Service School Topic.....

26 July 1982

SST-5C

Ref. Group No. 60
& No. 70

(This SST-5C supersedes and replaces SST-5B, dated 26 October 1978. Remove and destroy SST-5B from your files).

SUBJECT: Installation and break-in procedures for new or rebuilt hydraulic pumps. All models wheel loaders, dozers, scrapers and logging equipment.

PUMP REMOVAL, INSTALLATION AND 'BREAK-IN' PROCEDURES

The cause of pump failure must be found and corrected before a replacement pump is installed. Check all of the hydraulic components; cylinders, hoses and tubes, tanks. etc. Replace any worn parts and seals.

1. Put the machine in the SERVICE POSITION: Lower the implement(s). Connect the safety link(s). Put blocks in front of and behind the wheels of the machine. Stop the engine. Remove the ignition key. Put a red warning flag on the steering wheel. Let the machine become cool.

2. **Release the pressure from the hydraulic system and reservoir.**

3. **Release all of the pressure from all accumulators in any system using the same reservoir for hydraulic fluid. See the Operators Manual for the correct procedure to release the pressure from the accumulator(s).**

4. Remove pins and linkage, as needed, so that all cylinder rods can be retracted. Retract all cylinder rods.

   Make sure all implements are in a safe position. Use blocks, if needed, to hold the implements in a safe position when removing pins and linkage.

5. Drain the hydraulic fluid from the reservoir. If the hydraulic fluid is to be used again, it must be put through a 10 micron filter to clean it before it is used.

6. Remove all filters and strainers.

7. Disconnect all of the hydraulic lines from the pump(s).

8. Remove the pump mounting nuts or bolts and lockwashers. Pull the pump from the pump drive adapter. Remove the pump. Check the pump drive adapter for wear. If you see any wear, replace it.

9. Check, clean and repair or replace all other components and systems using the same reservoir.

10. Remove any access plates from the hydraulic reservoir. Check and clean the suction lines. Clean the inside of the reservoir and any magnets or magnatic plugs. Install any access plates that were removed from the reservoir using new o-rings. Install and tighten all drain plugs.

11. Clean the hydraulic filter elements of the type which can be cleaned, if used. Replace the elements which can not be cleaned.

12. Install a new gasket on the pump flange. Align the pump drive shaft with the pump drive adapter. Put the pump into position. Install the pump mounting nuts or bolts and lockwashers. Tighten the bolts or nuts to the correct torque. Check the bolts or nuts to make sure they are at the correct torque.

13. Fill the suction port of the pump with hydraulic fluid. Connect the suction line to the suction port of the pump.

14. Fill the pressure port of the pump with hydraulic fluid. Connect the line to the pressure port of the pump.

15. Install any other components that were removed.

16. Fill the hydraulic reservoir with clean hydraulic fluid. Specifications for hydraulic fluid for each machine can be found in the Operator's Manual.

17. Loosen the suction line connections of the pump until fluid fills the lines and runs out. Tighten the connections.

18. **Make sure all implements are in a safe position. Use blocks, if needed, to hold the implements in a safe position. Make sure the pressure is released from all accumulators. Carefully disconnect all lines from the cylinders, motors and (or) other components using the same hydraulic reservoir.**

19. If other systems have been worked on, make sure the fluids are at the correct level and the systems are ready for the machine to be run.

20. Start the engine. Run the engine at low idle for five minutes with the control valves in the "NEUTRAL" or "HOLD" position. Check for leaks and add hydraulic fluid to the reservoir if needed.

21. With the engine at low idle, carefully activate each circuit until the disconnected lines are flushed with clean fluid.

NOTE: *Make sure the fluid flows into a container and not on the machine and ground. Check the level of the hydraulic fluid from time to time during operation. Add fluid as needed.*

22. Install any pins and linkage that were removed.

23. Connect the lines to the base end of the cylinders and (or) the inlet port of motors or other components. DO NOT connect the lines to the rod end of the cylinders and (or) the outlet port of the motors or other components.

NOTE: *DO NOT cause the pressure of the hydraulic fluid to go over relief.*

24. Slowly extend all cylinders to the end of the stroke. This will push the dirty fluid out of the cylinders. Operate the motors or other components until clean fluid flows from the outlet port.

25. Connect the lines to the rod end of the cylinders and (or) outlet port of the motors or other components.

26. Check the fluid level in the hydraulic reservoir. Add fluid as needed.

NOTE: *DO NOT cause the pressure of the hydraulic fluid to go over relief.*

27. Operate all of the circuits one after the other for 15 minutes with the engine at 1500 rpm and no load on the system. Operate all of the circuits one after the other for 15 minutes with the engine at high idle and no load on the system.

28. With the engine at low idle, check the pressure of the hydraulic reliefs. This will prevent damage to the pump(s). Specifications for relief pressures can be found in the Operators Manual. Adjust the reliefs as needed.

29. Clean the hydraulic filter elements of the type which can be cleaned, if used. Replace the elements which cannot be cleaned.

30. If the pressure was removed from any accumulators, charge them.

31. Check the fluid level in the hydraulic reservoir. Add fluid as needed.

At 50 hours of operation, clean the hydraulic filter elements of the type which can be cleaned, if used. Replace the elements which cannot be cleaned. Check the relief pressures. Service the hydraulic filters at regular intervals. See the Operators Manual for the correct intervals.

CLARK Service gram

May 3, 1963 SG-226

Subject: Rebuilding of Converter Charging Pumps

The charging pump in the converter and transmission hydraulic system serves much as does the heart in the human body. Proper operation and functioning of the converter and transmission is dependent on a properly operating and efficient charging pump.

The efficiency of the gear type pumps used is directly related to the extremely close tolerances held between mating parts. This quality can only be guaranteed in a factory built and tested pump.

Field rebuilt pumps cannot generally be expected to function with the same degree of efficiency as a new pump. As a result the use of a field rebuilt pump as a converter charging pump would permit the possibility of damage to converter and transmission components due to lack of efficiency on the part of the pump. The comparative value of the torque converter, transmission and/or their components compared with the cost of the charging pump assembly clearly dictates that a new pump should be used instead of attempting to rebuild the old one.

Hydraulic pumps may, however, be field rebuilt for use in main hydraulic or steering pump applications. In these applications the degree of system performance is also dependent upon the efficiency of the pump, however, lack of efficiency on the part of the pump does not present the possibility of damage to the internal components of the system as is the case in the converter and transmission assemblies.

In view of the above, it is therefore strongly recommended that under no circumstance should a converter charging pump be field rebuilt for use as a converter charging pump. Converter charging pumps may be field rebuilt, however, for use in a steering pump application where pump specifications are alike.

In connection with the above recommendation warranty requests on torque converters, transmission and/or components thereof within the warranty period where a field rebuilt pump has been used, will not be honored.

CLARK Service gram

7 August 1974

MICHIGAN SG-423B
Group Ref. No. 1100

(This bulletin supersedes and replaces SG-423A, dated 3 May 1974.
REASON: To provide serial number break for machines built overseas).

SUBJECT: Change in Bucket Dump Control Restrictor Valve,
Main Hydraulic System
Model 175B

In response to requests from the field, a product improvement change has been made in the subject model machine. This change consists of changing the restrictor valve at the base end of the bucket control section of the main control valve (Item 51, Fig. 1 herein) from 1510741 to 1515868 for the purpose of reducing the speed of the bucket dumping action. This change became effective on machines shipped from the factory with serial number 427A250 & after, 427A134FSC & after, and 438A101FSC & after.

The above described change may be incorporated, if desired, on machines in the field prior to the above serial numbers by removing the 1510741 restrictor valve (Item 51, Fig. 1) and replacing it with a 1515868 restrictor valve. The new restrictor valve must be installed with the arrow on the side of the valve pointing in the direction as indicated in Fig. 1 herein, or toward the main control valve.

PARTS REQUIRED:

1 - 1515868 Valve, Restrictor

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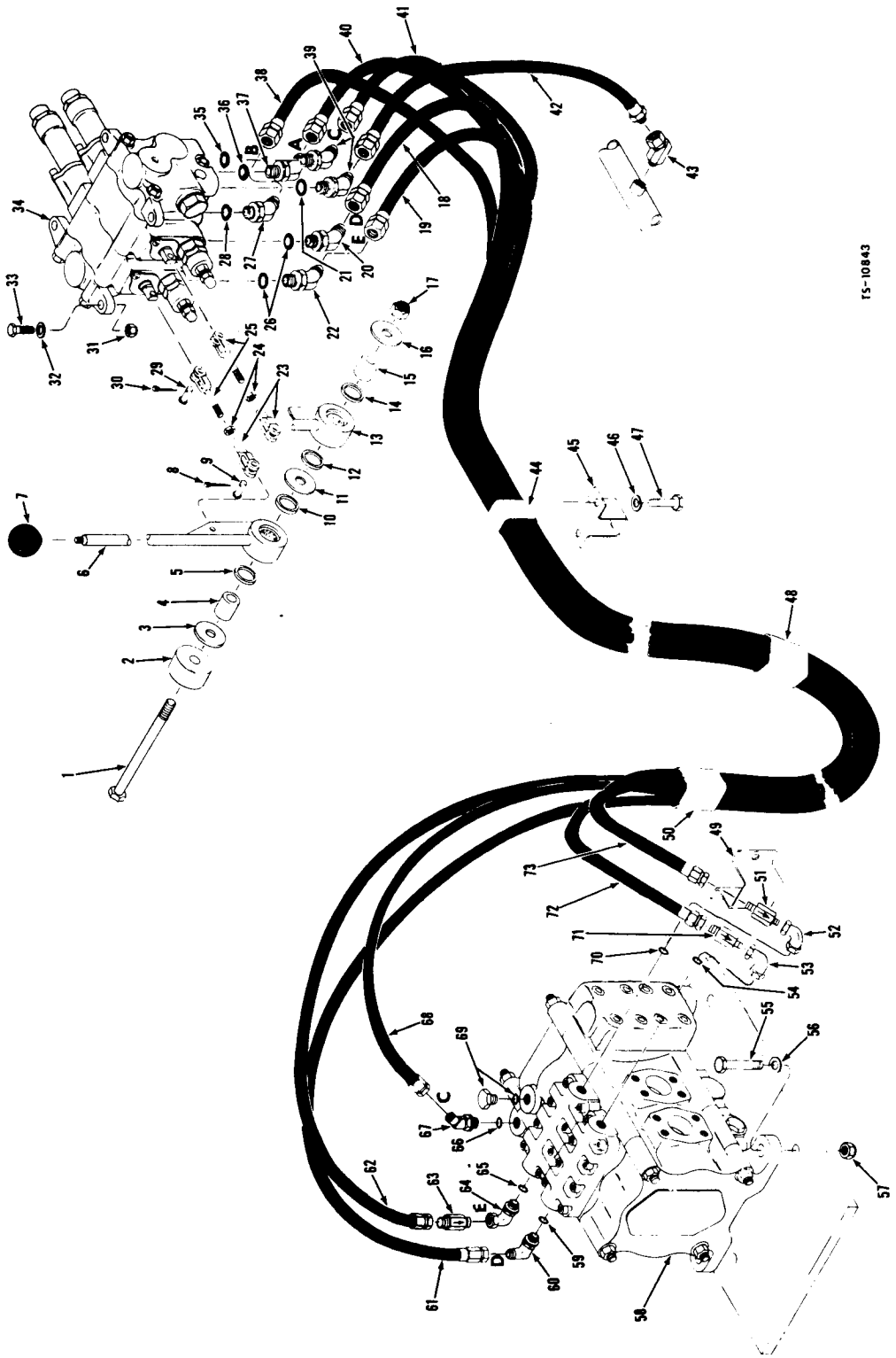

FIGURE NO. 1

CLARK Service gram

16 May 1973

MICHIGAN SG-479
Group Ref. No. 1100

SUBJECT: Main Hydraulic Valve Restrictors
Hole Diameter and Location
Model 175 B, 275 B, 475-111A, & 475 B

The following information has been released to provide a quick reference on restrictor part numbers, hole sizes and locations used on subject model machines equipped with HUSCO main hydraulic valves. This information applies to the machines listed below:

175 B - All Serial Numbers
275 B - All Serial Numbers
475-111 A - S/N 421E101 and After
475 B - All Serial Numbers

Refer to the charts below for restrictor part number, hole diameter and location:

Model	Bucket Base	Bucket Rod	Boom Base	Boom Rod
175 B	1515868	1510741	1510741	-------
275 B	1512096	1510741	1510741	-------
475-111A	1510741	1510741	1549128	1510916
475 B	1510741	1510741	1549128	1510916

Restrictor Part No.	Hole Size	Drill No.
1510741	.081 - .076	48
1510916 (90° Elbow)	.161 - .154	23
1512096	.063 - .059	53
1515868	.056 - .050	55
1549128	.116	32

CLARK Service gram

6 March 1974

MICHIGAN SG-508
Group Ref. No. 1100
1200

SUBJECT: Tyrone Power-Sensor Pumps
Used in Main and Steering Hydraulic Systems
Models 75B, 125-111A, 175B & 275B

The Tyrone power sensor type pumps which have been used in the main and steering hydraulic systems of the subject model machine are shown in the chart herein. The pump manufacturer has advised they are no longer able to furnish these pumps for service replacement, complete with power sensor valves, due to their inability to obtain castings for the valve assemblies.

In view of this situation, and upon exhaustion of Central Parts Division existant stock of pumps listed in Columns A & B in chart herein, service replacement pump kits listed in Column C will be furnished to replace pumps in Columns A & B. These pump kits will consists of the tandem pump assemblies, less the power sensor valve assembly and adapter plate, but including new o-rings used between the adapter plate and the pump assembly. When replacing the pumps listed in Columns A & B, it will be necessary to remove the power sensor valve assembly and adapter plate from the old pump and mount same on the new pump, using the new o-rings provided, before mounting in the machine. Replacement service parts, with the exception of the valve housing, will still be available for use in rebuilding the power sensor valve assemblies where necessary.

New pump assemblies, incorporating an internal power sensing device, plus the necessary plumbing to adapt same to the subject machines are being designed and details will be released to the field when available.

MACHINE MODEL & APPLICATION	"A" PREVIOUS PUMP ASSY	"B" CURRENT PUMP ASSY	"C" NEW PUMP KITS LESS SENSOR VALVE
75B Steer	1542411 1516617	1519916	960449
125-111A Main	1508329 1513315	1519954	960451
175B Main	1513228	1519366	960402
175B Steer	1513227	1519365	960450
275B Steer	1543435	1519363	960453
275B Main	1543436 1513226	1519364	960452

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CLARK Service gram

11 June 1975

Supplement 1 to
MICHIGAN SG-508
Group Ref. No. 1100
1200

SUBJECT: Renewed Availability of Sensor Valve Housing for Tyrone Power-Sensor Pumps for Models 175B & 275B as listed in Service Gram SG-508

Service Gram SG-508 covered the introduction of service replacement pump kits, less the power-sensor valve assembly and adapter plate. The pump kits are to be used when replacing power-sensor pumps on a machine and re-using the existant sensor valve assembly and adapter plate removed from the replaced pump. This was due to the pump manufacturers inability to obtain castings for the sensor valve housings.

The pump manufacturer has now advised they can again supply the sensor valve housings used in the main and steer pumps on the Model 175B & 275B as listed below. These sensor valve housings are for use in rebuilding the power-sensor valve assemblies, removed from the pump being replaced, for re-use with the service replacement pump kits shown.

MACHINE MODEL & APPLICATION	REPLACEMENT PUMP KIT (LESS SENSOR VALVES	APPLICABLE SENSOR VALVE HOUSING
175B Main	960402	948707
175B Steer	960450	948704
275B Main	960452	948707
275B Steer	960453	948770

Sensor valve housings continue to be unavailable for power-sensor pumps used in Models 75B & 125-IIIA. When sensor valve assemblies on these models are not rebuildable due to inavailability of sensor valve housing, refer to Service Gram SG-521A for data on replacement pump and plumbing to be used when replacing original pump on the Models 75B & 125-IIIA.

(NOTE: This Supplement is to be attached to and become a part of SG-508).

CLARK Service gram

11 June 1975

MICHIGAN SG-521A
Group Ref. No. 1100
1200

(This bulletin supersedes and replaces SG-521 issued 26 February 1975. REASON: Bulletin revised to remove pump replacement parts groups for Models 175B and 275B, due to notice by pump manufacturer of renewed availability of power-sensor valve housings).

SUBJECT: Replacement of Tyrone Power-Sensor Pumps with Bolt-On Sensor Valves Used in Main and Steering Hydraulic Systems on Models 75B, 125-IIIA, 175B & 275B

A - New Tyrone power-sensor pump assemblies, incorporating an internal power sensing device, became effective on the subject model tractor shovels shipped from the factory with the following serial numbers:

75B Cummins	443A175 and after, 443A211CAC and after
75B G. M.	447A161 and after, 447A201CAC and after
125-IIIA G. M.	403A751CAC and after
175B Cummins	438B157FSC and after
175B G. M.	427B381 and after, 427B386CAC and after, 427B131FSC and after
275B Cummins	425B503 and after, 425B501CAC and after, 425B186FSC and after

B - On Model 175B and 275B the power-sensor pumps on machines with serial numbers prior to those listed in Section A above should be serviced with replacement pump kits as described in Service Gram SG-508. Also, if the power-sensor valve assembly on the existant pump is damaged or malfunctioning, the valve should be rebuilt and re-used. This is now possible due to renewed availability of the sensor valve housing by the pump manufacturer as described in Supplement I to SG-508.

