

TS-4519

This transmission control cover has been used on all Series III machines with mechanical shift linkage for four and eight speed units.

Looking at the drawing from the right of the page, the first valve shown is the safety by-pass. This valve's function is to protect the transmission and converter from damage due to high pressure.

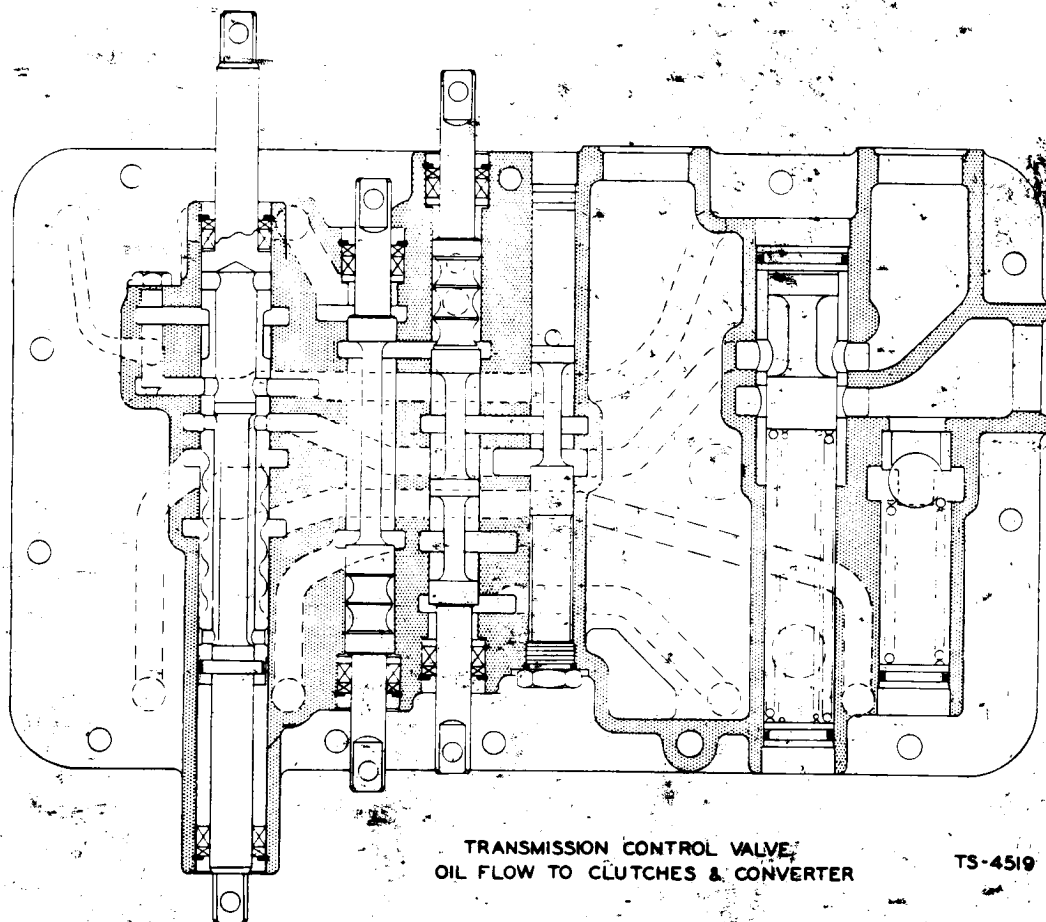
The next spool is the clutch pressure regulating valve. Oil entering the cover must pass by the valve. After passing by this valve it will apply a speed clutch and stop. This causes a back pressure which forces the spool off of its seat and allows oil flow to go to the converter.

The third spool in the cover is the de-clutch valve. The de-clutch valve blocks flow to the forward clutch and allows the clutch to release when the brakes are applied. This is done so drive line can be disengaged and full engine power can be used for hydraulics.

The fourth spool is the forward, neutral, reverse control.

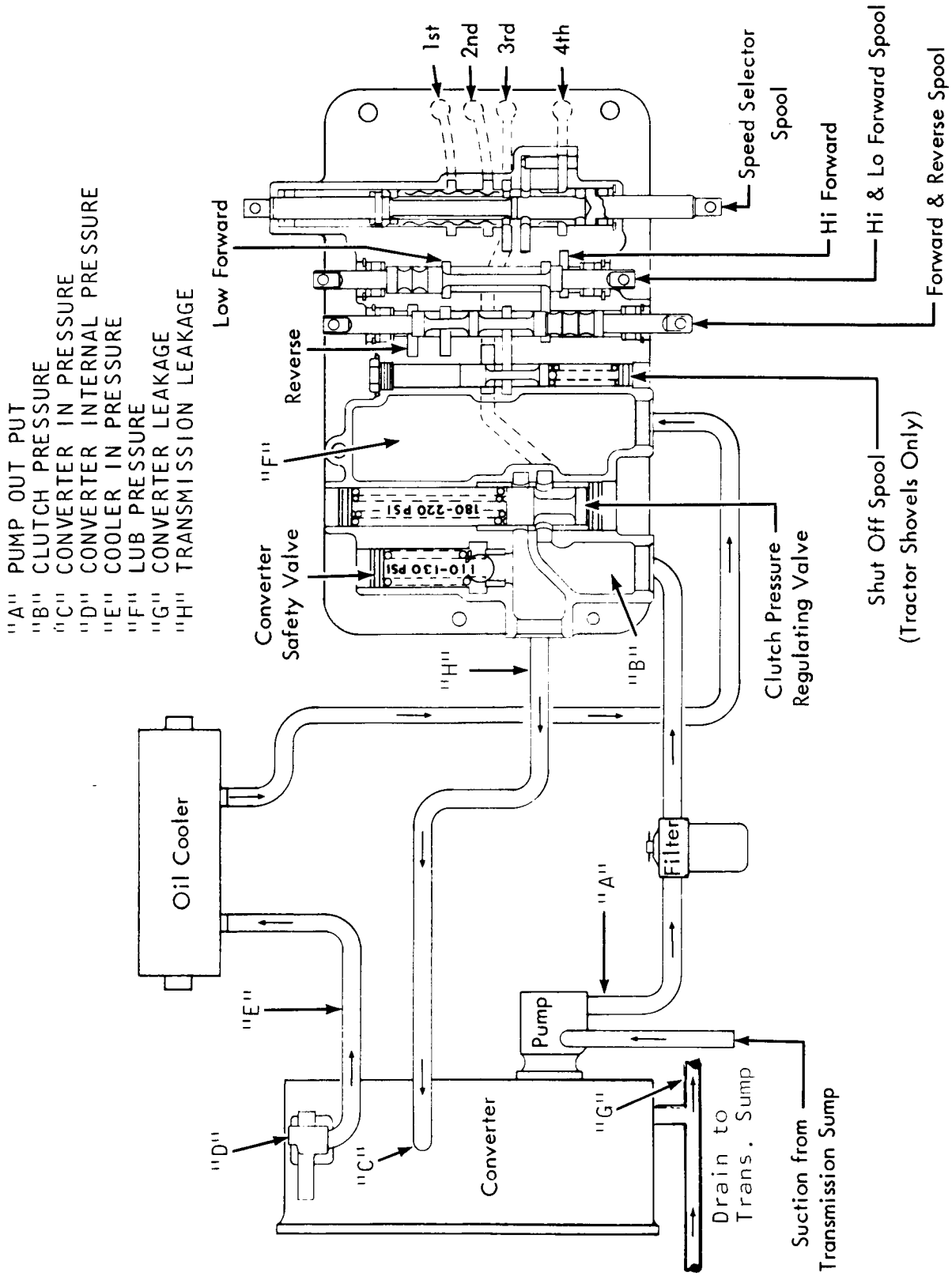
Spool No. 5 is the high and low forward spool.

The last spool in the cover is the speed selector. By shifting the spool into different positions oil is fed to one speed clutch and all others are open to drain.



TRANSMISSION CONTROL VALVE
OIL FLOW TO CLUTCHES & CONVERTER

TS-4519



TS-7956

TRANSMISSION CONTROL INTERNAL OIL FLOW

**TRANSMISSION CONTROL COVERS USED ON ALL
3,000, 4,000, 5,000, 8,000 and 16,000 SERIES TRANSMISSIONS**

The transmission shift control is a casting bolted to the top of the 3,000, 4,000, 5,000, 8,000 or 16,000 series transmission. It contains spools which regulate and direct hydraulic flow to and from various clutches in the transmission. When the transmission control spools are moved, clutches are applied or released, thus selecting a particular gear ratio in the transmission. Although all of the 3,000, 4,000, 5,000, 8,000 and 16,000 series transmission controls are of the same basic design, there are a few variations. Some of the variations are: number of gear ratio selections; use of a declutch or neutral valve; and method of controlling spool positions. There are other minor variations that will be pointed out later in this text.

There are three methods used for controlling spool positions. They are:

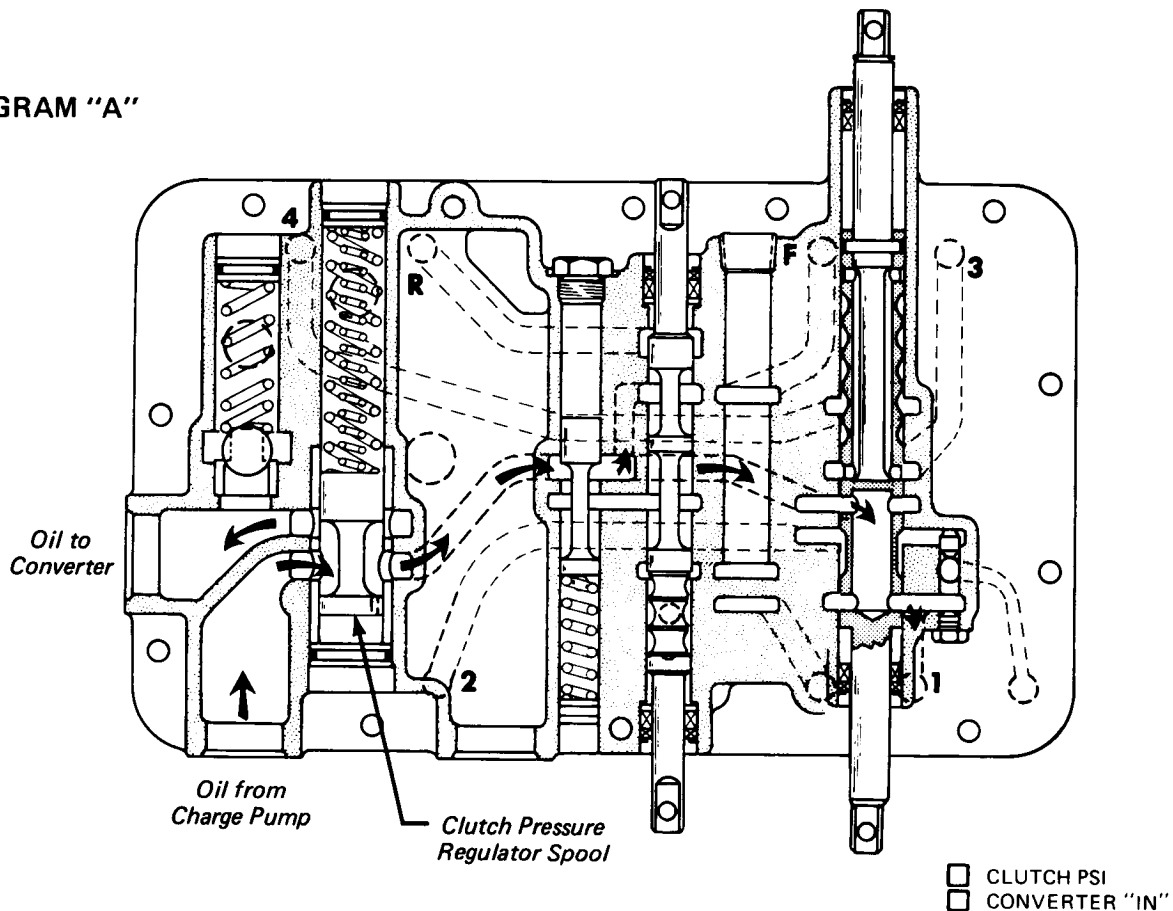
- 1) Transmission control cover in which all spools are shifted with mechanical linkage.
- 2) Transmission control cover with a combination of mechanical and hydraulically shifted spools.
- 3) Transmission control cover in which all spools are shifted hydraulically.

Clutch Pressure Regulator Operation

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The clutch pressure regulator spool operates the same in all control covers. Oil entering the cover from the converter charge pump must pass by the clutch pressure regulator valve. After passing by this valve it will apply a speed clutch and stop. When oil flow is stopped at the clutch, it builds pressure against the clutch pressure regulator spool. When the clutch pressure becomes great enough to overcome spring tension, the spool will move as indicated in Diagram "A", and bypass excess oil flow to the converter. The regulator valve maintains transmission clutch pressure.

DIAGRAM "A"



Safety Valve Operation

The safety valve protects the transmission and converter system from high pressure caused by a restricted line or similar problem. For example, with the port leading to the converter plugged, oil leaving the clutch pressure regulator valve is blocked. This oil will build pressure until the safety valve lifts from its seat and bypasses flow to the transmission sump as indicated in Diagram "B".

Forward, Neutral & Reverse Spool Operation

Tractor shovels, and dozers, with the exception of the 380 articulated dozer, have the same type of directional spool. It is a three position mechanically operated spool. It is either in forward, neutral or reverse. In forward, the forward clutch is applied. In neutral, neither forward nor reverse clutch is applied. In reverse, the reverse clutch is applied. This spool has three lands and is used in a control cover that has a special drilled passage for supply to reverse clutch. (See Diagrams "C", "D" and "E").

DIAGRAM "B"

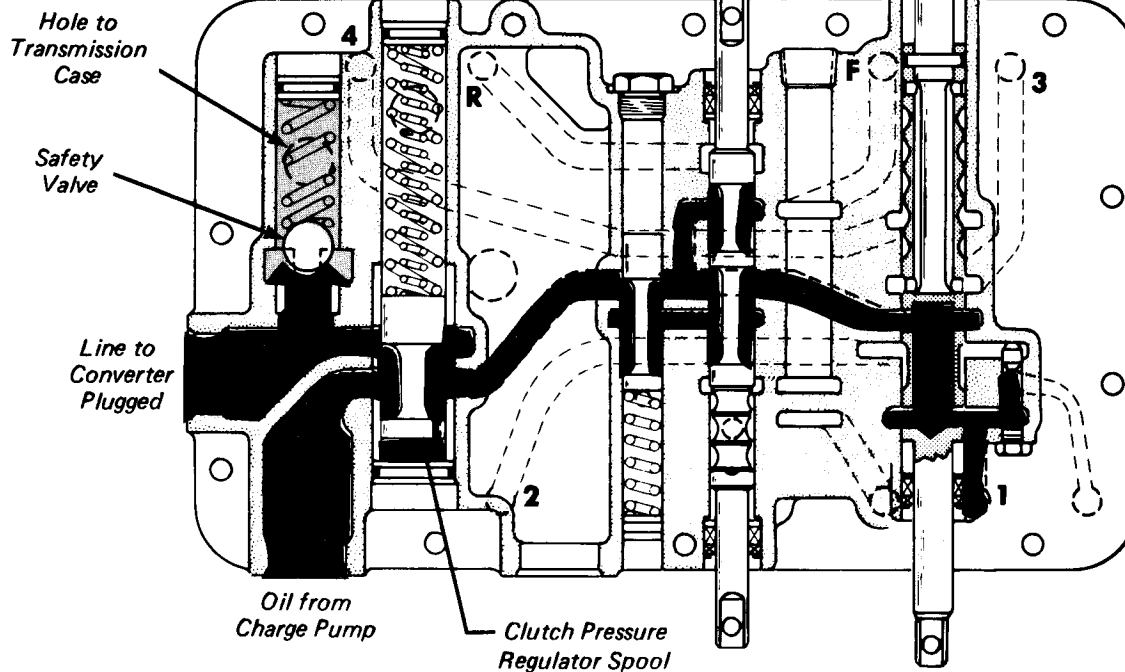
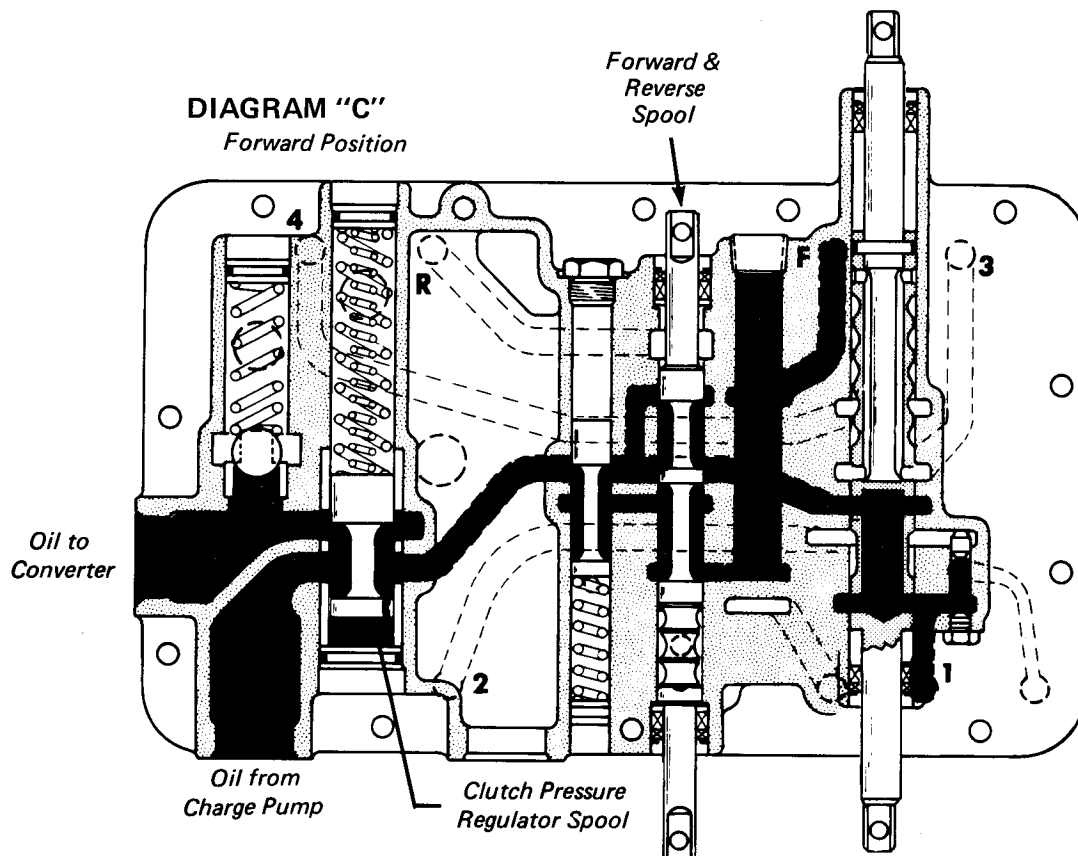


DIAGRAM "C"
Forward Position



■ CLUTCH PSI
 ■ CONVERTER "IN"
 □ SPEED SELECTOR CONTROL OIL

DIAGRAM "D"
Neutral Position

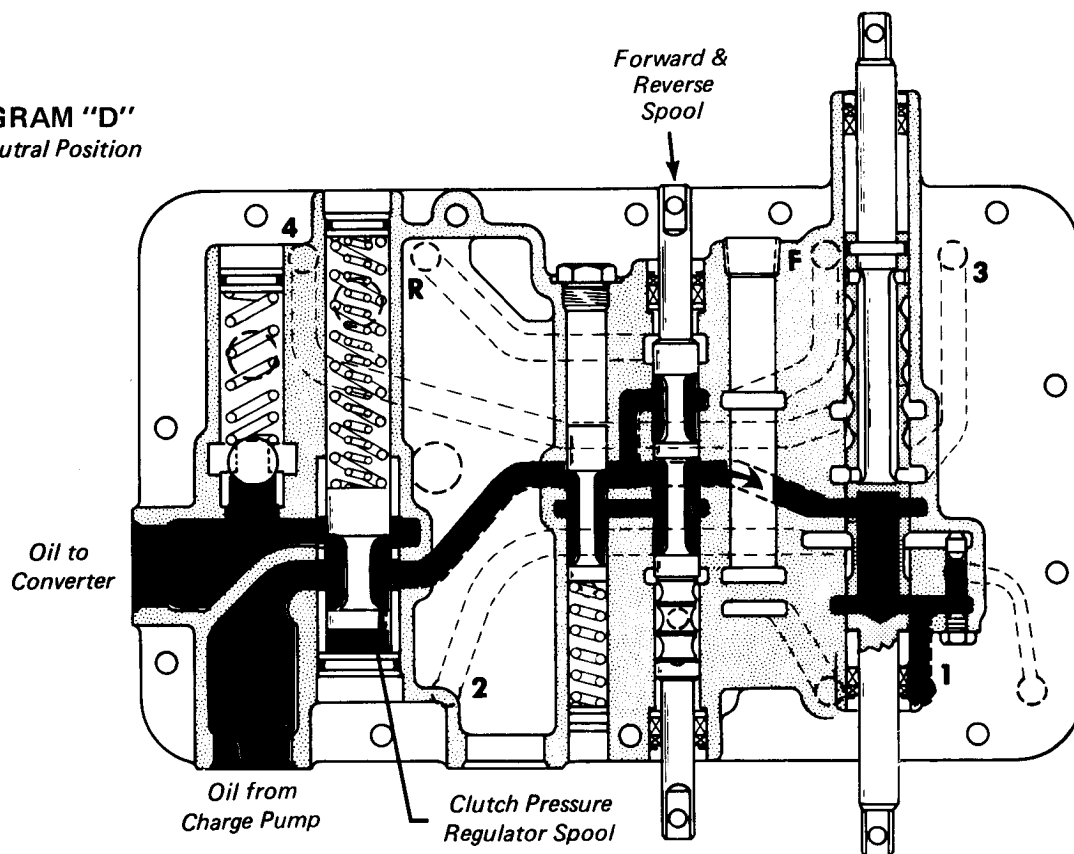
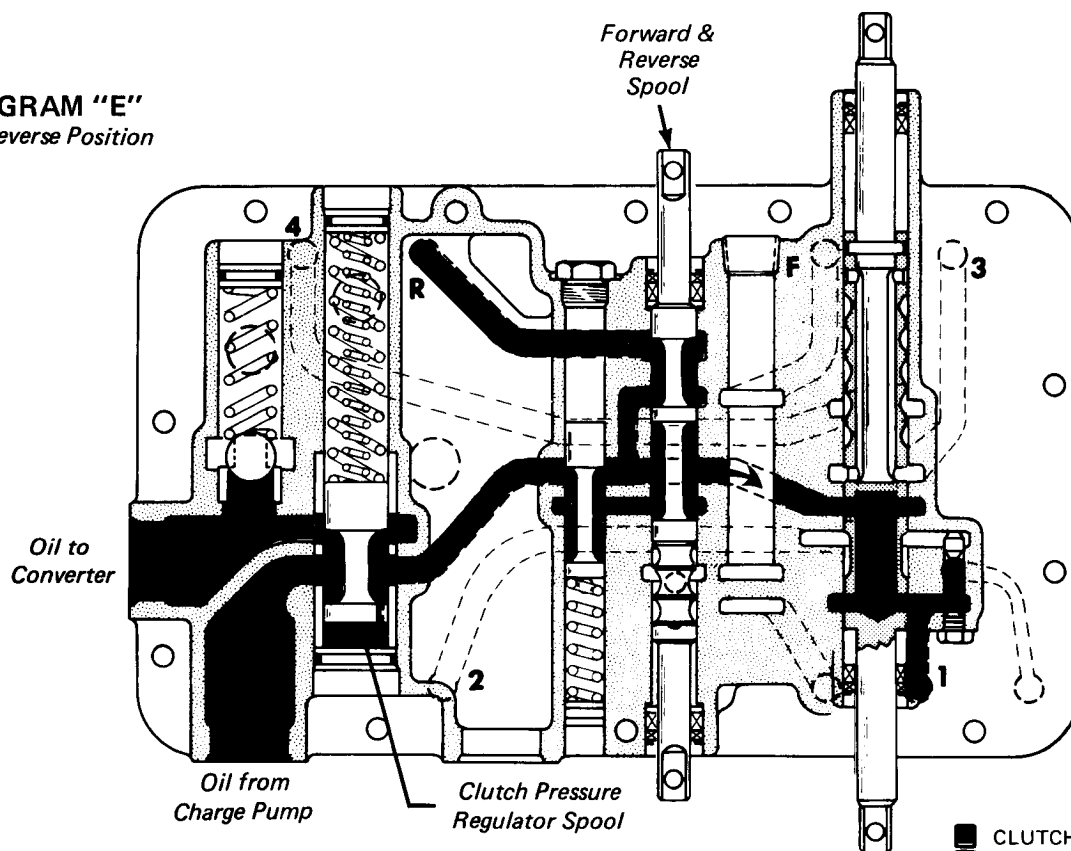


DIAGRAM "E"
Reverse Position



■ CLUTCH PSI
 ■ CONVERTER "IN"
 □ SPEED SELECTOR
 □ CONTROL OIL

Declutch Spool Operation

Tractor shovels have a declutch spool in the control cover. When the brake pedal is applied, air pressure is directed to the declutch spool. The spool shifts against spring tension to block oil flow to forward clutch and open the clutch pressure line to drain. Reverse clutch can still be applied through a drilled passage which bypasses the declutch valve. Therefore the transmission declutches in forward gears only. (See Diagram "F").

