

SHOP MANUAL

BINDER

GRADER

GALION MANUFACTURING COMPANY, Galion, Ohio 44833, U.S.A.

a Jeffrey Galion Inc. Company

FILE

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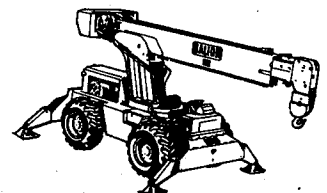
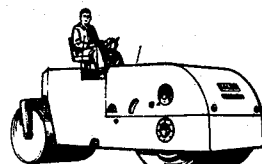
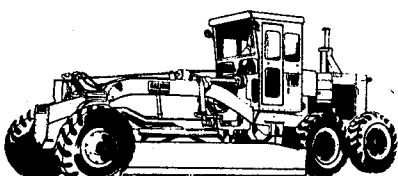
SECTION

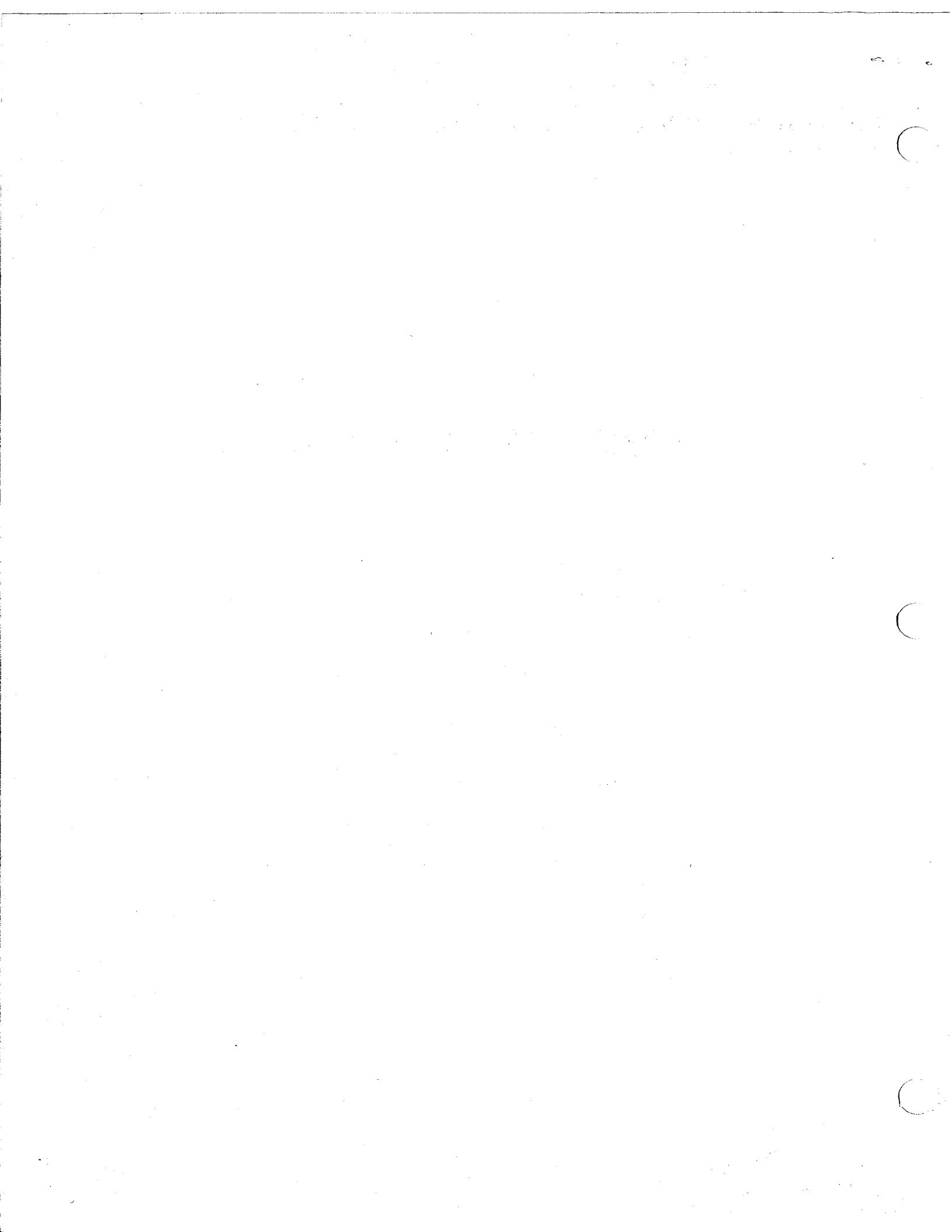
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GRADER TROUBLE-SHOOTING

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THE GRADER HYDRAULIC SYSTEM

The hydraulic pump is driven at the flywheel end of the engine. Flow from the pump is directed to the flow regulator.

At the flow regulator, 8 GPM (5.5 GPM on 503-A & L and 5 GPM on 303-A) is directed to the steering valve. The T400-A and 503-A & L graders utilize the full-hydraulic (Orbitrol) steering valve. The 303-A grader utilized the hydraulic-mechanical (Sheppard) steering gear. All other models utilize the hydraulic-mechanical (Ross) gear.

Graders equipped with four-wheel power-booster brakes use the return flow from the steering valve to actuate the brake power booster. Previous units were plumbed with the brake power booster preceding the steering valve.

Pump flow in excess of the 8 GPM supplied to the steering system is directed to the control manifold. Through a series-flow open-center valve arrangement, this flow is available for use by all control valves in the control manifold.



