MTD
For A Growing World.™

The "Must Have" Manual of

OUTDOOR POWER EQUIPMENT

BOOK 3 - GARDEN TRACTORS

Technical Service Information for the MTD Product LIne

MTD Product Training and Education

MTD SERVICE LLC Product Training and Education Department

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WORK SAFELY—FOLLOW THESE RULES

This symbol is used to call your attention to instructions concerning your personal safety. Be sure to observe and follow these instructions.

1. To prevent accidental starting, always pull the high tension wire(s) off the spark plug(s) before servicing and/or adjusting the machine.

2. To prevent injury, do not allow children or bystanders around the machine while it is being adjusted and/or serviced.

3. Do not wear rings, wrist watches or loose fitting clothing when working on machinery; they could catch on moving parts causing serious injury. Wear sturdy, rough-soled work shoes. Never adjust and/or service a machine in bare feet, sandals or sneakers.

4. Always wear safety glasses when using a hammer, chisel or other tools that may cause chips to fly.

5. Be sure to reinstall safety devices, guards or shields after adjusting and/or servicing the machine.

6. When operating a power washer to clean a machine before servicing, be careful at all times to avoid injury. Maintain proper footing and balance at all times. Never direct the spray at people or animals, as high pressure spray can cause serious injury.

7. If a portable heater is used to heat the service area, the following precautions must be observed:

   a. Do not use portable heaters in presence of volatile materials such as gasoline or paint, as fire or explosion may result.

   b. To avoid being burned, do not touch the heater during operation.

   c. Portable heaters consume oxygen and combustion fumes can be hazardous. Heater should be used only in a well-ventilated area. Keep a window or door partially open to provide ventilation.

   d. Keep the heater at least four feet from combustible materials.

   e. Never use gasoline as fuel.

8. Handle gasoline with care—it is highly flammable.

   a. Use approved gasoline container.

   b. Never remove the fuel tank cap or fill the fuel tank when the engine is running, is hot or indoors. Also, do not smoke when working around flammable fuel.

   c. Avoid fires—be sure container or funnel does not touch the battery. Do not overfill the fuel tank. Wipe up spilled gasoline.

   d. Replace fuel tank cap securely.

9. Never use trouble lights or electric powered tools that have cut and/or damaged cords or plugs. Be sure all electric tools are properly grounded.

10. Never run an engine in a confined area such as a garage or storage building any longer than is necessary for immediate moving of the machine out of or into the area. EXHAUST GASES ARE TOXIC. OPENING DOORS AND WINDOWS MAY NOT PROVIDE ADEQUATE VENTILATION.

11. After servicing, be sure all tools, parts or servicing equipment are removed from the machine.

12. Electrical storage batteries give off highly inflammable hydrogen gas when charging and continue to do so for some time after receiving a steady charge. Do not under any circumstances allow an electric spark or an open flame near the battery. Always disconnect a battery cable before working on the electrical system.

13. Hydraulic fluid escaping under pressure can have enough force to penetrate the skin. Hydraulic fluid may also infect a minor cut or opening in the skin. If injured by escaping fluid, see a doctor at once. Serious infection or reaction can result if medical treatment is not given immediately.

    Do not attempt to repair or tighten hoses that are under pressure, when the boom is raised or with the tractor engine running. Cycle all hydraulic control valves to relieve all pressure before disconnecting the lines or performing other work on the hydraulic system. Make sure all connections are tight and hoses and lines are in good condition before applying pressure to the system. To locate a leak under pressure, use a small piece of cardboard or wood. Never use hands.

14. When using an acetylene torch, always wear welding goggles and gloves. Keep a charged fire extinguisher within reach. Do not weld or heat areas near fuel tanks or fuel lines and utilize proper shielding around hydraulic lines.

15. Always use safety stands in conjunction with hydraulic jacks or hoists. Do not rely on the jack or hoist to carry the load; it could fail. Always use a safety bar to block hydraulic cylinders.

16. When splitting tractors or disassembling machines, be sure to use safety stands and adequate supports to prevent tipping or roll-over.

17. Use a safety catch on all hoist hooks. Do not take a chance, the load could slip off the hook.

18. Use pullers to remove bearings, bushings, gears, cylinder sleeves, etc. when applicable. Use hammers, punches and chisels only when absolutely necessary. Then, be sure to wear safety glasses.

19. Be careful when using compressed air to dry parts. Use approved air blow guns, do not exceed 30 psi, wear safety glasses or goggles and use proper shielding to protect everyone in the work area.

20. Petroleum based solvents, often used for cleaning parts, are flammable. Use care to avoid fire or explosion when using these solvents.

    IMPORTANT: The above is only a partial list of safe work rules. In addition, always refer to the Operator's Manual for the specific machine for additional safe work rules regarding the machine operation.

GENERAL INFORMATION AND SAFETY PRECAUTIONS

2-1. SAFETY PRECAUTIONS.

2-1.1 Refer to the Safety Summary on page 1-1, and observe all WARNINGS and CAUTIONS when servicing equipment covered in this manual.

2-2. GENERAL.

2-2.1 This service manual covers lawn mowers, riding equipment, snowthrowers, chore performers, rotary tillers and accessories through model year 1998.

2-2.2 More detailed instructions can be found in each of the individual model service manuals.

2-3. REFERENCE DATA.

2-3.1 Serial Number Location. Serial number plate is located behind the seat on the rear fender. See Figure 2-1.

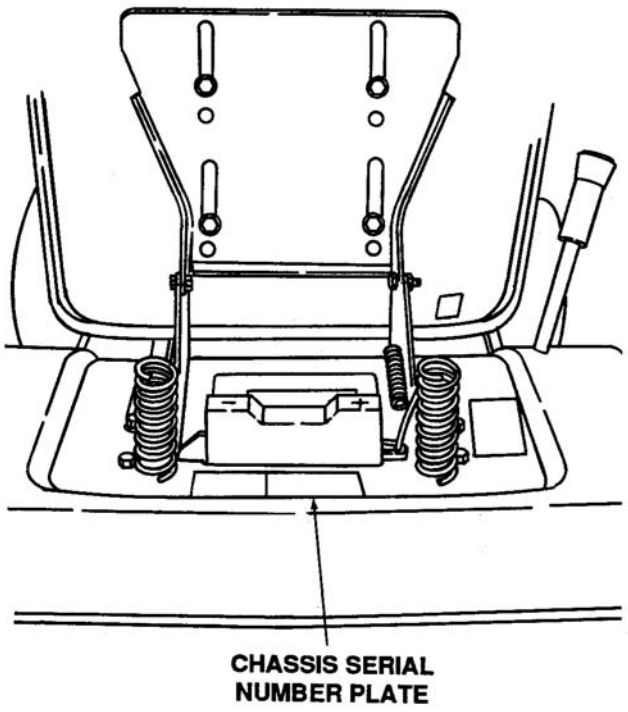


Figure 2-1.

NOTE

LEFT and RIGHT indicate the left and right side when facing forward in the driver's seat or behind the piece of equipment.

2-4. NUMBERING SYSTEM.

2-4.1 Due to the many different models, types of equipment and parts, it is very important to understand the MTD numbering system and how it is used. The following pages, Figures and Tables will explain the system and what each number and digit means.

NOTE

IMPORTANT: When ordering replacement parts, it is necessary to use both the model number and the date code.

2-4.2 Due to the many different colors of rims and different tire tread designs on riding mowers, orders for replacement tires and wheel assemblies must specify both color and tire brand. These can be identified by using the appropriate 900 series number after the part number.

NOTE

If you are entering an order electronically, the tire identification number can be entered where the paint code number is entered for a painted part.

2-5. CUSTOMER NUMBERS.

2-5.1 In addition to customers who purchase tractors and equipment marked with the MTD brand and name logos, there are customers who order tractors and equipment marked with their own brand name and/or logos. Basic units are the same except for color and decoration. Refer to the master book for further information.

BATTERIES AND CHARGING SYSTEMS

2-6. GENERAL.

2-6.1 The main storage or electrical power in our electric start lawn mowers, riders and tractors is the battery. With proper setup and maintenance the battery will last for years. However, in some remote cases even with proper maintenance a battery can lose power. This is unavoidable and should be handled as per warranty guidelines.

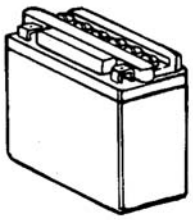
2-6.2 A chemical reaction between the battery's electrolyte and plates, or electrodes, will supply electrical energy to an external circuit. When the battery is being used, or discharging, the positive plate (lead dioxide) and the negative plate (sponge lead) are both changed to lead sulphate. At the same time, part of the electrolyte (diluted sulfuric acid) is changed to water. This conversion of diluted sulfuric acid to water reduces the specific gravity of the electrolyte. By measuring this specific gravity, a direct measure of how far the discharge process has progressed can be made.