Tractor dozers, except 380III A have a declutch spool in the control cover but it is not used. It always remains in the same position.

DIAGRAM "F"

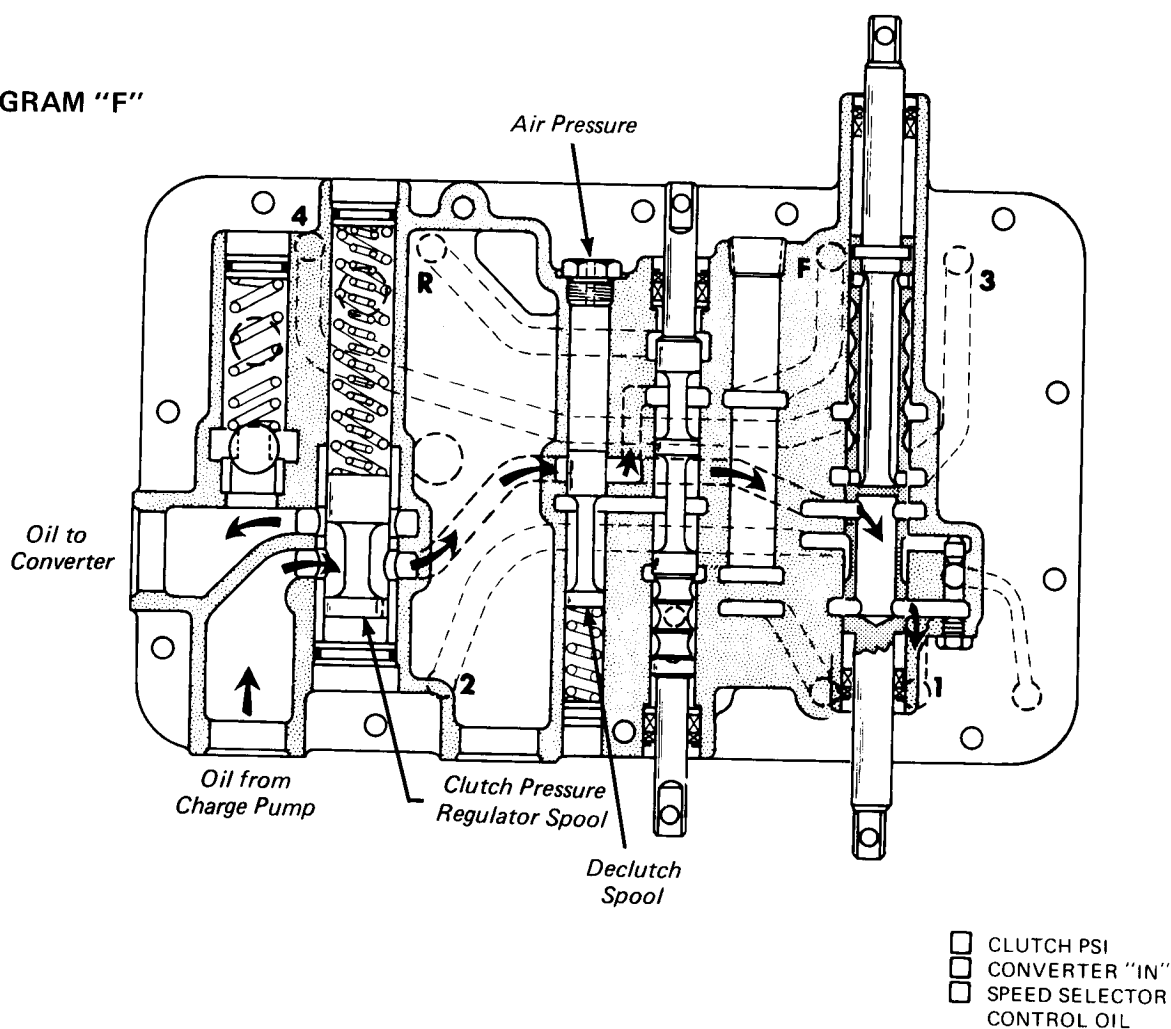
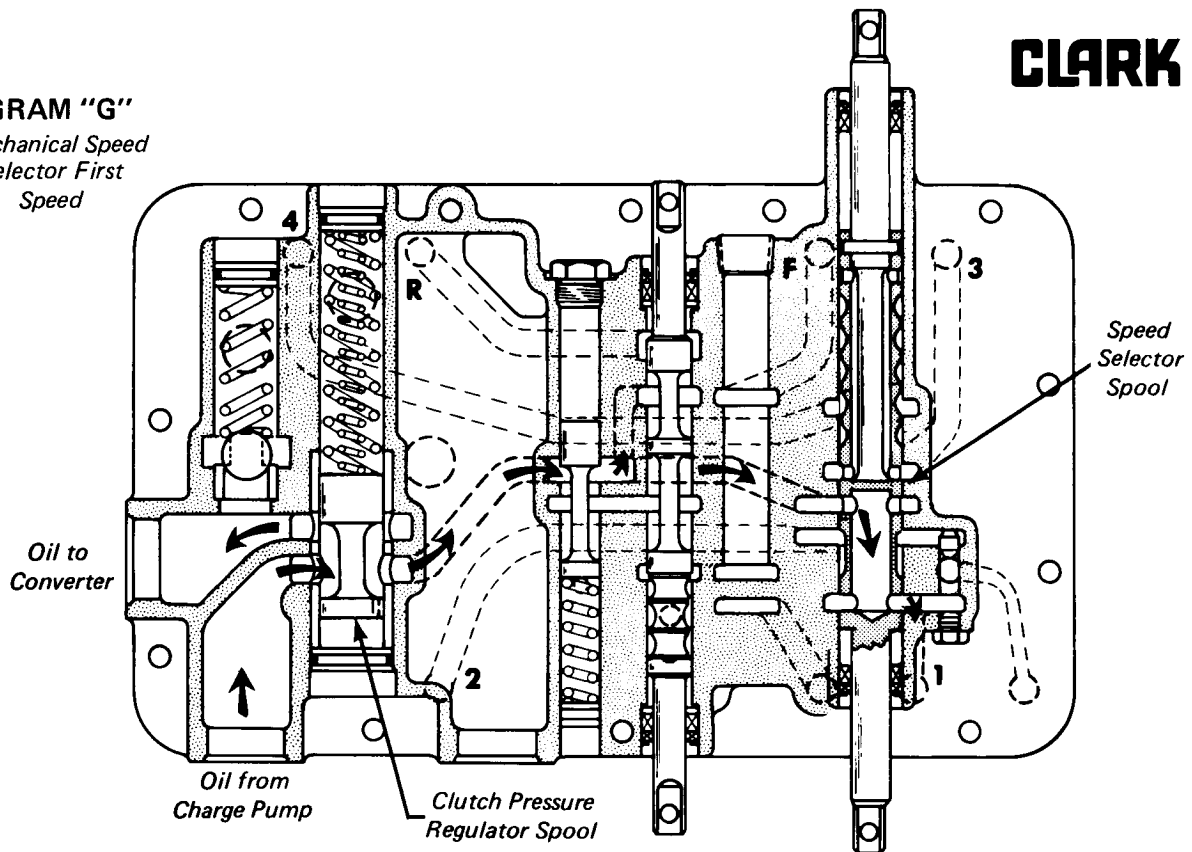


DIAGRAM "G"

*Mechanical Speed
Selector First
Speed*

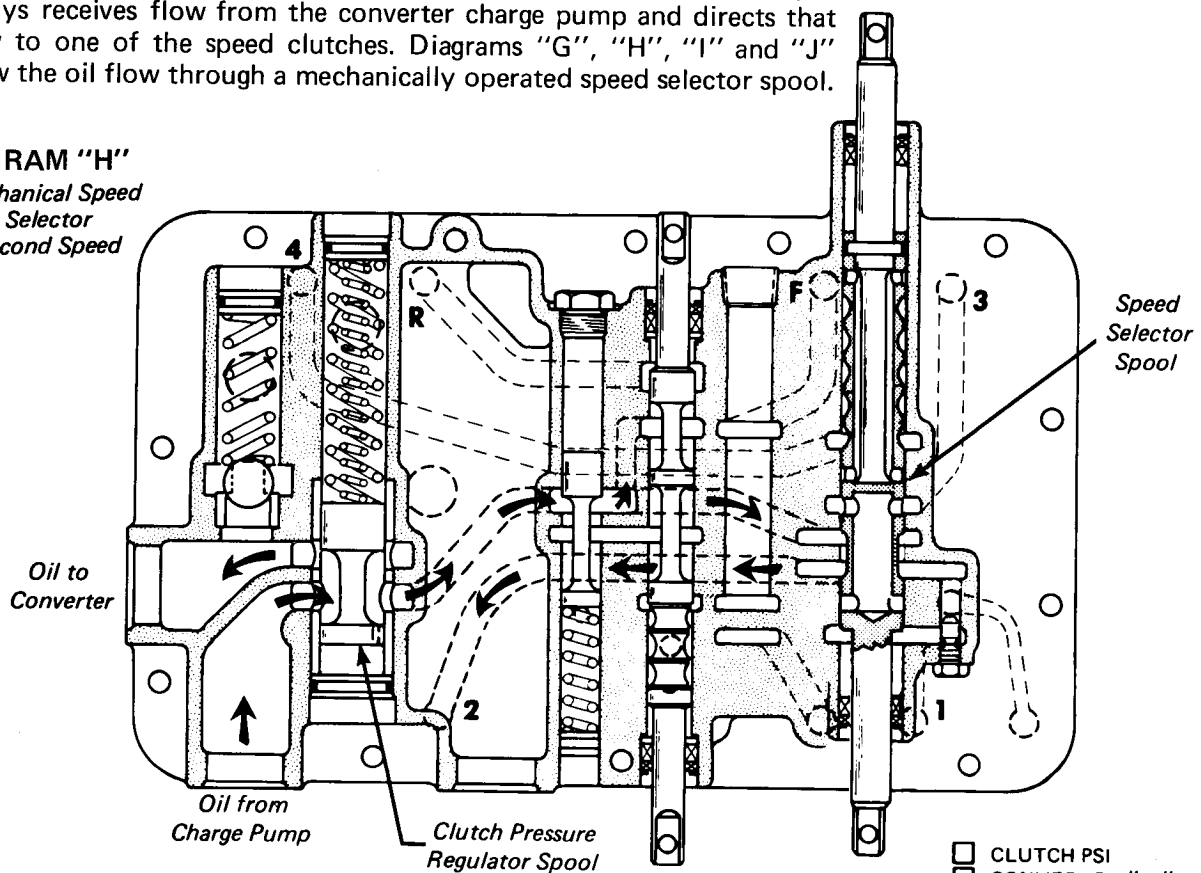


Speed Selector Spool Operation

The speed selector spool is a four position spool valve that can be controlled mechanically or hydraulically. With the engine running it always receives flow from the converter charge pump and directs that flow to one of the speed clutches. Diagrams "G", "H", "I" and "J" show the oil flow through a mechanically operated speed selector spool.

DIAGRAM "H"

*Mechanical Speed
Selector
Second Speed*



- ☐ CLUTCH PSI
- ☐ CONVERTER "IN"
- ☐ SPEED SELECTOR CONTROL OIL

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DIAGRAM "I"

*Mechanical Speed
Selector
Third Speed*

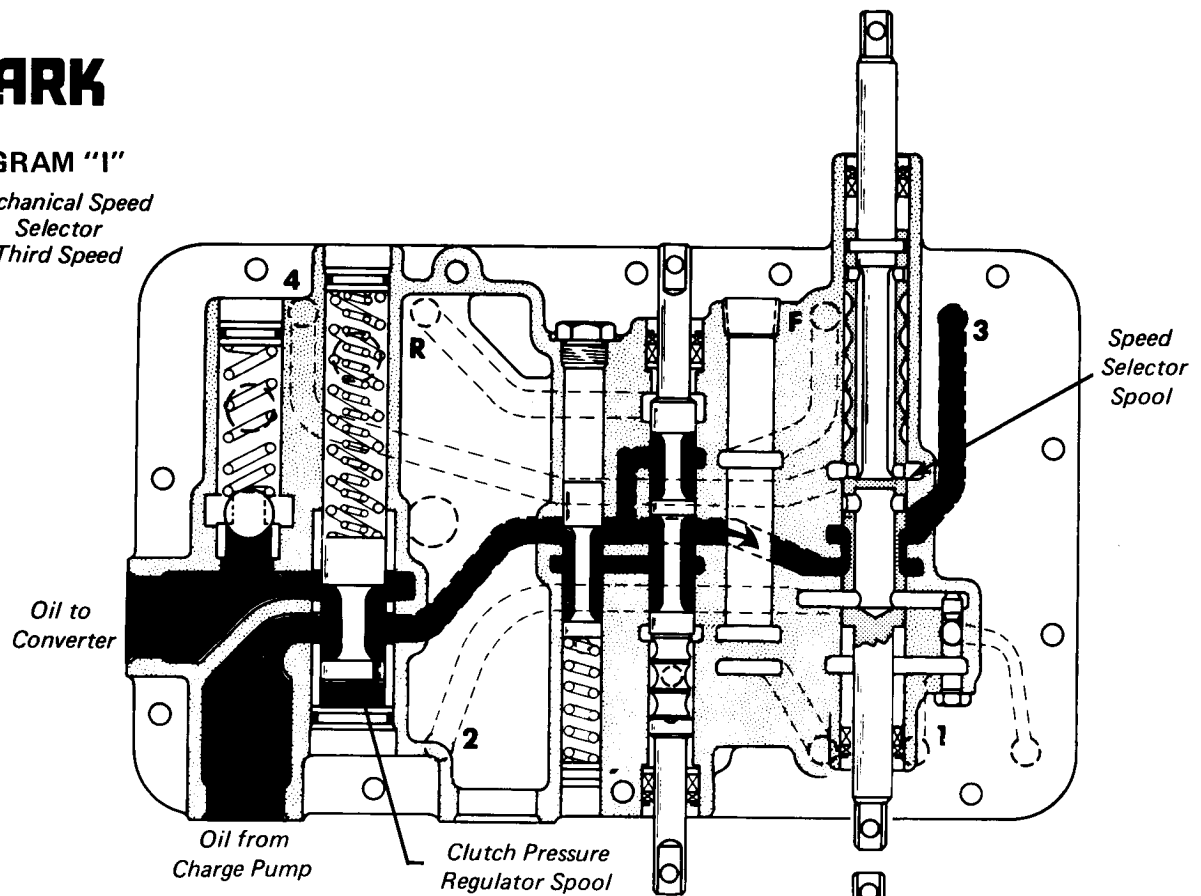
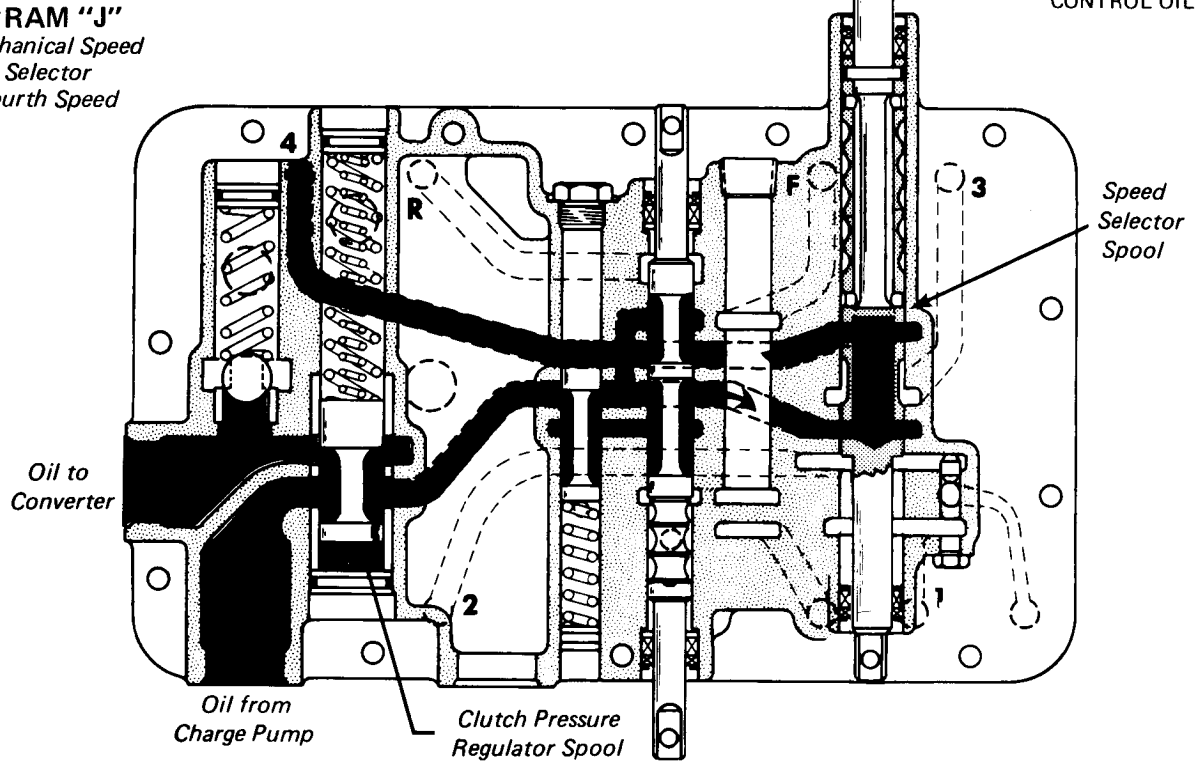


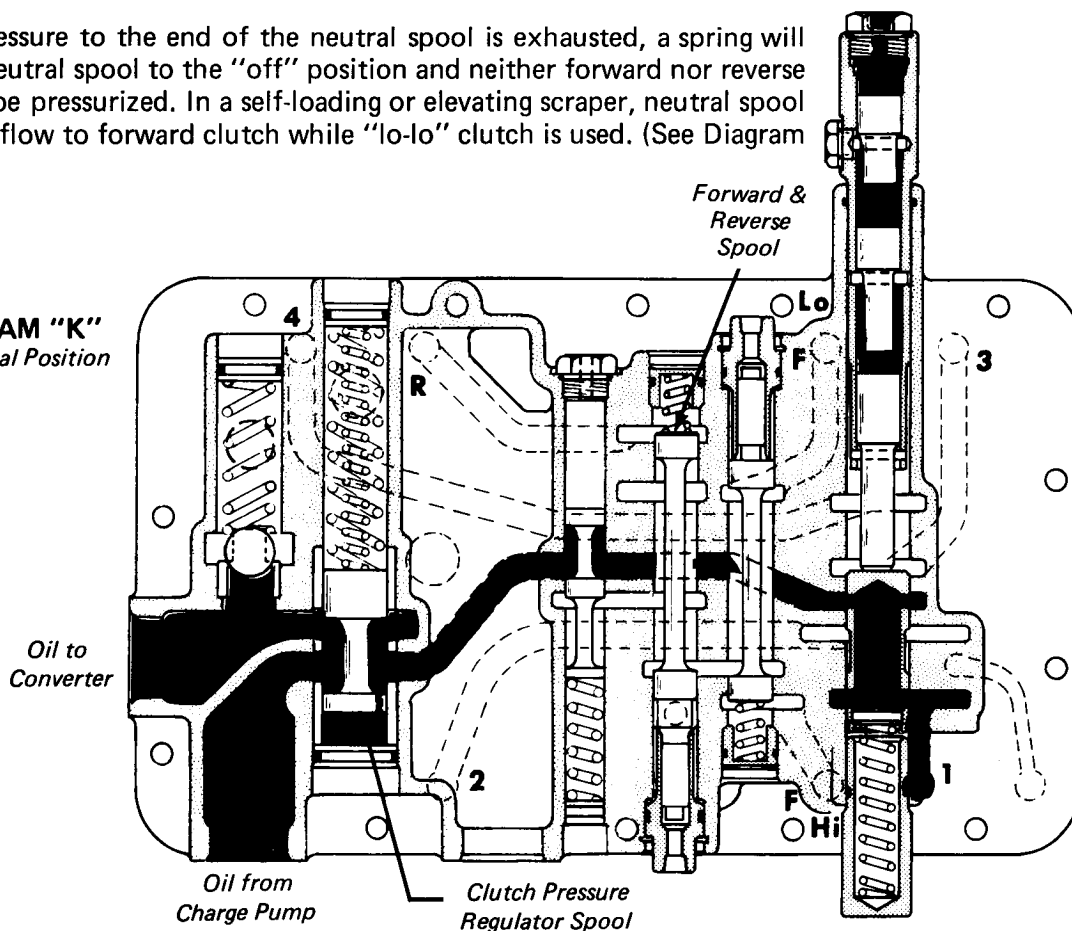
DIAGRAM "J"

*Mechanical Speed
Selector
Fourth Speed*



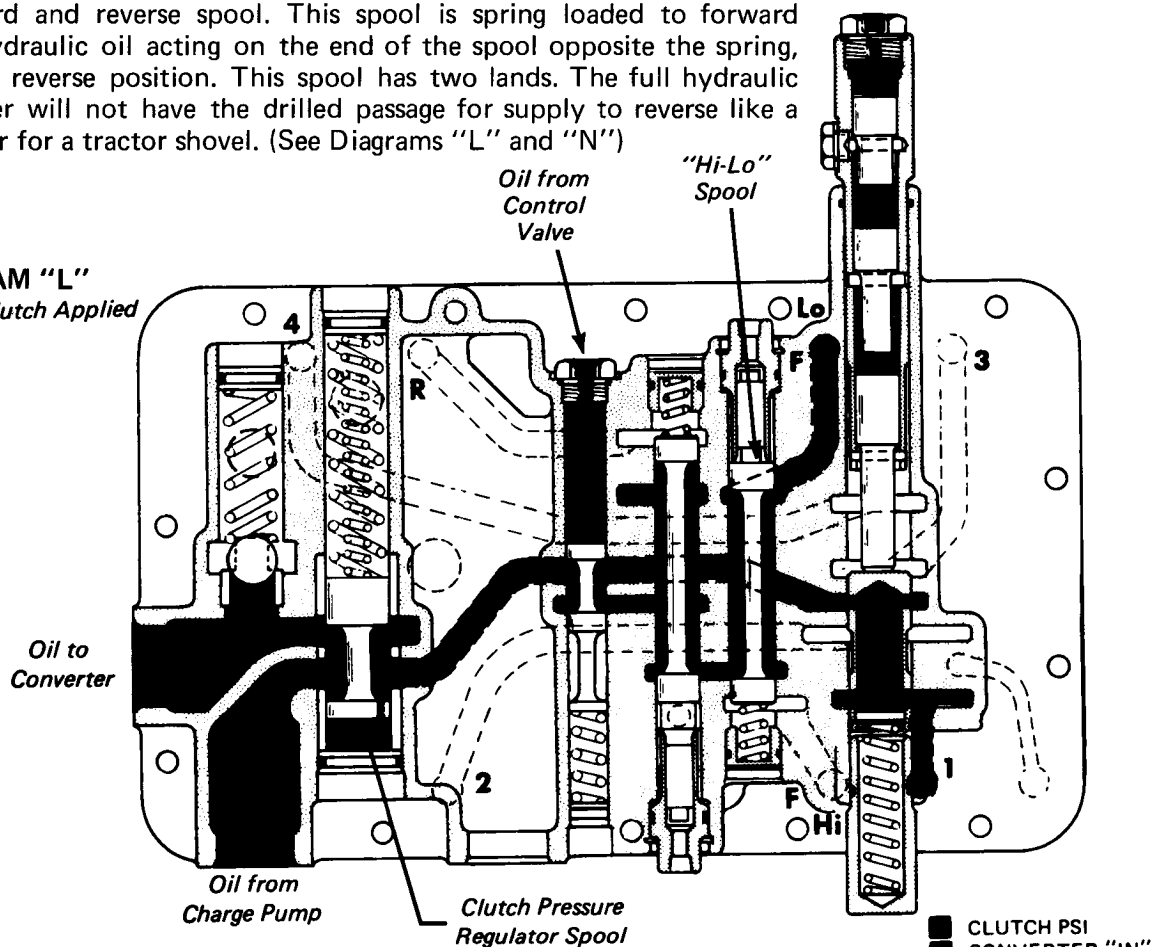
spool. If pressure to the end of the neutral spool is exhausted, a spring will move the neutral spool to the "off" position and neither forward nor reverse clutch can be pressurized. In a self-loading or elevating scraper, neutral spool must block flow to forward clutch while "lo-lo" clutch is used. (See Diagram "K" & "L")