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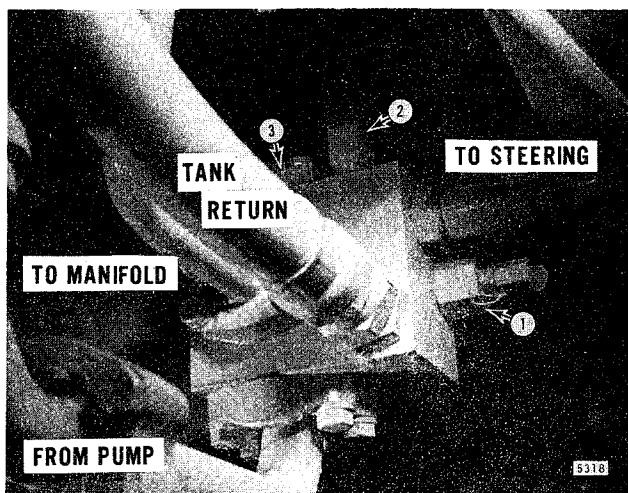
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GALION GRADER HYDRAULIC SYSTEM PRESSURES

MODEL	SERIAL NO.	STEERING SYSTEM	MANIFOLD SYSTEM
503-A	05101 - 06111	1200 ± 50	1200 ± 50
503-L	06112 & Up	1200 ± 50	1200 ± 50
303-A	26888 - 26950	1100 ± 50	1200 ± 50
104-B	07601 - 09950 09951 - 10749	1100 ± 50 1100 ± 50	1200 ± 50 1050 ± 50
104-C	10750 - 11214	1100 ± 50	1050 ± 50
104H-B	07619 - 09954 09955 - 10693	1100 ± 50 1100 ± 50	1200 ± 50 1050 ± 50
118-B	07614 - 09652 09653 - 09765 09766 - 09938 09939 - 10749	1100 ± 50 1100 ± 50 1100 ± 50 1100 ± 50	1200 ± 50 1050 ± 50 1200 ± 50 1050 ± 50
118-C	10750 & Up	1100 ± 50	1050 ± 50
160-B	02111 - 02517 02518 - 02713	1100 ± 50 1100 ± 50	1200 ± 50 1050 ± 50
160-C	02714 & Up	1100 ± 50	1050 ± 50
160-L	02101 - 02514 02515 & Up	1100 ± 50 1100 ± 50	1200 ± 50 1050 ± 50
T400-A	01001 & Up	1100 ± 50	1050 ± 50
T500-A	02601 - 03314 03315 & Up	1100 ± 50 1100 ± 50	1200 ± 50 1050 ± 50
T500-L	03286 - 03314 03315 & Up	1100 ± 50 1100 ± 50	1200 ± 50 1050 ± 50
T600-B	01501 - 01744 01745 & Up	1100 ± 50 1100 ± 50	1200 ± 50 1050 ± 50

All pressures at engine high idle (Limited high idle on power shift models)

Fig. 1 Location of Flow Regulator



1. Manifold System Relief Valve Cartridge.
2. Steering System Relief Valve Cartridge.
3. Flow Regulator Honed Assembly.

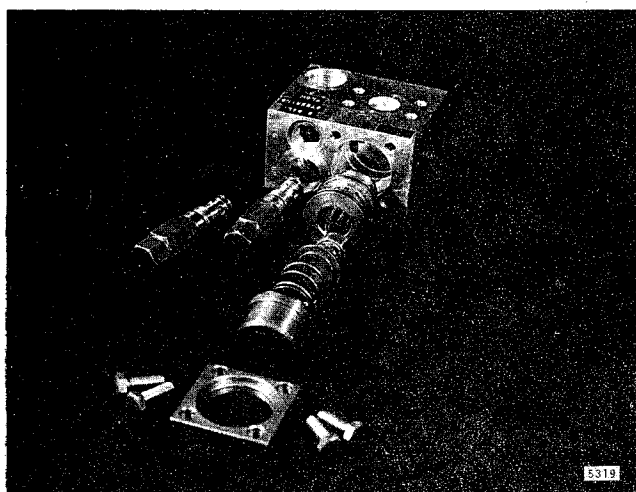


Fig. 2 Old Style Flow Regulator

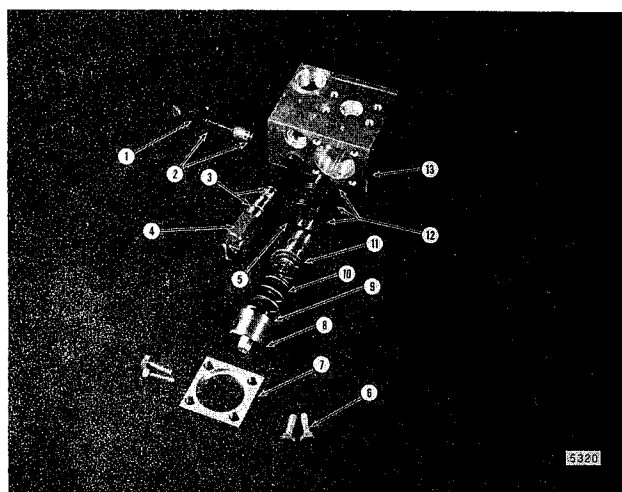


Fig. 3 New Style Flow Regulator



05101 to 06111	-----	503A	-----	Not used
06112 & Up	-----	503L	-----	Not used
26888 to 26950	-----	303A	-----	Not used
07601 to 09950	-----	104B	-----	09951 to 10750
Not used	-----	104C	-----	10750 to 11214
07619 to 09954	-----	104H-B	-----	09955 to 10693
07601 to 09939	-----	118B	-----	09940 to 10750
Not used	-----	118C	-----	10751 & Up
02111 to 02517	-----	160B	-----	02518 to 02714
Not used	-----	160C	-----	02715 & Up
02101 to 02514	-----	160L	-----	02515 & Up
Not used	-----	T400-A	-----	01001 & Up
02601 to 03314	-----	T500-A	-----	03315 & Up
03286 to 03314	-----	T500-L	-----	03315 & Up
01501 to 01744	-----	T600-B	-----	01745 & Up



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I. STEERING SYSTEM SLUGGISH OR INOPERABLE, BUT MANIFOLD SYSTEM NORMAL

A. With right hand, bottom (deadhead) leaning wheel control in either direction and with left hand, attempt to turn steering wheel.