2-7. BATTERIES AND CHARGING RATES.

2-7.1 There are basically 5 different batteries used. In this section we will show the battery number, the replacement number, cause of replacement, size, cold cranking amps and amp hours at a given rate.

1. Battery 725-0514A (Figure 2-2) is replaced by 725-1633. These batteries are used on riders and are the same size with the same cold cranking amps. The number was changed due to shipping regulations which would not allow acid packs to be shipped with batteries. Acid packs can be obtained by ordering part number 725-1637; how-ever, we suggest dealer obtain acid locally. Battery caps, part number 725-0691, can also be ordered separately.

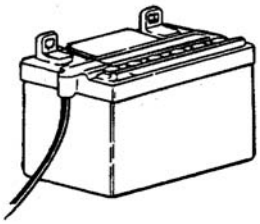
2. Battery 725-0453A (Figure 2-3) is shipped with no acid. Acid can be obtained by ordering part number 725-1637, but it is suggested acid be purchased locally. Battery caps can also be purchased separately by ordering part number 725-0690. Battery 725-0453A was used on 1989 and prior 700 and 800 series tractors. This battery is currently used in the 900 series tractor.



LENGTH	5-9/32"
WIDTH	3-1/2"
HEIGHT	5-11/16"
VOLTAGE	12 VOLT

CHARGING RATE 1.4 AMPS 3-5 HOURS
COLD CRANKING AMPS 125
14 AMP HOURS AT 10 HOURS RATE

Figure 2-2. Battery 725-0514A



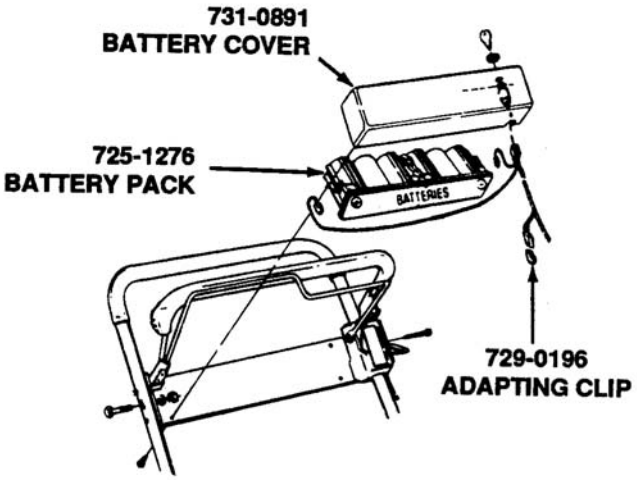
LENGTH	7-3/4"
WIDTH	5-3/16"
HEIGHT	6-11/16"
VOLTAGE	12 VOLT

CHARGING RATE 3 AMPS 3-5 HOURS
COLD CRANKING AMPS 240
30 AMP HOURS AT 20 HOURS RATE

Figure 2-3. Battery 725-0453A

3. Battery 725-1105 which was supplied in 1987 is no longer available. Use kit number 753-0459 as a replacement. The kit includes a battery, cover and adapting clip. The larger terminal end goes on the negative side of the battery. The adapting clip also goes on the negative side. The electric start unit uses a 7 amp fuse system.

4. Battery pack 725-1276 (Figure 2-4) is installed in electric lawn mowers.



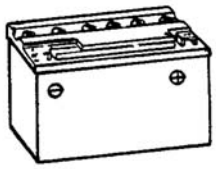
LENGTH	8-3/4"
WIDTH	1-3/4"
HEIGHT	2-3/4"
VOLTAGE	12 VOLT
2.5 AMP HOURS SEALED LEAD ACID	

Figure 2-4. Battery Pack 725-1276

NOTE

During shipment, the hot wire can vibrate off the battery and the unit will not start. Take the battery cover off, hook up the wire and charge the battery.

5. Battery 725-1430 (Figure 2-5) is replaced by 725- 1635. These batteries are the same size with the same cold cranking amp. The number was changed due to shipping regulations which do not allow acid packs to be shipped with batteries. Acid packs can be obtained by ordering part number 725-1637; however, we suggest dealers obtain acid locally.



LENGTH	8-1/8"
WIDTH	3-9/16"
HEIGHT	6-7/16"
VOLTAGE	12 VOLT
CHARGING RATE 2 AMPS FOR 3-5 HOURS	
COLD CRANKING AMPS 275	
20 AMP HOURS AT 10 HOURS RATE	

Figure 2-5. Battery 725-1430

NOTE

Batteries 725-1430 only contain a special chemical sulfate stop that has been added to reduce sulfate crystal deposits (which eventually prevent the battery from accepting a charge). Sulfate stop is a white powder chemical that may be visible before the battery is activated, but dissolved once electrolyte is added. After charging the battery (with sulfate stop added), the specific gravity of electrolyte rises to 1.280 or above. On a 5 ball hydrometer, it is acceptable to see the fifth ball float. If the battery contains sulfate stop and has not been in use for a long period of time, extended recharging time is required.

2-7.2 BATTERIES SECTION 1996-1998

#725-0453 E
Battery Type U1-11L
Dry 380 CCA Cold Cranking Amps @ Zero Degrees
Group No. U1L
Voltage 12V
Size Top 5.18 x 7.7
Number of plates 66
Height 6.12 to top of post 7.16
Weight wet 20.6 lbs.
Electrolyte capacity 72 oz.

Previously this battery was 240 CCA and it has been upgraded to 380 CCA which gives added cranking power in cold weather. It is shipped dry and it is suggested that the acid should be purchased locally. The acid pack number as shown is #725-1670 but acid is considered to be hazardous material, therefore when shipped, charges will be excessive due to special handling.

Battery #725-1704
Note! New Warning symbols
Battery Type U-1
Wet 125 CCA Cold Cranking Amps
All batteries are date coded
Replaced by #725-1707 C DRY 275 CCA Cold Cranking Amps
Size 5.18 x 7.7
Height 6.12 with Post 7.29
Voltage 12 volts

The #725-1704 is a wet battery meaning that it is shipped in the rider and it is hooked up with the positive terminal connected and the negative terminal has a plastic cover over it to protect from shorting out. The purpose of this is to assist stores with fast product turnover and in this manner the unit is ready to operate in the least amount of set-up time.

Battery #725-1705C
WET 150 CCA Cold Cranking Amps.
Battery Type U-1
All batteries are date coded
Replaced by #725-1707C DRY 275 CCA Cold Cranking Amps.
Voltage 12V

The #725-1705C is a wet battery and it is the same as stated above. If a failure occurs in warranty the #725-1707C will be shipped.

Battery #725-1706
WET 270 CCA Cold Cranking Amps.
Battery Type U-1
Negative terminal covered with a plastic cover and shipped with the positive cable connected.
Replaced by #725-1707C DRY 275 CCA Cold Cranking Amp.
All batteries are date coded
Battery is non-serviceable
Voltage 12V

The #725-1706 is a wet battery and is shipped in the tractor and is ready to go by just removing the plastic cover on the negative terminal and connecting the negative cable to the negative terminal.

Battery #725-1707C
DRY 275 CCA Cold Cranking Amps.
Battery Type U-1 Flat Top
Size 5.19 x 7.72
Height 6.12 Including Post 7.30
Voltage 12V
Manifold Vented

Specifications for ’97-’98 will be the same except all will be flat top style. The knobs will be flush with the top of the battery.

YUASA - EXIDE makes the DRY, add acid type batteries EAST P E N N makes the WET non-service able-type battery.

WET batteries are anticipated to be used in 50% of our production for fast moving product customers, all batteries can not be shipped wet because they would have a shorter shelf life than a dry battery.

For ’97 - ’98 little changes are anticipated. Dependability over all styles will remain the same. Replacement batteries will continue to be shipped without acid, and acid must be obtained locally due to acid being a hazardous material, therefore requires special handling when shipped.

New for ’98 season batteries will be similar in size but top will be flat with nothing sticking up except the posts. Fill caps will be flush with the top of the battery.

Batteries must be properly maintained if you want long-life, this remark is repeated over and over...

1. Check the electrolyte and add only water.

2. Keep clean, excessive acid build up around the terminals and top of battery will cause a discharge and drain the battery.

3. Check cables and clamps and battery case for obvious reasons of leakage as this could cause damage to the painted surfaces, the battery compartments and to the pulleys and transmission.

