Service Manual

Domestic Series 5000 Compact Tractor

NOTE: These materials are prepared for use by trained technicians who are experienced in the service and repair of equipment of the kind described in this publication, and are not intended for use by untrained or inexperienced individuals. Such individuals should seek the assistance of an authorized service technician or dealer. Read, understand, and follow all directions when working on this equipment. This includes the contents of the Operators Manual, which came with your equipment. No liability can be accepted for any inaccuracies or omission in this publication, although every care has been take to make it as complete and accurate as possible. The right is reserved to make changes at any time to this document without prior notice and without incurring an obligation to make such changes to previously published documents. All information contained in this publication is based on product information available at the time of publication. Photographs and illustrations used in this publication are for reference use only and may not depict actual model and component parts.

MTD Products Inc. - Product Training and Education Department

FORM NUMBER - 769-01633

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TABLE OF CONTENTS

Domestic Series 5000 Hydraulics

1. STANDARD HYDRAULIC SYSTEMS ON THE DOMESTIC SERIES 5000: ORIENTATION

NOTE: Subsections 1 and 2 of the Domestic Series 5000 Hydraulics portion of this manual provide a basic orientation to the system. Subsection 3 and those that follow it contain specific test procedures.

NOTE: Hydraulic diagrams are contained in an appendix to this section.

1.1. The transmission housing acts as a reservoir for all of the hydraulic systems on the tractor: hydrostatic drive pump, hydrostatic steering system, lift cylinder, and accessories.

1.2. Fluid: the transmission and hydraulic system are filled with 5.0 gallons (19.0 L) of Cub Cadet Hydraulic Drive System Fluid Plus (P/N: 737-3120 1Qt., 737-3121 1Gal.).

1.3. Filtration: The hydraulic system filter (P/N:723-0405) is located on a boss on the front surface of the transmission housing, adjacent to the mid-mount, 2000 R.P.M. P.T.O. shaft. See Figure 1.3.

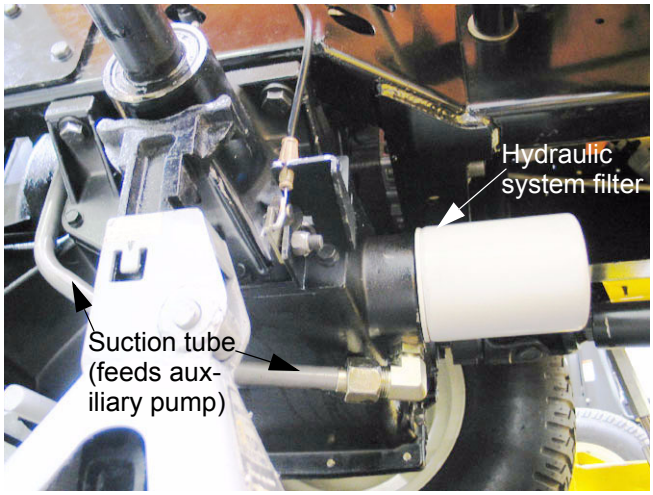

Figure 1.3

1.4. The hydrostatic drive filter (P/N: BS-492932S) is located on the return manifold, atop the transmission. It is accessible through the opening beneath the seat. See Figure 1.4.

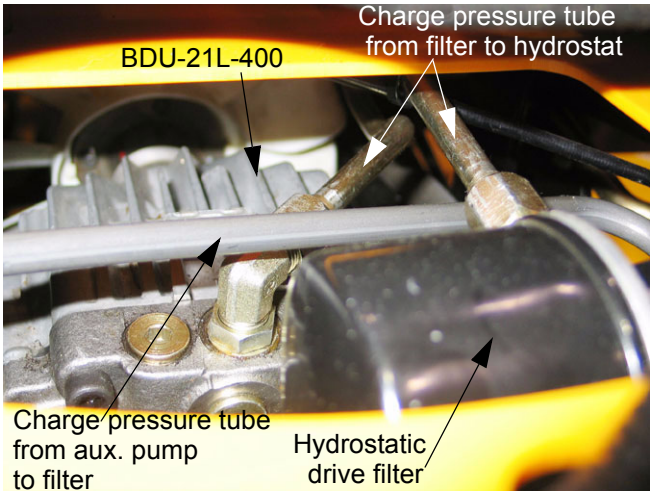

Figure 1.4

NOTE: Other than sharing a reservoir, the hydrostatic drive operates independently of the rest of the hydraulic system.

1.5. The hydrostatic drive is a Hydrogear model BDU-21L-400. It relies on the auxiliary pump to produce charge pressure. The auxiliary pump draws hydraulic fluid up the suction pipe from the base of the transmission housing. See Figure 1.5.

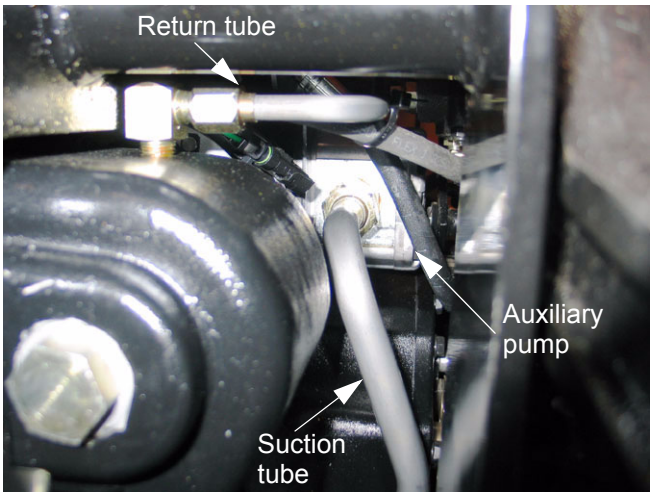

Figure 1.5

Domestic Series 5000 Hydraulics

1.6. The steering and lift cylinder are also powered by the a Sauer-Danfoss SNP 1/2.6 S auxiliary pump.

1.7. The steering unit, located in the dash pedestal contains it's own back-up gerotor charge pump that will enable steering control when the engine is not running. See Figure 1.7.

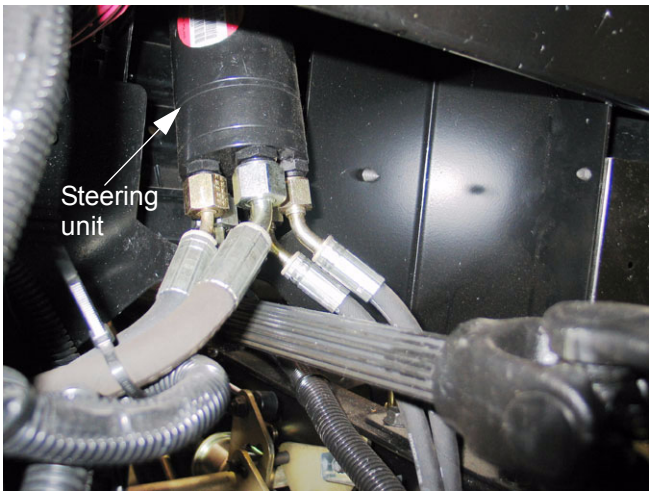

Figure 1.7

1.8. The steering unit directs fluid pressure to one end of the double-acting differential steering cylinder while allowing it to return from the other end of the cylinder in order to provide steering action.

1.9. The lift cylinder is operated by a control valve under the right rear fender. See Figure 1.9.

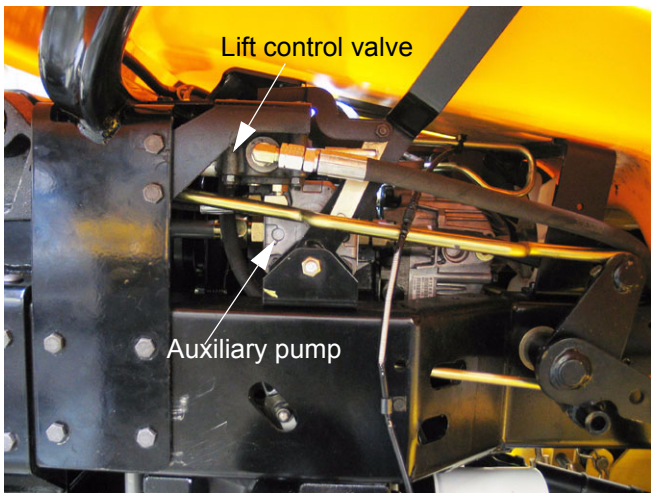

Figure 1.9

1.10. The control valve directs fluid pressure to a single-acting hydraulic cylinder that lifts the three-point lift arms.

1.11. The hydraulic fluid flow is as follows:

1.12. Through the pick-up tube from the transmission sump and filter, to the auxiliary pump.

1.13. Under pressure from the auxiliary pump the fluid goes to the hydrostatic drive and to the "P" port on the steering unit. See Figure 1.13.

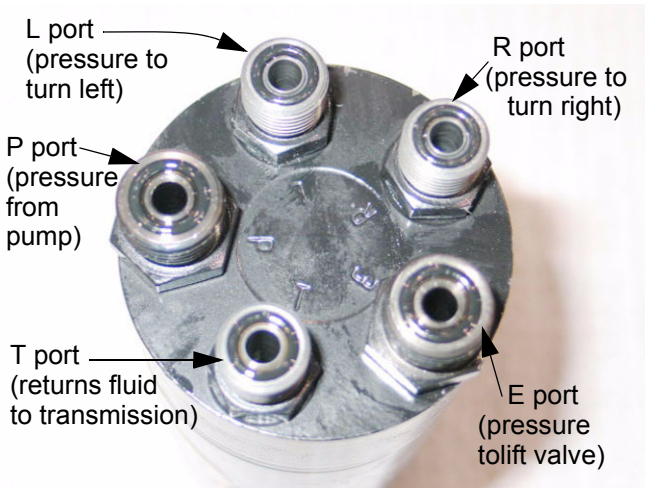

Figure 1.13

1.14. The steering unit distributes pressure to the steering cylinder according to the position of the steering wheel. Left turn input from the steering wheel forces fluid out the port labeled "L" and allows displaced fluid to return through the port labeled "R".

NOTE: The power steering unit is first in line, and has priority over the rest of the system.

1.15. For left turns, the fluid flows from the L port to the base end of the steering cylinder. This causes the ram to extend, turning the wheels to the left.

1.16. The steering cylinder is double-acting: As the piston is forced down the length of the cylinder by hydraulic pressure from the L port, fluid on the ram side of the piston is displaced, returning through the R port.

1.17. The process is reversed for right turns. See Figure 1.17.

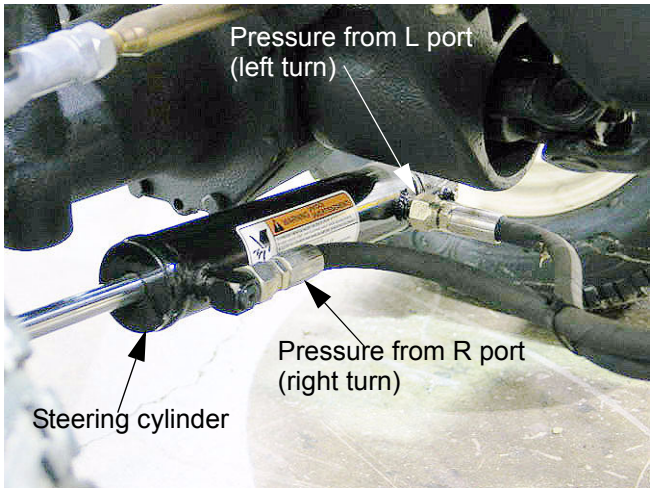

Figure 1.17

1.18. From the steering system, the fluid may follow one of two return paths:

1.19. The fluid may pass through the T port, to the return manifold. See Figure 1.19.

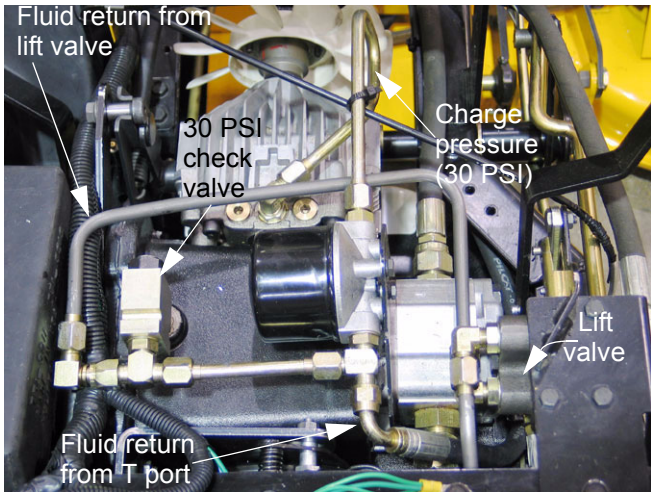

Figure 1.19

1.20. From the return manifold, the fluid may be directed through the hydrostatic drive filter, to provide charge pressure to the hydrostatic drive.

1.21. Pressure is maintained to the filter and hydrostatic drive by a spring loaded check valve. The check valve in this application acts to maintain at least 30 PSI (2.07 Bars) of hydraulic pressure in the system. Above 30 PSI, it allows fluid to return to the reservoir (transmission housing).

1.22. From the E port, fluid will travel to the lift control valve. See Figure 1.22.

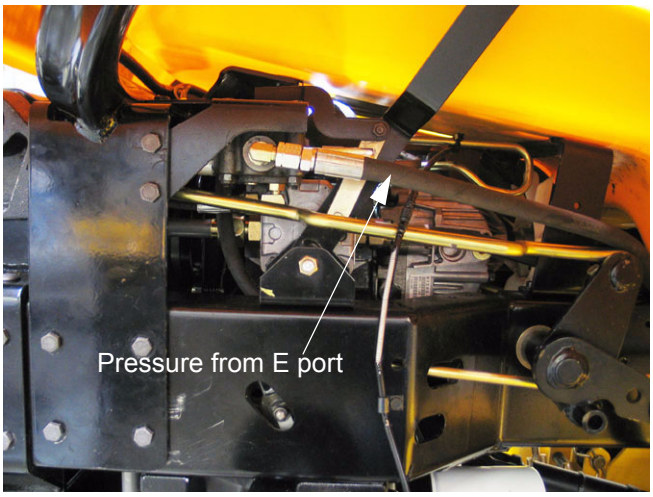

Figure 1.22

1.23. The fluid pressure that comes out of the E port goes to the outboard port of the lift control valve.

1.24. The lift control valve directs pressure to the single-acting lift cylinder through the elbow on the bottom of the valve when operator control input directs it to do so. See Figure 1.24.

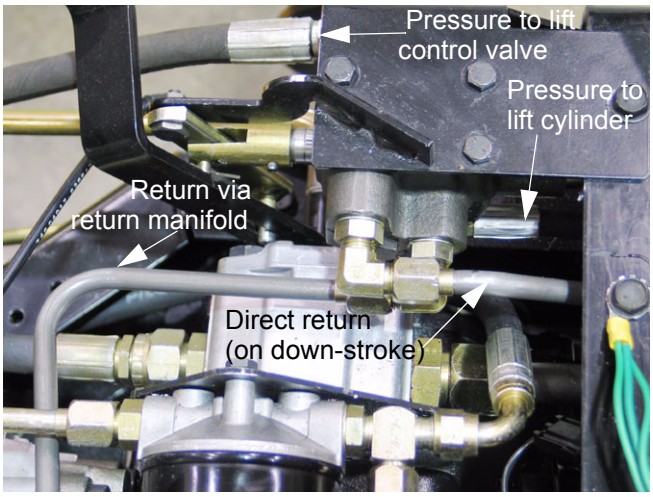

Figure 1.24

1.25. Fluid not required to power the lift cylinder will be continuously directed back to the transmission through the lower inboard port (forward facing elbow) via the return manifold.

1.26. When the tractor operator moves the control lever forward to lower the three point hitch, the lift control valve allows fluid to escape from the lift cylinder as the cylinder retracts under the weight of any accessories supported by the hitch.

1.27. Increased fluid volume beyond normal return flow rate is generated when the lift arms are lowered. This flow is exhausted through the top inboard port (rearward facing elbow) back into the transmission housing via a separate return tube. See Figure 1.27.

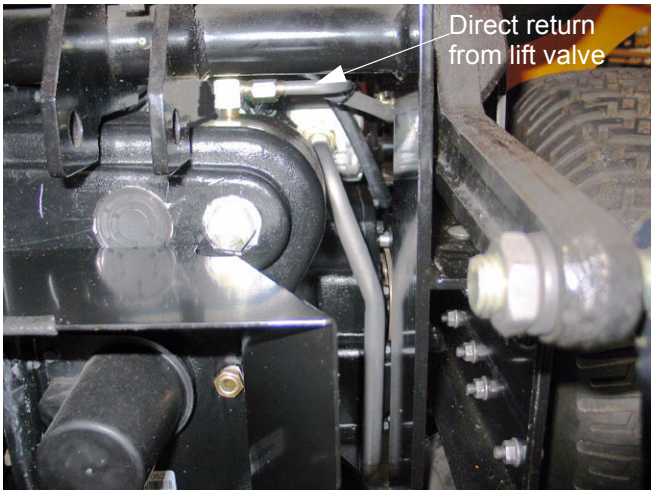

Figure 1.27

2. HYDROSTATIC DRIVE: BASIC OPERATION

2.1. The input shaft to the BDU-21L-400 turns a shaft that passes completely through the housing of the hydro., driving an engine speed input shaft in the transmission.

2.2. The input shaft drives the auxiliary hydraulic pump and the P.T.O. They are driven at relatively constant engine speed, rather than in relation to ground speed. See Figure 2.2.

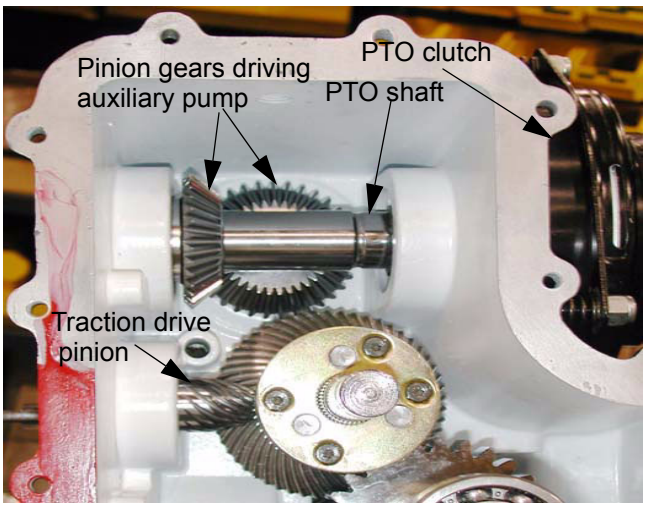

Figure 2.2

2.3. The lower part of the pump contains a fixed displacement axial piston hydraulic motor. The motor is driven by the output of the variable displacement pump.

2.4. The hydro. control arm (scissors bracket) moves a swash plate that controls the output of the pump.

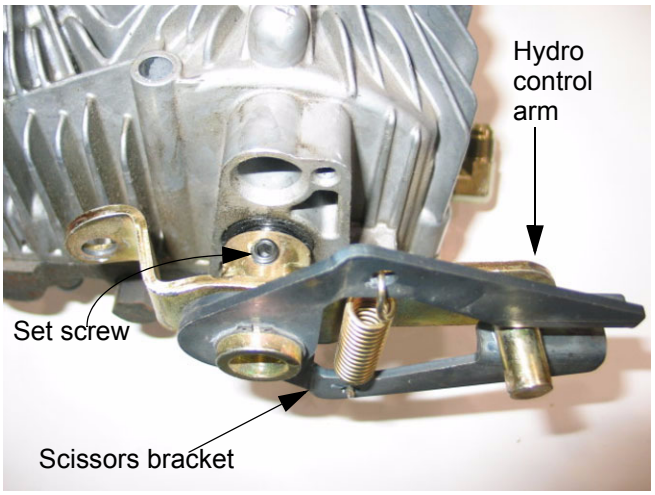

Figure 2.4

2.5. : tilting the swash plate in one way causes the variable displacement pump to drive fluid through the fixed displacement pump in one direction. See Figure 2.5.

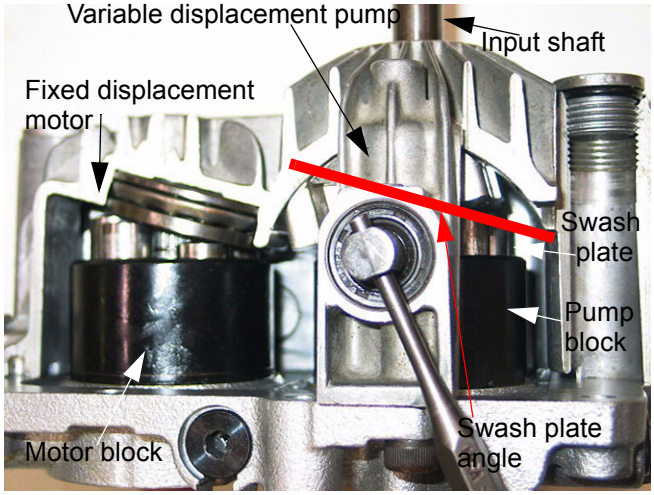

Figure 2.5

2.6. Tilting the swash plate the other way causes the variable displacement pump to drive fluid through the fixed displacement pump in the opposite direction. See Figure 2.6.

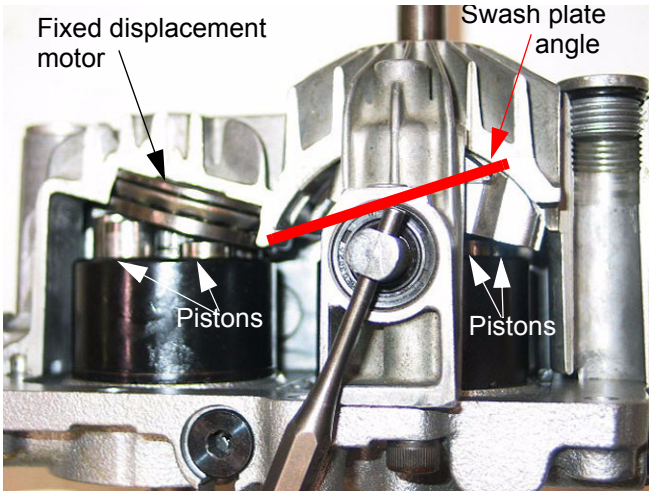

Figure 2.6

NOTE: In figure 2.5, the pistons in the variable displacement pump are alternately pressed into the bores, and then released from bores of the rotating pump block by the tilt of the swash plate.

- On the right side of the pump block in figure 2.5, the pistons are down.
- The pistons are extended on the left side of the pump block. They are forced up by springs contained in the pistons.
- This action causes the pistons to pump fluid in one direction.
- The further the swash plate is tilted, the greater the movement of the pistons as the pump block rotates.
- As the travel of the pistons is increased, the displacement of the pump is increased, and more fluid is pumped.
- The more fluid is pumped, the faster the fixed displacement motor is driven.

2.7. When the swash plate is flat, the pump pistons do not move up and down, no fluid is displaced and no power is transmitted to the fixed displacement pump.

2.8. The auxiliary pump maintains a supply of pressurized fluid (charge pressure) to the variable displacement pump to feed and lubricate the pump.

2.9. The charge check valves direct the flow of pressurized fluid to the ports that feed the pistons of the variable displacement pump.

- When driving forward, fluid flows into the variable displacement pump through one set of ports, and out through a second set.
- When driving backwards, the flow is reversed.
- One check valve opens and the other one closes, depending on the direction of fluid flow.
- If the hydro. is in “neutral”, lubrication is provided to this spinning (but not pumping) pump and motor blocks through separate channels in the housing.

2.10. If the hydrostatic drive is not performing correctly, begin diagnosing with simple things that can be seen with minimal disassembly.

3. EXTERNAL CHECKS

3.1. If the transmission creeps, check the neutral control adjustment. See Figure 3.1.

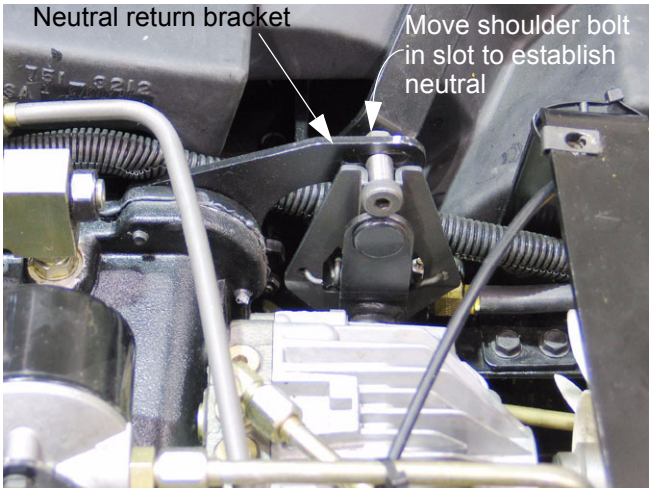

Figure 3.1

NOTE: Complete neutral control adjustment procedures can be found in the 2004 Cub Cadet Technical C.D.

3.2. If the tractor fails to achieve full ground speed, check the adjustment of the linkages that control the hydrostatic drive system.

NOTE: Advertised maximum ground speed
High range forward:8 MPH (12.9 KPH)
Low range forward: 4 MPH (6.44 KPH)
High range reverse:4 MPH (6.44 KPH)
Low range reverse: 2 MPH (3.22 KPH)

3.3. Confirm that full travel is achieved in the forward direction. See Figure 3.3.

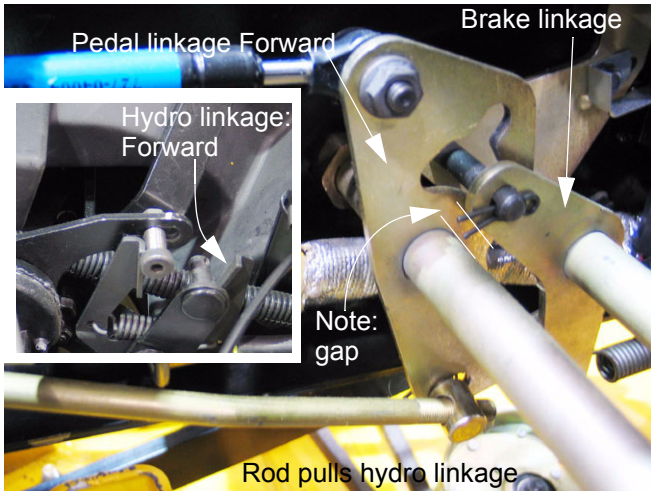

Figure 3.3

3.4. Confirm that full travel is achieved in the reverse direction. See Figure 3.4.

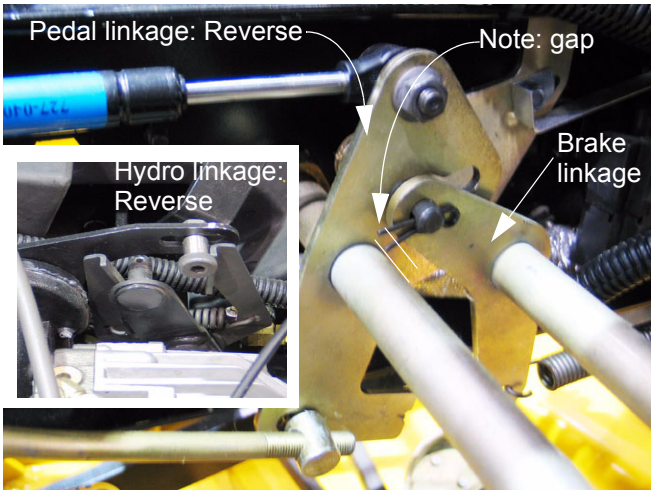

Figure 3.4

3.5. If the brake and drive pedals “fight” with each other, the drive control rod is out of adjustment. See Figure 3.5.

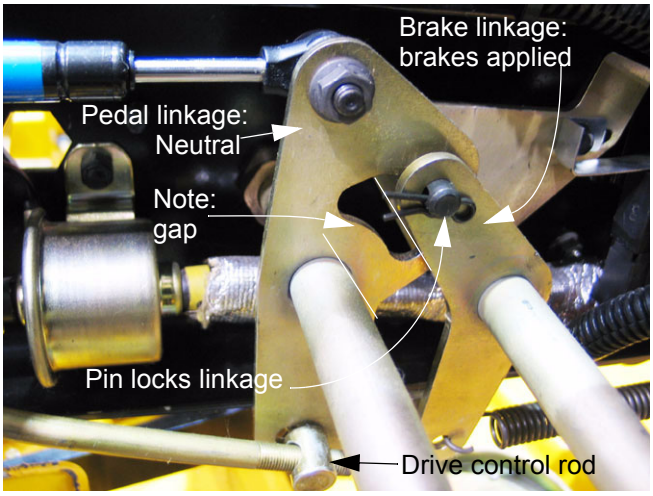

Figure 3.5

NOTE: Isolate the hydrostatic drive unit from the linkage, and confirm the correct adjustment of the neutral return before adjusting the linkage.

NOTE: After correct neutral return adjustment is established, adjust the ferrule on the drive control rod so that it rests lightly against the front edge of the slot that it fits into when the parking brake is engaged.

3.6. If the tractor fails to achieve normal ground speed, and the hydro pump emits an unusual amount of noise, check for brake drag:

- Confirm that the neutral return and hydro control linkages are correctly adjusted.
- With the tractor on a smooth, firm, level surface, place the gear selector in neutral, release the parking brake, and attempt to push the tractor.
- If the tractor does not roll with a reasonable amount of effort, check the brakes for drag.
- The left and right brakes can be checked individually by jacking-up the rear of the tractor and attempting to rotate the rear wheels. Leave the transmission in neutral.
- If either or both brakes drag, confirm that the linkage moves firmly and is properly adjusted.
- If the linkages are properly adjusted, and brake drag is still present, check the pull-off springs on the brake calipers.
- Bear in mind that both brake calipers act on a common cross-shaft within the transmission. With the rear wheels off the ground differential action will still occur when the brakes are applied, unless the differential lock is applied.
- Look for blueing on the brake rotors and freedom of movement when the brakes are released.

NOTE: Complete brake adjustment procedures can be found in the 2004 Cub Cadet Technical C.D.

3.7. If there is no drive at all, confirm whether the problem lies in the hydro or elsewhere.

- With the engine running, confirm that the PTO operates when it is turned-on. This confims that the input shaft is turning.
- On smooth, firm, level ground, with the engine turned-off and the parking brake released:
- Place the gear selector in high range and attempt to push the tractor. It should not roll.
- Place the gear selector in low range and attempt to push the tractor. It should not roll.
- If the tractor rolls, the problem is gear-related.
- Place the gear selector in neutral and attempt to push the tractor. It should roll. If it does not, the problem may be gear or brake related.

3.8. Check the fluid at sight glass gauge on the back of the transmission. Check the level, and compare the fluid to a sample of Cub Cadet Hydraulic Drive System Fluid Plus. Top-up or replace the fluid as necessary. See Figure 3.8.

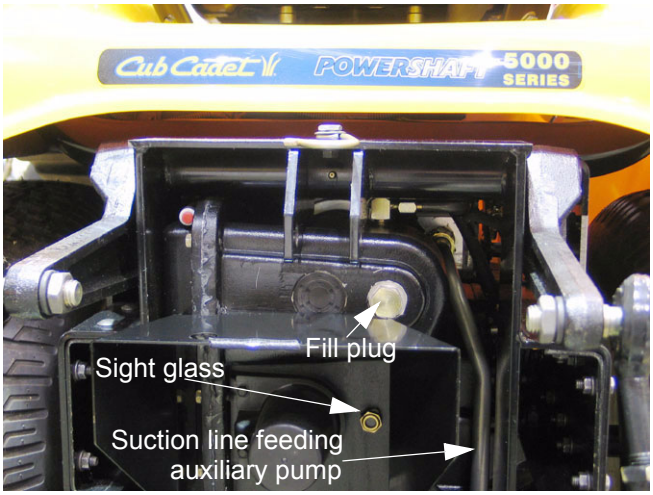

Figure 3.8

3.9. Replace the hydrostatic filter if there is any question of it's condition.

3.10. Visually inspect the hydraulic system filter and the suction tube that feeds fluid to the auxiliary pump from the sump of the transmission. If it is kinked or crushed, replace it. See Figure 3.10.

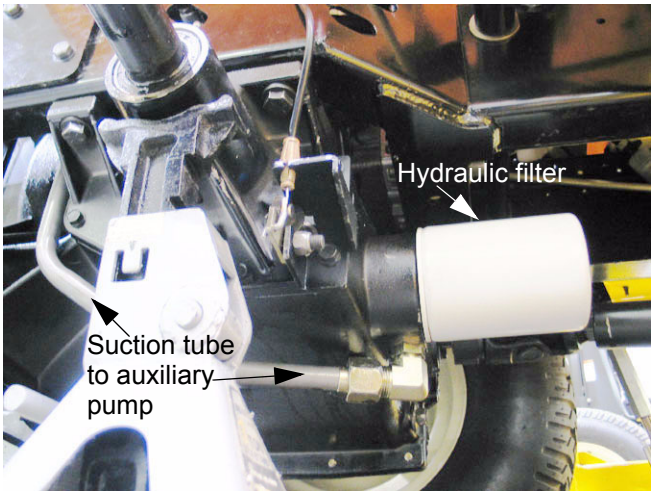

Figure 3.10

NOTE: Drain the transmission fluid before removing the suction tube.

3.11. Check that the set screw holding the control arm to the hydro control shaft has not backed-out, worn, or sheared.

4. BEST PRACTICES: HYDRAULIC SYSTEMS

NOTE: TESTS All hydraulic tests should be done with the fluid at normal operating temperature, and the engine at normal operating speed. In practical terms, normal operating temperature means that the tractor should be operated (if not disabled) for about 5 minutes before testing in normal temperate climates. If the tractor has been sitting outside for a week during February in Green Bay, Wisconsin, it is advisable to store the tractor in a heated shop for 12 hours before testing. Normal operating speed is 3,000RPM.

NOTE: CLEANLINESS It is very important to keep dirt out of hydraulic systems.

- Cleaning the areas around any joint to be disconnected, or component to be removed is advisable.
- Contaminated fluid should be disposed of properly, not re-used.
- Tools and work benches used for work on hydraulic systems should also be kept clean.
- Catch pans beneath work will ease clean-up.
- **CAUTION:** High pressure hydraulic leaks can be dangerous.
- Wear eye protection while performing tests.
- Do not operate any equipment with obvious damage to parts such as hoses.
- Do not disconnect any fittings that may be under pressure. Turn-off the engine and operate the circuit to relieve pressure.
- Remember that anything (front-end loaders, backhoe buckets, three-point hitches, etc....) that is supported by hydraulic pressure will be subject to gravitational force when that pressure is relieved.

NOTE: Sealants

- O-ring fittings require no sealant, though light lubrication with the fluid used in the system is sometimes helpful.
- Teflon tape is to be avoided. “Flash” from the tape can dislodge, blocking valves and damaging pumps.

NOTE: Priming

- When a new hydrostatic drive is installed, turn the input shaft at low speed until charge pressure builds to avoid immediate failure on initial start-up.

5. FLOW AND PRESSURE TESTS: HYDROSTATIC DRIVE

NOTE: The fenders have been removed from the tractor for the sake of photographic clarity. The test procedure described in this section can be performed without removing the fenders.

NOTE: It will be necessary to remove the seat.

NOTE: The hydrostatic drive can be removed from the tractor from beneath without removing the fenders.

5.1. If the problem is not revealed by any of the external checks, check the charge pressure.

5.2. Clean the area surrounding the charge pressure port immediately to the left of the feed tube from the filter. The plug to the right is not easily accessible.

5.3. Remove the plug using a 1/4” allen wrench.

5.4. Install a pressure gauge capable of reading 200 PSI (13.80 Bars) in the port that the plug was removed from. See Figure 5.4.

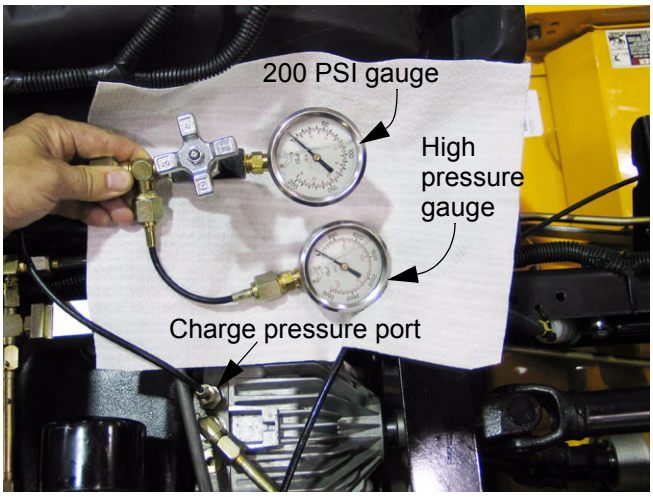

Figure 5.4

NOTE: Fitting size: 3/8” ORFS

5.5. Confirm that no unsafe conditions will be created by starting the engine or operating the drive system before performing the test.

5.6. Place the High/Low/Neutral gear selector in neutral, and set the parking brake.

5.7. Start the engine and allow the fluid to warm up briefly.

5.8. The charge pressure should read at least 30 PSI (2.07 Bars) @ 1,200 RPM. See Figure 5.8.

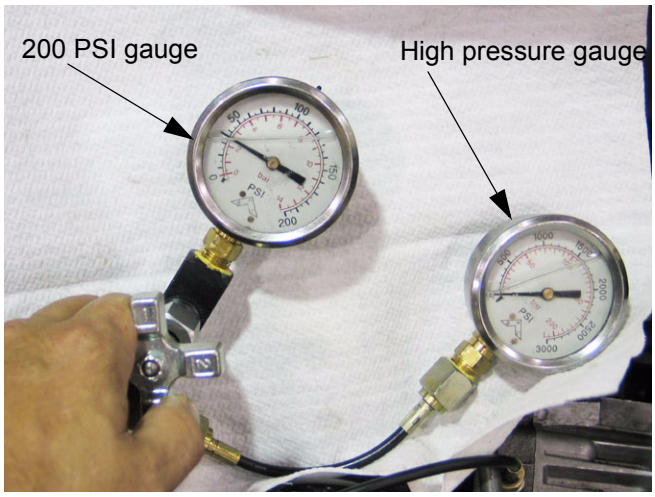

Figure 5.8

5.9. As the RPM is increased to the 3,000 RPM, the pressure may increase somewhat. If pressure goes down as engine speed increases, turn-off the engine and determine the cause.

5.10. After confirming that the supply to the pump is good, low pressure or a complete lack of pressure at this port indicates:

- The auxiliary pump that is not working.
- Pressure from the auxiliary pump is not reaching the charge port on the hydrostatic drive. The steering unit may not be transferring pressure as designed, or the return manifold check valve may be failing to maintain 30 PSI (2.07 Bars).
- Pressure is being lost within the hydrostatic drive, possibly because of a malfunctioning system relief valve.

5.11. If the charge pressure is good, but drive has been lost in one direction only, the corresponding charge check valve may not be working.

- There is a charge check valve located in each circuit: one for forward, one for reverse.
- These check valves enable the charge pump to provide charge oil to the side of the circuit that has the lowest pressure, while sealing-off the side that has higher pressure.
- The one on the left side maintains pressure in the forward circuit, the one on the right side maintains pressure in the reverse circuit.

5.12. The charge check valves can be removed using a 5/8” wrench. See Figure 5.12.

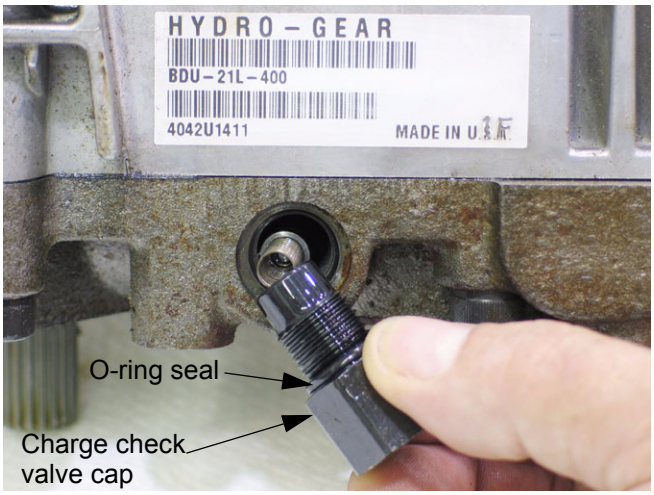

Figure 5.12

NOTE: The one on the right side (reverse) is easy to reach. The one on the left side (forward) can not be removed in the tractor. It may be removed for inspection on the bench.

5.13. When removed, each charge relief valve comes out as a cartridge. The light compression spring provides the check valve function. The heavy compression spring provides system relief. System relief comes into play in the event of a drive system overload. See Figure 5.13.

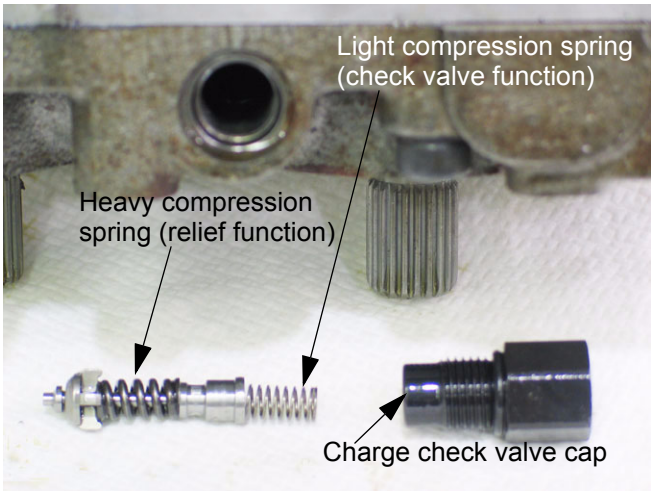

Figure 5.13

5.14. The output of the variable displacement pump is dependent upon the performance of the check valves.

5.15. The presence of fluid flow from the auxiliary pump, via the steering unit can be confirmed by installing a flow meter in place of the tube between the filter and the top port on the hydrostatic drive. See Figure 5.15.

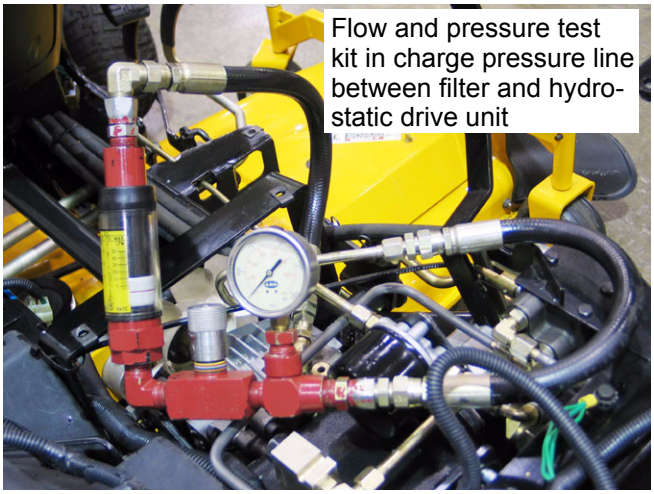

Figure 5.15

5.16. With the engine at a minimum speed of 1,200 RPM, fluid flow of roughly 2 GPM (7.60 LPM) should register on the meter. See Figure 5.16.

