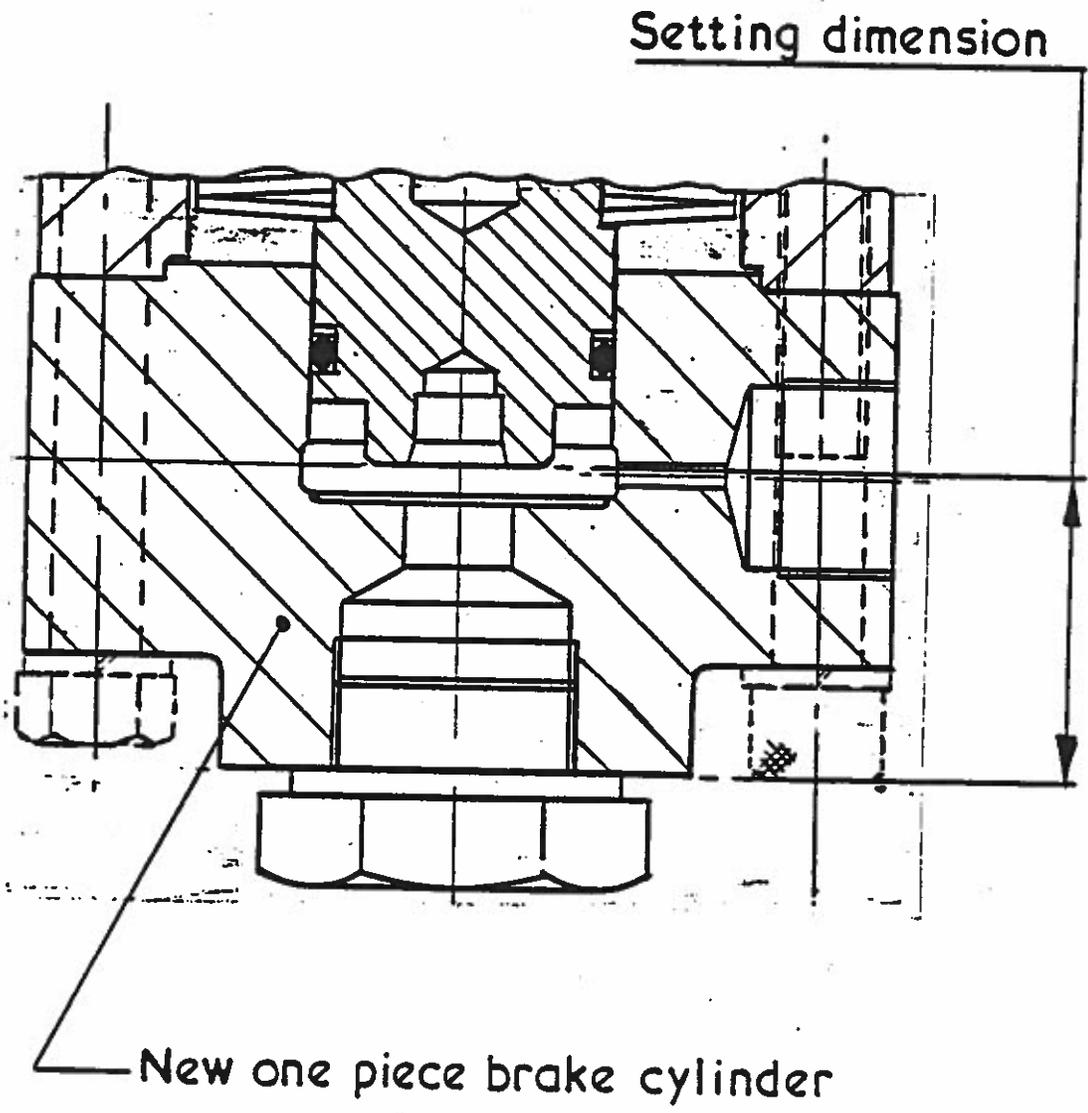