C - Service replacement pump kits, as described in Service Gram SG-508, may be used to service power-sensor pumps on the following machine models, as long as the external sensor valve housing and adapter plate from existing pump on the machine are in suitable condition for re-use.

Model	Serial Range
75B	S/N Prefixes 428A, 435A, 4167A, 4168A, and 443A & 447A prior to S/N's listed above.
125-IIIA	S/N Prefixes 403A & 404A, with the exception of 403A751CAC & after

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In the event that it becomes necessary to replace the sensor valve housing and pump on any of the machines with serial numbers as described in the previous paragraph, new pump assemblies incorporating an internal power sensing device must be installed. At the same time a corresponding change in plumbing must be made in order to adapt the new pump assembly to fit the existing main or steering hydraulic system.

Refer to the appropriate list for parts required to replace pump and sensor valve and install these parts as shown in the installation drawing indicated by model and serial number. In each case, the following procedure should be adhered to:

1. Drain hydraulic oil reservoir.
2. Remove pump(s) and mating parts as indicated.
3. Install new pump(s) and mating parts as shown.
4. Refill hydraulic oil reservoir.

PARTS REQUIRED (per machine):

Model 75B (Serial Ranges 428A, 435A, 4167A & 4168A)

1 - 2507292	Pump, Steering
1 - 18K-6	Elbow Assembly, 45°
1 - 2507319	Suction Tube
1 - 2507315	Elbow Assembly
1 - 2507316	Hose Assembly
1 - 556415	Hose
2 - 58K-219	O-Ring
1 - 58K-232	O-Ring
1 - 11K-8	Swivel, 90°
1 - 17K-8	Elbow Assembly, 90°
2 - 546371	Hose Clamp
4 - 23C-828	Bolt
4 - 4E-08	Lockwasher
1 - 2508905	Flange Clamp
1 - 561807	Gasket
1 - 2507321	Adapter
4 - 23C-652	Bolt
4 - 4E-06	Lockwasher
2 - 663093	Split Flange Half
2 - 540106	Clamp
1 - 587042	Hose

SG-521A

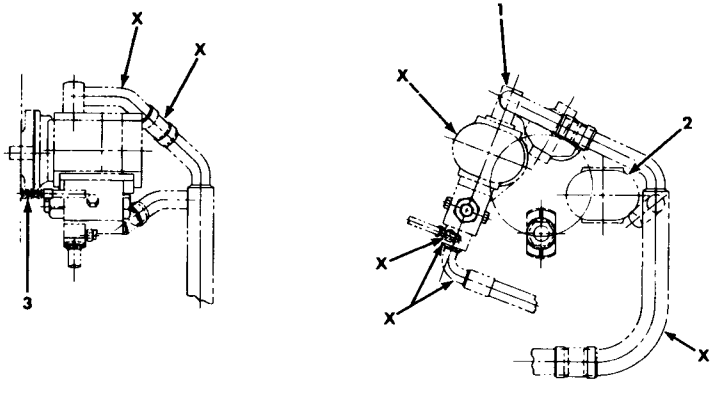
Model 75B (Serial Numbers 443A101 thru 443A174 & 447A101 thru 447A160, 443A101CAC thru 443A210CAC & 447A101CAC thru 447A200CAC)

1 - 2507292	Pump, Steering
1 - 2507317	Suction Tube
1 - 2507315	Elbow Assembly
1 - 2507321	Adapter
1 - 18K-6	Elbow Assembly, 45°
1 - 2507320	Hose Assembly
1 - 556415	Hose
1 - 11K-8	Swivel, 90°
1 - 58K-232	O-Ring
2 - 58K-219	O-Ring
1 - 561807	Gasket
1 - 2508905	Flange Clamp
4 - 23C-828	Bolt
4 - 23C-652	Bolt
4 - 4E-08	Lockwasher
4 - 4E-06	Lockwasher
2 - 663093	Split Flange Half
2 - 546371	Hose Clamp
1 - 17K-8	Elbow Assembly
1 - 556415	Hose
2 - 540104	Clamp

Model 125-111A (Serial Ranges 403A & 404A, and 403A101CAC thru 403A750CAC)

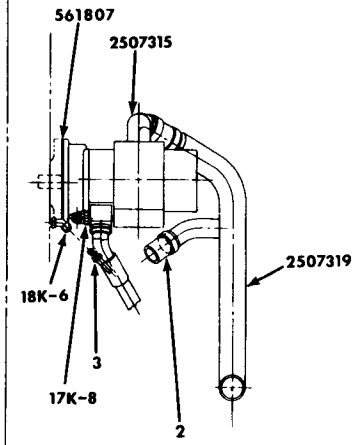
1 - 2507294	Pump, Main
1 - 2508386	Suction Tube Assembly
1 - 2508387	Tube Assembly
1 - 58K-225	O-Ring
1 - 58K-232	O-Ring
2 - 58K-222	O-Ring
1 - 2508391	Hose Assembly
2 - 540106	Clamp
1 - 533478	Hose
2 - 540102	Clamp
1 - 536942	Hose
2 - 540130	Clamp
1 - 569441	Hose

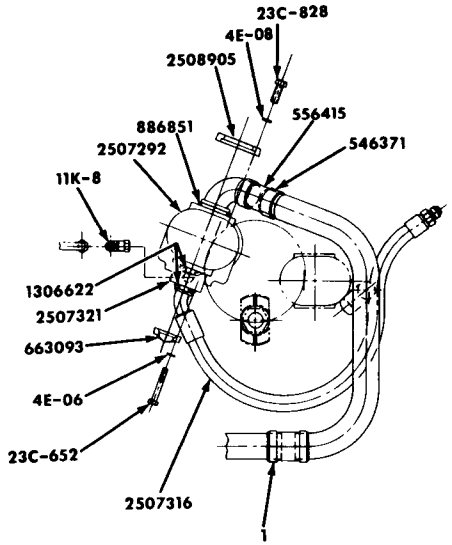
SPR-23573, 28674, 30274, 45474, 45374



VIEW A

1. Charging Pump Ref.
2. Main Pump Ref.
3. Disconnect Hose at Converter from Transmission & Remove Connector.
4. Remove Items Marked X.





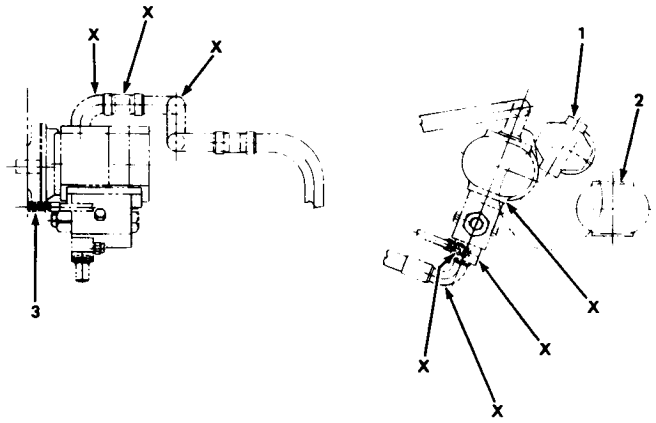
VIEW B

1. Use Existing Hose & Clamps.
2. Use Existing Hose & Clamps.
3. Connect Hose to Transmission.

TS-11307

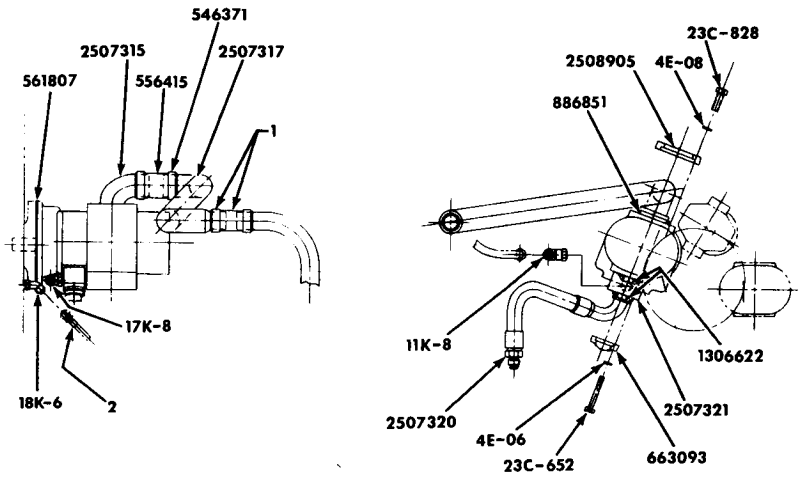
Model 75B, S/N 428A, 435A, 4167A & 4168A

Figure 1



VIEW A

1. Charging Pump Ref.
2. Main Pump Ref.
3. Disconnect Hose at Converter from Transmission & Remove Connector.
4. Remove Items Marked X.



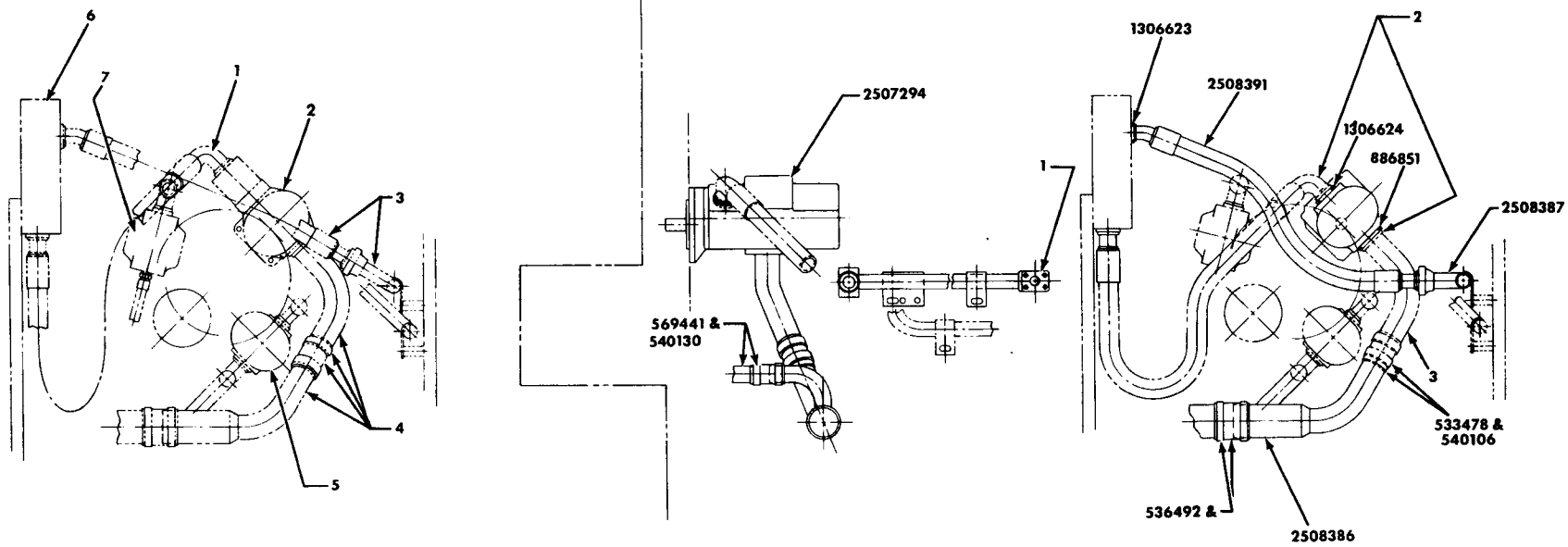
VIEW B

1. Use Existing Hose & Clamps.
2. Connect Hose to Transmission.

TS-11308

75B, S/N 443A101 thru 443A174 & 447A101 thru 447A160, 443A101CAC thru 443A210CAC & 447A101CAC thru 447A200CAC

Figure 2



VIEW A

1. Disconnect Outlet Hose.
2. Remove Main Pump.
3. Remove Hose & Tube Assembly.
4. Remove Suction Tube, Hose & Clamps.
5. Steer Pump Ref.
6. Main Valve Ref.
7. Charge Pump Ref.

VIEW B

1. Connect Hose to Front of Machine.
2. Connect Existing Outlet Hose & Suction Tube Using Existing Split Flange Halves and Hardware.
3. Existing Suction Tube.

TS-11309

125-111A, S/N 403A, 404A, and 403A101CAC thru 403A750CAC

Figure 3

CLARK Service gram

7 April 1976

MICHIGAN SG-575A
Group Ref. No. 1100

(This bulletin supersedes and replaces SG-575, dated 7 January 1976. REASON: Updated to include 475-IIIA, 475B & 675B).

SUBJECT: Main Hydraulic Control Valve Sections and Major & Minor Repair Kits Model 175B, 275B, 475-IIIA, 475B & 675B

Major and minor repair kits and service replacement sections are available for use on Husco main hydraulic control valves. These repair kits and sections may be ordered from the Central Parts Division. Refer to the table below for part number and application.

Part No.	Application	Model
*961198	Repair Kit, Minor - 2 Spool Valve	175B & 275B
*961199	Repair Kit, Major - 2 Spool Valve	175B & 275B
*961200	Repair Kit, Minor - 3 Spool Valve	175B & 275B
*961201	Repair Kit, Major - 3 Spool Valve	175B & 275B
961202	Inlet Section	175B & 275B
961203	Bucket Section	175B & 275B
961204	Boom Section	275B
961205	Accessory Section	175B & 275B
961206	Boom Section	175B
*961271	Repair Kit, Minor - 2 Spool Valve	475-IIIA & B, 675B
*961272	Repair Kit, Minor - 3 Spool Valve	475-IIIA & B
*961273	Repair Kit, Major - 2 Spool Valve	475-IIIA & B, 675B
*961274	Repair Kit, Major - 3 Spool Valve	475-IIIA & B
961275	Inlet Section	475-IIIA & B, 675B
961276	Bucket or Accessory Section	475-IIIA & B, 675B
961277	Boom Section	475-IIIA & B, 675B

*NOTE: Minor repair kits contain service o-rings and back-up rings for 2 and 3 spool valves. Major repair kits contain service o-rings, relief valve sub-assembly and poppet sub-assemblies for 2 and 3 spool valves.

INSTRUCTIONS FOR DISASSEMBLY AND REASSEMBLY:

1. Thoroughly clean the outside of the valve.

2. Tag all inlet, outlet, pilot and cylinder ports prior to removing the valve.

3. Tag all hoses and associated plumbing.

CAUTION: This valve is heavy (several hundred pounds). Make provisions for handling this weight when removing and installing valve.

4. Prepare a clean and adequate work area before disassembling. Remove valve from machine and position on mounting pads. It is recommended that a current assembly valve print be available for reference before disassembling the valve.

NOTE: CARE MUST BE TAKEN TO PROTECT ALL MACHINED SURFACES.

INLET SECTION

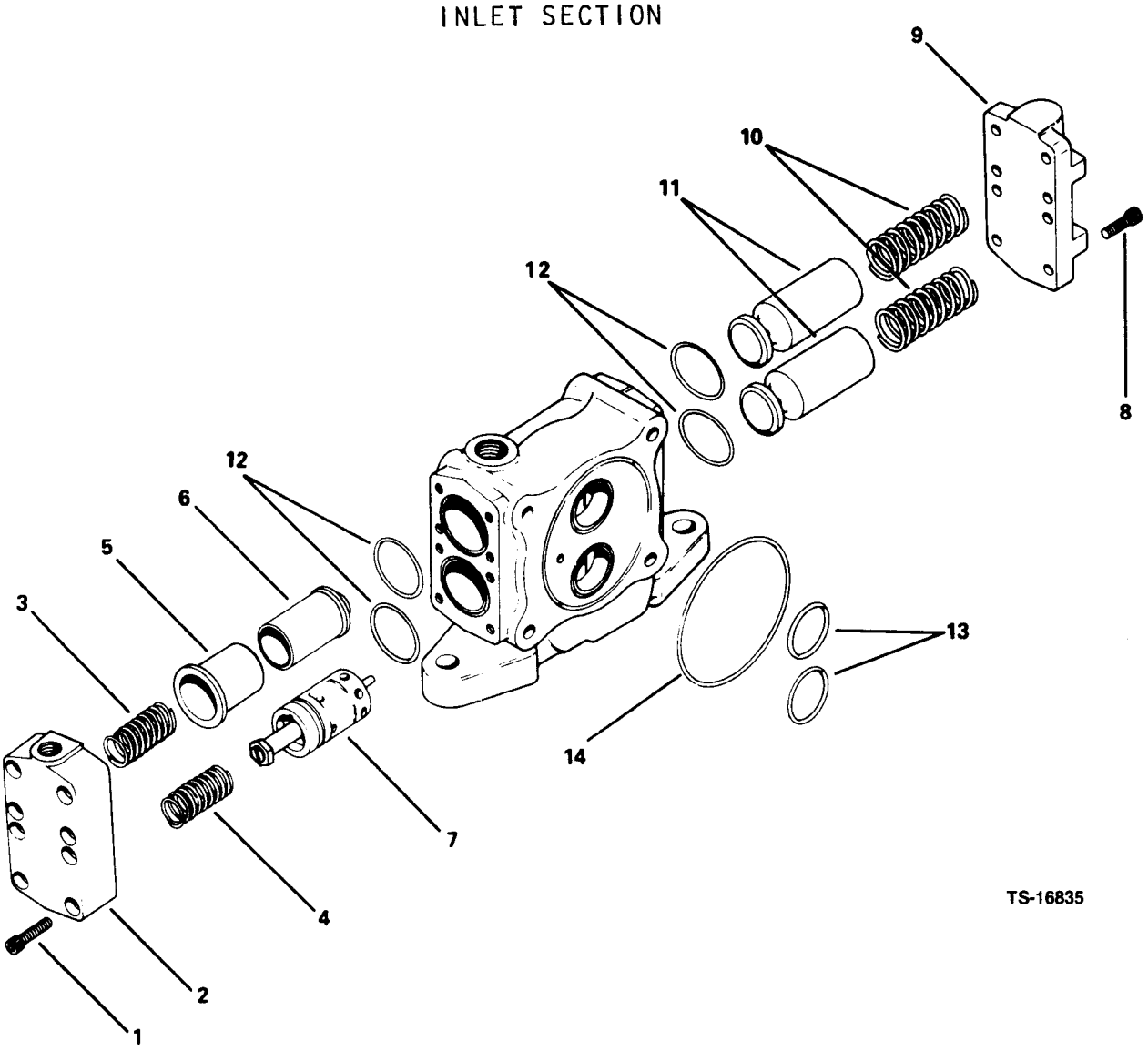


Figure 1 Split Spool Valve - Inlet Section

DISASSEMBLY

Note the position of parts during disassembly so they can be re-assembled in the correct position. Mark both covers (2 & 9) to insure correct reassembly. Remove the eight socket screws (1) and inlet cover (2). Remove springs (3 & 4) and tag for proper reassembly. Remove low pressure relief valve sleeve (5) with subassembly (6) and main relief valve subassembly (7).