1. If steering wheel functions normally with leaning wheel control bottomed, the flow regulator honed assembly spool is sticking. Remove the four (4) cap screws retaining the honed assembly plate. Remove plate, cap, O-ring and spring. It can be observed that the spool is not free in sleeve. Remove foreign material and make certain that spool moves freely in sleeve. Replace spool, spring, O-ring, cap and plate. Replace four (4) cap screws.
2. If steering is still sluggish or inoperable with leaning wheel control bottomed, remove steering system relief valve cartridge.

NOTE: Most model graders are equipped with the steering system relief valve cartridge located in the flow regulator. Previous graders with four-wheel power-booster brakes use this cartridge adjacent to the brake power booster. Present T400-A, 4-wheel brake models incorporate two (2) steering system relief valve cartridges. The one defective valve of the two can be located by operating the brake pedal: if power brakes function normally, remove relief valve cartridge beneath cab; if power brakes do not function normally, remove relief valve cartridge in flow regulator assembly.

Inspect the cartridge for foreign material, holding spool off its seat. If foreign material can be observed, depress spool and wash or blow out material. This cartridge is a sealed pre-set assembly and no repairs can be effected. If no foreign material is present, replace entire cartridge.

3. If steering continues to be sluggish or inoperable with leaning wheel control bottomed, and relief valve is known to be in good working condition, the flow regulator honed assembly spool is plugged or return spring is defective. Remove the four (4) cap screws retaining the honed assembly plate. Remove plate, cap, O-ring and spring. Effect repairs as necessary and replace spool, spring, O-ring, cap and plate. Replace four (4) cap screws.

B. When these repairs have been made and the steering system is still sluggish or inoperable:

1. Check the flow regulator inlet tube for a large piece of loose foreign material that could possibly plug the orifice hole in the flow regulator honed assembly spool. This difficulty often will cause the steering system to function normally when the engine is started, and then cease to function normally after a few moments of running.
2. If difficulty is still present, proceed to steering valve. Refer to Shop Manual Index for appropriate Shop Manual Section.



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II. MANIFOLD SYSTEM SLUGGISH OR INOPERABLE, BUT STEERING SYSTEM NORMAL

- A. Install a reliable 1500 PSI gage in the 1/8" NPT port on the left-hand end of the control manifold, with oil at operating temperature, set engine at high idle. Bottom (deadhead) leaning wheel control in either direction and record pressure.

NOTE: On 503-A & L grader, disconnect hose on the piston rod side of the leaning wheel cylinder. Adapt a reliable 1500 PSI gage to this hose. Lean wheel to the *RIGHT* (pull control lever) and record pressure. *DO NOT ATTEMPT TO LEAN WHEELS TO THE LEFT AT THIS TIME.*

1. If the pressure reading is low, remove the manifold system relief valve cartridge located in the flow regulator assembly. Inspect the cartridge for foreign material, holding spool off its seat. If foreign material can be observed, depress spool and wash or blow out material. This cartridge is a sealed pre-set assembly and no repairs can be effected. If no foreign material is present, replace with new cartridge.
 2. If the pressure reading is normal, operate each individual manifold control valve and locate defective control functions. If *all* controls are still sluggish or inoperable, proceed with Step B.
- B. If pressure reading is low, and relief valve cartridge is known to be in good working condition, or if pressure reading is normal and *all* controls are still sluggish or inoperable:
1. Engine high idle speed too low. Check Operator's Manual for correct speed settings.
 2. The flow regulator honed assembly sleeve may be plugged. Remove the four (4) cap screws retaining the honed assembly plate. Remove plate, cap, O-ring and spring. Remove both spool and sleeve and inspect. Effect repairs as necessary and replace sleeve, spool, spring, O-ring, cap and plate. Replace four (4) cap screws.
 3. If engine speed is correct and flow regulator honed assembly is not plugged, replace worn hydraulic pump.



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III. BOTH STEERING AND MANIFOLD SYSTEMS SLUGGISH OR INOPERATIVE

- A. Check hydraulic tank oil level at operating temperature with drawbar and moldboard centered, wheels straight, and lift and scarifier cylinders retracted. Engine must be shut off.

If grader is equipped with dipstick, remove dipstick and wait a minimum of 15 seconds. Reinstall dipstick and remove. The oil level should be between high and low marks.

If grader is equipped with sight gage, remove vent plug on top of tank cover. Wait a minimum of three (3) to five (5) minutes. The oil level should be halfway on sight gage.

- B. If hydraulic tank oil level is normal, bottom (dead head) leaning wheel control in either direction with right hand, and with left hand, attempt to turn steering wheel.
1. If steering wheel functions normally with leaning wheel control bottomed, the flow regulator honed assembly may be plugged. Remove the honed assembly and check for foreign material.
 2. If steering wheel is still sluggish or inoperable with leaning wheel control bottomed, proceed with Item C.
- C. Both relief valve cartridges may be defective. Remove and replace both cartridges.
- D. If both systems are still inoperative, replace hydraulic pump.



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IV. OVERHEATING OF HYDRAULIC OIL

- A. Hydraulic tank oil level may be too high or too low.
- B. Filter cartridge located in hydraulic tank may be plugged or clogged. This filter is to be replaced at the end of 100 hours of operation on a new machine or on a machine that has had the hydraulic system repaired. Replace cartridge each 1000 hours of operation thereafter. Use only Galion Part #B-67373.
- C. Air leak on pump inlet line.
- D. Incorrect hydraulic oil will cause overheating. Refer to Shop Manual Index for Lubrication Specifications.
- E. Check for defective or improperly installed relief valve cartridges.
- F. Inspect tubing, hoses, and other oil passages for dents, deformities, and restrictions.
- G. If hydraulic oil continues to overheat after these checks and repairs are made, replace worn hydraulic pump.

V. MANIFOLD CONTROL VALVE BOOTS SWELL

- A. Boots swell only when circle reverse or side shift control is activated:
 1. Check circle reverse motor as outlined in Symptom VI., Item C.
 2. Check side shift motor (if so equipped) as outlined in Symptom VII., Item B.
- B. Boots swell when any control is activated:
 1. Check 3/8" drain line from manifold to tank for dent or restriction.
 2. Control valve worn or defective.