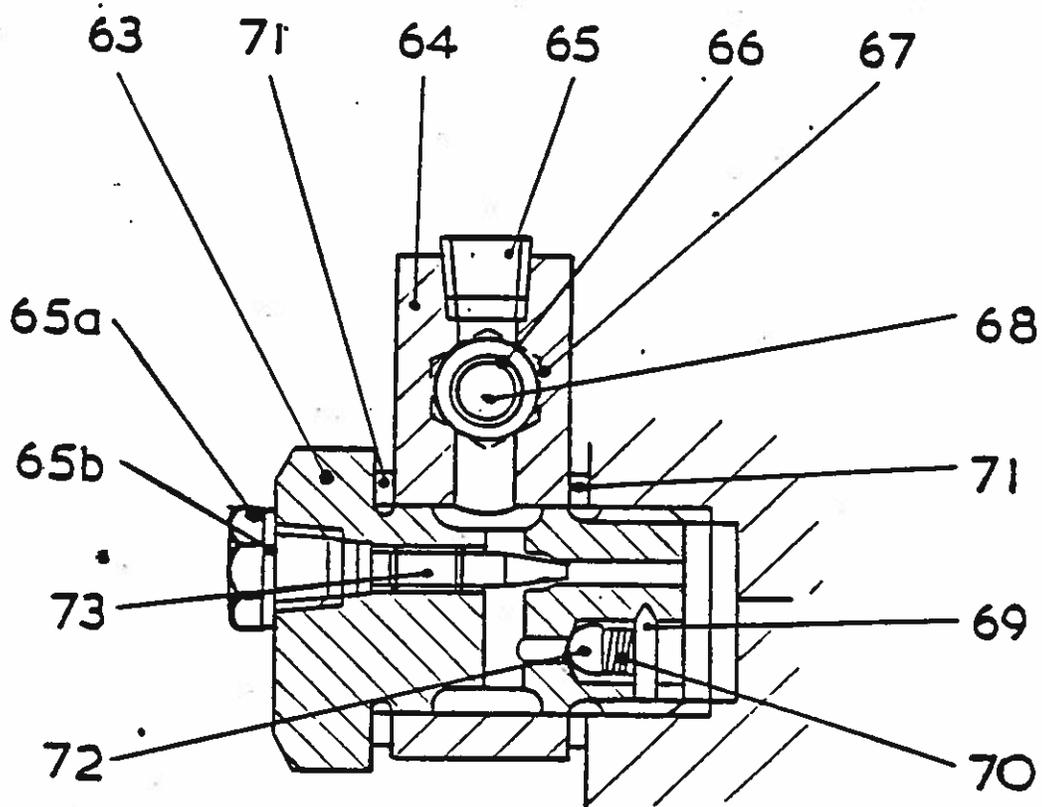