4. Make sure of the routing of the vent tubes and that it is not pinched and left to drip on pulleys, etc.

5. Replace caps firmly, if one or two gets lost, replace them as soon as possible, often they can be obtained from old batteries.

6. Maintain a fully charged battery with a reading by hydrometer showing 1.265.

2-7.3 Recently, a man well experienced in automobiles and lawn and garden equipment was charging a battery in his automobile in the garage for a long period of time and decided to check on how it was progressing. He walked into a partially dark garage, not thinking, and leaned over the battery and flipped on this cigarette lighter. Well, you can guess what happened next. The electrolyte gas exploded, which is hydrogen and oxygen. He was very lucky to have glasses on as the top of the battery hit him in the face. He quickly remembered to turn the hose on his face and wash off the acid which was starting to burn and no damage was done, but he was left quite shaken and thankful that things worse didn't take place. Think about it. His glasses were broken and bent tight to his eyes which helped protect his eyes, which proves it is a good practice to wear glasses when working with batteries.

2-8. BATTERY STARTING CIRCUITS.

2-8.1 Battery starting circuits consists of the following:

1. Battery as a source of energy

2. Starter solenoid switch to transfer high starting current from battery to starter (starter relay)

3. Key start switch or other switch to energize the starter solenoid

4. Starter. A series wound, low resistance, high current draw direct current motor.

NOTE

Sometimes the circuit breaker kicks out and will not allow the unit to crank. Check the diode wires to see if they are crossed. Reverse the diode wires if crossed.

2-9. BATTERY CHARGING SYSTEM.

2-9.1 There are four types of charging systems typically used on lawn and garden equipment.

1. Single circuit—3 amp system with one diode

2. Dual circuit—3 amp AC system that runs the lights and a 3 amp DC circuit to charge battery

3. Tri-circuit—5 amp two diode system

4. Regulated 16 amp system

MTD mainly uses the dual circuit and regulated systems.

2-9.2 Regulated systems are installed on units with electric clutches. These are Briggs and Stratton engines with a voltage regulator. Some of the early units had an 8 amp circuit breaker in the unit. This is a 16 amp unit and needs a 20 amp circuit breaker (part number 725-1382).

2-9.3 Dual Circuit (Engine Alternator) (Figure 2-6).

1. The charging system is an alternator located under the flywheel. A half wave rectification (single diode) is unregulated and rated at 3 amps at 3600 RPM.

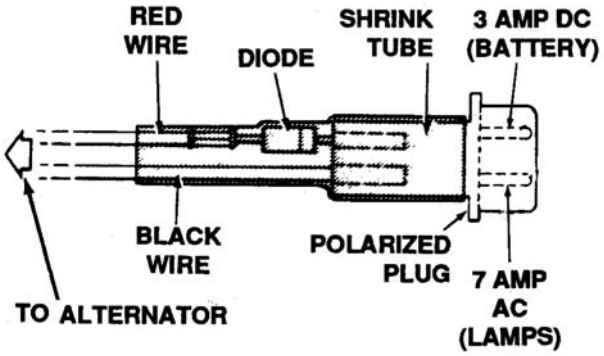


Figure 2-6. Dual Circuit

2. The diode changes AC to DC to charge the battery. A bad diode can either fail to charge the battery or discharge the battery if the alternator is shorted as well as the diode.

3. The 7 amp AC terminal operates the head lamps. The voltage rises from 8 volts at 2400 RPM to 12 volts at 3600 RPM. Therefore, the brightness of the lights changes with engine speed. In certain situations it is necessary to make use of the entire AC signal. To accomplish this we use multiple diodes in a bridge configuration. This produces full wave rectifica-

tion (regulator) which is regulated and rated 16 amps at 3600 RPM.

4. The 16 amp DC terminal at 3600 RPM operates the head lamp. The regulated system produces 12 volts DC which goes to the battery. Engine speed will determine amount of amps regulated.

2-9.4 Testing the DC Circuit (Figure 2-7).

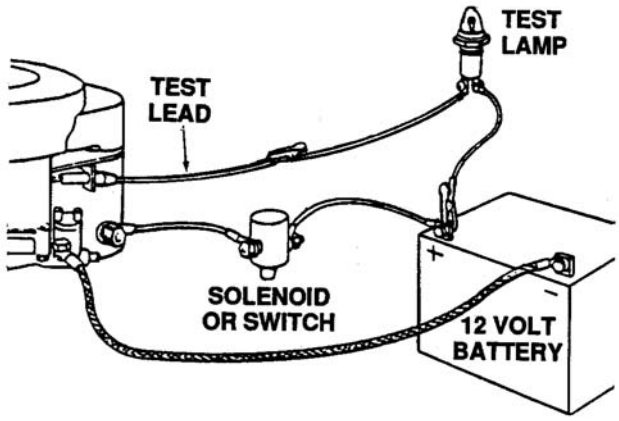


Figure 2-7. DC Circuit

1. Disconnect the charger lead from the battery (small red wire).

2. Connect a 12 volt test lamp between the DC charge lead and the positive terminal of the battery.

3. With the engine off, the lamp should not light. If it does, the diode and possibly the alternator may have failed.

4. Start the engine. The lamp should light. If it does not, the alternator (starter) or lead wire could be bad.

2-9.5. Battery Runs Down.

2-9.5.1 Testing Alternator Charging Output. Install ammeter in series with charging lead. See Figure 2-7. Start engine. Ammeter should indicate charge. The charge rate is dependent upon the condition of the battery. If ammeter shows no charge, test stator and regulator.

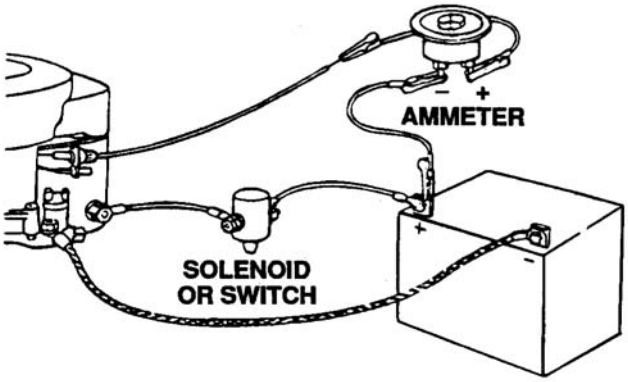


Figure 2-8. Alternator Charging Output

2-10. BATTERY SHIPPING AND STORAGE.

2-10.1 Check List For Proper Battery Storage.

1. Electrolyte level correct.

2. Battery fully charged.

3. The exterior of the battery is clean.

4. Store battery in a cool place.

5. Rotate stock. Always use the oldest battery first.

2.10.2 Dry Charged Battery Storage.

1. A dry charged battery has a shelf life of about five years.

2. Keep in a cool, dry place with the humidity as low as possible with a temperature between 60°F and 90°F. The temperature should be uniform and not subject to frequent changes.

3. Once a dry charged battery is actuated, it must be maintained the same as any wet battery.

2-10.3 Wet Battery Storage.

1. Wet batteries will slowly discharge while in storage.

2. Batteries not used in the winter should be stored in a fully charged condition.

3. Batteries in storage discharge slower when kept cold than when too warm.

4. The best place to store the battery is in the equipment.

2-11. ACTIVATING BATTERY.

2-11.1 The instructions listed below are packed with every battery shipped with each unit. Following these steps will prevent premature battery failure.

WARNING

LAWN AND GARDEN EQUIPMENT BATTERY (DRY AND CHARGED) FILLING AND INSTALLATION INSTRUCTIONS. Do not fill with electrolyte until battery is actually placed in service. This battery is supplied dry and charged. Do not fill with electrolyte until battery is to be used.

WARNING

POISON—CAUSES SEVERE BURNS. Contains sulfuric acid. Avoid contact with skin, eyes or clothing. To prevent accidents, neutralize excess acid with baking soda and rinse empty container with water. KEEP OUT OF THE REACH OF CHILDREN.
ANTIDOTE:
EXTERNAL—Flush with water.
INTERNAL—Drink large quantities of water or milk. Follow with milk of magnesia, beaten eggs or vegetable oil. Call physician immediately.
EYES—Flush with water for 15 minutes and get prompt medical attention.

WARNING

DANGER—BATTERY CONTAINS SULFURIC ACID MAY CONTAIN EXPLOSIVE GASES.

1. **Keep sparks, flame, cigarettes or any flame away.**

2. Shield eyes, protect skin and clothing when handling acid or battery containing acid or working near such batteries.

3. Ventilate when charging or using battery in enclosed space.

4. Make sure venting path of battery is always open once battery is filled with acid.

NOTE

When the battery is charged, the heat will expand the electrolyte.