DIAGRAM "K"
Neutral Position



Scrapers and 380 articulated dozers have a two position, hydraulically actuated, forward and reverse spool. This spool is spring loaded to forward position. Hydraulic oil acting on the end of the spool opposite the spring, pushes it to reverse position. This spool has two lands. The full hydraulic control cover will not have the drilled passage for supply to reverse like a control cover for a tractor shovel. (See Diagrams "L" and "N")

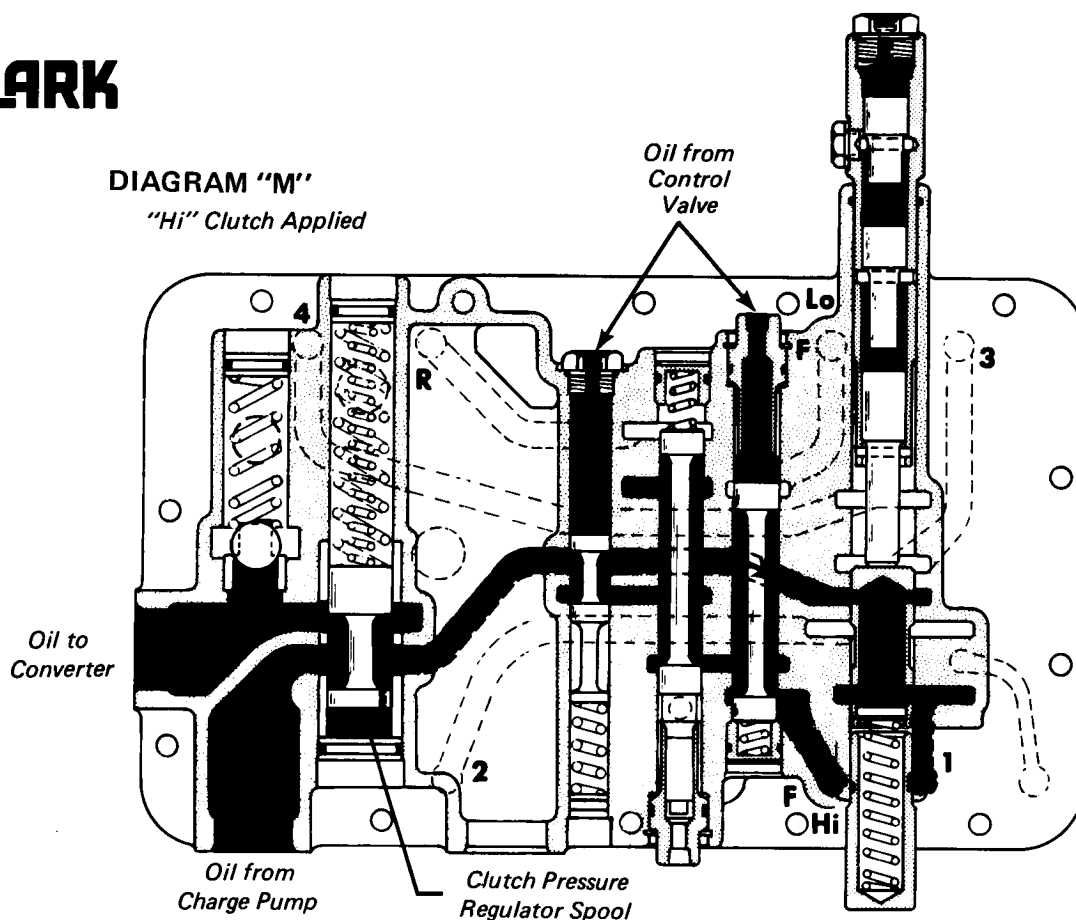
DIAGRAM "L"
"Lo" Clutch Applied



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DIAGRAM "M"

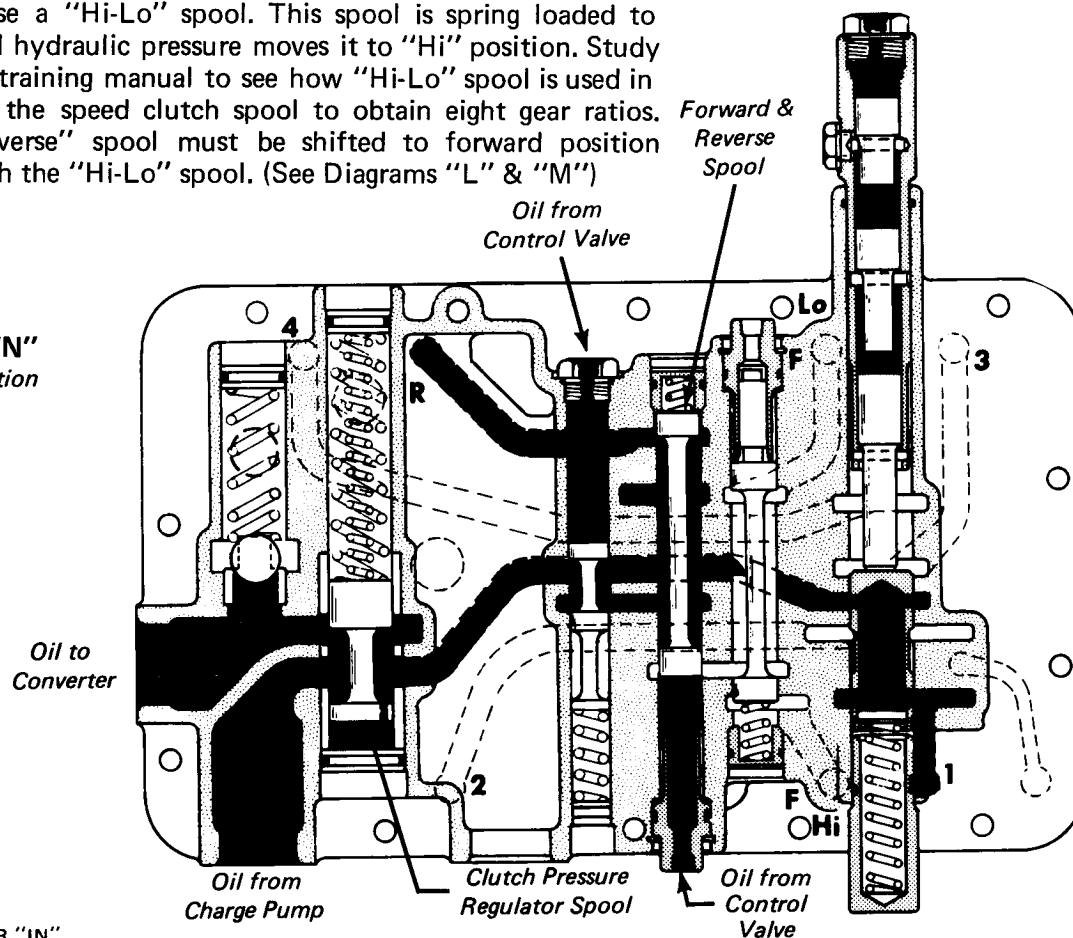
"Hi" Clutch Applied



Tractor Shovels, Dozers and Scrapers that have more than five gear ratio selections use a "Hi-Lo" spool. This spool is spring loaded to "Lo" position and hydraulic pressure moves it to "Hi" position. Study page D-22 in this training manual to see how "Hi-Lo" spool is used in conjunction with the speed clutch spool to obtain eight gear ratios. "Forward and reverse" spool must be shifted to forward position before oil can reach the "Hi-Lo" spool. (See Diagrams "L" & "M")

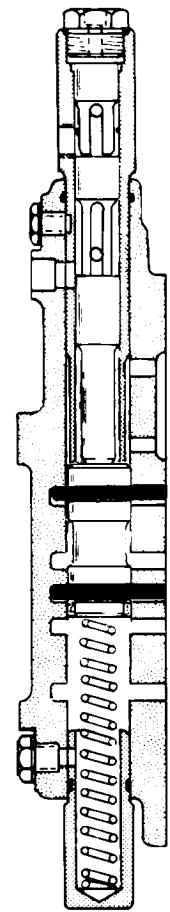
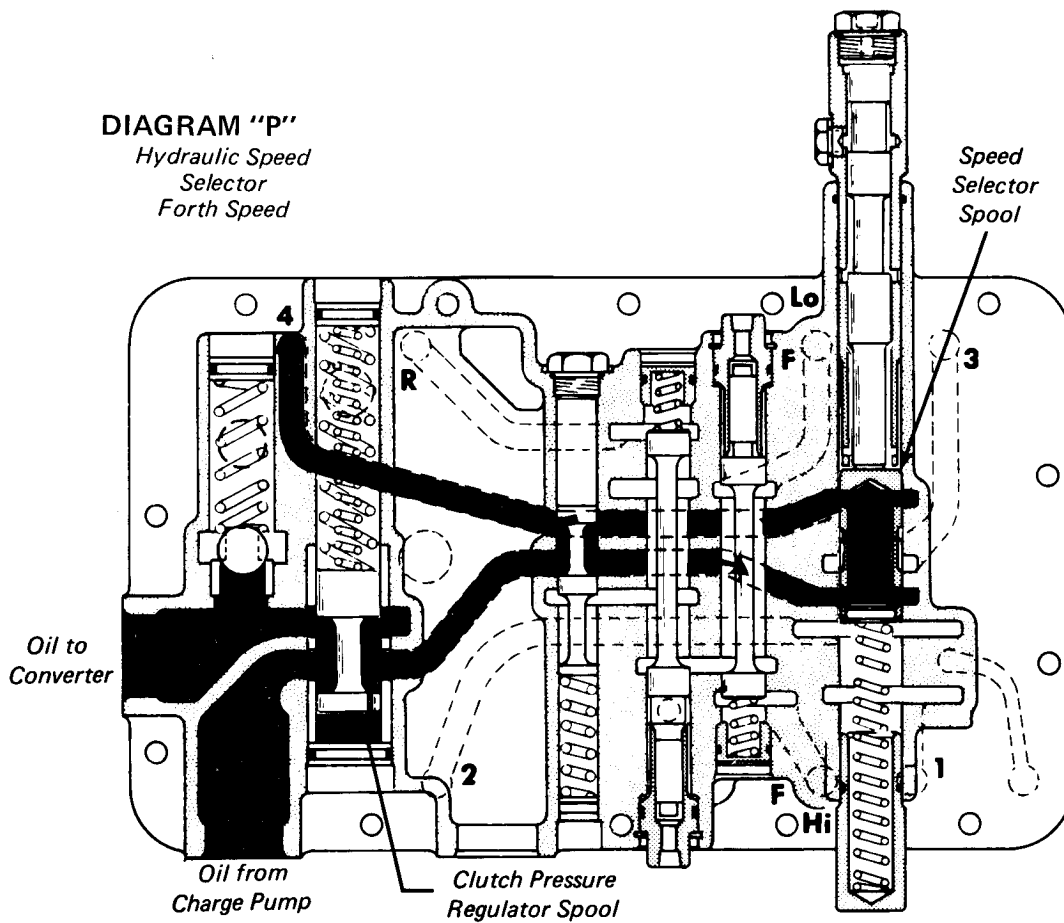
DIAGRAM "N"

Reverse Position



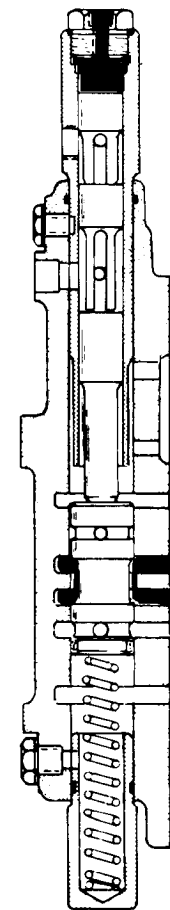
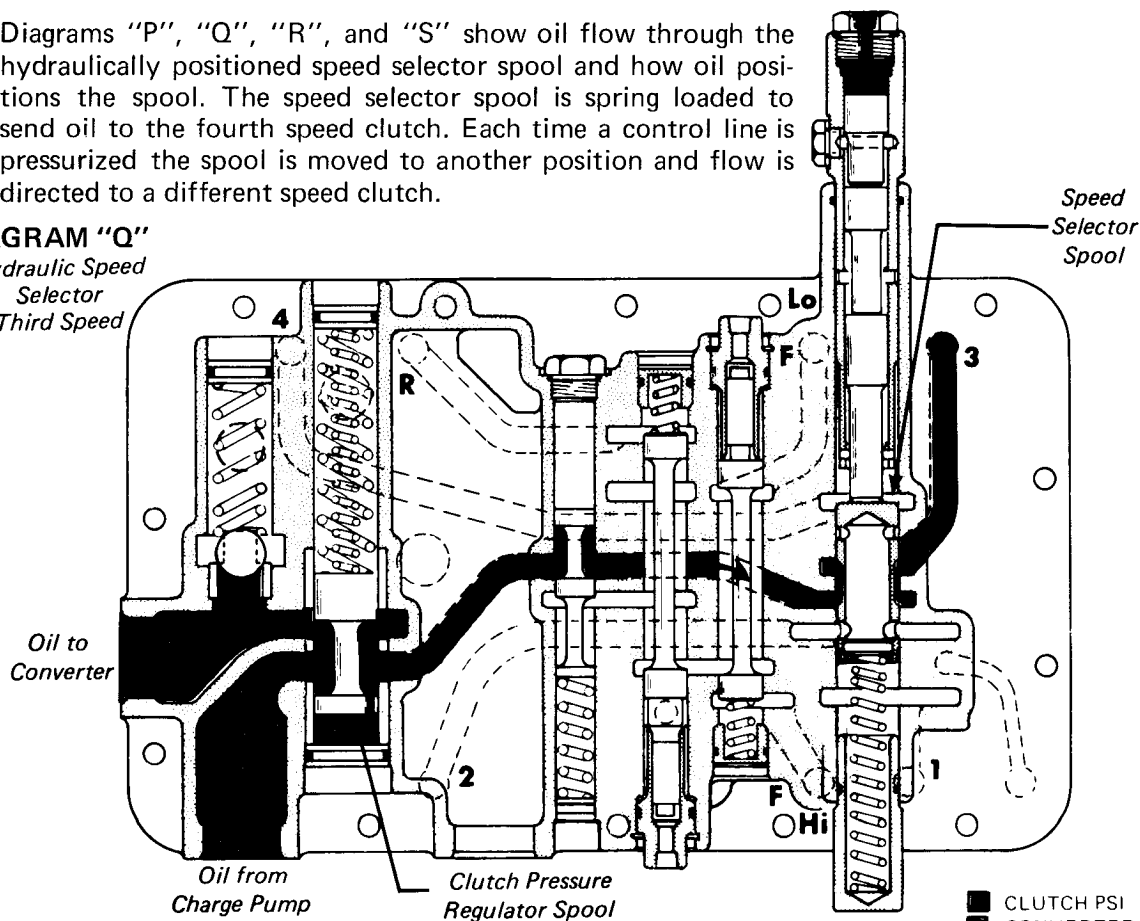
CLUTCH PSI
CONVERTER "IN"

DIAGRAM "P"
Hydraulic Speed
Selector
Forth Speed



Diagrams "P", "Q", "R", and "S" show oil flow through the hydraulically positioned speed selector spool and how oil positions the spool. The speed selector spool is spring loaded to send oil to the fourth speed clutch. Each time a control line is pressurized the spool is moved to another position and flow is directed to a different speed clutch.

DIAGRAM "Q"
Hydraulic Speed
Selector
Third Speed



■ CLUTCH PSI
■ CONVERTER "IN"

CLARK

DIAGRAM "R"
Hydraulic Speed
Selector
Second Speed

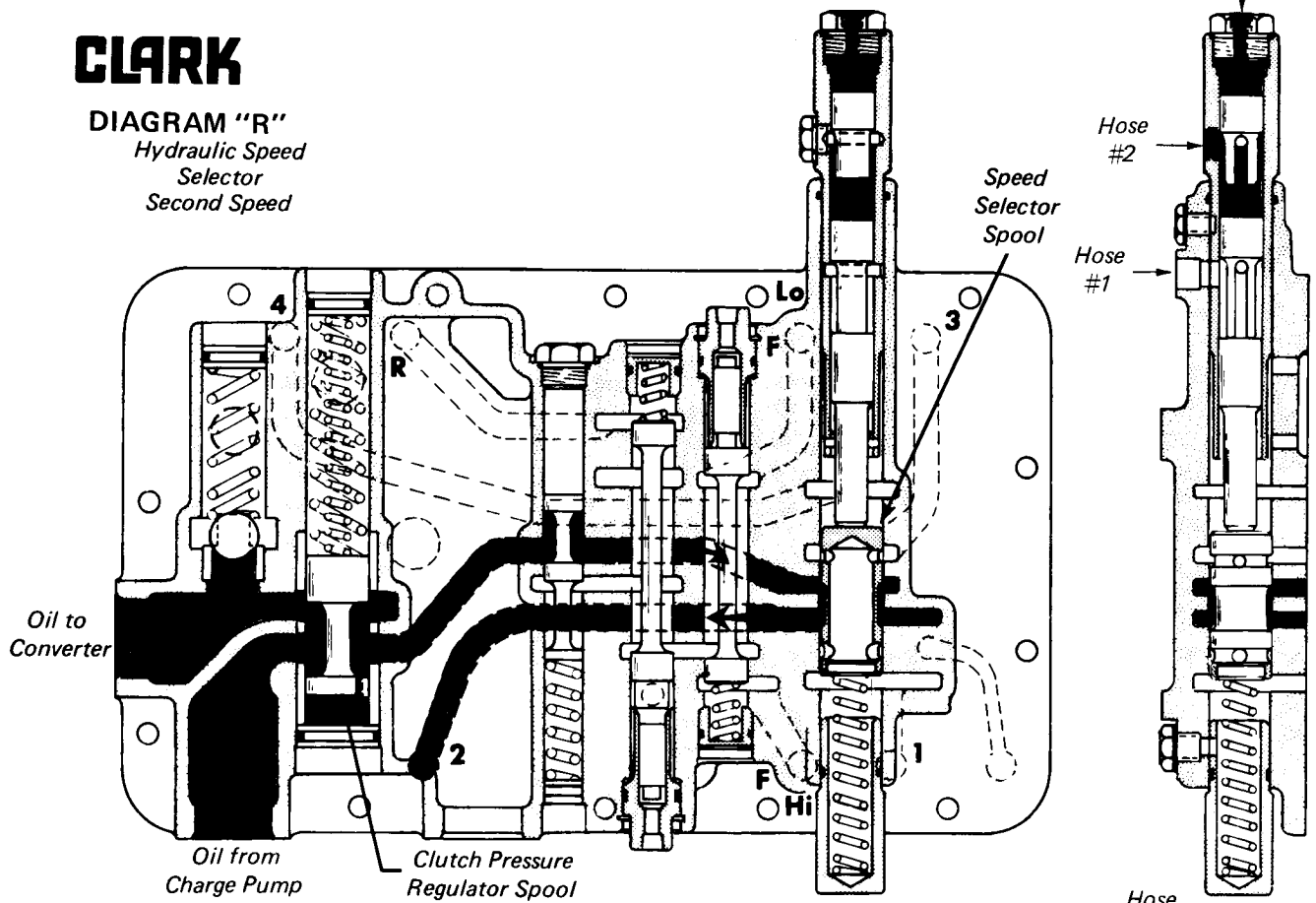
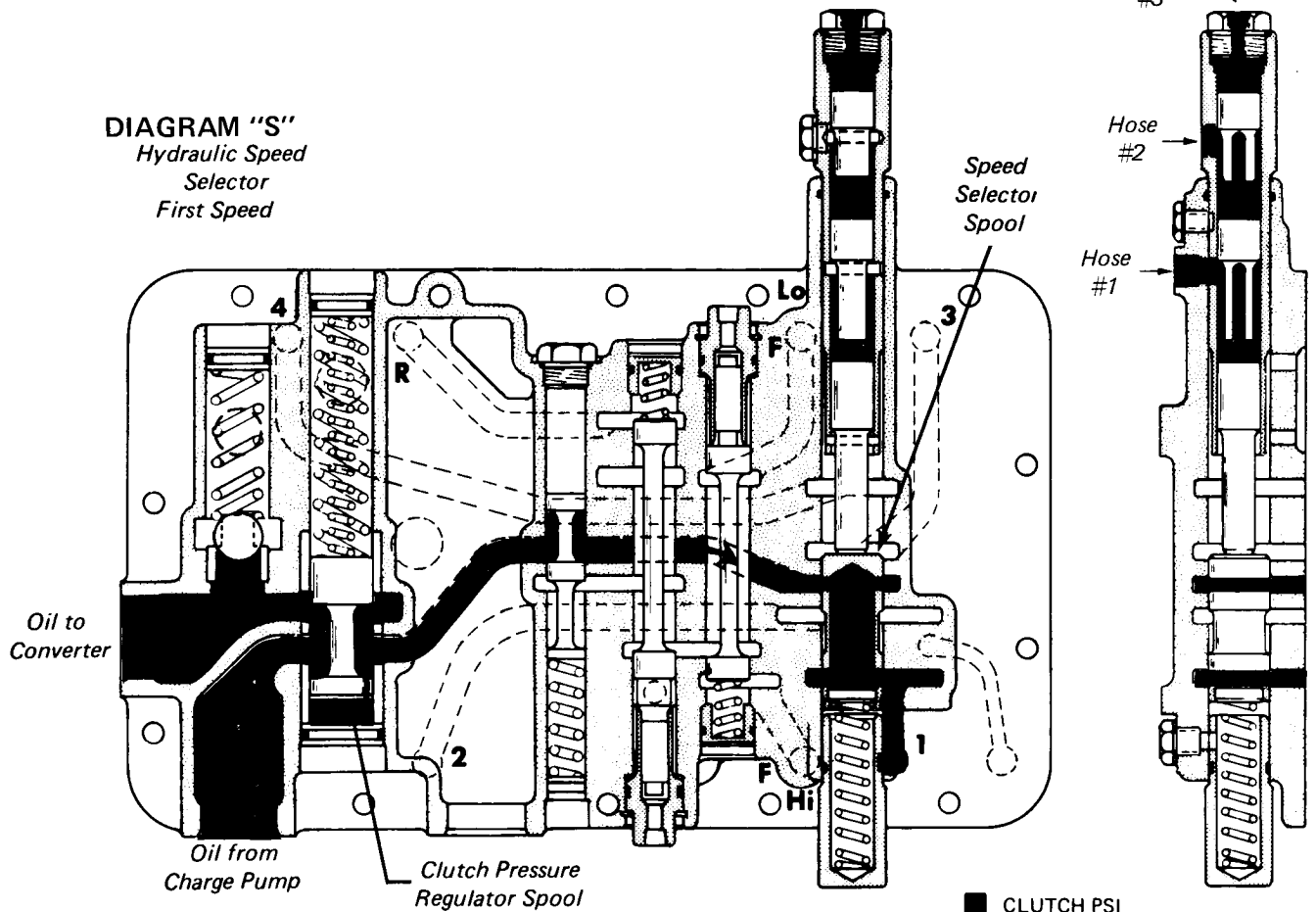


DIAGRAM "S"
Hydraulic Speed
Selector
First Speed



■ CLUTCH PSI
■ CONVERTER "IN"

December 2, 1960

SG-183

Subject: Checking Transmission Shafts for Re-use after Gear Breakage
Has Occured - All Models

It has been brought to our attention that in some cases a transmission shaft has been re-used in repair operations after gear tooth or gear breakage has occurred without checking the shaft for straightness. This has resulted in a second failure due to the shaft being bent in the original failure.

In all cases where a gear tooth breakage or gear failure occurs, the transmission shafts must be checked for straightness. All shafts must be straight within .002" Total Indicator Reading on all ground surfaces.

Straightness of shaft may be checked in one of two ways:

- a) Place shaft in identical "V" blocks on a surface plate. "V" blocks should bear on two bearing surfaces of identical diameter. Place indicator on surface plate with button of indicator bearing on ground surface of shaft. Rotate shaft in "V" blocks checking for runout.
- b) Attach indicator to face of transmission shaft with button of indicator bearing on ground diameter of splines clutch end of shaft. Set indicator at zero and slowly rotate shaft noting runout registered on dial only while button is bearing on tops of splines.