Remove the eight socket screws (8) blank poppet cover (9) springs (10) and poppets (11). Remove all external O-Rings (12, 13 & 14) from inlet housing.

INSPECTION

Clean all parts including subassemblies in solvent and dry with compressed air. Inspect the hole and ball poppet of low pressure subassembly (6) for foreign particles, clean with compressed air.

INLET SECTION

Examine all springs for breaks or distortion. Inspect all poppet surfaces for nicks or excessive wear. All seats must be sharp and free of nicks. All bores and surfaces of sliding parts must be free of nicks, scores or excessive wear. Insert the poppets (11) into their respective bore and test for fit. Poppets should fit snugly, without binding through a complete revolution. Follow same procedure to check fit between the sleeve (5) and low pressure relief valve (6).

Examine all O-rings and back-up rings for damage or deterioration. Replace defective parts.

ASSEMBLY

Coat all parts including housing bores with hydraulic oil. Insert poppets (11) and springs (10) into their respective bore. POPPETS MUST BE INSTALLED IN CORRECT POSITION. (See Figure 1).

Place O-rings (12, 13 & 14) into their corresponding grooves. A light coating of grease will hold them in place. Attach blank cover (9) with socket screws (8) and hand tighten.

Mate low pressure relief (6) with sleeve (5). Insert this subassembly along with relief valve (7) and spring (3 & 4) into their respective bore. Attach inlet cover (2) with socket screws (1) and hand tighten.

Tighten socket screws to 60 ft. lbs.(8,3 kgm) torque using a cross corner sequence.

BUCKET PLUNGER SECTION

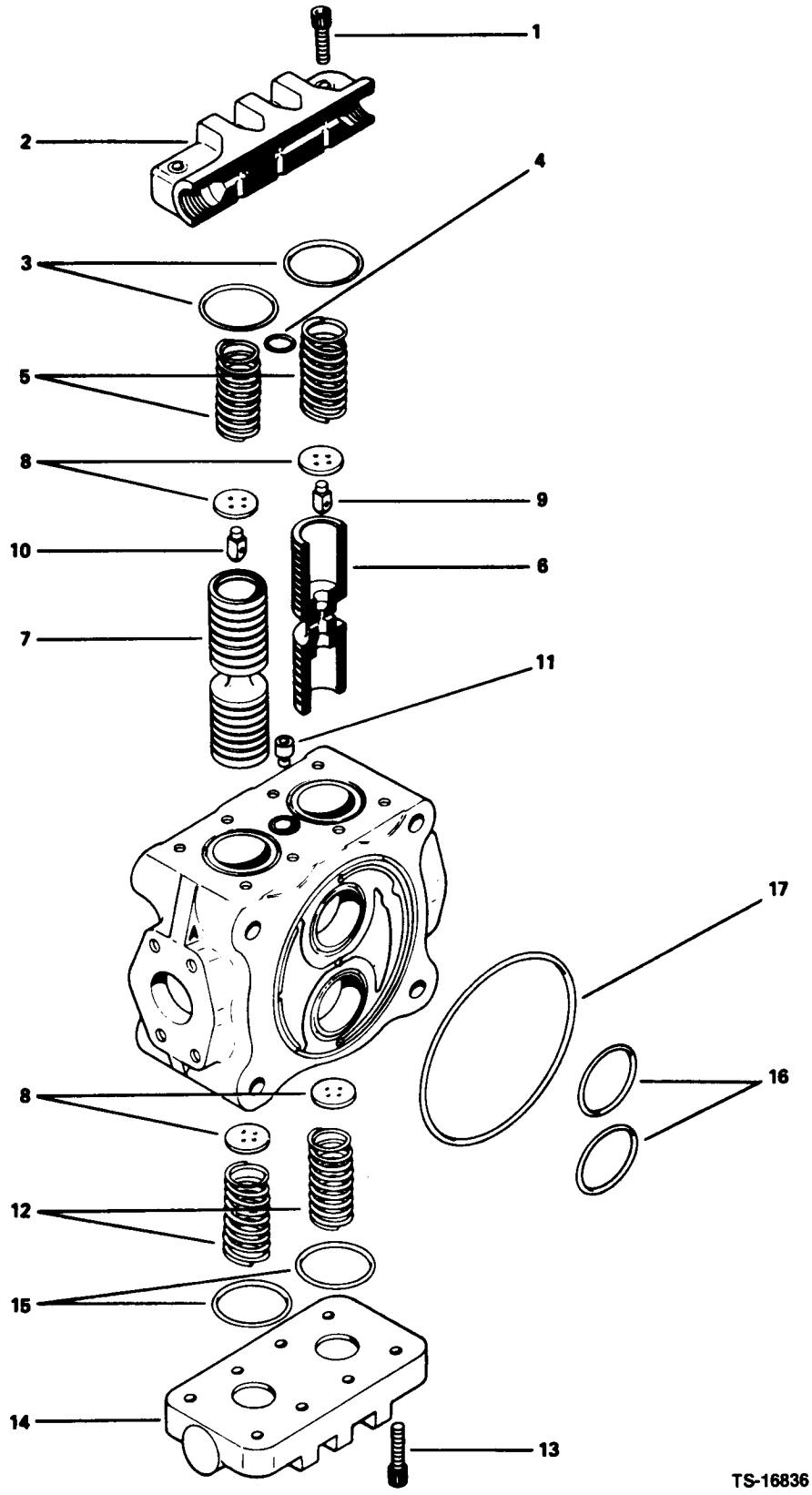


Figure 2 Split Spool Valve - Bucket Plunger Section

*BUCKET PLUNGER SECTION

DISASSEMBLY

Note the position of parts during disassembly so they can be re-assembled in the correct position. Mark both covers (2 & 14) to insure correct reassembly. Remove the eight socket screws (1), cover (2), O-rings (3 & 4), springs (5), and washers (8).

IMPORTANT: Mark each spool (6 & 7) with respect to their proper bore and position (top and bottom) before removing spools from plunger section. Reversing spools with result in the malfunction of this section.

The spools are a select fit and it may be necessary to turn section on an angle to facilitate removal. Identification of each poppet (9 & 10) with respect to its spool is mandatory. Remove spools (6 & 7), poppets (9 & 10) and check valve (11). Remove eight socket screws (13), blank cover (14), springs (12) and O-rings (15).

INSPECTION

Clean all parts (including subassemblies) in solvent and dry with compressed air. Examine all O-rings for damage or deterioration. Examine springs for breaks or distortion. Inspect both the poppet faces and corresponding seating surfaces in the spools. All seats must be sharp and free of nicks. Examine spools and bores for scratches or scoring. Test spools for fit in their respective bore. Spools should fit snugly without binding through a complete revolution. Follow same procedure for fir between the check valve and housing. Inspect the flow passages in spools, blank and spool covers. These passages must be clean and free from foreign particles. Clean passages with compressed air. Replace defective parts.

ASSEMBLY

Coat all parts, including housing bores, with hydraulic oil. Insert poppets (9 & 10) into spools (6 & 7). POPPETS MUST BE INSTALLED IN CORRECT POSITION. (See Figure 2).

Install washers (8) and springs (5 & 12) into spools (6 & 7). Slide spools into their respective bores. IT IS VERY IMPORTANT THAT SPOOLS ARE POSITIONED CORRECTLY.

Place O-rings (3, 4 & 15) into their corresponding grooves. A light coating of grease will hold them in place. Install check valve poppet (11). Attach cover (2) with socket screws (1) and hand tighten. Attach blank cover (14) with socket screw (13) and hand tighten.

Tighten socket head screws to 60 ft. lbs. (8,3 kgm) torque using a cross corner sequence.

*Loader application.

BOOM PLUNGER SECTION

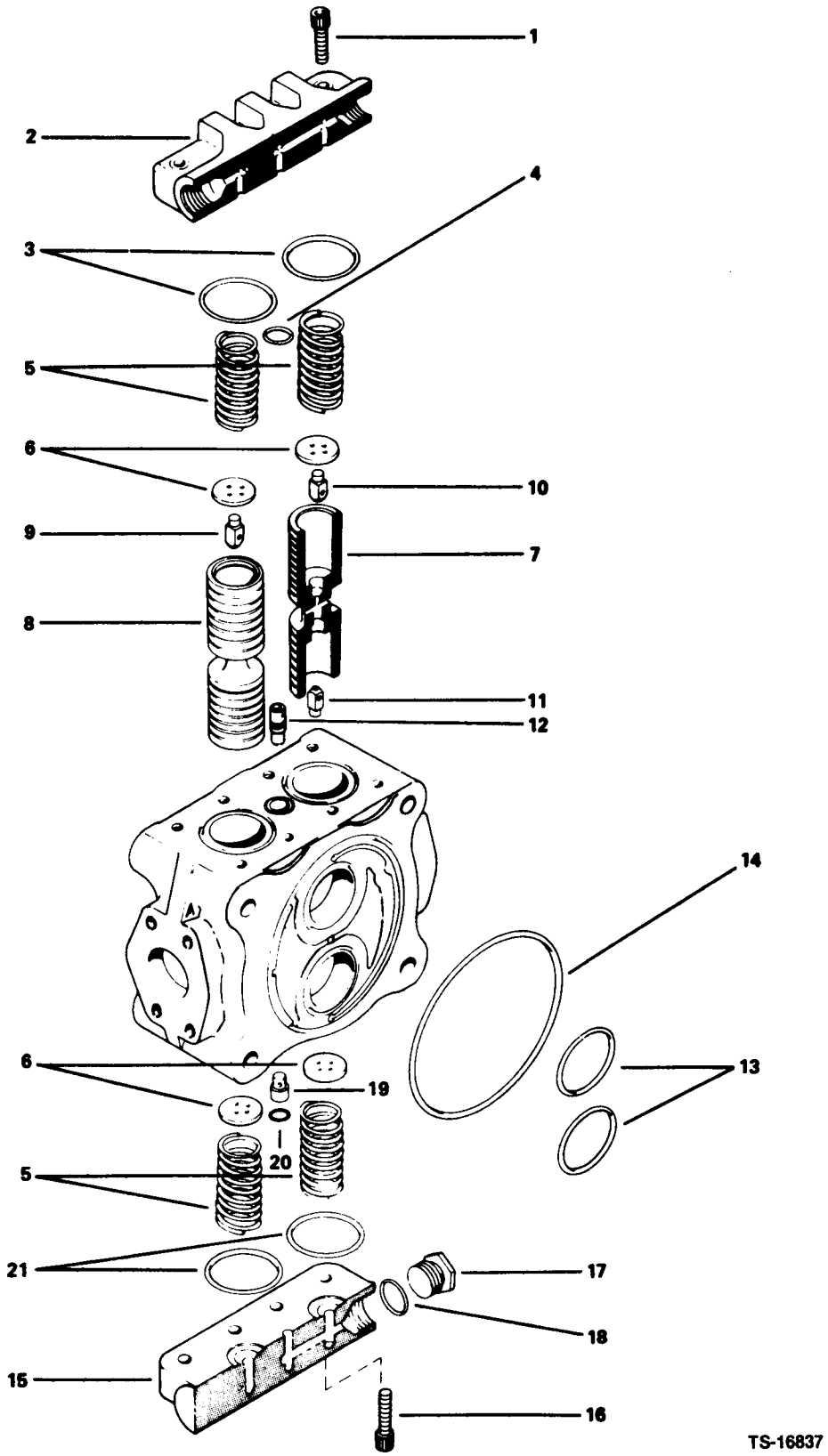


Figure 3 Split Spool Valve - Boom Plunger Section

*BOOM PLUNGER SECTION

DISASSEMBLY

Note the position of parts during disassembly so they can be reassembled in the correct position. Mark both covers (2 & 15) to insure correct reassembly. Remove the eight socket screws (1), cover (2), O-rings (3 & 4), springs (5) and washers (6).

IMPORTANT: Mark each spool (7 & 8) with respect to their proper bore and position (top and bottom) before removing spools from plunger section. Reversing spools will result in the malfunction of this section.

The spools are a select fit and it may be necessary to turn section on an angle to facilitate removal. Identification of each poppet (9 & 10) with respect to its spool is mandatory.

Remove spools (7 & 8) with the following: springs (5), washers (6), and poppets (9, 10 & 11). Remove float poppet subassembly (12) as a unit. Remove eight socket screws (16), and blank cover (15). Remove O-rings (20 & 21) and poppet (19). To complete disassembly remove plug (17) and O-ring (18).

INSPECTION

Clean all parts (including subassemblies) insolvent and dry with compressed air. Inspect the hole and ball poppet of float poppet subassembly (12) for any foreign particles, clean with compressed air.

Examine all O-rings for damage or deterioration. Examine springs for breaks or distortion. Inspect all poppet faces and corresponding seating surfaces in the spools. All seats must be sharp and free of nicks. Examine spools and bores for scratches or scoring. Test spools for fit in their respective bores. Spools should fit snugly, without binding through a complete revolution. Inspect the flow passages in spools, blank and spool covers. These passages must be clean and free of foreign particles. Clean with compressed air. Replace defective parts.

ASSEMBLY

Coat all parts, including housing bores, with hydraulic oil. Insert poppets (9, 10 & 11) into spools (7 & 8). POPPETS MUST BE INSTALLED IN CORRECT POSITION. (See Figure 3).

Install washers (6) and springs (5) into spools (7 & 8). Slide spools into their respective bores. IT IS VERY IMPORTANT THAT SPOOLS ARE POSITIONED CORRECTLY.

Place O-rings (3, 4, 20 & 21) into their corresponding grooves. A light coating of grease will hold them in place. Install check valve poppet (19) and float poppet subassembly (12). Assemble O-ring (18) to plug (17) and install in blank cover (15). Attach cover (2) with socket screws (1) and hand tighten. Attach blank cover (15) with socket screw (16) and hand tighten. Tighten socket head screws to 60 ft. lbs. (8,3 kgm) torque using a cross corner sequence.

*Loader application incorporating float feature.

MAIN FLOW CONTROL POPPET
AND RELIEF VALVE SUBASSEMBLY

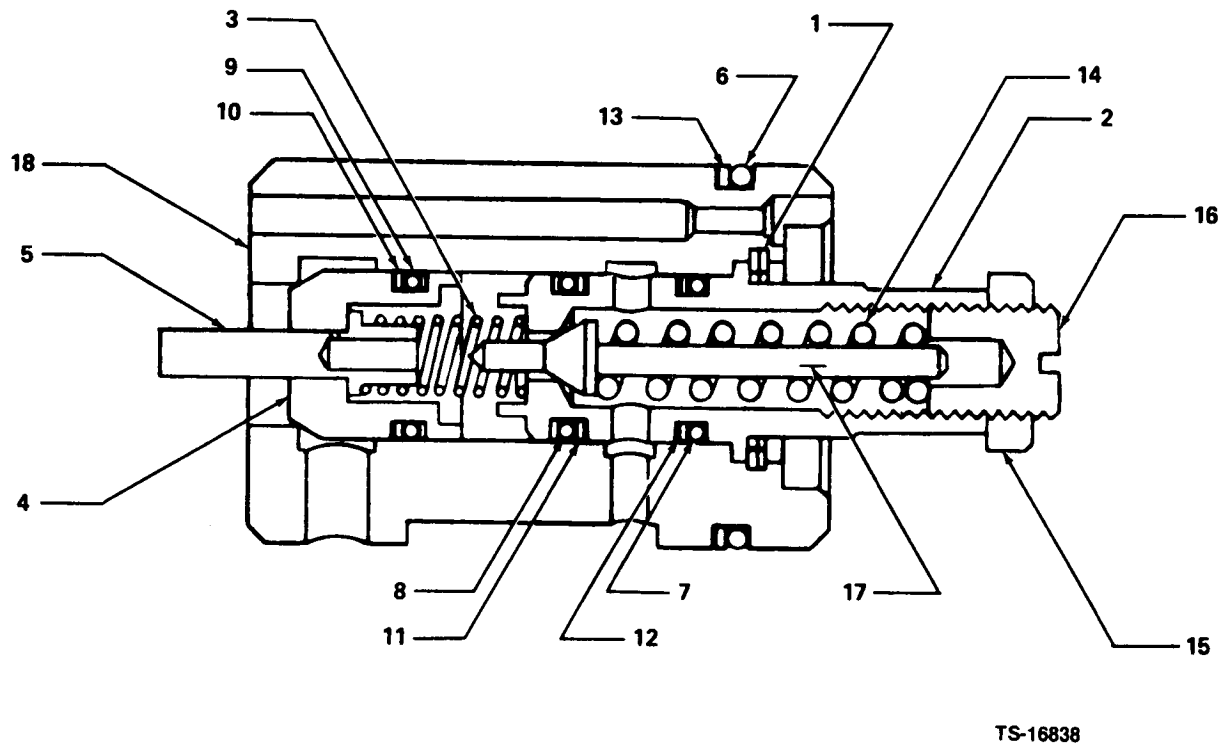


Figure 4 Main Flow Control Poppet and Relief Valve Subassembly

DISASSEMBLY

Remove relief valve Poppet (18) subassembly from split spool inlet section. Begin disassembly by removing snap ring (1), plug (2) with associated parts intact, spring (3),poppet (4) and piston (5). Remove O-rings (6, 7, 8 & 9) and back-up rings (10, 11, 12 & 13). If associated parts in the plug (2) are removed, relief pressure setting will be altered. However, to inspect the poppet (17) face and corresponding seating surface in the plug (2) disassembly is necessary. Finish disassembly by removing lock nut (15) adjust screw (16), spring (14) and poppet (17).