1. Allow the battery to sit 20 to 30 minutes. This allows the chemical action to take place.

2. The battery must be charged at the maximum rate until a specific gravity is reached. See paragraph 2.9.

3. Add electrolyte until it reaches the split ring.

CAUTION

DO NOT ADD ACID. Add only distilled water.

4. After charging, replace vent plugs firmly, wash off acid spillage with water and dry the battery.

5. If time does not permit charging the battery, or if charging equipment is not available, the battery should be installed and the unit should be run continuously for 20 to 30 minutes in order to sufficiently charge the battery.

2-11.2 Preparation for filling the battery is very impor tant.

1. Remove vent plugs just before filling with electrolyte.

WARNING

Internal gas pressure can cause battery to explode if sealing tube is left in place.

2. If your battery has a short sealing tube on the vent elbow and is supplied with a separate long tube, pull off short one and replace with long one.

WARNING

Electrolyte is sulfuric acid solution. Avoid spillage and contact with skin, eyes and clothing. See WARNING on back panel of battery.

CAUTION

Do not use water or any other liquid to activate. During cold weather, if electrolyte (acid) is stored in cold area, warm electrolyte to room temperature before filling.

3. Fill battery with electrolyte (diluted sulfuric acid) of a specific gravity of 1.265. Fill to upper level as indicated on battery. Electrolyte should be at room temperature before filling.

2-12. BATTERY INSTALLATION INSTRUCTIONS.

1. Remove old battery. Mark which cable is connected to positive (+) and negative (-) terminals. Positive cable is usually red.

2. Clean cable connectors with wire brush or sandpaper to remove oxidation.

3. After filling with acid and charging (see instructions), install new battery. Connect cables to the proper terminals. Positive cable to positive terminal (+) and negative cable to negative terminal (-). CONNECT NEGATIVE CABLE LAST.

CAUTION

Connecting in reverse, positive to negative and negative to positive, can cause serious damage to electrical system.

4. Check vent tube to avoid any crimping or obstruction to the tube.

5. Securely fasten battery to the unit using its battery holddown arrangement. This will minimize destructive vibration.

2-13. COMMON CAUSES FOR BATTERY FAILURE.

2-13.1 Overcharging. Charging a battery greatly in excess of what is required is harmful in several ways, as follows:

1. Severely corrodes the positive plate grids with consequent mechanical weakening and loss of electrical conduction.

2. Decomposes water of electrolyte into hydrogen and oxygen gas. Gas bubbles tend to wash active material from the plates and carry moisture and acid from the cells as a fine mist.

3. Decomposition of water leaves acid more concentrated. Concentrated acid is harmful to cell components, particularly at high temperatures over a prolonged period of time.

4. High internal heat is created, which accelerates the above mentioned corrosion of positive plate grids and damages separators and negatives. Also, containers may be softened and distorted.

5. Overcharging alone or in combination with a previous condition of undercharging may cause severe buckling and warping of positive plates with accompanying perforation of separators.

6. May cause damage by corrosion to battery box, cables and other vital electrical and engine parts by forcing liquid from the cells if charge rates are excessive.

2-13.2 Undercharging.

1. A battery operated with insufficient charge over a long period of time may develop a type of sulfate in the plates which is dense, hard and coarsely crystalline and which cannot be readily electro-chemically converted to normal active material again. Such lead sulfate, being less dense than the active material from which it was formed, will set up strains in the positive plates so that distortion or bowing of the plates, called buckling, may result. Buckling will be produced, especially if the sulfated battery is subjected to sudden prolonged overcharging, as might be experienced by an alternator or generator-regulator system which has gotten out of adjustment. Severely buckled plates will pinch the separators at the plate corners or chafe the center of the separators. This may result in perforations of the separators and develop a short circuit in the cell.

2. A battery operated in an undercharged condition is not only unable to deliver full power, but is liable to freeze during severe winter weather. See paragraph 2-13.7.

3. Lead sulfate formed on the plates during discharge is relatively insoluble as long as the specific gravity of the electrolyte indicates a substantially charged condition. If allowed to drop much below this state the lead sulfate becomes increasingly soluble and, aided by temperature fluctuations of the electrolyte, may migrate over a considerable period of time into

the pores of the separators and deposit as a white crystalline mass. Subsequent charging may convert these crystalline deposits to metallic lead which may short the positive and negative plates through the areas of the separators affected. These small shorts may cause a condition of low cell voltage when the battery is charged. For this reason battery cells should not be allowed to stand idle in a discharged condition.

2-13.3 Lack of Water. Water is one of the essential chemicals of a lead-acid storage battery and under normal conditions of operation is the only component of the battery which is lost as a result of charging. It should be replaced as soon as the liquid level falls to the top of the separators. If water is not replaced, and the plates are exposed, the acid will reach a dangerously high concentration that may char and disintegrate the separators and may permanently sulfate and impair the performance of the plates. Plates cannot take full part in the battery action unless they are completely covered by the electrolyte. Sulfuric acid must never be added to a cell unless it is known that acid has been spilled out or otherwise loose from the cell.

2-13.4 Loose Holddowns. Holddowns, if not properly adjusted, may allow the battery to bounce around in the battery box. This may cause the bridges on which the elements rest to notch the bottom of the separators and may cause the plates to notch the bridge tops, causing a severe disarrangement of the elements. The bouncing of the battery may also crack or wear the container badly and cause acid to leak. Leaking acid corrodes terminals and cables and results in high resistance battery connections, thereby weakening the battery's power and shortening its life. If holddowns are too tight, they can distort or crack the container, allowing loss of acid from the cells. This will cause loss of battery capacity.

2-13.5 Battery Electrolyte Substitutes. No satisfactory substitute electrolyte has been found for the simple mixture of sulfuric acid in water. Use no substitutes.

2-13.6 Excessive Loads. A battery should never be used to propel the rider by the use of the starting motor with clutch engaged except in a great emergency. This may produce extremely high internal battery temperature and damage the starting motor.

2-13.7 Freezing of Electrolyte.

1. The electrolyte of a battery in various states of charge will start to freeze at temperatures indicated below. The given temperatures indicate the approximate points at which the first ice crystals begin to appear in the solution. The solution does not freeze solid until a lower temperature is reached. Solid freezing of the electrolyte may crack the container and damage the positive plates.

2. A 3/4 charged automotive battery is in no danger from freezing. Keep batteries at 3/4 charge or more, especially during winter weather.

3. Battery power decreases while the need for engine power increases with falling temperatures.

80°F	100%
32°F	66%
0°F	46%

4. Sub-zero temperatures reduce the capacity of a fully charged battery to 30% of its normal power and at the same time increases cranking load beyond the normal warm weather load.

NOTE

The above failures do not constitute a warranty.

2-14. TESTING THE BATTERY.

2-14.1 A visual inspection of battery should be done by checking for:

1. Broken or leaking cover.
2. Broken case.
3. Damaged post.
4. Other.

2-14.2 Batteries should be handled with care. Never leave battery standing in a discharged position.

WARNING

Never test a battery by striking a cable across the output terminals. An internally shorted battery could EXPLODE.

2-14.3 The hydrometer measures the state of charge. Use of the hydrometer will also pinpoint a

shorted cell which, in some instances, cannot be charged or will not hold a charge. See Figure 2-9.

1. Specific gravity tests must be performed before adding water to the battery.
2. In the event the electrolyte level is too low to test with the hydrometer, add water and charge before testing.

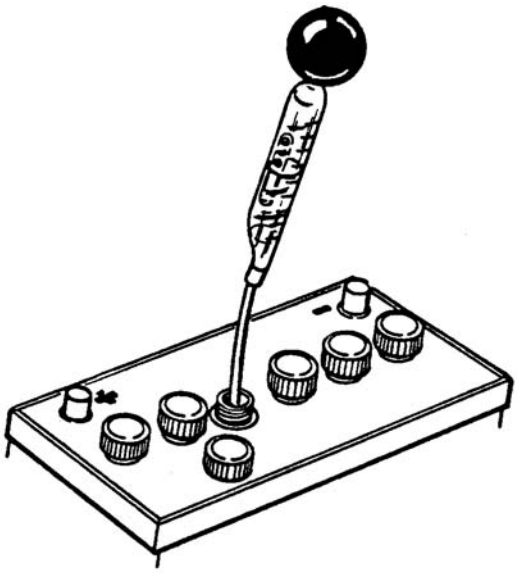


Figure 2-9. Using Hydrometer

3. A correct specific gravity reading can be measured only when the electrolyte temperature is 80°F. If the electrolyte temperature varies from this temperature, compensation must be made in the reading as follows:

   a. Add four gravity points (.004) for each 10° electrolyte temperature is above 80°F.

   b. Subtract .004 for each 10° below 80°F.

