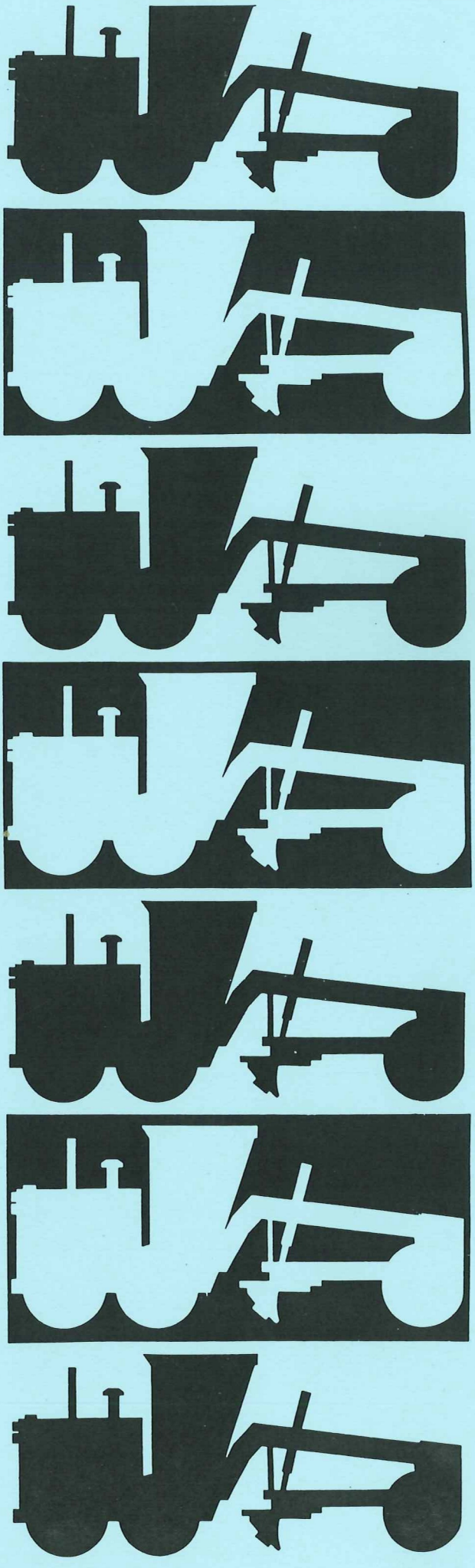
CHAMPION
ROAD MACHINERY



# SERVICE TRAINING MANUAL

S/N 16245 to 20604

U.S. S/N 2021-2 to 2658-2

# FRONT AXLE

1. Front Wheel
2. Spindle Nuts
3. Hub Cap
4. Tab Washer
5. Wheel Bearings
6. Back-up Ring
7. V-ring Seal
8. Spindle
9. Key Pin
10. Radius Arm
11. Adjusting Pin
12. Pivot Block
13. Steering Yoke
14. Lock Nut
15. Steering Drag Link
16. King Pin Bearings
17. Thrust Bearing
18. Seal
19. Knuckle Pin Bearings
20. Rear Pivot Pin Bushing
21. Axle Pivot Pin
22. Knuckle Pin Lock
23. R.H. Steering Cylinder
24. R.H. Leaning Wheel Cylinder*
25. Leaning Wheel Tie Bar
26. L.H. Steering Cylinder
27. L.H. Leaning Wheel Cylinder
28. Shim Pack
29. Front Bearing Cap
30. Front Pivot Pin Bushing
31. Axle Frame

The front axle of a motor grader must perform several functions such as: steering, oscillation, providing front wheel lean, and carrying heavy front-mounted attachments. The Champion front axle is designed to do all these things and provide long life with a minimum of maintenance.

Both the kingpin and knuckle pin are supported by needle bearings and require only recommended lubrication. The kingpin is a uniform diameter and turns with the spindle. Thrust loads are transmitted to the spindle from the knuckle by a roller thrust bearing. The knuckle is hardened in the areas carrying bearings. The knuckle pin is secured to the knuckle by a knuckle pin lock and is torqued to 75 ft./lb. The keypin nut which locks the kingpin to the knuckle is also torqued to 75 ft./lb.

The front axle bearings have grease fittings in the hub caps.

Lubricate the bearings according to the lubrication chart. Lube until fresh grease is pushed out past the V-ring seal on the inside of the wheel. Repacking front wheel bearings is not required.

The front axle pivot pin bearing preload should be checked every 250 hours by raising the front end off the ground and pulling or standing on one wheel to move it down. It should take at least 150 lbs. to move the wheel down. If less force is required a shim should be removed from behind the front bearing cap to bring it back to specification.