INSEPCTION

Clean all parts in solvent and dry with compressed air. Inspect O-ring grooves for contamination. Check springs for breaks or distortion. Examine poppets (4 & 17) faces and corresponding seating surfaces in poppet (18) and plug (2) for scratches or excessive wear. All seats must be sharp and free of nicks. With O-ring and

back-up ring removed, insert poppet (4) into poppet subassembly (18) and test for fit. Poppet must fit snugly without binding through a complete revolution. Examine all O-rings and back-up rings for damage or deterioration. Replace any parts found to be defective.

ASSEMBLY

Coat all parts with hydraulic oil. Insert poppet (17), spring (14) into plug (2) and thread in adjust screw (16). After the adjust screw contacts the spring (14) each complete turn represents a pressure increase of approximately 1600 P.S.I. on Model 175B and 275B, and 600 P.S.I. on Model 475-111A, 475B and 675B. When required pressure setting is attained, install lock nut (15) and apply 30 ft. lbs. of torque. Assembly O-rings (6, 7, 8 & 9) and back-up rings (10, 11, 12 & 13), note Figure 4 for positioning. Insert piston (5) spring (3) into poppet (4) and install as an assembly into poppet (18). Insert plug (2) with associated parts into poppet (18) and install snap ring (1). Assemble relief valve sub-assembly in inlet section. To function properly as a flow control valve it must fit snugly without binding through a complete revolution.

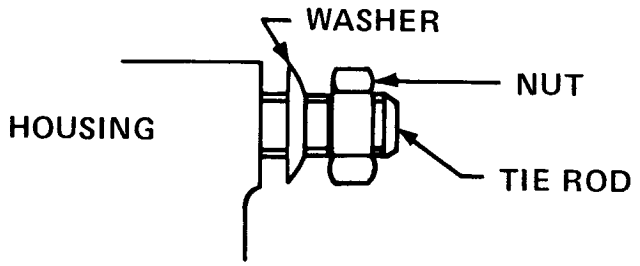
MAIN CONTROL VALVE - LEAKAGE BETWEEN SECTIONS AND TORQUE PROCEDURE

CAUTION: UNTORQUING AND RETORQUING OF THE MAIN VALVE TIE RODS COULD CAUSE DISTORTION RESULTING IN BINDING OR SEVERLY STICKING PLUNGERS.

The following procedure is for replacing the O-ring between the sections to prevent leakage between the sections.

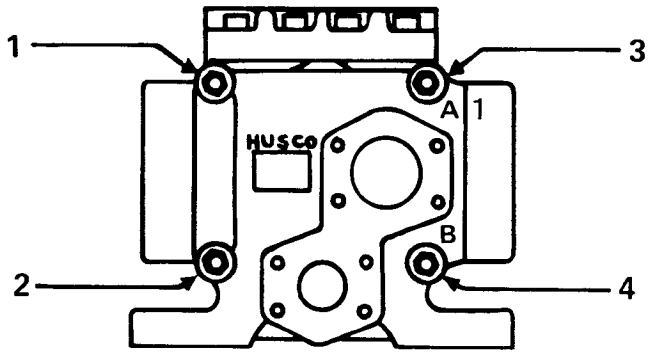
Disassemble the plunger as described on Pages 5, 6, 7 & 8. Be certain to mark each plunger with respect to its mating bore. Remove the four tie rod nuts from one end of the valve. Slide the tie rods from the valve and separate the sections. Inspect the machined sealing surfaces for scratches or nicks. NOTE: Care must be taken to protect all machined surfaces. If scratches or nicks are present, remove by lapping on a perfectly smooth flat steel surface with fine lapping compound.

Replace O-rings between the sections with new ones. Stack inlet, plunger sections and end cover together. Be sure O-rings between the sections are properly positioned. Install the four tie rods with the dished washer between the housing and the nut.



TS-16839

A torque wrench should be used to torque the nuts in a cross bolt pattern. The tie rods should be torqued evenly to 105 ft. lbs. for the 175B & 275B valve and 160 ft. lbs. for the 475-111A, 475B & 675B valve. The following is the recommended tie rod torquing sequence:



TS-16840

Step 1: Torque evenly to 20 ft. lbs. in the following order - 1,4,2,3.

Step 2: Torque evenly to 50 ft. lbs. in the following order - 1,4,2,3.

Step 3: Torque evenly to 105 ft. lbs. in the following order - 1,4,2,3.
NOTE: The 175B & 275B valve tie rods are fully torqued at 105 ft. lbs.

Step 4: Torque the 475-111A, 475B & 675B valve tie rods evenly to 160 ft. lbs. in the following order - 1,4,2,3.

Coat the plungers and housing bores with clean hydraulic oil. Check plungers for freeness by moving the plunger back and forth in the bore and by turning the plunger thru one complete revolution. If plungers are free, re-assemble valve as described on Pages 5, 6, 7 & 8.

CLARK Service gram

13 October 1976

MICHIGAN SG-616A
Group Ref. No. 1100

(NOTE: This bulletin supersedes and replaces SG-616, dated 8 September 1976. REASON: Updated to provide metric information).

SUBJECT: Troubleshooting Boom Drop Complaints - Husco Valves 175, 275, 475, 675

The following procedure should be followed when troubleshooting a machine with complaints of boom dropping. This procedure will help isolate the cause of boom drop.

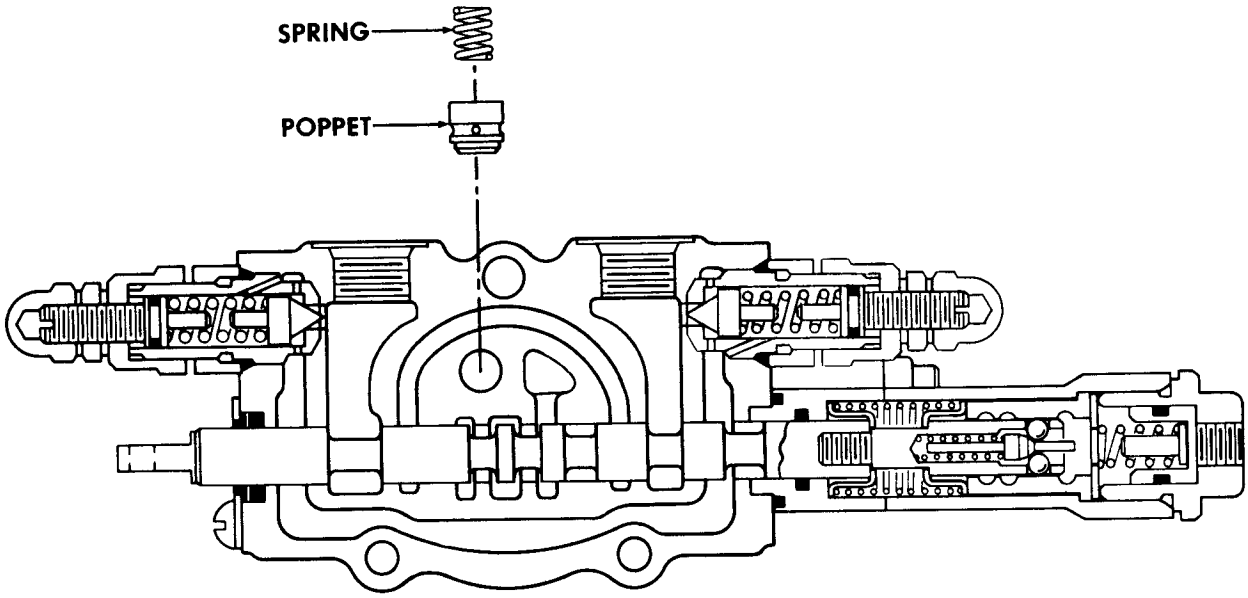
With the machine safely parked in the service position check the hydraulic oil level. The hydraulic oil should be at operating temperature - the boom drop condition is usually not apparent with cold oil.

WARNING - Relieve pressure in hydraulic system before working on valves.

If the boom drops under the following conditions:

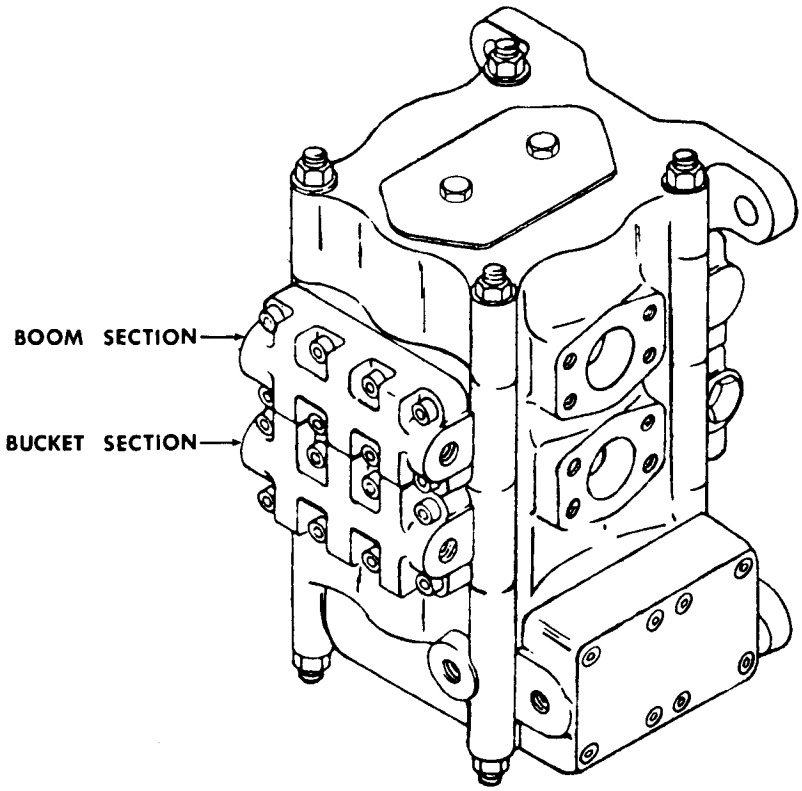
1. Boom lever in either neutral or hoist position.
2. Bucket lever in dump position - either metering or at full dump.
3. Engine at ANY RPM.
4. Load in bucket.
5. Boom cylinder extended - usually near top.

PROBABLE CAUSE	REMEDY
1) Malfunctioning overload reliefs.	Repair or replace overload reliefs.
2) Spools binding in boom section of main valve.	Remove all foreign material until spool moves freely. Replace all worn or damaged parts.
3) Broken or weak spool return spring.	Replace springs in pairs.
4) Holes in either spool or restrictor poppets plugged	Free holes of foreign material. Replace worn or damaged parts.



PILOT VALVE

TS-14749



MAIN VALVE

TS-14731

5)	Boom spool in pilot valve not positioned properly (could also occur with bucket lever in neutral position).	Free and clean binding linkage. Check spool, spring and detent balls and replace if scored or damaged.
6)	Pilot valve load checks (ONLY with boom lever in hoist position and usually only at IDLE RPM).	Replace poppet, spring or valve section as necessary.

It is RECOMMENDED that the LOAD CHECK POPPETS and SPRINGS BE REPLACED in the BOOM AND BUCKET SECTIONS of the PILOT VALVE. Proceed as follows:

1. Remove pilot valve end cap.

2. Remove load check poppet and spring and discard.

3. Inspect load check valve seat. If seat is damaged, replace pilot valve section.

4. Replace o-rings between valve sections.

5. Install new load check poppet 961693 and new spring 961692.

6. Re-assemble pilot valve; be sure tie rods are properly torqued and spools shift freely.

   .3125 in (8,9 mm) dia. rod----------14 ft. lbs (1,9 kgm)
   .375 in (9,5 mm) dia. rod----------33 ft. lbs (4,6 kgm)

7. Test machine for boom drop under conditions outlined earlier.

If the problem of boom dropping cannot be corrected following these procedures, replace the main control valve assembly.

CLARK Service gram

29 December 1976

MICHIGAN SG-630
Group Ref. No. 1100
1200
1300

SUBJECT: Service Data Form 2875 Rev.
Hydraulic Pump Flow Rate

The listing of hydraulic pump flow rates contained in Service Data Form 2875 Rev., attached, is intended for use with the Schroeder Portable Tester in checking all pumps regardless of machine model and system application.

The pump flow rates given in this form are measured at 1500 psi (106 kg/cm^2) with exceptions as noted. Hydraulic oil temperature should be, 150°F. (66°C.) for steering and main hydraulic systems and 180°F. (82°C.) for converter and transmission hydraulic systems minimum.

Converter charging pumps are checked "in line" without the use of the tester load valve, using the system regulating valve to govern the pressure.

Printed in U.S.A.

SERVICE DATA FORM 2875 Rev.

HYDRAULIC PUMP FLOW RATE @1500 PSI (106 kg/cm^2) & 1500 RPM (Exceptions noted)

For Use With Schroeder Portable Tester

The listing of hydraulic pump flow rates contained in this bulletin is intended for use with Schroeder Portable Tester in checking all pumps regardless of machine model and system application.

All flow rate checks must be made with oil at operating temperature: 150°F. (66°C.) for steering and main hydraulic systems and 180°F. (82°C.) to 200°F. (93°C.) for converter and transmission hydraulic systems.

When checking pump flow rate in steering and main hydraulic systems connect pressure part of tester to outlet port of pump and connect tester return port to reservoir filler opening. Set tester load valve at 1500 psi (106kg/cm^2) and run at 1500 rpm. Exceptions to this pressure and rpm are noted in the listing of flow rates.

Converter charging pumps are checked "in line" without use of the tester load valve, using the system regulating valve to govern the pressure.

ALLOWABLE WEAR TOLERANCES:

The flow rates listed in this bulletin apply to new pumps. Up to a 20% wear tolerance below these rates is permissible on used pumps.

When checking rebuilt pumps, check pumps (main hydraulic and steering applications only) at 0 psi (0kg/cm^2) and at 1500 psi (106kg/cm^2) and record readings. A 10% drop in flow rate at 1500 psi (106kg/cm^2) from that recorded at 0 psi (0kg/cm^2) is permissible. Exceptions to 1500 psi (106kg/cm^2) pressure check are noted in listing.

NOTE: Converter Charging Pumps ARE NOT TO BE REBUILT for use as converter charging pumps, but may be used as steering pumps where applicable.