CLARK

Service gram

June 7, 1971

MICHIGAN SG-306B
Group Ref. No. 2300

(This bulletin supersedes and replaces SG-306A dated 4-5-71.

REASON: Updated to include correct part number data)

SUBJECT: Clutch Inner & Outer Discs as used in 3000, 5000, 8000 & 16000 series transmissions. All Models of MICHIGAN Tractor Shovels, Dozers & Scrapers

Field reports have indicated that clutch discs are being improperly applied in the field. Attempts to substitute or use old style discs where not allowed can only have one result - improper performance of the transmission, clutch failures and costly repairs.

The improved surface finish (circular ground or cold rolled finish) steel outer clutch discs listed below have replaced, since late 1969, the previous unground or hot rolled outer discs for use with the graphite inner discs. The clutch inner discs listed below must be used with the improved finish outer disc part numbers in this bulletin. Outer discs used previously were of the unground or hot rolled variety and should not be used with the graphite inner discs.

The following data covers clutch inner and outer disc part numbers, transmission model and clutch group application, and parts identification which will permit using the right disc in its proper place. Service replacement parts stock should be checked to determine that the right clutch disc is being stocked under the proper part numbers. The graphite plates are being supplied by two vendors - S. K. Wellman and Raybestos-Manhattan.

S. K. Wellman ink stamps part number on their plates with white ink, and, for their own internal identification, they have been painting a green spot on the O.D. of these plates. The green spot is not a requirement of Clark but for identification in S. K. Wellman's plant, so may eventually be omitted. Raybestos-Manhattan ink stamps Clark's part number on their plates with black ink, which sometimes is hard to see. They also etch a "W" (for their Wabash plant) on one tooth, which is a requirement of Clark to identify their plates. Therefore, a plate which has a "W" etched on one tooth, but on which the part number is unreadable, may be identified as a usable plate by its size and finish as given below. Also, when replacing clutch discs in any transmission at any time, only the part numbers shown in this bulletin should be used in the locations as shown.

DO NOT SUBSTITUTE CLUTCH DISCS IN ANY APPLICATION.

<u>Clutch Group Application</u>	<u>Clutch Inner Disc No.</u>	<u>Diameter</u>	<u>Clutch Outer Disc No.</u>
<u>3000 Series Transmission</u>			
1st & 2nd	232778 (graphite)	7.687"	232394 (improved finish)
Input (fwd), Rev., 3rd, 4th & Splitter	227495 (bronze)	7.687"	232394 "
<u>5000 Series Transmission</u>			
1st & 2nd	232779 (graphite)	9.187"	232285 "
Input (fwd), Rev, 3rd, 4th & Splitter	227495 (bronze)	7.687"	232394 "
<u>8000 Series Transmission</u>			
1st & 2nd	232780 (graphite)	11.500"	232395 "
Input (fwd), Rev, 3rd, 4th & Splitter	232779 (graphite)	9.187"	232285 "
<u>16000 Series Transmission</u>			
1st & 2nd	232781 (graphite)	12.875"	232396 "
Input (fwd), Rev, 3rd, 4th & Splitter	232780 (graphite)	11.500"	232395 "

Again, all service replacement parts stock of these clutch inner and outer discs should be checked 100% to be sure the discs being stored under the respective part numbers are to the specifications for that part number as outlined above.

JC-443-70
SCN 4818A
DW

December 13, 1972

MICHIGAN SG-460
Group Ref. No. 2300

SUBJECT: Removal of Shuttle Valve from
Transmission Control Cover Assy.
Models 125-111A, 175-111, 175-111A, 175B,
275-111, 275-111A, 275B, 180-111, 280-111,
280-111A, LF280, 380-111, 380-111A,
475-111A, 110-H, 210-111, 210-H, 310-111,
310-H & 410

The shuttle valve used in control cover assemblies of transmissions used in the 100, 200, 300 & 400 Series machine models, as listed above, has been discontinued and removed since it served no useful function in these units. See Fig. 1 for typical location of shuttle valve and plug in the control cover assemblies.

The machining of the control cover casting has been changed to eliminate the cross-drilled hole for the shuttle valve and plug. On exsistant units in the field, however, whenever servicing a transmission or control cover assembly for any reason, on the above models, the shuttle valve and plug, where exsistant, should be removed and replaced with a plug assembly as outlined below.

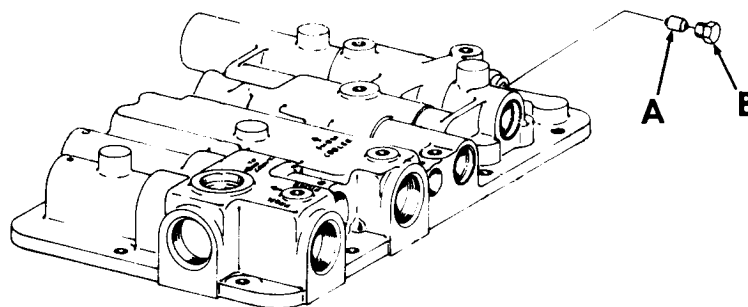


Figure 1

A - Shuttle valve B - Plug

TS-11835 B

INSTRUCTION (See Fig. 2):

1. Remove 47K-3 plug.
2. Using a magnet, remove shuttle valve (217654 for 100 & 200 Series machines and 217684 for 300 & 400 Series machines).
3. Install plug assembly - 232464 for 100 & 200 Series machines and 232975 for 300 & 400 Series machines. Both plug assemblies include 91F-3 o-ring.
4. Tighten plug assembly to 15-25 ft. lbs. torque (2,1-3,5 kgm) and install lockwire thru hole in plug and around plug in top of cover as shown in Fig. 2.

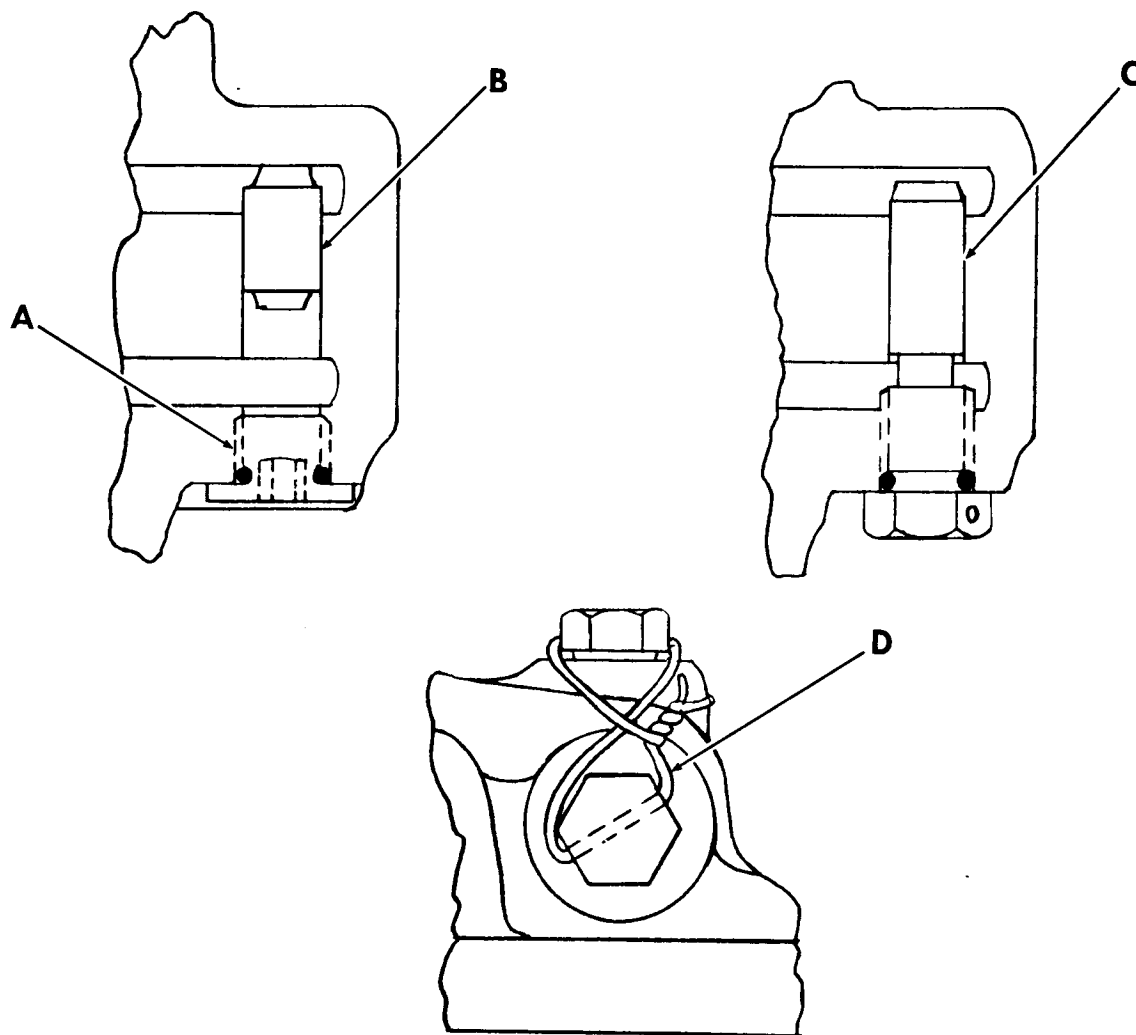


FIGURE 2

- A - 47K-3 Plug
- B - 217654 Shuttle Valve - 100 & 200 Series Machines
217684 Shuttle Valve - 300 & 400 Series Machines
- C - 232464 Plug Assy - 100 & 200 Series Machines
232975 Plug Assy - 300 & 400 Series Machines
- D - Lockwire As Shown

25 June 1975

MICHIGAN SG-538
Group Ref. No. 1300

SUBJECT: Transmission & Converter Filter Assembly
Model 175B Tractor Shovel

An improvement change has been made on subject model machines featuring the use of a new, improved, heavy duty, dual element filter assembly in place of the previously used single element transmission and converter filter assembly. This change became effective on Model 175B Tractor Shovels shipped from the factory with serial numbers 427C101 and after for G. M. powered machines and 438C101 and after for Cummins powered machines.

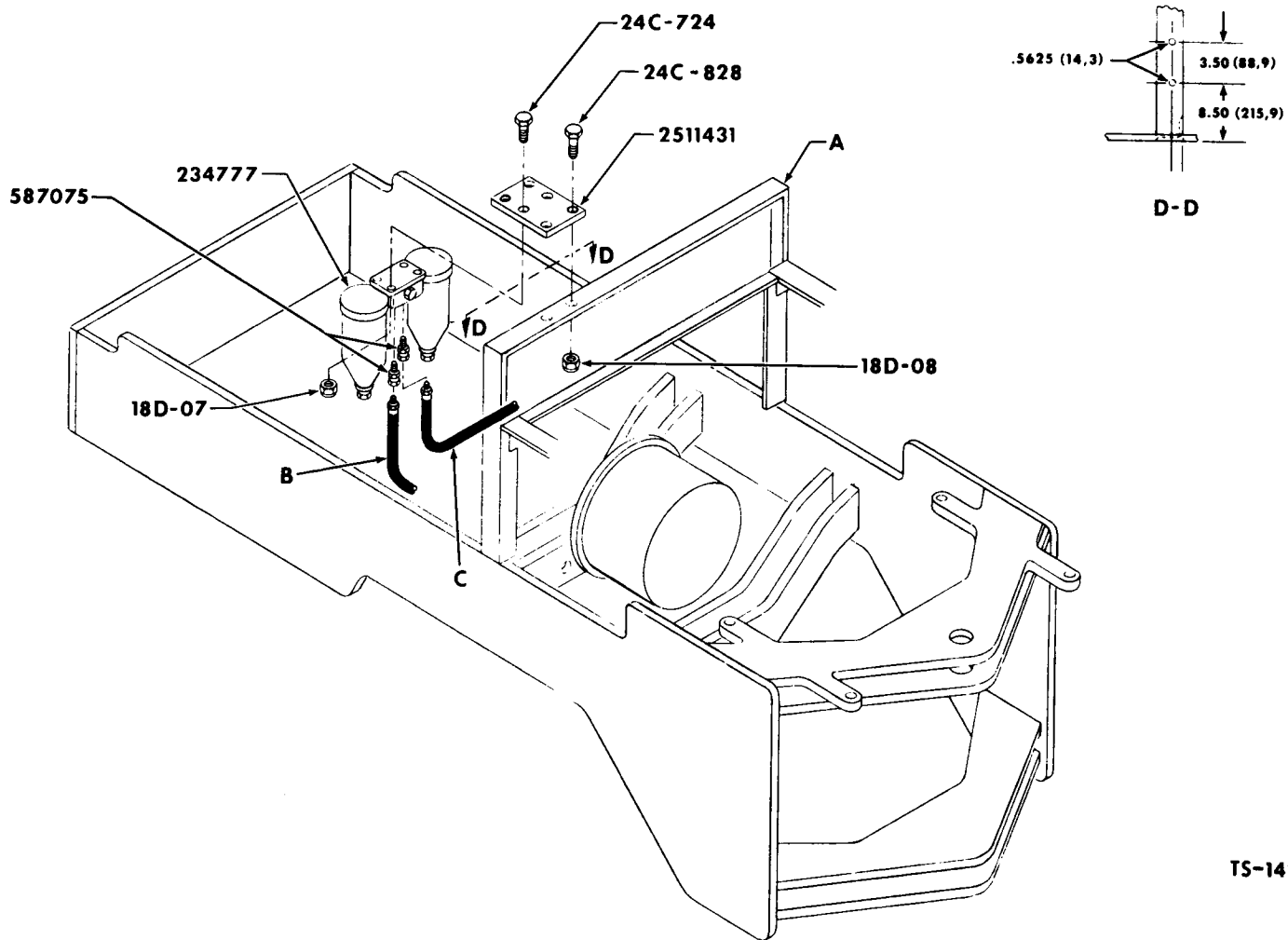
This improvement may be made, if desired, on subject model machines shipped from the factory with serial numbers prior to the above by ordering parts listed below and installing them in accordance with the following instructions.

PARTS REQUIRED (per machine):

1 - 234777	Filter Assembly
1 - 2511431	Mounting Bracket
2 - 587075	Adapter Union - Straight
2 - 24C-828	Bolt
2 - 18D-08	Locknut
4 - 24C-724	Bolt
4 - 18D-07	Locknut

INSTALLATION:

1. Remove existing transmission filter assembly and bracket.
2. Refer to Figure 1 and drill two .5625 (14,3) diameter holes in the upper support angle according to dimensions shown.
3. Install 2511431 Mounting Bracket on upper support angle as shown using two 24C-828 Bolts and two 18D-08 Locknuts.
4. Install 234777 Filter Assembly on mounting bracket as shown using four 24C-724 Bolts and four 18D-07 Locknuts.
5. Connect existing hoses to filter assembly as shown using two 587075 Adapter Unions.



TS-14205

Figure 1

- A - Upper Support Angle
- B - Inlet Hose from Pump
- C - Outlet Hose to Trans.

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Service gram

26 Jan. 79

MICHIGAN SG-742
Group Ref. No. 2300

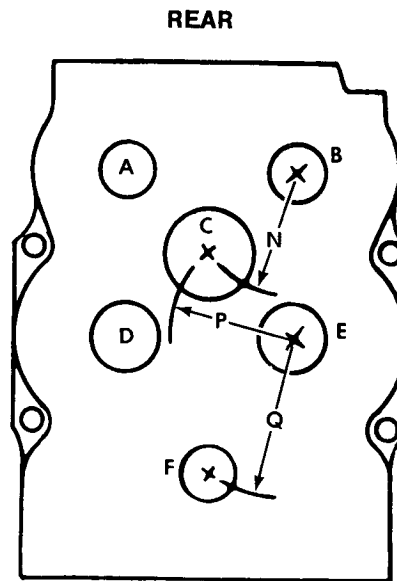
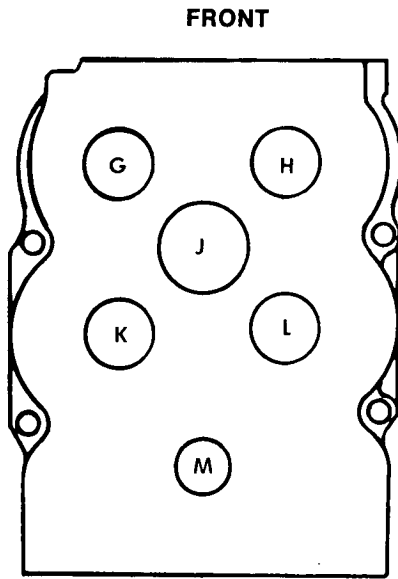
SUBJECT: Transmission Case Bore Size Dimensions — All Models

Information on transmission case bore size dimensions is needed occasionally.

The chart that is with this servicegram gives minimum and maximum bore size dimensions and nominal center distances.

Because each transmission case is different from the other, the maximum outside dimensions cannot be given for any bore. This must be determined by a reliable machinist.

TRANSMISSION CASE BORE SIZES (INCHES)
3000, 4000, 5000, 8000, & 16000 Series



TS-15402

TRANSMISSION	BORE	MAXIMUM	MINIMUM	CENTER DISTANCE	NOMINAL
3000 Series 4 & 5 Speed	A & B	3.1506	3.1496	N & P Q	6.7185 9.0015
	C & J	5.5125	5.5115		
	D, E, G, H, K & L	3.9380	3.9370		
	F & M	3.6260	3.6250		
4000 Series 4 & 5 Speed	A & B	3.1506	3.1496	N & P Q	6.7185 9.0015
	C & J	5.5125	5.5115		
	D, E, G, H, K, L	3.9380	3.9370		
	F & M	4.3317	4.3307		
5000 Series 4 Speed	A & B	4.3317	4.3307	N & P Q	7.6015 10.4015
	C	5.9065	5.9055		
	D & E	4.5025	4.5015		
	F & M	4.7254	4.7244		
	G, H, K & L	3.9380	3.9370		
	J	4.4385	4.4375		
5000 Series 8 & 9 Speed	A & C thru M	Same As 4 Speed		N, P & Q	Same as 4 Speed
	B	7.3770	7.3750		
8000 Series 4 Speed	A, B & J	5.5125	5.5115	N & P Q	9.3765 12.0015
	C	6.6940	6.6925		
	D & E	5.3780	5.3770		
	F & M	5.3760	5.3750		
	G, H, K & L	4.9223	4.9213		
8000 Series 8 & 9 Speed	A & C thru M	Same As 4 Speed		N, P & Q	Same as 4 Speed
	B	8.7520	8.7500		
16000 Series 4 Speed Drop Output	A & B	4.5025	4.5015	N & P Q	10.3015 10.0015
	C	7.8750	7.8735		
	D & E	6.3017	6.3007		
	F & M	6.3760	6.3750		
	G & H	5.9066	5.9055		
	J	6.7510	6.7500		
	K & L	5.9065	5.9055		
16000 Series 8 Speed	A & C thru M	Same As 4 Speed		N, P & Q	Same as 4 Speed
	B	10.3140	10.3120		

CLARK

Service gram

March 1980

MICHIGAN SG-795
Group Ref. No. 2300

SUBJECT: Transmission Input and Reverse Shaft Revision
Model 4421 Transmission Assembly with serial numbers before 84026XJ

Model 175B Tractor Shovel with S/N:

Cummins 438C
G.M. 427C

Input and reverse shafts made of different material are now available for machines with serial numbers listed above.

The new shafts are stronger for better reliability.

The new input shaft part number is 238550, which replaces part number 237946.

The new reverse shaft part number is 238551, which replaces part number 237947.

Whenever the transmission is serviced, check the shafts at this time.

See Figure 1 for correct shaft identity.

If the shafts are in the suspecting range, replace them. Order the parts from the parts list below and follow the installation instructions.


PARTS NEEDED FOR ONE MACHINE:

1 - 238550	Input Shaft
1 - 238551	Reverse Shaft
1 - 217555	Gasket
1 - 217653	Gasket
6 - 25K40026	O-rings
2 - 217558	Gasket
1 - 206864	Seal
1 - 25K40112	O-ring
1 - 1F432	Cotter Pin
4 - 217600	Ring
3 - 91F10	O-ring

INSTALLATION:

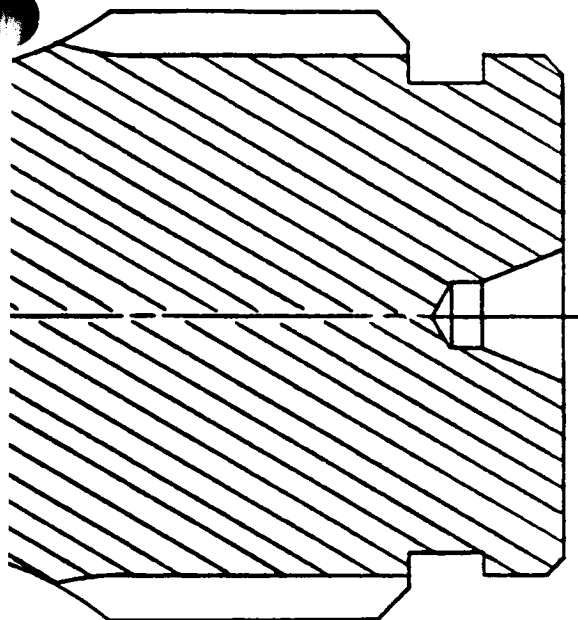
(See Transmission Shop Manual No. 2995 for additional information).

1. Put the machine on a level surface.

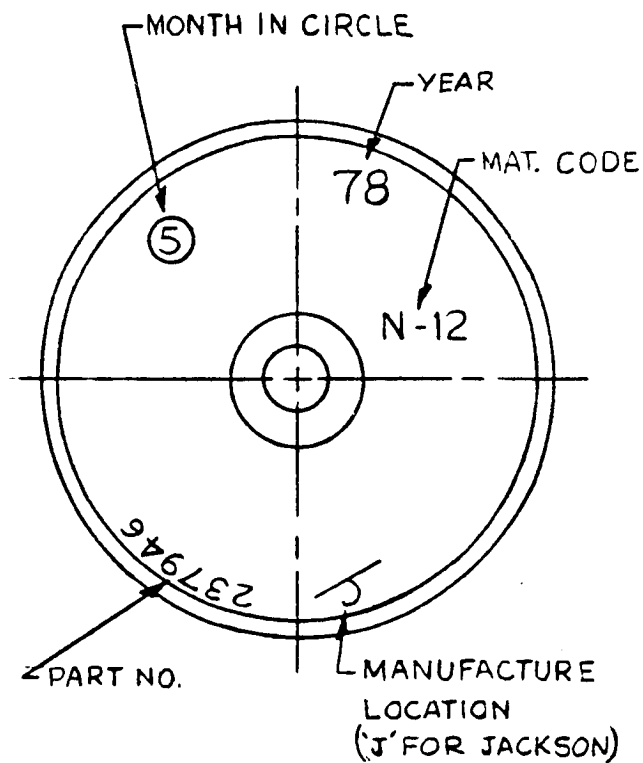
2. Put the machine in the 'service' position: Bucket on the ground, parking brake applied, engine stopped, ignition key removed, red warning flag on steering wheel, safety link connected, wheels blocked.
3.  Loosen the hydraulic reservoir cap slowly to reduce pressure in the reservoir.
4. Remove the oil from the main hydraulic reservoir. NOTE: *Before disassembling the transmission, the exterior of the unit must be thoroughly cleaned to prevent dirt and other foreign matter from entering the mechanism.*
5. Remove the forward, reverse, 3rd and 4th clutch cover bolts (Item 1, Figure 2).
6. Remove the clutch cover and gasket (Items 2 and 3, Figure 2). Discard the gasket.
7. Check the input and reverse shafts. See Figure 1 for correct identification. If one or both shafts have the suspect code, replace both of them at this time.
8. Remove the operators seat, heater assembly (if equipped) and the floor plate. This will permit access to the control cover assembly on the transmission.
9. Remove the tube, hoses, elbows and o-rings from the control cover assembly. Discard the o-rings. Keep the other parts for re-use.
10. Remove the control cover bolts and lockwashers (Items 14 thru 18, Figure 2).
11. Remove the control cover (Item 13, Figure 2), gasket and o-rings (Items 12 and 19, Figure 2). Discard the gasket and o-rings.
12. See Figure 2 and remove the retaining rings and clutch assemblies from the clutch supports (Items 4, 5, 6, 48, 49 and 50). Discard Items 6 and 48.
13. Remove the idler gear retainer ring and idler gear (Items 51 and 52, Figure 2).
14. Remove the clutch support bolts (Items 7 and 47, Figure 2).
15. Using a soft hammer, tap the clutch supports (Items 8 and 46, Figure 2) top and bottom and remove these from the transmission case.
16. Lock the transmission gears with a soft bar and remove 1 – cotter pin, nut, washer and o-ring (Items 33 thru 36, Figure 2) from the input flange. Remove the input flange (Item 32, Figure 2).
17. Remove the input shaft bearing cap bolts and washers (Item 31, Figure 2). Remove the bearing cap, seal and gasket (Items 28, 29 and 30, Figure 2). Discard the gasket and seal.
18. Remove the reverse shaft bolts and washers (Item 37, Figure 2). Remove the bearing cap and gasket (Items 38 and 39, Figure 2). Discard the gasket.
19. Remove the reverse shaft bearing retainer ring (Item 40, Figure 2).
20. Remove the input gear retainer ring (Item 26, Figure 2) from the ring groove.
21. Use a suitable shaft pusher tool and remove the input shaft and gear (Items 11 and 25, Figure 2) from the case. Remove the bearing and locating ring (Items 9 and 10, Figure 2) from the shaft. Discard the input shaft.
22. Remove the reverse gear retainer ring (Item 42, Figure 2) from the ring groove.
23. Use a suitable shaft pusher tool and remove the reverse shaft and gear (Items 11 and 43, Figure 2) from the case. Remove the bearing and locating ring (Items 44 and 45, Figure 2) from the shaft. Discard the reverse shaft.