4. In taking the hydrometer reading, the float must be floating freely and the eye must be even with the liquid level to obtain accurate readings.

5. When all cells are tested, if the specific gravity between the highest and lowest cell varies 50 points (.050) or more, condemn the battery; it is no longer serviceable.

6. If there is less than a 50 point variation between the highest and lowest cell, and the specific gravity in one or more cells is below 1.235, recharge the battery.

7. The inability to bring the specific gravity of any one cell up to 1.235 after charging is also an indication of an unserviceable battery and it should be condemned.

8. After the recharge, let the battery stand at least 24 hours, and repeat hydrometer test on all cells. If there is a variation of 50 points or more between the highest and lowest cell, condemn the battery.

2-14.4 Batteries 725-1105 and 725-1276 are 12 volt sealed lead-acid batteries. These batteries can be checked by using a standard DC voltmeter. When checking the voltage, the male terminal of the connector plug of the harness is the negative terminal. See Figure 2-10.

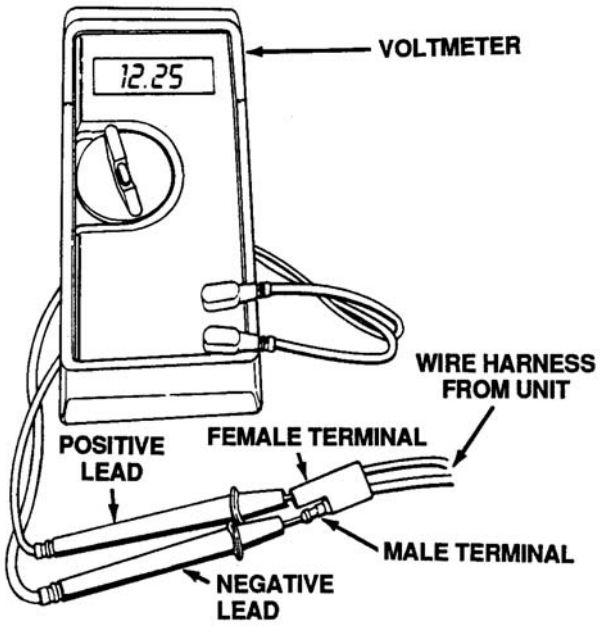


Figure 2-10.DC Voltmeter

2-14.5 Check battery charge with voltmeter as follows:

NOTE

Check to be certain the in-line fuse in the wire harness is OD.

1. Connect the negative lead of the voltmeter into the male end of the plug on the wire harness.

2. Connect the positive lead of the voltmeter into the female pin on the plug on the wire harness.

3. A fully charged battery will register 13.0 volts on the voltmeter

4. A battery that needs charging should read between 11.0 and 13.0 volts.

5. If the reading is below 10.0 volts on the voltmeter, the battery probably will not accept a charge and should be replaced.

2-15. BATTERY CHARGERS AND CHARGING.

2-15.1 Restore charge.

1. An electric current is sent through the cell in the reverse direction to that in which the current flows when the battery is delivering current. The charging rate must be slightly higher than the voltage. A single battery cell produces approximately 2 volts. A 12 volt battery will consist of six 2 volt cells. To charge a 12 volt battery requires (.5 volts x 6 cells = 3 volts) (12 volts + 3 volts = 15 volts). When a battery is discharged, its internal resistance is low. In this low resistance condition, the battery will draw a greater charging current. As the battery becomes charged, the internal resistance increases and the current draw will diminish.

2. Batteries should only be tested with a hydrometer for specific gravity, or a test device that applies a current draw to the battery while testing. A voltmeter does not give an accurate indication of battery condition, as even a partially discharged battery will indicate correct voltage when not under load. The normal specific gravity of a charged battery should be between 1.285 and 1.300 approximately. A discharged battery cell has a specific gravity of 1.150 approximately.

2-15.2 Recharging is necessary when you find lights get dim, and/or when battery is not used for longer than one month. Charge the 12 volt battery with a 12 volt 1 amp automotive charger. Recommended charging for 6 volt or a 12 volt battery should not exceed 1 amp. Charge until battery gases freely and specific gravity of electrolyte rises to 1.265 or above.

WARNING

When charging, care must be taken to ventilate the fumes from the battery as they are highly EXPLOSIVE. The gases issuing from a charging battery are a mixture of hydrogen and oxygen gases and will explode with great violence and spraying of acid if a spark or flame is brought too near them. A room or compartment in which charging batteries are confined should be ventilated. Do not bring flame or sparks near vent openings.

WARNING

In all automotive battery cells small quantities of hydrogen gas are given off at the negative plates when the cells are not being charged. It must therefore be assumed that explosive mixtures of hydrogen gas are present within the cells at all times. A torch, match flame, lighted cigarette or sparks from metal tools accidentally contacting the terminals could cause ignition of the gases.

WARNING

To avoid sparks, do not disturb connections between batteries while charging: first throw switch “off” at the charger. The possibility of ignition of hydrogen gas by static electricity when working on or near batteries is minimized by grounding ones self and the vehicle to remove any static charge.

WARNING

The improper use of a booster battery to start a rider, when the normal battery is inadequate, presents a definite explosion hazard. To minimize this hazard the following procedures are suggested.

CAUTION

Exceeding the recommended charging rate can cause warping of the plates and will affect the life of the battery.

1. When possible, use equipment with a switch in the line connecting the booster battery to the installed battery. Check to see that both batteries have the same voltage type: e.g., 6 volt or 12 volt.

2. If only jumper cables are available and the booster battery is in a car, set the hand brakes, turn off accessory switches and ignition keys and place the gearshift or gear selector in the neutral or park position for both vehicles. Now proceed in exact sequence.

3. Always rock the connector clips to insure secure grip contact.

a. Connect one end of first cable to the terminal of the discharged battery which is connected to the starter switch or solenoid (not grounded). Note if this is the positive or negative battery terminal.

b. Connect the other end of the first cable to the terminal post of the booster battery having the same marking; that is, positive to positive or negative to negative. Most have a negative grounded electrical system.

c. Connect the first end of the second jumper cable to the other terminal of the booster battery. With the other end make final connection and this is to be the rider frame of the mower with the discharged battery as far away as possible from the battery.

2-15.3 Charging the Battery.

1. Connect the charger to the lawn mower harness.

2. Plug the charger into a 110 volt AC wall outlet.

3. Check the charger after 15 minutes. The charger should be warm to the touch (approximately 100°F).

WARNING

Charger could be HOT and cause burns.

4. If the charger is hot, it is drawing too much current and should be disconnected immediately. One of the following conditions exist:

   a. The battery is defective.

   b. The polarity of the battery connectors is reversed.

   c. There is a short in the wire harness.

5. If the charger is cold to the touch, one of the following conditions exist:

   a. The battery is not connected to the wire harness.

   b. The charger is bad. Check the output voltage.

   It should be above 9 volts DC with the male terminal of the charger being positive.

   c. There is no voltage present at the wall socket.

   d. The charger should be checked once more by touch within an hour. Use caution when touching the charger.

6. Normally, if the unit starts the first time, it is unlikely that the wire harness is defective. However, if the wire harness is suspect after using the above procedures, it should be replaced.

2-15.4 Plug-in Trickle Chargers. Different trickle chargers are used for different batteries. The following is a list of chargers and the rate at which the batteries are to be charged.

Plug-In Trickle Chargers

725-0727	300 ma. use on 725-1105 and 725-1276 battery
725-0507	1/2 amp charger, used on 725-0415
725-0579	Alligator clips for 725-0507 charger to be used when charger does not plug into the wire harness
725-0156	Old red Schauer charger. Not available. Use 753-0220. This kit consists of: 1 725-0507 charger 1 725-0579

Charging Rates

725-0130	automotive type with tapered terminals 15 amp maximum
725-0453	
725-0661	4-5 amp maximum
725-0117	
725-0726	300 ma. elec. start self-propelled
725-1104	lawn mowers
725-1276	
725-0514	motorcycle type 3 amp maximum

2-15.5 New Information Concerning Battery Charging. It is important that new batteries are charged according to the owner's guide or

Technical Handbooks Volume I, II and III. We have found that rider and tractor batteries do not have memories, and the capability of recharging a low or dead battery is feasible. A 3 to 10 amp taper charger should be used; charging time varies between 12 to 40 hours. This charging procedure should be followed prior to checking the specific gravity or condemning any rider or tractor battery.