CLARK PART NO.	*MANUFACTURER'S PART NO.	GALLONS PER MINUTES	LITERS PER MINUTE
450001	----------	65	246
450002	----------	65	246
450003	----------	13	49
450004	----------	13	49
450007	----------	32	121
450008	----------	32	121
450009	----------	52	197
450010	----------	52	197

CLARK PART NO.	*MANUFACTURER'S PART NO.	GALLONS PER MINUTE	LITERS PER MINUTE
450011	----------	8	30
450012	----------	6	23
450015	----------	20	76
450018	----------	40	151
450023	----------	**7	**26
450047	----------	26	98
450059	----------	20	76
450060	----------	26	98
450061	----------	20	76
450063	----------	8	30
450072	----------	6	23
450091	----------	65	246
450092	----------	52	197
450118	----------	20	76
450124	----------	40	151
450126	----------	52	197
450127	----------	52	197
450130	----------	60	227
450133	----------	13	49
450134	----------	40	151
450136	----------	40	151
450139	----------	20	76
450140	----------	20	76
450142	----------	20	76
450143	----------	20	76
450145	----------	26	98
450155	----------	32	121
450156	----------	32	121
450161	----------	13	49
450168	----------	6	23
450169	----------	13	49
450174	----------	40	151
450176	----------	8	30
450182	----------	40-7	151-26
450183	----------	26	98
450185	----------	6	23
450188	----------	52	197
450192	----------	40	151
450199	----------	26-6	98-23
450215	----------	52	197
450221	----------	26	98
450229	----------	6	23
450230	----------	8	30
450233	----------	40	151
450235	----------	16-6	61-23
450237	----------	13	49
450245	----------	13	49
450246	----------	20	76
450247	----------	20	76
450249	----------	8	30

CLARK PART NO.	*MANUFACTURER'S PART NO.	GALLONS PER MINUTE	LITERS PER MINUTE
220988	052941-070	11	42
221450	051002-201	8	30
221980	052844-050	28	106
228995	C230-26	30	113
228996	C230-29	30	113
228997	D230-7	35	132
228998	E230-1	50	189
228999	E230-2	62	235
229000	C230-27	18-9	68-34
229001	S230-2	24-9	91-34
229002	C230-25	30-9	113-34
229003	J230-3	36-9	136-34
233540	----------	11	42
512096	053073-010	53	201
513544	053073-030	54	204
515379	051006-120	18	68
518318	3615A4A2	82	310
518776	3620A1A2	***82	***310
520149	3025K11J11	55	208
521237	051758-070	24	91
538319	2012A19E9AL	15	57
539409	3030A9D4AR	67	254
539618	3030C1A1AL	67	254
539741	2012C19E9AL	15	57
539744	2025C19L11AL	33	125
541742	3615A4A4	82	310
541796	3620A1A6	***82	***310
541828	3615A1A16	82	310
543042	3615C10R1AL	82	310
543273	20058-0YKA	58	219
543914	20054-1ZMA	39	148
544209	3615C10S1AL	82	310
549319	3615C10L1AL	82	310
550242	051758-030-01	23	87
550243	052792-010 & 011	**7	**26
550244	051552-040 & 041	40	151
550245	051553-020	48	182
553413	051553-020 & 023	45	170
553415	051552-040 & 043	40	151
553417	051758-303, 033 & 061	23	87
564403	3125C1A1AL	69	261
564653	20450-AEE	58	219
568067	25660-AM	83	314
569329	2017C-SP1	21	79
569354	C230-7	23	87
570977	C230-6	18	68
571497	1715E3C1AL	18	68
571995	45V60A-19A10L	72	272
573924	20350-AEE	43	163
574293	20150-A	18	68

CLARK PART NO.	*MANUFACTURER'S PART NO.	GALLONS PER MINUTE	LITERS PER MINUTE
574294	25550-AM	68	257
574345	3520V30A12	34-14	129-53
582269	3017C1A1AL	38	144
582368	3025K11J2	55	208
582686	2020C19E5AL	25	95
582687	3025C1A1AL	55	208
582688	3615C1B1AL	82	310
583480	3025C1E1AL	55	208
584119	1512A1B1FL	9	34
588351	3620C1A1AL	***82	***310
591267	051552-022	40	151
592403	3615A1A2	82	310
593980	3025K11J	55	208
1502919	TP25660-20350ADF	80-14	303-53
1504849	45V60A-52B10L	72	272
1508714	20200-AMG	26	98
1509497	TP25560-20350AFF	82-45	310-170
1510691	22PL220045	32	121
1512954	20350A-DES	43	163
1512955	TP20400A-P2-45-DEN	50-5	189-19
1514624	TP20350-080A-1D	43-10	163-38
1518341	TP25660-20350AJF	82-45	310-170
1519912	20200-AWM	26	98
1519913	20250-AWM	32	121
1519914	20350-ATM	43	163
1519915	25550-AKY	68	257
1520706	1517E1B1AL	10	38
1520707	1512E1B1AL	7	26
1520839	D230-6	31	117
1520849	1915E3C1GL	23	87
1520928	25660-ADK	83	314
1521085	1711E3C1CL	11	42
1521257	1413E1C1CL	7	26
1521270	1715E3C1GL	15	57
1521641	20350-AEF	43	163
1521845	E230-3	62	235
1522303	3125A-3017SP1	74-38	280-144
1522476	4535V60A-3819BC10L	68-42	257-159
1522477	4535V50A-3019	55-42	208-159
1524257	2025C26D11AL	32	121
1525425	3022A9A1AR	46	174
1525507	C230-38	31-8	117-30
1525904	2000C19E9AR	15	57
1526549	45V50A11CL	55	208
1526550	2520V21A14-11CD10L	24-15	91-57
1532858	2017C-SP2	21	79
1533314	4525V60A21-84DC10L	68-24	257-91
1533315	3525V30A21-84DC10L	33-24	125-91
1533933	25770-AGP	***72	***272
1535508	2520V17E11-11BA4H10L	20-13	76-49

CLARK PART NO.	*MANUFACTURER'S PART NO.	GALLONS PER MINUTE	LITERS PER MINUTE
1535739	20250AMG	32	121
1536206	TP25660-20350ADD	80-44	303-166
1536958	2520V21E11-11BA4H11L	23-12	87-45
1538115	1413E1C1JL	8	30
1548989	25550A-GL	68	257
1551958	P30B242B10G15-25D0G12-1	18-15	68-57
1551959	P75A678BE9X257	61	231
1564610	22-2096	25	95
1564643	23-2073	32	121
1564733	24306-LBB	INA	INA
1564818	P30B242B10G12-25D0G121	15-15	57-57
1564842	P50B278B10M17-7D0M151	27-23	102-87
1565083	P50A278BE0M177	27	102
1566233	P50A242BE0S277	35	132
1566234	P50B242B10M15-7D0M151	23-23	87-87
1576377	21-2049	19	72
1576424	P30B197B10J12-C0J121	15-15	57-57
1578826	23-2120	32	121
1675095	C230-30	18-12	68-45
2500490	THP8-770-660AD	***72-63	***272-238
2500491	HP8-770AD	***72	***272
2500492	THP8-770-20200AD	***72-19	***272-72
2511307	TP25660-20350A	82-45	310-170
2511359	TP20400-P245DHG	50-5	189-19
2512450	THP8-770-660A	92-80	348-303
2512451	THP8-770-20200A	92-24	348-91
2512452	HP8-770A	92	348
3151160	1413E1C1AL	7	26
3953109	18PR220563	26	98
3953110	CP230A-61	18	68

The following listed power-sensor pumps are to be checked at 1250psi (88kg/cm^2) and 1250 rpm.

CLARK PART NO.	MANUFACTURER'S PART NO.	GALLONS PER MINUTE	LITERS PER MINUTE
1508329	SH20350-200AE5	55	208
1513226	SH20350-300A1D2	65	246
1513227	ST20300-300A1D2	60	227
1513228	SH20400-300AT	70	265
1513315	SH20350-200AV	55	208
1516617	ST20150-150AV2	30	113
1519363	SD20350-350A1D3	#70	#265
1519364	SH20350-300A1D3	65	246
1519365	ST20300-300A1D3	60	227
1519366	SH20400-300ADF	70	265
1519916	ST20150-150ADE	30	113
1519954	SH20350-200ADE	55	208

CLARK PART NO.	MANUFACTURER'S PART NO.	GALLONS PER MINUTE	LITERS PER MINUTE
1539860	SH20400-300AJ8	70	265
1542411	ST20150-150A1F1	30	113
1543435	SD20350-350A1D	#70	#265
1543436	SH20350-300A1D	65	246
2507292	NST20150-150A-DN	30	113
2507293	NST20300-300A-1D	60	227
2507294	NSH20350-200A-DY	55	208
2507295	NSH20300-350A-1D	65	246
2507296	NSD20350-350A-1D	#70	#265
2507297	NSH20350-350A-DY	70	265
2511763	NSH20350-350A-ER	70	265
2511764	NSD20350-350A-DW	#70	#265
2511765	NSH20300-350A-ED	65	246
2512566	NST20350-350A-1D	70	265
2514127	NST20150-150A-EG	30	113
2514128	NST20300-300A-1D-1	60	227
2514129	NSH20350-200A-EW	55	208
2514130	NSH20300-350A-ES	65	246
2514131	NSD20350-350A-EJ	#70	#265
2514132	NSH20350-350A-ET	70	265

- All of the previously listed power-sensor pumps have single outlet ports with the exception of 1519363, 1543435, 2507296, 2511764 & 2514131 which have two outlet ports. Flow rate check on 1519363, 1543435, 2507296, 2511764 & 2514131 should be made with tester pressure port connected to outlet port closest to the pump mounting flange.

* - Clark part number and/or manufacturer's part number will be found stamped on nameplate or into pump body for purposes of pump identification. Where manufacturer's number is not given in listing, pump is of Clark manufacture and therefore will have only one number stamped on it.

** - Check pump @ 1350 psi (95 kg/cm^2) and 1500 rpm. Pump not designed for higher pressures.

*** - Check pump @ 1500 psi (106 kg/cm^2) and 1200 rpm. This is to maintain flow rate under 100 gpm (379 liters per min.), which is capacity of Schroeder Model PT-100 Tester.

NOTE: Included in the preceeding listing are a number of dual or "piggyback" pumps. Flow rate is expressed in two figures with a hyphen or dash between. Example: "34-14 gpm (129-53 lpm) indicates 34 gpm (129 lpm) for large pump and 14 gpm (53 lpm) for small pump.

CLARK Service gram

22 August 1978

MICHIGAN SG-714
Group Ref. No. 1100
1200

SUBJECT: Replacement of Tyrone Sensor Pumps with Bolt-on Sensor Valves in Main and Steering Hydraulic Systems
Model 175B & 275B

This bulletin is intended for customers who have machines with external sensor pumps and machines with internal sensor pumps, and wish to standardize to one type of pump for service replacement. The following machines were shipped from the factory with internal sensor pumps.

175B Cummins	438B157FSC & after, 438C101 & after
175B G. M.	427B131FSC & after, 427B386CAC & after 427B381 & after
275B Cummins	425B186FSC & after, 425B501CAC & after, 425B503 & after

Machines with serial numbers prior to those listed above were equipped with external sensor pumps. You can replace the external sensor pumps with internal sensor pumps by ordering parts from the appropriate list and installing these parts as shown in this bulletin.

In each case, use the following procedure:

1. Drain the hydraulic oil reservoir and replace the filters.
2. Remove the pumps and mating parts.
3. Install the new pumps and mating parts.
4. Refill the hydraulic oil reservoir.

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PARTS LIST FOR ONE MACHINE:

Model 175B

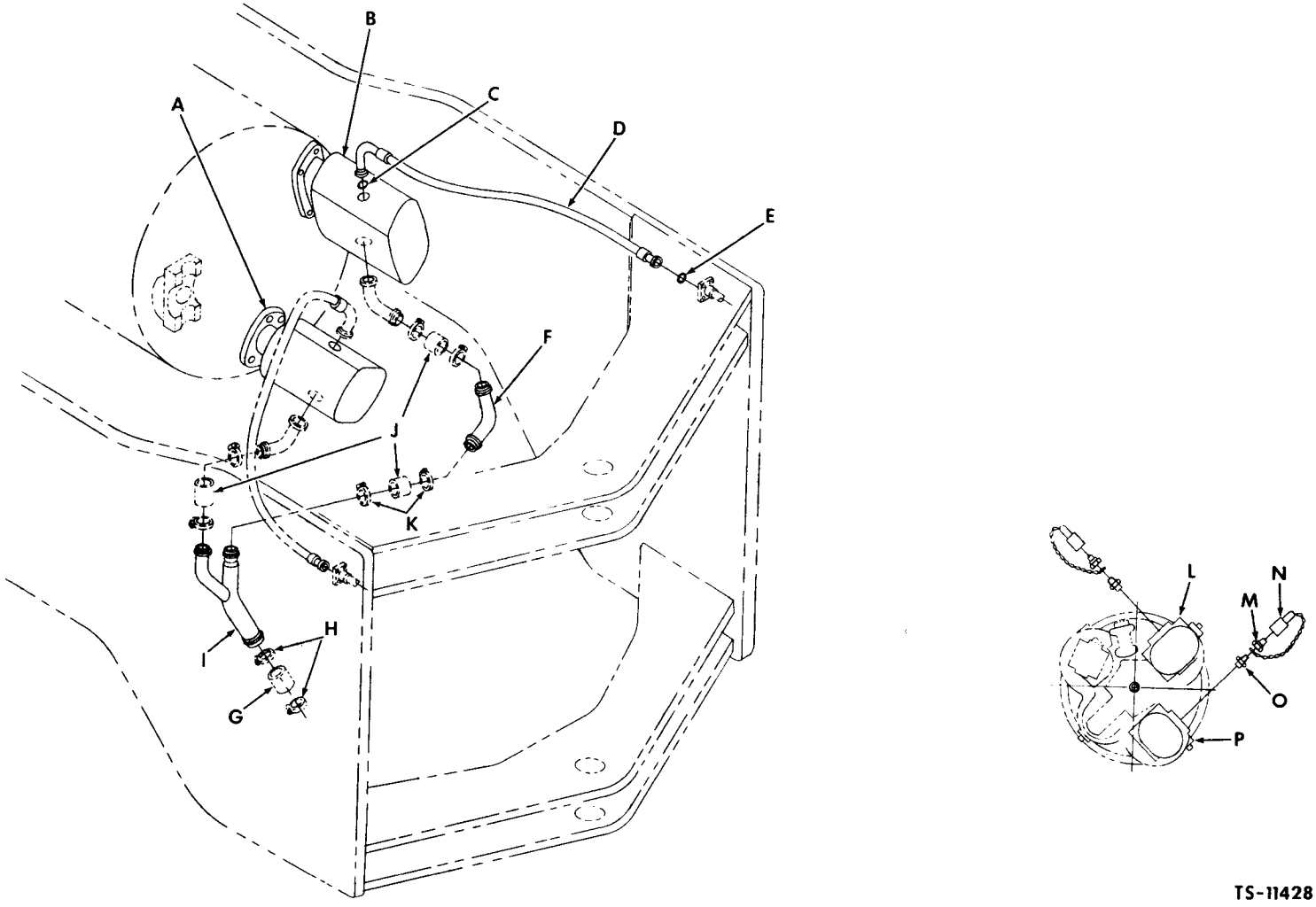
NOTE: Both main and steering pumps should be changed at the same time whenever either external sensor pump is to be replaced with an internal sensor pump.

1	2514132	Pump, Main
2	552161	Gasket
1	2508436	Suction Tube Assembly
2	540102	Clamp
1	1542512	Hose
6	540106	Clamp
2	585887	Hose
1	2514128	Pump, Steering
1	2507186	Suction Tube
1	58K-225	O-Ring
1	58K-219	O-Ring
1	2507187	Hose Assembly
4	1314178	Connector
4	1306142	Coupler
4	6000689	Cap

Model 275B

NOTE: Both main and steering pumps must be changed at the same time whenever either external sensor pump is to be replaced with an internal sensor pump.

1	2514130	Pump, Main
2	552161	Gasket
1	2517214	Pump, Steering
1	2507324	Suction Tube Assembly
1	2508864	Suction Tube
1	2508870	Suction Tube Assembly
1	2508872	Tube Assembly
4	23C-828	Bolt
4	4E-08	Lockwasher
1	1547041	Hose Assembly
1	2508868	Hose Assembly
1	2508869	Hose Assembly
2	533478	Hose
6	540106	Clamp
1	518330	Hose
1	1545012	Hose
2	540102	Clamp
1	58K-219	O-Ring
2	58K-232	O-Ring
3	58K-222	O-Ring
3	58K-225	O-Ring
4	29F-1	Street Elbow 90°
4	1306142	Coupler
4	6000689	Cap
1	2508865	Tube Assembly
4	1314178	Connector

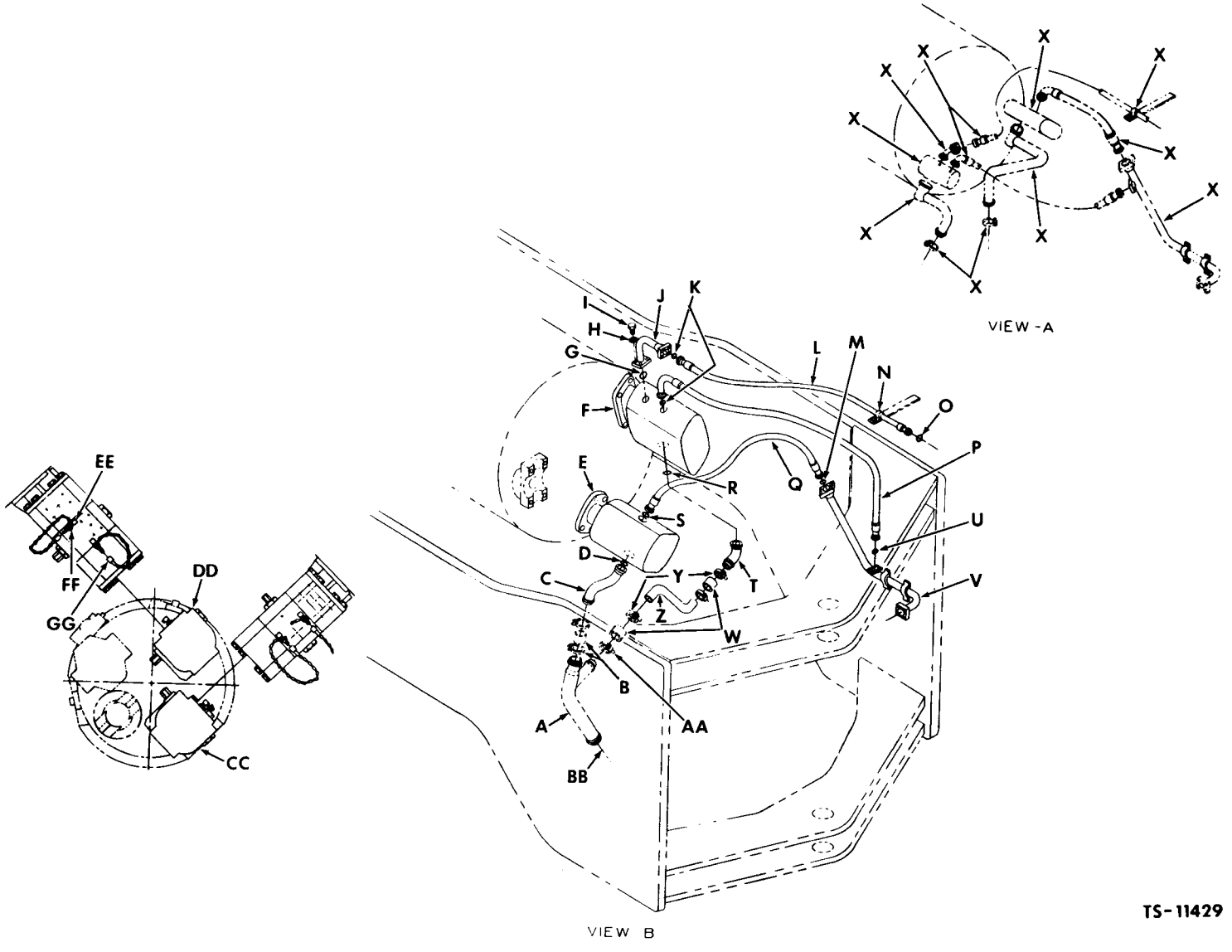


175B, S/N 427A101 thru 427A999, 427B101 thru 427B380, 427A101CAC thru 427C999CAC, 427B101CAC thru 427B385CAC, 427A101FSC thru 427A999FSC, 427B101FSC thru 427B130FSC, 438A101FSC thru 438A999FSC & 438B101FSC thru 438B156FSC

Figure 1

Refer to Figure 1

A.	2514132 552161	Main Hydraulic Pump & Gasket (Use Existing Hardware)
B.	2514128 552161	Steering Hydraulic Pump & Gasket (Use Existing Hardware)
C.	58K-225	O-Ring
D.	2507187	Hose (Use Existing Hardware Both Ends)
E.	58K-219	O-Ring
F.	2507186	Suction Tube
G.	1542512	Hose
H.	540102	Clamp (2 req'd.)
I.	2508436	Suction Tube Assembly
J.	585887	Hose (3 req'd.)
K.	540106	Clamp (6 req'd.)
L.	2514128	Steering Pump Ref.
M.	1306142	Coupler (4 req'd.)
N.	6000689	Cap (4 req'd.)
O.	1314178	Connector (4 req'd.)
P.	2514132	Main Pump Ref.