VI. CIRCLE LACKS POWER OR DOES NOT CIRCLE

- A. Circle not lubricated properly or at all.
- B. Circle not adjusted properly.
- C. If circle is properly lubricated and adjusted, circle reverse motor may be defective. Disconnect drain line tube at motor. With hydraulic oil at operating temperature, engine at 1800 RPM and control valve fully opened, drain flow from motor should not exceed one-half (1/2) GPM. Flow in excess of this amount indicates necessity of motor overhaul or replacement.



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VII. ROTARY-TYPE SIDE SHIFT LACKS POWER OR DOES NOT WORK

- A. Inspect arm, telescoping rod and related items for possible failure.
- B. Disconnect drain line tube at motor. With hydraulic oil at operating temperature, engine at 1800 RPM and control valve fully opened, drain flow from motor should not exceed one-half (1/2) GPM. Flow in excess of this amount indicates necessity of motor overhaul or replacement.

VIII. STICKING CONTROL VALVES

- A. Manifold tiebolts improperly torqued. Torque on tie-bolt nuts must not exceed 25 ft-lbs.
- B. Foreign material lodged between valve body and spool.

THE TOLERANCE BETWEEN THE VALVE SPOOL AND THE VALVE IS MAINTAINED WITHIN APPROXIMATELY 4/10,000 OF AN INCH. UNDER NO CIRCUMSTANCES SHOULD THE VALVE SPOOL BE RUBBED DOWN WITH CROCUS CLOTH OR SHOULD ANY ATTEMPT BE MADE TO HONE OUT THE VALVE BODY. THIS WILL CAUSE INTERNAL LEAKAGE.

UNDER NO CIRCUMSTANCES SHOULD ANY VALVE SPOOL BE INTERCHANGED INTO ANY OTHER VALVE BODY. THE VALVE SPOOL AND BODY ARE MATCHED SETS AND CANNOT BE OBTAINED SEPARATELY. REPAIR IS BY REPLACEMENT OF COMPLETE VALVE ASSEMBLY(IES).

- C. To replace a valve assembly in the manifold, support valves on either side of valve to be removed with hydraulic jacks. Measure from shortest end of manifold and add one inch -- then back out all three tierods this distance, while simultaneously inserting dummy tierods from other end. Back out dummy tierods until clear of valve to be removed. Remove valve with seals and shims. Install new valve, making certain seals and shims are properly located. Knock out dummy tierods with tierods. Torque on tiebolt nuts must not exceed 25 ft-lbs.



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IX. DRIFTING OR CREEPING LIFT CYLINDERS

- A. Start engine and raise moldboard 10 to 12 inches off ground. Stop engine. Place hydraulic jacks under either end of moldboard. Raise jacks until they support both ends of moldboard. Move control levers in both directions repeatedly to release any hydraulic pressure. Remove hoses from lift cylinders and install four (4) caps on cylinder fittings. Remove jacks from beneath moldboard.
1. If the moldboard drifts after a period of time, the cylinders need overhaul or replacement.
 2. If the moldboard does not drift, the control valve or valves are worn and must be replaced.
- B. Drifting or creeping due to worn or defective cylinders is caused by:
1. Bad seal between piston rod and piston.
 2. Defective or worn piston packing.
 3. Scored cylinder bore.

X. STEERING PRESSURE CHECK

To check steering pressure, the hydraulic oil must be at operating temperature. Disconnect the front hose on the steering cylinder (except on the 503-A & L and the T-400-A). Connect a reliable 1500 psi gage directly into the end of the hose. Start engine and turn the steering wheel to the LEFT. Raise engine speed to maximum RPM and take pressure reading. Steering pressure should be 1150 + 50 psi.

CAUTION: DO NOT ATTEMPT TO TURN STEERING TO THE RIGHT DURING THIS OPERATION.

Model 503-A & L Grader

To check the steering pressure on the 503-A & L grader, disconnect the hose on the piston rod side of the steering cylinder. Adapt a reliable 1500 psi gage directly into this hose. Start engine and turn steering wheel to the RIGHT. Raise engine speed to maximum RPM and take reading. Pressure should be 1100 + 50 psi.

CAUTION: DO NOT ATTEMPT TO STEER LEFT DURING THIS OPERATION.

Model T 400-A Grader

To check the steering pressure on the T-400-A grader, disconnect the hose on the piston rod side of the steering cylinder. Adapt a reliable 1500 psi gage directly into this hose. Start engine and turn steering wheel to the LEFT. Raise engine speed to maximum RPM and take reading. Steering pressure should be 1000 + 25 psi.

CAUTION: DO NOT ATTEMPT TO STEER MACHINE TO THE RIGHT DURING THIS OPERATION.