24. Install the existing bearing and locating ring (Items 44 and 45, Figure 2) on the new reverse shaft. Install 1 — new 238551 Reverse Shaft into the transmission and through the reverse gear (Item 11, Figure 2) (hub of gear toward the rear of case).
25. Install the reverse gear retainer ring (Item 42, Figure 2).
26. Install the existing bearing and locating ring (Items 9 and 10, Figure 2) on the new input shaft. Install 1 — new 238550 Input Shaft into transmission through the input gear (Item 11, Figure 2) (hub of gear toward the rear of case).
27. Install the input gear retainer ring (Item 26, Figure 2) . Block the shaft on the rear of the case and drive the front bearing (Item 27, Figure 2) into position.
28. Block the reverse shaft (Item 43, Figure 2) on the rear of the case and drive the front bearing (Item 41, Figure 2) into position.
29. Install the reverse shaft front bearing retainer ring (Item 40, Figure 2).
30. Install 1 — new 217558 Gasket on the reverse shaft bearing cap (Item 38, Figure 2). Position cap over bearing.
31. Install the bearing cap bolts and washers (Item 37, Figure 2). Tighten the bolts to a torque of 20-25 lbf·ft (27,1-33,4 N·m) (2,8-3,5 kgf·m).
32. Apply a thin coat of Permatex No. 2 or equal on outer diameter of the new 206864 Input Shaft Oil Seal (Item 30, Figure 2). With the lip of the seal inward, press oil seal into bearing cap (Item 29, Figure 2). Install 1 — new 217558 Gasket on the input shaft bearing cap. Position cap on input shaft.
33. Install the bearing cap bolts and washers (Item 31, Figure 2). Tighten the bolts to a torque of 20-25 lbf·ft (27,1-33,4 N·m) (2,8-3,5 kgf·m).
34. Install the input flange, 1 - new 25K40112 O-ring, flange washer and nut (Items 32, 33, 34 and 36, Figure 2).
35. Lock gears with a soft bar and tighten the input flange nut to a torque of 150-175 lbf·ft (203,4-237,3 N·m) (20,7-24, 2 kgf·m). After tightening the nut, install 1 — new 1F432 Cotter pin (Item 35, Figure 2) through the nut.
36. Install the input and reverse clutch supports (Items 8 and 46, Figure 2).
37. Align the holes in the clutch supports with holes in the transmission case and install the bolts (Items 7 and 47, Figure 2). Tighten the bolts to a torque of 75-85 lbf·ft (104,7-115,2 N·m) (10,4-11,7 kgf·m).
38. Install the idler gear and retainer ring (Items 51 and 52, Figure 2).
39. Install new 217600 Clutch Support Piston Rings (Items 6 and 48, Figure 2). Lock rings in position. Lubricate the piston rings with transmission fluid.
40. Install the clutch assemblies and retaining rings (Items 4, 5, 49 and 50, Figure 2).
41. Install 1 — new 217555 Gasket (Item 3, Figure 2) on the forward, reverse, 3rd and 4th clutch cover (Item 2, Figure 2).
42. Install the clutch cover on the transmission by using the existing bolts and washers (Item 1, Figure 2). Tighten the bolts to a torque of 20-25 lbf·ft (27,1-33,4 N·m) (2,8-3,5 kgf·m).

43. Install 6 — new 25K40026 O-rings (Item 19, Figure 2) and 1 — new 217653 Gasket (Item 12, Figure 2) onto the transmission case. Install the control cover assembly (Item 13, Figure 2) using existing bolts and lock-washers (Items 14 thru 18, Figure 2). Tighten the bolts to a torque of 20-25 lbf·ft (27,1-33,4 N·m) (2,8-3,5 kgf·m).
44. Install 3 — new 91F10 O-rings and the existing tube, hoses and elbows into the control cover.
45. Reinstall the floorplate, heater assembly (if equipped) and the operators seat in the cockpit.
46. Check all connections and make sure they are tight. Refill the hydraulic oil reservoir with oil. Install the cap.
47. Disconnect the safety link. Remove blocks from wheels. Start the engine. Check the machine for proper operation.
48. Stop the engine. Check the main hydraulic reservoir and refill if necessary.
49. Remove warning tag from steering wheel.



4421 TRANS. INPUT SHAFT
CLUTCH END OF SHAFT



TRANSMISSION SHAFT IDENTIFICATION

MODEL 4421 TRANSMISSION

SUSPECT SHAFTS

No month stamp 78

(2) 79

(9) 78

(12) 78

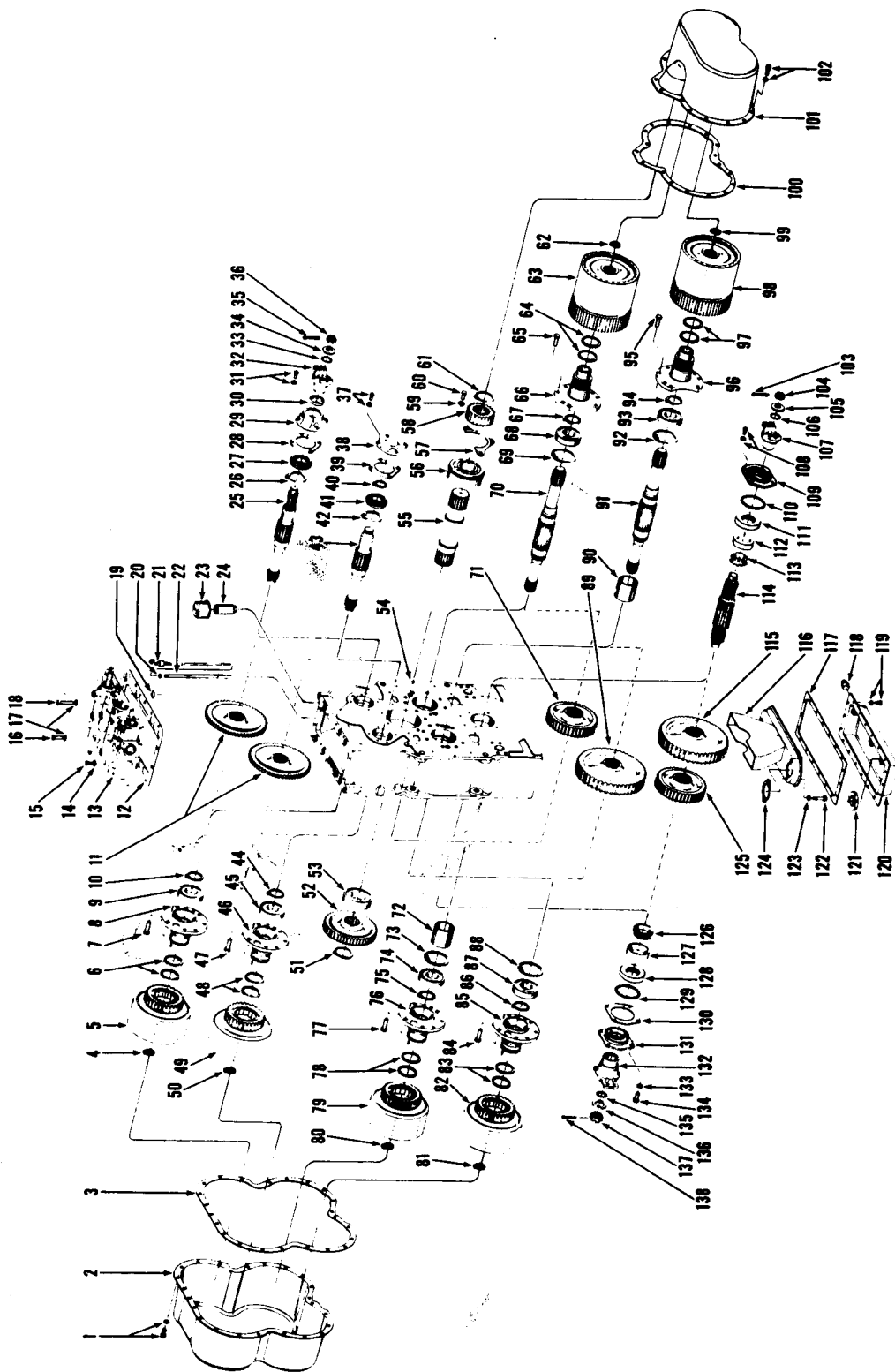
GOOD SHAFTS

(5) - 79 & later

No month stamp 79

TS-15772

Figure 1



TS-4862

Figure 2

CLARK

Service gram

April 1981

MICHIGAN SG-869
Group Ref. No. 2300

SUBJECT: Transmission Clutch Oil Supply and Lubrication Tube Replacement

Clark Series 3000, 5000, 8000, 16000, 18000 and 28000 Power Shift Transmissions

Whenever replacement of a transmission clutch oil supply tube or a lubrication tube is necessary follow the procedure listed below for correct removal and installation.

If the tube and sleeve are damaged, both must be removed. If the tube is fastened with a clip, remove it also.

Install the new tube into the transmission or converter housing. Some transmissions use a sleeve on both ends of the tube. Other transmissions will use an o-ring on one end of the tube and a sleeve on the other end.

A special tube expander is used to expand the tube in the sleeve to make an oil tight connection.

The tube expander has rollers which expand when the mandrel is installed into the tube. When the mandrel is turned, the rollers expand against the internal bore of the tube. The tube will then expand against the tube sleeve which has a groove on the inside diameter. When the tube expands into the groove it will hold tightly in position.

Use the correct tube expander for each transmission as listed below:

Tool No. CE-805 – For use with .500 in (12,70 mm) O.D. Tubes

This tool is used for the clutch supply and lubrication tubes in Series 3000, 4000, 5000, 8000 and 28000 power shift transmissions.

NOTE: Use this tool on all 18000 Series power shift transmissions built BEFORE serial number 152336-W.

For 18000 Series transmissions built AFTER serial number 152336-W, use Tool No. CE-805 for the Clutch supply tube and Tool No. CE-817 for the lubrication tubes.

Tool No. CE-817 – For use with .625 in (15,88 mm) O.D. Tubes

This tool is used for the 16000 Series Power Shift Transmission and the lubrication tube on all 18000 Series transmissions built AFTER serial number 152336-W.

Tool No. CE-855 – For use with 1.000 in (25,40 mm) O.D. Tubes.

This tool is used for the HR 28000 Series transmission converter housing pump suction tube.

The above tube expanders and parts can be purchased from the Nuday Company, 2291 Elliott Avenue, Troy, MI 48084
Telephone: (313) 585-2450.

When replacement of a transmission tube becomes necessary, follow the instructions listed below for correct use of the tube expander.

1. Install the tubing into the transmission case with the end of the tube level with the case.

NOTE: See Figure 1 for the HR 28000 Series Transmission pump suction tube dimension.

2. Install the tube sleeve over the end of the tube and press it into the bore of the transmission case.
3. Pull the mandrel shaft out as far as it will go and install the expander into the tube in the transmission case (See Figures 2 and 3).
4. Turn the mandrel by hand until the tool is firmly installed into the transmission tube. Use a wrench to turn the mandrel as far as possible (See Figure 4).
5. Remove the mandrel from the transmission tube and check the tube for proper installation.

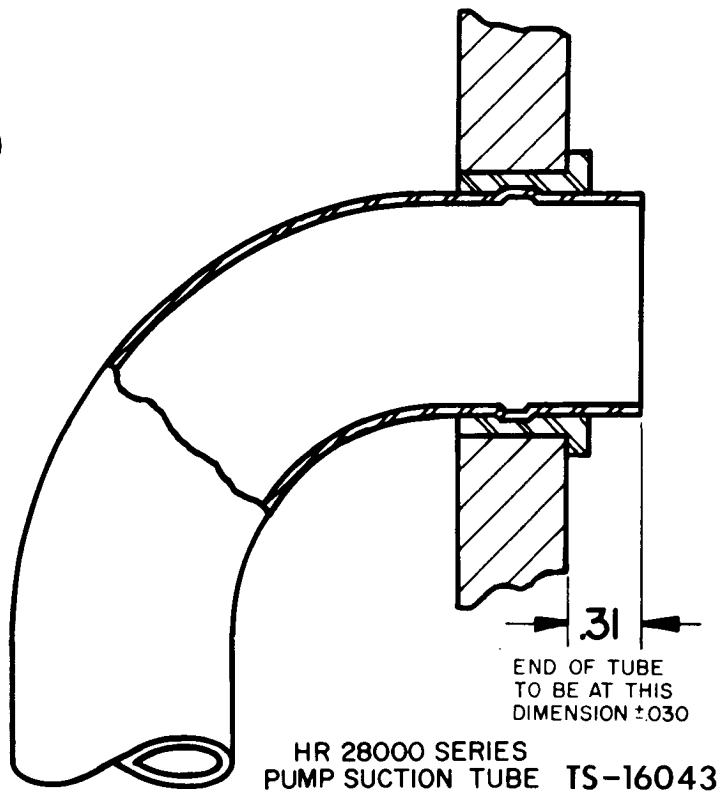


Figure 1

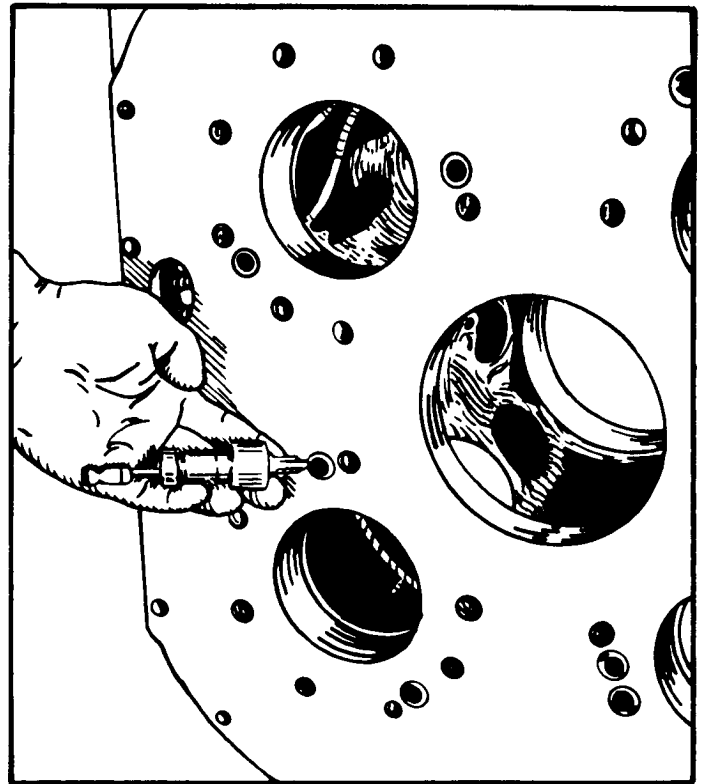
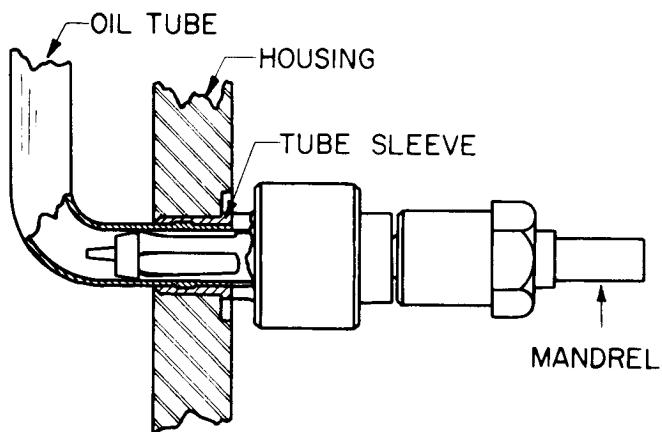


Figure 2

TS-16040



TS-16042

Figure 3

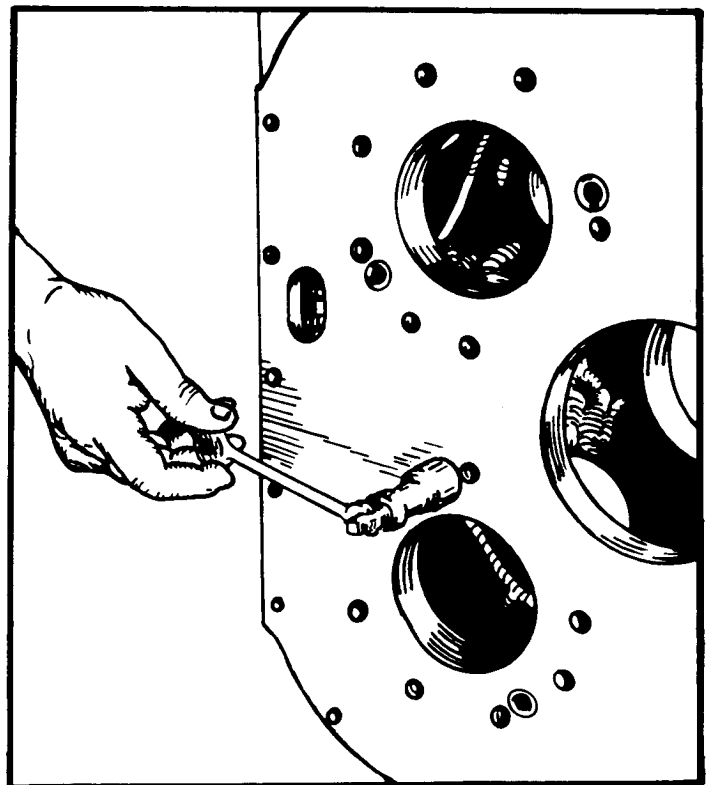


Figure 4

TS-16041

CLARK

Service gram

July 1982

MICHIGAN SG - 896
Group Ref. No. 1300
2200
2300

SUBJECT: Modulated Transmission Conversion
Model 175B Wheel Loader with S/N:
Cummins 438C101 thru 999
GM 427C101 thru 999 (Equipped with Young Radiators)

The standard non-modulated transmissions installed on model 175B Wheel Loaders with serial numbers listed above can now be converted to modulated transmissions by using the parts and by following the installation instructions.

The modulated transmission conversion will give greater machine performance and faster operating times.

PARTS LIST FOR ONE MACHINE:

Cummins and GM Powered Machines:

1 - 228996	Converter Charging Pump	3 - 203253	Stud
20 - 232778	Disc	18 - 238174	Disc
12 - 238196	Pin	12 - 238195	Spring
2 - 220806	Ring	1 - 237156	Gasket
1 - 238197	Spacer	1 - 238319	Control Cover - Modulator Valve
2 - 238413	Support		
2 - 238739	Piston	2 - 238829	Hub
2 - 240251	Plate Assy.	(1) 1 - 229778	Gear
2 - 240188	Drum and Hub Assy.	(1) 1 - 238406	Shaft
1 - 11F12	Plug	23 - 21C632	Screw
1 - 217653	Gasket	1 - 235961	Gasket
23 - 237328	Washer		

(1) For machines using 29.5 - 25 Tires ONLY

Order the following parts for CUMMINS POWERED MACHINES only:

1 - 2529877	Bottom Tank and Oil Cooler Assy.	1 - 948935	Gasket
1 - 963765	Fan Shroud	1 - 2530359	Tube
1 - 2530358	Hose	1 - 1M20040	Hose
4 - 43H1294	Clamp	1 - 2529915	Fan
6 - 17C836	Bolt	6 - 4E8	Lockwasher
2 - 2530235	Fan Guard	8 - 33C616	Bolt
18 - 27E6	Washer	5 - 86D6	Nut
4 - 18C620	Bolt	4 - 1527276	Vibration Mount
2 - 569739	Vibration Mount	2 - 2519609	Bracket
1 - 533608	Flat	5 - 522906	Block

1	- 2529878	Bottom Tank and Oil Cooler Assy.	1	- 1544788	Block
1	- 963802	Fan Shroud	1	- 533608	Flat
4	- 1527276	Vibration Mount	1	- 234777	Filter Assy.
1	- 2529831	Tube	2	- 215502	Element
1	- 2529916	Fan	2	- 16K10	Connector
6	- 17C544	Bolt	2	- 2530639	Tee
6	- 4E5	Lockwasher	2	- 11K10	Elbow
2	- 2530419	Fan Guard	8	- 18C728	Bolt
8	- 33C616	Bolt	8	- 86D7	Nut
18	- 27E6	Washer	1	- 2530627	Tube
5	- 18C620	Bolt	8	- 19J24	Flange Half
6	- 86D6	Nut	4	- 77K225	O-ring
1	- 2538563	Pulley	12	- 17C824	Bolt
1	- 963753	Belt Set	1	- 2534891	Hose
2	- 1M22044	Hose	4	- 17C820	Bolt
4	- 43H1319	Clamp	1	- 2530632	Hose
2	- 569739	Vibration Mount	2	- 19J16	Flange Half
2	- 2531036	Bracket	1	- 77K219	O-ring
1	- 654451	Flat	4	- 17C620	Bolt
7	- 522906	Block	4	- 2503569	Clip
4	- 18C612	Bolt	1	- 25K60116	O-ring
2	- 2531254	Hose	1	- 209587	Seal
2	- 2511095	Clip	1	- 232978	Flange
1	- 2531255	Hose	1	- 25K40112	O-ring
1	- 1M20140	Hose	10	- 18C836	Bolt



Order the following parts for GM POWERED MACHINES only:

1	- 1544788	Block	1	- 2530635	Hose
1	- 234777	Filter Assy.	1	- 2530626	Tube
2	- 215502	Element	5	- 18C616	Bolt
2	- 17K10	Connector	1	- 1505890	Strainer
2	- 2530639	Tee	1	- 40K12	Plug
1	- 11K11	Elbow	1	- 89F11	Connector
1	- 12K11	Elbow	2	- 2530637	Hose
8	- 18C728	Bolt	2	- 2530640	Elbow
8	- 86D7	Nut	3	- 40K2	Plug
1	- 2530627	Tube	1	- 2530641	Tube
12	- 19J24	Flange Half	1	- 2530636	Hose
6	- 77K225	O-ring	1	- 2530638	Connector
1	- 17C824	Bolt	1	- 1324974	Elbow
1	- 2534891	Hose	1	- 2530633	Hose
4	- 17C820	Bolt	1	- 2527576	Elbow
1	- 2530632	Hose	1	- 2517078	Tee
2	- 19J16	Flange Half	1	- 2536855	Tube
1	- 77K219	O-ring	4	- 18C1232	Bolt
4	- 17C620	Bolt	4	- 27E12	Washer
3	- 2503569	Clip	4	- 19J32	Flange Half
5	- 18C616	Bolt	2	- 77K228	O-ring
1	- 2530631	Hose	16	- 17C824	Bolt
1	- 2526335	Hose	1	- 1925664	Propeller Shaft
1	- 2511095	Clip	1	- 222233	Flange
1	- 2534961	Hose	1	- 25K60116	O-ring
2	- 18C612	Bolt	1	- 209587	Seal
1	- 2530638	Connector	1	- 232978	Flange
1	- 1324974	Elbow	1	- 25K40112	O-ring
10	- 18C836	Bolt	2	- 1540463	Flat
4	- 27E8	Washer	2	- 86D8	Nut

1 - 2530638	Connector	2 - 1540463	Flat
1 - 1324974	Elbow	4 - 27E8	Washer
1 - 2530635	Hose	2 - 86D8	Nut
1 - 2531257	Tube	1 - 2536855	Tube
5 - 18C616	Bolt	4 - 18C1232	Bolt
1 - 1505890	Strainer	4 - 27E12	Washer
1 - 40K12	Plug	4 - 19J32	Flange Half
1 - 89F11	Connector	2 - 77K228	O-ring
2 - 2530637	Hose	16 - 17C824	Bolt
2 - 2530640	Elbow	3 - 40K2	Plug
1 - 2531256	Tube	3 - 6H28	Clip
1 - 2530636	Hose	1 - 2530638	Connector
1 - 1324974	Elbow	1 - 2530633	Hose
1 - 2527576	Elbow	1 - 2517078	Tee
12 - 19H24	Flange Half	6 - 77K225	O-ring
1 - 1925664	Propeller Shaft	1 - 222233	Flange

INSTALLATION:

NOTE: *For disassembly and assembly of the transmission, see Shop Manual No. 2995.*

1. Put the machine on a level surface.
2. Put the machine in the 'SERVICE' position: Bucket on the ground, parking brake applied, engine stopped, ignition key removed, red warning flag on steering wheel, safety link connected, wheels blocked.
3. Actuate boom and bucket control levers forward and backward, holding levers in forward and backward positions until all boom and bucket motion stops. Put both levers in neutral. The pressure should now be relieved in the boom and bucket systems.
4.  Let the machine become cool. Remove the hydraulic reservoir cap **slowly** to reduce pressure in the reservoir. Remove the fluid from the main hydraulic reservoir.
5.  Remove the cap from the radiator **slowly** to reduce pressure in the radiator. Remove the coolant from the radiator.
6. Remove the fluid from the transmission and torque converter.
7. Remove the existing mounting bolts, nuts and washers from the hood and grille assemblies. Remove the hood and grille from the machine. Keep all mounting hardware, hood and grille for reuse.
8. Remove all clamps, hoses and mounting hardware from the radiator assembly. Remove all fan guard attaching hardware. Remove the fan guards. Discard the fan guards, attaching hardware, lower radiator tube, hoses and clamps. Keep all other parts for reuse.
9. Remove the attaching hardware from the radiator assembly and remove the radiator from the machine. Remove the shroud and bottom tank assembly from the radiator. Discard the shroud and bottom tank assembly. Keep the radiator and all shroud and radiator attaching hardware for reuse.
10. Remove the existing fan mounting hardware. Remove the existing fan. Remove 1 of 3 - .80 in. (20,3mm) thick fan spacers. Discard the fan mounting hardware, fan and spacer. On GM powered machines remove the existing fan belts, crankshaft mounting bolt, and crankshaft pulley from the engine. Keep the crankshaft mounting bolt for reuse. Discard the pulley and belts.