275B, S/N 425A101 thru 425A999, 425B101 thru 425B502, 425A101CAC thru 425A999CAC, 425B101CAC thru 425B500CAC, 425A101FSC thru 425A999FSC & 425B101FSC thru 425B185FSC

Figure 2

Refer to Figure 2

1. Remove Items in View A marked "X".

2. Install the following items as shown in View B.

A.	Existing Suction Tube Assembly	
B.	518330	Hose & 2 - 540106 Clamps
C.	2507324	Suction Tube
D.	58K-232	O-Ring
E.	2514130	Main Pump & 552161 Gasket (Use Existing Hardware)
F.	2517214	Steering Pump & 552161 Gasket (Use Existing Hardware)
G.	58K-225	O-Ring
H.	4E-08	Lockwasher (4 req'd.)
I.	23C-828	Bolt (4 req'd.)
J.	2508872	Tube Assembly
K.	58K-222	O-Ring
L.	2508868	Hose
M.	58K-225	O-Ring
N.	Use Existing Clip & Hardware	
O.	58K-219	O-Ring
P.	2508869	Hose
Q.	1547041	Hose
R.	58K-232	O-Ring
S.	58K-225	O-Ring
T.	2508870	Suction Tube
U.	58K-222	O-Ring
V.	2508865	Tube Assembly (Use Existing Hardware)
W.	533478	Hose (2 req'd.)
Y.	540106	Clamp (2 req'd.)
Z.	2508864	Suction Tube
AA.	Tighten Clamps	
BB.	To Hydraulic Reservoir	
CC.	Main Hydraulic Pump (Ref.)	
DD.	Steering Pump (Ref.)	
EE.	29F-1	Elbow (4 req'd.)
FF.	1306142	Coupler (4 req'd.)
GG.	6000689	Cap (4 req'd.)

CLARK Service gram

21 June 1979

MICHIGAN SG-736A
Group Ref. No. 1100

(This bulletin replaces Service Gram SG-736, dated 17 April 1979. REASON: Added connector and changed hose assembly part number).

SUBJECT: Main Control Valve Flow Control Damping Kit
Model 175B and 275B Tractor Shovels

A flow control damping kit is available for use on Model 175B and 275B machines. The purpose of the damping kit is to be like a cushion against sudden short periods of high pressure in the valve.

These sudden short periods of high pressure occur when you shift the spools of the valve. You can install the damping kit on Model 175B machines with serial numbers: 427A, 427B, 427C, 438A, 438B or 438C. You can install the damping kit on Model 275B machines with serial numbers: 425A, 425B, 425C or 479A. Make an order for parts from the following list. Install the parts as shown in this bulletin.

PARTS LIST FOR ONE MACHINE:

1 - 2524588 Damping Kit including:

a.	3 -	948063	O-ring
b.	1 -	948851	O-ring
c.	2 -	76K226	O-ring
d.	3 -	948849	Back-up ring
e.	1 -	948852	Back-up ring
f.	1 -	962997	Poppet

*1 -	89F5	Connector
1 -	15K5	Connector
**1 -	3729803	Hose assembly
1 -	30F1	Tee
1 -	6000689	Cap
1 -	1306142	Coupler
1 -	5K207	Nipple

INSTALLATION:

1. Disconnect the supply hose for the pilot valve from the supply cap on the main valve. Remove and keep the hose to cap fitting.

2. Remove the pilot supply cap and relief cartridge assembly.

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3. Remove the poppet on the main relief cartridge.

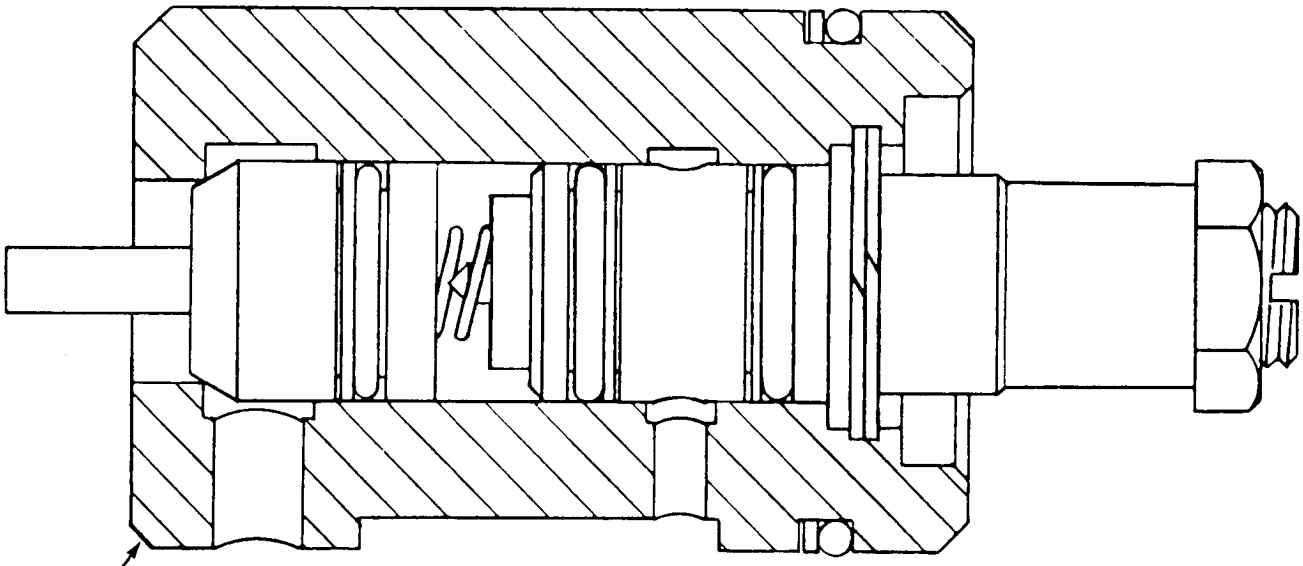
4. Install the new poppet and o-rings, included in the 2524588 Damping Kit, on the main relief cartridge (See Figure 1).

5. Install the main relief cartridge and the new pilot supply cap. See Figure 2 for cross section of pilot supply cap.

6. Install the 15K5 Connector, 2524405 Hose, 30F1 Tee, 5K207 Nipple, 1306142 Coupling and 6000689 Cap on the pilot supply cap (See Figure 3).

7. Install the present hose and fitting (disconnected in Step 1) on the pilot supply cap (See Figure 3).

*Part Added
**New Part Number



TS-15107

(Cartridge Assy. Part No. 962585)

Figure 1

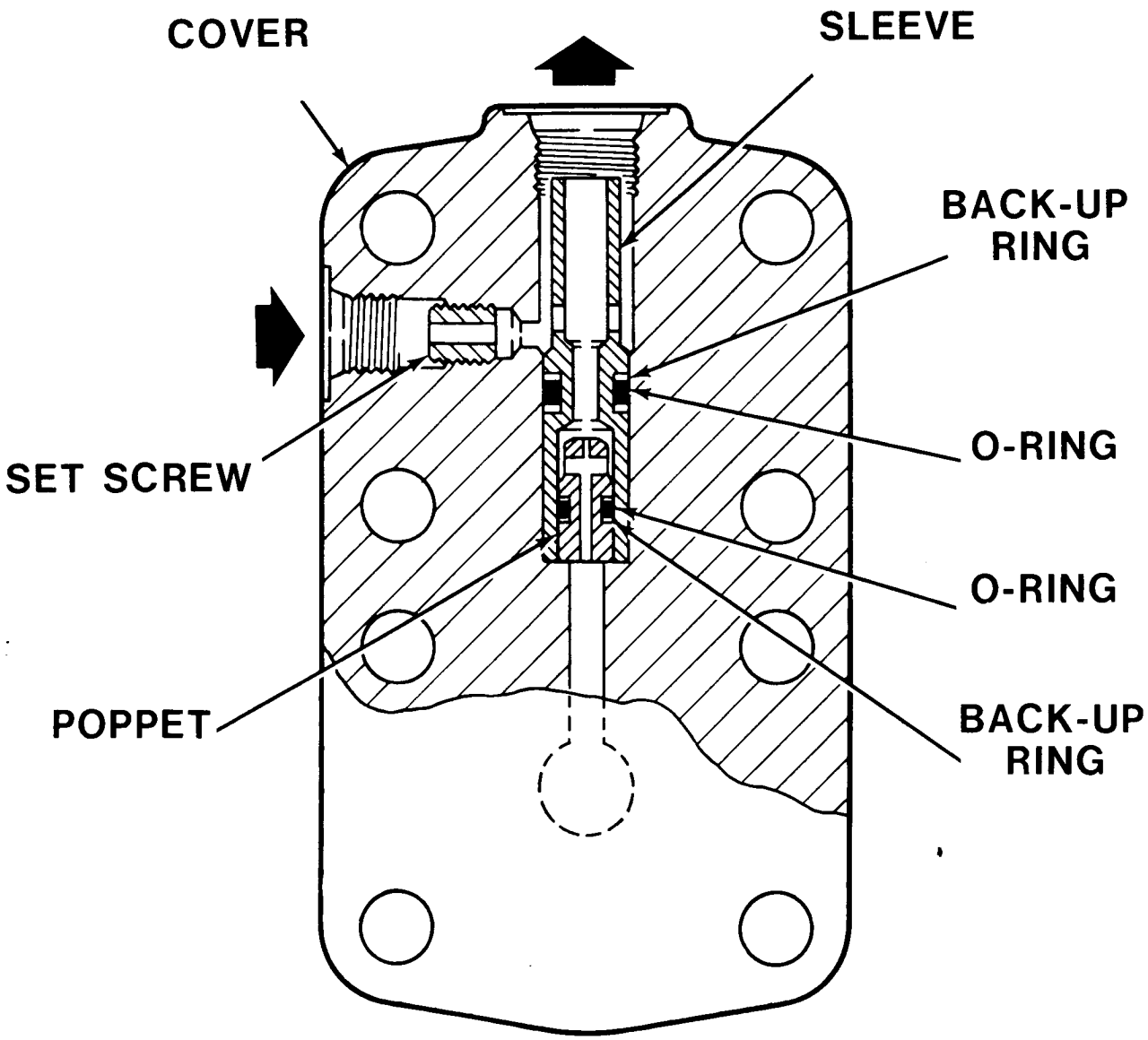

COVER
SLEEVE
BACK-UP RING
O-RING
SET SCREW
O-RING
POPPET
BACK-UP RING

Figure 2

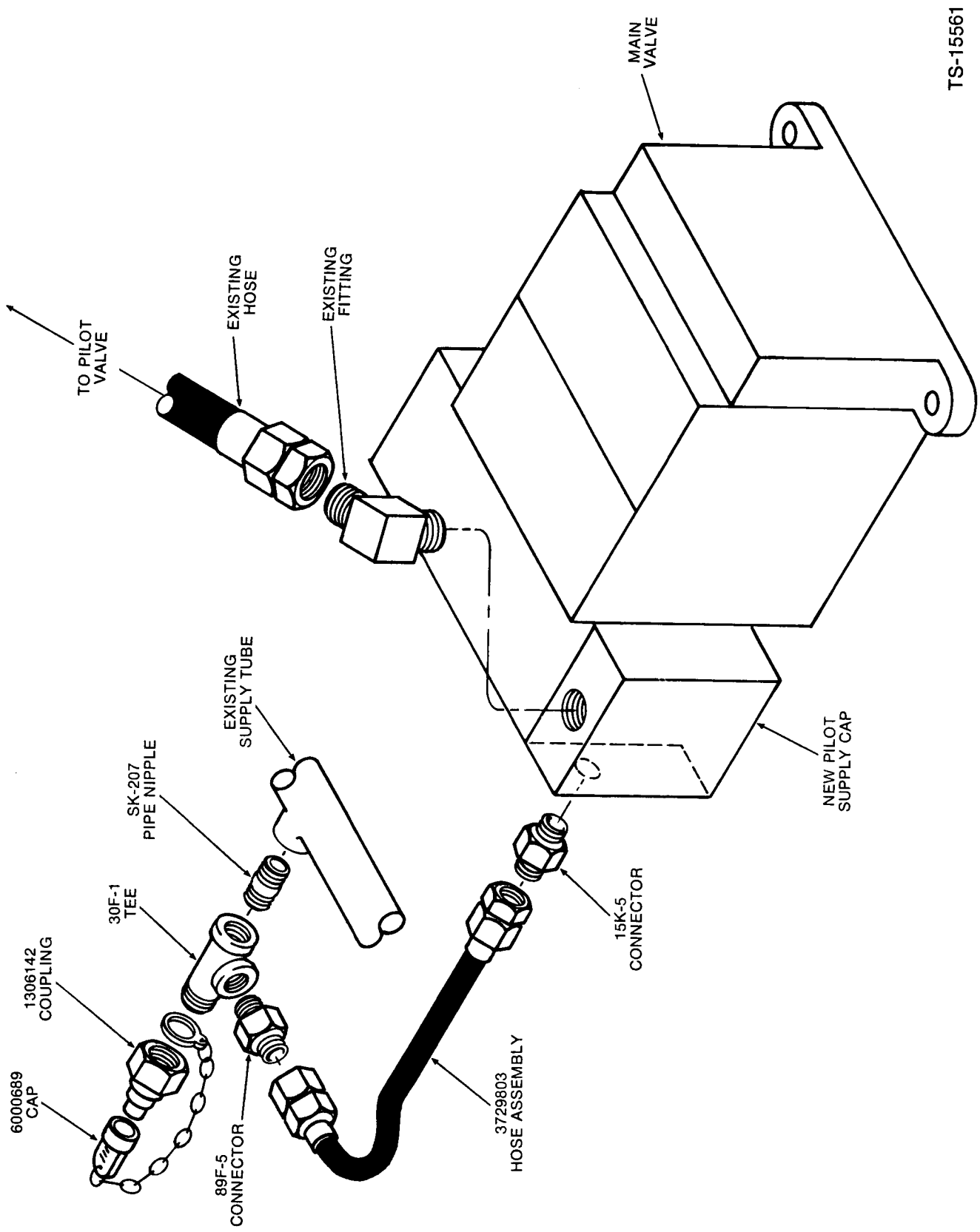

TS-15561
MAIN VALVE
TO PILOT VALVE
EXISTING HOSE
EXISTING FITTING
EXISTING SUPPLY TUBE
SK-207 PIPE NIPPLE
30F-1 TEE
1306142 COUPLING
6000689 CAP
89F-5 CONNECTOR
3729803 HOSE ASSEMBLY
15K-5 CONNECTOR
NEW PILOT SUPPLY CAP

Figure 3

CLARK Service gram

March 1980

MICHIGAN SG-743C
Group Ref. No. 1200
2000

(This bulletin supersedes and replaces SG-743B, dated 23 April 1979. REASON: Added information in Step 2 of Installation Instructions).