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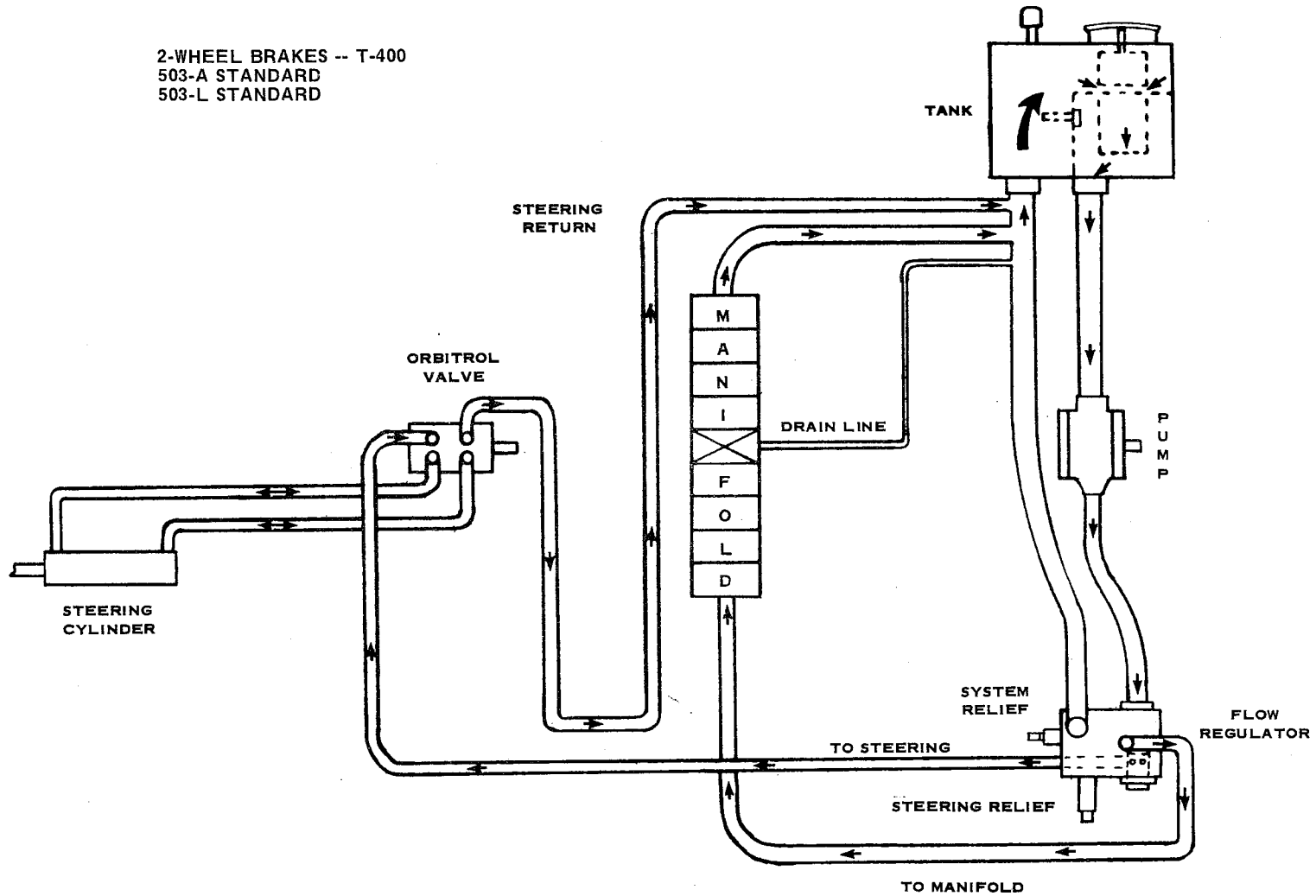
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HYDRAULIC CIRCUIT DIAGRAMS

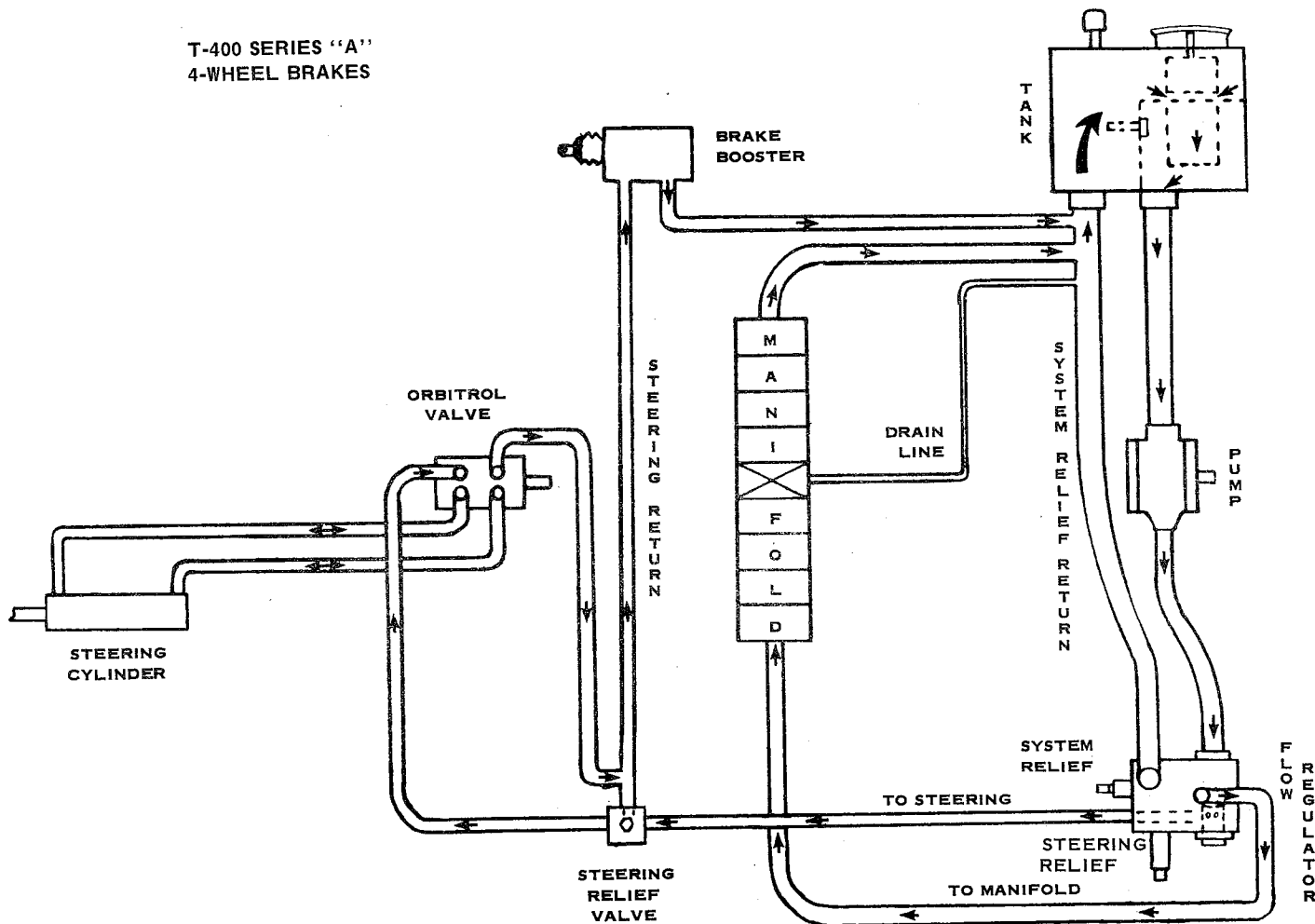
<u>MODEL</u>	<u>SERIAL NUMBER</u>	<u>PAGE</u>
503-A	05101 - 06111	11
503-L	05101 - 06111	11
303-A	26888 - 26950	11
104-B, 104H-B, 118-B		
2 Wheel Brakes	07601 - 10141	13
	10142 - 10749	14
4 Wheel Brakes	07601 - 10141	15
	10142 - 10749	16
104-C		
4 Wheel Brakes	10750 - 11214	16
118-C		
4 Wheel Brakes	10750 & Up	16
160-B		
2 Wheel Brakes	02101 - 02553	13
	02554 - 02713	14
4 Wheel Brakes	02101 - 02553	15
	02554 - 02713	16
160-C		
4 Wheel Brakes	02714 & Up	16
160-L		
2 Wheel Brakes	02101 - 02553	13
	02554 & Up	14
4 Wheel Brakes	02101 - 02553	15
	02554 & Up	16
T400-A		
2 Wheel Brakes	01001 & Up	11
4 Wheel Brakes	01001 & Up	12
T500-A, T500-L		
2 Wheel Brakes	02601 - 03402	13
	03403 & Up	14
4 Wheel Brakes	02601 - 03402	15
	03403 & Up	16
T600-B		
2 Wheel Brakes	01501 - 01773	13
	01774 & Up	14
4 Wheel Brakes	01501 - 01773	15
	01774 & Up	16