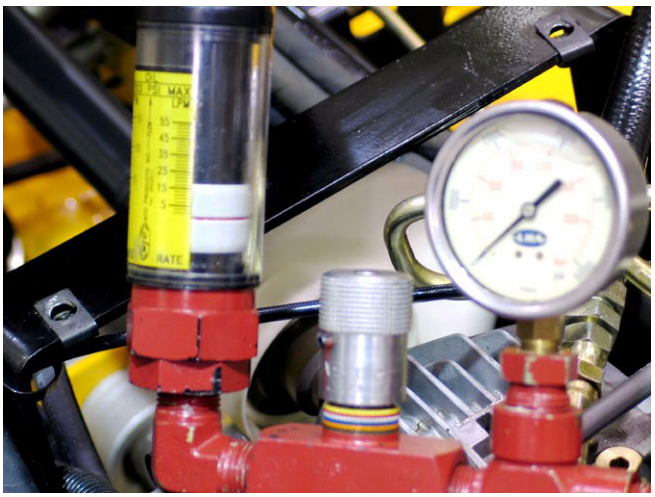

Figure 5.16

NOTE: No hydraulically powered systems should be in motion during this test. The steering and lift cylinder should be stationary. Confirm that the lift control valve is not in the down position.

5.17. **Conclusion:** If flow is present, but there is no pressure, as determined by the 200 PSI gauge, then the auxiliary pump is producing flow, the steering unit is passing that flow along to the return manifold through the T port, but pressure is being lost in the return circuit. The most likely culprit is the return circuit check valve.

5.18. **Conclusion:** If there is neither flow nor pressure, either there is none reaching the return circuit, or it is being spilled-off through a path that offers lower resistance.

- The lift control valve is the only other possible outlet from the return circuit. Lift control valve failure in this mode would be highly unusual. If the lift control valve operates normally, this issue can be eliminated from consideration.
- To discern if the auxiliary pump is functioning, operate other hydraulic systems. If the steering and the lift cylinder for the three point hitch fail to operate, it is safe to assume that the auxiliary pump is not producing pressure.
- The pressure that operates the lift cylinder comes from one of two possible return paths from the steering unit (E port). The charge pressure for the hydrostatic drive comes from the

other (T port). If there is pressure to the steering unit, at least one return path will have pressure.

5.19. The return circuit check valve maintains a minimum pressure given sufficient flow. It does not control the maximum pressure in the system: it is a check valve, not a relief valve.
See Figure 5.19.

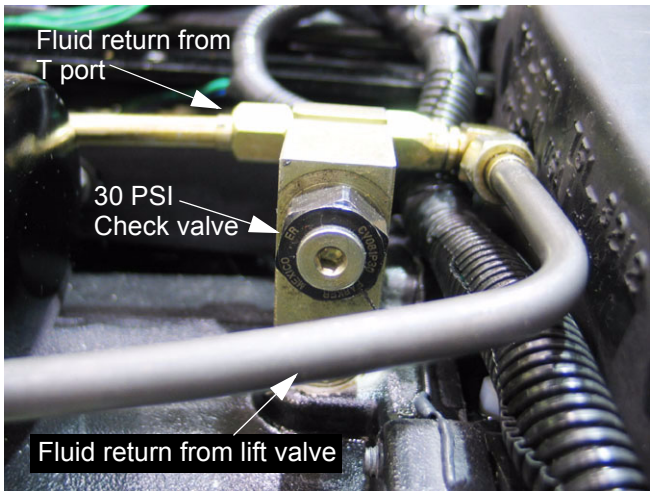

Figure 5.19

5.20. The core of the valve can be removed for inspection. The nut and set screw are not a means of adjusting pressure. See Figure 5.20.

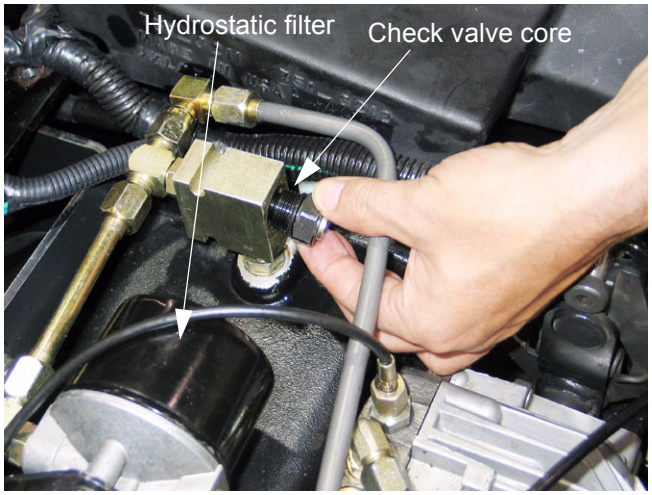

Figure 5.20

5.21. If any mechanical problem is found with the check valve, it is to be replaced as a unit. Individual service components are not available through Cub Cadet. See Figure 5.21.

Figure 5.21

6. AUXILIARY PUMP

6.1. The auxiliary pump provides pressure for the hydrostatic power steering unit, the lift cylinder attached to the three-point hitch, and any hydraulic-driven accessories that may be installed on the tractor.

6.2. Series 5000 tractors come with a single auxiliary pump mounted to the right side of the transmission. See Figure 6.2.

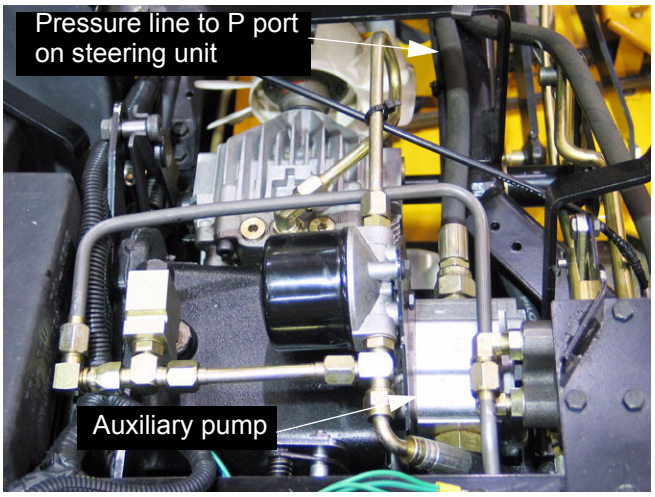

Figure 6.2

6.3. If performance of any of the tractors hydraulic features or attachments is poor, it is necessary to confirm that sufficient hydraulic power is being supplied by the pump that drives it.

6.4. Begin with the basics: confirm that the pump drive and supply are intact before drawing conclusions about the pump itself by making these preliminary checks:

- Check the fluid. If the fluid level is low, or the fluid is not the correct type, both the hydrostat and the auxiliary pump will perform poorly.
- Replace the hydraulic filter if there is any question of its condition.
- Confirm that the suction tube that provides fluid to the auxiliary pump from the sump of the transmission is not crushed or kinked, and that the connections are free of leaks.

6.5. The filter and suction tubes are easily reached for inspection with little or no disassembly. See Figure 6.5.

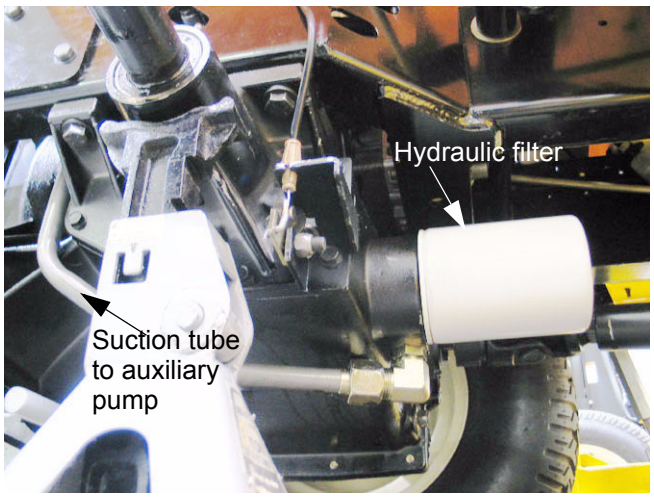

Figure 6.5

6.6. The rear fenders must be removed to access the auxiliary pump itself. Fender removal is detailed in the 2004 Cub Cadet Technical C.D.

6.7. To test the auxiliary pump, use a flow and pressure gauge set. See Figure 6.7.

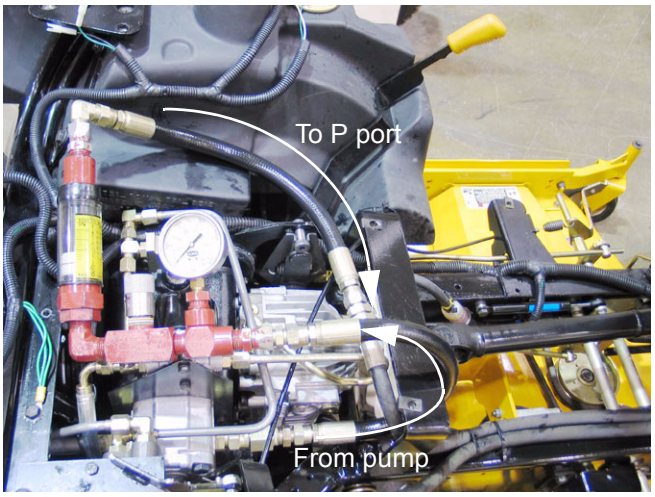

Figure 6.7

NOTE: Equipment will vary from shop to shop, but operating principles are similar.

6.8. Disconnect the output line from the top of the pump using a 3/4” wrench and a 9/16” wrench.

6.9. Install the gauge set in-line between the auxiliary pump and the steering pump. The pressure gauge should be near the auxiliary pump, and the flow meter should be near the steering unit.

6.10. Set the parking brake, place the gear selector in neutral, open the flow valve on the gauge set all the way, and confirm that no unsafe conditions will be created by starting the tractor engine.

6.11. Start the engine, allow the engine and hydraulic system to warm-up. See Figure 6.11.

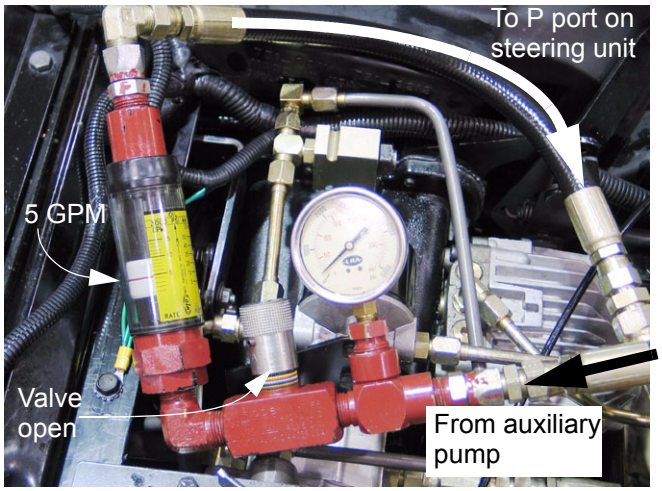

Figure 6.11

6.12. **Performance:**

- The SKP1/4.3 S auxiliary pump does not contain a relief valve. It is capable of producing roughly 3,600 PSI (250 bars) at engine speeds beyond 1,200 RPM.
- This is far in excess of the needs of the rest of the system, which is designed to operate at 1,500 PSI (103 Bars).
- **For our purposes**, it is not necessary to test the pump to its full capacity, only to establish that it produces enough flow and pressure to operate the hydrostatic steering and hydraulic lift cylinder.
- The auxiliary pump was observed to move about 4.6 GPM (15 LPM) at an engine speed of 3,000 RPM, with no load applied.
- Flow will vary with engine speed, but pressure tests can be done at lower engine speeds: 1,200-1,500 RPM.
- Set the throttle to maintain an engine speed in this range, and note the reading on the flow meter.

6.13. Close the flow valve until the pressure gauge reads 1,500 PSI (103 Bar). Note the flow reading. See Figure 6.13.

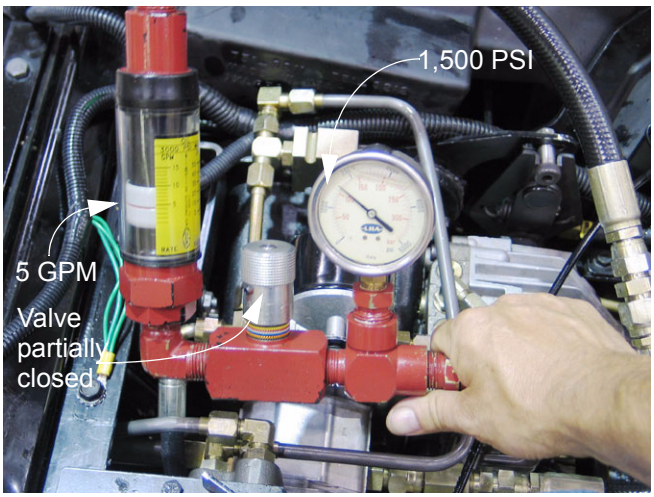

Figure 6.13

6.14. As soon as the flow reading is noted, open the the flow valve completely, relieving pressure from the system. Turn -off the engine.

6.15. The flow readings noted at zero pressure and 1,500 PSI (103 Bars) should not vary significantly. Flow is more related to engine RPM than to pressure.

7. STEERING PUMP AND CYLINDER

NOTE: It is normal for the spokes of the steering wheel on an open-center hydrostatic power steering system to change orientation with use. There is no mechanical connection between the steering wheel and the front wheels.

7.1. **Identification:** The Sauer OSPM 63 PB unit has a round body. The ports are on the bottom of the steering unit connecting to the hydraulic lines with male straight thread O-ring seal fittings. See Figure 7.1.

Figure 7.1

7.2. The ports are arranged as follows:

- P Pressure from the auxiliary pump.
- T Tank return of fluid pressure and volume not required by the steering system.
- E Equipment power for accessories.
- R Right turn, pressure out when turning right.
- L Left turn, pressure out when turning left.

7.3. R&R: instructions for removal and replacement of the steering units can be found in the DASH PANEL AND STEERING PUMP section of this manual.

7.4. If there is a warrantable problem with the power steering unit, it is to be replaced as a complete unit. Cub Cadet does not stock any internal components for the steering units.

7.5. The following set of symptoms, causes, and solutions has been adapted from a list compiled by Sauer-Danfoss to aid in the diagnosis of hydrostatic steering issues. Internal steering unit problems are described to aid technicians in distinguishing internal steering unit problems from problems that lie elsewhere in the system. Internal problems dictate replacement of the steering unit.

- **High Effort Required to Turn Steering Wheel:**

Cause 1: The auxiliary pump is not supplying sufficient fluid to the steering unit. Confirm by testing auxiliary pump out-put.

Solution 1: Correct the problem with the auxiliary pump.

Cause 2: The priority spool within the steering unit is not moving, causing fluid to be directed to other parts of the system when the steering system needs it.

Solution 2: Internal problem; priority spool.

Cause 3: The relief valve in the steering unit is stuck open.

Solution 3: Internal problem; relief valve.

- **“Motoring” Steering Wheel: rotates on its own:**

Cause 1: Bad leaf spring in steering unit.

Solution 1: Internal problem; leaf spring.

Cause 2: The relief valve is stuck open.

Solution 2: Internal problem: relief valve.

- **Poor Straight Line Steering Characteristics:**

Cause 1: There is a bind in the steering column.

Solution 1: Binds may be created by angular or radial misalignment between the steering column and the steering unit. Binds may also be created by a lack of axial clearance between the steering column and the steering unit. Correct any situation that may create friction or binding in the steering column.

Cause 2: Bad leaf spring in steering unit.

Solution 2: Internal problem; leaf spring.

- **Backlash**

Cause 1: Wear or play between the steering column and the cardan shaft.

Solution 1: If the wear is in the steering column, replace the steering column (steering shaft per Cub Cadet IPL). If the wear is in the cardan shaft, this is an internal problem.

Cause 2: Bad leaf spring in steering unit.

Solution 2: Internal problem; leaf spring.

- **Shimmy:**

Cause 1: Air in steering system.

Solution 1: Repair any leaks in the hydraulic system. Be aware that a leak on the suction side of the auxiliary pump would entrain air into the hydraulic fluid, but may not display significant fluid loss.

Cause 2: Worn mechanical connections.

Solution 2: Inspect the MFD and steering linkage for sources of excessive play: worn wheel bearings, worn tie rod ends, worn king pins, worn steering cylinder mounting points, etc.... Replace the worn components.

- **Steering Wheel Input Does Not Cause Steering cylinder to Move:**

Cause 1: No fluid in the system.

Solution 1: Fill the system.

Cause 2: Worn steering cylinder / blow-by. Confirm with flow test in line to cylinder.

Solution 2: Replace the steering cylinder.

- **Heavy Impacts to Steering Wheel in Both Directions:**

Cause 1: The hydraulic hoses are incorrectly connected; the hose that should connect to the “P” port is connected to the “L” port or the “R” port.

Solution 1: Correct the hydraulic connections.

Cause 2: Incorrect setting of the cardan shaft to the gear wheel (timing).

Solution 2: Internal problem; cardan shaft / gear wheel timing.

- **Slow Steering:**

Cause 1: Insufficient fluid flow to the steering unit. Confirm by testing the out-put of the auxiliary pump.

Solution 1: Repair of replace the auxiliary pump or delivery line from the pump to the “P” port on the steering unit.

Cause 2: The priority valve in the steering unit is not working properly. This valve normally maintains precedence of the steering system over all subsidiary systems (lift cylinder).

Solution 2: Internal problem; priority valve.

- **The Steering Wheel Does Not Return to Center:**

Cause 1: There is a mechanical bind in the steering column.

Solution 1: Repair or adjust the steering column (steering shaft) to eliminate the bind.

Cause 2: Bad leaf springs.

Solution 2: Internal problem; leaf springs.

Cause 3: The spool is pressing against the sleeve in the steering unit.

Solution 3: Internal problem; relief valve causing too much pressure to build, displacing the spool.

Cause 4: Binding between spool and sleeve caused by fluid contamination.

Solution 4: Internal problem; **contamination.** If this is a possibility, cleaning, fluid replacement, and filter replacement will help prevent a repeat failure.

- **Steering Action is Opposite of Input:**

Cause 1: The “L” and “R” hoses are reversed at their connections to the steering cylinder or steering unit.

Solution 1: Correct the connections of the hydraulic lines from the steering unit to the steering cylinder.

Cause 2: Incorrect setting of cardan shaft to gear wheel.

Solution 2: Internal problem; cardan shaft / gear wheel timing.

Domestic Series 5000 Hydraulics

- **Steering Power Too Low:**

Cause 1: The relief valve is set too low or malfunctioning.

Solution 1: Internal problem; relief valve.

- **Fluid Leakage:**

Cause 1: The seal around the cardan shaft is leaking.

Solution 1: Internal problem; cardan shaft seal.

Cause 2: The port fittings are leaking.

Solution 2: Replace port adaptors or O-rings. Tighten the fittings to a maximum torque of 221 in-lbs. (25 NM) on the “T”, “R”, and “L” ports. Tighten the fittings to a maximum of 239 in-lbs. (27 Nm) on the “P”, and “E” ports.

7.6. Engine-off test: With the engine turned-off so that no pressure is supplied by the auxiliary pump, the pump within the steering unit should work well enough in manual mode to turn the front wheels from one steering stop to the other (full travel) with roughly 2.75 turns of the steering wheel.

NOTE: The tractor was engineered to comply with German TUV directive #38stVZo. It will provide steering action without pressure from the auxiliary pump, maintaining steering wheel force within a specified limit.

7.7. If there is air in the system, it will not perform to design intent:

- If there are any leaks in the steering hydraulics, air will be drawn into the system, degrading performance.
- If the system has been disassembled for any reason, the engine must be started to provide pressure from the auxiliary pump. With auxiliary pump pressure to assist, turn the steering wheel lock-to-lock three times, to purge air from the steering system.
- After the air is purged, the engine-off test can be performed with validity.

7.8. If the hydraulic steering lacks speed, test the auxiliary pump as described in the previous section of this manual.

7.9. Once it has been established that the auxiliary pump is developing enough flow and pressure, then test the steering unit.

7.10. Install the hydraulic test kit in either one of the two hydraulic lines leading from the steering pump to the steering cylinder.

7.11. Disconnect the hydraulic line between the steering unit and the steering cylinder using a 5/8” wrench and a 3/4” wrench. See Figure 7.11.

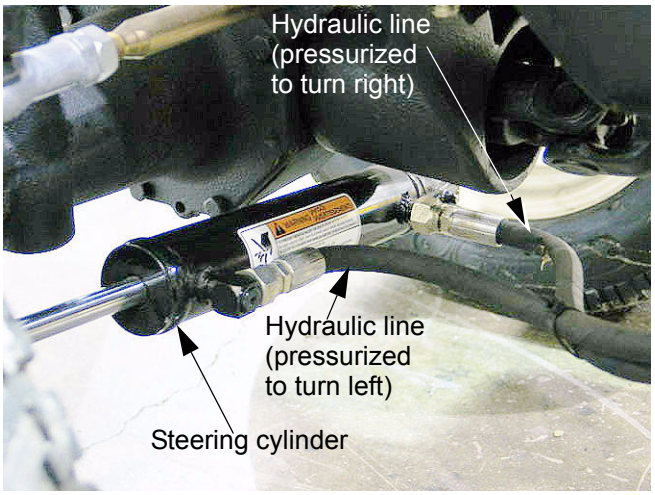

Figure 7.11

7.12. Connect the test kit so that the pressure gauge side (as opposed to the flow meter side) is near the source (steering unit). See Figure 7.12.

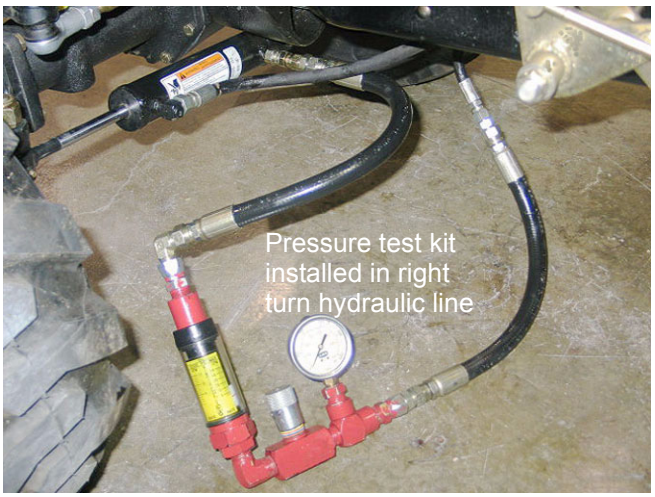

Figure 7.12

7.13. Confirm that the test kit valve is all the way open, and that no unsafe conditions will arise from starting the tractor engine.

7.14. Start the engine, warm-up the engine and hydraulic system, then position the throttle to 1,200-1,500 RPM.

7.15. Have an assistant slowly turn the steering wheel until the steering linkage hits the end of its travel. Applying pressure to the steering wheel while the linkage is at full lock will build pressure in the system.

NOTE: The wheel can be turned in either direction to get a pressure reading.

NOTE: The steering pump is equipped with a relief valve that will not permit the pressure to rise above 1,087 to 1,160 PSI (75 to 80 Bars).

7.16. Observe the pressure reading on the test kit, at full-lock. The pressure should be in the range of 1,087 to 1,160 PSI (75 to 80 Bars).
See Figure 7.16.

Figure 7.16

7.17. If steering pressure is low, and the auxiliary pump has been confirmed to be functioning properly, then the steering unit is the problem.

NOTE: Steering unit failure is a rare occurrence.

7.18. If the pressure is good between the steering unit and the steering cylinder, but the steering system lacks power, then the steering cylinder is the most likely hydraulic problem.

7.19. It is possible for the piston seals in the steering cylinder to experience “blow-by” without creating an externally visible leak.

7.20. To check for blow-by, turn the steering wheel in whichever direction causes the flow meter on the test kit to rise:

- If the test kit is attached (as illustrated in figure 7.15) to the fitting at the base end of the cylinder, turn the steering wheel to the right.
- If the flow meter is attached to the fitting at the rod end of the steering cylinder, turn the wheel to the left.

7.21. If the steering hits the end of its travel, builds terminal pressure, and the flow meter continues to have a reading above zero, then fluid is blowing-by the seals on the piston.

7.22. If the flow meter falls to zero and remains there as pressure builds, then fluid is not blowing-by the seals on the steering cylinder piston.

7.23. If blow-by exists, the steering cylinder is bad.

NOTE: A steering cylinder can get “blown-out” by a steering pump with a relief valve that fails to keep the pressure below 1,500 PSI (103 bars). If this is the case, replacing the cylinder without replacing the pump will result in rapid failure of the replacement cylinder.

7.24. If the hydraulic system (Auxiliary pump, steering unit, cylinder, lines) is all in good order, then the problem may be a mechanical bind in the steering linkage.

8. HYDRAULIC LIFT CYLINDER AND CONTROL VALVE

8.1. If the hydraulic lift cylinder does not work or is low on power, begin by making a visual inspection of the valve, cylinder, linkage, and hydraulic hose. See Figure 8.1.

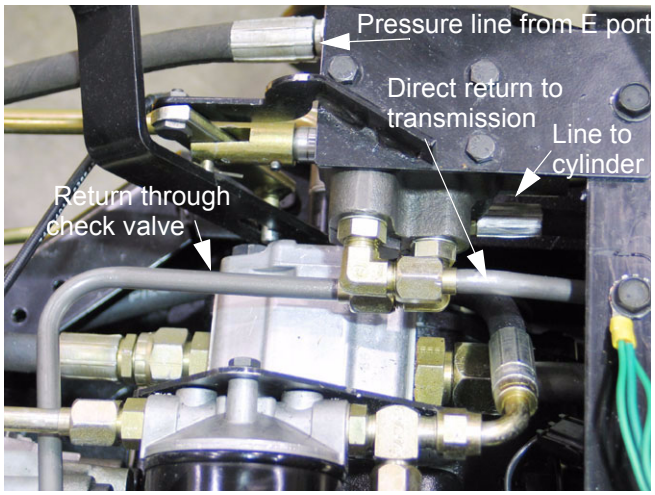

Figure 8.1

8.2. The outboard plumbing and linkage connections to the control valve are visible beneath the fender. More complete inspection, diagnosis, and service require fender removal.

8.3. The lift cylinder and the hydraulic hose that connects it to the control valve are visible beneath the left fender. See Figure 8.3.

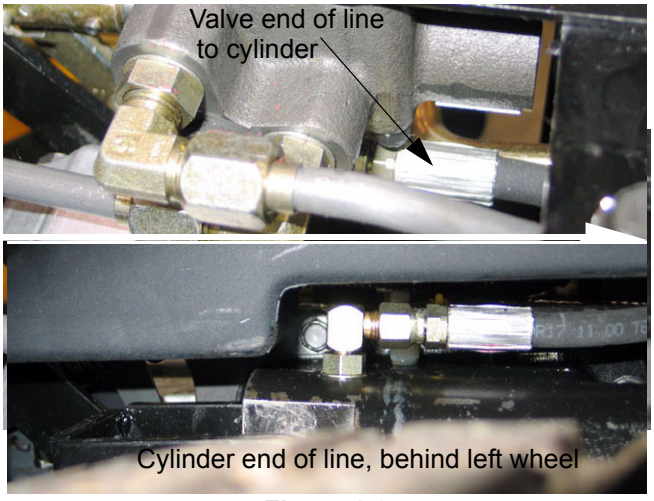

Figure 8.3

8.4. If the lift cylinder is operable, run it through the full range of travel to confirm that the feedback rod is working correctly. Normal operating characteristics include:

- The the lift arms move up when the control lever is moved back. The lift arms move down when the control lever is moved forward.
- In all positions, the lift cylinder will apply only upward force to the lift arms. It is a single-acting cylinder.
- Downward travel is not under hydraulic force, and is only caused by the weight of the lift arms and any accessories mounted to them.
- At any point in their travel, the lift arms may be manually lifted beyond the point that the hydraulic system is holding them at. They will always “float”.
- Because the steering system has priority over the lift cylinder, it is normal for the lift cylinder to have less power when the steering system is in motion.

8.5. Orientation of the valve: See Figure 8.5.

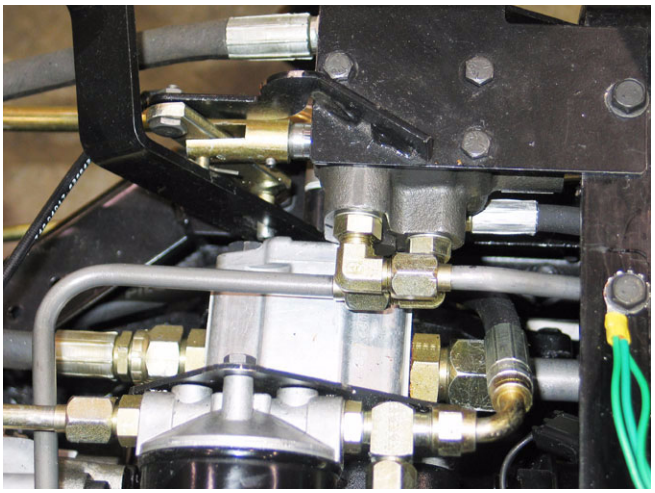

Figure 8.5

- The flexible line to the outboard side of the valve provides pressure from the steering pump.
- A flexible line from the bottom of the valve connects it to the lift cylinder.
- The steel line leading rearward from the front port on the valve carries fluid directly back to the transmission housing (reservoir).
- The steel line leading forward from the rear port on the valve directs fluid to the return manifold, and back to the transmission housing.

8.6. Fluid movement:

- Fluid is constantly circulating from the auxiliary pump, to the steering unit, through the valve, then to the return manifold.
- When the valve is actuated to raise the lift arms, it redirects fluid from this path to the lift cylinder.
- When the valve is actuated to lower the lift arms, fluid is allowed to empty from the lift cylinder through the valve, into the steel line leading from the top of the valve to the transmission cover.

8.7. Control Linkage Description: The operator control handle pivots on a bracket bolted to the frame. A pin on the valve link engages a slot in the handle, above the handle pivot point. The ratio of travel varies with the position of the handle, but when the pin is centered in the slot there is a 10:1 ratio between the movement of the handle and the movement of the pin. The top of the valve link pivots on the valve mounting bracket. Between the pin and the fulcrum is a connection to the tubular link. There is a 3:1 ratio between the movement of the valve link and the movement of the tubular link.

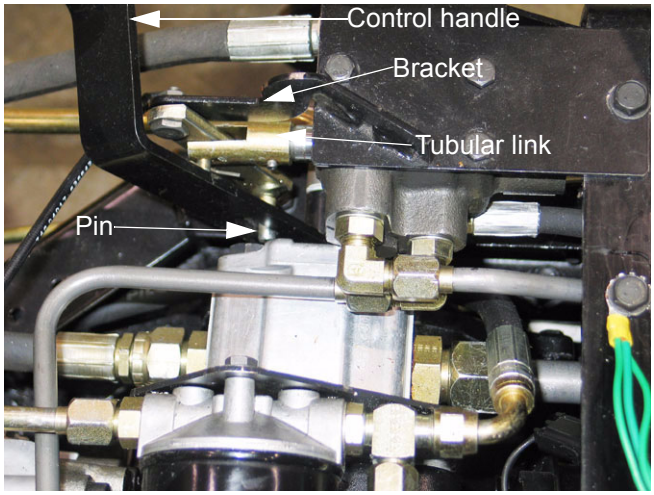

Figure 8.7

8.8. The effective movement ratio of 30:1between the handle and the input to the control valve allows precise movement of the three point lift without the complexity of the shifting fulcrum linkage used on the domestic Series 7000.

8.9. The category 1 three point hitch system on the domestic Series 5000 tractor should be capable of lifting 950 lbs. (430 Kg.), 24 in. (61 cm.) behind the hitch. If it does not perform as designed, use the following procedure to diagnose it.

8.10. Confirm that the lift cylinder control valve is getting pressure from the steering pump:

- Remove any rear mounted attachments that are supported by the lift arms or will interfere with access to the lift cylinder and control valve.
- Remove the rear fenders.
- Lift and safely support the rear of the tractor.
- Remove the right rear wheel using a 21mm wrench.
- Lower the lift arms to the bottom of their travel, and confirm that the lift cylinder is fully retracted.
- Disconnect the flexible hydraulic line from the bottom of the control valve using a 3/4” wrench and a 5/8” wrench.
- Install the test kit with the flexible line connected to the pressure gauge end of the kit, and the control valve connected to the flow meter end of the kit. See Figure 8.10.

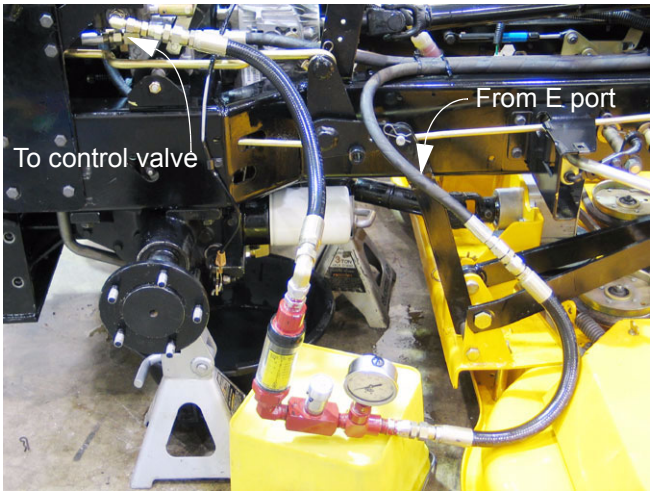

Figure 8.10

8.11. Confirm that the test kit valve is all the way open, and that no unsafe conditions will arise from starting the tractor engine.

8.12. Start the engine, warm-up the engine and hydraulic system, then position the throttle to 3,000 RPM.

8.13. The flow meter should rise to 4 GPM (15 LPM) and hold steady at that level. See Figure 8.13.

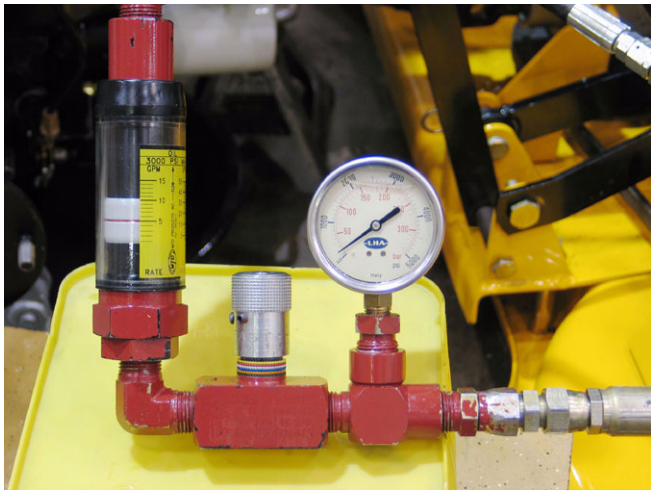

Figure 8.13

8.14. After the flow rate is established, lower the throttle setting to 1,200-1,500 RPM

8.15. Carefully close the valve on the test kit. It is not necessary to move the lift cylinder to generate pressure.

NOTE: Designed system pressure is 1,500 PSI (103 Bars). Testing beyond this pressure subjects the system to needless over-load. See Figure 8.15.

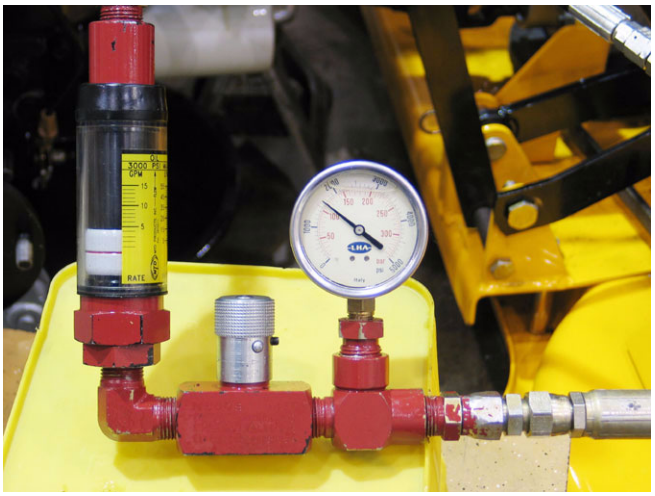

Figure 8.15

8.16. The flow should remain constant, while the pressure climbs to 1,500 PSI (103 Bars). Open the valve a soon as the readings are confirmed.

NOTE: Remember, the flow varies with engine RPM, but does not vary with pressure generated unless the auxiliary pump is failing.

8.17. Turn off the engine. Retract the lift cylinder fully to relieve pressure from the hydraulic system.

8.18. Remove the test kit from the line between the steering unit and the lift control valve, and connect the hydraulic line to the control valve.

8.19. If the control valve is receiving full pressure from the steering unit, but the lift cylinder lacks power, perform a pressure test at the line between the valve and the cylinder.

8.20. Install the test kit between the control valve and the lift cylinder.

8.21. If the tractor is equipped with a mid-mount mower deck, it will be necessary to disconnect and remove the link that connects the three point lift arm to the deck lift mechanism. See Figure 8.21.

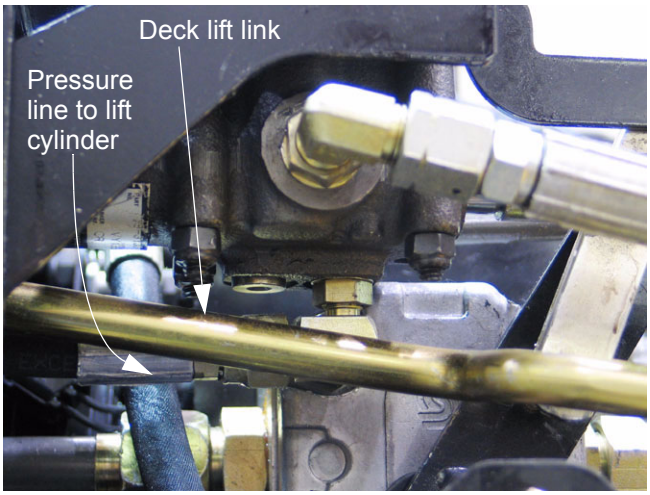

Figure 8.21

8.22. Disconnect the flexible hydraulic line that leads from the control valve to the lift cylinder using an 11/16” and a 3/4” wrench. See Figure 8.22.

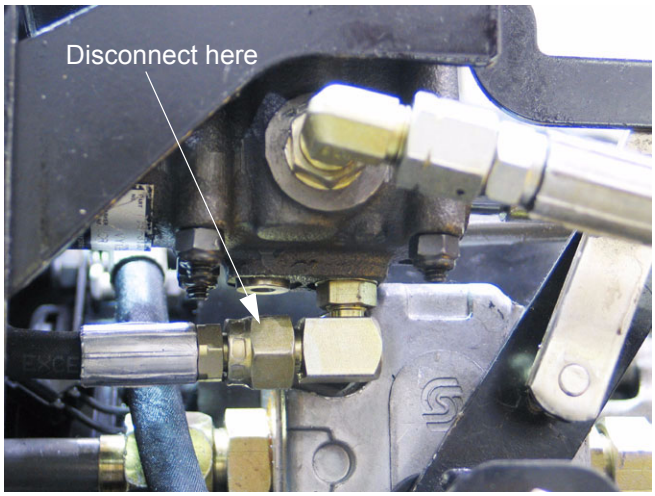

Figure 8.22

8.23. Connect the test kit to the 3/8” flare fittings. The pressure gauge should be near the valve, and the flow meter should be near the cylinder. See Figure 8.23.

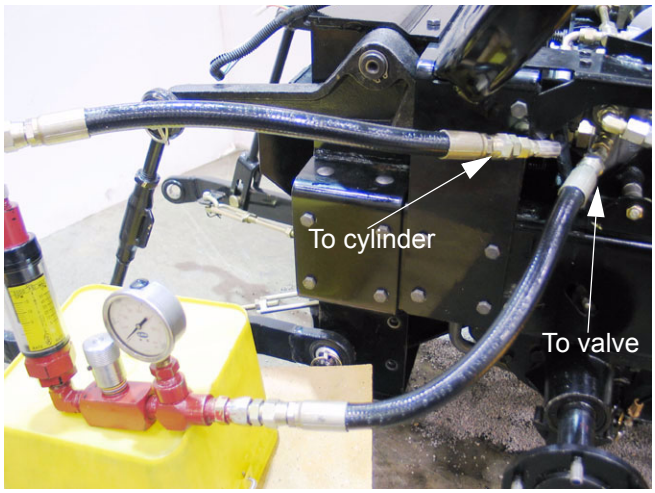

Figure 8.23

8.24. Set the parking brake, place the gear selector in neutral, open the flow valve on the gauge set all the way, and confirm that no unsafe conditions will be created by starting the tractor engine.

8.25. Start the engine, allow it to warm-up. Set the throttle to maintain 3,000 RPM.

8.26. Move the hydraulic lift lever rearward to raise the lift arms.

8.27. As the lift arms travel upward, note the reading on the flow meter. It should be in the vicinity of 5 GPM (19 LPM). See Figure 8.27.

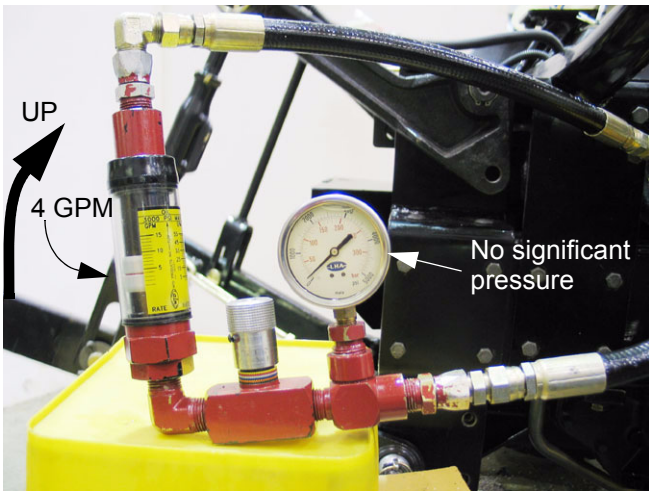

Figure 8.27

8.28. Continue moving the arms up until they reach the top end of their travel. Note the pressure reading. See Figure 8.28.