SUBJECT: Steering Gear to Valve Seal for MICHIGAN Tractor Shovels, Dozers and Scrapers equipped with Saginaw Steering Gears and Column Mounted Valves.

There have been reports of hydraulic oil leakage from the steering control valve into the steering column.

To correct this, an improvement change has been made using a seal and back-up washer assembly.

The seal and back-up washer will give a better fit and will withstand higher oil pressure, reducing the possibility of hydraulic oil leakage from the steering control valve into the steering column.

The seal used by itself may not withstand the higher oil pressure, causing leakage.

The part number for the seal is 873293 and the part number for the back-up washer is 962993.

The seal and back-up washer replaces part number 2525732 seal.

If serious oil leakage occurs, replace it with the 873293 seal and 962993 back-up washer.

NOTE: *Present adapter assemblies must be reworked before the washer can be used. See Step No. 2 in Installation Instructions for correct rework information.*

New adapter assemblies with this change are available by ordering part number 962990 or part number 962992. Part number 962990 Adapter Assembly is used with Steering Gear Assembly 566434. Part number 962992 Adapter Assembly is used with Steering Gear Assemblies 1521916 and 1529890.

New steering gear assemblies that have the seal and back-up washer installed are identified by two date stamp tags stamped with 'XX'. These date stamp tags are located under the side cover bolts.

INSTALLATION:

1. Be sure to mark steering valve parts before disassembly to insure proper assembly.

2. See Figure 1 for correct installation of Adapter Assembly. Be certain that the lip portion of the 873293 Seal points toward the steering valve. Make sure that the chamfered edge of the 962993 Washer is against the shoulder of the adapter assembly. The seal must be pressed tight against the washer. *

   NOTE: *Use of the seal and washer required a minimum bore depth of .370 in (9,40 mm) in the adapter assembly.*

3. See Figure 2 and put spacer (Item 52) on Shaft (Item 63).

4. Add lubrication to and install bearing (Item 49) on Shaft (Item 63) with larger bearing washer race toward the valve spool (Item 53).

*Added information

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5. Apply heavy grease to pinside of washer (Item 50) and put on shaft (Item 63) with pins pointing toward the valve spool (Item 53).

6. Place valve housing (Item 19) less valve spool (Item 53), plungers (Item 55), and springs (Item 54) over shaft (Item 63). Start bolts (Item 60) into adapter (Item 21) using some type of spacer that is the same thickness as cover (Item 62) between bolt heads and housing (Item 19).

7. Turn steering wheel (Item 29) counter-clockwise against stop as viewed from operator's seat.

8. Pull valve housing (Item 19) back against bolt heads (Item 60) and using a small screwdriver, position the pins of washer (Item 50) into pin holes in valve housing (Item 19). Move valve housing (Item 19) against spacer (Item 52) and snug up bolts (Item 60). As bolts become snug, steering wheel will rotate slightly.

9. Fabricate a go-no-go gauge wire out of a piece of .030 inch (0,8 mm) wire approximately 7 inches (177,8 mm) long. On one end make a 90 ^{0} bend approximately .25 in (6,4 mm) long.

10. Slide gauge wire into valve housing (Item 19) along steering shaft (Item 63). Look into housing spool bore and make sure that washer (Item 50) internal hole is centered around steering shaft (Item 63). Try to put small end of gauge between the valve housing (Item 19) and the washer (Item 50) at the outside diameter of the valve spool bore. If the pins of washer (Item 50) are not positioned in pin holes of valve housing (Item 19) the wire will fit between the housing and washer. If the washer is in place, proceed to Step 11. If the wire fits between the washer and valve housing, loosen bolts (Item 60) and return to Step 7.

11. Lubricate valve spool (Item 53) and install in bore of valve housing (Item 19). Spools with o-ring groove are installed with groove toward nut (Item 64).

12. Lubricate plungers (Item 55) and springs (Item 54) and install in valve housing (Item 19). Check parts manual for correct number of springs and plungers. Install o-rings (Item 65) in spool (Item 53) if so indicated in parts book.

13. Place washer (Item 56) over shaft assembly (Item 63) with pins toward valve housing (Item 19).

14. Lubricate and install bearing (Item 58) on shaft assembly (Item 63) with larger bearing washer race toward valve spool (Item 53).

15. If belleville washer was removed during disassembly, place washer on shaft assembly (Item 63)

16. Start nut (Item 64) on shaft assembly (Item 63). Center washer (Item 56) on shaft assembly (Item 63) so that pins in washer line up with pin holes in valve housing (Item 19). Tighten nut (Item 64) until nut feels firm. Back-off nut 1/8 to 1/4 turn.

17. Remove bolts (Item 60) and spacers from valve housing (Item 19) and install cap (Item 62) and reinstall bolts.

18. Check steering wheel (Item 29) in full right and full left turn position. When wheel is released from either a full right or left turn position, the wheel should rotate in opposite direction showing that the centering springs are centering the valve spool. If steering wheel does not rotate as described above, remove bottom cap (Item 62) and adjust nut (Item 64) until valve spool will center itself freely.

NOTE: *It may be necessary to perform pitman arm adjustment at this time. If adjustment is required, proceed as directed in appropriate Operator's Manual.*

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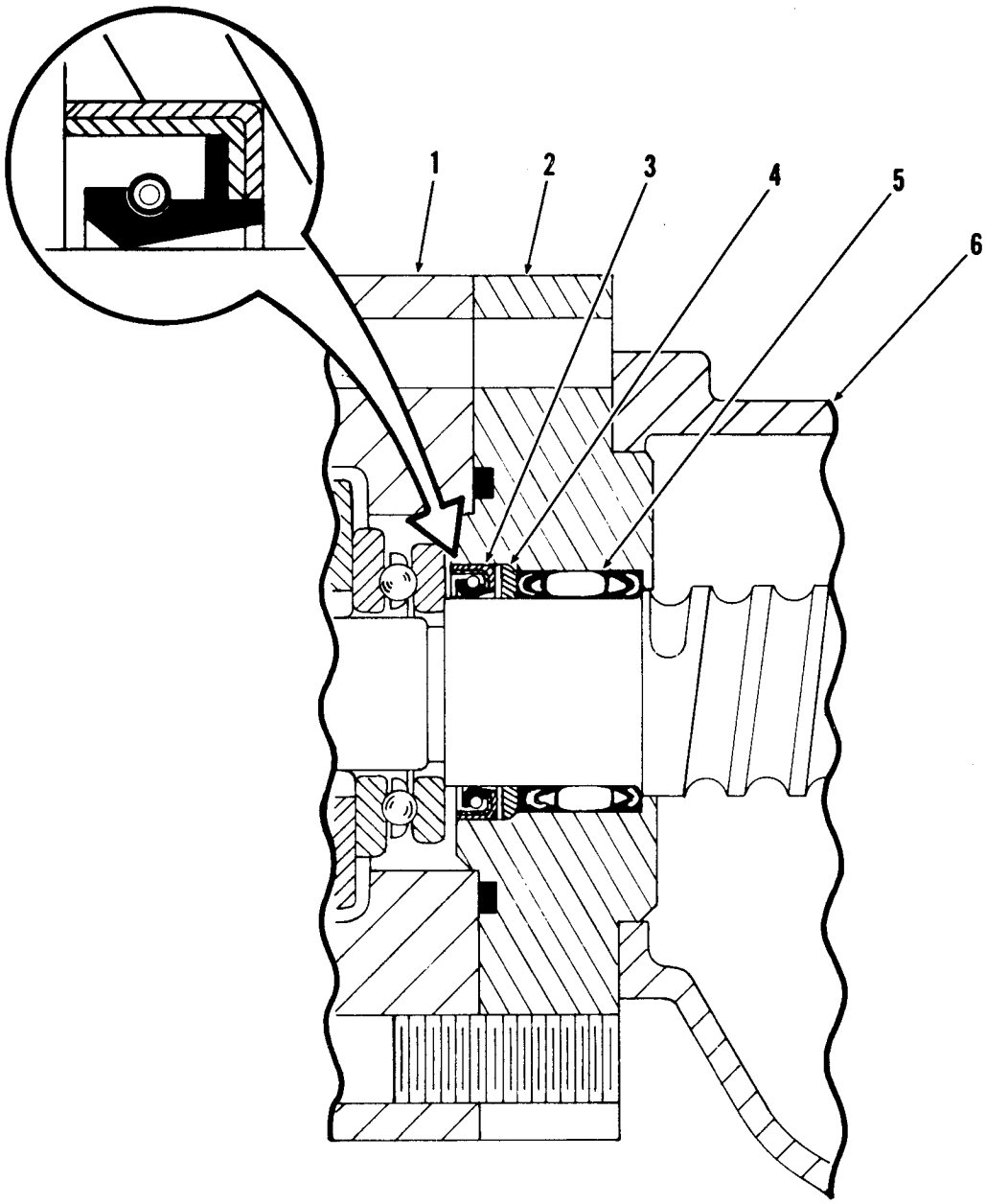
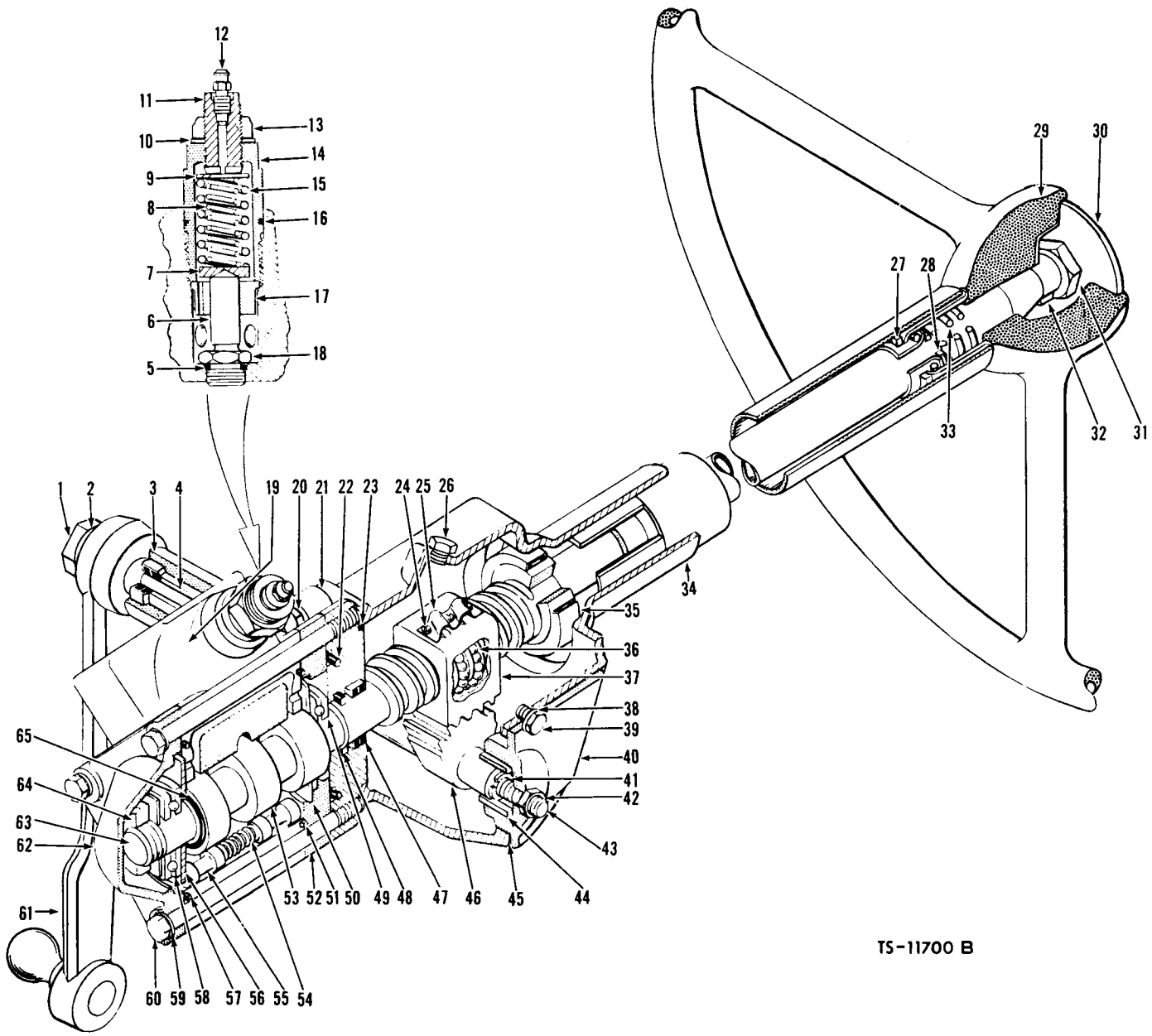


TS-15470

Figure 1

1. Steering Valve
2. Adapter
3. 873293 Seal
4. 962993 Back-up washer
5. Bearing
6. Steering Gear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TS-11700 B

Figure 2

CLARK Service gram

July 1980

MICHIGAN SG-817
Group Ref. No. 1100

SUBJECT: **Main Pump Case Drain Installation**
Model 175B Tractor Shovels with S/N:

Cummins **438C101C thru 487C, 438C101CAC thru 380CAC, 438C101FSC thru 252FSC**

G. M. **427C101C thru 436C, 438C, 440C thru 449C, 427C101CAC thru 298CAC, 427C101FSC thru 124FSC**

(Production machines after these serial numbers shown have this modification)

An improvement can be made in the main hydraulic system on Model 175B Tractor Shovels with serial numbers listed above by using a new main hydraulic pump with a pump case drain line.

The drain line is used to increase pump reliability by preventing heat build-up inside the pump. The drain line will give lubrication and cooling at all engine speeds – especially low speeds at maximum pressure setting.

The new main hydraulic pump assembly with the drain line will replace current main hydraulic pump assembly part numbers 2507297, 2511763 and 2514132.

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

PARTS NEEDED FOR ONE MACHINE:

1 – 2526551	Main Pump Assembly
1 – 552161	Gasket
1 – 29F1	Elbow
1 – 58K232	O-ring
2 – 19J24	Flange Half
2 – 58K225	O-ring
4 – 17C824	Bolt
4 – 879768	Washer
1 – 2527576	Elbow
1 – 2528306	Hose
6 – 19J20	Flange Half
3 – 58K222	O-ring
8 – 17C720	Bolt
1 – 2527410	Manifold Block
1 – 91F5	O-ring

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.  Loosen the hydraulic reservoir cap slowly to reduce pressure in the reservoir.

4. Remove the oil from the hydraulic system. If a pump failure has occured, remove the hydraulic oil completely. Clean the reservoir and clean the suction filters.

5. Remove 4 – 17C824 Bolts, 4 – 4E8 Lockwashers and 2 – 19J24 Flange Halves that connect the 1515624 Hose (Item 2, Figure 1) to the main pump. Remove the hose. Discard the o-ring. Inspect the flange halves and bolts and replace as necessary. Discard the lockwashers.

6. Remove 4 – 23C828 Bolts, 4 – 4E8 Lockwashers and 2 – 19J40 Flange Halves that connect the 1539796 Tube (Item 62, Figure 1) to the main pump. Discard the o-ring. Inspect the flange halves and bolts and replace as necessary.

7. See Figure 3 and remove 4 – 62D8 Nuts and 4 – 4E8 Lockwashers from the studs holding the main pump assembly to the converter. Remove the main pump assembly. Discard the lockwashers and gasket. Remove the drive sleeve. Keep the sleeve for use on the new pump assembly.

8. After the main pump assembly has been removed, see Figure 3 and remove 1 – 6000689 Cap, 1 – 1306142 Coupling, 1 – 1314178 Connector and 1 – 91F5 O-ring from the main pump assembly. Inspect these parts and replace if necessary. Discard the 91F5 O-ring.

9. Before installing the 2526551 Main Pump Assembly, remove the plug in the rear check port only. See Figure 3 and install 1 – 91F5 O-ring, 1 – 1314178 Connector, 1 – 29F1 Elbow, 1 – 1306142 Coupling and 1 – 6000689 Cap into the check port on the main pump. Install the 219413 drive sleeve.

   IMPORTANT: Before connecting any lines to the pump, fill all parts with clean oil to provide enough lubrication when the pump is used for the first time.

10. See Figure 3 and install 1 – 552161 Gasket. Connect the new main pump assembly to the converter by using 4 – existing 4E8 Lockwashers and 4 – existing 62D8 Nuts.

11. See Figure 2 and install 1 – 2527576 Elbow into the drain port on the new main pump assembly.

12. See Figure 2 and connect one end of the 2528306 Hose to the 2527576 Elbow mounted on the main pump.

13. See Figure 1 and connect the existing 1515624 Hose (Item 2) to the main pump assembly by using 1 – new 58K225 O-ring, 2 – existing 19J24 Flange Halves, 4 – new 879768 Washers and 4 – 17C824 Bolts. Tighten the bolts to a torque of 46-58 lbf·ft (62-79 N·m) (6,4-8,0 kgf·m).

14. See Figure 1 and connect the existing 1539796 Tube to the main pump by using 1 – new 58K232 O-ring, 2 – existing 19J40 Flange Halves and 4 – 23C828 Bolts. Tighten the bolts to a torque of 79-92 lbf·ft (107-125 N·m) (10,9-12,7 kgf·m).

15. See Figure 4 and remove 1 – adapter (Item 37) and 1 – hose (Item 38) from the tube (Item 39) connected to the main hydraulic reservoir. Remove 8 – 17C724 Bolts, 8 – 4E7 Lockwashers, 4 – 19J20 Flange Halves and 2 – 58K222 O-rings from the tube and hose. Remove the hose from the tube and the tube from the main hydraulic reservoir. Discard the tube and o-rings. Keep the other parts for re-use. Inspect these parts at this time and replace if necessary.