2-WHEEL BRAKES -- T-400
 503-A STANDARD
 503-L STANDARD



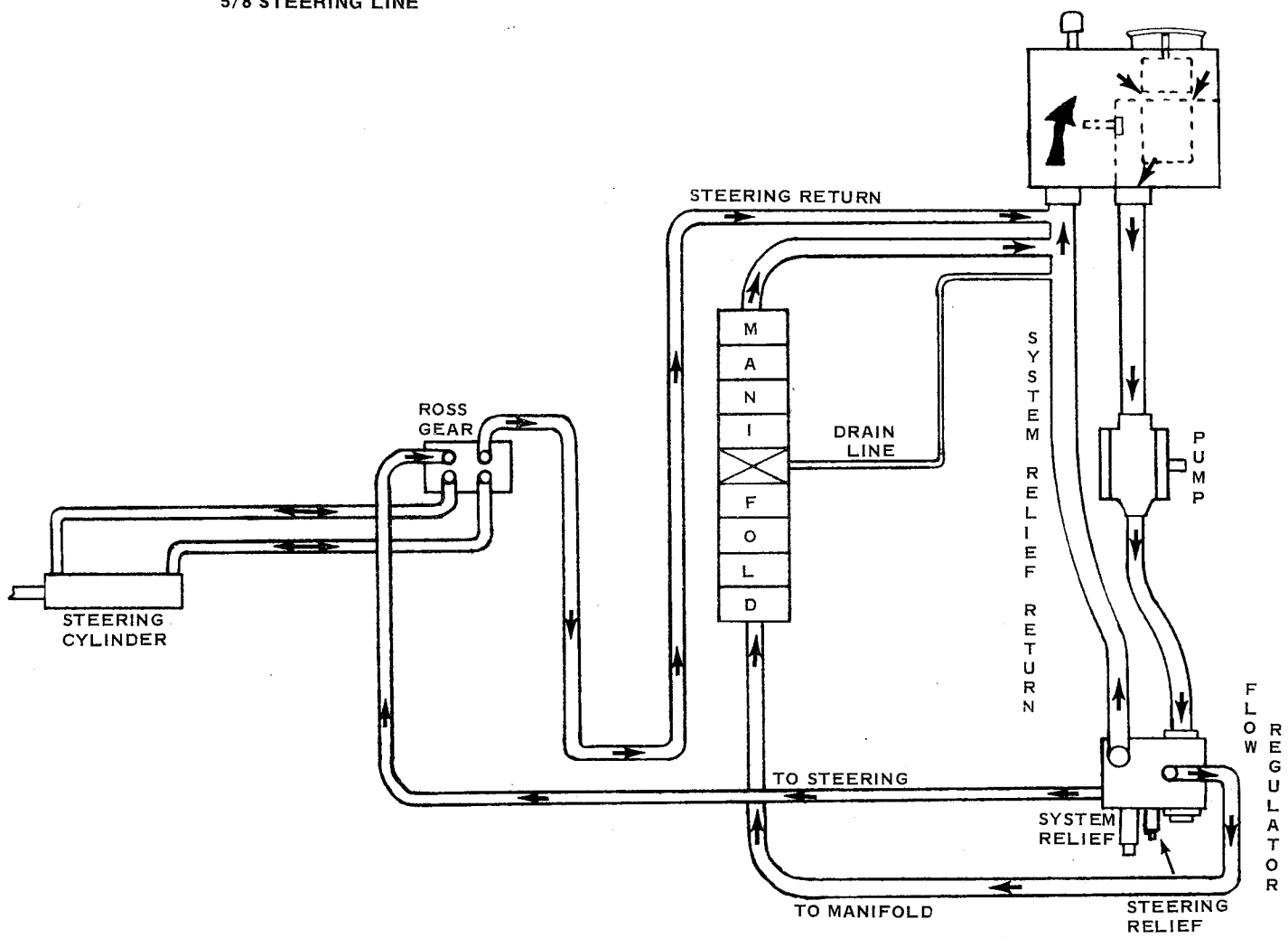
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T-400 SERIES "A"
4-WHEEL BRAKES