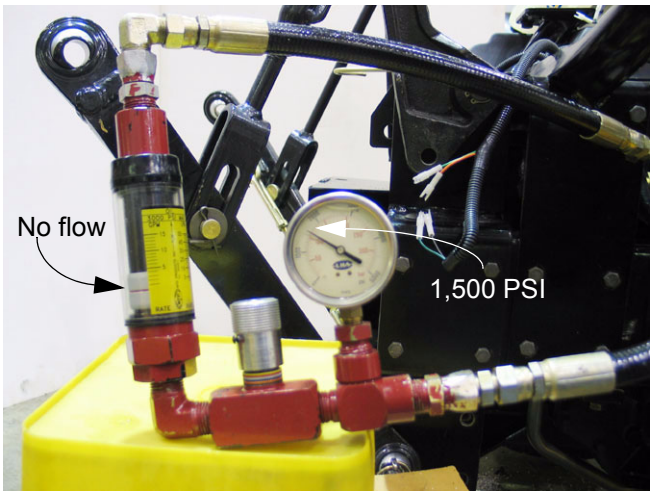

Figure 8.28

- The pressure should approach but not exceed 1,500 PSI (103 Bars).
- The flow will fall to zero as the pressure builds.

8.29. If the pressure delivered to the control valve is low, the auxiliary pump has tested good, and the hydraulic lines show no signs of physical damage or leakage, then the problem lies in the steering unit.

8.30. If the pressure delivered to the control valve is sufficient, but the pressure delivered to the cylinder is low, then the problem is likely to be in the control valve.

8.31. If the pressure delivered to the cylinder is sufficient, yet the cylinder does not perform adequately, look for leakage from the cylinder.

8.32. If the pressures are O.K., no leakage exists, yet the cylinder does not perform adequately, there may be a mechanical bind, or the operator may be overloading the equipment.

9. LOADER VALVE

9.1. The simplest way to check pressure to the attachment is by connecting the test kit to the Quick Disconnect ports. See Figure 9.1.

Figure 9.1

- The hydraulic lines are arranged as follows, from the outboard inward when connected to a front-end loader:

1. Outboard coupling, blue band, boom up.
2. Second coupling in, yellow band, bucket dump.
3. Third coupling in, green band, boom down.
4. Furthest inboard, red band, bucket roll up.

- One female quick disconnect and one male quick disconnect will be required on the test kit.
- Connect to alternating couplers, eg.: 1 & 3 to check boom operation, or 2 & 4 to check bucket operation.

9.2. If the performance problem is isolated to the movement of one set of cylinders (boom or bucket), connect the test kit to the set of couplings that is associated with that movement (1 & 3) or (2 & 4).

9.3. With the test kit installed to test the boom, the kit loops fluid from one boom connector to the other. They hydraulic lines that lead to the cylinders that operate the boom will be left disconnected. For this test, the kit is not connected in-line with the cylinders, and the cylinders will not be in motion during the test.

9.4. After the test kit is connected, confirm that no unsafe conditions will result from starting the engine or operating the hydraulic system.

9.5. Open the flow valve on the test kit completely, then start the engine, and set the throttle to maintain 3,000 RPM.

9.6. With the test kit installed so that the pressure gauge is near the boom-down fitting (green band 3d one in), and the flow meter is near the boom-up fitting (blue band, outboard coupler), pushing the loader valve forward to the detent will generate a reading on the flow meter of about 5.0 GPM (19.0 LPM) when the test kit flow valve is open. Pressure will be zero. See Figure 9.6.

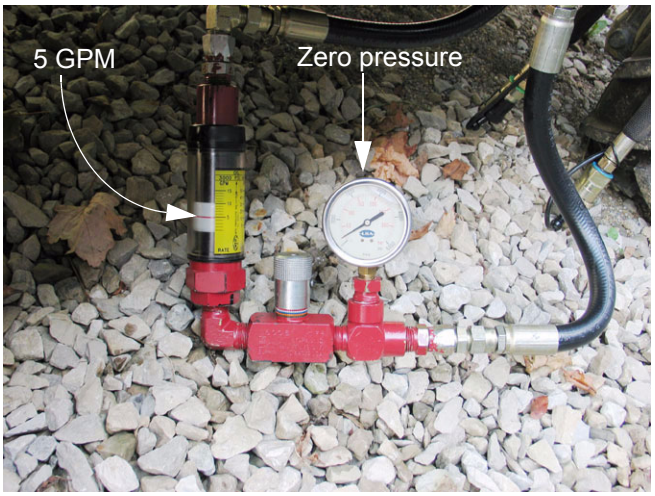

Figure 9.6

NOTE: Pushing the loader valve lever all the way forward, past the detent, will put the valve into “float” mode. This is reflected by a flow meter reading that falls to zero, and a pressure gauge reading falls to zero.

NOTE: Pushing the loader valve lever forward, but not all the way to the detent will produce readings with less flow, but increased pressure.

9.7. Reducing throttle to the 1,200-1,500 RPM range, observe the flow while pushing the loader valve lever forward to the detent. The flow should be around 5.0 GPM (19.0 LPM).

9.8. While holding the loader valve lever forward gains the detent (but not into Float), slowly close the flow valve on the test kit. See Figure 9.8.

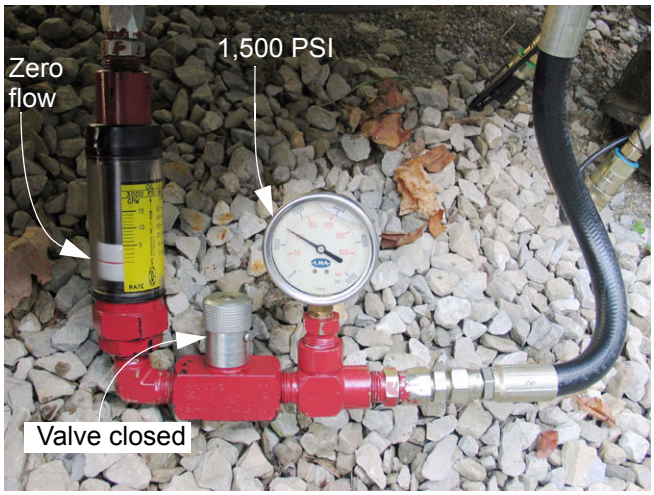

Figure 9.8

NOTE: Because of the relief feature built into the loader valve, as pressure approaches the relief point of 1,500 PSI (103 Bars) more fluid will be diverted to the return manifold. As more fluid is diverted, the flow meter will show progressively lesser readings while the pressure remains constant at 1,500 PSI (103 Bars). If the flow valve on the test kit is closed completely, flow will stop completely.

CAUTION: If pressure rises substantially above 1,500 PSI (103 Bars) discontinue the test immediately. Correct the pressure relief issue before continuing.

9.9. The test described above will check the ability of the hydraulic system to apply downward pressure to the boom. The test can be reversed, to check lifting ability by reversing the connection of the test kit and pulling the loader valve control lever back instead of pushing forward.

9.10. The same procedures will work for testing the controls for the roll operation of the bucket, but the test kit will be connected to couplers 2 and 4 (second one in, red band and far inboard coupler, yellow band).

9.11. If the pressure varies slightly in above or below 1,500 PSI (103 Bars), the relief valve can be adjusted. It is located on the top, outboard corner of the loader valve.

9.12. In order to adjust the relief valve, it is necessary to remove the right side fender cover. See Figure 9.12.

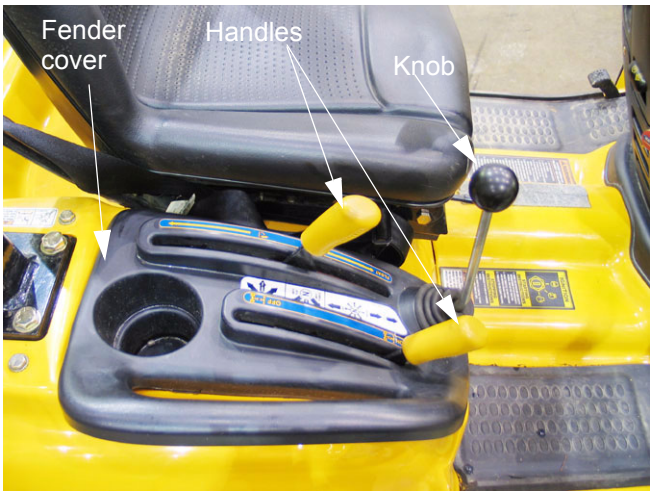

Figure 9.12

9.13. Remove the handles from the hydraulic lift control lever and the high-low range gear selector lever by pulling them off.

9.14. Remove the knob and boot from the loader valve control handle. The knob has normal right-hand threads.

9.15. Remove the fender cover using a T-40 driver from inside the fender. See Figure 9.15.

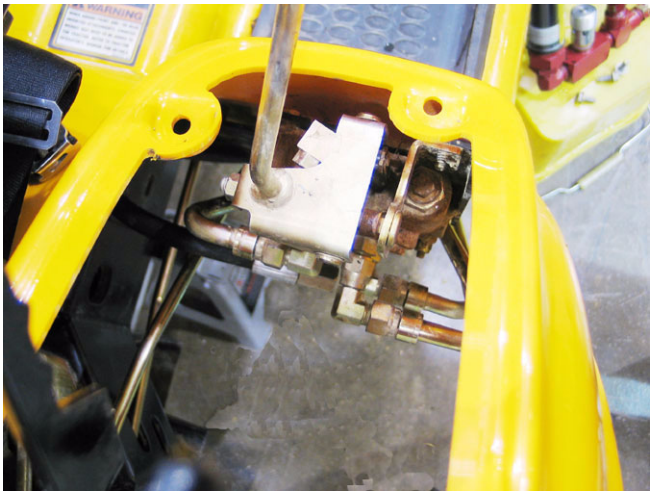

Figure 9.15

9.16. Unbolting the loader valve bracket from the frame of the tractor will provide additional wrench clearance between the pivot bracket and the fender. This can be done with a 1/2" wrench. See Figure 9.16.

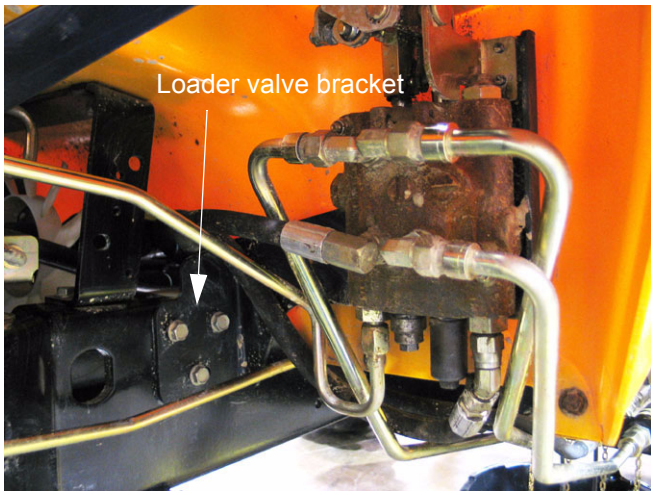

Figure 9.16

9.17. It is necessary to unbolt the pivot bracket assembly from the loader valve in order to get a wrench on the relief valve adjustment screw. The pivot bracket can be unbolted using a 3/8" wrench. See Figure 9.17.

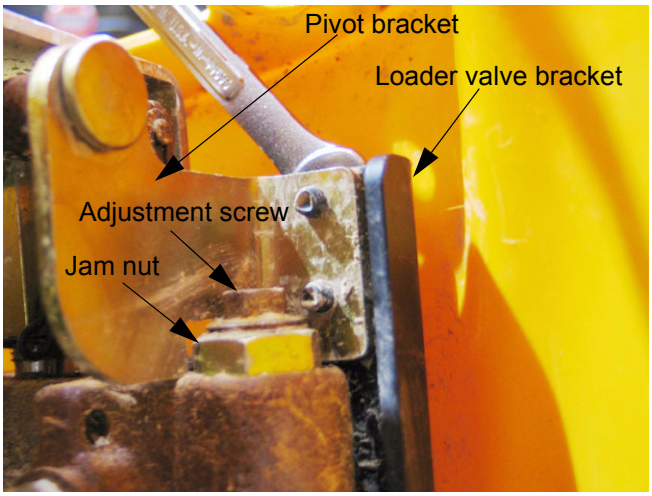

Figure 9.17

9.18. Once access is gained to the adjustment screw, index the screw, jam nut, and housing using a marker.

9.19. Loosen the jam nut using a 7/8" wrench and turn the adjuster screw using a 7/16" wrench. See Figure 9.19.

Figure 9.19

9.20. Make adjustments to the relief valve in single-facet increments:

- Loosen the jam nut.
- Make adjustment: 1/6th turn or less.
- Tighten jam nut.
- Install pivot bracket.
- Test relief valve pressure.
- Repeat as necessary.
- **DO NOT** "crank-up" the pressure beyond 1,500 PSI (103 Bars).
- Install the fenders when adjustment is completed.

9.21. The pressure readings at both sets of ports should respond equally to adjustments made to the relief valve. If there is substantial difference between the pressures found at the two sets of ports, there is an internal problem with the loader valve.

9.22. If the loader valve does not respond to adjustment, or does not perform as described in this section:

- Confirm that the pressure delivered to the loader valve is adequate, and if not, why not. -or-
- Replace the valve.

10. COMPONENT BREAKDOWN: AUXILIARY PUMP

NOTE: The auxiliary pump is to be replaced as a unit if it fails. Disassembling it will **VOID the warranty.** The pump has been disassembled here to illustrate how it works.

NOTE: Individual pump components will not be available through Cub Cadet.

10.1. The gear must be removed from the pump in order to remove the pump from the transmission. See Figure 10.1.

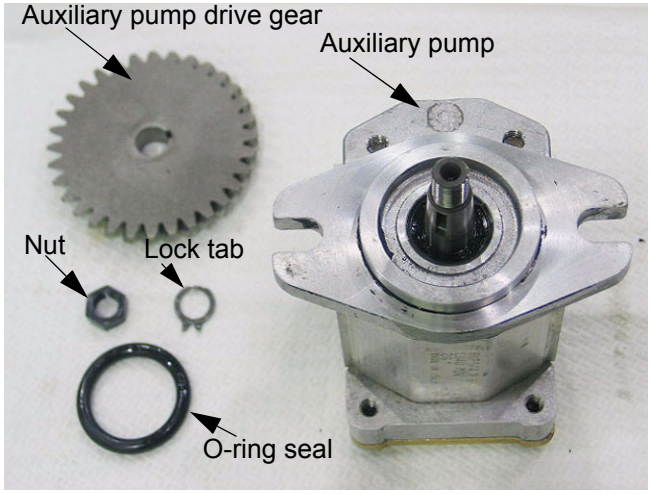

Figure 10.1

- The gear is a taper-fit to the pump shaft, and it is keyed to the shaft.
- The lock tab, key, and nut are included with the pump.
- The nut and shaft have a non-standard metric thread. They will not be commonly available.
- An O-ring seal and Ultra-black sealant are used to seal the pump to the front of the transmission.

10.2. The back cover can be removed from the pump by removing the four socket head cap screws. See Figure 10.2.

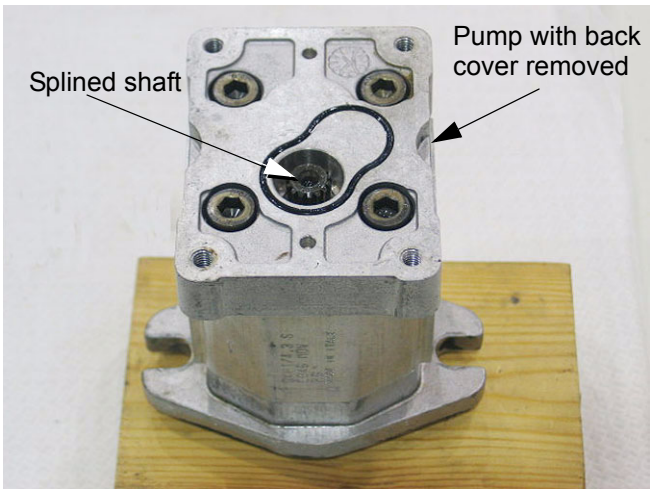

Figure 10.2

10.3. Removing the rear cover reveals an O-ring seal, the splined shaft that transmits power to the tandem pump (when fitted), and four more socket head cap screws.

10.4. The second set of socket head cap screws holds the two housing ends to the body of the pump. See Figure 10.4.

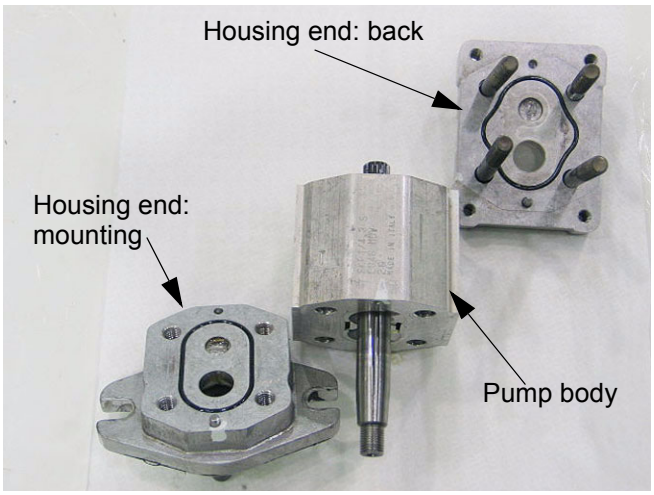

Figure 10.4

10.5. Both ends of the pump have O-ring type seals where they meet the pump body.

10.6. The body contains a simple gear pump.

10.7. There is a cartridge that slides into the pump body. See Figure 10.7.

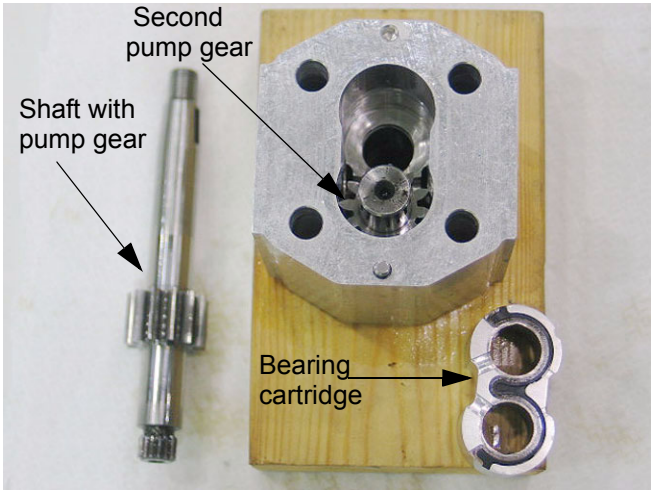

Figure 10.7

- The gears operate within, and are located by the cartridge.
- The cartridge end is partially sealed. Lubrication channels direct a metered amount of pressurized oil to the bearings and thrust surfaces.

11. COMPONENT BREAKDOWN: STEERING UNIT

NOTE: The steering unit is to be replaced as a unit if it fails. Disassembling it will **VOID the warranty.** The steering unit has been disassembled here to illustrate how it works.

NOTE: Individual components of the steering unit are not available through Cub Cadet.

11.1. The fittings on the end of the steering unit extend through the first two sections of the body, into the third and largest section. They hold all three sections of the steering unit body together. See Figure 11.1.

Figure 11.1

- O-rings seal the lines to the steering unit.
- O-rings also seal the fittings to the end of the steering unit.
- There are two sizes of fitting: 9/16”-18 and 11/16”-16
- If a 9/16”-18 fitting should come loose, tighten it to a torque of 25 in-lbs. (221 Nm).
- If an 11/16”-16 fitting should come loose, tighten it to a torque of 27 in-lbs (239 Nm).

11.2. With the fittings removed, the three sections of the steering unit can be separated. See Figure 11.2.

Figure 11.2

11.3. The first two sections comprise a gerotor pump and end plate to pressures the system using steering wheel motion. See Figure 11.3.

Figure 11.3

11.4. The cardan shaft transfers motion from the steering wheel, through the body of the steering unit, to the pump. See Figure 11.4.

Figure 11.4

11.5. The relief valve ball and retainer live in one of the fitting bores. Carefully extract them with a magnet while the steering unit is in the upright position. See Figure 11.5.

Figure 11.5

11.6. The spool and sleeve can be easily tapped-out of the housing. A thrust bearing assembly fits between the spool and sleeve assembly and the housing. See Figure 11.6.

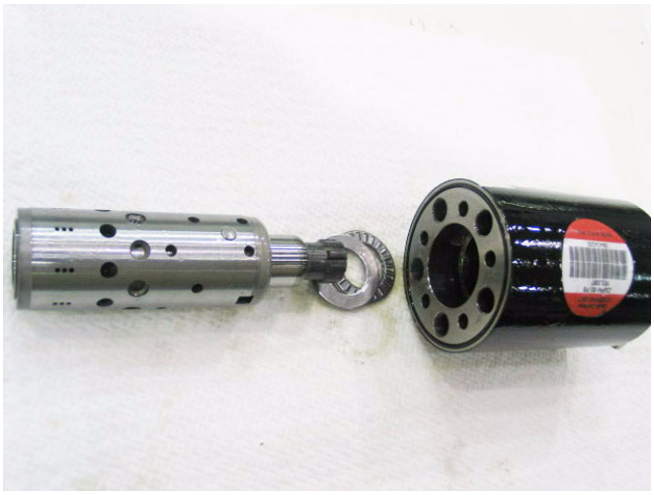

Figure 11.6

11.7. A circular retainer holds the leaf springs in place. See Figure 11.7.

Figure 11.7

- The leaf springs transmit steering force from the sleeve to the spool.
- The effort it takes to deflect the leaf springs determines the amount of force that must be applied to the steering wheel before hydraulic force is applied to the steering.

11.8. A dowel pin connects the spool and sleeve axially, and transmits steering force to the sleeve from the cardan shaft. See Figure 11.8.

Figure 11.8

11.9. Removing the dowel pin allows the spool to separate from the sleeve. See Figure 11.9.

Figure 11.9

11.10. There are two types of leaf spring: flat and bowed. A pair of each goes together, back-to-back. See Figure 11.10.

Figure 11.10

Domestic Series 5000 MFD

ABOUT THIS SECTION:

The Cub Cadet Series 5000 MFD (Mechanical Front Drive) axle is visually similar to the MFDs used in the Series 7000 Tractor. The MFDs used in the Series 5000 are functionally different from those used in the Domestic Series 7000, and cannot be inter-changed. The first part of this section describes the characteristics that will enable a technician to identify the three different units.

Early (2002 and 2003) production of the domestic Series 7000 four wheel drive tractors used an MFD (Mechanical Front Drive) sourced from another manufacturer. Beginning with serial number 1B014G20001 (February 1st, 2004) domestic Series 7000 tractors were built using an MFD assembled in Cub Cadet's transmission plant in Leitchfield, KY.

Removal and replacement procedures for the MFDs in the two tractors are not substantially different from one-another. **Service Policy** on the Cub Cadet produced MFDs will be to establish a pool of rotable exchange units that can be ordered by dealers to replace damaged MFDs. This applies to the Cub Cadet produced MFDs only, NOT to the outsourced MFDs that were used in some early production domestic Series 7000 tractors.

For tractors with warrantable repairs required to a Cub Cadet built MFD:

- The complete assembly is to be removed and replaced.
- The core shall be returned to Cub Cadet for rebuilding. It is not to be disassembled in any way.
- The determination as to whether a new or factory rebuilt MFD is to be installed under warranty will be made on a case-by-case basis.
- Outside of warranty, the dealer is free to repair a worn or damaged MFD, replace a worn or damaged MFD with a factory rebuilt unit, or to replace a worn or damaged MFD with a new one.

1. TO IDENTIFY THEM MFD:

1.1. The Cub Cadet built MFD for the Series 5000 is 618-04028. The out-sourced Series 7000 MFD is part number 618-3207. The Cub Cadet built MFD for the Domestic Series 7000 is 618-0484.

1.2. The out-source MFD has numbers embossed on most major components, the Cub Cadet Unit does not. See Figure 1.2.

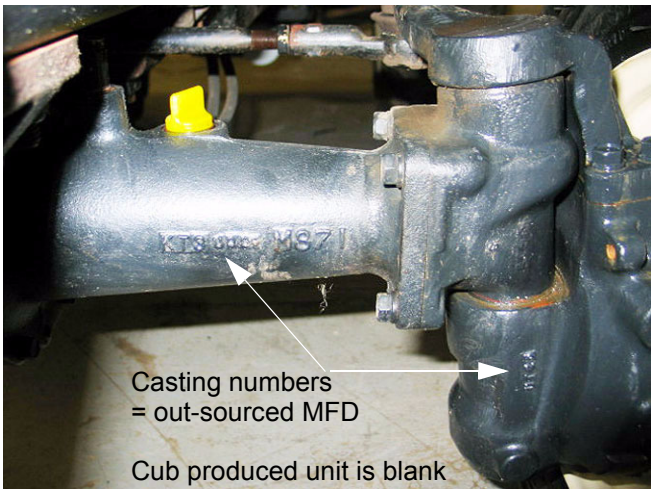

Figure 1.2

1.3. The Octagonal "pumpkin" is roughly 2" wide on the out-sourced MFD. It is roughly 4" wide on the Cub Cadet MFD. See Figure 1.3.

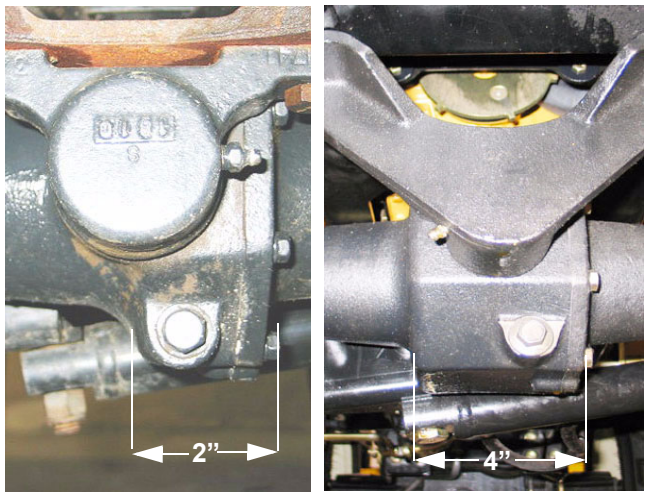

Figure 1.3

Domestic Series 5000 MFD

1.4. The MFD manufactured by Cub Cadet is mounted to two one-piece brackets. See Figure 1.4.

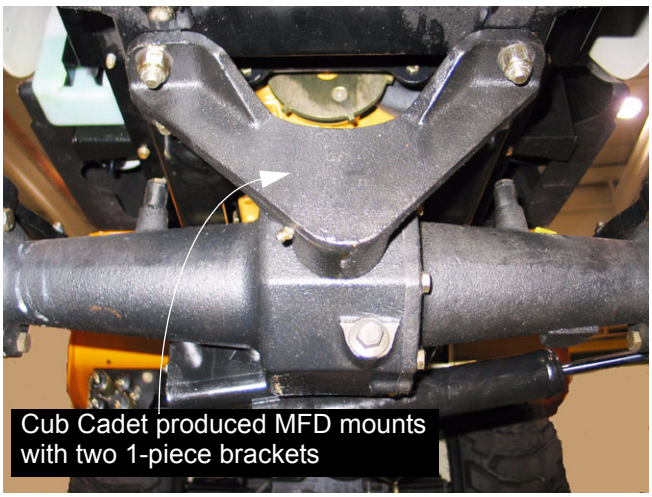

Figure 1.4

1.5. The out sourced MFD is mounted to a pair of two-piece brackets. See Figure 1.5.

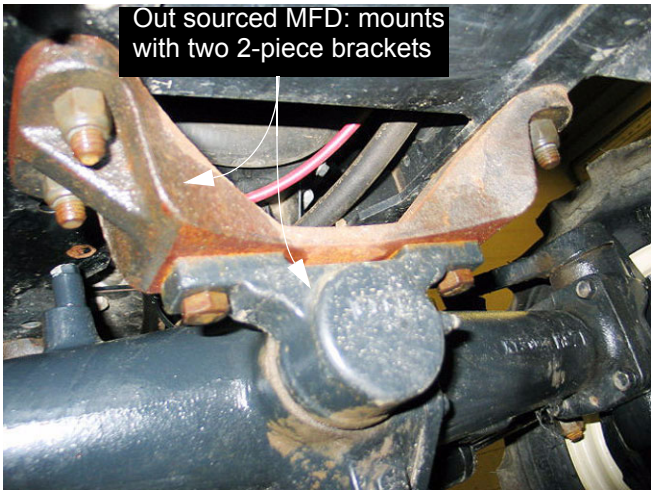

Figure 1.5

1.6. The Cub Cadet Series 5000 MFD (618-0428) uses many of the same castings as the Cub Cadet Series 7000 MFD (618-0484). The Series 5000 has a different ring and pinion gear orientation and the out-put to the wheels is in the opposite direction.

1.7. To visually distinguish the Series 5000 MFD from the Series 7000 MFD: the Series 5000 unit has four tapped holes or wheel studs on the axle flanges, while the Series 7000 has five tapped bolt holes on the axle flanges.

1.8. The Series 5000 MFD is wider than the Series 7000 MFD. The outside edge (measured at the top) of the axle flanges on the 5000 are 3 1/2” (8.9 cm) outboard of the seam where the axle cover meets the drop axle housing. See Figure 1.8.

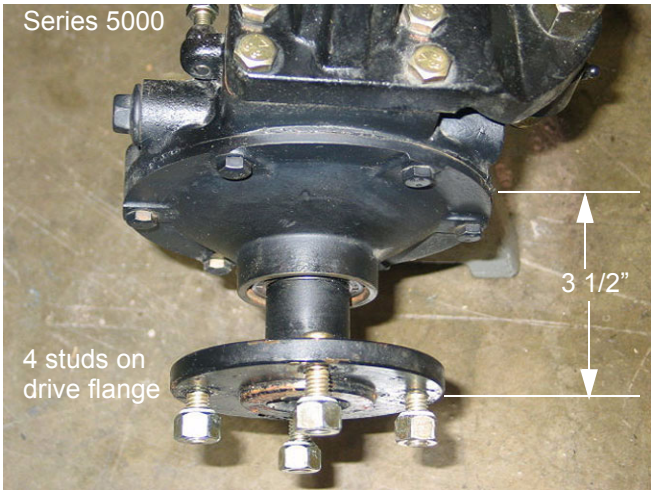

Figure 1.8

1.9. While the main castings are the same, the outside edge (measured at the top) of the axle flanges on the 7000 are 2” (5 cm) outboard of the seam where the axle cover meets the drop axle housing See Figure 1.9.

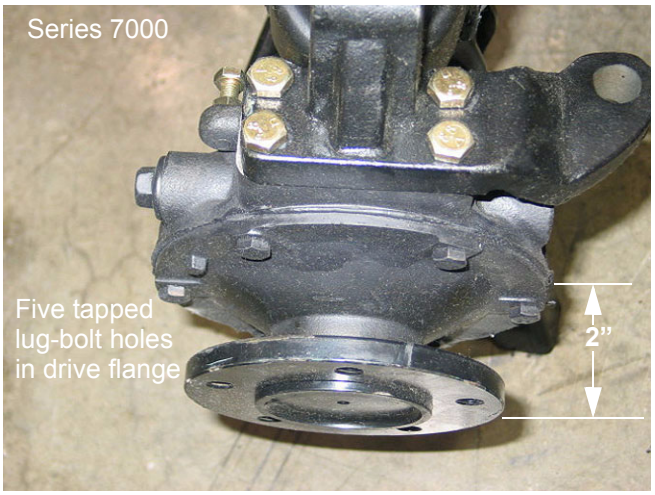

Figure 1.9

1.10. The difference in widths is accounted for by the fact that axle flanges protrude visibly further out of the housing on the 618-0428 (5000 MFD) than they do on the 618-0484 (7000 MFD).

1.11. To mechanically distinguish between a Series 7000 MFD and a Series 5000 MFD, rotate the input (pinion) shaft. Clockwise rotation (looking at the end of the pinion shaft) will result in forward tractor motion on the Series 7000 (618-0484 or 618-3207). Clockwise rotation will result in reverse tractor motion on the Series 5000 (618-0428).

Tractor	7000 Cub	7000 Outsourced	5000 Cub
Part #	618-0484	618-3207	618-0428
Input	Clockwise	Clockwise	C.C.W.
Axle	Stubby	Stubby	Extended
Mounting	1 piece	2 piece	1 piece
Wheel	5 bolt	5 bolt	4 stud

2. MFD REMOVAL: PREPARATION

NOTE: This procedure can be done on tractors that are equipped with cutting decks, front-end loaders, and other attachments. It is not necessary to remove the attachments in order to remove and replace the MFD.

2.1. Park the tractor on a firm level surface. Lower any attachments to the ground.

2.2. Place a drain pan under each final drive housing. Remove the drain plugs using an 11 mm wrench. Remove the fill plugs using a 16 mm wrench. See Figure 2.2.

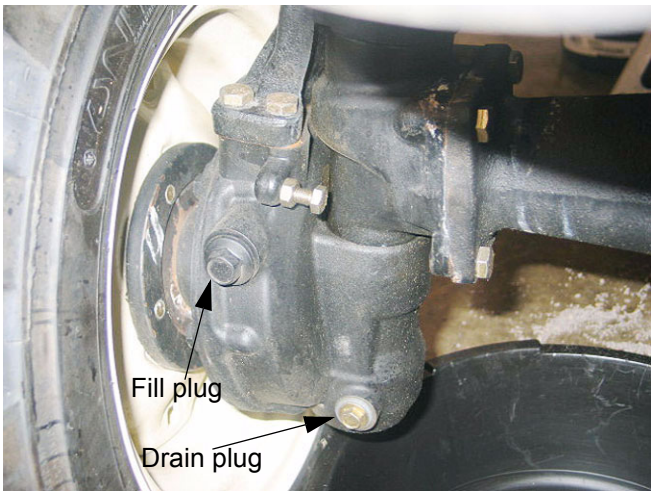

Figure 2.2

2.3. Place a drain pan under the differential housing, and remove the drain plug using a 16 mm wrench. Remove the oil level gauge to allow faster draining. See Figure 2.3.

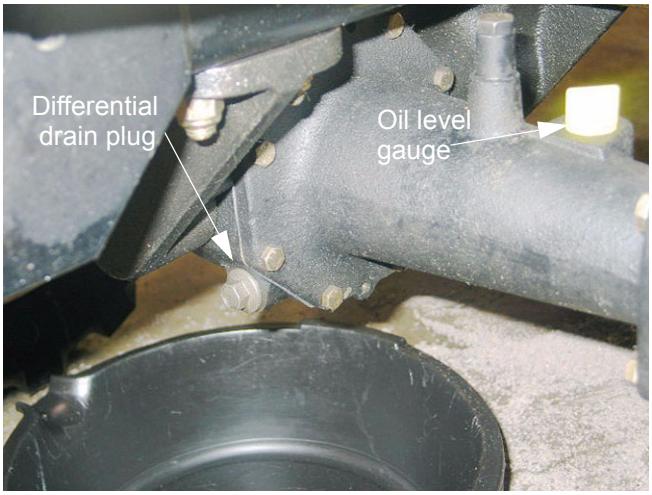

Figure 2.3

3. REMOVAL

3.1. Loosen the set screw that secures the back end of the 4 W.D. drive shaft to the splined output shaft on the front of the transmission. See Figure 3.1.

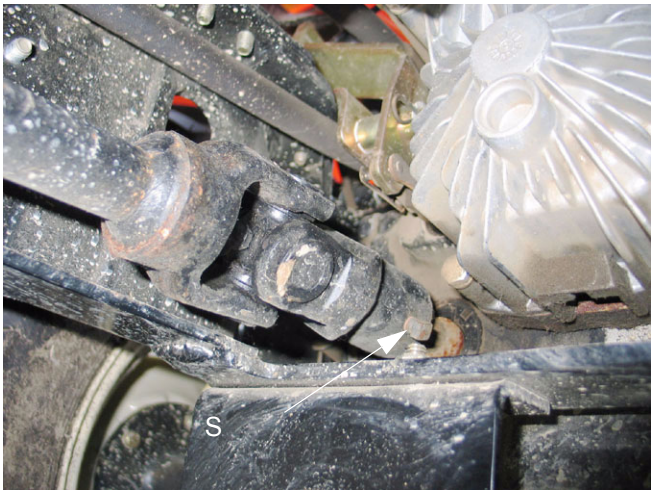

Figure 3.1

3.2. Slip the 4 W.D. drive shaft back to disengage it from the MFD.

3.3. If the tractor is equipped with a cutting-deck, loosen the two nuts on the front of the “U” bar using a 3/4” wrench. Remove the “U” bar.

3.4. Remove the nut that secures the ram of the steering cylinder to the steering cylinder mounting stud using a 24 mm wrench. See Figure 3.4.

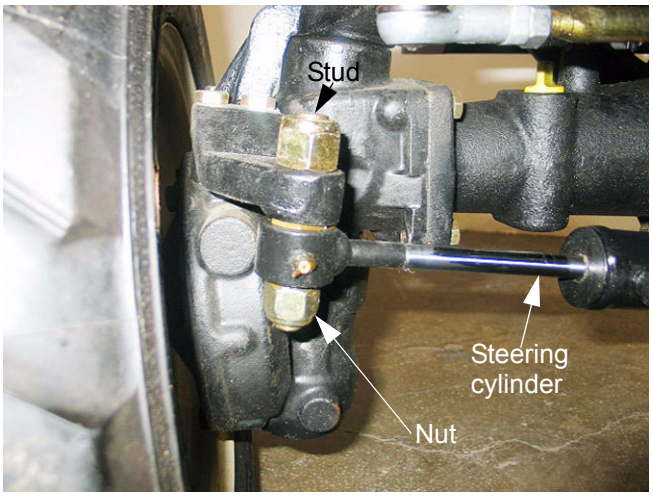

Figure 3.4

3.5. Remove the four bolts holding the steering cylinder bracket to the MFD housing using a 19 mm wrench. See Figure 3.5.

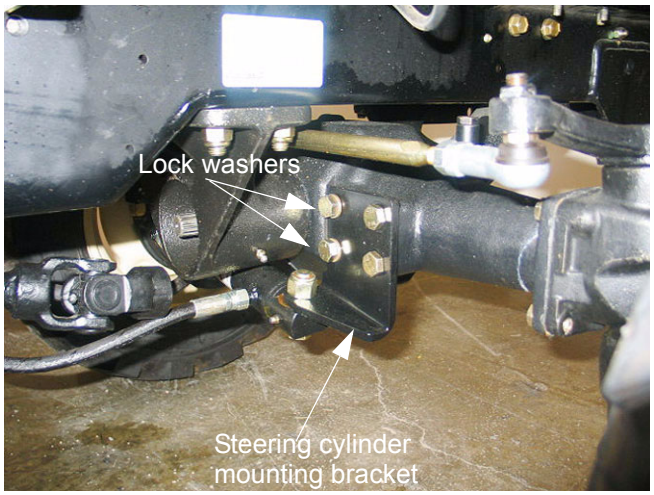

Figure 3.5

NOTE: Only the inner two bolts (closer to the axle mounting bracket) have lock washers.

3.6. Lower the steering cylinder carefully off of the mounting stud, and position it safely out of the way. See Figure 3.6.

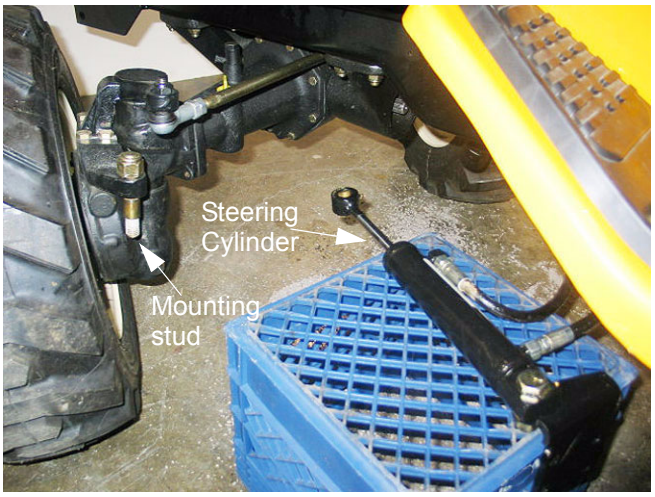

Figure 3.6

NOTE: Do not allow the steering cylinder to hang on the hydraulic hoses.

3.7. Remove the steering cylinder mounting stud using a 1” wrench and a 1 1/16” wrench.

3.8. Lift and support the front of the tractor by the differential housing. Leave the hydraulic jack in place. See Figure 3.8.

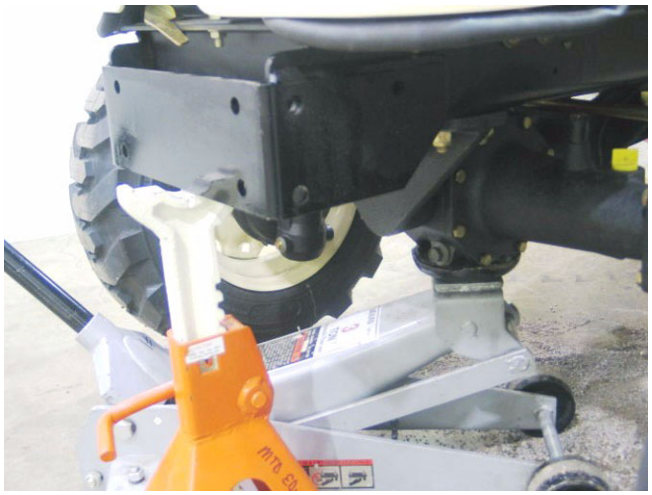

Figure 3.8

NOTE: If the MFD is being replaced because the housing is broken, an alternative jacking point may need to be identified by the technician.

3.9. Support the front cross-member of the tractor frame on one or two jackstands.

3.10. Remove the front wheels using a 19 mm wrench.

3.11. Remove the battery:

- Remove the wing-nuts and hold down bar that secure the battery.
- Disconnect the negative terminal using a 3/8" wrench.
- Disconnect the positive terminal using a 3/8" wrench.
- Carefully lift the battery out of the tractor.

NOTE: Removing the battery yields access to two of the bolts that hold the front MFD bracket.

3.12. Remove the four nuts that secure the front axle bracket to the frame using a pair of 3/4" wrenches. See Figure 3.12.