Also at 250 hours check, by moving the steering wheel, for any free play between pivot block and steering yoke. To remove any free play tighten both upper and lower adjusting pins.

The final adjustment required is toe-in. This procedure is described on the following two pages.

*Optional on some models

# MAIN HYDRAULIC SYSTEM

1. Main Hydraulic Tank
2. Hydraulic Suction Line
3. Pump Drive Assembly
4. Main Hydraulic Pump
5. Breather Cap
6. Main Hydraulic Relief Valves
7. Rigid Circuit (If Applicable)
8. Electric Solenoid Valve
9. Thermal Relief Valve
10. Hydraulic Return Filter
11. Control Console
12. Main Manifold
13. Counterbalance Valve (720 to 760)
14. Blade Lift Cylinder
15. Hydraulic Hoses
16. Cushion Valve
17. Circle Timing Valve
18. Swivel Connector
19. Articulation Cylinder
20. Suction Screen
21. Inspection Cover
22. Dipstick/Inlet Strainer

Oil is supplied from the hydraulic tank through a suction strainer to a tandem section gear type pump. On 720 - 760 graders this pump is driven by a pump drive gearbox that also drives the steering/transmission pump. Each section of the hydraulic pump supplies 20 GPM at 2100 RPM.

710 s use two sections of a three section gear pump which is driven directly by a drive shaft from the engine. Each of these two sections supplies 17 GPM at 2500 RPM. The third section supplies oil for steering and brake boost units (A).

Two relief valves are mounted directly to the front of the hydraulic tank. They regulate pressure in each separate line to 1900 PSI at 2100 RPM when measured at the manifold test ports. Pressure oil is supplied to two 4-section manifold valves by two separate lines (C).

Oil returns (B) through a 10 micron spin-on type return filter and to the hydraulic reservoir. This filter is directly below the fuel tank on left side of grader. The filter must be changed every 500 hours and the hydraulic fluid, Shell Tellus 32 or Dexron II, should be replaced every 1000 hours or annually (whichever comes first). At the same time the suction screens should be removed and cleaned.

If the unit has articulation, two articulation cylinders are used to operate the articulation hinge. These cylinders are connected to each other in parallel — as one extends the other retracts. The articulation circuit, however, is in series with the rest of the hydraulic system. Oil leaving the cylinders continues to the main manifold, not directly to return.

To articulate, the operator moves a self-centering toggle switch mounted on the wheel lean lever. This sends electrical current to one solenoid on the electric solenoid valve. This valve is mounted near the final drive on the left hand side of the grader. Energizing the solenoid pulls the valve spool to one side allowing oil flow to the head end of one articulation cylinder and the rod end of the other. This articulates the machine.

Thermal relief and cross over relief valves are incorporated into the electric solenoid valve to protect the system from excessive pressure.

# TURNING THE CIRCLE

1. Timing Valve Body
2. Timing Valve Spool
3. L.H. Turn Cylinder
4. R.H. Turn Cylinder
5. Circle Turn Cranks

In this series of illustrations we have shown what happens with the control lever pushed forward to turn the circle clockwise out of the timing position.

The top illustration shows the components in their relative positions for the circle timing exercise we just completed: R.H. cylinder is fully retracted and is momentarily stopped before starting its outward movement. The L.H. cylinder is half way through its stroke and is capable of turning the circle (under load) by itself.

Note that the ports that we ensured were closed are, in fact, connected to the R.H. cylinder.

Since it is momentarily stopped, it requires no oil flow.

As the control lever is moved we will direct oil to the rod-end of the L.H. cylinder to make it retract. This will move the crank and pinion to turn the circle. As this happens, the R.H. pinion turns it will cause the crank to be offset and in a position to help the L.H. cylinder. The valve pinion also turns the timing valve spool and opens the ports to the R.H. cylinder giving us a situation as shown in the lower L.H. illustration.

Now follow the sequence to arrive at the position shown in the third diagram.

# 8400 TRANSMISSION OIL CIRCUIT
(FIRST FORWARD SHOWN)

1. Transmission Sump
2. Suction Strainer
3. Transmission Pump
4. Transmission Oil Cooler
5. Oil Cooler Bypass Valve
6. Transmission Oil Filter
7. Oil Filter Bypass Valve
8. Transmission Regulator Valve Body
9. Main Pressure Regulator Valve
10. Lubrication Pressure Regulator Valve
11. Reverse Solenoid Control Valve
12. A/B Clutch Solenoid Control Valve
13. D Clutch Solenoid Control Valve
14. H/L Clutch Solenoid Control Valve
15. Reverse Clutch/Shaft
16. A/B Clutch/Shaft
17. C/D Clutch/Shaft
18. H/L Clutch/Shaft
19. Main Engine Clutch

The 8400 Transmission was developed to be a simple, efficient, full power shift transmission with a simple hydraulic circuit. The following pages describe this circuit and show several shift engagements.