Table 2-1.Specific Gravity Freezing Points

Specific Gravity	Freezing Point
1.265	-75°F
1.225	-35°F
1.200	-17°F
1.150	5°F
1.100	18°F
1.050	27°F

2-16 MAINTENANCE AND SERVICE.

2-16.1 Proper maintenance and service could extend the life of a battery. The following procedures should be taken:

1. Clean battery top with a stiff brush, being careful not to scatter corrosion products. Wipe off with a cloth wetted with ammonia or baking soda in water. Fully wipe with a cloth with clean water.

2. Inspect cables—urge replacement if unserviceable. Inspect the terminals posts to see that they are not deformed or broken.

3. Clean the battery and cable contact surface to a bright metal finish whenever they are removed. Coat the contact surfaces with mineral grease or petroleum jelly before the terminals are reconnected.

4. Inspect battery box and adjust holddowns. Urge replacement if unserviceable.

5. Check electrolyte level once a month. If found below middle of UPPER and LOWER LEVEL, add clean drinking water to restore level.

WARNING

NEVER use ACID to refill a battery.

6. Make hydrometer or voltage test.

7. Keep exhaust tube free of kinks and obstructions.

8. Store battery with a full charge. A discharged battery will freeze.

NOTE

All batteries discharge during storage. Recharge battery every two months and before returning to service.

9. Carefully inspect and recharge the battery at the beginning and end of each mowing season.

SAFETY INTERLOCK SYSTEMS

3-1. GENERAL.

3-1.1 There are two basic electric wiring systems used: one for battery start models and one for recoil start models. All safety systems used are based on the same principle.

3-1.2 Most riders and tractors produced in 1982 were equipped with a reverse safety switch. This safety system required the cutting deck to be disengaged before the unit can be shifted into reverse gear. These systems will be used on all current production units.

3-1.3 The lift and disengagement lever is used to raise and lower the cutting deck which determines the cutting height. Pulling it all the way back and locking it disengages the blades. The lift and disengagement lever MUST be in the disengaged position when starting the engine, when shifting into reverse or if the operator leaves the seat.

3-1.4 All lawn and garden tractors produced after July, 1987 were requested by ANSI (American National Standards Institute) to have an operator present as an added safety feature. If the operator leaves the seat with the blades or PTO engaged, the engine will shut off. This seat switch is a safety device, designed for your protection. See Figure 3-1.

WARNING

NEVER attempt to bypass this operation.

3-1.5 In mid 1986, safety switches were added to most lawn and garden tractors, internally mounted in the seat.

3-1.6 On 1988 production, the location and type of safety switch was changed on most front engine lawn tractors. It was mounted on the seat bracket under the seat and it will shut off the engine with the deck engaged, with less than 40 lbs. of weight on the safety seat.

3-1.7 The 1990 riders and tractors have incorporated a new seat safety switch. The operator must engage the parking brake before leaving seat or unit will stall out. This new switch will also be present on riders and tractors with electric PTO's.

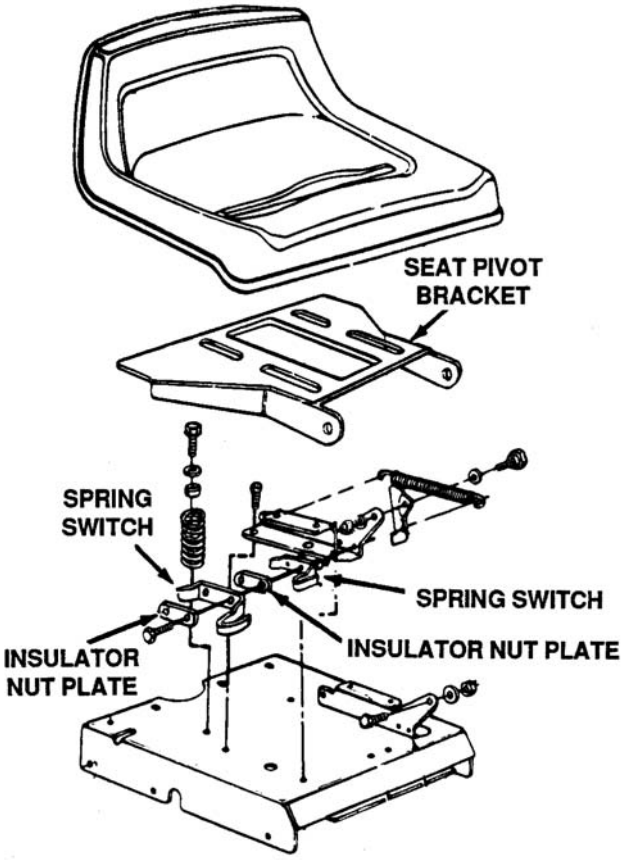


Figure 3-1.

3-1.8 For further information regarding this section, refer to the Technical Service Video "Safety Interlock Systems."

WARNING

At no time should the safety interlock system be bypassed for consumer's operation or convenience.

NOTE

The safety interlock system for 1991 has some changes that may or may not retrofit prior production units.

3-2 600 Series Rider Only.

1. The PTO safety switch mounting bracket was changed for added support to 14 gauge steel. This will retrofit 1990 production units. See Figure 3-2.

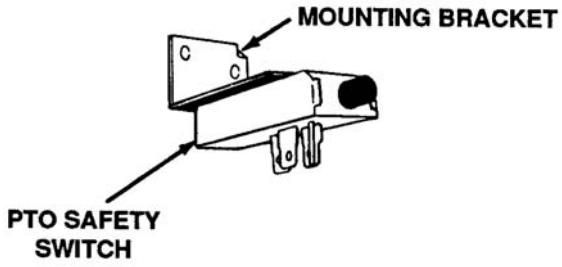


Figure 3-2. Mounting Bracket.

2. The standard battery used in the 600 series is 725-0514 (125 cold cranking amps). This battery can now be replaced by part number 725-1430 (275 cold cranking amps) by removing the battery spring retainer to allow clearance for the larger battery. This will not retrofit prior production units. See Figure 3-3.

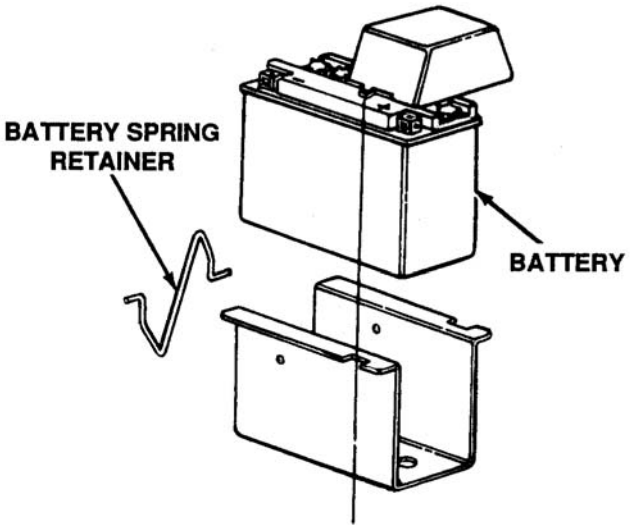


Figure 3-3. Battery With Spring Retainer.

3. Attach the steering wheel and indicator light panel as follows:

   a. Place the indicator wires through the steering bellows and place the bellows over the steering shaft.

   b. Place the five wires through the slotted hole located towards the center of the steering wheel hub. With the front wheels positioned straight forward, place the steering wheel over the steering shaft. Secure with the cupped washer and lock nut provided in the screwpack. See Figure 3-4.

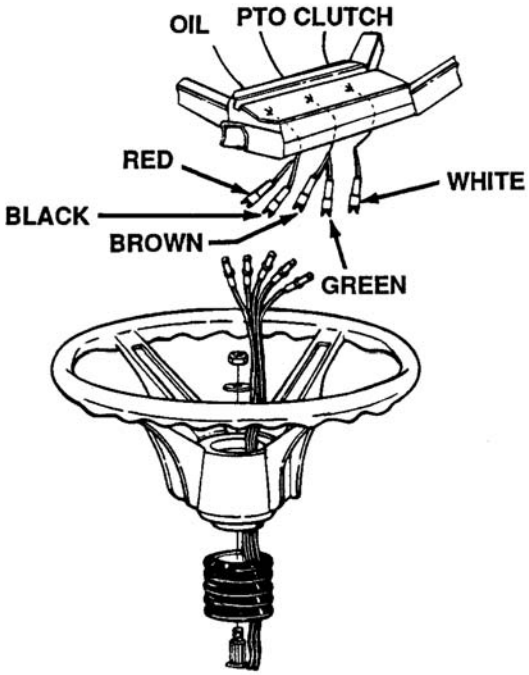


Figure 3-4. Steering Wheel.