11. Remove all hydraulic system hoses, bolts, flanges, o-rings and other attaching parts from the existing torque converter assembly. Remove the torque converter to transmission propeller shaft. **NOTE:** *MICHIGAN SERVICE GRAM SG-816B gives instructions for the installation of an improved torque converter impeller hub bearing. If the machine has not had the improved impeller hub bearing installed, it must be done at this time. Follow the instructions as shown on SG-816B. IMPORTANT: For machines using 29.5 - 25 tires, the torque converter driven gear (Item 30, Figure 10) and the turbine shaft (Item 57, Figure 10) must be changed.*

Discard the hoses, o-rings, flanges, gaskets and the propeller shaft. Keep the other parts for re-use.

12. Remove the existing transmission piping and the transmission assembly from the machine. See Figures 1 and 2 and install all new transmission and transmission clutch parts as shown. Keep the existing transmission hydraulic system filter assembly, the transmission mounting brackets and hardware, the hose and tube assembly that connects the lower right hand rear port on the transmission to the bottom of the torque converter, and the dipstick filler tube assembly. Discard all other parts.
13. Remove the existing bolts, flanges, hoses and o-rings from the rear main valve supply and return tubes. Discard the o-rings, bolts and flanges. Remove the existing main valve supply and return tube assembly from the rear frame. Discard the tube assembly and mounting hardware.
14. See Figure 3 for Cummins powered machines, Figure 4 for GM powered machines and rework the rear frame assembly as shown.
15. See Figure 5 and rework the pivot plate area of the frame assembly as shown. Install the new 2536855 tube assembly and mounting hardware as shown. Install the existing hoses using 4 - new o-rings, 8 - new flanges and 16 - new bolts as shown on the chart.
16. For GM powered machines, see Figure 7 and install 1 - new 2538563 Crankshaft Pulley, using the existing bolt, at this time. Tighten the bolt to a torque of 180 lbf·ft (244,0 N·m) (24,9 kgf·m). Using a 2 to 3 lb. (0,9 to 1,4 kg) lead hammer, strike the end of the bolt. Tighten the bolt to a torque of 300 lbf·ft (406,7 N·m) (41,5 kgf·m). Hit the end of the bolt again with the hammer. Tighten the bolt again to a torque of 300 lbf·ft (406,7 N·m) (41,5 kgf·m).
17. On GM powered machines only, lower the fan pulley assembly 1 in. (25,4 mm). Install 1 - new 3 Belt set (Part No. 963753, see Figure 7). Tighten the belts to 100 lbs. (45,4 kg) tension.
18. See Figure 6 for Cummins powered machines and install 1 - new 2529915 Fan. Install 6 - new 17C836 Bolts and 4E8 lockwashers. See Figure 7 for GM powered machines and install 1 - new 2529916 Fan. Install 6 - new 17C544 Bolts and 4E5 Lockwashers. Tighten the bolts to the correct torque as shown on Figure 6 or 7.
19. See Figure 8 for Cummins powered machines or Figure 9 for GM powered machines and install the transmission. Install all component parts as shown. After installing the existing transmission mounting brackets, tighten the transmission to mounting bracket bolts to a torque of 425 to 525 lbf·ft (576,2 to 711,8 N·m) (58,8 to 72,6 kgf·m). Tighten the transmission mounting bracket to frame bolts to a torque of 300 to 330 lbf·ft (406,7 to 447,4 N·m) (41,5 to 45,6 kgf·m) **NOTE:** *Make sure that all hoses do not rub any sharp corners or any other hoses.*
20. If the converter was removed for rework (See Step 11) install it at this time. Remove the existing nuts, lockwashers, studs, converter charging pump and gasket from the converter. See Figure 10 and install 1 - new 235961 Gasket, 1 - new 228996 Converter Charging Pump, 3 - new 203253 Studs, existing lockwashers and nuts onto the converter assembly. Discard the existing converter charging pump, gasket and studs.
21. See Figures 6 and 8 for Cummins powered machines, 7 and 9 for GM powered machines and install the reworked radiator assembly, radiator coolant connections, steering system cooling connections and fan guard. Tighten all bolts to the correct torque specifications as shown.

22. See Figure 11 and remove, rework and install the existing steering crossover tube assembly onto the rear frame as shown. Install the new torque converter to transmission propeller shaft, using the parts and following the installation instructions as shown.
23. **NOTE:** *New heavy duty propeller shafts and flanges may be installed at this time. See MICHIGAN Service Gram SG-878B for complete installation instructions. If new propeller shafts are not going to be used, install the existing propeller shafts using the existing hardware at this time. Tighten the bolts to a torque of 65 to 75 lbf·ft (88,1 to 101,7 N·m) (9,0 to 10,4 kgf·m).*
24. Make sure all connections are tight. Make sure the radiator draincocks are closed. Fill the radiator with the correct amount of coolant. Install the cap. Fill the hydraulic fluid reservoir to the FULL mark on the dipstick with the correct type of fluid. Install the reservoir cap.
25. Before starting engine, add 12.5 gal. (47,3L) of Clark Part No. 962669 or 962672 Transmission and Converter Fluid to the transmission. Start the engine. The fluid temperature must be 180° to 200°F (82° to 93°C). Operate the engine for three minutes. During this time, put the transmission in each speed range and both directions 2 times. The engine must be running at low idle. Put the transmission in NEUTRAL position. Check the transmission fluid level. Add fluid as needed until the fluid level is at the FULL mark. Look for fluid leakage. Stop the engine.
26. Check the transmission clutch pressure at this time. Follow the pressure check instructions as shown for the correct procedure and pressure specifications:

Pressure Check Conditions:

Condition 1: Transmission in FORWARD 3rd or 4th, in REVERSE 3rd or 4th and converter stalled.

Condition 2: Transmission in NEUTRAL position. Transmission range selector in 1,2,3 and 4 position.

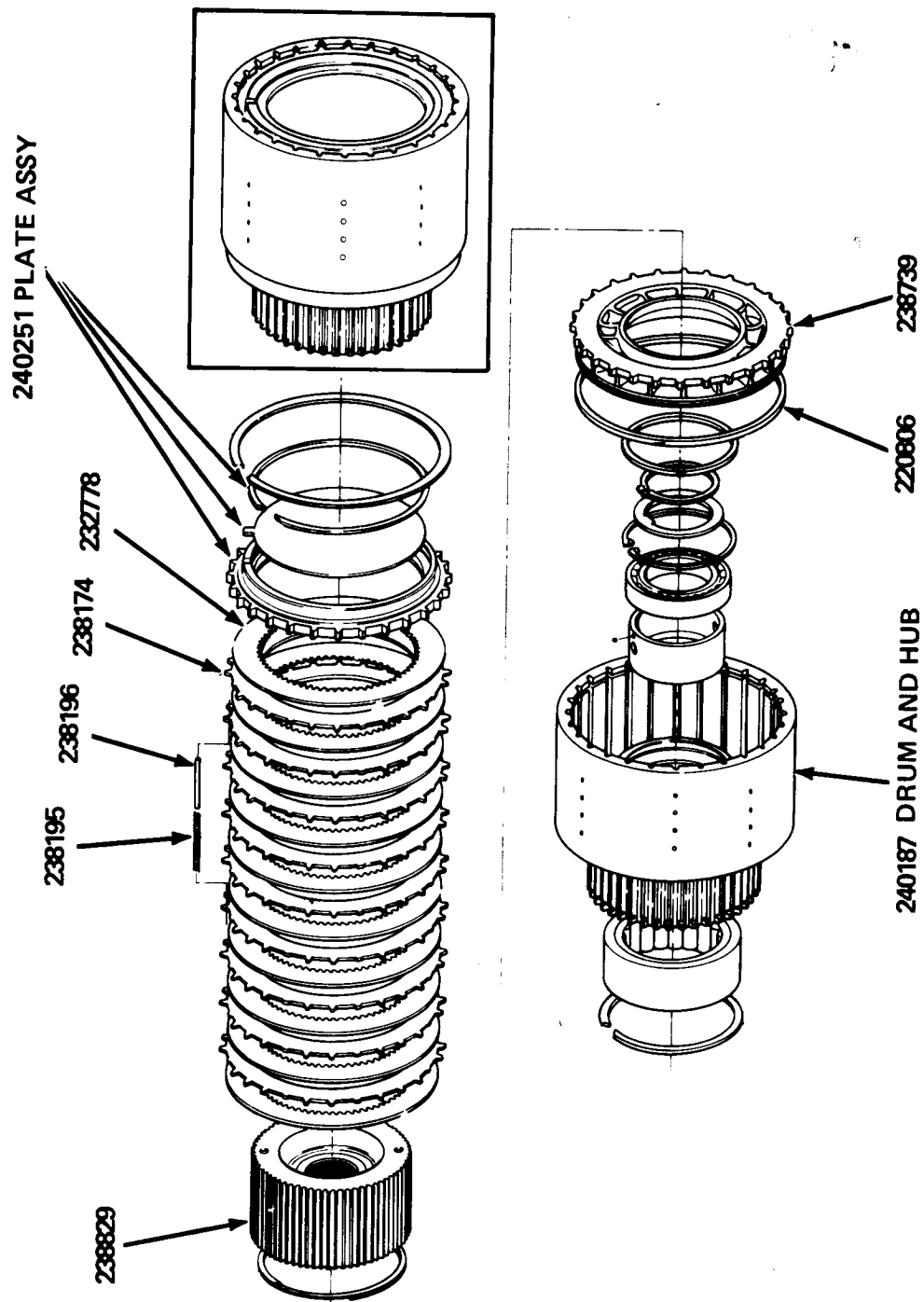
Lubrication Oil Pressure Check Procedure:

- (1) Install a 100 PSI (700 kPa) pressure gauge into the LUBE OIL pressure check port on the transmission (See Figure 6 for Cummins powered machines, Figure 7 for GM powered machines). Start the engine. The converter outlet fluid temperature must be 180° to 200°F (82° to 93°C) and the engine at full throttle. The normal pressure range is 20 to 25 PSI (138 to 172 kPa) with a 5 PSI (34 kPa) maximum differential under conditions 1 and 2. (16 PSI (110 kPa) minimum). **IMPORTANT:** *Do not let the oil become overheated.*
- (2) Check the lubrication oil pressure under conditions 1 and 2. (See pressure check conditions listed above).
- (3) Stop the engine. Remove the pressure gauge.

Transmission Fluid Pressure Check Procedure:

- (1) Install a 400 PSI (3000 kPa) gauge into the REGULATOR, FORWARD and REVERSE pressure check ports on the transmission (See Figure 6 for Cummins powered machines, Figure 7 for GM powered machines). Start the engine. Check the fluid pressure with the converter fluid temperature at 180° to 200°F (82° to 93°C) and the engine idle speed at 700 to 775 RPM.
- (2) REGULATOR pressure to be 240 to 280 PSI (1655 to 1932 kPa) with a 5 PSI (34 kPa) maximum differential as the transmission range selector is moved through 1,2,3 and 4 positions. FORWARD and REVERSE pressures may have a 15 PSI (103 kPa) maximum differential from the REGULATOR pressure.

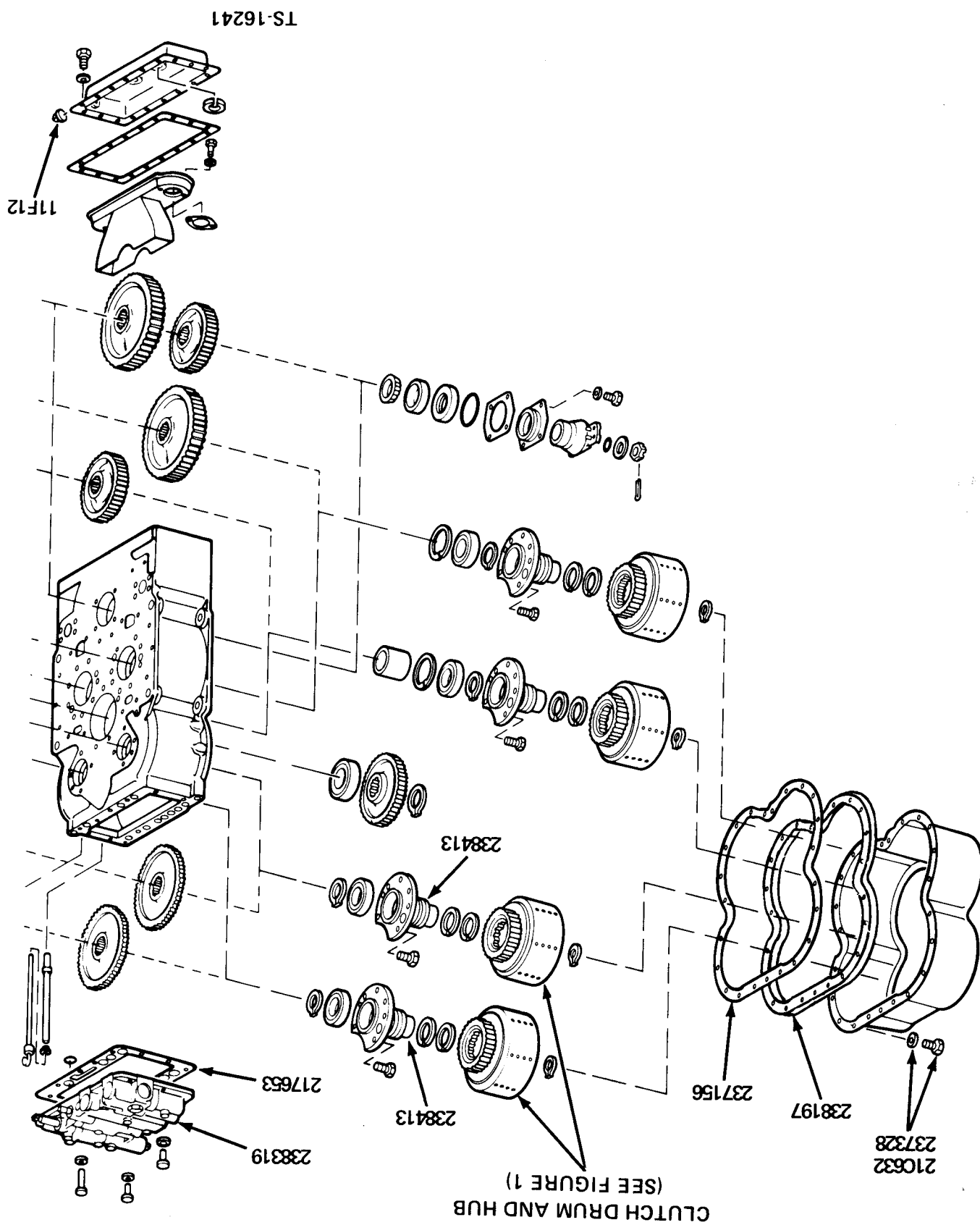
- (3) Check the REGULATOR pressure under conditions 1 and 2. (See pressure check conditions).
- (4) Check FORWARD and REVERSE pressures under condition 1 (See pressure check conditions).
- (5) Stop the engine. Remove the pressure gauge.
- 27. Replace the hood and grille assemblies using the existing hardware.
- 28. Remove warning flag from steering wheel. Disconnect safety link. Remove blocks from wheels.



TS - 16354

Figure 1
- 7 -
(11C14)

Figure 2



PROCEDURE

REMOVE ALL OLD WELD USING CARBON ARC (AIR ARC), GRINDER OR PNEUMATIC CHIPPER WHEN REQUIRED. OXY ACETYLENE TORCHES SHOULD NOT BE USED.

IF A CARBON ARC IS USED, THE AREA TO BE REWELDED SHOULD BE GROUND TO REMOVE CARBON DEPOSITS.

CLEAN AREA OF REPAIR REMOVING ALL GREASE, OIL, RUST AND SCALE FROM SURFACES TO BE JOINED.

DISCONNECT BATTERY GROUND CABLE WHEN WELDING ON MACHINE.

LOCATE PART AND WELD USING METAL ARC PROCESS IN ACCORDANCE WITH DRAWING SPECIFICATIONS.

NOTE

WELDER SHALL BE QUALIFIED FOR THE TYPE OF WELD BEING MADE IN ACCORDANCE WITH AWS D14.3 (LATEST ISSUE). QUALITY AND WORKMANSHIP OF WELD SHALL BE IN ACCORDANCE WITH AWS D14.3 (LATEST ISSUE).

WARNING

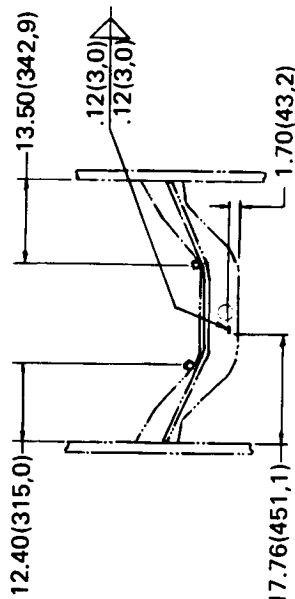
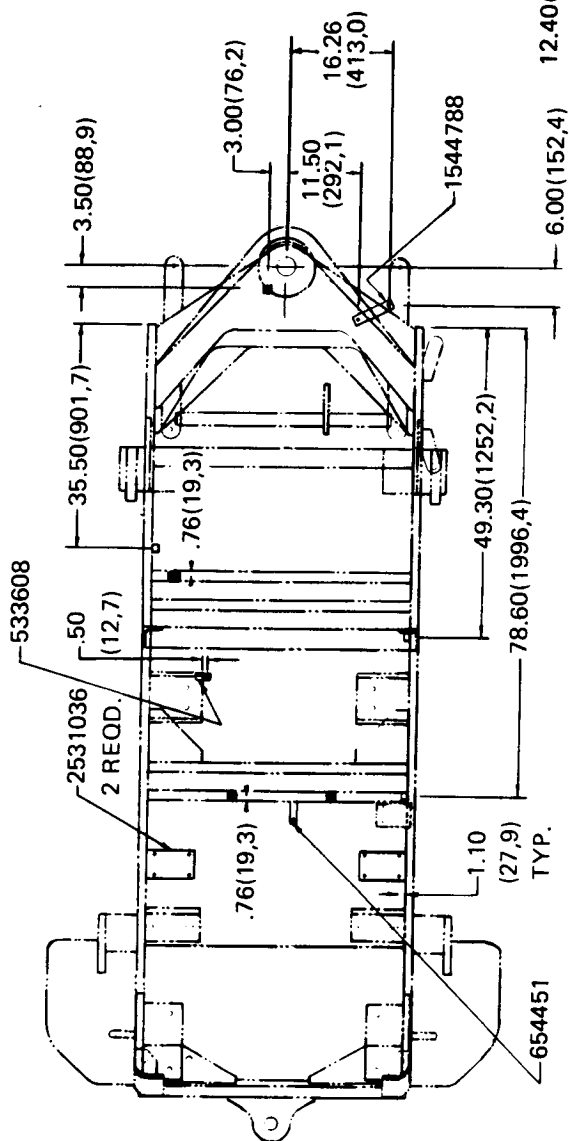
FAULTY WELDING OR IMPROPER INSTALLATION COULD CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



ELECTRODE:

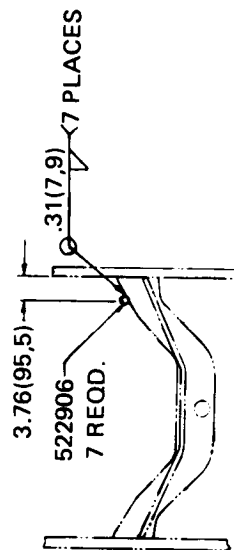
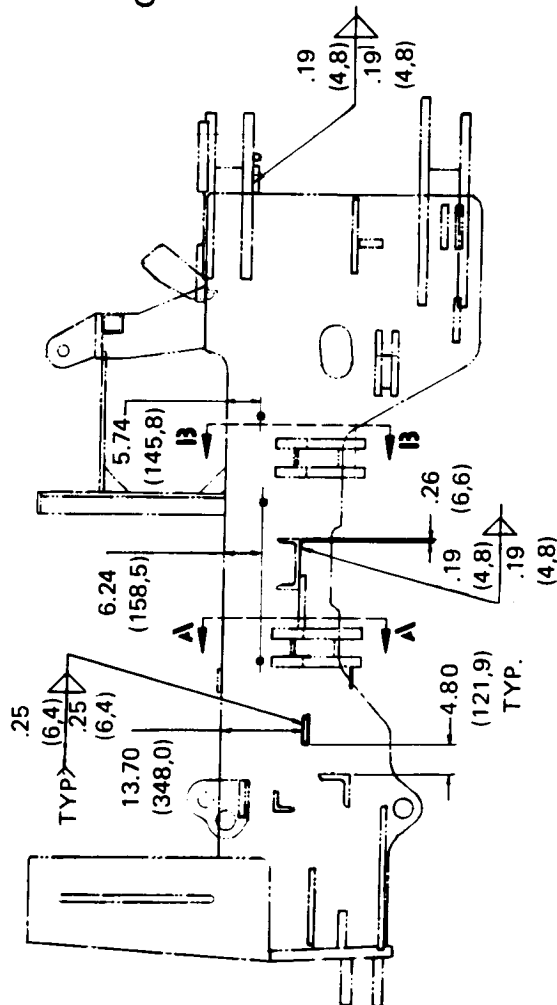
.156 (3,9) DIA. AWS E-7018 OR EQUIV.