Transmission oil is drawn from the transmission sump through the suction strainer to the transmission pump. A transmission pump, mounted either to the pump drive gearbox or engine, then pushes oil through the transmission oil cooler and on to the filter. Both cooler and filter have bypass valves which open if there is a large pressure differential between inlet and outlet sides of the cooler or filter. This differential could be caused by either cold, stiff oil or a blockage of either component. The cooler bypass valve should open if inlet oil pressure is 65 PSI greater than the cooler outlet pressure, while the filter bypass opens at 25 PSI differential. A 10-micron disposable spin-on type filter is used. **Changing filters at recommended intervals is vital to long transmission life.**

Oil is then directed to the transmission regulator valve body. Inside this valve body are two regular spools. The first sets main transmission pressure. This spool has one spring and is shim adjustable to maintain transmission engagement pressure at 165-185 PSI. At the regulated pressure the spool moves back against its springs to open a passage to the lubrication circuit and lube pressure spool. Should a maximum lubrication pressure of 25 PSI be reached this valve spool moves back and opens a passage to sump. This valve has one spring and is also shim adjustable. If lube pressure drops below 2 PSI a warning light on the console will come on. The grader should be stopped and the problem diagnosed.

Lubrication oil goes through the center of each clutch shaft. From this central drilled passage oil lubricates and cools the clutch bearings and clutch plates and then drains back to sump. Lubrication oil also goes to lubricate and cool the engine clutch. This oil also drains back to sump.

Lock up pressure oil is directed to the four solenoid valves which are actuated by the transmission controller in the cab. With the exception of the D solenoid valve the solenoids block oil to the packs until energized. The C clutch pack is always engaged until the controller energizes the D solenoid and the D clutch pack locks up. The controller energizes the appropriate solenoids which then direct oil to the clutch packs to lock them up and provide the speed selected by the operator.

To obtain first forward the operator works the controller to indicate "1" on the display and with the mode lever in forward the controller energizes the A/B solenoid to direct oil to the A clutch pack and the H/L solenoid to direct oil to the L (low) clutch pack. This combination of clutches ACL, provides the lowest overall gear ratio available and results in first forward speed.

# LOCK/UNLOCK DIFFERENTIAL
720A-740A

1. Oil Pump
2. Nut
3. Taper Bearing
4. Ring Gear Retaining Bolt
5. Ring Gear
6. Differential Hub
7. Shift Clutch Gear
8. Shift Fork
9. Cross Shaft Bearing Cap
10. Bull/Spider Pinion
11. Shift Clutch
12. Spider Gear
13. Bearing
14. Shift Rail Seal
15. Cylinder Body
16. Hook Type Seal Ring
17. Switch
18. Drain Port
19. Spring Retainer
20. Spring
21. Vent
22. Half Ring
23. Shim Pack
24. Shift Cartridge
25. Shift Valve
26. Oil Supply Hose
27. Return to Sump
28. Shift Cylinder

A standard final drive drives all four tandem wheels at the same speed. However, in sharp turns when articulated, it is an advantage to have a differential action available. A lock/unlock differential type final drive is standard on 720A, 730A and 740A motor graders and optional on 720R, 730R, 740R and 760R graders. This allows both maximum traction in the locked position and minimum turning radius in the unlocked position. **Normal operating position should be locked. An indicator light in the cab will come on when the differential is unlocked.**

To lock or unlock the differential an electrical switch on the right-hand cab post is moved. To unlock the differential the solenoid is energized allowing oil to flow to the cylinder body and pull the piston and shift fork to unlock the spider pinion from the differential hub, allowing differential action. At full travel the piston contacts a normally open switch, closing it and turning the indicator light on in the cab.

Pressure oil to supply this circuit is supplied from the filtered side of the transmission filter and all return and leakage oil returns to the transmission sump. The oil pressure is the same as transmission oil pressure — 165-185 PSI.

To lubricate the bull/spider pinion bearings and the spider gears a small bi-directional oil pump is mounted on the end of the right cross shaft. It sends pressure oil down the cross shaft and lubricates the bearings and gears through small cross drilled passages.

The recommended final drive oil is SAE 80W/90 and should be changed every 2000 hours or annually.