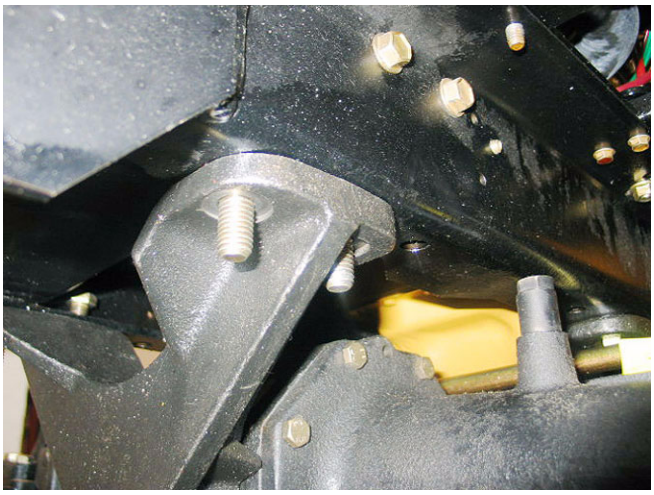

Figure 3.12

3.13. Remove the four nuts that secure the rear axle bracket (of the front axle) to the frame using a pair of 3/4" wrenches. See Figure 3.13.

Figure 3.13

3.14. Lower the MFD to the ground.

3.15. Remove the axle brackets from the MFD, for transfer to the replacement MFD. See Figure 3.15.

Figure 3.15

4. MFD INSTALLATION

4.1. Lubricate the pivot bosses on the new MFD with a good all-purpose grease.

4.2. Confirm that the thrust washers are in place in both front axle brackets. See Figure 4.2.

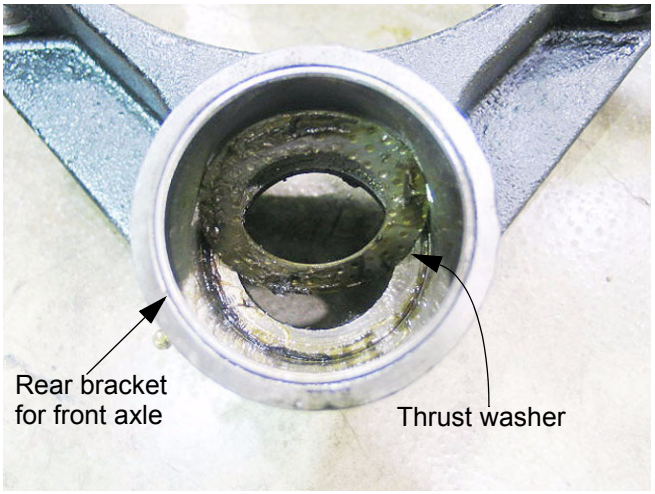

Figure 4.2

NOTE: The flat side of the thrust washers goes into the brackets first, so that the dimpled side faces the pivot boss on the MFD.

4.3. Position the front axle brackets on the replacement MFD.

NOTE: Tie-down straps or heavy cable ties will help hold them in place temporarily.

4.4. Lift the replacement MFD into position. See Figure 4.4.

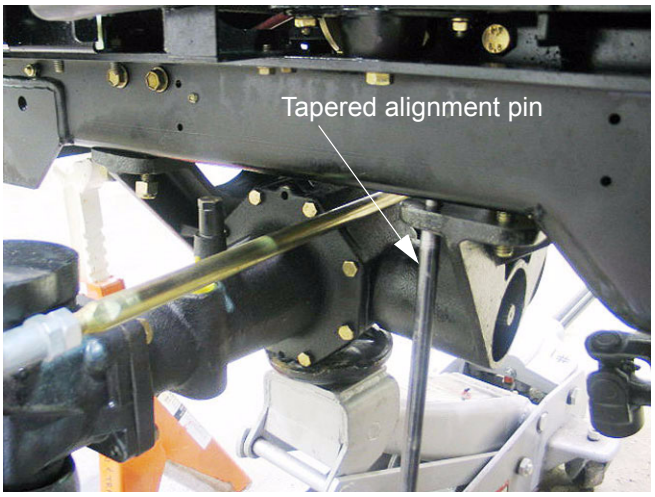

Figure 4.4

NOTE: A tapered pin can be used to help align the brackets with the bolt holes.

4.5. Install the nuts that secure the axle brackets. tighten them to a torque of 75 ft.-lbs. (100 Nm). If the nylon locking ring has worn, replace the nut with a new one, or apply a small amount of thread locking compound such as loctite 242 (blue) to the threads on assembly.

4.6. Install the front wheels.

4.7. Lower the tractor to the ground, and tighten the lugs to a torque of 55 ft.-lbs. (63 Nm). Re-torque the wheels after 10 hours of operation.

4.8. Remove the fill plugs from the final drive housings. Fill each housing to the bottom of the fill plug hole with Cub Cadet 85W140 Gear Lube (P/N: 737-3065 for 1 qt.). Install the fill plugs.

4.9. Remove the oil level gauge from the main housing, and install sufficient Cub Cadet Gear Lube to reach the “FULL”, mark on the oil level gauge.

NOTE: Total lube capacity of the MFD is approximately 82 fl. oz. (2.5 qts.) or (2.37 liters).

4.10. Install the steering cylinder stud in the replacement MFD steering knuckle. Tighten the nut to at torque of 100 ft.-lbs. (136 Nm).

4.11. Install the steering cylinder:

- Lubricate the shoulder of the steering cylinder stud with grease.
- Apply a small amount of thread locking compound such as loctite 242 (blue) to the threads of the four bolts that secure the steering cylinder bracket to the MFD.
- Lift the steering cylinder into position, with the eyelet of the ram seated over the stud.
- Install the four bolts that secure the steering cylinder bracket. Tighten them to a torque of 75 ft.-lbs (100 Nm). The lock washers go on the inboard bolts.
- Install the nut that secures the steering cylinder ram to the stud. Tighten the nut to a torque of 150 ft.-lbs. (200 Nm).

4.12. Connect the 4 W.D. driveshaft: See Figure 4.12.

- Apply a small amount of anti-seize to the splines of the MFD pinion shaft.
- Install the 4 W.D. driveshaft on the pinion shaft of the MFD.
- Position it so that the end of the pinion shaft is even with the rear edge of the front U-joint yoke.
- Tighten the set screw on the rear U-joint to secure the 4 W.D. drive shaft.

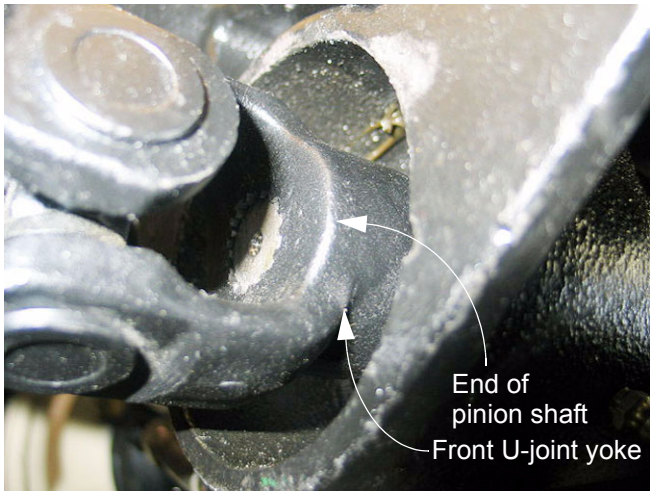

Figure 4.12

5. IN-FRAME REPAIRS: DROP AXLE SERVICE

NOTE: Within the warranty period of the domestic Series 7000 tractor, repairs to the MFD will be accomplished by replacement of the complete assembly. Refer to the **Service Policy** portion of the MFD section of this manual.

NOTE: Repairs to the **drop-axle assembly** are most easily performed without removing the MFD from the tractor.

5.1. Lift and safely support the side that is to be serviced. See Figure 5.1.

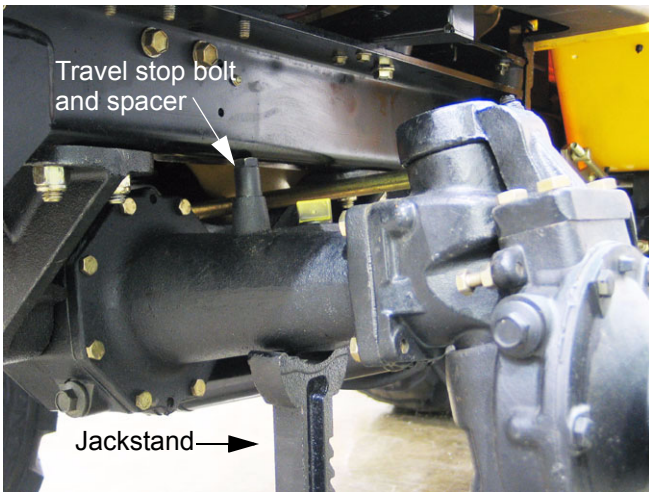

Figure 5.1

NOTE: By lifting the side of the axle to be serviced as far as it can go before the stop hits the frame, the gear lube in the center section will move to the lower side. This will allow the drop axle assembly to be removed with minimal loss of gear lube, without draining the main housing.

5.2. Remove the wheel using a 19 mm wrench.

5.3. Clean the area surrounding the drop axle assembly, and drain the gear lube from it.

- Place a clean catch pan under the drop axle assembly.
- Remove the drain plug using an 11mm wrench.
- Remove the fill plug using a 16 mm wrench.

NOTE: The steps above are preliminary to any in-frame drop axle service. Specific procedures are outlined in the following sections; In-frame repairs: drop axle cover, In-frame repairs: drop axle cover, In-frame repairs: drop axle removal. Bench repairs: kingpin and drop axle housings.

6. IN FRAME REPAIRS: DROP AXLE COVER

6.1. If there is an obvious problem within the drop axle housing, or for purposes of inspection, the axle cover is easily removed.

6.2. Remove the axle cover bolts using a 13 mm wrench. See Figure 6.2.

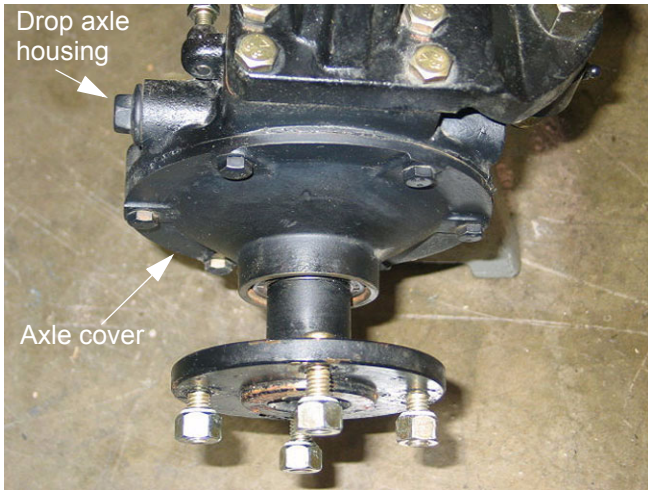

Figure 6.2

6.3. From this point, the contents of the drop axle housing are visible. See Figure 6.3.

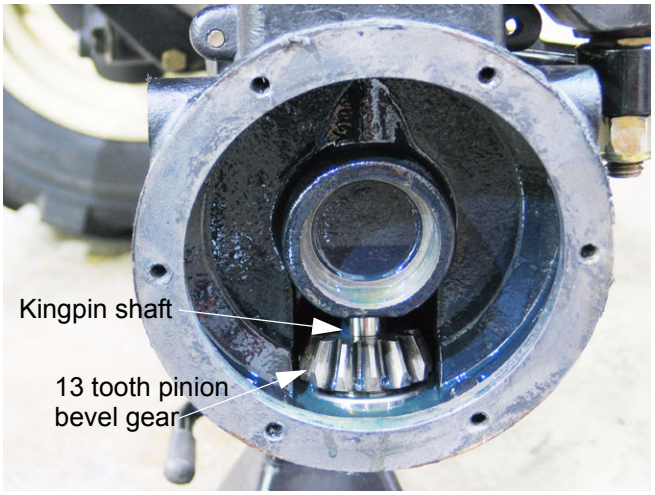

Figure 6.3

6.4. The axle cover assembly may be serviced on the bench.

6.5. The inner axle bearing is a slip fit on the axle. It can be removed with light pressure on the bearing, or (preferably) by lifting the axle bevel gear. See Figure 6.5.

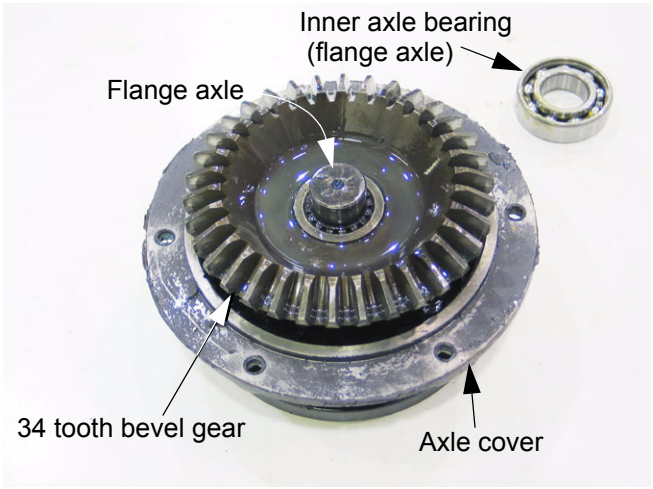

Figure 6.5

6.6. Lift the gear off of the splined portion of the flange axle to gain access to the retaining ring that secures the flange axle and the outer axle bearing to the axle cover. See Figure 6.6.

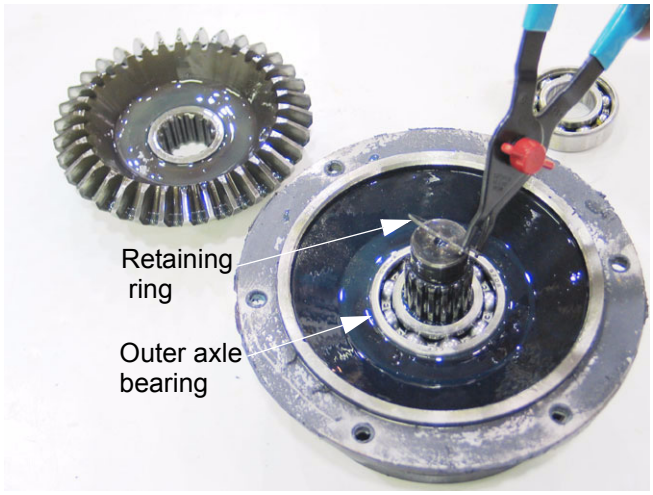

Figure 6.6

6.7. The axle should push out of the bearing and cover with light pressure.

6.8. After the axle is separated from the bearing and cover, the bearing, and the seal that protects it may be easily removed from the cover. See Figure 6.8.

Figure 6.8

6.9. Clean and inspect all of the components and sealing surfaces on mating components:

- Bearings should turn smoothly and freely.
- The splines, wheel mounting flange, bearing journals, lug threads, splines and seal surface of the axle should all be in good condition.
- Check the axle cover for damage.

6.10. To reassemble the axle cover: See Figure 6.10.

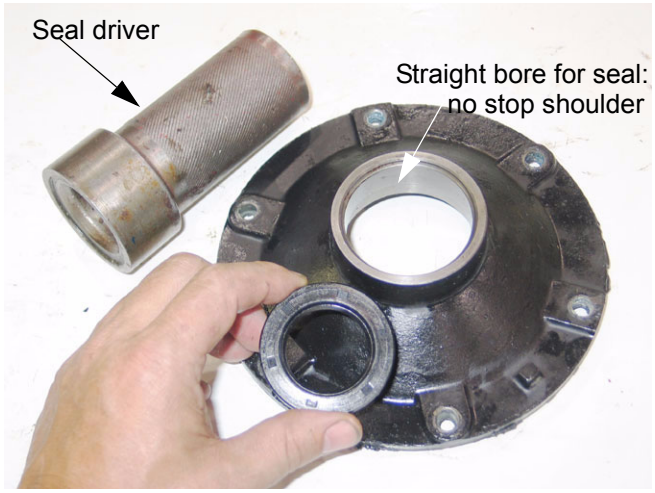

Figure 6.10

- Use a seal driver to install a new seal in the cover. There is no shoulder for the seal to seat against, so it must be driven far enough that the outer edge of the seal is flush with the outer edge of the machined bore that the seal seats in.
- Lubricate the lip of the seal.
- Assemble the axle, bearings, and axle bevel gear to the axle cover. Be certain that the retaining ring is properly seated in its groove on reassembly.

6.11. On installation to the drop axle housing:

- Apply a small bead of sealant such as Black Loctite # 5900 to the mating surfaces.
- Apply a small amount of thread locking compound such as Loctite 242 (blue) to the threads of the bolts that secure the axle cover.
- Install the cover to the drop axle housing, and tighten the bolts to torque of 160-220 in-lbs. (18-25 Nm). There is an embossed square on the cover, but there is no need to orient it in any specific location.
- Refill the drop axle housing with 85W140 gear lube.

7. IN-FRAME REPAIRS: DROP-AXLE REMOVAL

7.1. The drop axle assembly can also be removed complete.

7.2. If working on the left side drop axle, disconnect the cylinder mounting stud from the steering arm using a 24 mm wrench to hold the bottom nut and a 1 1/16” wrench to turn the top nut.

7.3. Remove the nut from the tie rod end, using a 19 mm wrench for the nut and a 17 mm wrench to hold the stud. See Figure 7.3.

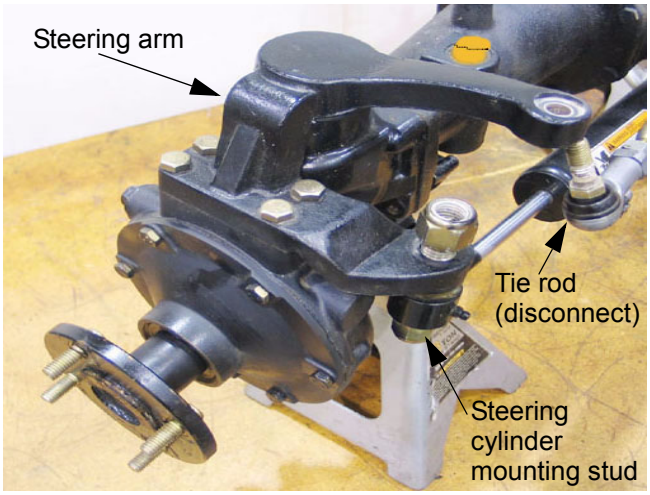

Figure 7.3

7.4. Support the drop axle housing, and remove the four bolts that hold the steering arm to the king pin housing using a 17 mm wrench.
See Figure 7.4.

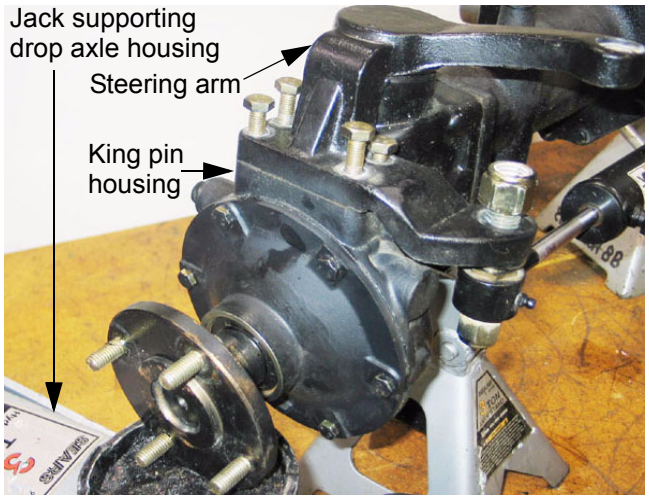

Figure 7.4

7.5. Lift the steering arm off of the kingpin housing and the stud for the steering cylinder.
See Figure 7.5.

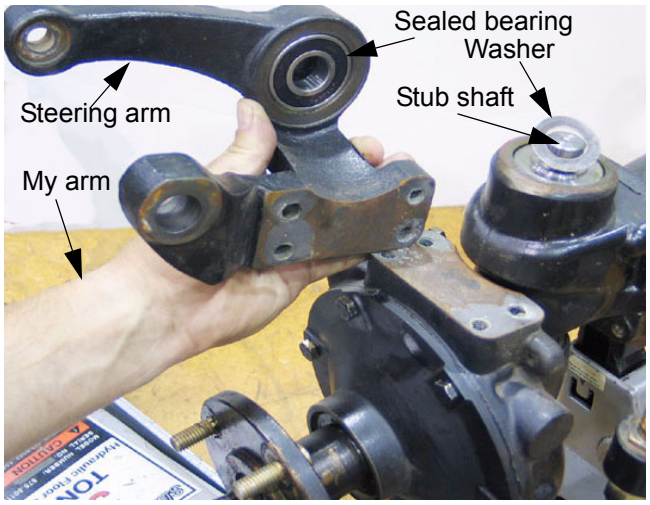

Figure 7.5

7.6. At this point, the most common service procedure will be to remove the kingpin housing and drop axle housing as a unit.

7.7. If there is obvious damage that is isolated to the drop axle housing, it is possible to separate the two at this point without removing the kingpin housing.

7.8. Grip the stub shaft and pull it out of the kingpin housing. It is retained by the friction of a rubber o-ring that also serves as a seal.
See Figure 7.8.

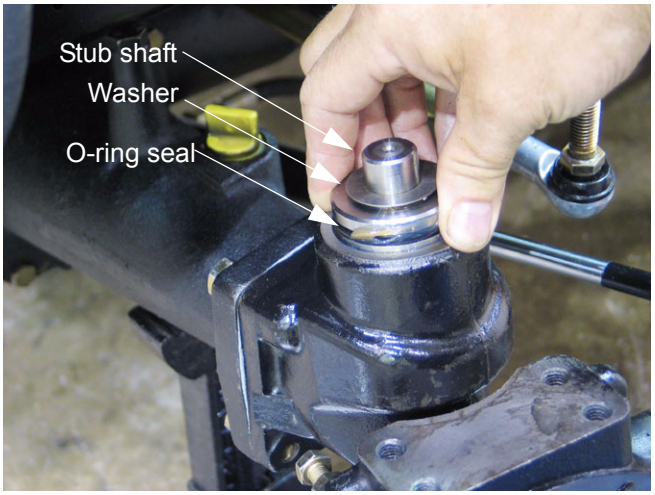

Figure 7.8

7.9. The drop axle housing can then be pushed down off of the kingpin housing with some twisting and light force. See Figure 7.9.

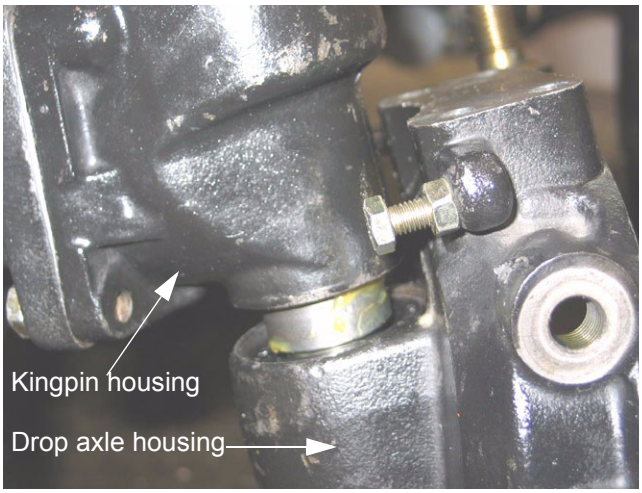

Figure 7.9

7.10. Most service that requires the removal of the drop axle housing is most easily performed by removing the drop axle housing along with the kingpin housing.

7.11. To separate the kingpin housing from the axle housing, loosen all four bolts that secure the two together using a 16 mm wrench. See Figure 7.11.

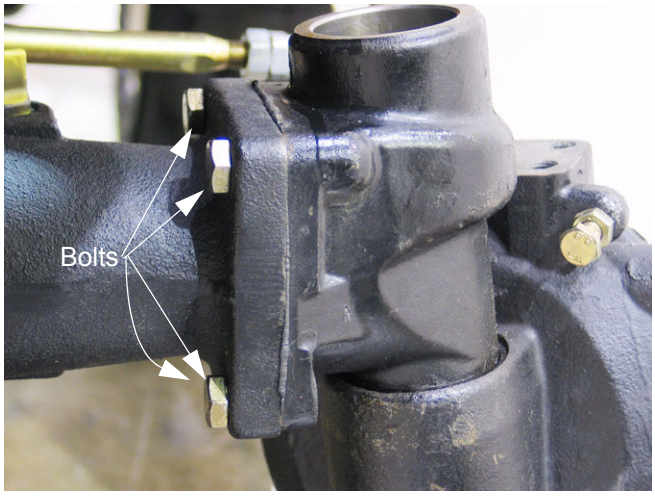

Figure 7.11

NOTE: It may be useful to use the head of a loosened bolt to pry or drive against to loosen the sealant between the two castings.

7.12. Support the drop axle housing, and separate it from the axle housing. See Figure 7.12.

Figure 7.12

7.13. With the kingpin housing removed, access is gained to the bevel gear on the end of the axle shaft, and the bearing that supports the outer end of the axle shaft. See Figure 7.13.

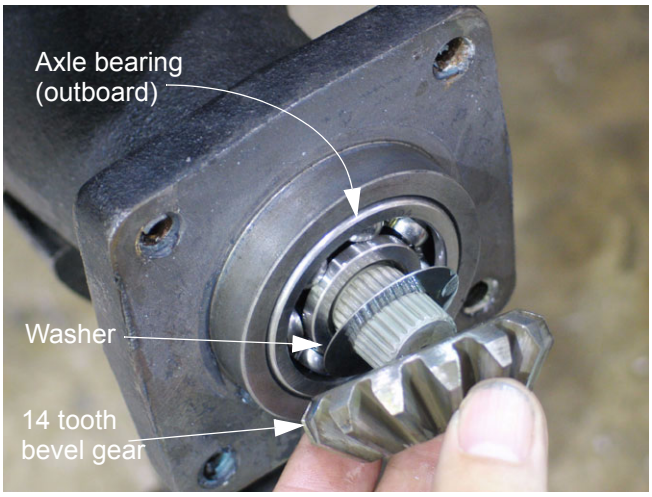

Figure 7.13

7.14. The gear and bearing are easily removed.

7.15. To remove the bearing it may help to slide the axle shaft out roughly 1/4" (6mm). Once sufficient grip is available to withdraw the bearing, push the axle back into place.

NOTE: If the axle shaft is pulled-out too far, the shims that are used to set ring gear component of the differential back-lash may fall out of place. If this happens, the axle housing must be removed from the tractor and separated to repositions the shims.

8. BENCH REPAIRS: DROP AXLE AND KINGPIN HOUSING ASSEMBLIES

8.1. Once on the bench, the drop axle housing and the kingpin housing are easily separated from each other by twisting and pulling.

8.2. To remove the kingpin shaft, bearing, and gear from the kingpin housing, fixture it in a soft-jaw vise.

8.3. Carefully drive the kingpin shaft out the bottom of the kingpin housing. See Figure 8.3.

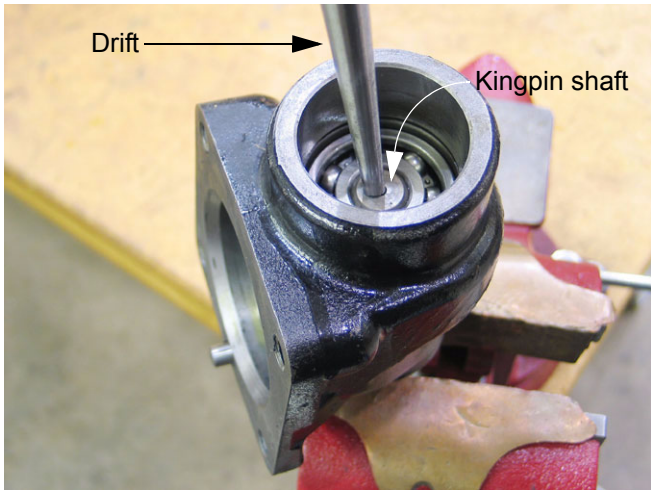

Figure 8.3

NOTE: There is a snap ring in the bore of the kingpin housing that provides a stop for the bottom of the stub shaft, and locates the top of the bearing. Ensure that it is securely in place when reassembling the kingpin housing.

8.4. With the kingpin shaft removed, the 14 tooth bevel gear can be removed. See Figure 8.4.

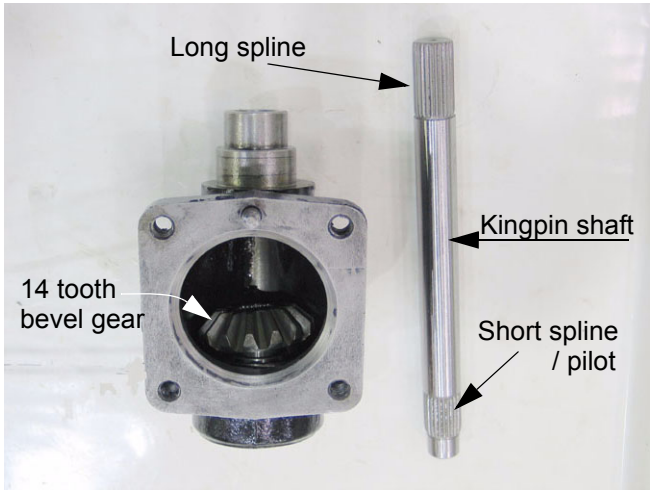

Figure 8.4

8.5. The bearing that supports the top of the kingpin shaft can also be pushed out of the kingpin housing with light pressure. See Figure 8.5.

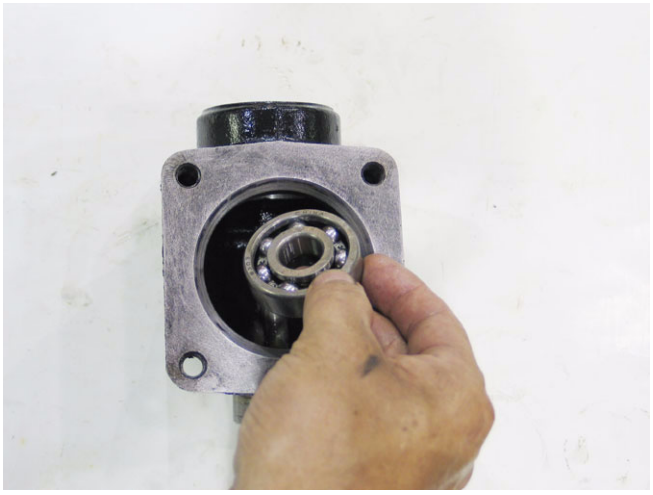

Figure 8.5

8.6. To disassemble the drop axle housing, fixture it in a soft-jaw vise.

8.7. Remove the axle cover using a 13mm wrench.

8.8. There are two seals to be removed from the top bore of the drop axle housing. See Figure 8.8.

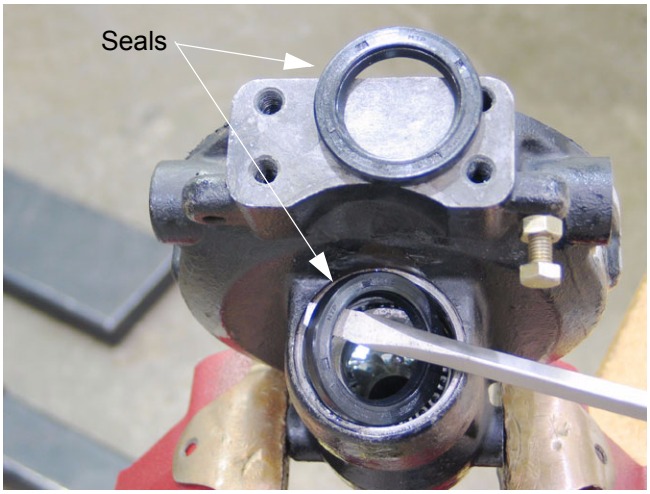

Figure 8.8

NOTE: The lips of both seals face inward.

8.9. After the seals are removed, the tapered roller bearing can be lifted out. See Figure 8.9.

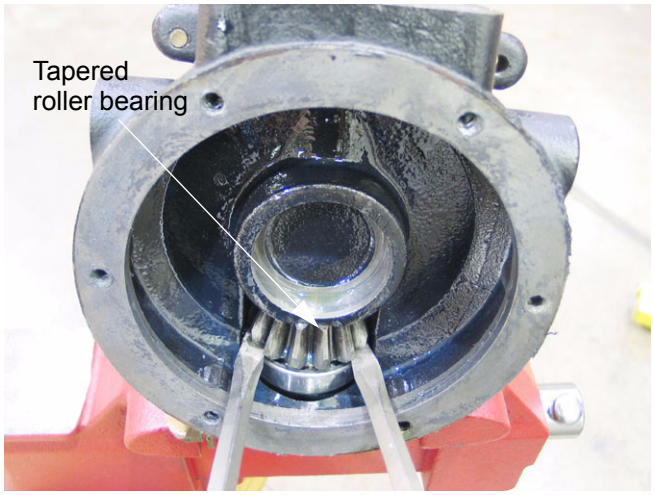

Figure 8.9

8.10. The 13 tooth bevel gear that is driven by the bottom of the kingpin shaft, and the bearing that supports the gear are in the bottom of the drop axle housing.

8.11. Carefully pry the gear and bearing out of the bore at the base of the drop axle housing. See Figure 8.11.

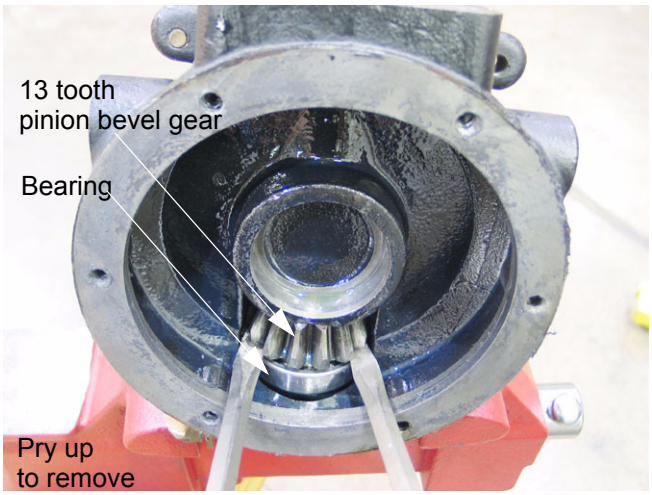

Figure 8.11

8.12. Use a bearing puller to separate the gear from the bearing. See Figure 8.12.

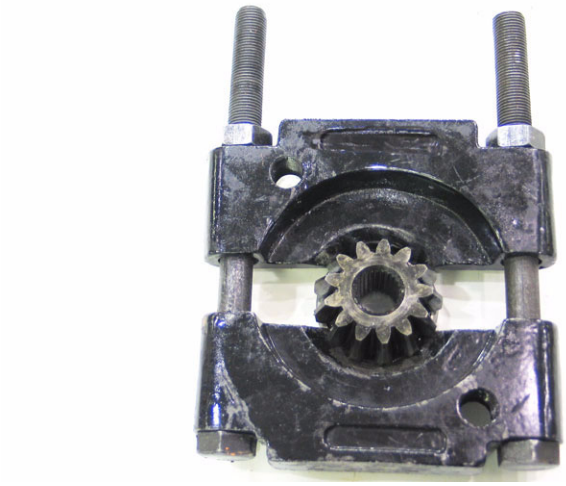

Figure 8.12

8.13. To assemble the drop axle housing:

- Clean and inspect all components-replace any that are suspect.
- If the tapered roller bearing needs to be replaced, drive the outer race of the old bearing out of the drop axle housing.
- Replace all seals and o-rings with new ones.
- Clean all traces of old sealant from sealing surfaces, including those on mating parts (axle housings).

Domestic Series 5000 MFD

8.14. Carefully press the 13 tooth pinion bevel gear into the bearing that carries it. Use care to isolate pressing force to the inner race of the bearing. See Figure 8.14.

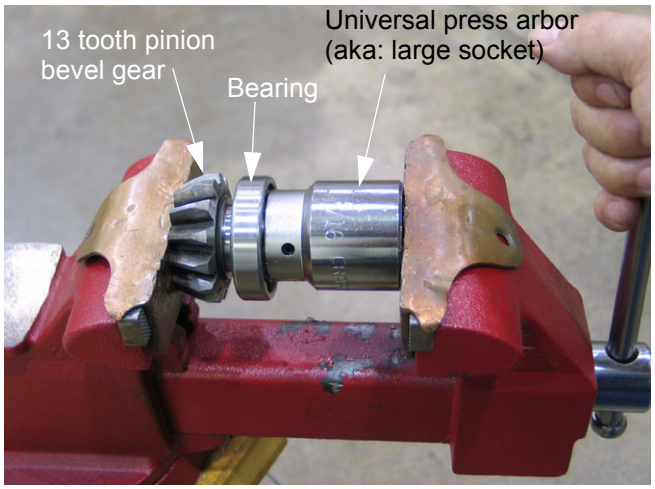

Figure 8.14

8.15. Position the bearing and bevel gear in the base of the bore in the drop axle housing.

8.16. If the tapered roller bearing required replacement, drive or press the outer race of the new bearing into the bore at the top of the drop axle housing using an appropriate tool. See Figure 8.16.

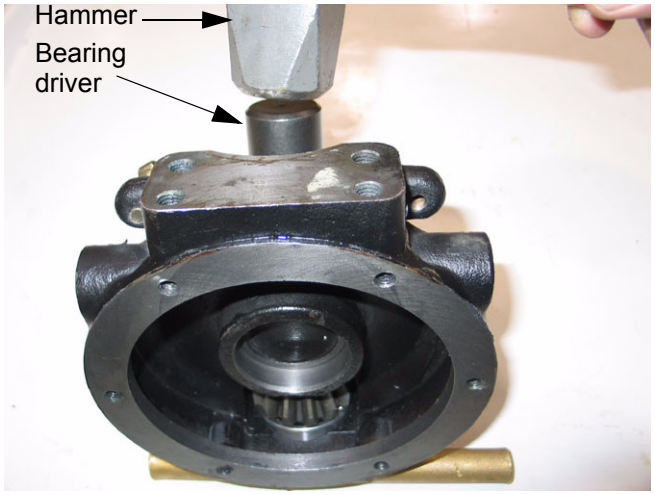

Figure 8.16

8.17. Install the tapered roller bearing in the bearing race.

8.18. Install the two seals above the tapered roller bearing using an appropriate driver. See Figure 8.18.

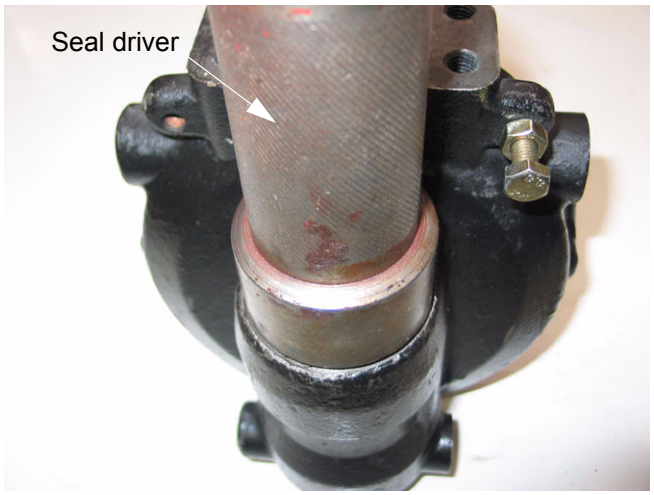

Figure 8.18

NOTE: The “open” side of both seals faces into the casting. The first seal should be driven roughly 1/4” into the machined bore. The second seal should be driven flush with the top of the machined bore. The top edge of the machined bore is beneath the top lip of the casting.

8.19. Confirm that the retaining ring in the kingpin housing is properly seated.

8.20. Install the bearing and 14 tooth bevel gear in the kingpin housing. See Figure 8.20.

Figure 8.20

8.21. Install the kingpin shaft in the kingpin housing. The end of the shaft with the pilot nose should engage the 14 tooth bevel gear.

8.22. Lubricate the shoulder of the kingpin housing that will ride against the seals.

8.23. Slip the kingpin housing and kingpin shaft into the drop axle housing:

- Twisting and light pressure are better than brute force.
- The splines on the bottom end of the kingpin shaft must engage the splines on the 13 tooth bevel gear for the two housings to fully seat.

8.24. Fixture the housings in a soft-jaw vice.

8.25. Install the drop axle cover:

- Apply a small bead of sealant such as Black Loctite # 5900 to the mating surface.
- Apply a small amount of thread locking compound such as Loctite 242 (blue) to the threads of the bolts that secure the axle cover.
- Install the cover to the drop axle housing, and tighten the bolts to torque of 160-220 in-lbs. (18-25 Nm). There is an embossed square on the cover, but there is no need to orient it in any specific location.

8.26. Install the drop axle assembly to the axle housing:

- Apply a small bead of sealant such as Black Loctite # 5900 to the mating surface.
- Apply a small amount of thread locking compound such as Loctite 242 (blue) to the threads of the bolts that secure the axle cover.
- Confirm that the axle bearing, washer, and 14 tooth bevel gear, are in place at the end of the axle shaft.
- Position and support the drop axle assembly against the axle housing.
- Install the bolts that joint the kingpin housing to the axle housing, and tighten the bolts to torque of 220-280 in-lbs. (25-34 Nm).
- Lubricate the o-ring seal that fits tin the groove in the plug shaft, and slip it into position on the plug shaft.
- Install the plug shaft in the top of the kingpin housing.
- Position the washer on the plug shaft.
- Apply a small amount of thread locking compound such as Loctite 242 (blue) to the threads of the bolts that secure the steering arm to the kingpin housing.
- Install the steering arm. Tighten the bolts to a torque of 220-280 in-lbs. (25-34 Nm).

  NOTE: If working on the left steering arm, position the steering cylinder mounting stud in the steering arm before installing the bolts.
- Apply a small amount of thread locking compound such as Loctite 242 (blue) to the threads of the nut that secures the steering cylinder mounting stud.
- Install the nut using a 1 1/16” wrench to turn the nut and a 24 mm wrench to hold the nut on the bottom of the stud. Tighten the nut to a torque of 150 ft.-lbs (200 Nm).
- Apply a small amount of thread locking compound such as Loctite 242 (blue) to the threads of the nut that secures the tie-rod end stud.
- Connect the tie-rod end to the steering arm, and tighten the nut to a torque of 49 ft-lbs (66 Nm) using a 19 mm wrench.

8.27. Final assembly:

- Install the drain plug and sealing washer in the drop axle housing using an 11 mm wrench.
- Fill the housing to level with the fill plug with 85W140.
- Install the fill plug using a 16 mm wrench.

8.28. Lower the tractor to the ground, and tighten the lugs to a torque of 55 ft.-lbs. (63 Nm) using a 21 mm wrench. Re-torque the wheels after 10 hours of operation.

8.29. Test the operation of the tractor before returning it to service. Carefully check all serviced items for:

- Leaks
- Looseness
- Unusual noises

9. BENCH REPAIR: AXLES AND DIFFERENTIAL.

9.1. Remove the MFD complete, as described in the “REMOVAL” section of this manual.

9.2. Lift and safely support the MFD on a convenient work surface.

NOTE: Get assistance or use mechanical lifting equipment. The MFD complete weighs roughly 150 lbs. (68 Kg.).