NOTE

The indicator wires should be positioned at the bottom of the steering wheel (6 o'clock position).

4. Place the indicator wires through the cable tie located on the bottom side of the steering wheel insert. Connect the wires to the corresponding wires in the steering wheel insert. Tighten the cable tie on the insert to securely hold the wires in position.

5. Snap the steering wheel insert over the four spokes making sure the indicator lights are positioned towards the bottom.

6. Tighten the special cable tie in such a manner so the cable tie can slide up and down the wire harness which goes through the dash panel. (Slide the cable tie up until it rests against the hole on the inside of the dash panel.)

7. Turn the steering wheel fully in both directions. Pull the wires down from the dash and slide the cable tie down an additional 1/4 inch and tighten the cable tie securely. While doing this procedure the cable tie will automatically position itself on the harness to prevent damage to the wires during normal operation.

CAUTION

Do not cut off excess cable tie. The excess end will help keep the harness from being drawn up into the steering wheel and causing serious damage to the wires.

3-2.1 All Riders and Tractors.

1. The clutch safety switch has a retainer bracket for added support. This will retrofit 1990 production units. See Figure 3-5.

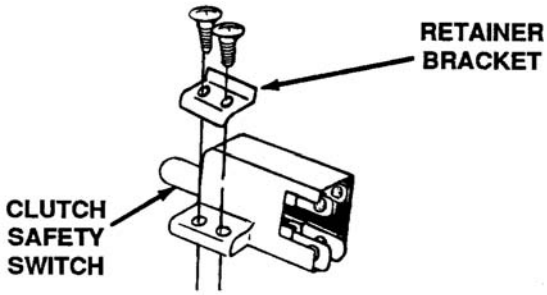


Figure 3-5. Retainer Bracket.

NOTE

If the clutch safety switch (part number 725-3169A) is ordered, it will NOT come with the retainer bracket or screws. To retrofit to a pre 1991 production unit, it is necessary to order the retaining bracket (part number 179162) and two screws (part number 710-0351).

2. The seat safety switch insulator nut plates have been redesigned to reduce the chances of a direct short. This will retrofit 1990 production units. See Figure 3-6.

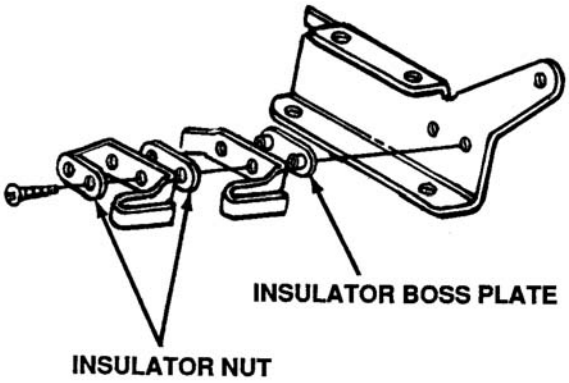


Figure 3-6. Safety Switch Insulator Nut Plates.

NOTE

This boss plate goes all the way through the two spring switches and will reduce the chances of a short. This also will retrofit prior production unit

3-2.2 600, 700 and 800 Series Only. The circuit breaker is being replaced by a standard automotive type fuse. Nonregulated electrical systems will use a 7-1/2 amp fuse. On regulated electrical systems, a 20 amp fuse will be used. This will not retrofit prior production units. See Figure 3-7.

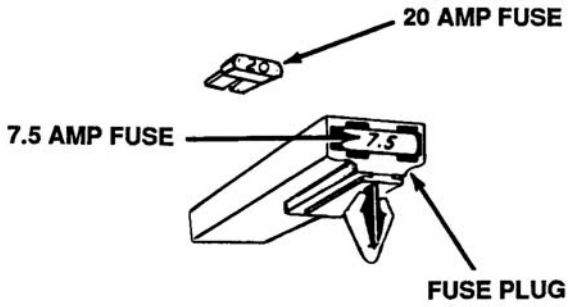


Figure 3-7. Fuse Holder.

NOTE

Although this will not retrofit our prior production units, there are, however, two separate fuses: the 7.5 amp fuse for a standard dual circuit alternating system and the 20 amp fuse for a regulated system.

3-3. ELECTRIC START SYSTEM.

3-3.1 Before the engine will crank, the key must be turned on and both of the safety switches must be activated. One is activated when the clutch is depressed and one is activated when the blade is disengaged. When this happens the circuit will be complete between the battery and the coil primary of the solenoid. This will close the solenoid which will allow the starter motor to crank the engine. The safety switches are wired in series on the electric start models. See Figure 3-8.

3-3.2 Testing the Interlock System on the Electric Start System.

1. Starting instructions:

   a. Disengaged the blade or PTO.

   b. Depress the clutch pedal.

   c. Set the throttle (and choke if separate).

d. Turn the ignition key to the START position.

NOTE

If the engine does not crank, use the following procedure to check out the system. If the engine cranks but does not start, the problem is not with the interlock system. engaging of the blade and the depressing of the clutch depresses the black plunger a minimum of 1/8 inch.

3. Check the fuse or circuit breaker between the positive terminal of the battery and the ignition switch. If the fuse or circuit breaker is blown the engine will not crank.

4. Check the following terminal to see that the wires are in place.

   a. The positive terminal of the battery. A large and a small wire should be fastened securely to this terminal. On some units both wires are cast into one clamp.

   b. The negative terminal on the battery and the ground to the frame.

   c. The ignition switch terminal.

   d. The clutch safety switch.

   e. The blade safety switch.

   f. The solenoid terminals. A small wire is fastened to the coil primary and the two larger wires are fastened to each side.

5. Check the condition of your battery. Even if the battery is dead you should be able to hear the solenoid click. This would verify that the starting system is operating at least to the solenoid. The specific gravity of the battery should be 1.265.

6. A continuity tester can be used to check the continuity between each component of the interlock system. Follow the instructions packed with the continuity tester which can be purchased at electrical shops.

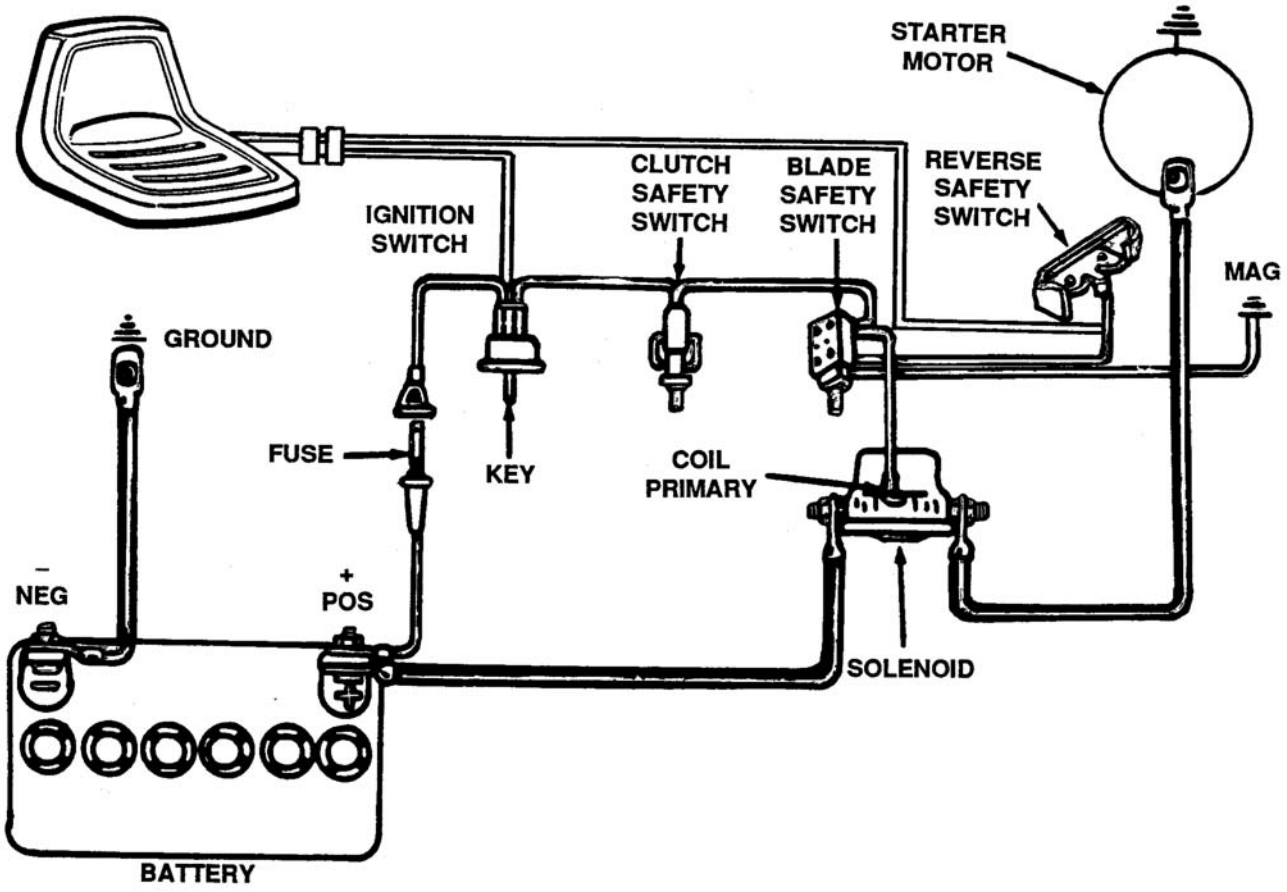


Figure 3-8. Typical Electric Start System.