16. See Figure 2 and connect 1 – 2527410 Manifold Block to the main hydraulic reservoir by using 1 – new 58K222 O-ring, 2 – existing 19J20 Flange Halves and 4 – 17C724 Bolts. Tighten the bolts to a torque of 35-46 lbf·ft (46-62 N·m) (4,8-6,4 kgf·m).

17. See Figure 2 and connect 1 – existing adapter and hose to the manifold block. Connect the other existing hose to the manifold block by using 1 – new 58K222 O-ring and 2 – existing 19J20 Flange Halves and 4 - new 17C720 Bolts. Tighten the bolts to a torque of 35-46 lbf·ft (48-62 N·m) (4,8-6,4 kgf·m).

18. See Figure 2 and connect the other end of the 2528306 Hose to the manifold block by using 1 – new 58K222 O-ring, 2 – existing 19J20 Flange Halves and 2 – new 17C720 Bolts. Tighten the bolts to a torque of 35-46 lbf·ft (49-62 N·m) (4,8-6,4 kgf·m). *NOTICE: Keep all parts clean at all times. Do not permit any foreign material to get into the hydraulic system.*

19.  Wipe up all spilled oil from work area immediately. Oil on work area floor could result in personal injury.

20. After lines have been properly connected, change the hydraulic system filters. Fill the hydraulic oil reservoir to the full mark on the dipstick. Replace the reservoir cap.

21. Operate the machine a few minutes, checking all connections for leaks. Check hydraulic reservoir oil level and add oil as needed.

22. Remove warning flag from steering wheel. Remove blocks from wheels.

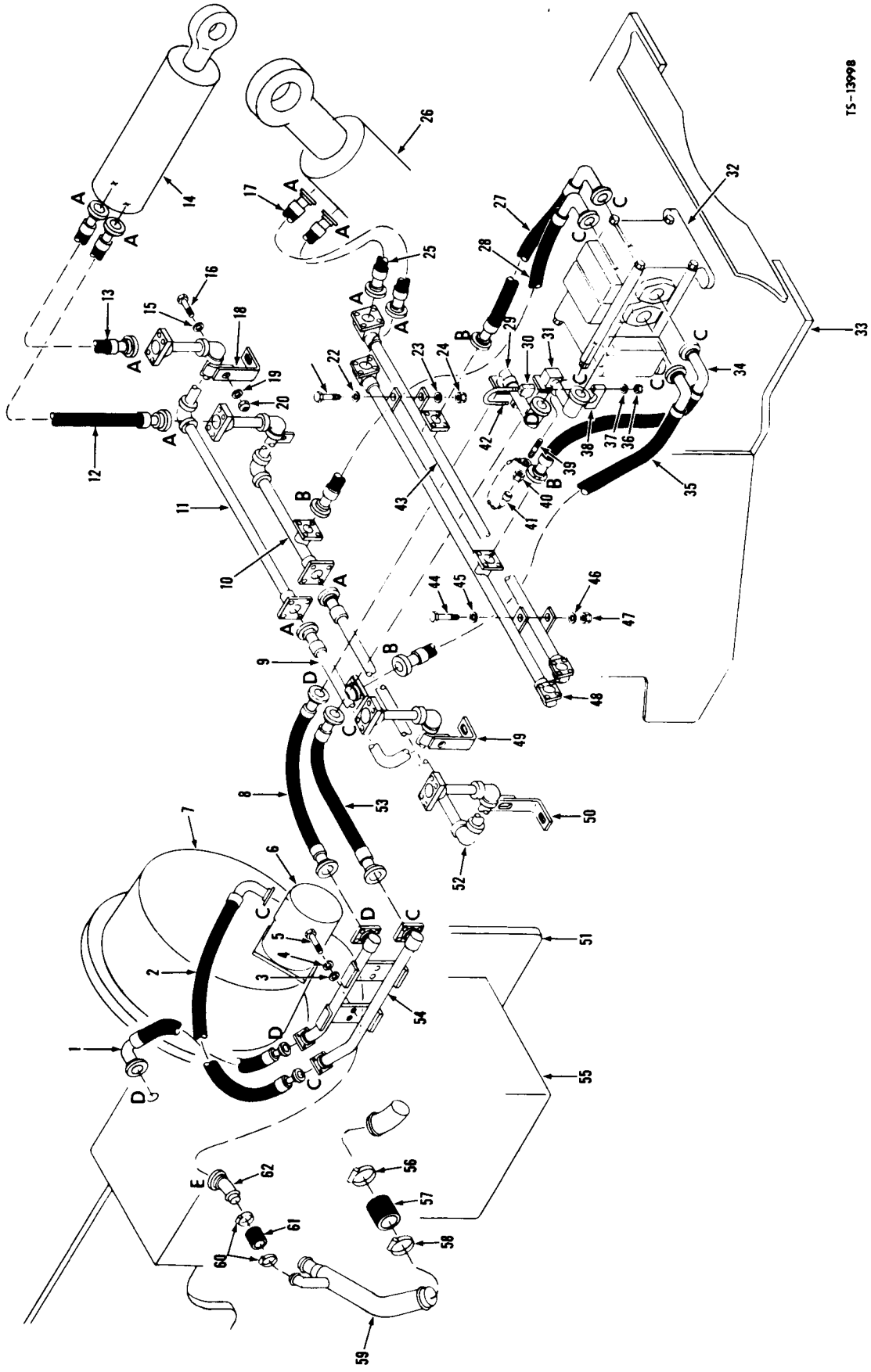

Figure 1

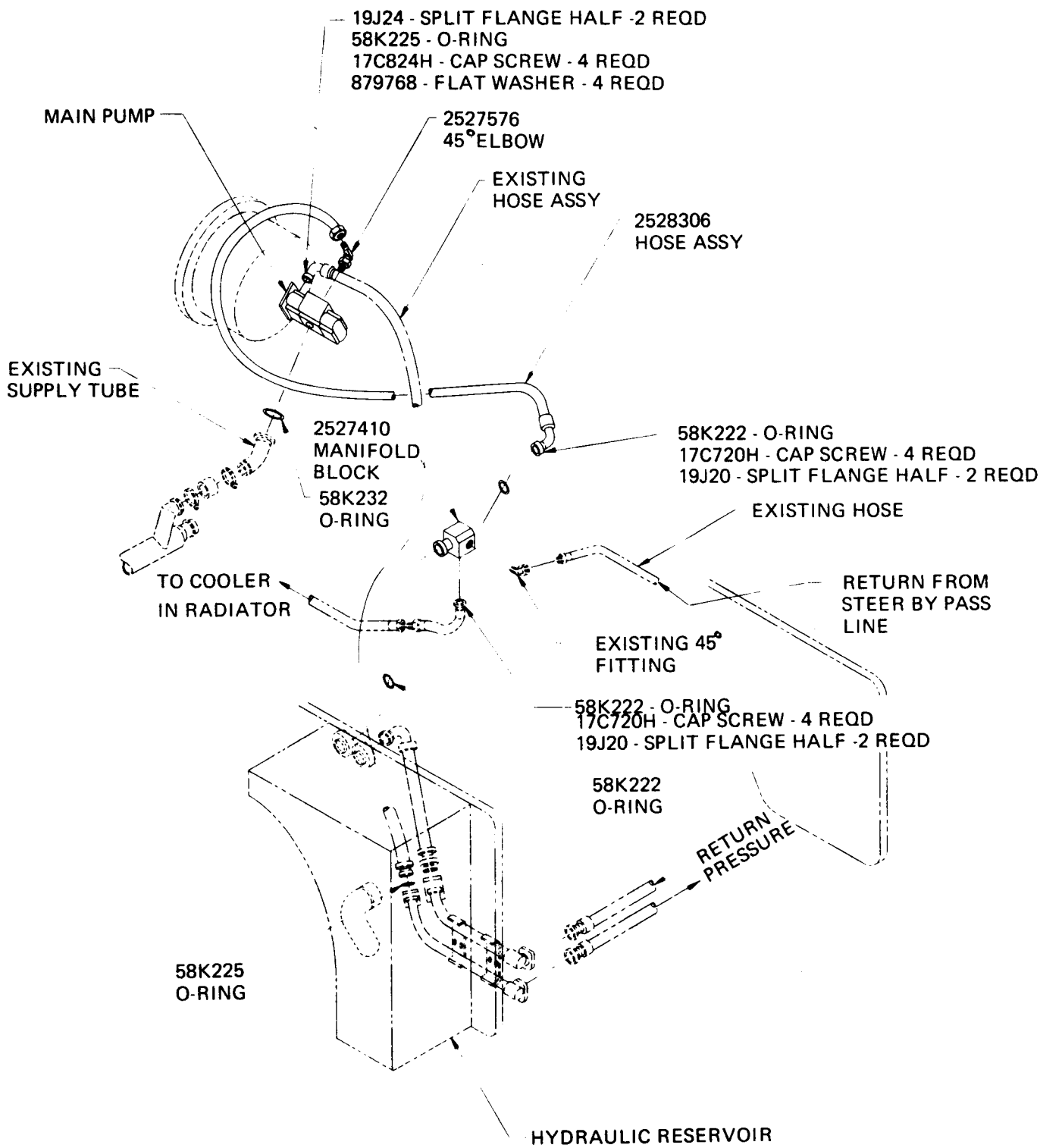

Figure 2

TS 15704

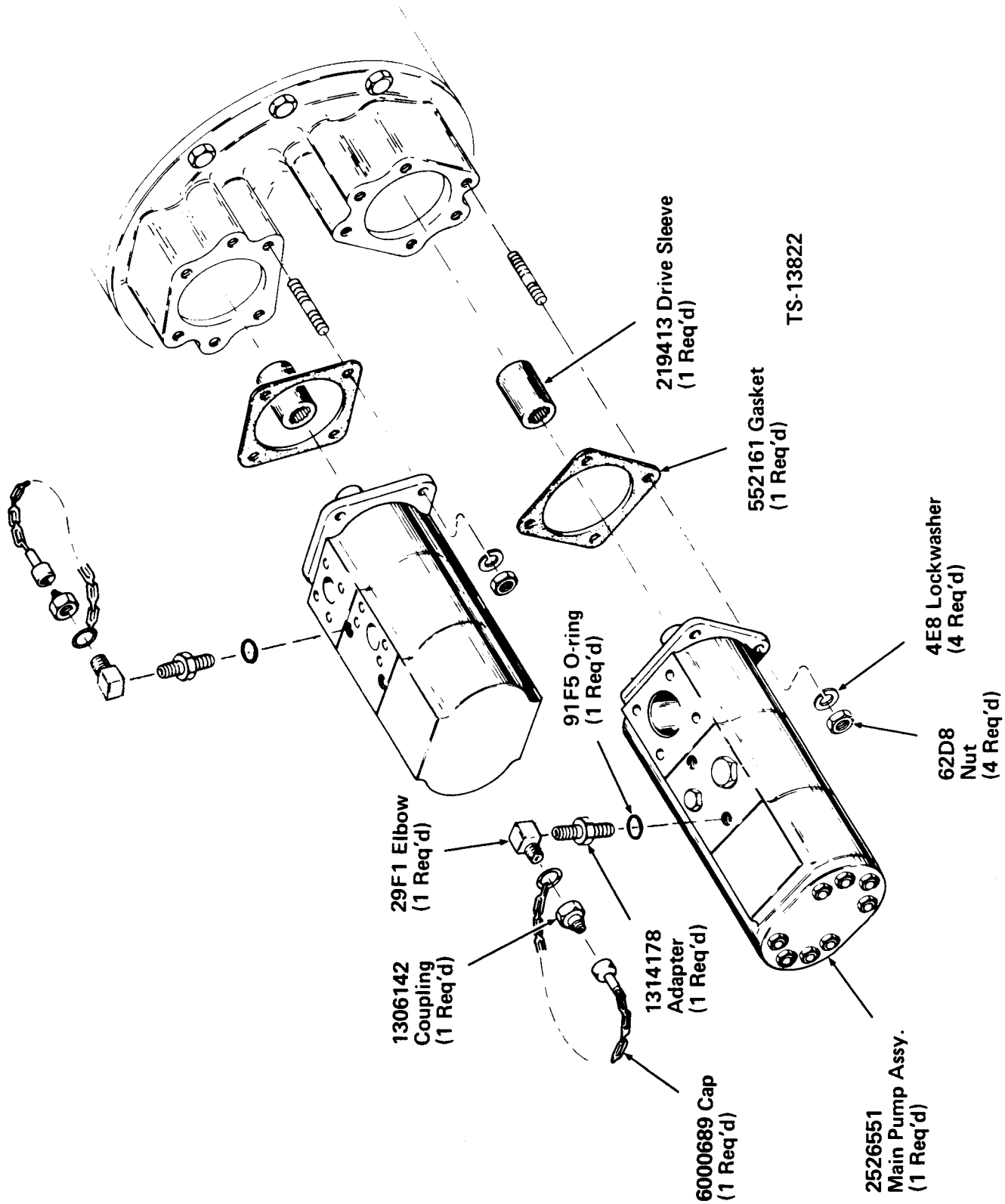
219413 Drive Sleeve
(1 Req'd)
552161 Gasket
(1 Req'd)
TS-13822
4E8 Lockwasher
(4 Req'd)
62D8
Nut
(4 Req'd)
91F5 O-ring
(1 Req'd)
29F1 Elbow
(1 Req'd)
1306142
Coupling
(1 Req'd)
1314178
Adapter
(1 Req'd)
6000689 Cap
(1 Req'd)
2526551
Main Pump Assy.
(1 Req'd)

Figure 3

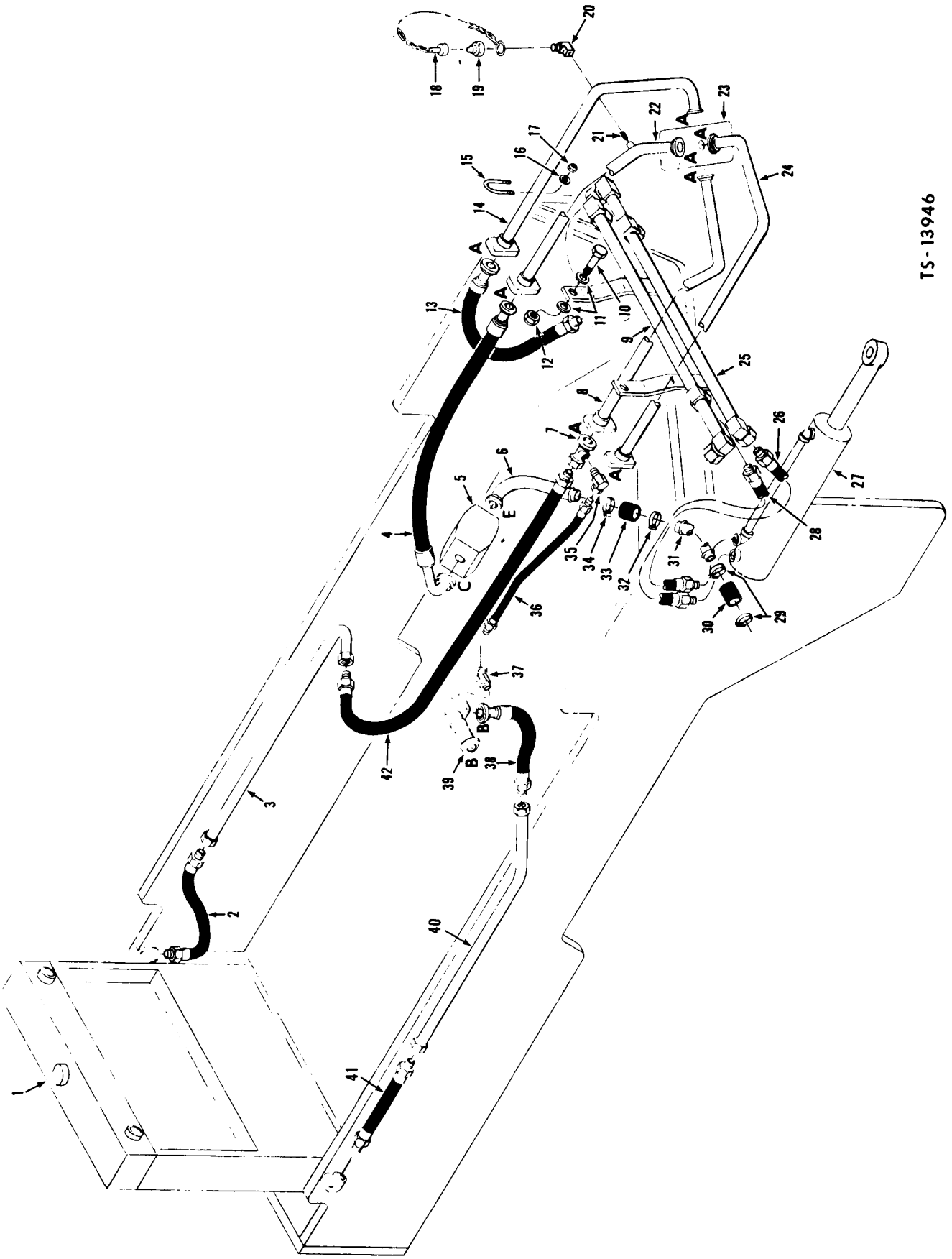

Figure 4