9.3. If not previously done, drain the gear lube from main housing and drop-axle housings, as described in the “REMOVAL” section of this manual. See Figure 9.3.

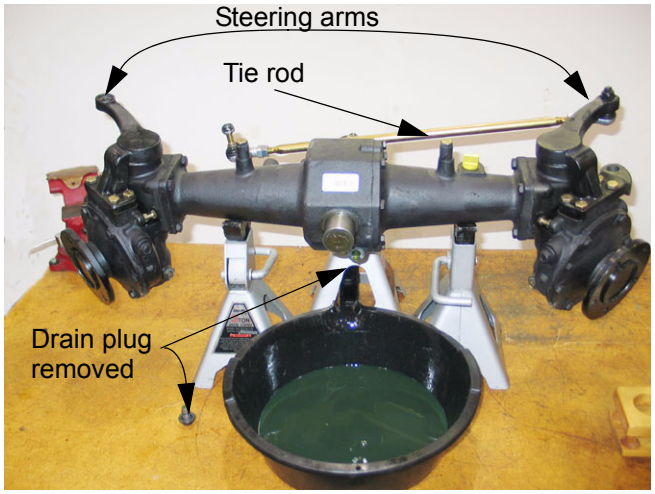

Figure 9.3

9.4. Disconnect the tie-rod ends from both steering arms using a 16 mm wrench and a 17 mm wrench.

NOTE: Drop axle gear lube:

- If the drop axles are to be serviced, or there is a chance that the gear lube they contain is contaminated, drain them as well.
- If the drop axles are undamaged, and the gear lube they contain is not contaminated, they need not be drained for removal.

9.5. Remove both drop-axle housings using a 17 mm wrench. See Figure 9.5.

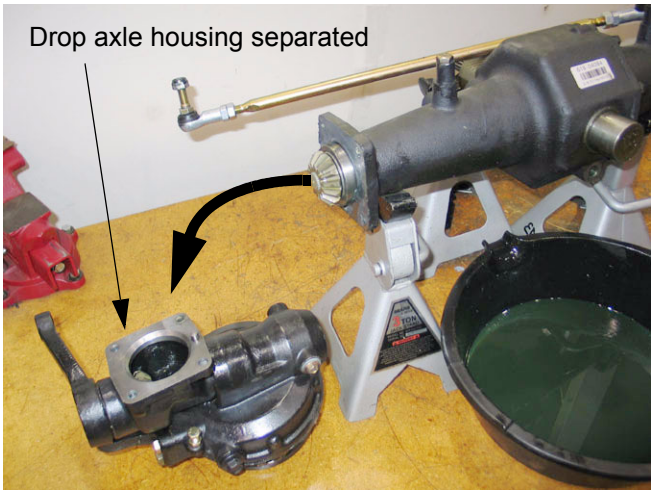

Figure 9.5

9.6. With both drop axle assemblies removed, the MFD can be placed directly on the bench, at the technician’s discretion.

NOTE: alternatively, the drop axles can be taken off of the MFD before it is removed from the tractor.

9.7. The axles, outer axle bearings, 14 tooth bevel gears, and washers can be removed from the MFD at this point. See Figure 9.7.

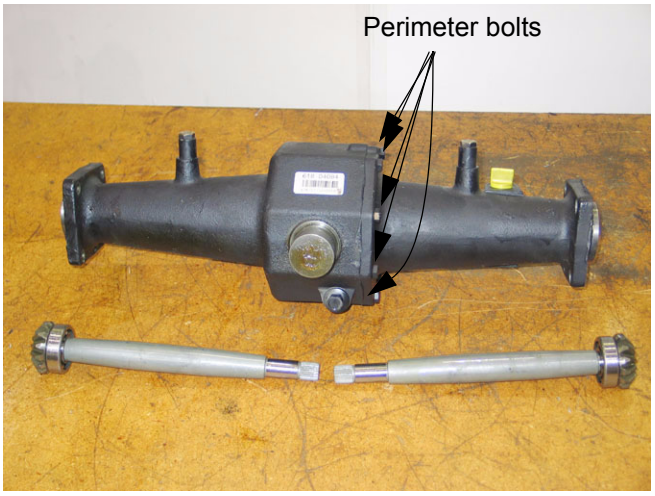

Figure 9.7

9.8. Slightly loosen the perimeter bolts that hold the axle housings together using a 13 mm wrench.

NOTE: The two axle housings are most easily separated in the vertical position.

9.9. Separating the housings is best done in a vertical position. After the sealant between the two housings is broken, securely stand the assembly on-end to remove the bolts and separate the housings. See Figure 9.9.

Figure 9.9

9.10. Lift the smaller left housing off of the larger right housing. See Figure 9.10.

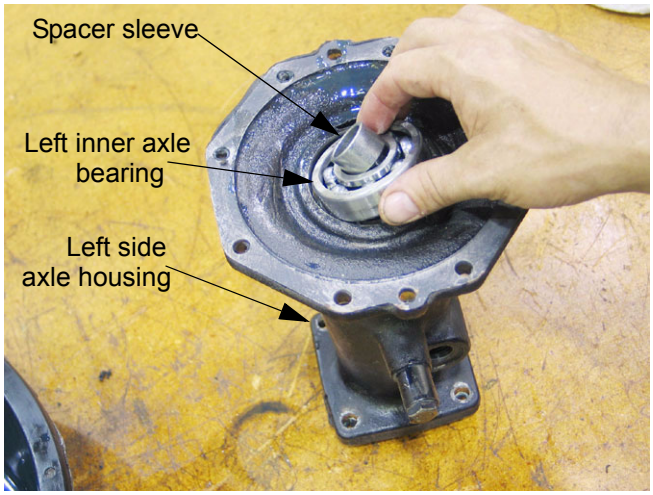

Figure 9.10

NOTE: The left housing at this point contains only an inner axle bearing and a sleeve that fits into that bearing. Both can be removed with light pressure.

9.11. A spacer resides between the inner axle bearing and the differential bearing. See Figure 9.11.

Figure 9.11

NOTE: Back-lash is set by the shim washers beneath the differential. The spacer sets the residual end-play after back-lash is set.

9.12. The differential housing can be easily grasped and lifted out of the right side axle housing. See Figure 9.12.

Figure 9.12

NOTE: The differential must be manipulated so that the ring gear clears the pinion gear.

Domestic Series 5000 MFD

9.13. Beneath the differential housing are shim washers, between the right side differential bearing and the right side inner axle bearing. See Figure 9.13.

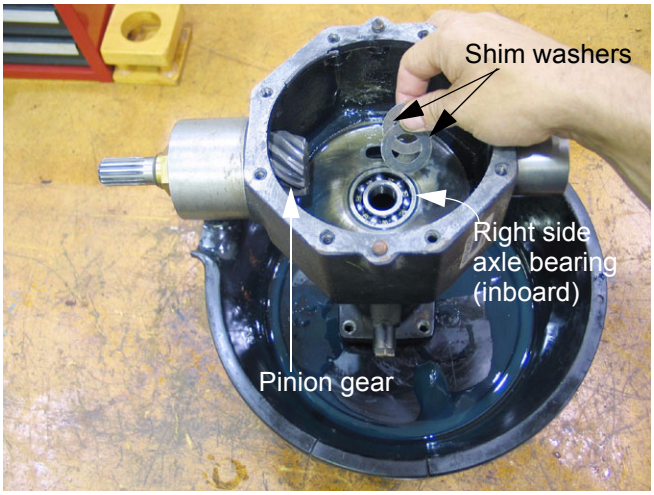

Figure 9.13

NOTE: Keep track of the size and number of these washers.

9.14. The shim washers and inner axle bearing can be easily removed from the right side axle housing.

9.15. The right side axle housing also contains the pinion gear and bearings.

9.16. The nut that holds the pinion assembly in place is staked into position. The staking must be chiseled-out. See Figure 9.16.

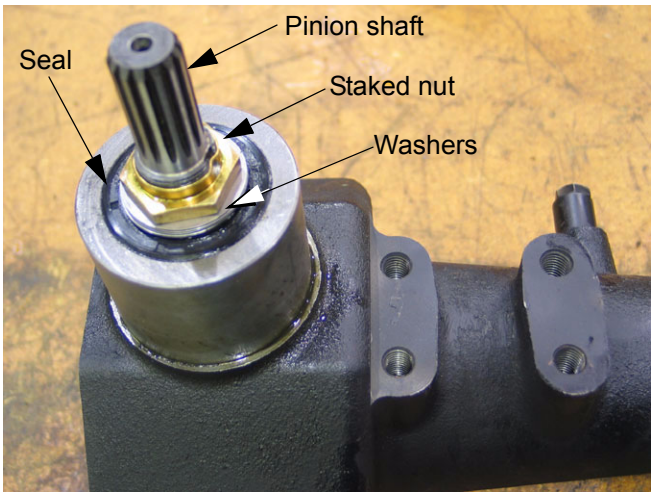

Figure 9.16

9.17. After the nut is de-staked, use the front wheel drive shaft to hold the pinion shaft, while tuning the nut with a 1 1/4" wrench. See Figure 9.17.

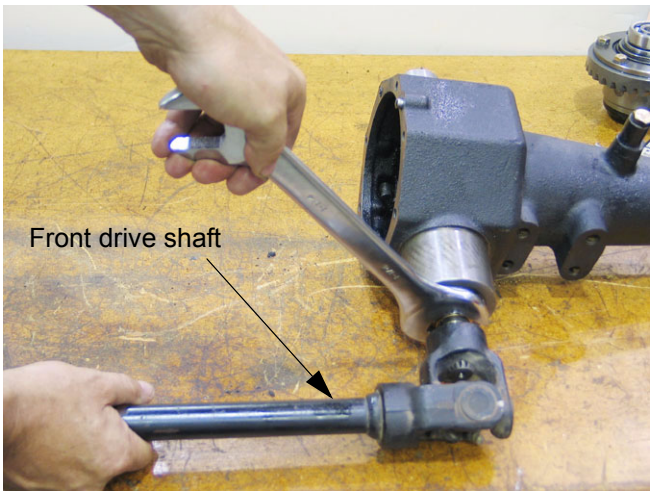

Figure 9.17

NOTE: A damaged driveshaft, cut-off to a length of 1' may be kept as a permanent pinion tool.

9.18. Remove the nut and washers from the pinion shaft. keep track of the size, quantity, and position of the washers. See Figure 9.18.

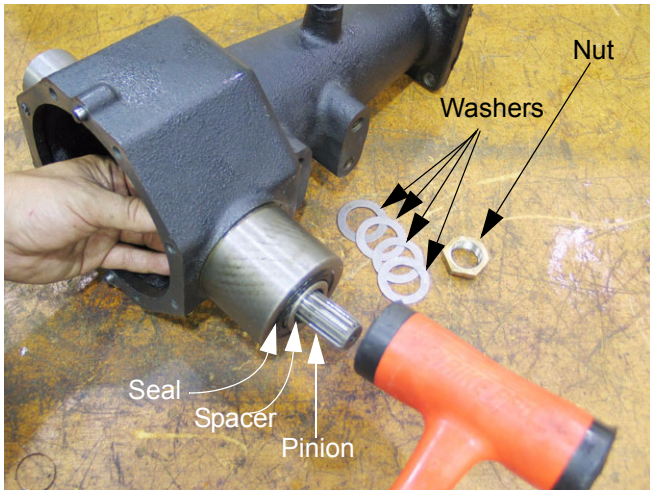

Figure 9.18

9.19. Drive the pinion gear into the inside of the differential using a soft hammer or drift.

9.20. Remove the spacer that fits between the pinion shaft and the seal. See Figure 9.20.

Figure 9.20

9.21. Pry out the pinion seal. The outer pinion bearing will come out when the seal is removed. See Figure 9.21.

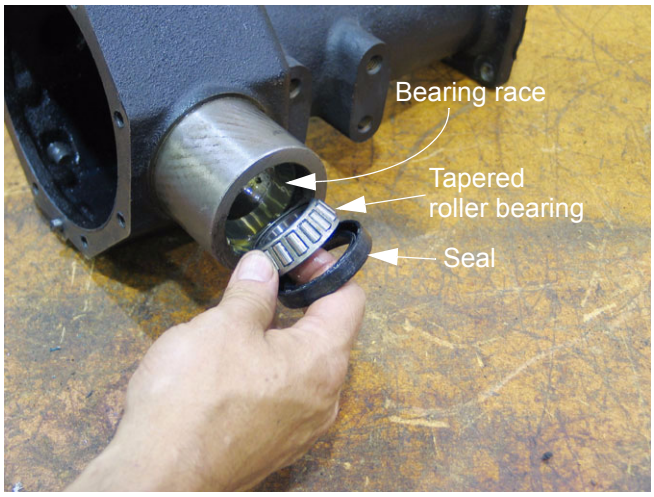

Figure 9.21

9.22. If the pinion bearings are suspect, drive the outer races from the pinion bore as well. Keep the races associated with the same bearings that originally ran in them. See Figure 9.22.

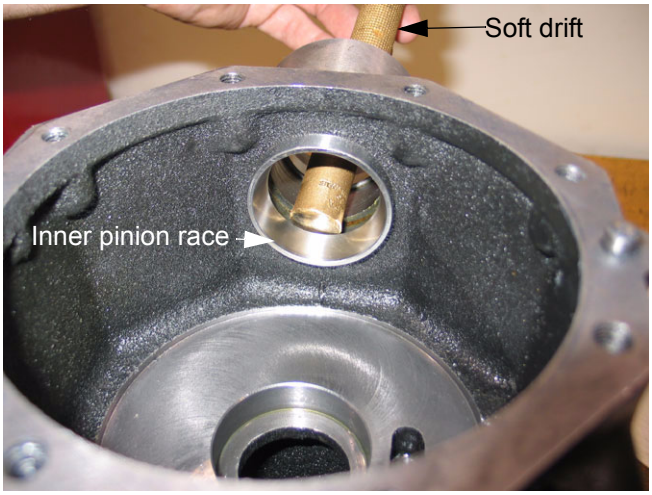

Figure 9.22

9.23. Remove the right side differential bearing and spacer sleeve from the differential. See Figure 9.23.

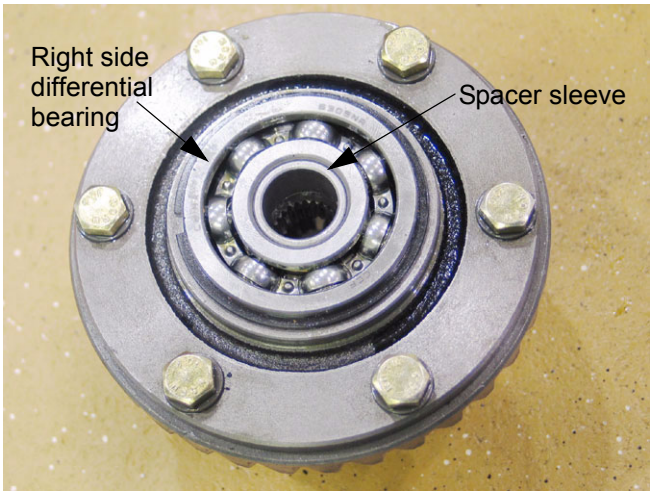

Figure 9.23

9.24. To disassemble the differential, fixture the differential assembly in a soft-jaw vice.

9.25. Drive the roll pin from the cross pin that the miter gears ride on using a flat-nosed drift. See Figure 9.25.

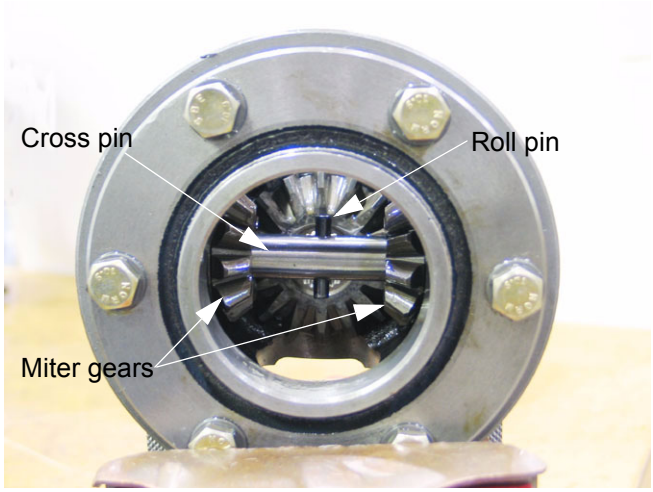

Figure 9.25

9.26. When the roll pin is out, the cross pin can be withdrawn through the side of the differential housing.

9.27. With the cross pin removed, the 10 tooth miter gears, and the spherical thrust bearings that fit behind them can be removed. See Figure 9.27.

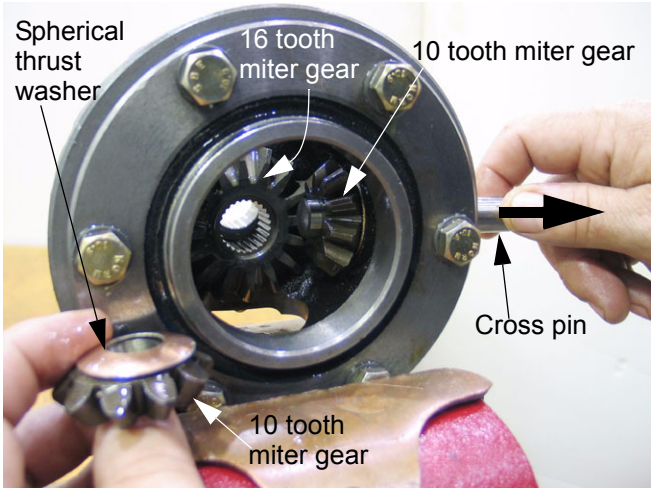

Figure 9.27

9.28. The second 16 tooth miter gear can be removed, along with the second differential bearing (right side), after the 10 tooth miter gears are out. See Figure 9.28.

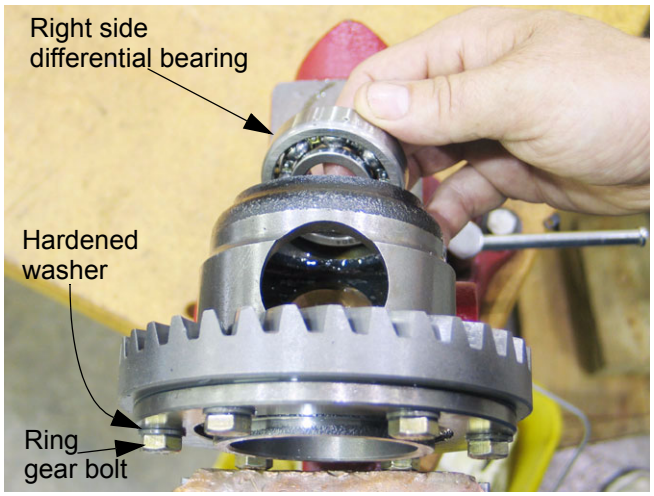

Figure 9.28

9.29. The ring gear bolts can be removed using a 13 mm wrench.

9.30. Clean and inspect all components.

- Replace all of the seals and o-rings.
- Replace the stake nut that goes on the pinion shaft.
- If the bearings show signs of damage, wear, or roughness, replace them.

  NOTE: Do not spin bearings with an air gun to dry them.
- Replace any components that show wear or damage.
- Replace the ring and pinion gears as a set if either shows signs of wear or damage.
- Replace the miter gears as a complete set of any show wear or damage.

9.31. Install the pinion assembly: gear, washers, bearings, spacer, o-ring. See Figure 9.31.

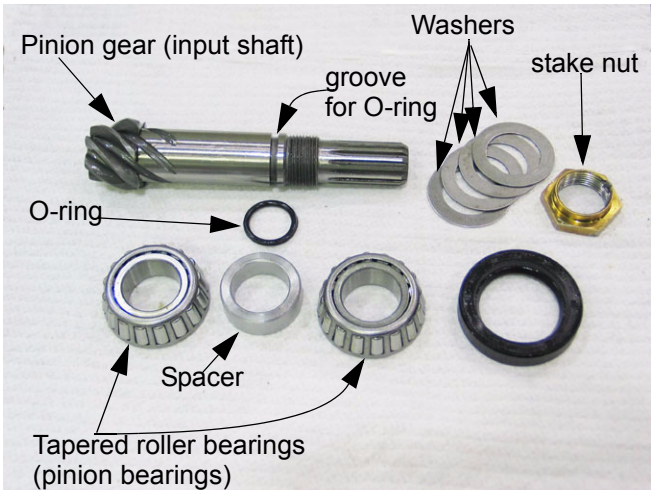

Figure 9.31

9.32. Drive new outer races into place if the pinion bearings have been replaced.

9.33. Install the inner pinion bearing on the pinion shaft, and install the shaft from the inside of the right axle housing.

9.34. Slip the outer pinion bearing onto the pinion shaft.

9.35. Lubricate the new o-ring, and slide it into position on the pinion shaft.

9.36. Twist and push the spacer over the o-ring. The o-ring forms the seal between the O.D. of the pinion shaft and the I.D. of the spacer.

9.37. Install the washers and pinion nut onto the pinion gear.

NOTE: In some applications, a variety of washers are available to adjust the depth of the pinion gear in the case. On the Cub Cadet Series 5000 MFD, all of the backlash adjustment is done by shimming the differential from side to side. No adjustment is intended to be done on the pinion.

NOTE: If no major components have been replaced, simply replacing the original shim washers in their original positions is likely to result in the correct ring and pinion gear backlash setting. Otherwise, some adjustment may be necessary.

9.38. Tighten the pinion nut until the pinion gear is subject to 25-30 in-lbs (2.825-3.40) of drag. To measure pinion drag: See Figure 9.38.

Figure 9.38

- Slip a shop towel over the splines on the pinion shaft.
- Use a 19 mm 12 point socket, on a torque wrench to turn the pinion shaft.
- Read the pinion drag on the scale of the torque wrench.
- Tighten the nut to increase drag, loosen the nut to decrease drag.
- Mark the position of the nut in relation to the shaft once the correct drag is achieved. This can be done with a paint marker or marker pen.

NOTE: For the purpose of setting the back lash, the cross-shaft, miter gears, and pinion gears may be left out of the differential. This will make alignment and fitting much easier, but will not effect the measurement.

9.39. Install the ring gear to the differential housing, if it has been removed. Apply a small amount of thread locking compound such as Loctite 242 (blue), and tighten the bolts to a torque of 160-220 in-lbs(18-25 N-m).

9.40. Suspend the right axle housing so that it hangs in a vertical position, with 18” (46 cm) of clear access beneath it.

NOTE: Any number of means can be improvised to suspend the axle housing by the pivot journal, with the drop axle housing on the ground for stability.

9.41. Install the right inboard axle bearing in the housing.

9.42. Stick the anticipated amount of shim washers to the right side differential bearing with grease. Shims are available in thicknesses from .005” to .025” (.127mm to .635) in .005” increments. Use as required to achieve correct back lash. See Figure 9.42.

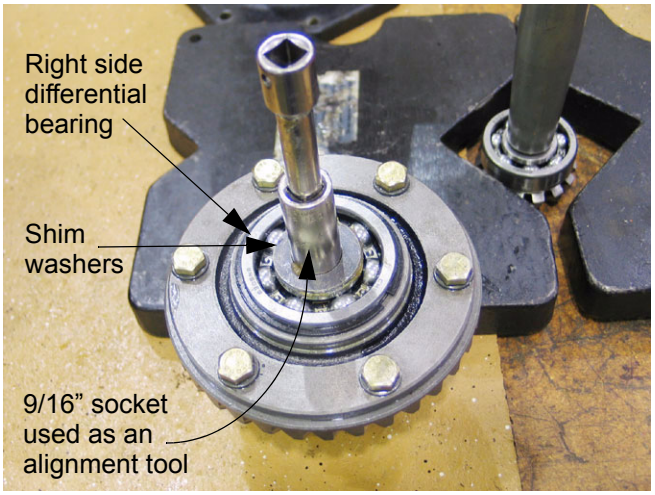

Figure 9.42

NOTE: Make sure the washers are all aligned with the spacer sleeve in the right side differential bearing. The inside diameter of the spacer sleeve and washers is .780” (1.98 cm). A typical deep 9/16” (14 mm) socket can be used as a pilot tool.

9.43. Position the differential in the right side axle housing. See Figure 9.43.

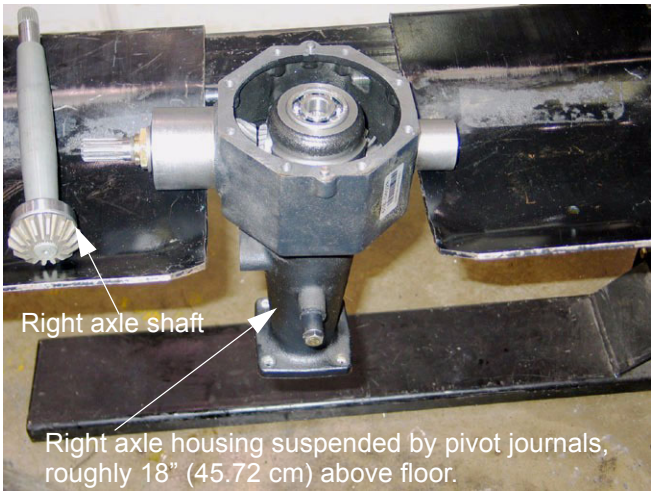

Figure 9.43

9.44. Position wood blocks or similar supports (base plates from a hydraulic press work well) to hold the flange on the outer end of the axle housing about 1.25” (3.175 cm) above the work bench. This will provide a stable support for the assembly, and hold the axle shaft in place.

9.45. Install the right side axle shaft (with outer bearing, washer, and pinion gear) into the right side axle housing from beneath. See Figure 9.45.

Figure 9.45

9.46. Carefully lift the axle housing onto the work bench. See Figure 9.46.

Figure 9.46

- Maintain a vertical position while moving the assembly.
- Support the axle shaft with one hand during movement.

9.47. Position the left side inner axle bearing, with its spacer sleeve, on the differential. See Figure 9.47.

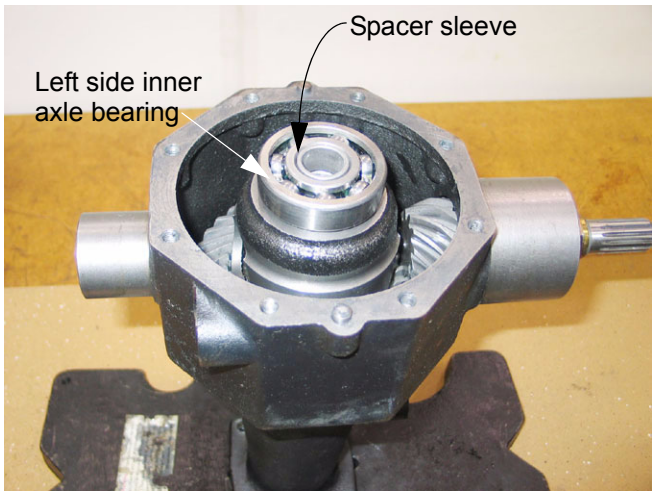

Figure 9.47

9.48. Insert the left axle shaft through the bearings (inner axle bearing and differential bearing). See Figure 9.48.

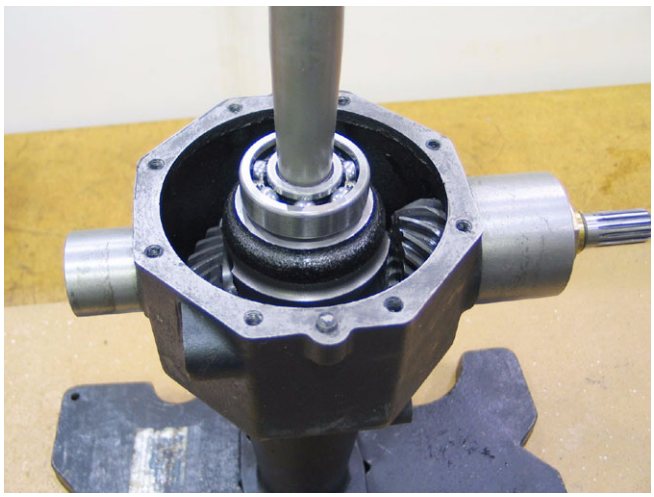

Figure 9.48

9.49. Position the differential set-up plate tool over the dowel pins and differential bearing. See Figure 9.49.

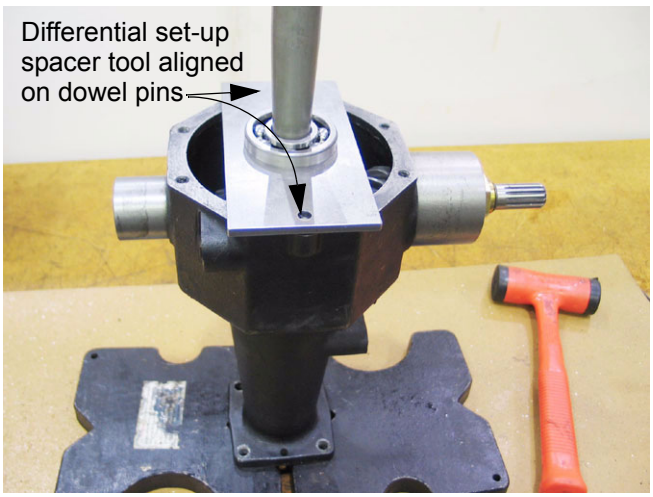

Figure 9.49

9.50. Dimensions for the fabrication of a differential set-up plate tool are given below: See Figure 9.50.

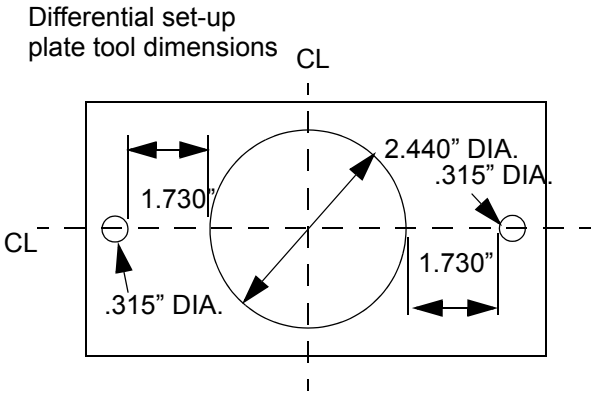

Figure 9.50

9.51. The set-up plate tool is necessary to stabilize the differential, permitting the accurate measurement of the backlash between the ring gear and the pinion gear.

NOTE: It is extremely difficult to get a dial indicator to register properly on the ring gear.

Domestic Series 5000 MFD

9.52. Use blue plastigage having a range of .004”-.009” (.102-.229 mm) to measure the clearance between the ring gear and the pinion gear. See Figure 9.52.

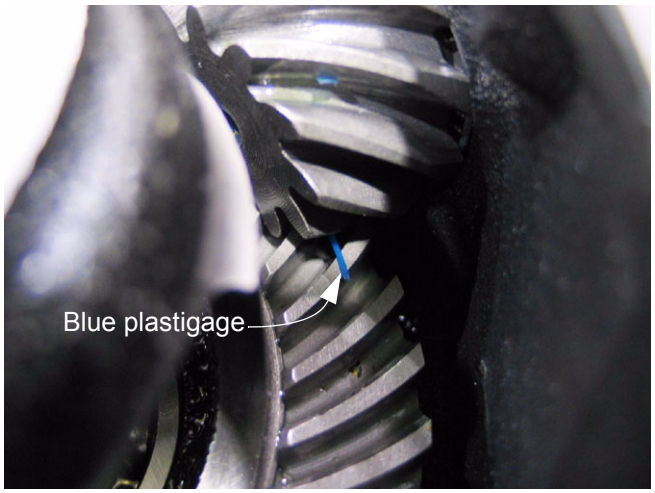

Figure 9.52

- Position the plastigage so that it compresses only against one side of the teeth. If it wraps around one of the teeth, it will give a false reading.
- The measurement should be taken on the unloaded side of the gear. If the plastigage is put on the loaded side of the gear, it will give a false reading.

9.53. Add or remove shims from beneath the differential as necessary to obtain backlash of .009”± .004” (.229 mm ± .102mm). Repeat the measurement after each change to confirm the results. See Figure 9.53.

Figure 9.53

9.54. After backlash is set, it is necessary to set the remainder of the end play between the differential and the left side axle housing.

9.55. Remove the differential set-up plate tool.

9.56. Confirm the presence of the spacer washer between the left differential bearing and the left inner axle bearing.

9.57. Add a known quantity of additional shim washers having an inside diameter of .780” (1.98 cm). The differential will be intentionally over-shimmed. See Figure 9.57.

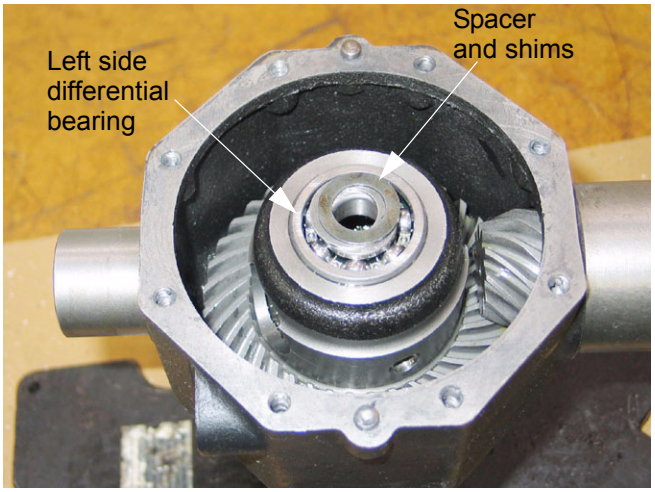

Figure 9.57

9.58. Position the left inner axle bearing, and install the left axle through the bearings and shims. See Figure 9.58.

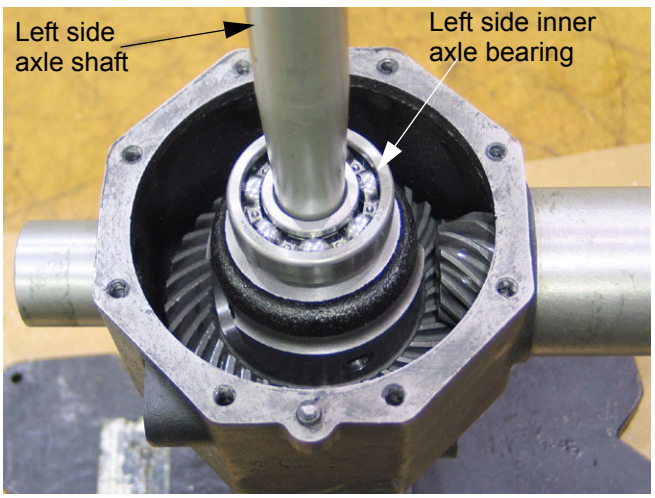

Figure 9.58

9.59. Install the right side axle housing for measurement purposes. See Figure 9.59.

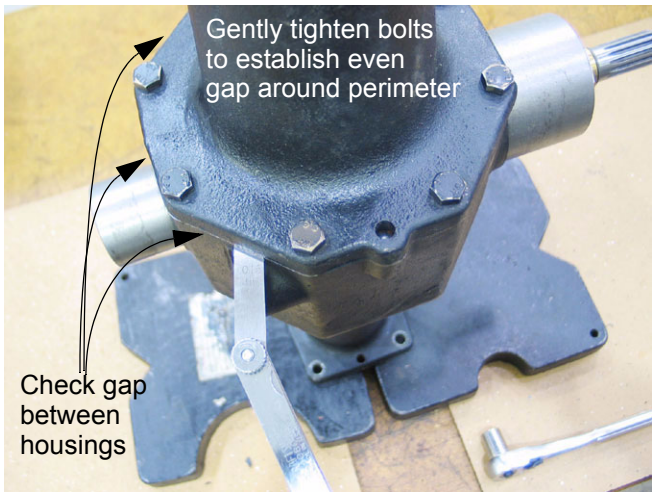

Figure 9.59

- Start at least 4 of the 8 bolts that hold the two housings together.
- Tighten them far enough to obtain an even gap between the two housings. Do not exceed 20 in-lbs. of torque at this stage.
- Measure and record the gap between the housings with a feeler gauge.
- Carefully remove the bolts, left side axle housing, bearings, and washers.
- From the shim washers between the left side inner axle bearing and the left side differential bearing, remove an amount of washers having a total thickness equal to the gap between the housings plus .003”-.010” (.076-.254 mm).
- This should establish the amount of shimming necessary between the two bearings to maintain .003”-.010” (.076-.254 mm) end play.

9.60. Lift the right axle and differential assembly back onto whatever means was used to suspend it for the installation of the differential.

- Maintain a vertical position while moving the assembly.
- Support the axle shaft with one hand during movement.
- If the technician is not comfortable lifting the weight of the axle assembly, they should seek an assistant to help move the axle assembly to the bench.

9.61. Remove the axle shaft, bearing, washer, and bevel gear by carefully lowering them out of the housing. See Figure 9.61.

Figure 9.61

9.62. Remove the differential for final assembly.

9.63. To assemble the differential:

- Install the ring gear to the differential housing (if not done previously).
- Apply a small amount of thread locking compound such as Loctite 242 (blue), and tighten the bolts to a torque of 160-220 in-lbs. (18-25 Nm).

9.64. Install the differential bearing and 16 tooth miter gear that go in the back of the housing, behind the 10 tooth miter gears. See Figure 9.64.

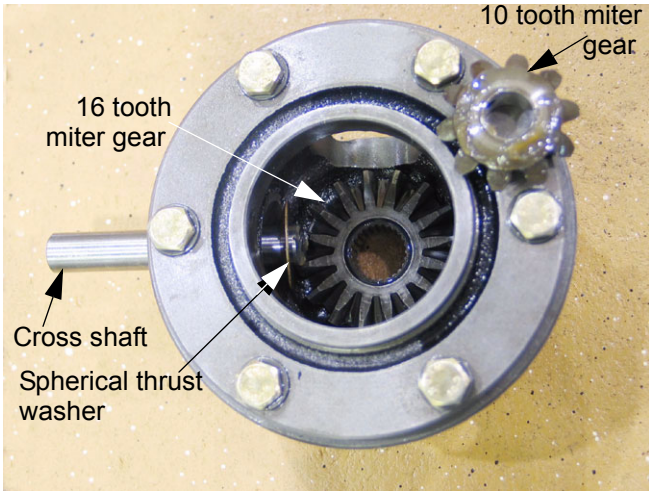

Figure 9.64

9.65. Install the two 10 tooth miter gears (flanking the 16 tooth miter gear), spherical thrust washers, and cross shaft. See Figure 9.65.

Figure 9.65

9.66. Secure the cross shaft by driving in a new roll pin with a flat-nosed drift. See Figure 9.65.

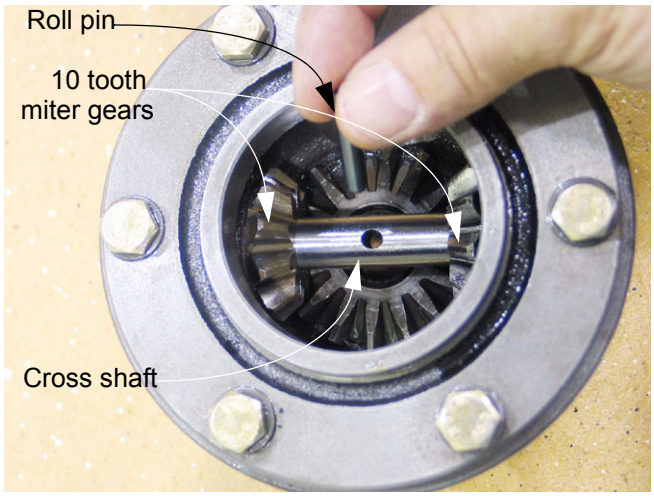

Figure 9.66

9.67. Install the second 16 tooth miter gear, and the right side axle bearing in the differential.

NOTE: Confirm that the 16 tooth miter gears are both centered in the differential housing.

9.68. Stick the appropriate shim washers to the right side differential bearing with grease, as was done previously for the back-lash measurement.

9.69. Install the differential in the right side axle housing.

9.70. Install the right side axle, as was done previously for the back lash measurement.

NOTE: Confirm that the roll pin in the cross shaft engages the bore in the end of the axle shaft.

9.71. Carefully lift the right side axle assembly back onto the work bench, as was done previously for the back lash measurement.

9.72. Install the necessary shim washers or spacer, as determined earlier by the end play measurement. See Figure 9.72.

Figure 9.72

9.73. Position the left side axle bearing and axle in the differential. The shim washers should be between the differential bearing and the bearing that supports the inboard end of the axle. See Figure 9.73.

Figure 9.73

NOTE: Confirm that the axle shaft is fully seated in the differential assembly, with the roll pin in the bore in the end of the axle.

9.74. Apply small bead of sealant such as Loctite 5900 to the mating surfaces where the left and right axle housings join.

9.75. Place the axle housing over the axle shaft and bearing. The stop bolts on the top of each housing can be used to confirm correct orientation.

9.76. Install the bearing that supports the outboard end of the axle shaft. See Figure 9.76.

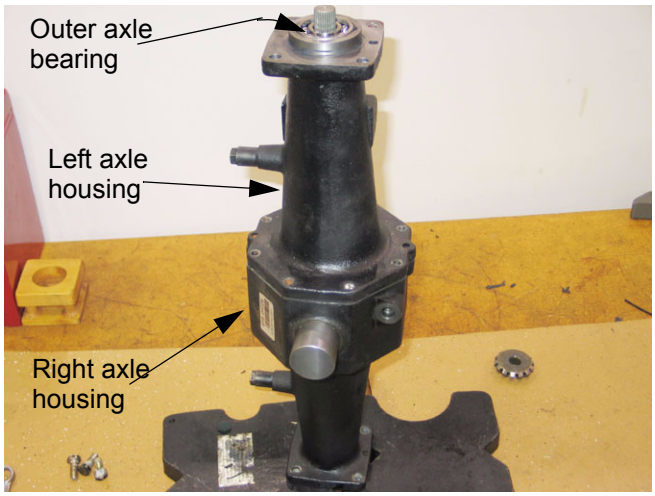

Figure 9.76

9.77. Apply a small amount of threadlocking compound such as Loctite 242 (blue) to the threads of the 8 bolts used to fasten the left and right axle housings together.