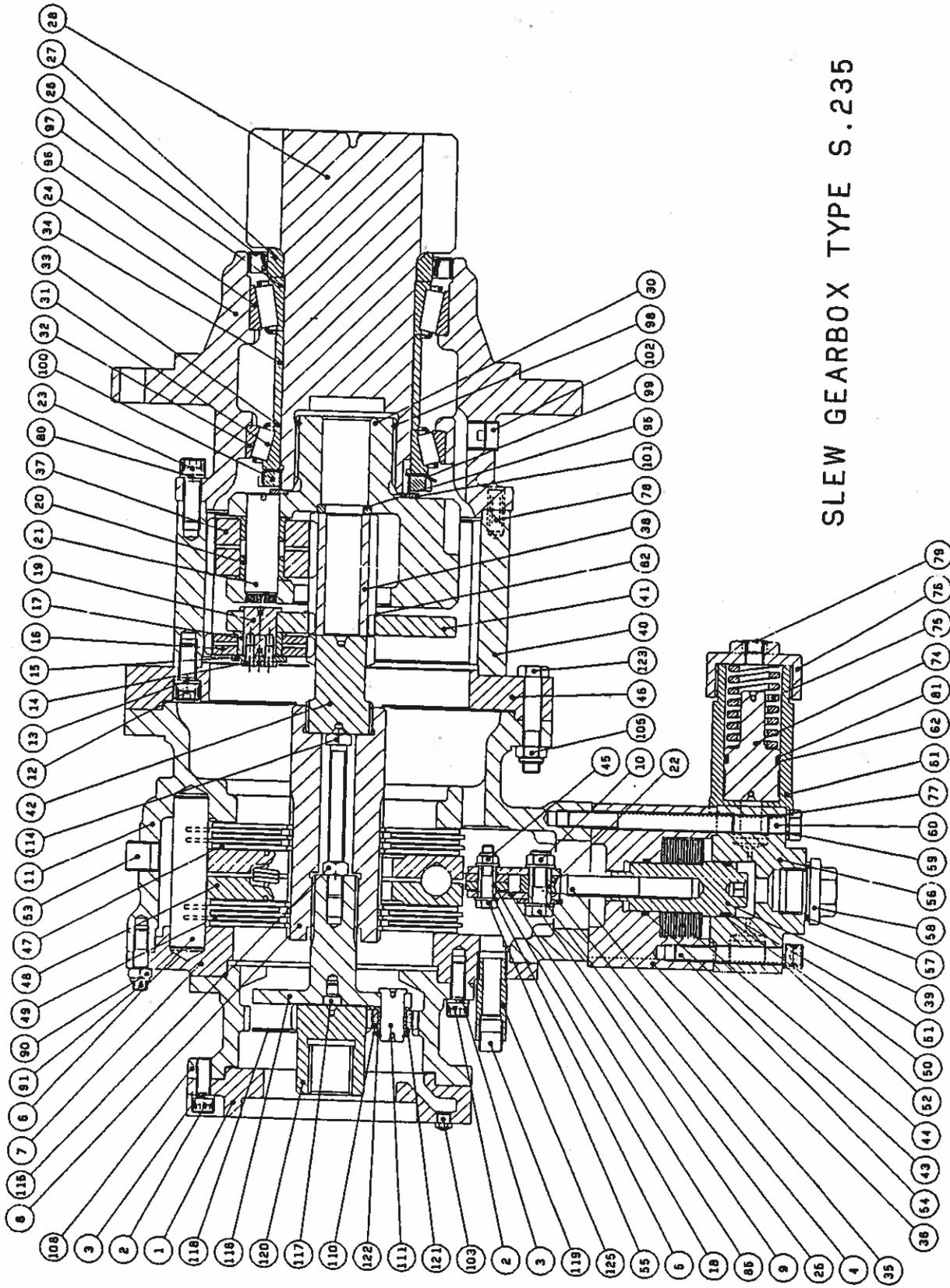