NOTE:
REMOVE EXISTING TAPPED
BLOCKS THAT INTERFERE
WITH INSTALLATION OF
NEW PARTS



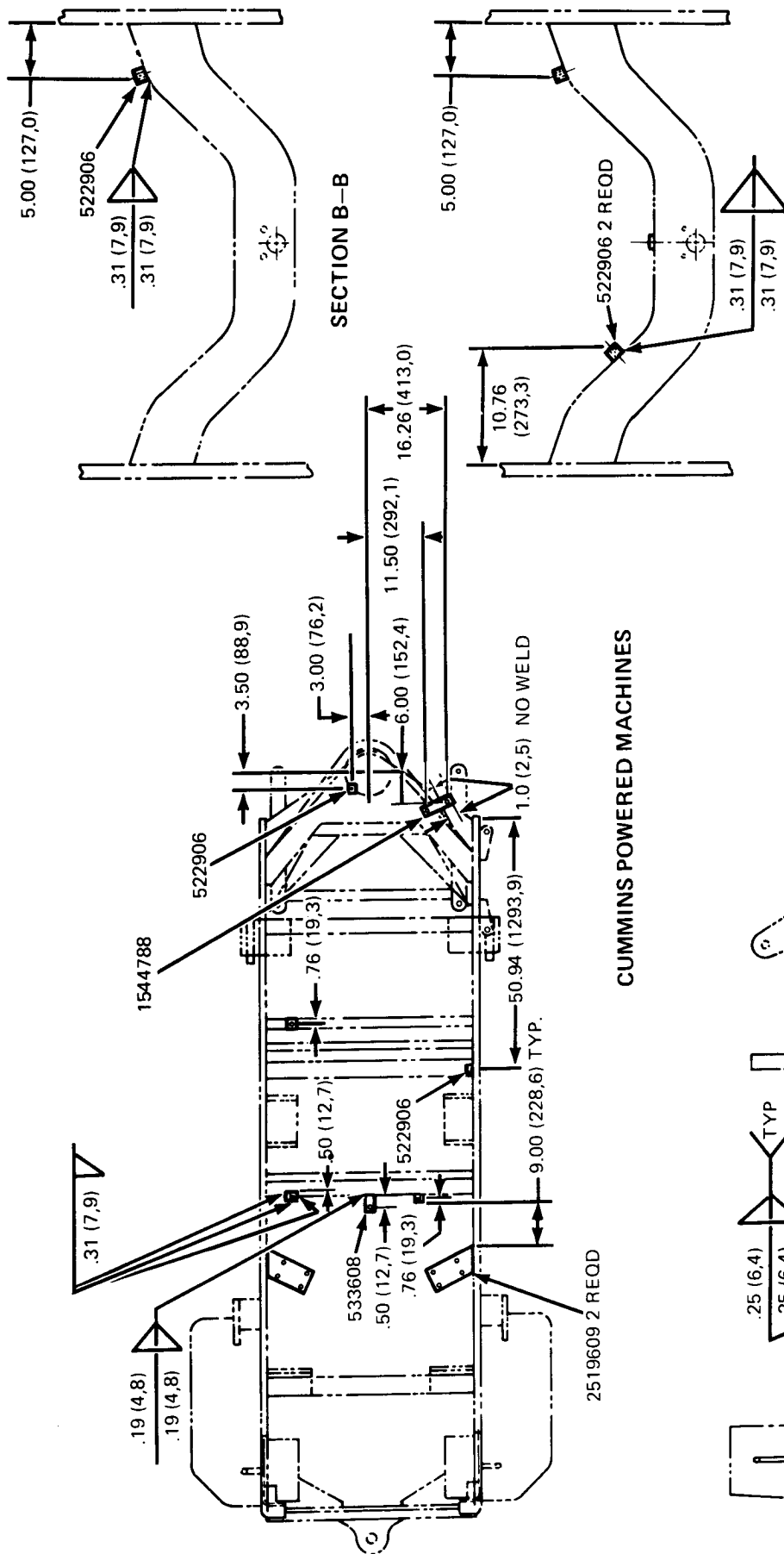
SECTION A-A

GM POWERED MACHINES



SECTION B-B

TS-16194



CUMMINS POWERED MACHINES

PROCEDURE

REMOVE ALL OLD WELD USING CARBON ARC, AIR ARC, GRINDER OR PNEUMATIC CHIPPER WHEN REQUIRED. OXYACETYLENE TORCHES SHOULD NOT BE USED.

IF A CARBON ARC IS USED, THE AREA TO BE REWELDED SHOULD BE GROUND TO REMOVE CARBON DEPOSITS.

CLEAN AREA OF REPAIR REMOVING ALL GREASE, OIL, RUST AND SCALE FROM SURFACES TO BE JOINED.

DISCONNECT BATTERY GROUND CABLE WHEN WELDING ON MACHINE.

LOCATE PART AND WELD USING METAL ARC PROCESS IN ACCORDANCE WITH DRAWING SPECIFICATIONS.

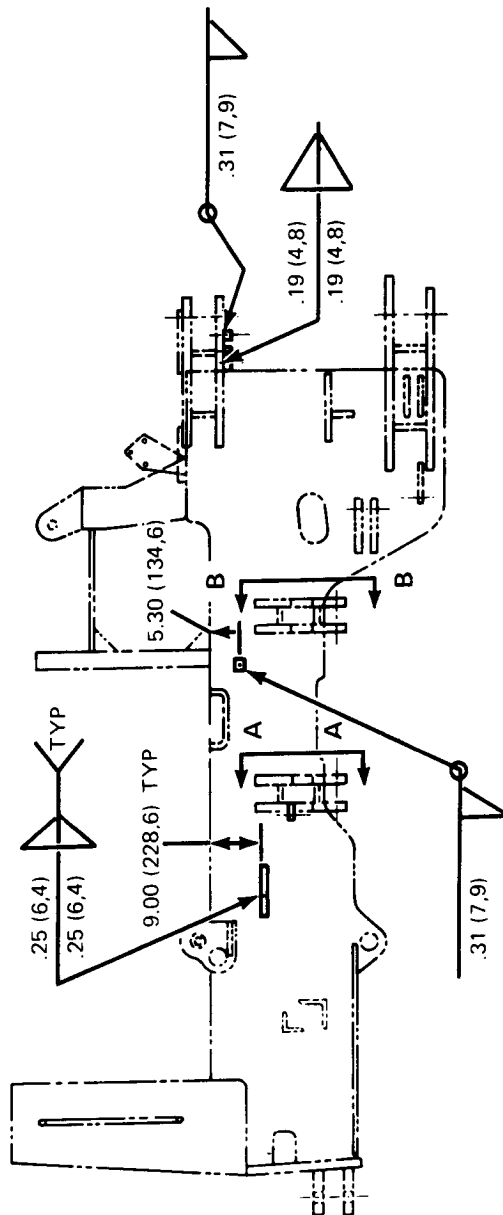
NOTE

WELDER SHALL BE QUALIFIED FOR THE TYPE OF WELD BEING MADE IN ACCORDANCE WITH AWS D14.3 LATEST ISSUE.

QUALITY AND WORKMANSHIP OF WELD SHALL BE IN ACCORDANCE WITH AWS D14.3 LATEST ISSUE.

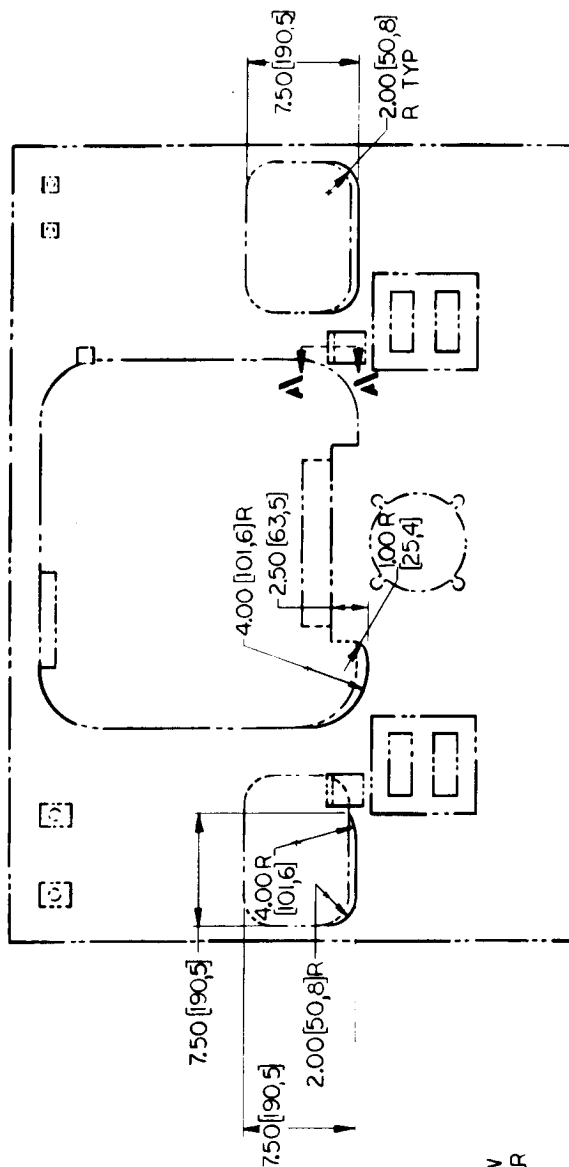
WARNING

FAULTY WELDING OR IMPROPER INSTALLATION COULD CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



CODE	SIZE	FLANGE	REQD.	"O" RING	REQD.	CAPSCREW	REQD.	BOLT TORQUE
C	1.50	19J24	2	77K225	1	17C824H	4	46-58 lbf-ft (62-79 N·m) (6.4-8.0 kgf·m)
D	2.00	19J32	2	77K228	1	17C824H	4	54-67 lbf-ft (73-90 N·m) (7.5-9.3 kgf·m)

SG - 896

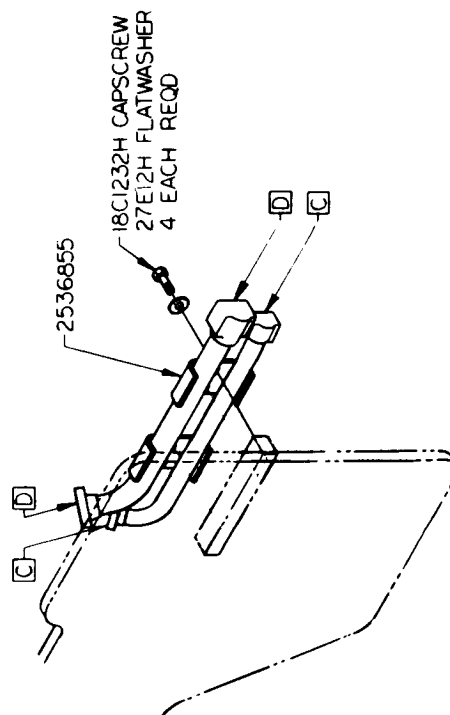


PIVOT PLATE REWORK



IF BUCKET SUPPLY TUBES
ARE MOUNTED AS SHOWN
ABOVE LEFT, REMOUNT
THEM AS ABOVE RIGHT

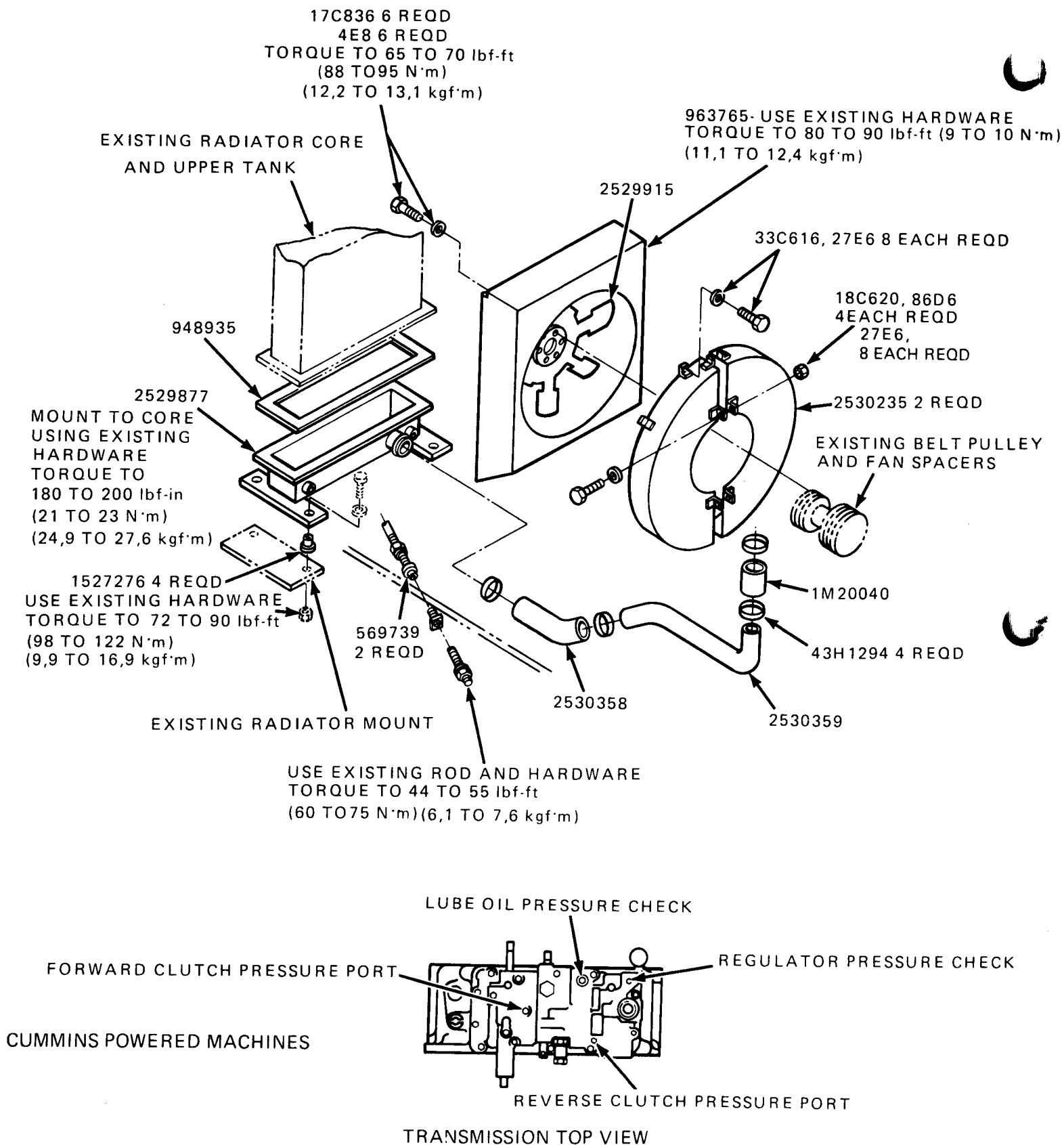
VIEW A-A



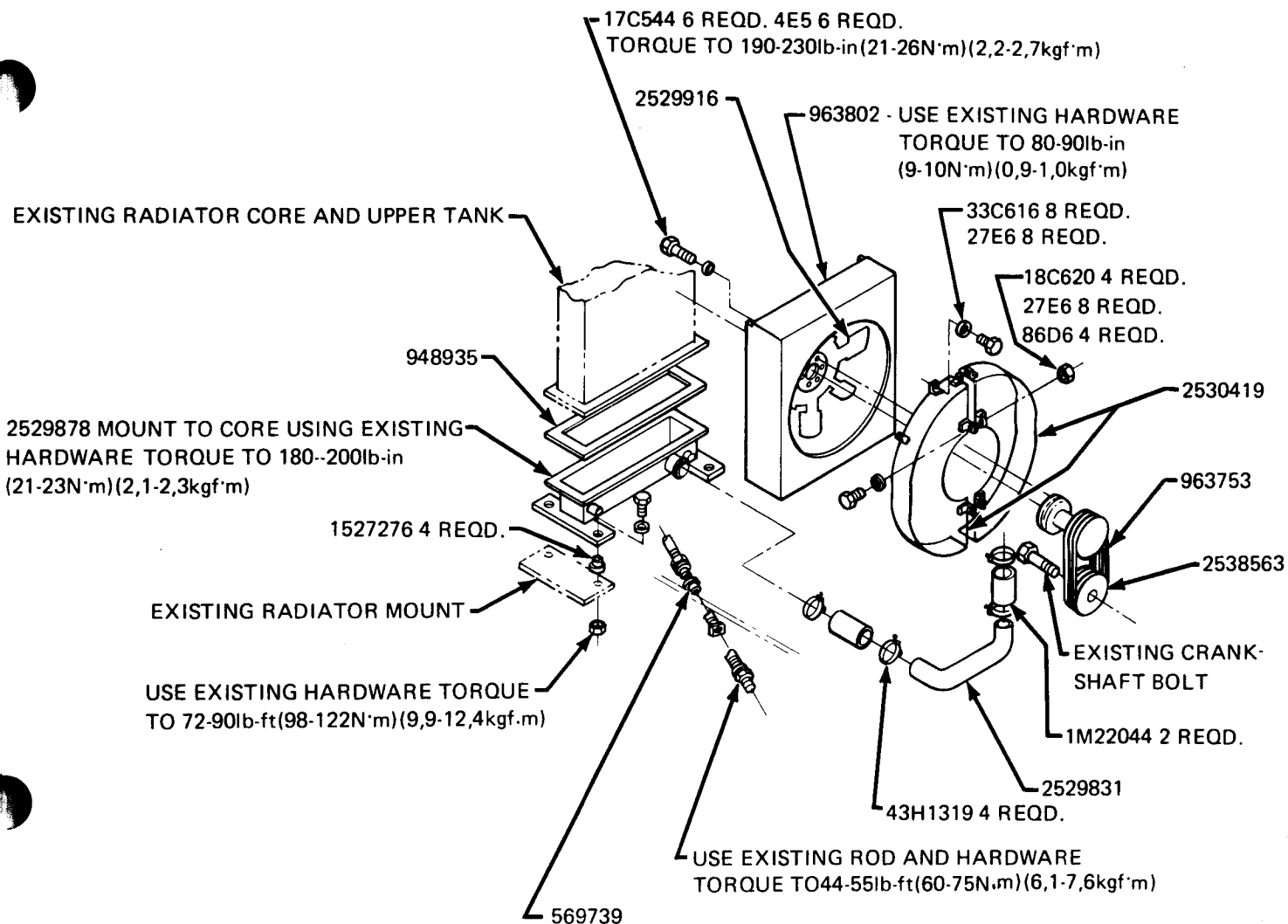
NOTE: LUBRICATE O RINGS WITH GREASE BEFORE INSTALLING

FIGURE 5

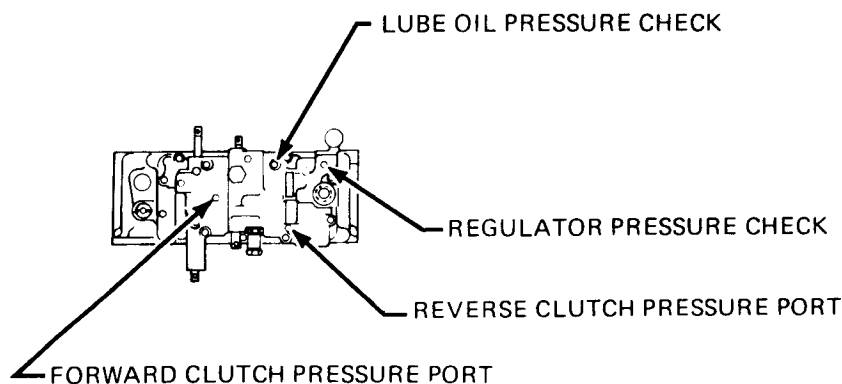
TS - 16355



TS-16359



GM POWERED MACHINES



TRANSMISSION TOP VIEW

TS - 16286

CODE	SIZE	FLANGE	REQD	O-RING	REQD	BOLT	REQD	BOLT TORQUE
A	1.00	19J16	2	77K219	1	17C620	4	27 TO 35 lbf-ft (37 TO 48 N·m) (3,7 TO 4,8 kgf·m)
C	1.50	19J24	2	77K225	1	17C824	4	46 TO 58 lbf-ft (62 TO 79 N·m) (6,4 TO 8,0 kgf·m)

CODE	SIZE	FLANGE	REQD.	"O" RING	REQD.	CAPSCREW	REQD.	BOLT TORQUE
A	1.00	19J16	2	77K219	1	17C620	4	27-35lb-ft(37-48N.m)(3,7-4,8kgf.m)
C	1.50	19J24	2	77K225	1	17C824	4	46-58lb-ft(62-79N.m)(6,4-8,0kgf.m)

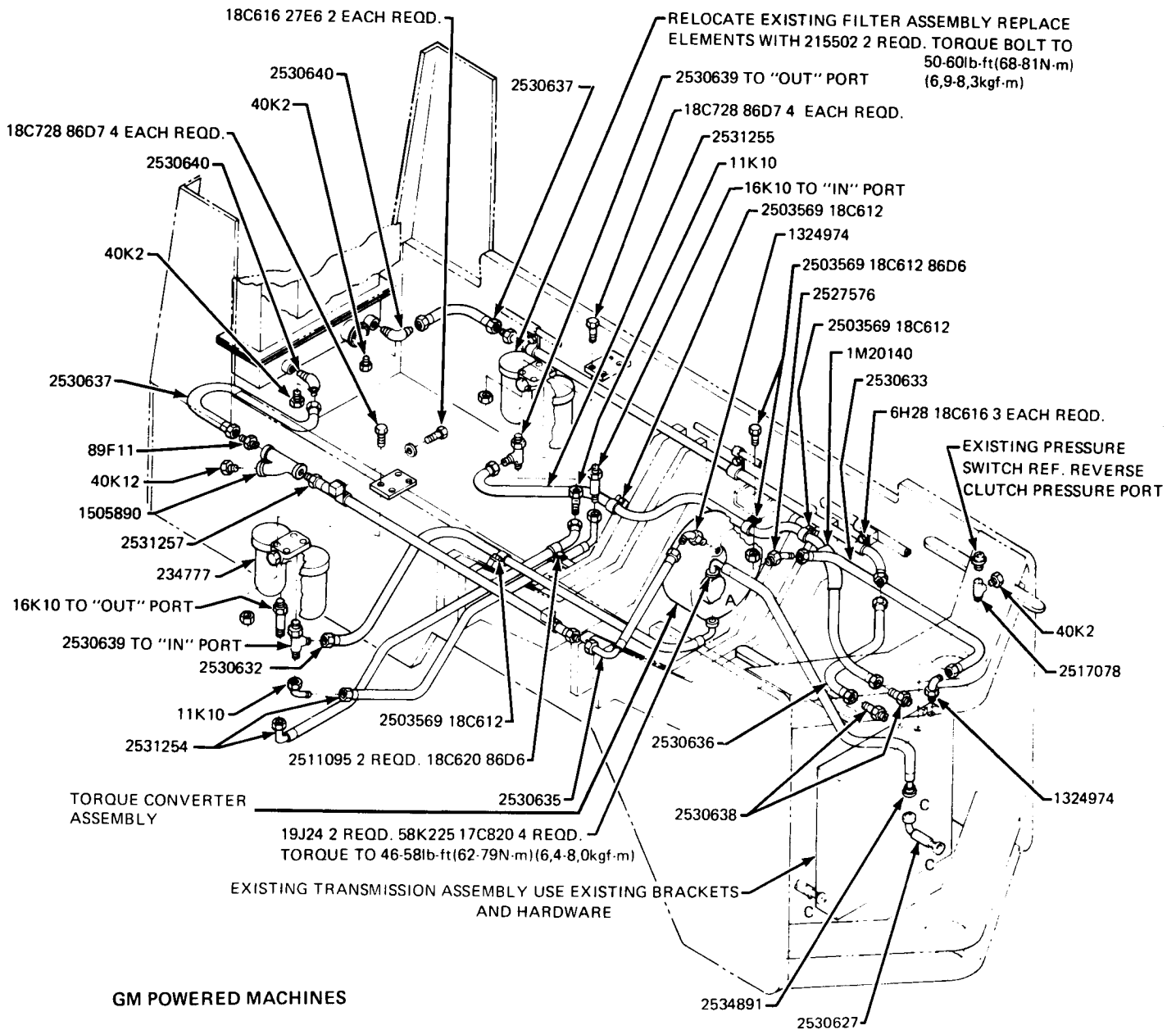
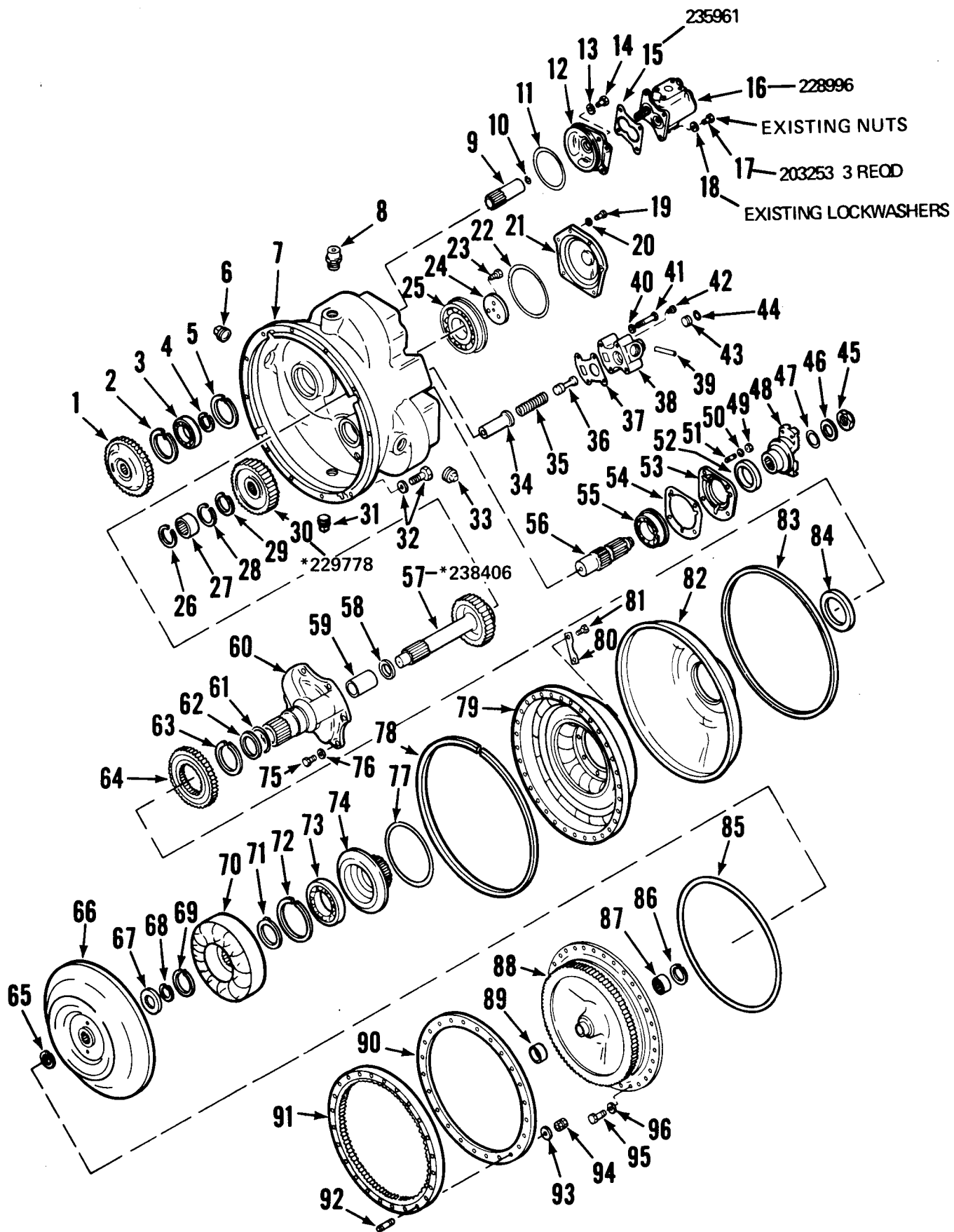