9.78. Install the bolts, and tighten them to a torque of 160-220 in-lbs. (18-25 Nm) using a 13 mm wrench.

9.79. Install the washer and 14 tooth bevel gear on the end of the axle shaft. See Figure 9.79.

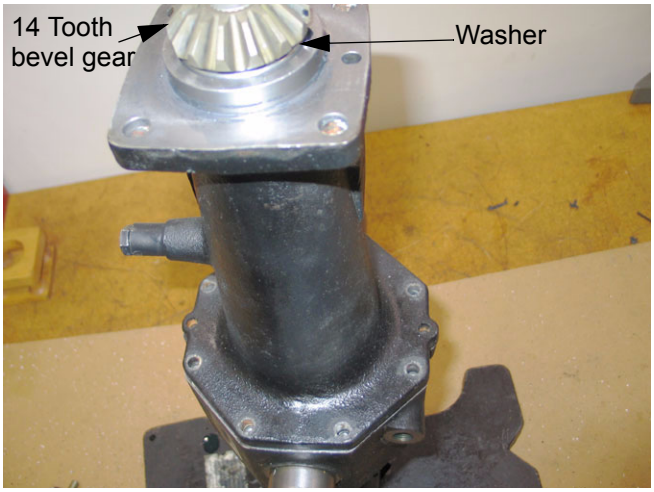

Figure 9.79

9.80. Apply a thin bead of sealant to the mating surface where the drop axle assembly meets the left axle housing.

9.81. Apply a small amount of threadlocking compound such as Loctite 242 (blue) to the threads of the 4 bolts used to fasten the drop axle housing to the left axle housing.

9.82. Install the left side drop axle and secure it with the four bolts. Tighten the bolts to a torque of 220-280 in-lbs. (25-34 Nm) using a 16 mm wrench. See Figure 9.82.

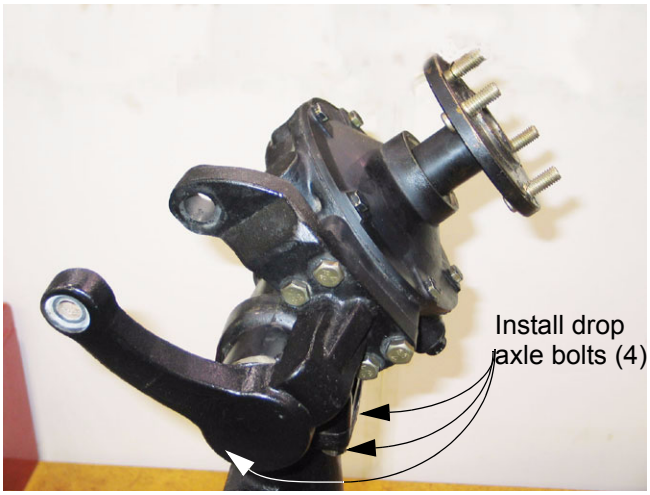

Figure 9.82

9.83. Orientation:

- The steering arms should extend to the rear.
- The drop axle should extend downward.
- The input shaft on the axle points to the rear, and the travel stop bolts are on the top of the axle housings.
- There is a dowel pin at the bottom mating surface of the axle housing.
- The drop axle housings will only fit in the correct direction if they are on the correct sides of the axle assembly.
- The bolts that limit the pivot travel of the MFD indicate the top of the housing. The drain plug indicates the bottom.

9.84. Position the MFD assembly so that the right side of the axle housing is accessible. Install the washer and bevel gear on the end of the axle. See Figure 9.84.

Figure 9.84

9.85. Apply sealant to the mating surface, apply threadlocking compound to the bolt threads, and install the right side drop axle housing in the same manner as the left side drop axle housing.

9.86. To install the pinion seal, position the MFD so that the pinion shaft is easily accessible, and the MFD is supported in a safe and stable position.

9.87. Use the front wheel drive shaft to hold the pinion shaft, while using a 1 1/4" wrench to loosen the nut from the pinion shaft. See Figure 9.87.

Figure 9.87

9.88. Remove the nut and washers from the pinion shaft.

9.89. Lubricate the lip of the seal, and install it in the housing. See Figure 9.89.

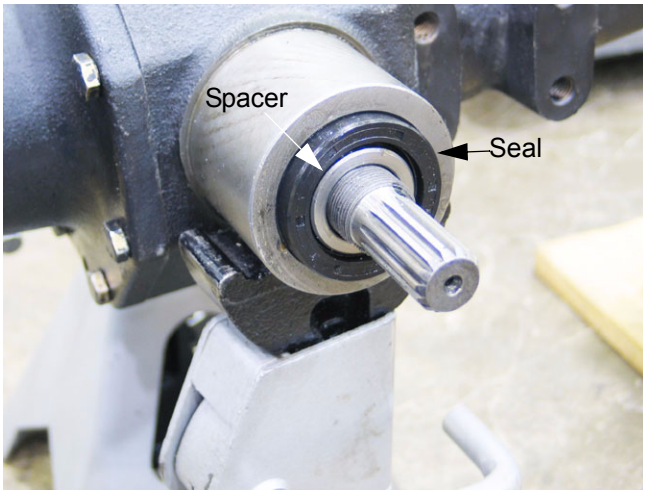

Figure 9.89

NOTE: It may be easier to get the lip positioned correctly if the pinion spacer is pulled-out slightly.

NOTE: Use a seal driver that applies force to the outer edge of the seal to seat it into the housing.

9.90. Install the washers and nut. tighten them until the match marks made previously align.

9.91. Stake the nut so that it does not loosen. See Figure 9.91.

Figure 9.91

9.92. Install the tie rod.

- Use a 17 mm wrench to turn the tie rod end nuts, and a 16 mm wrench to keep the studs from turning in the tie rod ends.
- Tighten the nuts to a torque of and tighten the nut to a torque of 264-312 in.-lbs (30-35 Nm) using a 3/4” wrench.

  NOTE: If the nylon locking ring on the tie-rod end nuts is worn, replace the nuts or apply a small amount of threadlocking compound such as Loctite 242 (blue) before installation.

9.93. Install the MFD in the tractor as described in the MFD INSTALLATION section of this manual.

10. TORQUE SPECIFICATIONS

Item	Torque SAE	Torque Metric	Loctite
Ring Gear Bolts	160-220 in-lbs	18-25 Nm	242 blue
Perimiter Bolts (axle housing)	160-220 in-lbs	18-25 Nm	242 blue
Kingpin Housing to Axle Housing	220-280 in-lbs	25-34 Nm	242 blue
Axle Cover	160-220 in-lbs	18-25 Nm	242 blue
Stop Bolts (top of axle housings)	220-280 in-lbs	25-34 Nm	242 blue
Steering Arm to Kingpin Housing	220-280 in-lbs	25-34 Nm	242 blue
Tie Rod End Nuts	49 ft-lbs	66 Nm	242 blue *
Tie Rod End Jam Nuts	360-420 in-lbs	488-570 Nm	242 blue *
Steering Cylinder Stud to Housing	267 ft-lbs	362 Nm	242 blue *
Steering Cylinder Stud Nut	150 ft-lbs	136 Nm	242 blue *
Steering Cylinder Mounting Bracket	75 ft-lbs	100 Nm	242 blue
Axle Mounting Bracket	75 ft-lbs	100 Nm	242 blue
Fill Plug	220-280 in-lbs	25-34 Nm	no
Drain Plug	220-280 in-lbs	25-34 Nm	no
Pinion Drag (Not tightening troque)	25-30 in-lbs	2.825-3.4 Nm	stake
Lug Nuts	55 ft-lbs	63 Nm	re-torque*

Notes:
242 blue*: Loctite may be applied if
nylon locking feature is worn.
Replacement preferred.
re-torque*: Re-torque after 10 hrs. of operation.

Cub Series 5000 Rear Axle

REASON FOR CHANGE:

The rear axles of Cub Cadet Series 5000 compact tractors built during 2003, with serial numbers lower than that are used with a backhoe attachment should be upgraded part of the backhoe installation process.

The upgraded axles are dimensionally identical to the original axles. They can be identified by the letters "BH" stamped on the end if the axle.

1. PREPARATION:

1.1. Position the tractor on firm level ground.

1.2. Clean the areas surrounding the rear axle horns to prevent dirt from contaminating the transmission fluid. If the fluid is to be partially drained and re-used, clean the areas surrounding the drain plug as well.

1.3. If other attachments such as a cutting deck are presently on the tractor it will be easier to drain roughly 3 gallons of fluid out of the transmission than to remove the attachments. This may be the case when a customer anticipates the installation of a backhoe in the near future. If there are no attachments mounted on the tractor yet, tilting the tractor at a 20 degree angle will permit the procedure to be done without draining the fluid. See Figure 1.3.

Figure 1.3

1.4. Place a clean drain pan under the front of the transmission housing. Remove the drain plug using a 5/8" wrench. See Figure 1.4.

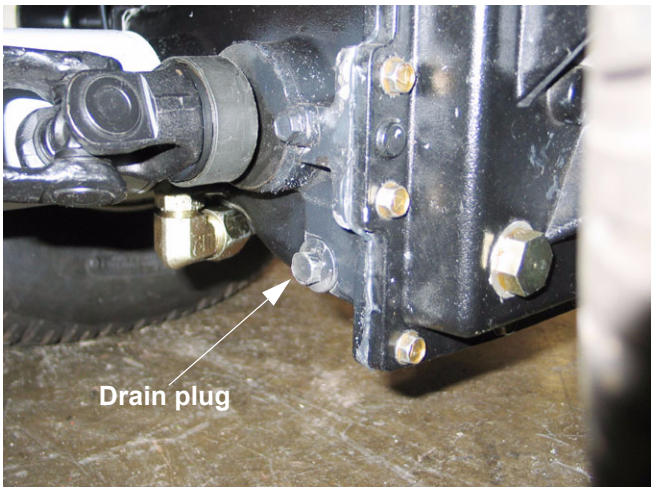

Figure 1.4

1.5. After draining sufficient transmission fluid, install the drain pug.

1.6. If the tractor has no attachments installed, it can be safely lifted and supported at a 20 degree angle. See Figure 1.6.

Figure 1.6

NOTE: At this angle, the axle can be removed with minimal loss of fluid.

1.7. Remove the left rear wheel using a 3/4" socket.

1.8. Place a drain pan under the left rear axle seal.

Cub Series 5000 Rear Axle

1.9. With the left rear wheel removed, the left axle seal can be easily reached and removed. See Figure 1.9.

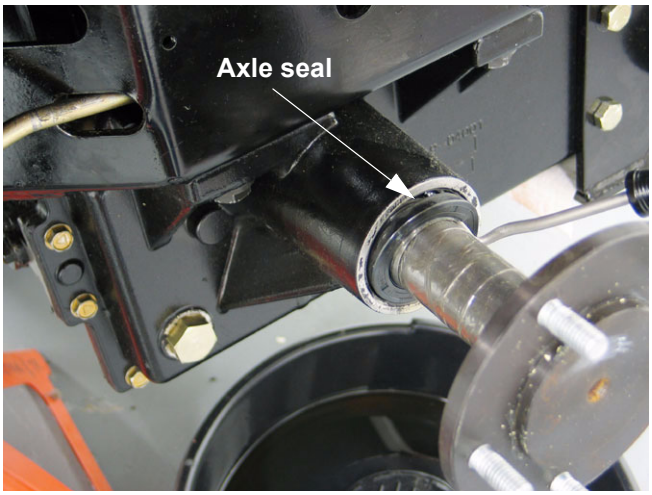

Figure 1.9

1.10. The seal covers a retaining ring that secures the axle bearing. Remove the retaining ring. See Figure 1.10.

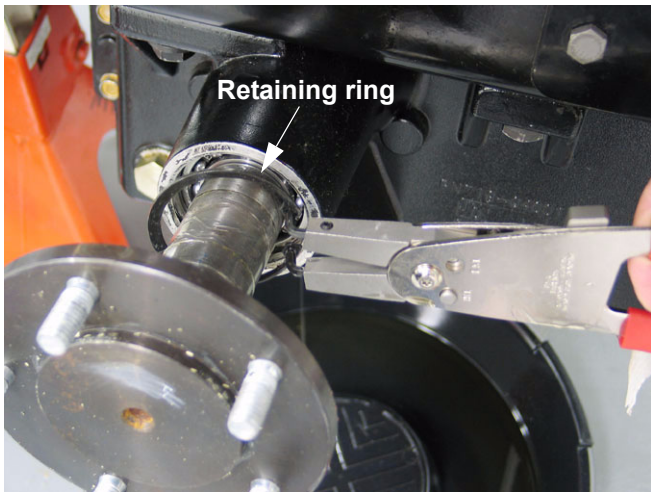

Figure 1.10

1.11. With the retaining ring removed, the axle can be drawn out of the transmission, along with the axle bearing. See Figure 1.11.

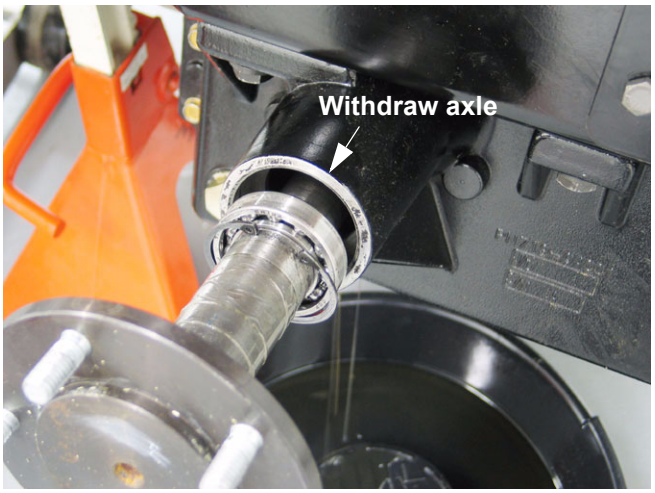

Figure 1.11

1.12. With the axle removed, it can be compared to the replacement axle to confirm correct length. See Figure 1.12.

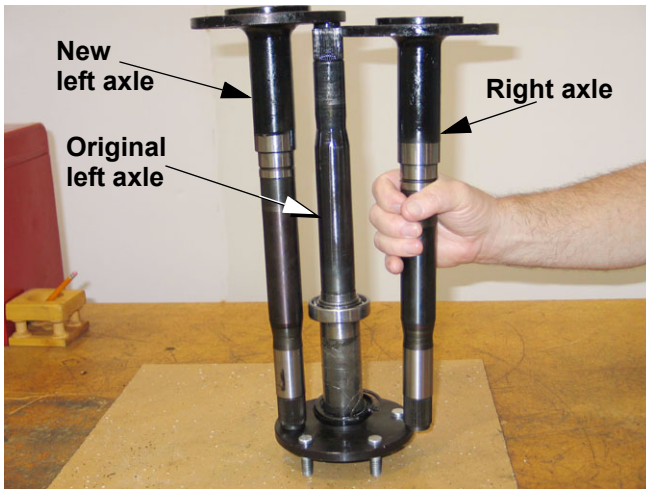

Figure 1.12

NOTE: The left axle is slightly longer than the right axle. When the two axles are positioned flange-to-flange, the difference is apparent.

2. AXLE ASSEMBLY

2.1. If the replacement axle does not have studs installed, new studs should be driven into the holes in the drive flange. See Figure 2.1.

Figure 2.1

2.2. Lubricate the portion of the axle between the machined surface for the seal and the drive flange. Install the seal on the axle shaft. Carefully slip the seal over the shoulders on the machined surfaces. Use a seal protector sleeve if available. See Figure 2.2.

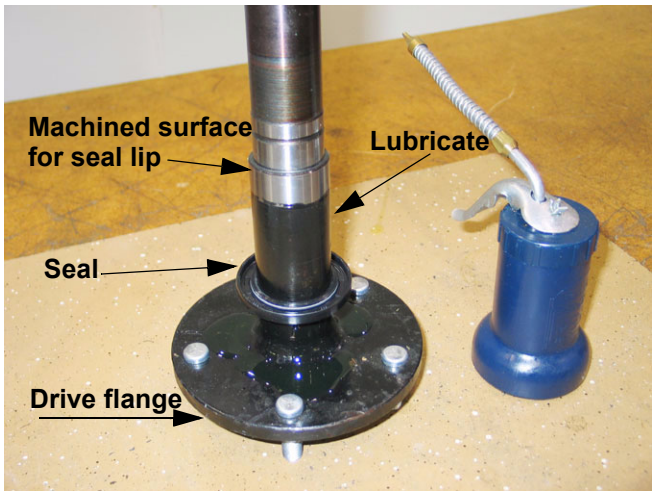

Figure 2.2

2.3. Put the retaining ring on the axle, with the sharper edge facing the seal.

2.4. Install the axle bearing on the axle. See Figure 2.4.

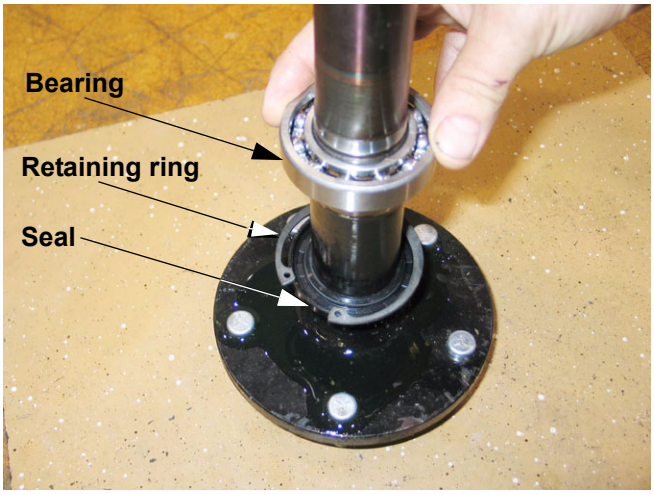

Figure 2.4

2.5. Secure the bearing with a new hog ring. the hog ring can be driven into place with an old bearing or appropriate size piece of tubing. See Figure 2.5.

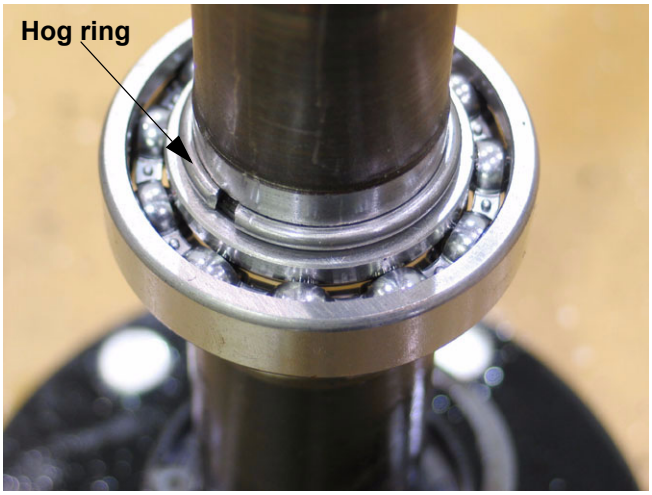

Figure 2.5

NOTE: After installation, examine the hog ring to confirm that it has not stretched out of shape, and is fully seated in the groove in the axle.

Cub Series 5000 Rear Axle

3. INSTALL THE NEW AXLE.

3.1. Slip the axle into the transmission housing. It may be necessary to rotate the axle in order to get the splines on the end to engage the splines on the differential assembly. Once in place, it may be necessary to lightly drive the axle home with a dead blow hammer. Significant force should not be required. See Figure 3.1.

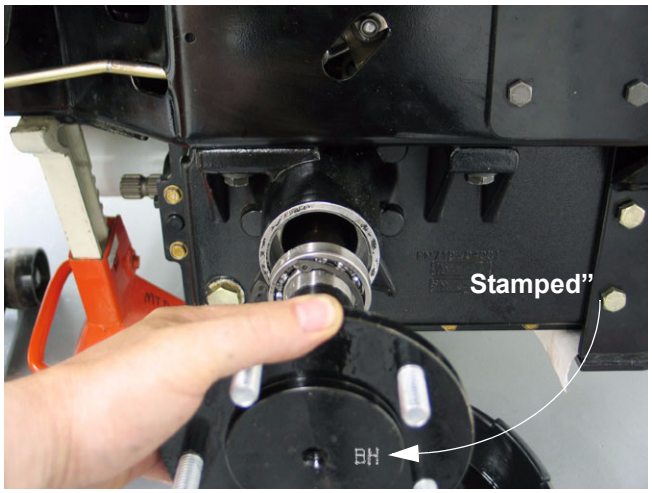

Figure 3.1

3.2. Install the retaining ring in the groove in the housing. Confirm that the ring is fully seated in the groove. See Figure 3.2.

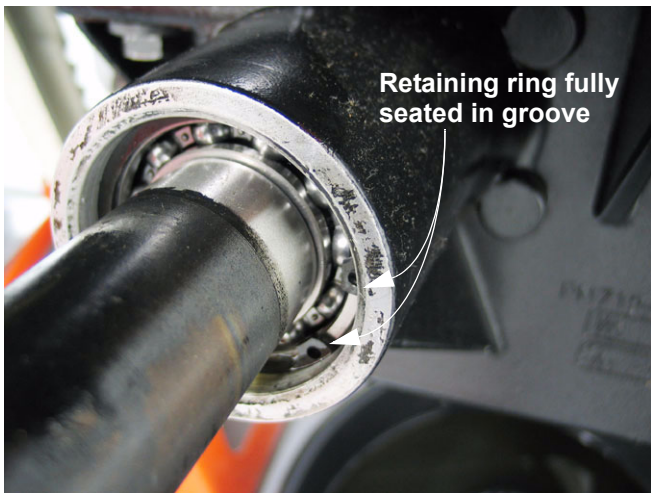

Figure 3.2

3.3. Confirm that the axle is lubricated and free of foreign objects that may damage the lip of the seal.

3.4. Slide the seal into position at the end of the axle bore in the housing.

3.5. Carefully pry the seal into the bore. Use a piece of dimensional lumber, or similar object to press with. This will ensure that the seal is pressed in evenly, and winds up flush with the outer surface of the housing. A brake adjustment spoon or similar tool can be used to apply force to the item used to press the seal in. See Figure 3.5.

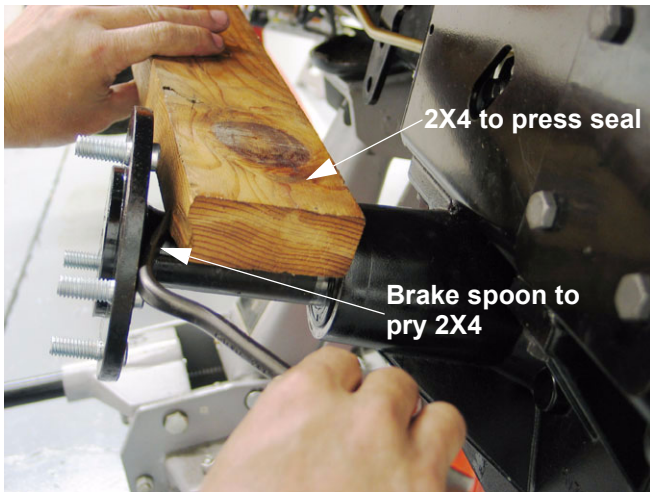

Figure 3.5

3.6. Install the rear wheel using a 3/4" socket.

3.7. Lower the tractor to the ground. Tighten the lug nuts to a torque of 60-70 ft.lbs.

3.8. Safely lift and support the other side of the tractor in similar fashion to the first side.

3.9. Repeat the procedure on the second side.

3.10. Replace any lost transmission fluid with Cub Cadet hydraulic drive system fluid plus. (P/N 737-3120: Qt. P/N 737-3121 Gal.)

3.11. Test-run the tractor in a safe area before returning it to service.

3.12. Check lug nut torque after 10 hours of use.

Series 5000 deck adapter kit 190-830-100

ABOUT THIS SECTION:

The 190-830-100 deck adapter kit enables a mid mount cutting deck to be mounted on the Series 5000 Cub Cadet tractor. It should be ordered by the dealer in conjunction with the intended mower deck: without the deck a dapter, the deck cannot be mounted.

1. PREPARATION AND BRACKETS:

1.1. Compare the contents of the kit to the parts list. confirm that all the parts are present and identify the parts for assembly purposes.

1.2. Position the tractor in a clear, safe work area with sufficient room to move around the tractor, and at least 8’ of clear space to the right of the tractor.

1.3. Chock the front wheels.

1.4. Loosen the lug nuts on the right rear wheel using a 3/4” socket.

1.5. Lift and safely support the right rear of the tractor.

1.6. Remove the right rear wheel.

1.7. Remove the lynch pin securing the right lift link to the right lift arm (three point hitch) at the rear of the tractor, and disconnect the lift link from the lift arm. See Figure 1.7.

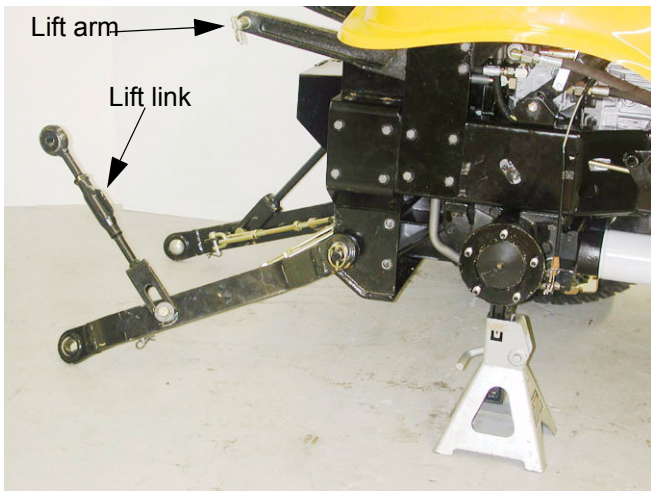

Figure 1.7

1.8. Attach the rear hanger brackets (left and right) to each side of the tractor frame. The pin on each bracket should face outward, near the lower rear corner of the bracket. See Figure 1.8.

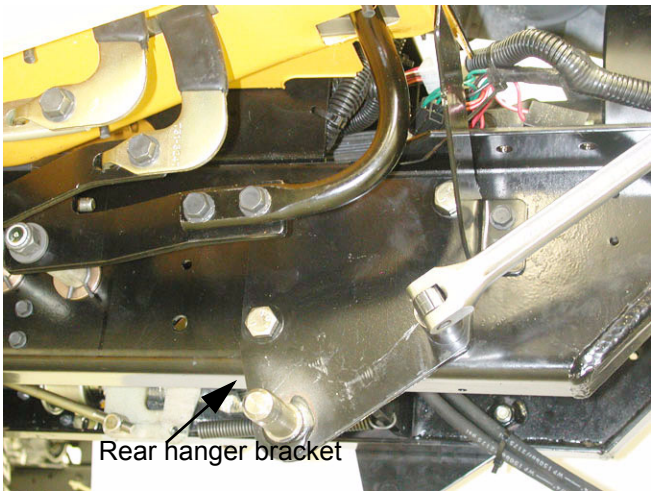

Figure 1.8

1.9. Tighten the bolts to the weld nuts at 70-80 ft.-lbs. using a 3/4” socket.

1.10. Attach the front hanger brackets (left and right) to the front corners of the frame They should be oriented so that the the box sections are on the inside of the brackets, and the slots on the front. Tighten the bolts to 70-80 ft.-lbs. using a pair of 3/4” wrenches. See Figure 1.10.

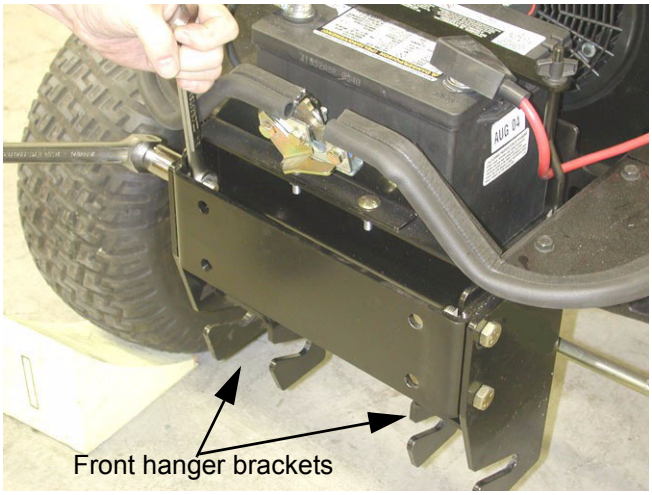

Figure 1.10

Series 5000 deck adapter kit 190-830-100

1.11. Install the lift crank rod from the back of the tractor. Teh rolled eyelets at each end of the rod should face down. The off-set section at the center of the rod whould face out, away from the frame, and the longer end of the rod should be toward the back of the tractor. See Figure 1.11.

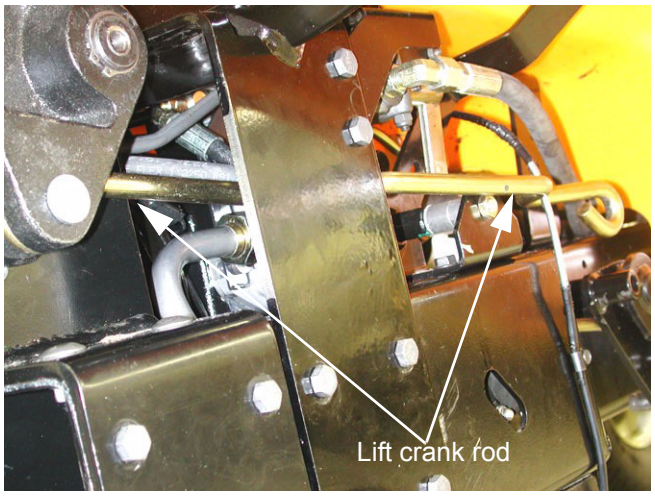

Figure 1.11

1.12. Attach the lift rod crank to the rear lift arm with a clevis pin. the clevis pin should be oriented so that the hairpin clip that secures it is on the inside of the arm. See Figure 1.12.

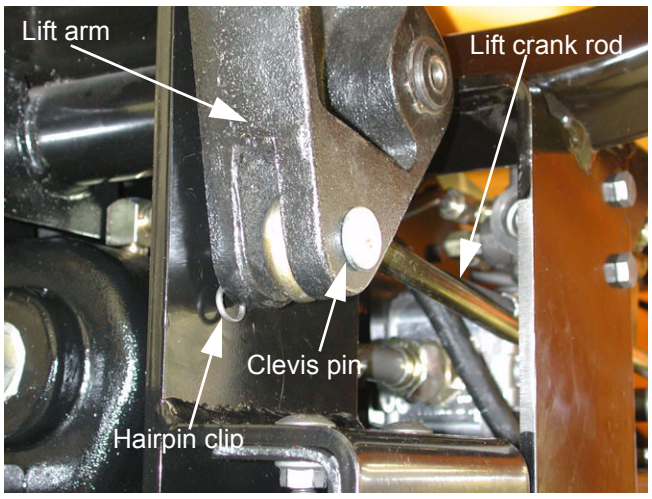

Figure 1.12

2. LIFT SHAFT AND ARMS:

2.1. Install one Double-D bushing in the right side frame, with the flange outside the frame. See Figure 2.1.

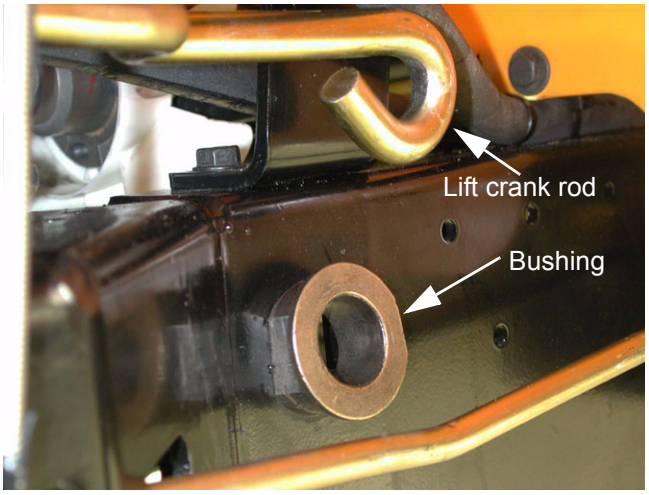

Figure 2.1

2.2. Slip the right side lift arm (from the kit) onto the lift shaft so that the hollow post rests in the notch on the arm that is welded to the lift shaft. See Figure 2.2.

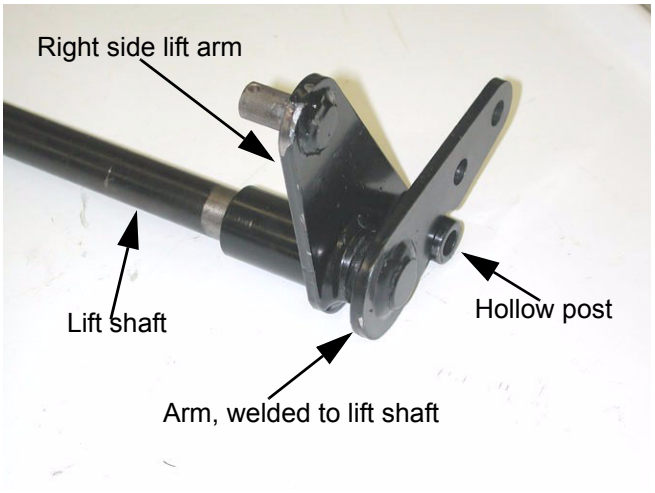

Figure 2.2

2.3. Install the lift shaft in the frame, through the Double-D bushing. Hook the front eyelet on the lift crank rod over the solid post on the right side lift arm. See Figure 2.3.

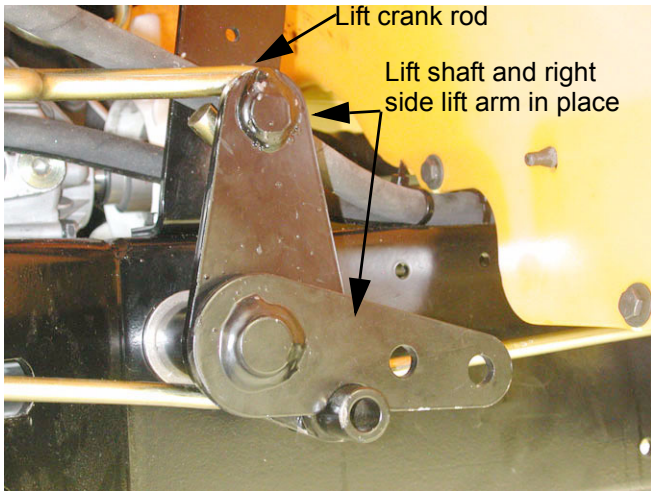

Figure 2.3

2.4. Install the second Double-D bushingover the lift shaft and into the left side of the frame.

2.5. Install the left side lift arm on the lift shaft so that it is parallel with the right side lift arm. The holes in the arm must align with the holes in the lift shaft. The arm should be stepped-out away from the frame. See Figure 2.5.

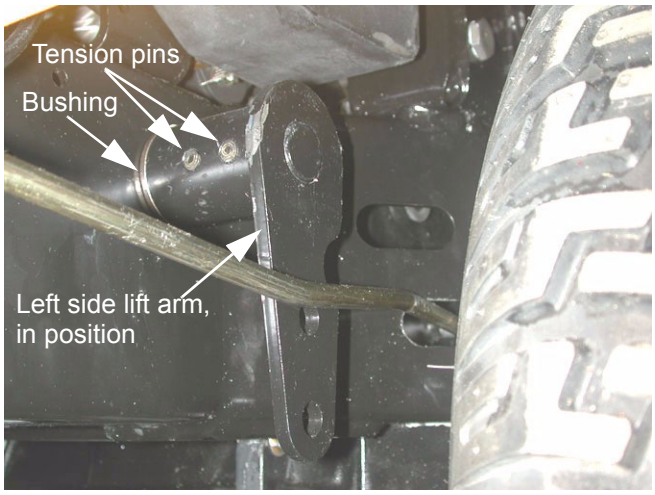

Figure 2.5

2.6. Secure the left side arm to the lift shaft with the two tension pins.

2.7. Secure the lift crank rod to the right side lift arm using a hairpin clip.

3. HANGER TO DECK CONNECTIONS

3.1. Assemble the hanger rod mounting pins to the front hanger rod, then install the nylon locking nuts onto the hanger rod ends. Tighten the nuts until they are about 1” from the ends of the rod. See Figure 3.1.

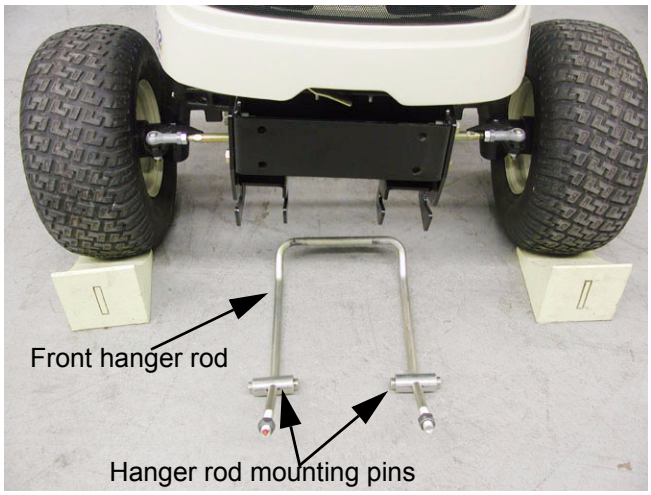

Figure 3.1

3.2. Slide the shouldered ends of the hanger rod mounting pins into the slots in the front hanger brackets, so that the bottom of the rod is roughly parallel to the ground.

3.3. Install the fixed lift link between the inner and outer brackets welded near the back of the deck, on the right side. See Figure 3.3.

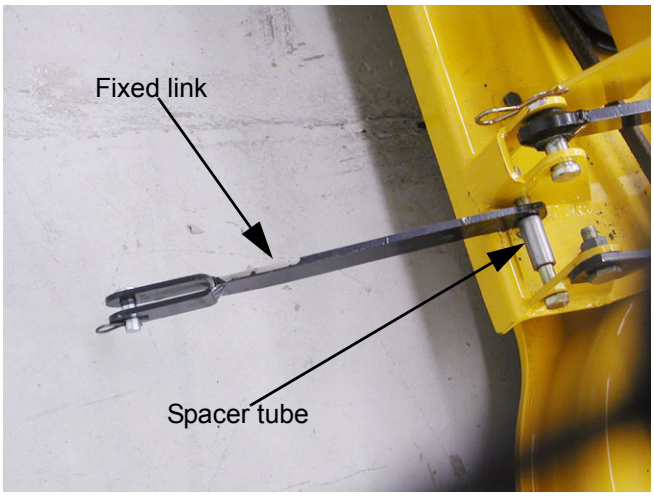

Figure 3.3

NOTE: The spacer tube is outboard of the lift link, on the bolt. Tightne the bolt to a torque of 70-80 ft.-lbs. using a pair of 3/4” wrenches.

3.4. Install the clevis end of the adjustable lift link between the inner and outer brackets welded near the back of the deck, on the left side. See Figure 3.4.

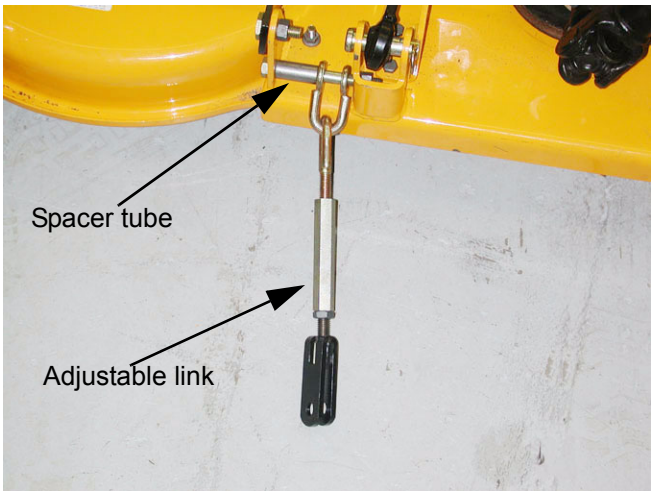

Figure 3.4

NOTE: The spacer tube is outboard of the lift link, on the bolt. Tighten the bolt to a torque of 70-80 ft.-lbs. using a pair of 3/4" wrenches.

3.5. Connect the deck lift links (flat links with fixed spherical bearing ends) to the inner brackets near the back of the frame (left and right) using clevis pins and hairpin clips.

3.6. Connect the deck side braces (flat links with plain ends) to the outer-most location on the brackets (left and right) at the rear of the deck using shoulder bolts. They should be oriented to angle inward from the mounting point on the deck. Tighten the bolts to a torque of 70-80 ft.-lbs. using a 15/16" wrench and a 3/4" wrench.

4. MATING THE DECK TO THE TRACTOR

4.1. Remove the hairpin clips and clevis pins that prevent the rear deck caster wheels from swiveling.

4.2. Install the retaining ring on the input shaft of teh gearbox on the cutting deck. It acts as a stop for the driveshaft.

4.3. Connect the drive shaft to the deck, and secure it with the socket head cap screw as a through-bolt. Tighten the nut to 12 ft.-lbs. using a 1/2" wrench and a 1/4" allen wrench.

4.4. Fold the lift links and side braces to the rear.

4.5. Fold the fixed link and adjustable link to the front and slide the deck under the tractor from the right side. See Figure 4.5.

Figure 4.5

NOTE: After initial installation of the deck lift kit, it is not neccessary to remove the rear wheel to install the deck.

4.6. Hook the front hanger rod into the bracket at the front of the deck.

4.7. Slide the collar on the rear drive shaft yoke to connect it to the 2000 R.P.M. P.T.O. output shaft on the front of the transmission.

4.8. Connect the adjustable link to the lift arm on the left side of the frame using a clevis pin and hair-pin clip.

4.9. Connect the fixed link to the lift arm on the right side of the tractor using a clevis pin and hairpin clip.

4.10. Engage the forward end of each lift link to the pin on the front hanger bracket.

4.11. Connect each side brace to the pin on the front hanger bracket, and secure each with a lynch pin.

NOTE: It may be neccessary to lift the front of the deck to make the final connection.

4.12. Install the clevis pins and hairpin clips that fix the caster wheels.

4.13. Install the rear wheel, and lower the tractor to the ground.

4.14. Torque the lug nuts to 60-70 ft.-lbs. using a 3/4" wrench.

4.15. Check the air pressure in the tires: it should be 15 psi., and evenly matched between the left and right sides.

4.16. Ensure that no dangerous conditions will arise from starting the tractor. Start the tractor and lift the deck clear of the ground, to roughly the mid-point of it's up/down travel.

4.17. Turn the engine off and remove the keys from the key switch.

NOTE: Effective cutting height of the deck is measured at the bottom of the blade tips when they are appropriately positioned for the measurement to be taken (latteral for side-to-side leveling, longintudinal for fore/aft adjustment). Use caution when rotating the blades. Heavy gloves ar reccomended.

4.18. Level the deck side-to-side using the adjustable link on the left side. Lock the turnbuckle wiht the jam nut using two 3/4" wrenches.

4.19. Use the nylon locking nuts on the front hanger rod to adjust the fore/aft attitude of the deck. It should be roughly 1/4" lower at the front than at the back for most cutting conditions. Both ends of the hanger rod should be under equal tension when the adjustment is correct.

4.20. Operate the tractor, and test all operational functions before returning it to service.

Series 5000 deck adapter kit 190-830-100

Domestic Compact Dash and Steering Pump

ABOUT THIS SECTION:

The parking brake linkage, throttle lever and cable, power steering pump, and portions of the electrical system are accessible by removing the dash panel. It may be possible to service these systems without removing the dash panel. Removing the dash is a relatively simple procedure, and the ease of access provided by doing so will save time.