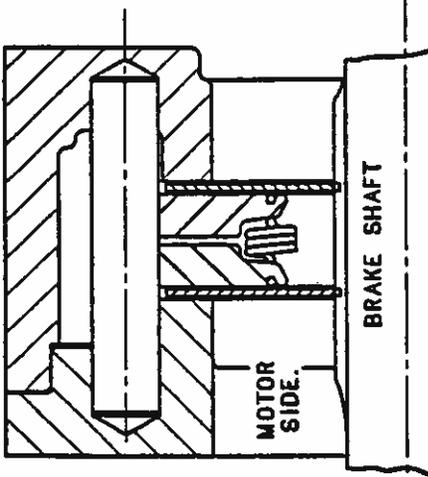
ILLUSTRATION SHOWING NEW "ONE PIECE" BRAKE CYLINDER/END CAP
(Replacement for Part No. 630062111)



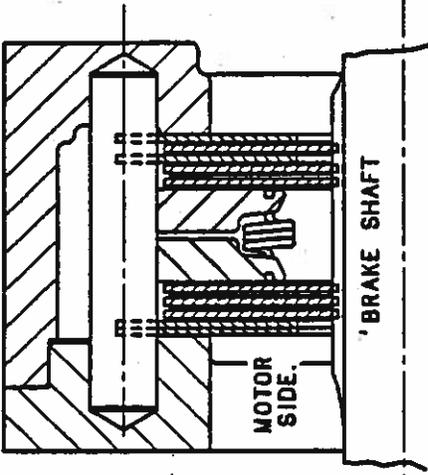
Section Through Restrictor Valve



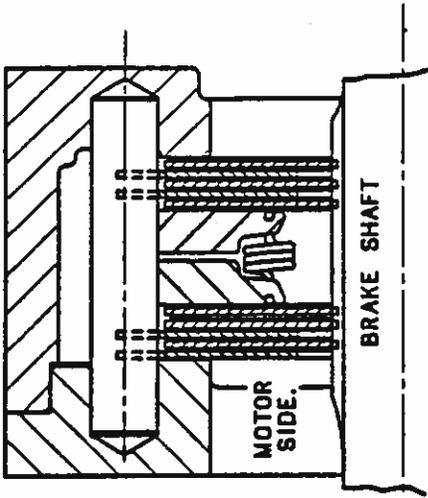
SLEW GEARBOX TYPE S.235



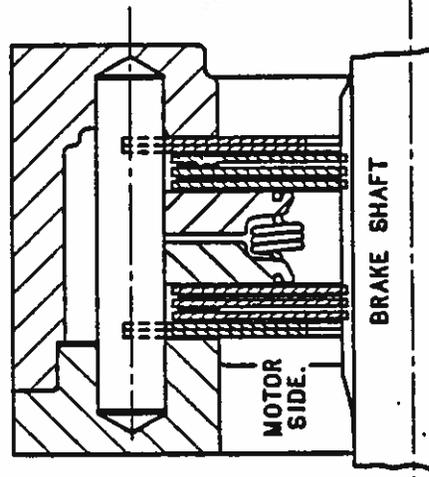
2 WORKING BRAKE PLATES.
(6" X 6" 35° RAMP ANGLE BRAKE)
(USED ON :- 100)



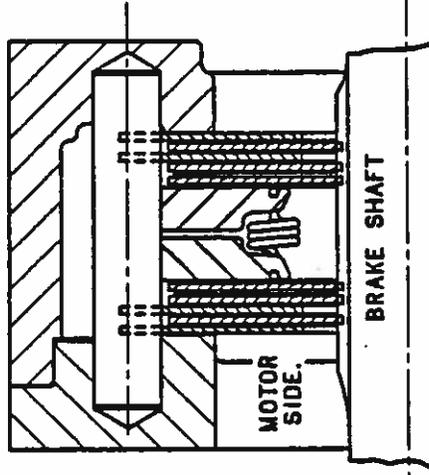
3 WORKING BRAKE PLATES.
(7" X 6" 20° RAMP ANGLE BRAKE)
(USED ON :- 174/234/236/384/385/444/445)



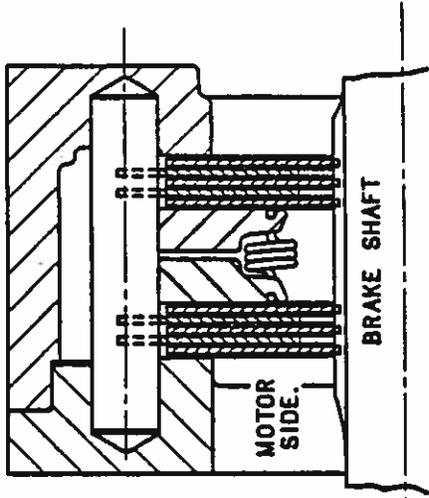
5 WORKING BRAKE PLATES.
(7" X 6" 20° RAMP ANGLE BRAKE)
(USED ON :- 174/234/236/384/385/444/445)