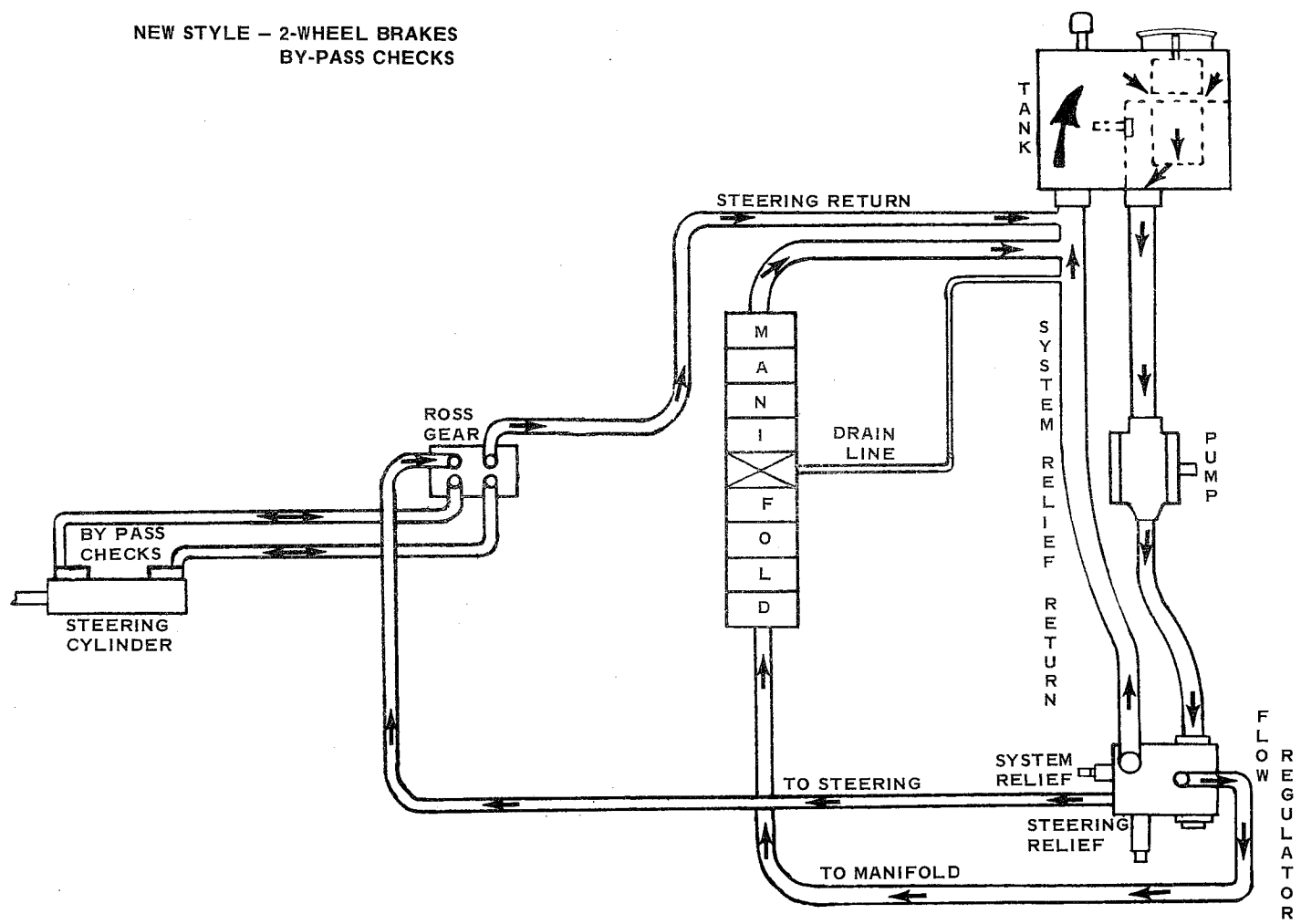
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OLD STYLE - 2 WHEEL BRAKES
 5/8 STEERING LINE



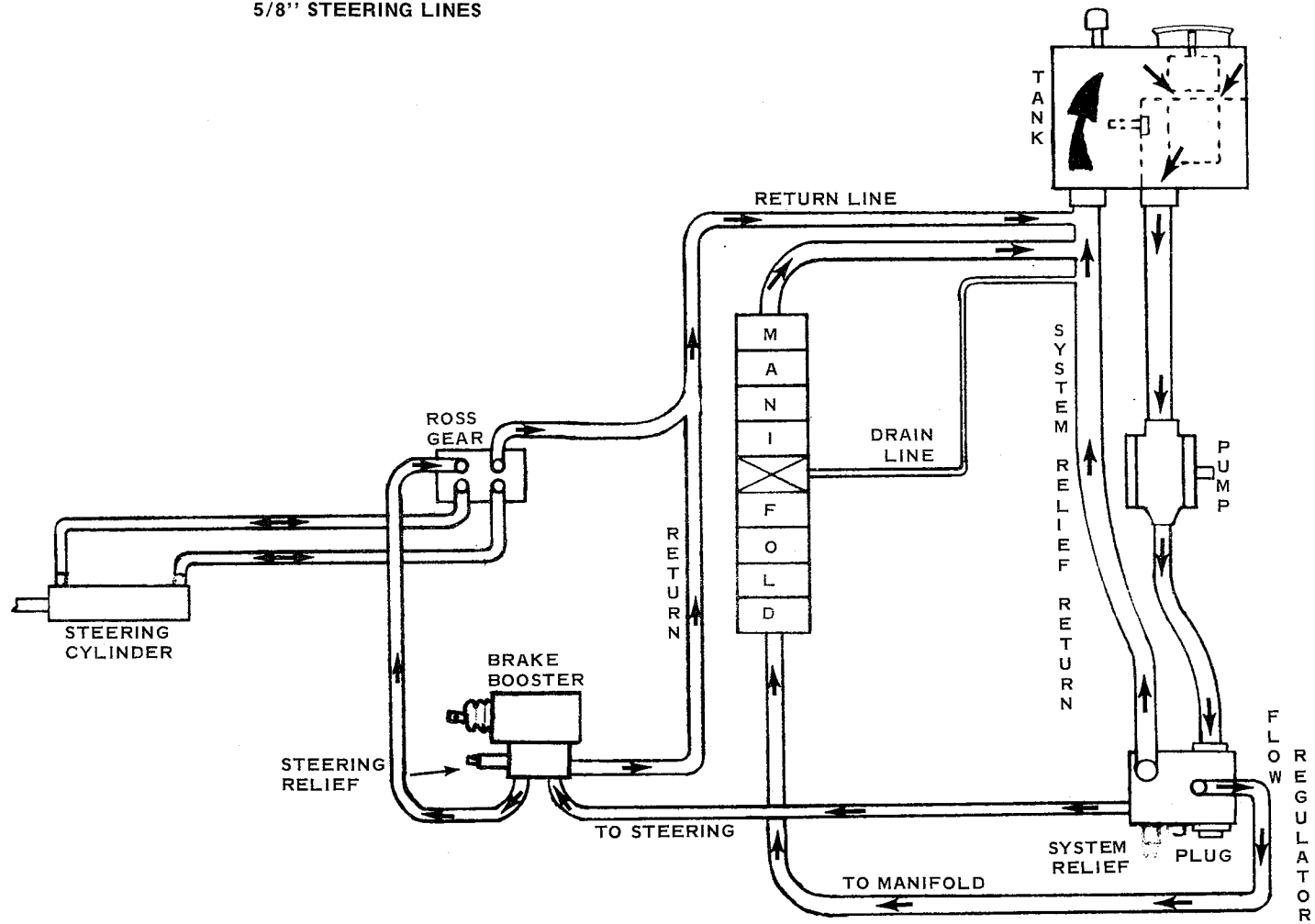
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**NEW STYLE - 2-WHEEL BRAKES
BY-PASS CHECKS**