1. DASH PANEL REMOVAL

1.1. Park the tractor on a firm level surface, open the hood, and disconnect the negative battery cable.

1.2. Removing the two phillips head screws at the top of the insert panel will allow the panel to be tilted back and lifted out of the dash panel. See Figure 1.2.

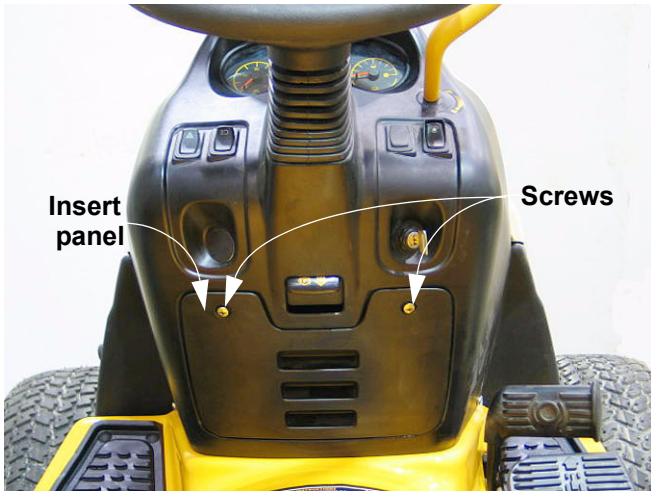

Figure 1.2

1.3. With the insert panel removed, the fuse and relay center can be easily reached in the lower right corner of the dash.

1.4. The switches can be removed by squeezing the tabs on the short sides of the switch body, and pushing them up through the dash panel. See Figure 1.2.

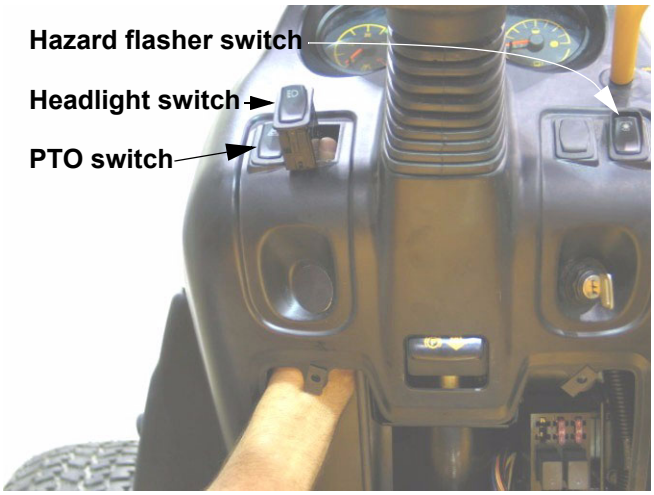

Figure 1.4

NOTE: It is not necessary to disconnect or remove the switches to remove the dash panel.

1.5. Disconnect the wiring harness from the instrument panel. The plug can be reached from under the hood. See Figure 1.5.

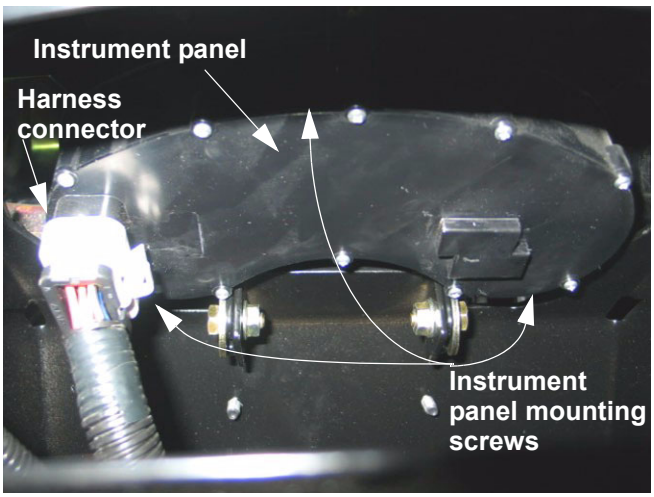

Figure 1.5

NOTE: If the instrument panel is to be removed, the three screws that secure it can be removed using a 7/16” wrench.

Domestic Compact Dash and Steering Pump

1.6. Use a pair of 1/2” wrenches to loosen the bolts flanking the instrument panel on the inside of the dash panel. The mounting holes in the dash panel are slotted, so the bolts need not be completely removed.

1.7. There are tabs on the perimeter of the steering wheel cover that clip into each spoke of the steering wheel. Depress these tabs and pry off the cover. See Figure 1.7.

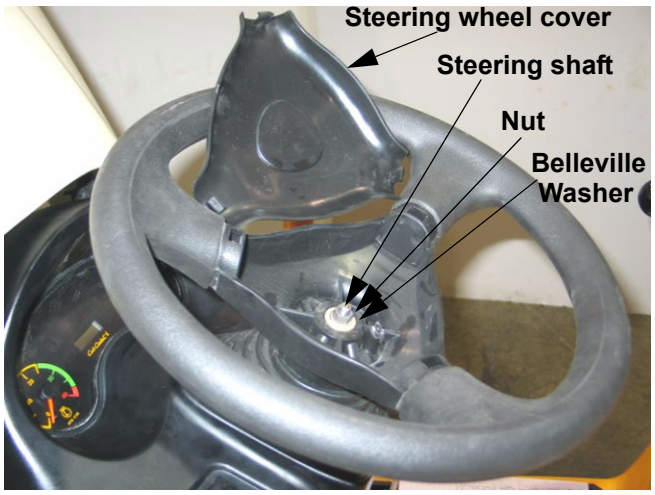

Figure 1.7

1.8. The nut and belleville washer that secure the steering wheel can be removed using a 1/2” wrench.

1.9. Remove the steering wheel. It may be necessary to drive the steering wheel off of the splined steering shaft using a soft dead-blow hammer.

1.10. The bottom lip of the steering shaft boot can be easily separated from the dash panel.

1.11. There is a shoulder bushing and flat washer on the steering shaft. They provide support for the steering shaft boot, and reduce friction between it and the steering shaft. Remove them. See Figure 1.11.

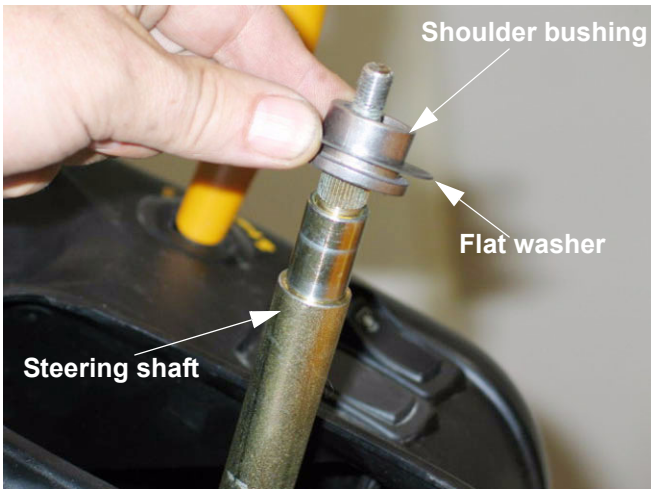

Figure 1.11

1.12. Remove the side panels from the engine compartment.

1.13. Disconnect the throttle cable from the injector pump on diesel powered tractors. On Caterpillar engines, the cable is connected to the pump with a hairpin clip and clevis pin. Use a 5/16” wrench and a 3/8” wrench to loosen the cable clamp. See Figure 1.13.

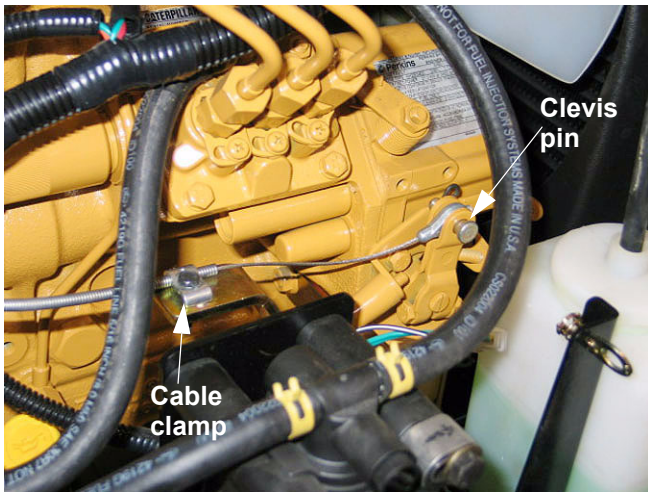

Figure 1.13

1.14. On Briggs & Stratton / Daihatsu engines, a Z-fitting connects the cable to the pump. An 8mm wrench will fit the screw on the cable clamp. See Figure 1.14.

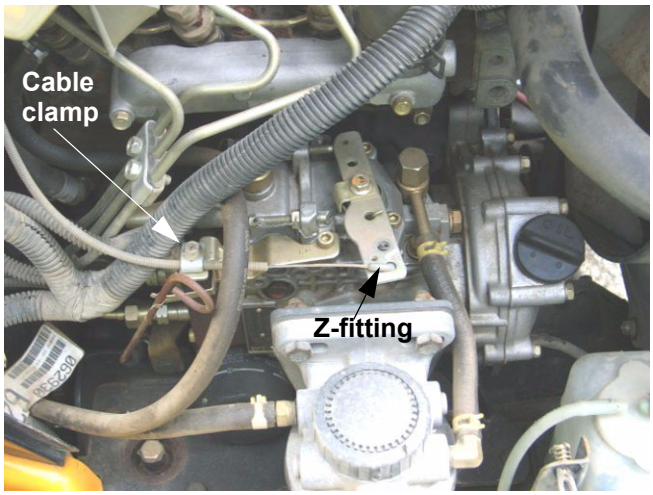

Figure 1.14

1.15. On gasoline powered tractors, the choke cable must also be disconnected. Use an 8mm wrench to loosen the cable clamps, then unhook the z-fittings. See Figure 1.15.

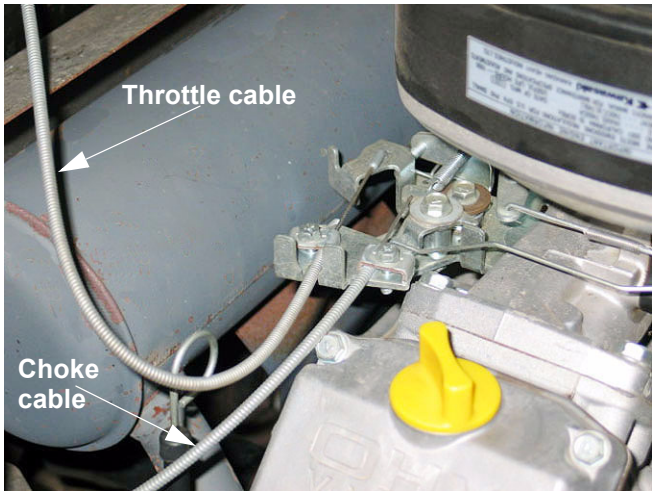

Figure 1.15

1.16. Remove the two phillips head screws that secure the lower rear corners of the dash panel. See Figure 1.16.

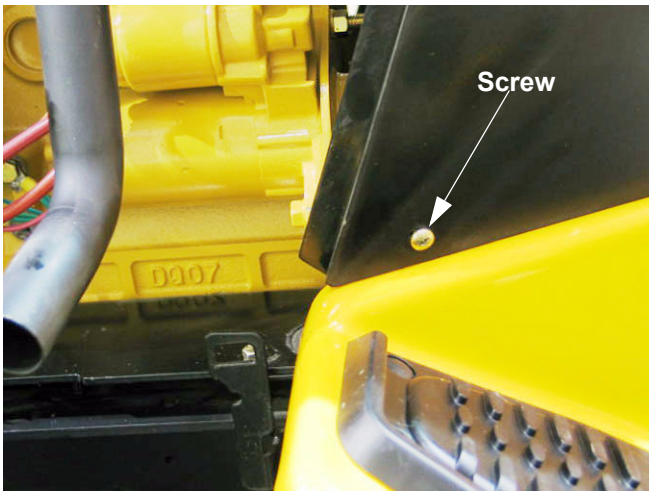

Figure 1.16

1.17. Disconnect the dash wiring harness from the main wiring harness by unplugging the connector that is near the fuse / relay center.

1.18. Use a 1/2” wrench to remove the two screws holding the base of the dash panel to the pedestal. See Figure 1.18.

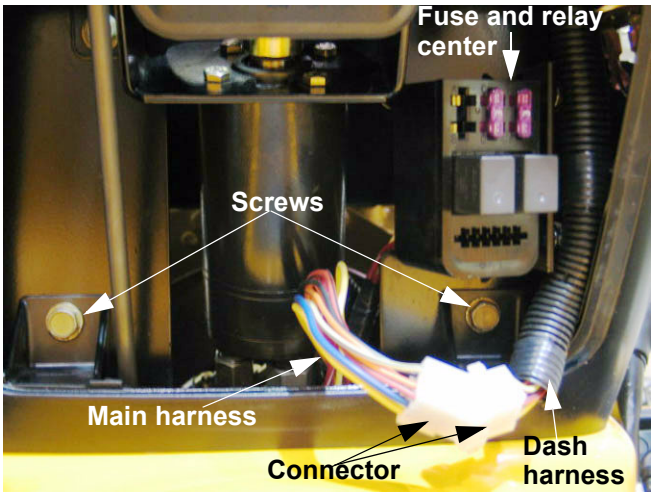

Figure 1.18

1.19. Close the hood.

Domestic Compact Dash and Steering Pump

1.20. Carefully lift the dash panel and remove it from the tractor. Confirm that the wiring harness and control cables do not snag as they pull out with the dash panel. See Figure 1.20.

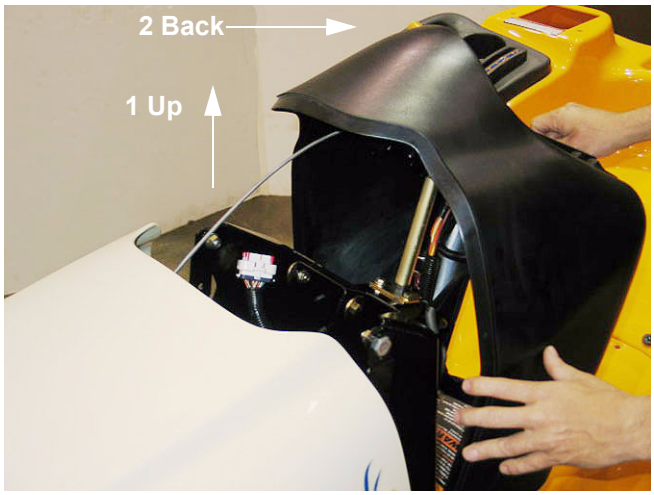

Figure 1.20

1.21. Dash panel installation is essenitally the the reverse of the removal process. The following tips may ease the installation:

1.22. Route the control cables as the dash panel is lowered into place. The throttle cable passes through the grommeted hole at the top right corner of the lower heat shield. See Figure 1.22.

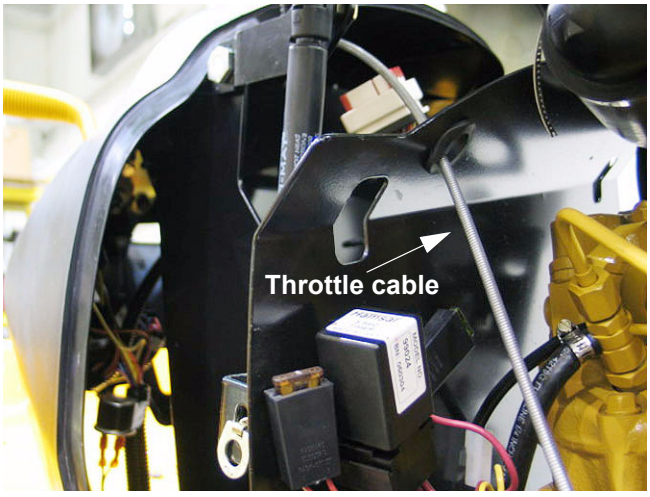

Figure 1.22

1.23. The choke cable on gasoline engined tractors passes through the large opening in the pedestal, below and to the left of the steering column bracket. See Figure 1.23.

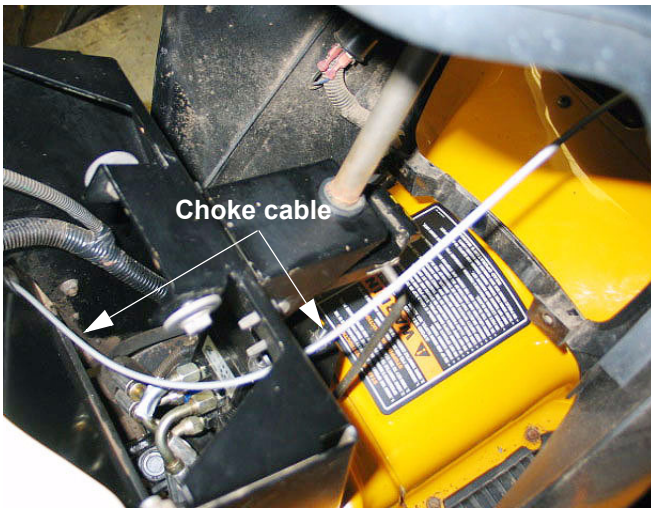

Figure 1.23

1.24. The choke cable then passes through the grommeted hole at the lower right corner of the lower heat shield. See Figure 1.24.

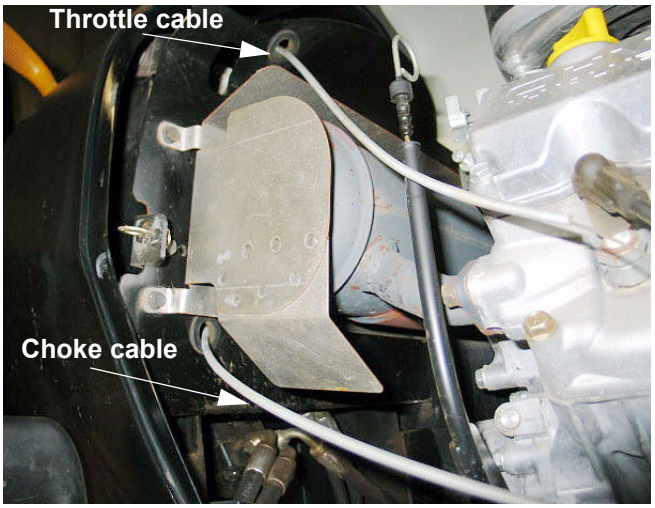

Figure 1.24

1.25. Lower the dash panel into positon, so that the slotted holes flanking the instrument panel slip over the bolts between the heavy flat washers and the pedestal.

1.26. Confirm that the lower rear cornerof the dash panel has cleared the brake pedal.

1.27. Confirm that the lower right mounting point has cleared the fuse and relay center.

1.28. Connect the choke and throttle control cables in the slack position.

1.29. On gasoline powered tractors:

- Apply full choke, confirm that the choke plate is fully closed, tighten the choke cable clamp.
- Release the choke, confirm that the choke plate in the carburetor opens fully.

NOTE: If the choke does not fully close, the tractor will be extremely difficult to start when the engine is cold.

1.30. Adjust the throttle cable so that the wide open throttle travel stop on the injector pump or carburetor coincides with the full throttle travel stop on the control lever.

1.31. Tighten the throttle cable clamp.

1.32. If the throttle lever has been disassembled, confirm that sufficient friction exists to maintain a throttle setting. Do not apply so much friction that the throttle lever becomes difficult to move.

1.33. If throttle tension needs to be adjusted, do so before the dash panel is fastened down. It will be necessary to lift the dash panel to reach the adjustment nut with a 9/16" wrench.
See Figure 1.33.

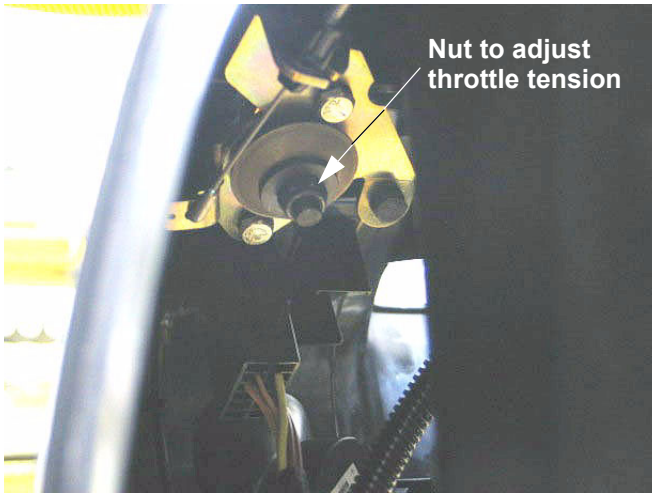

Figure 1.33

2. THE DASH PANEL

2.1. The primary reason to remove the dash panel would be to gain access to the following items:

- parking brake linkage, mounted to the pedestal
- steering shaft & pump, mounted to the pedestal
- throttle assembly, mounted to the dash panel

2.2. There are electrical components (instrument panel, key switch, dash panel wire harness, PTO switch , hazard flasher switch, headlight switch, hazard flasher relay) mounted to the dash panel. It is not necessary to remove the dash panel to service any of these components.
See Figure 2.2.

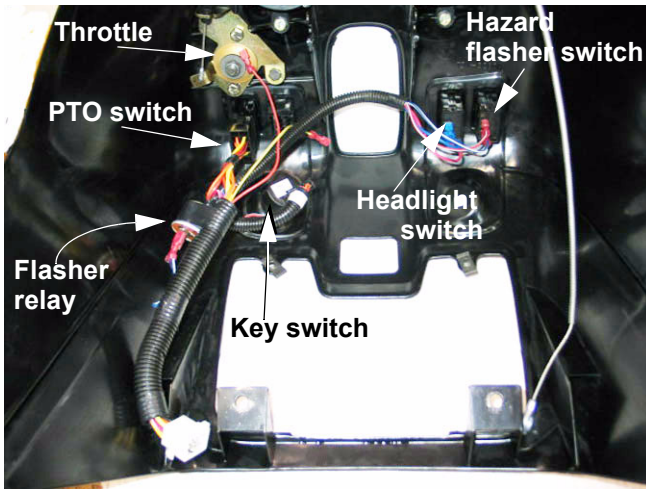

Figure 2.2

2.3. When in position on the tractor, access to the throttle assembly is blocked by the heat shield.

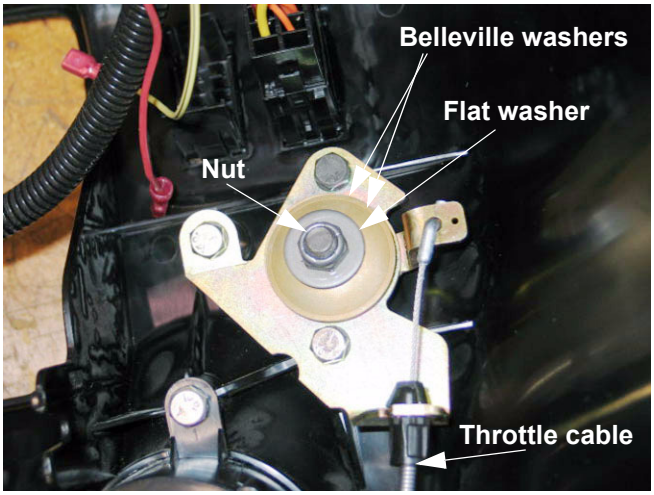

Figure 2.3

Domestic Compact Dash and Steering Pump

2.4. The throttle cable can be removed from the throttle assembly by squeezing the barbs on the cable end.

2.5. The lock nut, flat washer and two bellville washers can be removed from the base of the throttle lever, using a 9/16” wrench. See Figure 2.5.

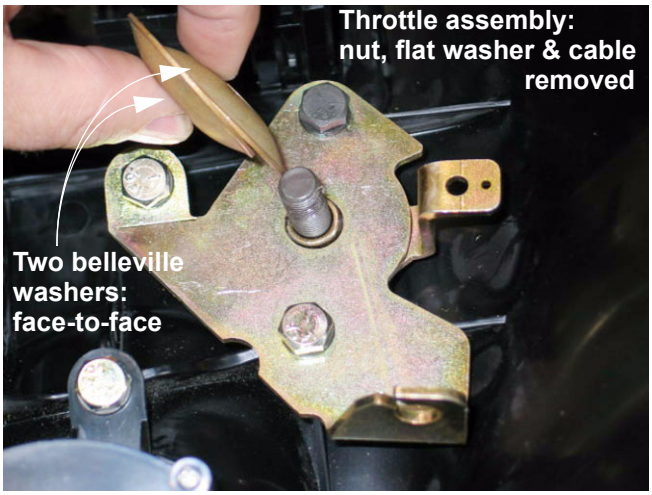

Figure 2.5

2.6. The throttle lever can then be removed from the throttle assembly. See Figure 2.6.

Figure 2.6

2.7. The throttle assmebly can be unbolted fromt he dash panel using a 7/16” wrench. See Figure 2.7.

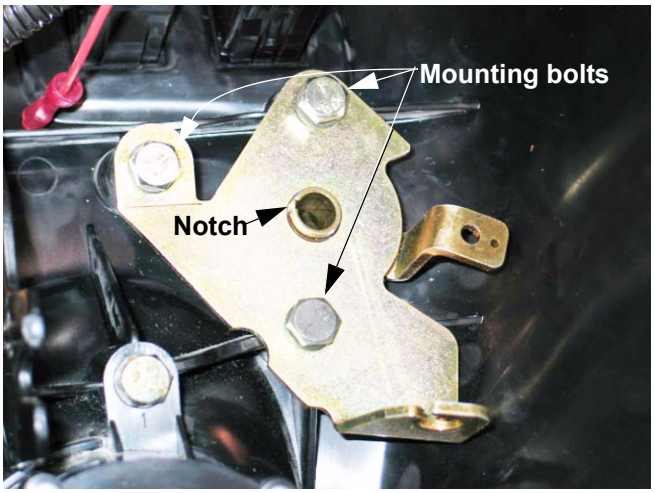

Figure 2.7

2.8. The correct order of assembly for the throttle is: throttle tab, friction washer, mounting plate, two bellville washers (face-to-face), flat washer , locking nut. The throttle lever passes through all of these parts, with the ears on the lever engaging the slots in the throttle tab. See Figure 2.8.

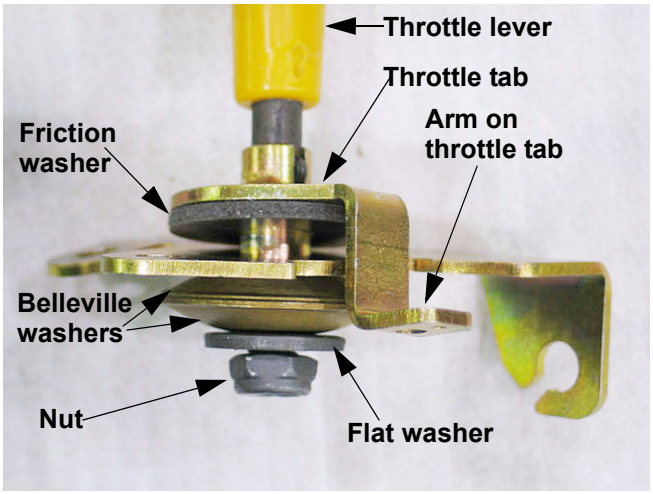

Figure 2.8

NOTE: The throttle lever should be extend in the same direction as the arm on the throttle tab. The ears on the throttle lever allow it to be installed in one of two positions: aligned with the arm, or 180 out, facing the opposite direction.

3. STEERING SHAFT AND PUMP: SAUER

3.1. **Identification:** Series 7000 tractors built before the 2004 model year are equipped with a Sauer steering pump. The body of the Sauer pump is round in cross-section. O-ring fittings for the hydraulic lines are located on the bottom surface of the pump. See Figure 3.1.

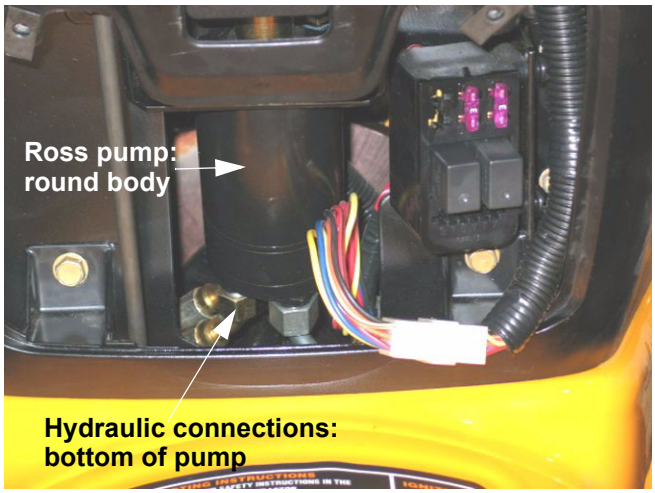

Figure 3.1

3.2. To access the steering shaft and pump, remove the dash panel as described in the dash panel removal section.

3.3. Remove the hairpin clips and spring that secure the parking brake rod to the brake lever bracket. See Figure 3.3.

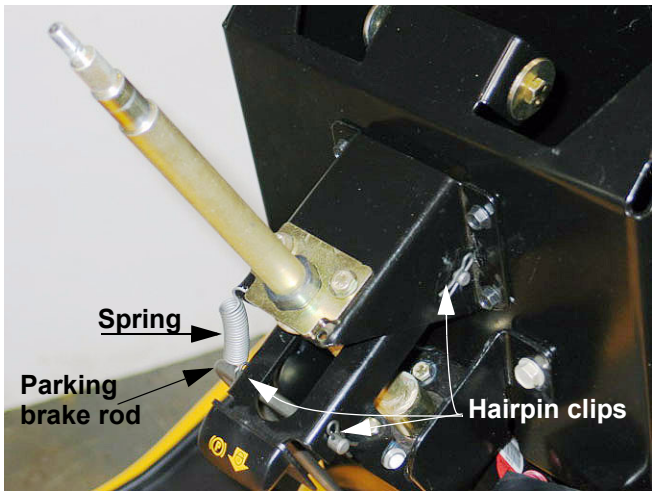

Figure 3.3

3.4. Remove the hairpin clip and clevis pin that secure the brake lever bracket to the steering column bracket. The steering shaft passes through the brake lever bracket.

3.5. Remove the four bolts that hold the steering column bracket to the pedestal using a 3/8” wrench. See Figure 3.5.

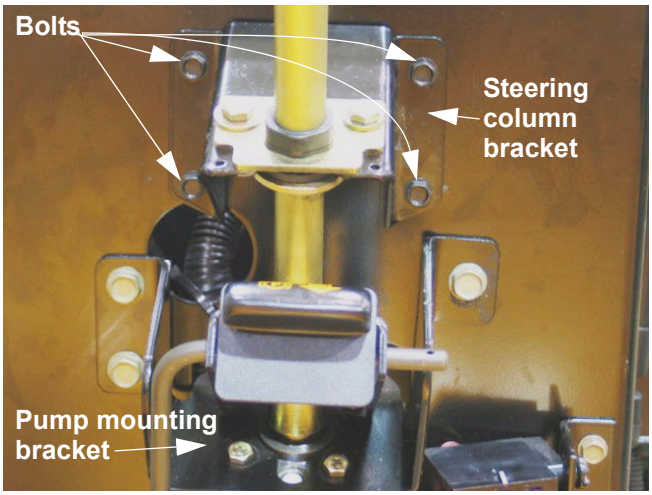

Figure 3.5

3.6. Lift the steering column bracket and steering shaft off of the pedestal.

3.7. Slide the brake lever bracket to the right to remove it from the parking brake rod.

NOTE: If the plastic parking brake lever needs to be replaced, it is not necessary to remove the brake lever bracket.

3.8. Clean the area surrounding the steering pump hydraulic connections and mark the hydraulic lines connected to the steering pump to ease installation:

- The small hose on the front left side of the steering pump (“L” port) goes to the shaft end of the steering cylinder.
- The small hose just behind the front left hose (“R” port) goes to the base end of the steering cylinder.
- Large hose at the rear of the pump (“E” port) goes to the bottom port on the hydraulic control valve.
- The large hose at the front of the pump (“P” port) goes to the top fitting on the hydraulic pump.
- The small hose on the right side of the pump (“T” port) goes to the forward-facing elbow on the return manifold.

Domestic Compact Dash and Steering Pump

3.9. Place a drain pan under the steering pump.

3.10. Working from back to front, disconnect the hydraulic lines fromthe steering pump. Cap the lines as they are removed. See Figure 3.10.

- On the large lines, use a 13/16” wrench to turn the fitting while holding the adaptor with a 3/4” wrench.
- On the small lines, use an 11/16” wrench to turn the fitting while holding the adaptor with a 5/8” wrench.
- After the front-most line is loosened, it may be easiest to unbolt the pump before the line is removed completely.

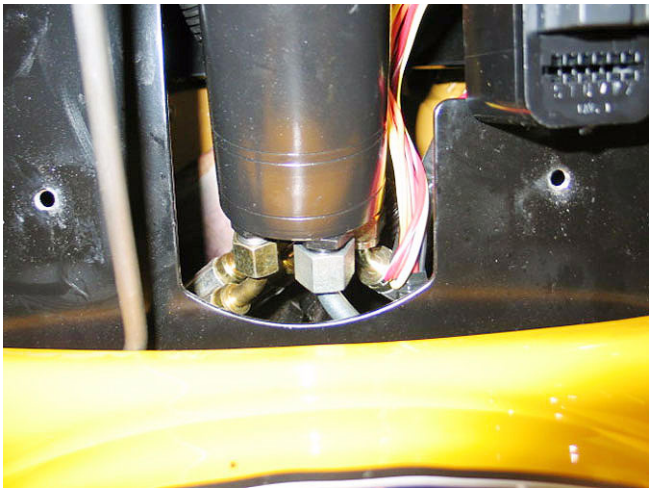

Figure 3.10

3.11. Unbolt the steering pump from the pump mounting bracket using and 10mm wrench. See Figure 3.11.

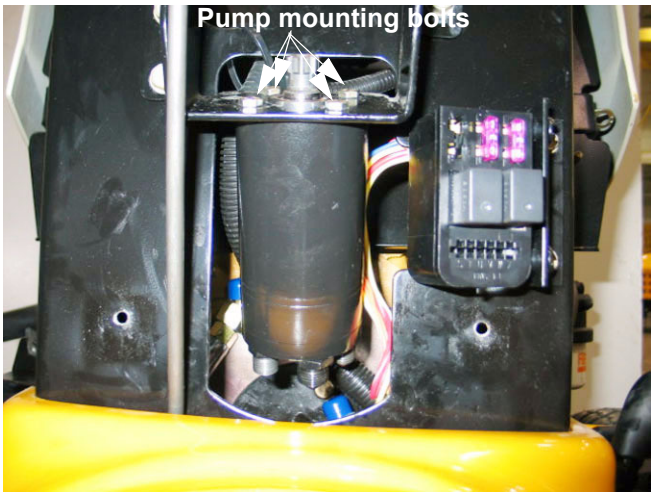

Figure 3.11

3.12. The ports are labeled on the bottom of the steering pump. See Figure 3.12.

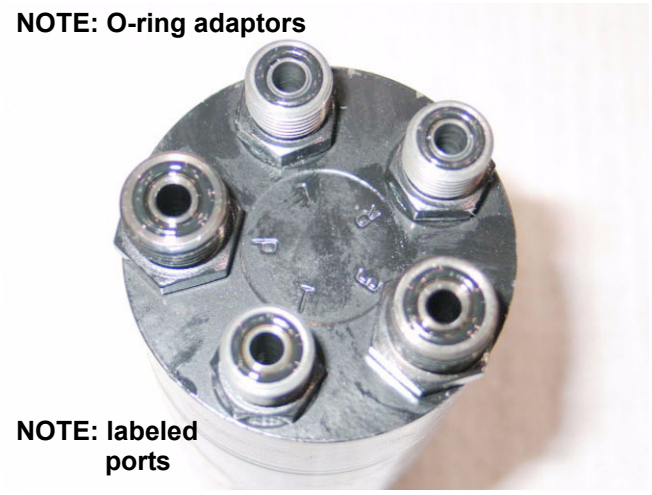

Figure 3.12

3.13. Intallation is the reversal of the removal process. The following are notes on installation:

- Attach the steering pump to the pump mounting bracket. Tighten the bolts to a torque of 10 ft.-lbs.
- Position the steering shaft and steering coulmn bracket as an assembly, connecting the parking brake lever and parking brake rod in the process. It will be neccesssary to rotate the steering shaft until the base of the shaft engages the steering pump
- Bolt the steering column bracket to the pedestal.
- Connect all of the hydraulic fittings previously removed from the the pump.
- Install the dash panel and steering wheel on the tractor, but do not fasten the dash panel in place.
- Connect the main wire harness to the dash panel wire harness and the instrument panel.
- Test run the tractor in a safe area to check the operation of the steering and to confirm that there are no hydraulic leaks. Repair any problems that are identified.
- After successful testing, complete final assembly.

4. STEERING SHAFT AND PUMP: ROSS

4.1. Series 7000 tractors built during and after the 2004 model year, and all 5000 series tractors are equipped with a Ross steering pump. The body of the Ross pump is square in cross section. Flare fittings that connect to the hydraulic lines are located on the bottom end of the pump. See Figure 4.1.

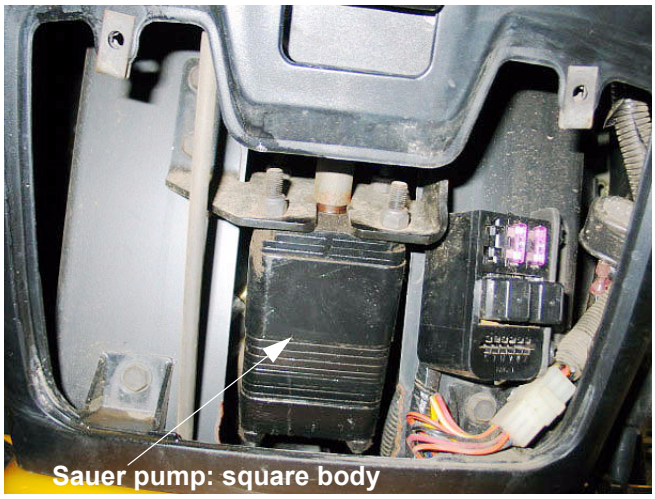

Figure 4.1

4.2. To access the steering shaft and pump, remove the dash panel as described in the dash panel removal section.

4.3. Remove the hairpin clips that secure the parking brake rod to the brake lever bracket. See Figure 4.3.

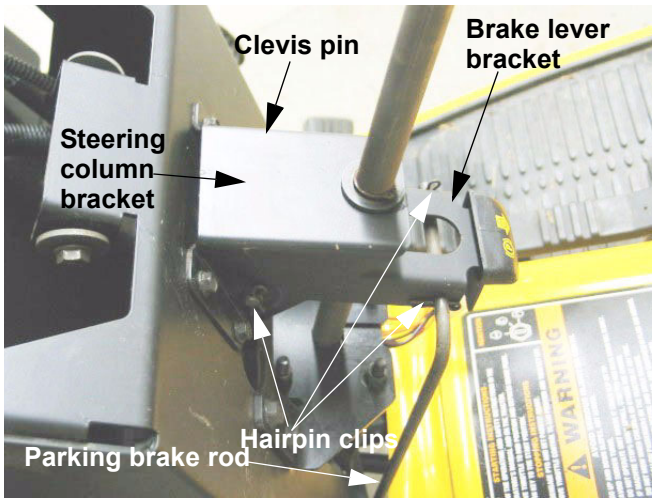

Figure 4.3

4.4. Remove the hairpin clip and clevis pin that secure the brake lever bracket to the steering column bracket. The steering shaft passes through the brake lever bracket.

4.5. Remove the four bolts that hold the steering column bracket to the pedestal using a 3/8" wrench.

4.6. Clean the area surrounding the steering pump hydraulic connections and mark the hydraulic lines connected to the steering pump to ease installation: See Figure 4.6.

- The hose at the top left side of the steering pump ("RT" port) goes to the base end of the steering cylinder.
- The hose at the top right side of the steering pump ("LT" port) goes to the shaft end of the steering cylinder.
- The hose beneath the "RT" port of the steering pump ("IN" port) goes to the top fitting on the hydraulic pump.
- The hose beneath the "LT" port of the steering pump ("OUT" port) goes to the forward-facing elbow on the return manifold.
- The hose beneath all of the others ("AUX" port) goes to the bottom port on the hydraulic control valve.
- An 11/16" wrench will fit the fittings and the adaptors.

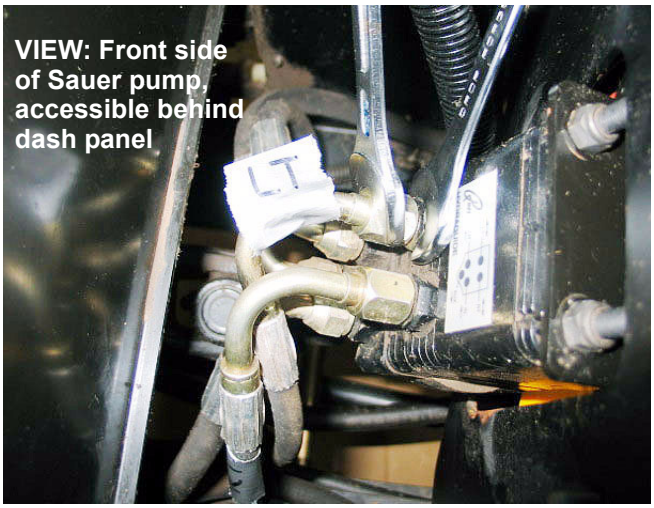

Figure 4.6

NOTE: There is a port diagram on the steering pump.

Domestic Compact Dash and Steering Pump

4.7. After the lines are disconnected, and the lines and fittings are capped, remove the nuts that secure the steering pump to the pump mounting bracket using a 1/2 wrench.

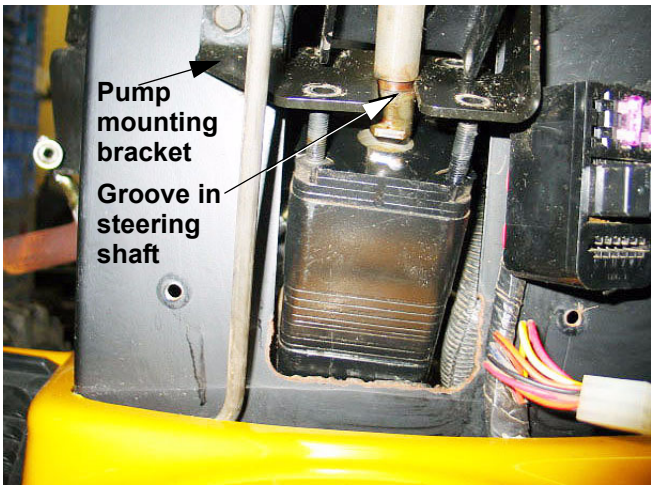

Figure 4.7

4.8. As the pump is lowered away from the bracket, it will separate from the steering shaft.

- The steering shaft has a “Double-D” section at the end of the shaft that engages the pump.
- A groove in the steering shaft engages the pump bracket. The steering shaft cannot be removed until the pump is lowered.