2 WORKING BRAKE PLATES.
(7" X 6" 20° RAMP ANGLE BRAKE)
(USED ON :- 174/234/236/384/385/444/445)



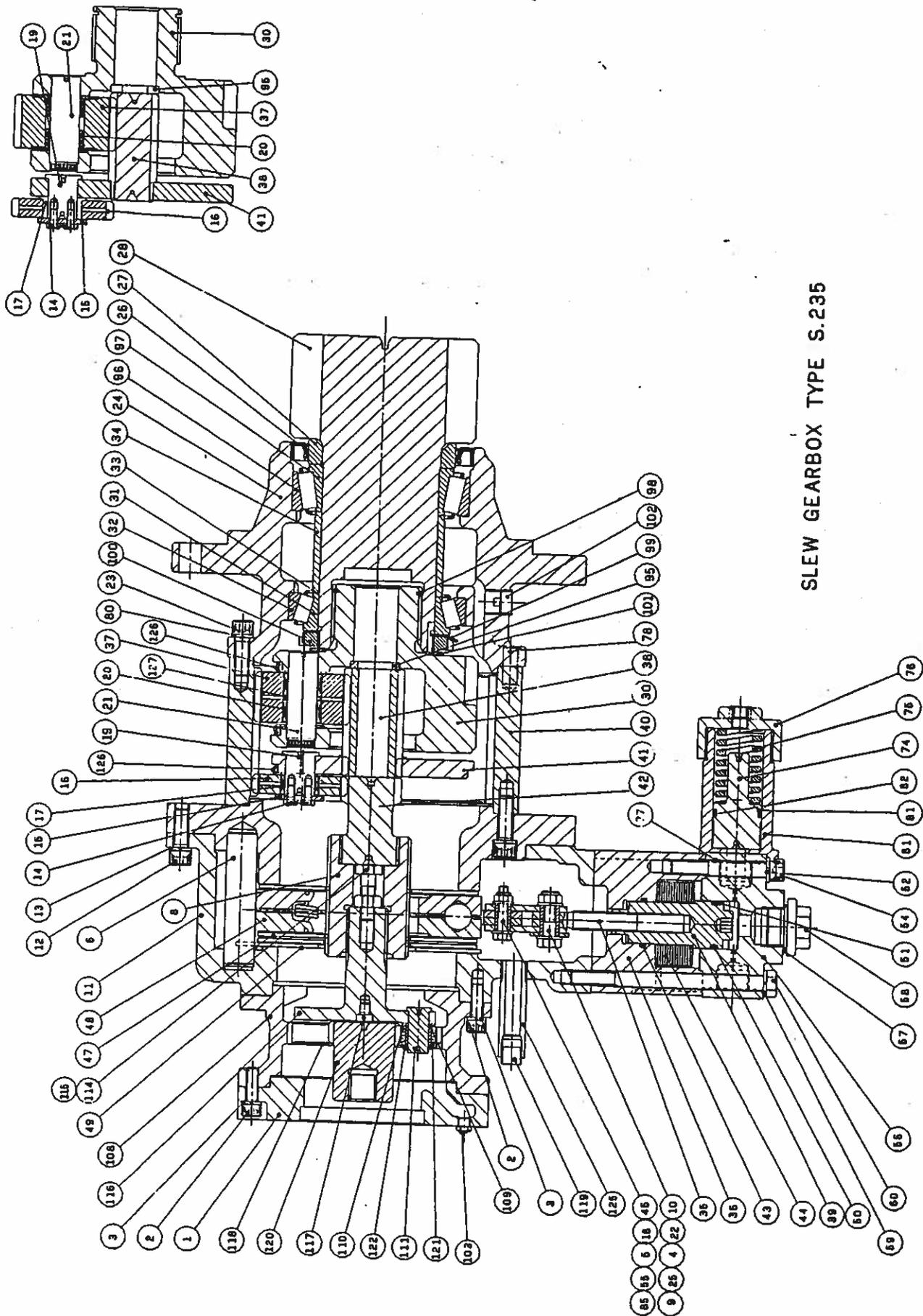
4 WORKING BRAKE PLATES.
(7" X 6" 20° RAMP ANGLE BRAKE)
(USED ON :- 174/234/236/384/385/444/445)



6 WORKING BRAKE PLATES.
(7" X 6" 20° RAMP ANGLE BRAKE)
(USED ON :- 174/234/236/384/385/444/445)

IMPORTANT CHECK LIST OF PARTS FOR AMOUNT
OF WORKING BRAKE PLATES REQUIRED.

DO NOT SCALE DRAWING		ALL DIMENSIONS IN IN	
NO.	DESCRIPTION	QTY.	REMARKS
1	BRACKET	1	
2	BRAKE PLATE ARROGT		
3	BRACKETS ON MK 2 GE		
4	BRACKETS ON MK 2 GE		
5	BRACKETS ON MK 2 GE		
6	BRACKETS ON MK 2 GE		
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SLEW GEARBOX TYPE S.235