Figure 9
- 15 -
(11C22)

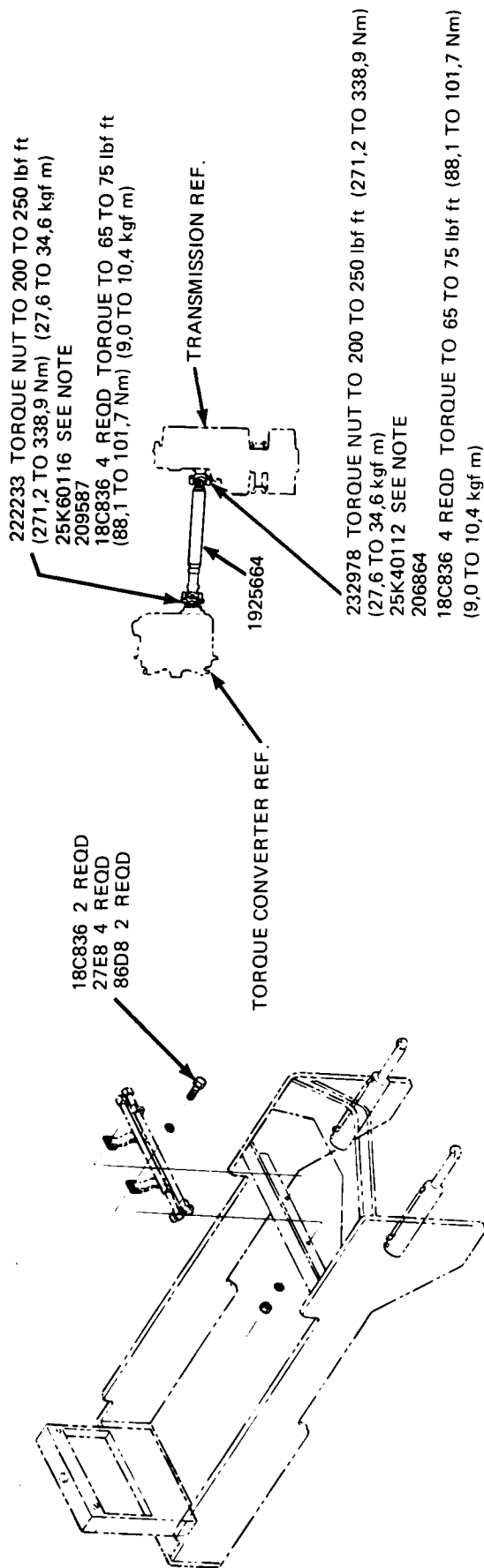


*New parts to be installed on machines using 29 .5-25 tires ONLY.
See Step 11 of installation instructions.

TS-20749

Figure 10

- 16 -
(11C23)



<p>PROCEDURE</p> <p>REMOVE ALL OLD WELD USING CARBON ARC (AIR ARC), GRINDER OR PNEUMATIC CHIPPER WHEN REQUIRED. OXY ACETYLENE TORCHES SHOULD NOT BE USED.</p> <p>IF A CARBON ARC IS USED, THE AREA TO BE REWELDED SHOULD BE GROUND TO REMOVE CARBON DEPOSITS.</p> <p>CLEAN AREA OF REPAIR REMOVING ALL GREASE, OIL, RUST AND SCALE FROM SURFACES TO BE JOINED.</p> <p>DISCONNECT BATTERY GROUND CABLE WHEN WELDING ON MACHINE.</p> <p>LOCATE PART AND WELD USING METAL ARC PROCESS IN ACCORDANCE WITH DRAWING SPECIFICATIONS.</p>	<p>NOTE</p> <p>WELDER SHALL BE QUALIFIED FOR THE TYPE OF WELD BEING MADE IN ACCORDANCE WITH AWS D14.3 (LATEST ISSUE). QUALITY AND WORKMANSHIP OF WELD SHALL BE IN ACCORDANCE WITH AWS D14.3 (LATEST ISSUE).</p> <p>WARNING</p> <p>FAULTY WELDING OR IMPROPER INSTALLATION COULD CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.</p>
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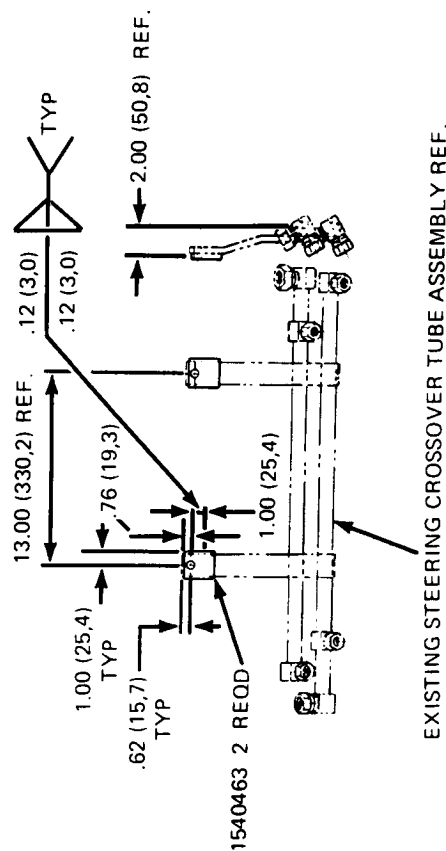


Figure 11
- 17 -
(11C24)

NOTE: O RINGS MUST BE LUBRICATED WITH GREASE BEFORE ASSEMBLY

February 1982

MICHIGAN SG - 898
Group Ref. No. 1300
2300

SUBJECT: Modulated Transmission Pressure Check Installation
Model 175B Wheel Loader with S/N:
Cummins 438D
GM 427D

Transmission pressure check ports can now be installed on machines with serial numbers listed above.


Keeping correct transmission pressure is very important for efficient machine operation.

To make this change, order the parts from the parts list below and follow the installation instructions.

PARTS LIST FOR ONE MACHINE:

1 - 2538871	Bracket
1 - 2527054	Grease Block
1 - 2539009	Decal
1 - 1549038	Tee
2 - 31F1	Elbow
1 - 1512886	Hose
1 - 539981	Hose
2 - 36F2	Connector
2 - 5K207	Nipple
2 - 1306142	Coupling
2 - 6000689	Cap

INSTALLATION:

1. Put the machine on a level surface.
2. Put the machine in the 'SERVICE' position: Bucket on the ground, parking brake applied, engine stopped, ignition key removed, red warning flag on steering wheel, safety link connected, wheels blocked.
3. Actuate the boom and bucket control levers. Hold the levers in raise and lower positions until all boom and bucket motion stops. Put both levers in neutral. The pressure should now be relieved in the boom, bucket and steering systems.
4.  Let the machine become cool. Loosen the hydraulic reservoir cap **slowly** to reduce pressure in the reservoir.
5. Remove the existing pressure check hoses from the frame end, one at a time. Put a cap on the end of each hose immediately. Mark the correct location on each hose.
6. Remove each existing grease hose from the frame end, one at a time. Put a cap on the end of each hose. Mark the correct location on each hose.
7. Remove the fittings from the existing pressure check block and the grease block. Keep these fittings for reuse.

8. Remove the existing pressure check block and the grease block from the rear frame assembly.
9. See Figure 1 and install 1 - 2538871 Bracket and 1 - 2527054 Grease Block to the rear frame assembly as shown.
10. See Figure 1, remove the caps from the hoses and install all existing and new components as shown. **NOTE:** *Make sure that all pressure check hoses and grease hoses are in their correct locations.*
11. Make sure that the surface of the bracket assembly is clean. See Figure 1 and install 1 - 2539009 Decal as shown.
12. Make sure all connections are tight. Install the cap on the main hydraulic reservoir.
13. Follow the instructions listed below for the correct transmission pressure checking procedure and pressure specifications:

Pressure Check Conditions:

Condition 1: Transmission in FORWARD 3RD or 4TH, in REVERSE 3RD or 4TH and converter stalled.

Condition 2: Transmission in NEUTRAL position. Transmission range selector in 1,2,3 and 4 position.

Transmission Fluid Pressure Check Procedure:

- (1) Install a 400 PSI (3000 kPa) gauge into the REGULATOR, FORWARD and REVERSE pressure check ports on the transmission (See Figure 1 for locations). Start the engine. Check the fluid pressure with the converter fluid temperature at 180° to 200°F (82° to 93°C) and the engine idle speed at 700 to 775 RPM.
- (2) Regulator pressure to be 240 to 280 PSI (1655 to 1932 kPa) with a 5 PSI (34 kPa) maximum difference as the transmission range selector is moved through the 1,2,3 and 4 positions. FORWARD and REVERSE pressures may have a 15 PSI (103 kPa) maximum difference from the regulator pressure.
- (3) Check the REGULATOR pressure under conditions 1 and 2.
- (4) Check the FORWARD and REVERSE pressures under condition 1.
- (5) Stop the engine. Remove the pressure gauge.

Lubrication Fluid Pressure Check Procedure:

- (1) Install a 100 PSI (700 kPa) pressure gauge into the LUBE OIL pressure check port on the transmission (See Figure 1 for location). Start the engine. The converter outlet fluid temperature must be 180° to 200°F (82° to 93°C) and the engine at full throttle. The normal pressure range is 20 to 25 PSI (138 to 172 kPa) with a 5 PSI (34 kPa) maximum difference under conditions 1 and 2 (16 PSI (110 kPa) minimum). **IMPORTANT:** *Do not let the fluid become overheated.*
 - (2) Check the lubrication fluid pressure under conditions 1 and 2. (See pressure check conditions listed above).
14. Stop the engine. Remove the pressure gauge. Remove warning flag from steering wheel. Disconnect safety link. Remove blocks from wheels.

PROCEDURE

REMOVE ALL OLD WELD USING CARBON ARC, AIR ARC, GRINDER OR PNEUMATIC CHIPPER WHEN REQUIRED. OXY ACETYLENE TORCHES SHOULD NOT BE USED.

IF A CARBON ARC IS USED, THE AREA TO BE REWELDED SHOULD BE GROUND TO REMOVE CARBON DEPOSITS.

CLEAN AREA OF REPAIR REMOVING ALL GREASE, OIL, RUST AND SCALE FROM SURFACES TO BE JOINED.

DISCONNECT BATTERY GROUND CABLE WHEN WELDING ON MACHINE.

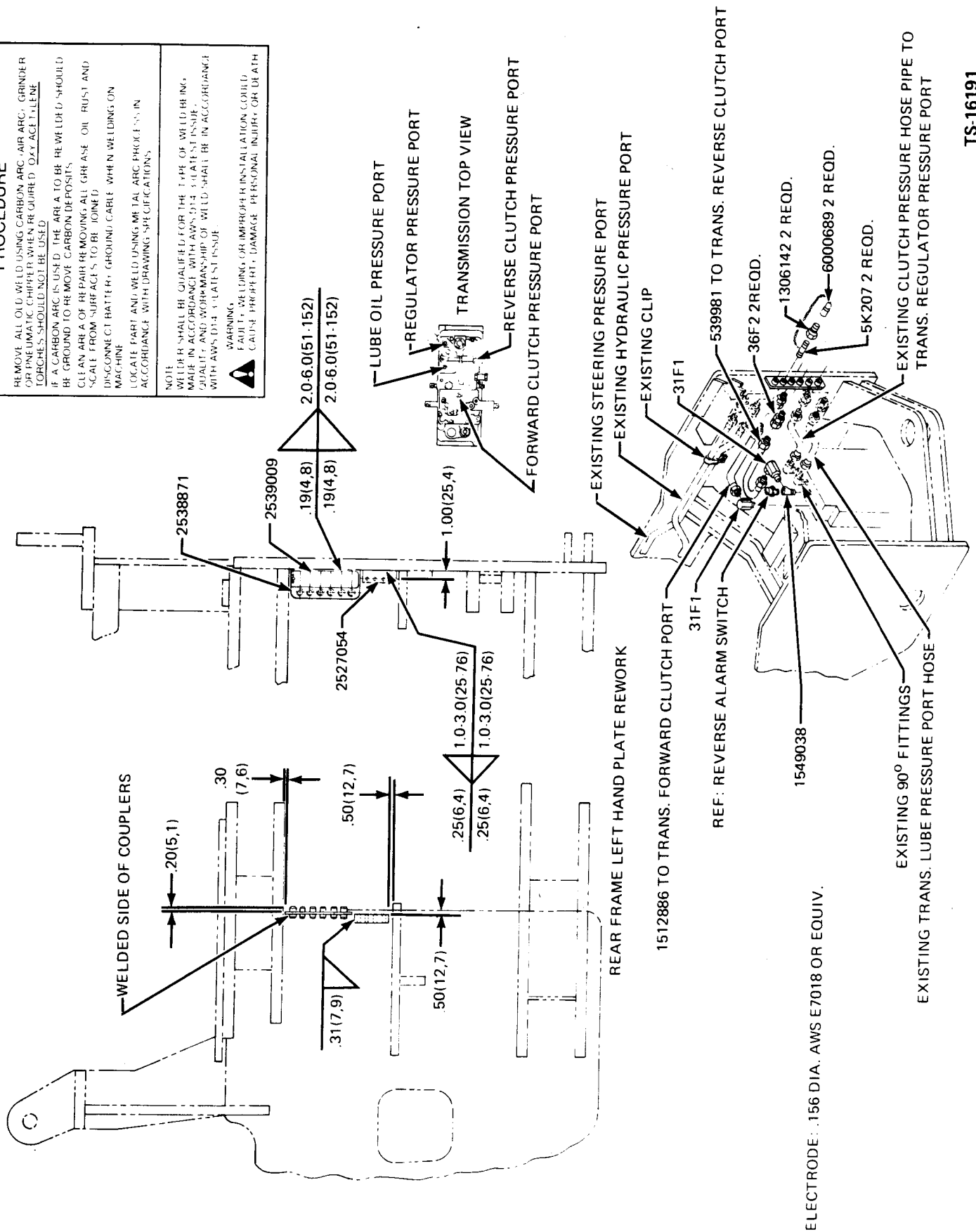
LOCATE PART AND WELD USING METAL ARC PROCESS IN ACCORDANCE WITH DRAWING SPECIFICATIONS.

NOTE:

WELDER SHALL BE QUALIFIED FOR THE TYPE OF WELDING, MADE IN ACCORDANCE WITH AWS D14.3 LATEST ISSUE. QUALITY AND WORKMANSHIP OF WELD SHALL BE IN ACCORDANCE WITH AWS D14.3 LATEST ISSUE.

WARNING:

FAILURE TO WELD OR IMPROPER INSTALLATION COULD CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.



CLARK

Service gram

November 1981

MICHIGAN SG-903
Group Ref. No. 1300
1400

**SUBJECT: Transmission Filter and Fluid Change Interval Revision
All Models of Wheel Loaders and Dozers**

The transmission filter and fluid change interval for all machines has been extended.

Transmission filter change interval has been extended to **500 operating hours** from the 250 operating hour interval previously used for normal fluid changes.

An additional requirement to change the filter cartridge at the first **50 operating hours and 100 operating hours** is recommended for new machines **and whenever the converter pump, transmission or torque converter is repaired or overhauled for any reason.**

Transmission fluid change interval has been extended to **1000 operating hours** from the 500 operating hour interval previously used.

IMPORTANT: *The above fluid and filter change intervals are for average environmental and operating conditions.* High operating temperatures or very dusty operating conditions will require more frequent fluid and filter changes.

Always use Clark approved transmission filters and fluid. See MICHIGAN Service Gram SG-856A for recommended fluid specifications.

May 1983

CLARK

SERVICE GRAM

SUBJECT: Large Diameter Input and Reverse
Shaft Kits, 4000 Series Transmission
Model 175B, 175C with S/N:
427B171, 427B101ENC & 427B101FSC
& All 427C & 438C, All 427D & 438D,
490A101CAC thru 177CAC, 491A-201CAC
thru 219CAC

CLARK SG - 979
Group Ref. No. 2300

The 175C is now equipped with larger transmission shafts and bearings. This became effective with machine serial numbers 490A178CAC (Cummins) and 491A220CAC (Detroit Diesel).

The new shafts have larger splines and bigger bearings for increased reliability.

Service kits are available to allow installation of larger input and reverse shafts in earlier 175B and 175C machines without replacing the transmission case.

This improvement can be made to machines with serial numbers listed above by ordering the appropriate kit and flange from the information provided below:

802129	Shaft Kit - for standard transmission
802130	Shaft Kit - for modulated transmission
222029	Input Flange - for 175B
231749	Input Flange - for 175C

NOTE: *One kit is required for each shaft (input, reverse) being replaced.*

Refer to Clark Shop Manual 2995 for transmission disassembly and reassembly instructions.

See Figure 1 for new parts location.

NOTICE: *Shaft kits and flanges will be approximately 1 inch longer than original and the drive-line must be checked to assure the slip joint has enough movement to be reconnected. If there is not enough slip the shaft must be shortened.*

To shorten propshaft mark both ends for proper alignment, remove packing nut and separate shaft, cut required amount from male splined end and deburr, reassemble in proper alignment, tighten packing nut and lubricate slip joint.

((12J18))

PARTS LIST FOR ONE Forward (Input) or Reverse Shaft kit

STANDARD — 427B, 427C, 438C

Item No.	Qty	Part No.	Description
1	1	222960	Nut
2	1	222179	Washer
3	1	25K60116	O Ring (Input Shaft only)
4	1	225823	Oil Seal (Input Shaft only)
5	4	17C632	Bolts
6	4	4E06	Lockwasher
7	1	743415	Bearing
8	1	241024	Shaft
9	1	240304	Clutch Support Assembly
10	1	240294	Outer Race
11	1	240297	Clutch Hub
12	1	659764	Clutch Disc Hub Snap Ring
13	2	240293	Piston Rings
14	1	241025	Bearing Retainer
15	1	240298	Bearing Cap
16	1	237376	Spacer (Reverse Shaft only)
17	1	228953	Oil Cap (Reverse Shaft only)

NOTE: *Order specific input flange separately*

Forward (Input) or Reverse Shaft Kit

WITH MODULATION — 427D, 438D, 490A, 491A

Item No.	Qty	Part No.	Description
1	1	222960	Nut
2	1	222179	Washer
3	1	25K60116	O Ring (Input Shaft only)
4	1	225823	Oil Seal (Input Shaft only)
5	4	17C632	Bolts
6	4	4E06	Lockwasher
7	1	743415	Bearing
8	1	241024	Shaft
9	1	240305	Clutch Support Assembly
10	1	240294	Outer Race
11	1	240635	Clutch Hub
12	1	659764	Clutch Disc Hub Snap Ring
13	2	240293	Piston Rings
14	1	241025	Bearing Retainer
15	1	240298	Bearing Cap
16	1	237376	Spacer (Reverse Shaft only)
17	1	228953	Oil Cap (Reverse Shaft only)

NOTE: *Order specific Input Flange separately*

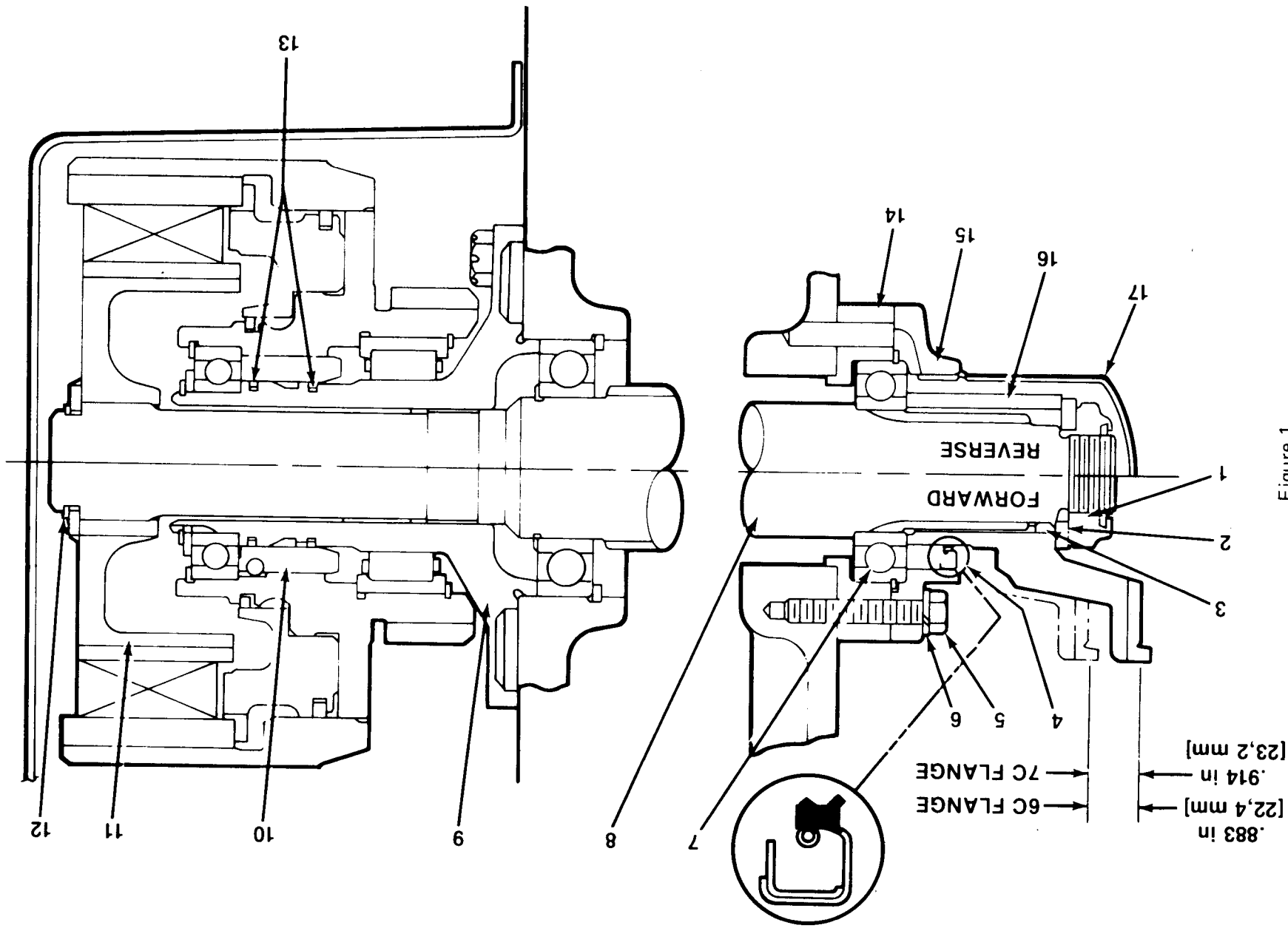


Figure 1
3
(12J20)