4.9. Once the pump is separated from the shaft, the pump can be removed from the tractor.

4.10. The steering shaft can be lifted out of the tractor along with the steering coumn bracket. See Figure 4.10.

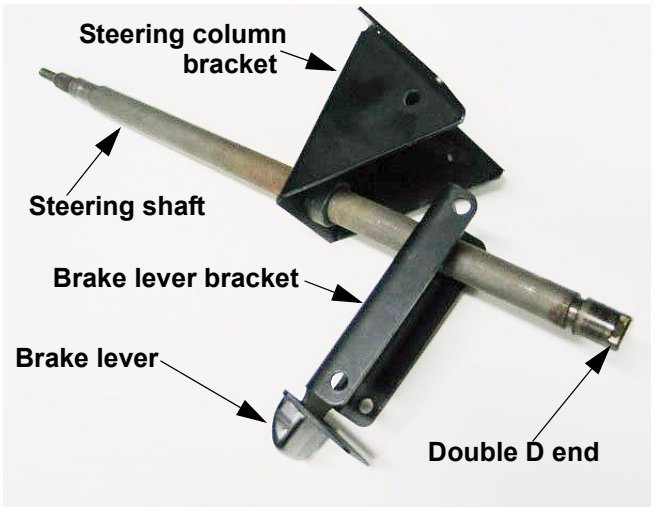

Figure 4.10

4.11. At the technician’s discretion, the retaining ring securing the steering shaft to the steering column bracket can be removed, and the two parts separated before this stage, but it is not essential to removing the steering pump or shaft.

4.12. Intallation is the reversal of the removal process. The following are notes on installation:

- Position the steering shaft and steering coulmn bracket as an assembly.
- Attach the steering pump to the pump mounting bracket, connecting the parking brake lever and parking brake rod in the process . It will be neccesssary to rotate the steering shaft until the base of the shaft engages the steeering pump before the nuts that secure the pump can be tightened.
- If the nylon locking feature of the nuts has worn-out, replace them with new nuts or apply a small amount of threadlocking compound such as Loctite 242 (blue) to the threads. Tighten the nuts to a torque of 17 ft.-lbs.
- Bolt the steering column bracket to the pedestal.
- Connect all of the hydraulic fittings previously removed from the the pump.
- Install the dash panel and steering wheel on the tractor, but do not fasten the dash panel in place.
- Connect the main wire harness to the dash panel wire harness and the instrument panel.
- Test run the tractor in a safe area to check the operation of the steering and to confirm that there are no hydraulic leaks. Repair any problems that are identified.
- After successful testing, complete final assembly.

Domestic Compact Electrical Systems

About this section:

This part of the manual provides verbal descriptions of the function of each electrical component in the system. It is best used to compliment the Cub Cadet Wiring Schematics found on disc 772-9085A-CD, available through Cub Cadet.

The intent is to help orient the skilled but unfamiliar technician with the electrical system on these Cub Cadet tractors.

1. SIMILARITIES AND DIFFERENCES BETWEEN SYSTEMS:

1.1. Series 5000, series 6000, and domestic series 7000 tractors have similar electrical systems. They share a common dash panel and instrument cluster, and are similar in operation.

1.2. The instrument cluster contains a logic board that monitors and controls safety and operating circuits.

1.3. Because the instrument cluster contains circuits that may be over-loaded by a standard test light, it is recommended that a high-impedance test light, or DVOM be used in diagnosing most electrical circuits on the domestic Cub Cadet compact tractors.

NOTE: Typical of these is Thexton part #125 High Impedance Computer Circuit Tester. This tool is available at reasonable cost through many truck vendors, and auto-parts stores such as NAPA.

1.4. Early versions of the Series 7000 used a hall-effect sensor mounted in the transmission to send a tachometer signal.

1.5. There are variations between models and within model lines, primarily according to the engine that is used. Various gas and diesel engines have been sourced from Briggs& Stratton-Daihatsu, Caterpillar, Kawasaki, and Kohler.

1.6. Current gasoline-powered domestic compact tractors get a tachometer signal from the ignition system.

1.7. Current diesel powered domestic compact tractors get a tachometer signal from a hall-effect sender on the crankshaft.

1.8. Gasoline engines will have a magneto ground and after-boom solenoid power-off to turn-off the engine.

1.9. Diesel engines will have a stop solenoid on the injector pump to shut-off the fuel supply and turn-off the engine. See Figure 1.9.

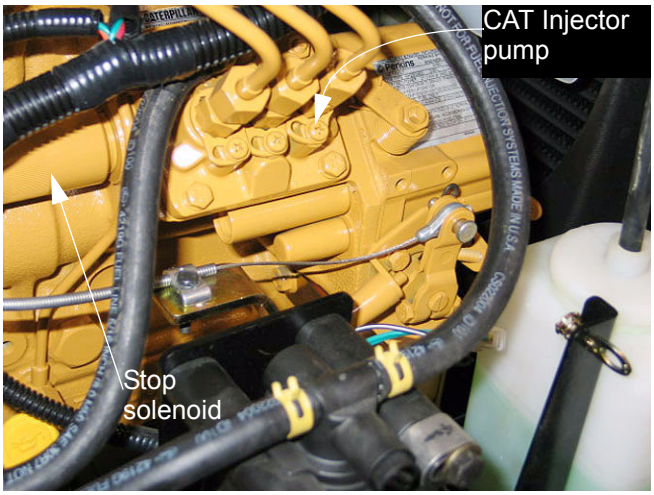

Figure 1.9

1.10. Charging systems differ between the engines: the diesel engines have stand-alone alternators with integrated voltage regulator-rectifiers. See Figure 1.10.

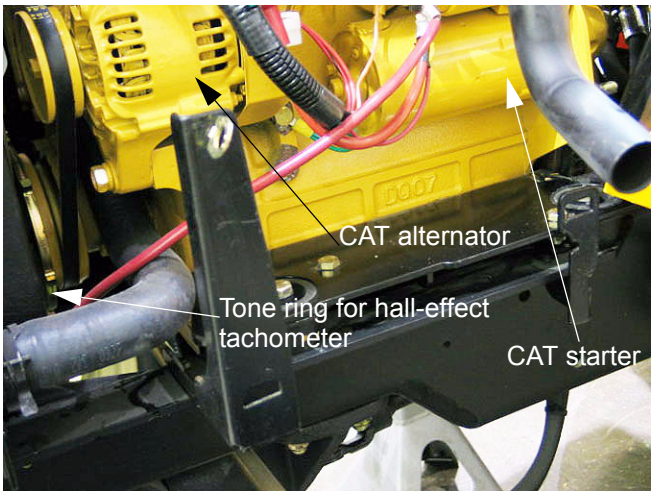

Figure 1.10

Domestic Compact Electrical Systems

1.11. The gasoline engines use flywheel mounted rotors and engine mounted stators to generate A.C. current. The current is processed through regulator-rectifier modules before being passed to the main harness of the tractor. See Figure 1.11.

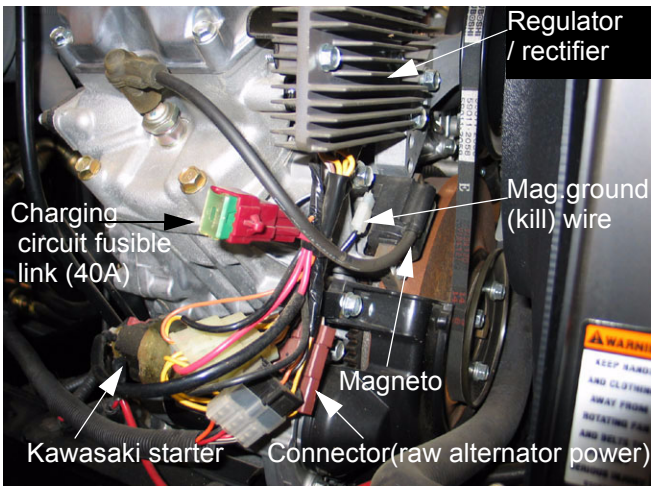

Figure 1.11

1.12. Systems vary slightly between engine manufacturers, but principles of operation are comparable. See Figure 1.12.

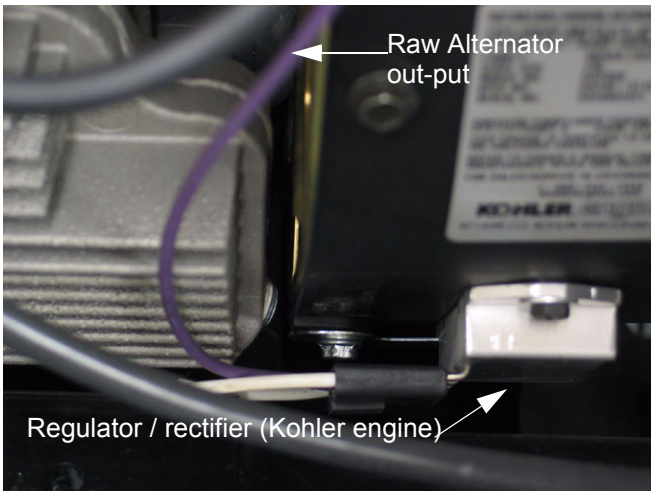

Figure 1.12

1.13. Charging system diagnosis: Flywheel charging systems can be diagnosed using the Briggs & Stratton shunt (B & S part # 19468) or inductive ammeter and DVOM. Charging systems on the diesel engines are similar enough to automotive designs that an automotive type AVR tester (eg. Snap-On MT3750) can be a feasible alternative

1.14. As with all electrical systems, do not neglect the basics: clean connections and good ground paths. See Figure 1.14.

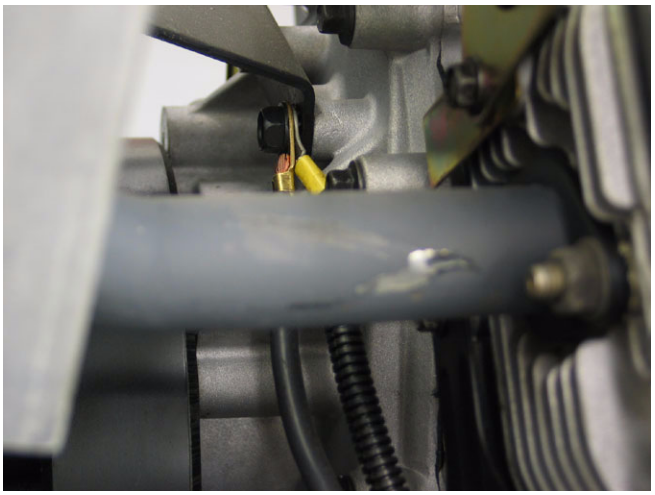

Figure 1.14

2. COMPONENTS

2.1. The heart of the electrical system is in the dash panel. It is some components are accessible from beneath the hood, others may be reached by removing the access panel. See Figure 2.1.

Figure 2.1

2.2. Behind the access panel is a fuse center. See Figure 2.2.

Figure 2.2

- The two fuses (3A) in the right side positions at the top of the center protect the instrument panel.
- The left-most position is empty.
- The right relay, below the fuses, controls the PTO. (P/N: 725-1648)
- The left relay, below the fuses, controls the starter circuit. (P/N: 725-1648)
- Below the relays are unused positions for additional fuses.

2.3. Taped to the harness, just above the fuse center is the flasher relay, in the hazard light circuit. See Figure 2.3.

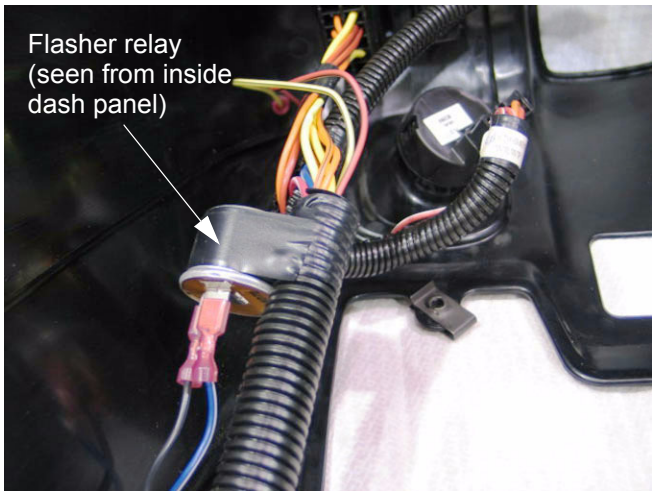

Figure 2.3

2.4. Diesel powered tractors will have the following components at the right rear corner of the engine bay:

- A single relay to power the glow-plug circuit. (P/N: 725-04164)
- A glow-plug timer that supplies power to the windings of the glow plug relay during the pre-start cycle. Caterpillar and Briggs & Stratton - Daihatsu each use different glow-plug timers.
- A main fuse (30A)
- A glow-plug timer fuse (5A)

2.5. Kawasaki powered tractors will have a single relay and main fuse (30A) at the right rear corner of the engine bay. See Figure 2.5.

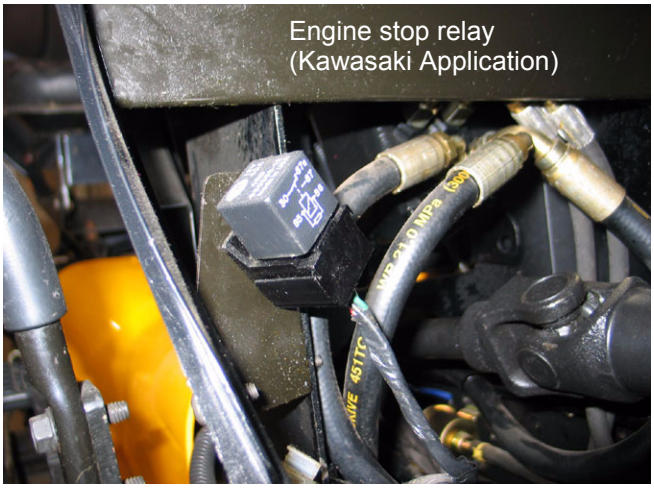

Figure 2.5

- The windings of the relay are energized by the after-fire solenoid circuit.
- When the key switch is turned to the OFF position, power to the after-fire solenoid circuit is cut, de-energizing the relay as well.
- The relay common connection (ground) and the normally closed contact (held open when the windings are energized) connect when power is taken from the windings.
- The normally closed contact leads to the magneto primary windings. When it is grounded, the magneto stops producing sparks.

2.6. Kohler powered tractors use a similar engine kill relay arrangement. See Figure 2.6.

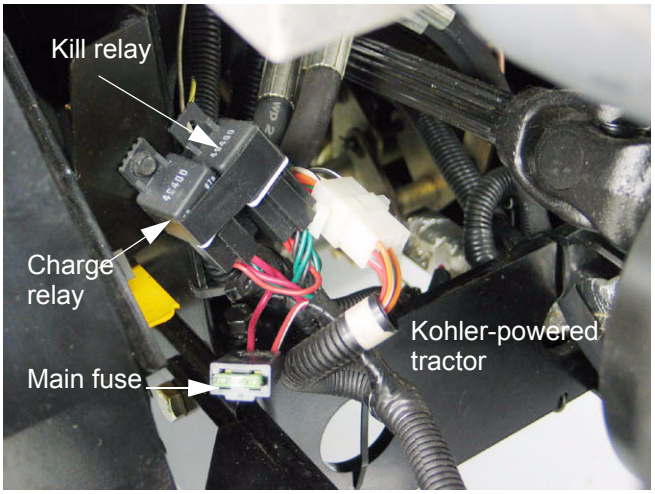

Figure 2.6

- Engine kill relay has red, green, and black wires.
- When the red wires are hot, the relay is energized, pulling the normally closed contact open, breaking the path that grounds-out the magneto.
- When power is taken away from the red wire by turning the key switch to OFF, the relay de-energizes, and the magneto is grounded when the normally closed contact (magneto primary windings) connects with the common contact (ground)
- A second relay controls the charge circuit and after-fire solenoid (red wires, and red wires with white trace).
- When the key is ON, regulator out-put and the after-fire solenoid are connected to the battery: charging the battery and powering the solenoid.
- When the key is OFF, the relay is de-energized, breaking contact with the battery. With the after-fire solenoid receiving power only from the regulator, the fuel flow stops when the rotor (flywheel) stops turning.

2.7. Located on the dash panel are the hazard flasher switch, light switch, PTO switch, Key switch, and instrument panel. See Figure 2.7.

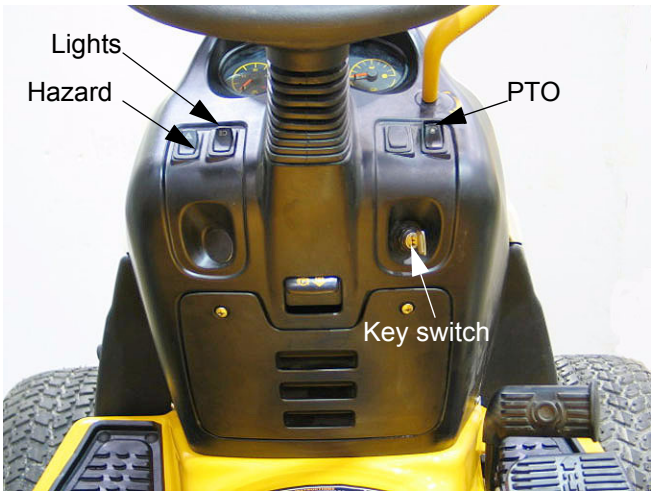

Figure 2.7

2.8. With the access panel removed, any of the rocker switches can be taken out of the dash panel by squeezing the retaining tabs. See Figure 2.8.

Figure 2.8

2.9. The hazard flasher draws constant hot through the red wire with white trace. See Figure 2.9.

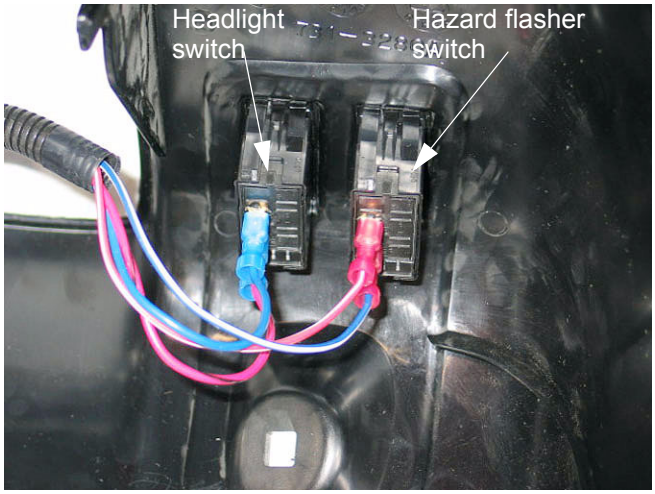

Figure 2.9

- When the contacts are closed (hazard switch ON), power is passed to the hazard lights via flasher relay through the blue wire with white trace.
- The hazard circuit extends beyond the lights, back to the instrument panel, illuminating arrows: pin #10 = left arrow Pin #21 = right arrow.
- The headlight switch gets power from the red wire with black trace when the key switch is ON.
- When the contacts are closed (headlight switch ON), power is passed to the headlights through the blue wire.
- The headlight circuit extends beyond the lights, to the instrument panel (pin # 3) where it illuminates a headlight indicator.
- Not all Series 5000 tractors are equipped with hazard flashers.
- The female spade connectors are color coded: Red for the Hazard circuit and Blue for the Headlight circuit.

2.10. The PTO switch is more complex. See Figure 2.10.

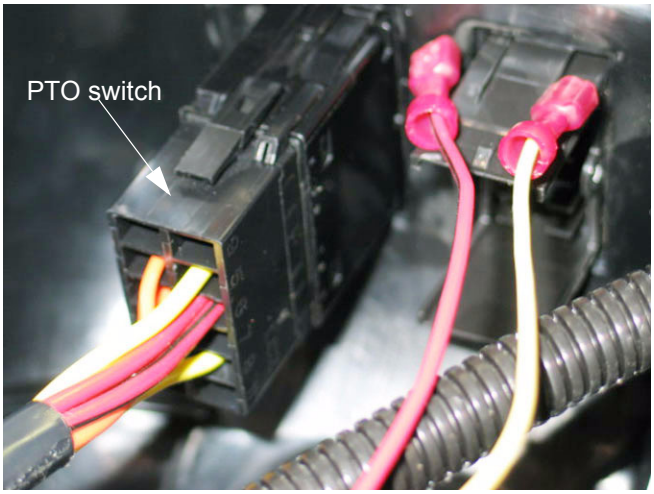

Figure 2.10

- The PTO switch contains two sets of contacts: one in the starter circuit, and the other in the engine shut-down and PTO circuits.
- The orange wire (starter circuit) brings power form the key switch in the START position.
- If the PTO switch is turned OFF, the contacts close, passing power to the orange and black wire.
- The orange and black wire conducts power to the brake switch.
- The red wires with black traces conduct power to the second set of contacts within the PTO switch when the key switch is ON.
- If the PTO switch is ON, contact is made to the yellow wire with white trace, providing power to the common terminal on the PTO relay
- If the PTO switch is OFF, contact is made to the plain yellow wire, leading to the brake switch.

2.11. The key switch has four spade terminals. See Figure 2.11.

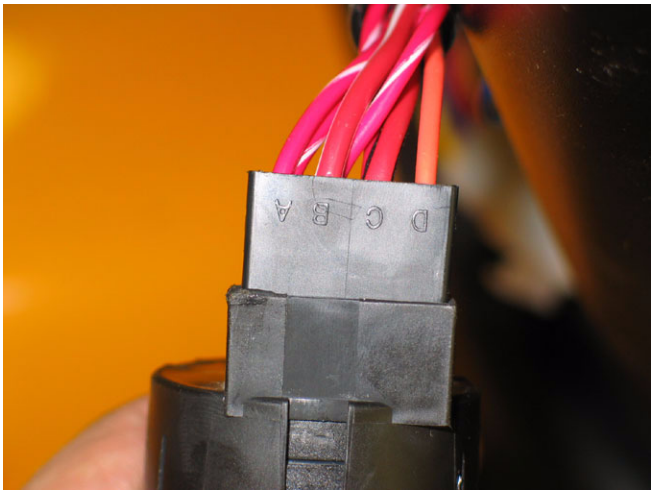

Figure 2.11

- The red wires with white trace (terminal A & B) are fused constant hot-leads.
- In the OFF position, no terminals are connected.
- In the RUN position, only terminals B and C are connected to, sending power through the red wire with black trace to the lighting and accessory circuits and pin # 18 (run input) on the instrument panel.
- The START position makes the “RUN” contacts, and A terminal and D terminal are connected to each other, sending power through the orange wire to pin #16 (start input) on the panel.

2.12. The instrument panel is easily unplugged or removed with the hood open. See Figure 2.12.

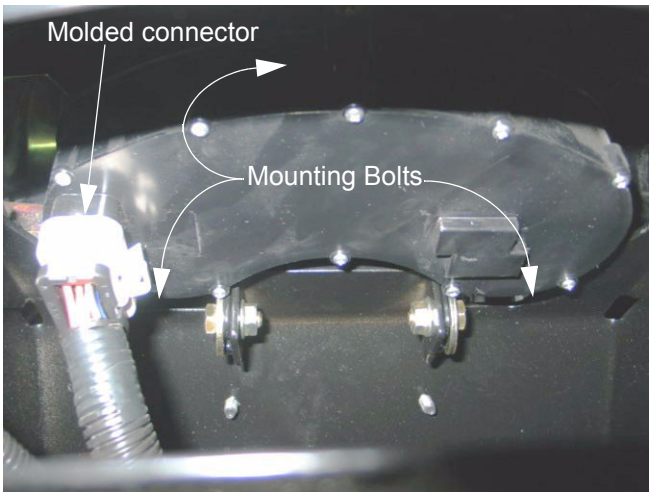

Figure 2.12

2.13. The pin numbers are indicated on the molded connector. See Figure 2.13.

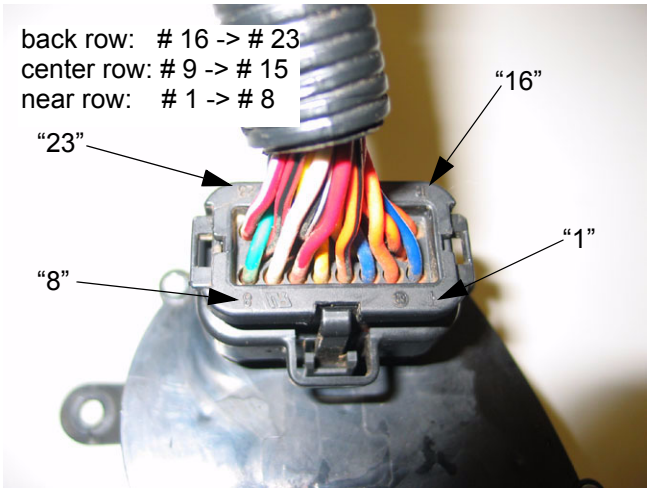

Figure 2.13

2.14. Each number corresponds to a pin position on the instrument panel. See Figure 2.13.

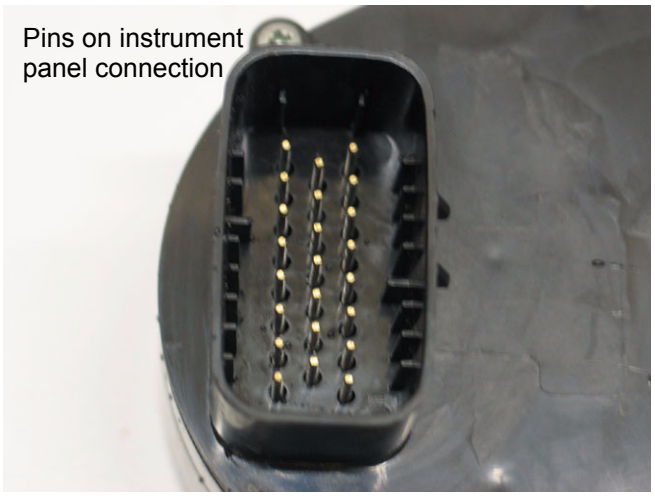

Figure 2.14

2.15. The pin identities are as follows: See Figure 2.15.

Pin-out chart	
Pin	**Signal**
1	Cruise Control Input
2	Oil pressure
3	Headlights
4	Reverse over-ride
5	PTO ON
6	PTO relay
7	Fuel Gauge unit
8	Ground, -
9	Reverse
10	Left arrow
11	Glow plugs
12	Tachometer sending unit
13	Magneto
14	Cruise control magnet
15	12 volts, +
16	Start input
17	Temp sender unit
18	Run input
19	Open
20	Brake on
21	Right arrow
22	Open
23	Open

Figure 2.15

2.16. The reverse over-ride switch is located on the rear fender. On all Series 5000, 6000 and domestic 7000 tractors, the fenders must be removed to reach the switch. See Figure 2.16.

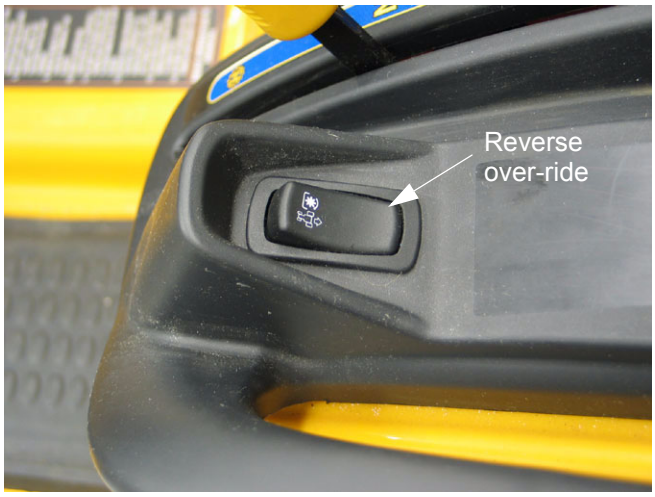

Figure 2.16

2.17. On Series 6000 and domestic Series 7000, there are four wires to the switch. See Figure 2.17.

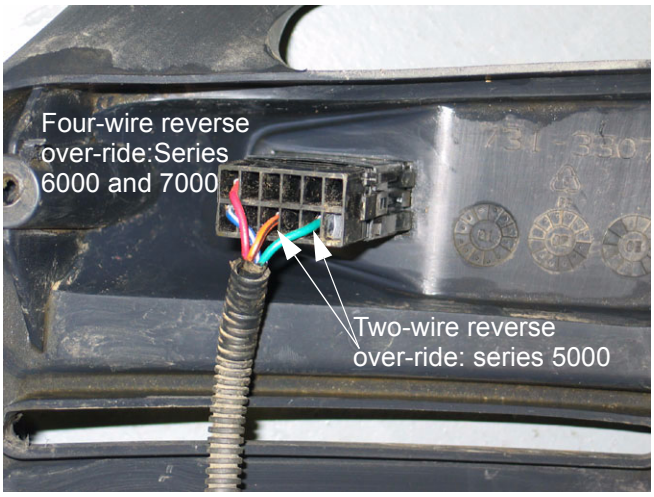

Figure 2.17

- There are two sets of contacts in the reverse over-ride switch on the series 7000 tractor: one set normally open, and one set normally closed
- Engaging the reverse over-ride sends a ground-signal to the instrument panel through the orange and black wire by closing contacts that connect it to the green ground wire.
- Engaging the reverse over-ride breaks the second set of contacts, between red wire with black trace (auxiliary power) the blue wire with white trace (pin #1 on instrument panel). This shuts-off power to a cruise control feature that was facilitated in the wiring harness but did not go into production.

2.18. On series 5000 tractors, only the orange wire with black trace and the green wire are present. Engaging the reverse over-ride sends a ground-signal to the instrument panel through the orange and black wire by closing contacts that connect it to the green ground wire.

2.19. The fuel tank sender unit also lives under the fender, on the left hand side. It is basically a potentiometer actuated by a float. It creates more or less resistance between the white wire leading to pin #7 on the instrument panel and a ground circuit. See Figure 2.19.

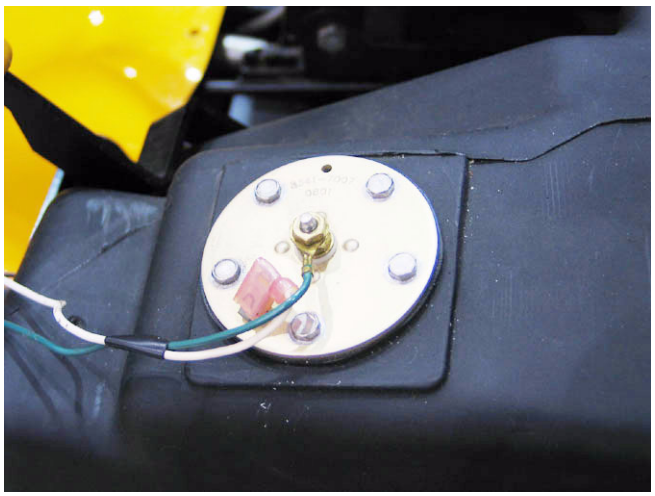

Figure 2.19

2.20. The seat switch contains a set of normally open contacts. When the seat is occupied, power is sent to the PTO relay windings. When the seat is empty, the PTO relay is de-energized, braking the contact that provides power to the PTO. We never want the PTO running with the seat empty. See Figure 2.20.

Figure 2.20

2.21. The reverse switches differ between the Series 5000 tractor and the other domestic compact tractors. See Figure 2.21.

Figure 2.21

- The series 5000 reverse switch is located on the right hand side frame channel, just in front of the pedal linkage.
- There are two sets of contacts in the switch, but only one is used: normally closed.
- When the plunger is depressed (in reverse), the contacts connecting the red wire with black trace (power) and the orange wire with black trace (pin # 9 on the instrument panel) are broken.
- When the instrument panel sees no power signal from the reverse switch and sees no ground signal from the reverse over-ride, it breaks the ground path for the windings on the PTO relay (pin # 6). This de-energizes the relay, breaking the contacts that provide power to the PTO clutch.

2.22. The reverse switch on the series 6000 and 7000 tractors operates in the same manner to control the PTO clutch. See Figure 2.22.

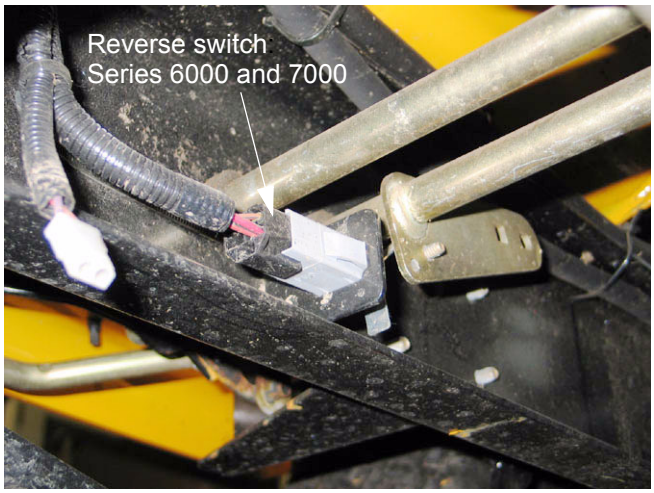

Figure 2.22

- The reverse switch on Series 6000 and Series 7000 domestic compact tractors is located on the right side frame channel, just ahead of the pedal linkage.
- The second set of contacts in the switch is normally open.
- When the plunger is depressed (in reverse), the contacts close, enabling power to pass form the red wire with black trace (power) to the white wire that feeds power to the back-up lights.

2.23. The brake switch for the Series 5000 compact tractor is located on the left hand side frame channel, just in front of the pedal linkage, with the plunger vertical (up). See Figure 2.23.

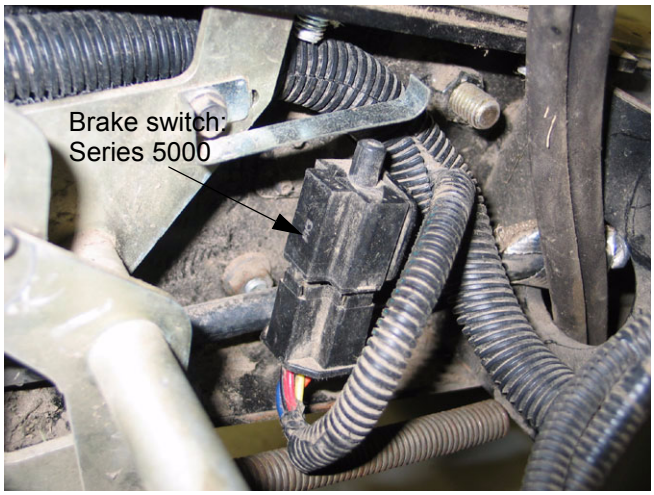

Figure 2.23

2.24. The brake switch on the Series 5000 tractor contains three sets of contacts. See Figure 2.24.

Figure 2.24

- All three sets are normally open: when the brake is not applied, the plunger is up, and none of the circuits connected to the switch have continuity through the switch.

2.25. Depressing the plunger (brake applied) closes all three sets of contacts. See Figure 2.25.

Figure 2.25

- With the plunger depressed, each pair of spade terminals that are adjacent to one another (flat side to flat side) will have continuity.

2.26. The circuits completed by the closing of the three sets of contacts in the Series 5000 domestic compact are as follows:

- The red wire with black trace connects to the blue wire, sending power to the instrument panel (pin # 20) telling it that the brake is on. This illuminates a “brake” lamp in the panel.
- The starter circuit (orange wire with black trace) connects from the PTO switch (PTO OFF), through the brake switch contacts, to the orange wire with white trace that energizes the windings of the starter relay. Energizing the starter relay passes power to the other orange and white wire on the relay, triggering the starter solenoid and motor.
- The yellow wire gets power from the PTO switch when the PTO is off. When the brakes are applied, the power passes to the red wire on the brake switch. The red wire takes power to the after-fire solenoid.
- If this circuit is broken, the engine will stop from lack of fuel.
- The seat switch feeds this circuit between the brake switch and the after-fire solenoid. Either the seat most be occupied -or- the brake must be applied -and- the PTO must be off to keep the after-fire solenoid energized.

2.27. The Series 6000 and Series 7000 brake switch has two sets of contacts. It is mounted to the right hand side frame channel, in front of the pedal linkages. See Figure 2.27.

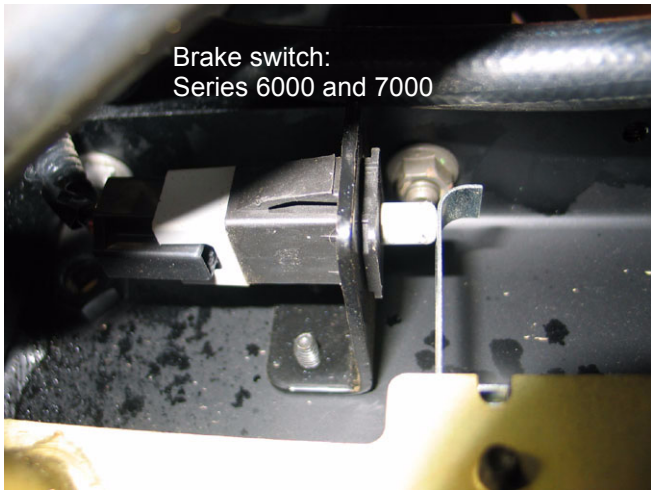

Figure 2.27

2.28. The circuits completed by the closing of the three sets of contacts in the Series 5000 domestic compact are as follows:

- The Starter circuit (orange wire with black trace) delivers power from PTO switch (PTO OFF) through the brake switch contacts, to the orange wire with white trace. This sends power to trigger the starter solenoid and to the instrument panel (pin # 20) telling it that the brake is on. This illuminates a “brake” lamp in the panel.
- The yellow wire gets power from the PTO switch when the PTO is off. When the brakes are applied, the power passes to the red wire on the brake switch. The red wire takes power to the after-fire solenoid.
- If this circuit is broken, the engine will stop from lack of fuel.
- The seat switch feeds this circuit between the brake switch and the after-fire solenoid. Either the seat most be occupied -or- the brake must be applied -and- the PTO must be off to keep the after-fire solenoid energized.

3. ELECTRIC CLUTCH AND FUEL PUMP

3.1. The electric PTO clutch on the Series 6000 and domestic Series 7000 compact tractors is contained inside the transaxle. The wire that provides power to it enters the transaxle housing through a notch in the top edge of the right side of the housing. See Figure 3.1.

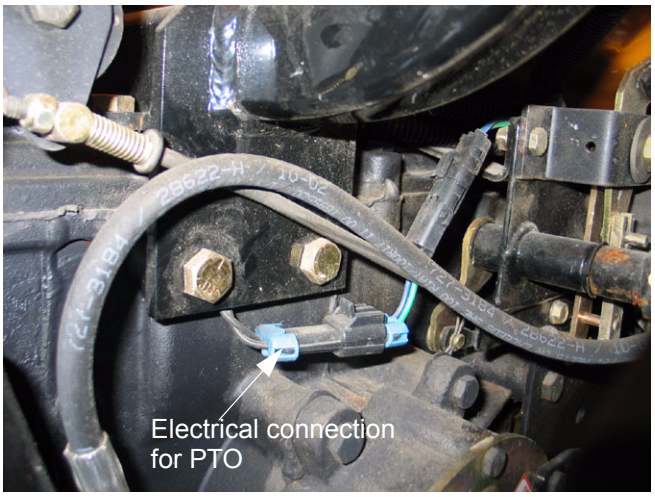

Figure 3.1

3.2. The Electric PTO clutch on Series 5000 compact tractors is external, but requires some transaxle disassembly to remove. See Figure 3.2.

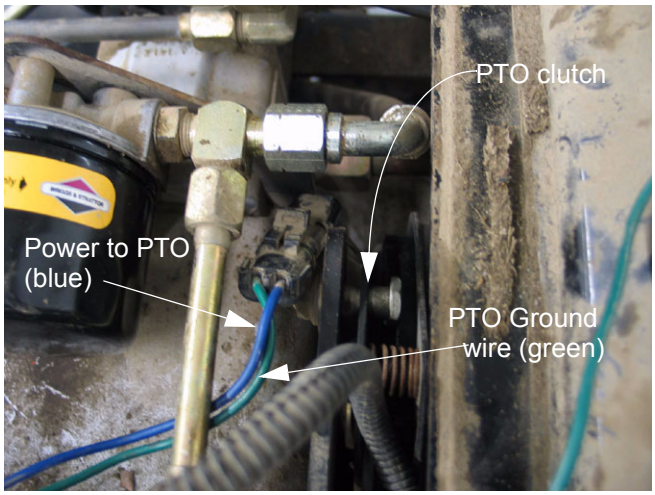

Figure 3.2

- It is possible to set the clutch air-gap in-situ, without removing the fenders.
- R&R instructions are contained in the 2004 Cub Update material.

3.3. The electric fuel pump is mounted to the left hand side frame channel on all gasoline powered domestic compact tractors. See Figure 3.3.

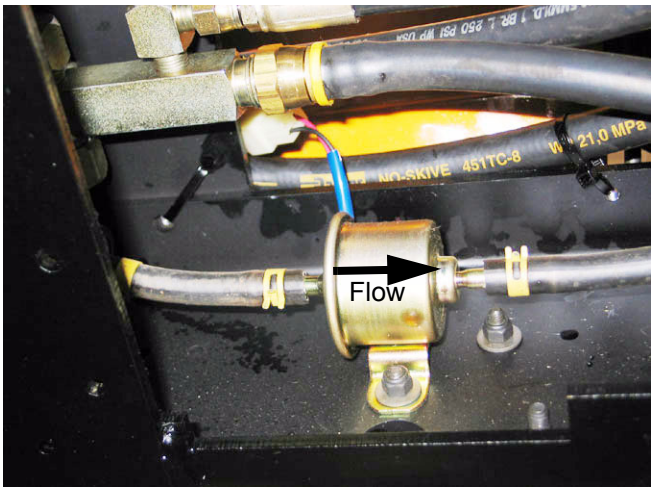

Figure 3.3

- Diesel powered tractors in the Series 5000, 6000, and domestic 7000 line do not have electric fuel pumps.
- Caterpillar engines have a mechanical lift pump feeding the high-pressure injector pump, and Briggs & Stratton Daihatsu pumps are able to self-feed.
- The electric fuel pump is powered whenever the key switch is ON. When they run there is an audible clatter. The noise is louder when there is air in the system, and quiets-down as the system fills with gasoline. This may take 10-15 seconds after the key switch is turned-on.