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OLD STYLE - 4-WHEEL BRAKES
5/8" STEERING LINES

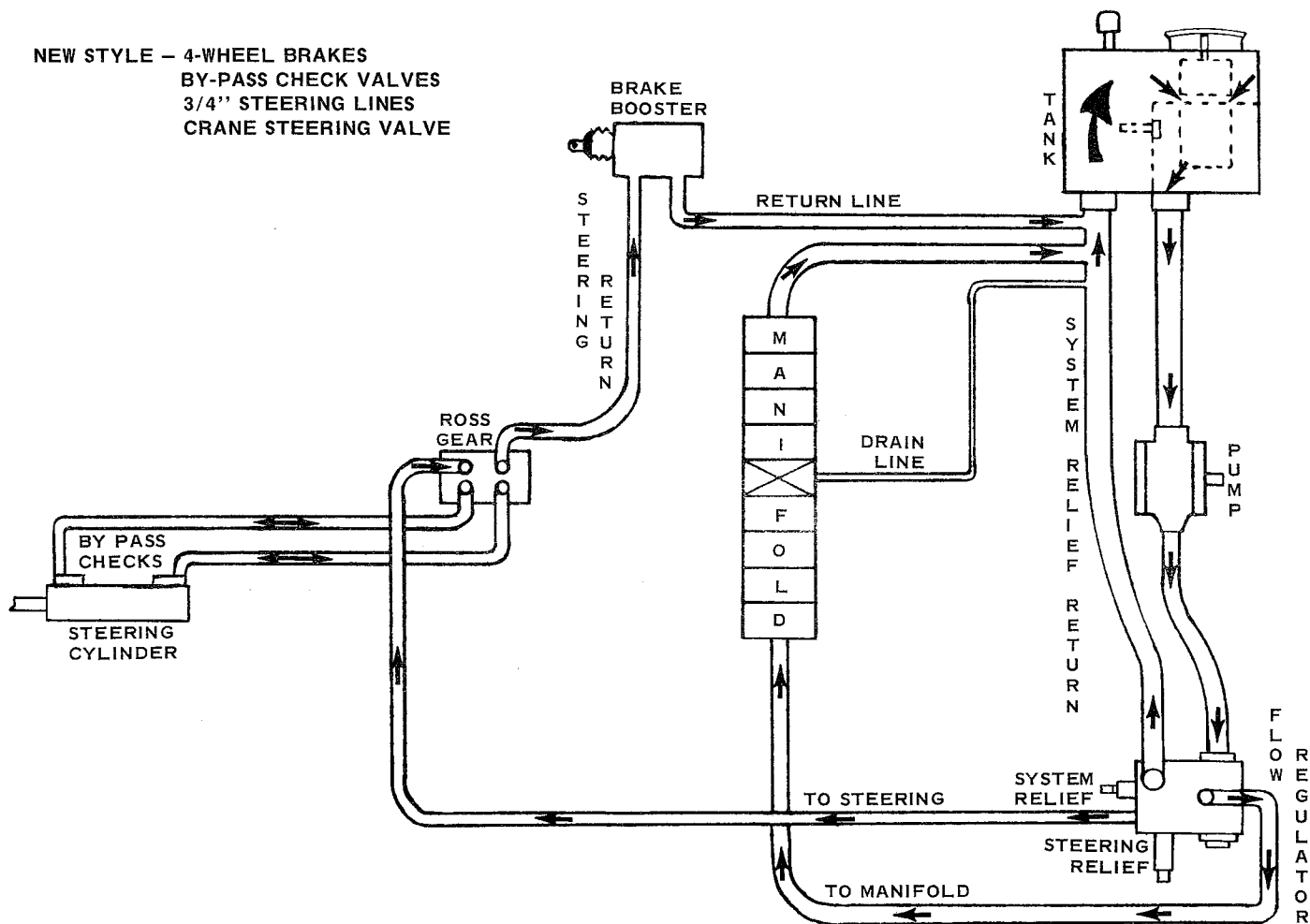


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NEW STYLE - 4-WHEEL BRAKES
BY-PASS CHECK VALVES
3/4" STEERING LINES
CRANE STEERING VALVE



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