WARNING

To test the interlock system further, you will be bypassing the safety switches. Make sure that the clutch is disengaged and the blade engagement lever is in the disengaged position. If the clutch cannot be locked in the disengaged position, place the gear shift lever in the neutral (N) position. When using a jumper wire in the following tests the engine may crank over.

NOTE

Disconnect the spark plug lead and ground it against the engine block.

7. Use a jumper wire between the following points:

   a. The positive terminal on the battery to the terminal on the solenoid (coil primary). If the engine cranks, then test within this circuit to find the exact area of the problem. See steps b and c below.

   b. The positive terminal of the battery and the S terminal on the ignition switch. If the engine cranks, the problem is between the battery and the ignition switch.

   c. The S terminal on the ignition switch to the coil primary terminal on the solenoid. If the engine cranks, the problem is between the ignition switch and the solenoid.

   d. Jump between the two large terminals on the solenoid.

NOTE

Only use a wire as heavy as the wire from the solenoid to the starter with an alligator clip. If you have current up to the coil primary terminal of the solenoid and the starter will not crank, however, you can crank the starter using the jumper wire, the problem is with the solenoid. Check the base of the solenoid to see that it has a good ground to the frame of the unit. If it still fails to operate, replace it.

3-3.3 Testing the Safety Reverse Switch on the Electric Start Systems. If the engine can be started, but stalls when the blade is engaged, use the following procedure to determine if the problem is in the reverse safety switch:

NOTE

Transmission lever must not be touching the reverse spring switch and the key must be in the ON position.

1. Disconnect the yellow wire going to the magneto on the engine.

2. Disconnect the wire attached to the spring switch.

3. Attach one lead of a continuity tester to the spring switch and the other lead to ground. If there is continuity, the fiber washers could be damaged and should be replaced.

3-3.4 Testing the Solenoid on Electric Start Riders and Tractors.

NOTE

Through examination of returned warranty parts, we have found instances of solenoids being replaced unnecessarily on electric start riders.

1. The following are real solenoid problems and require replacement of the solenoid:

   a. Solenoid is stuck—Unit will start with ignition key in OFF position.

   b. Coil wire (inside solenoid) is bad—Solenoid will not function.

   c. Bad washer (inside solenoid)—Solenoid clicks but starter motor does not turn.

2. Other problems which can appear to be a defective solenoid:

   a. Faulty ground.

   b. Defective safety switch.

   c. Discharged battery.

   d. Defective starter motor.

   e. Blown circuit breaker.

   f. Defective ignition switch.

   g. Defective wire harness.

1. Coil Check:

a. Disconnect the spark plug wire from the spark plug.

b. Disconnect the coil wire from the solenoid.

c. Using a DVOM (in the OHMS setting) attach the red lead to the coil connection and the black lead to system ground.

d. The resistance reading should be about 5 ohms.

*Meter readings greater than 10 ohms or less than 3 ohms indicates solenoid failure.

e. Remove meter leads and reconnect coil wire.

2. Contact Check:

a. Disconnect the spark plug wire from the spark plug.

b. Disconnect the wire AT THE STARTER which runs to the solenoid.

c. Using a DVOM (in the OHMS setting), attached the red lead to a contact bolt and the black lead to the other contact bolt. The meter should read “OPEN” circuit, or infinity.

*A “closed” circuit indicates solenoid failure.

d. Energize the solenoid using the start switch. WARNING: DO NOT HOLD “ON” FOR MORE THAN 5 SECONDS AT A TIME.

e. The meter should read “CLOSED” circuit, or less than 10 ohms. Continued on page 3-15.

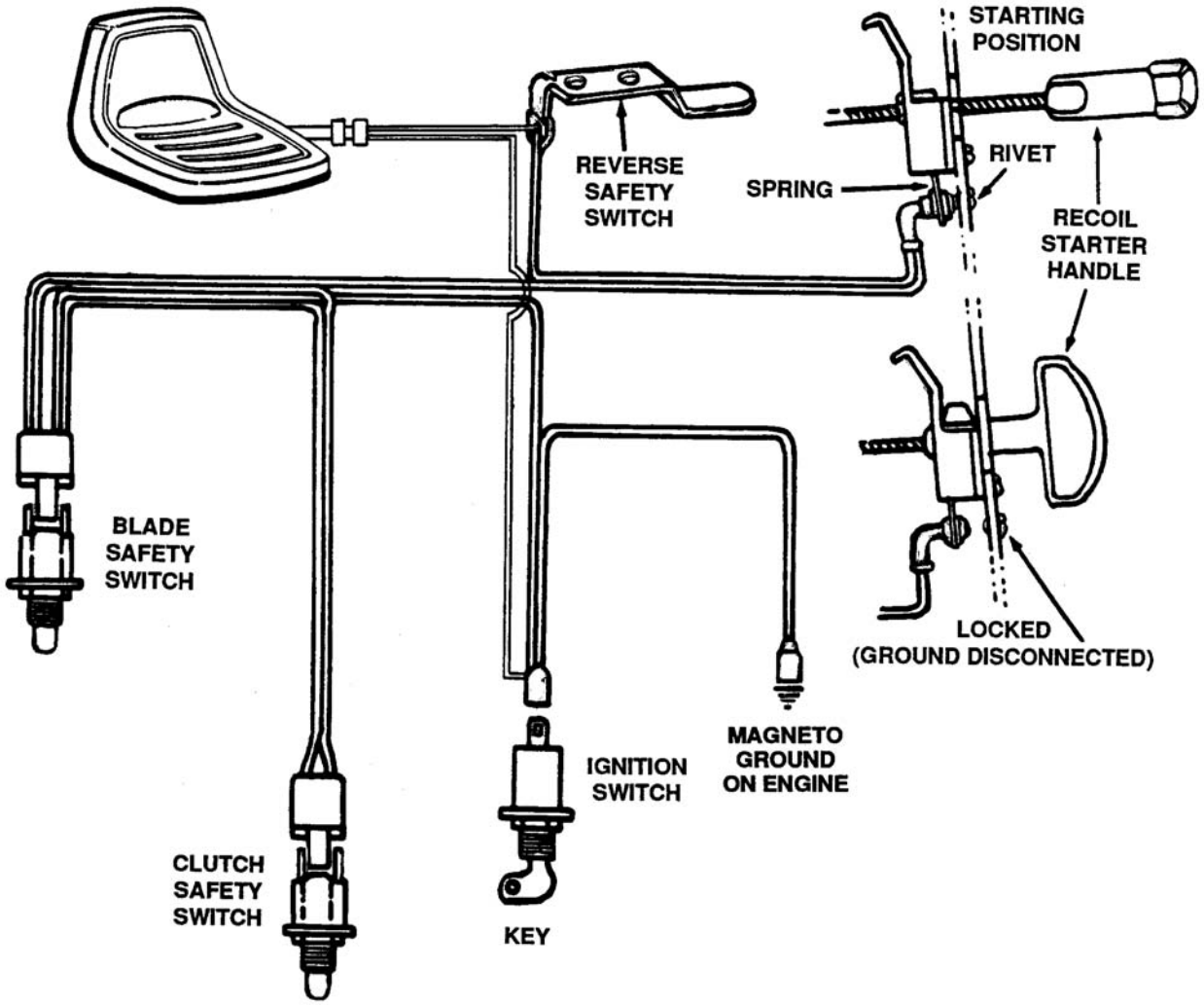


Figure 3-9. Typical Recoil Start System

INTERLOCK CIRCUIT (800 SERIES TWIN)

With the engine running, current exists in the safety circuit. By grounding the reverse switch or the seat switch or a short in the yellow wires, the engine will shut down.

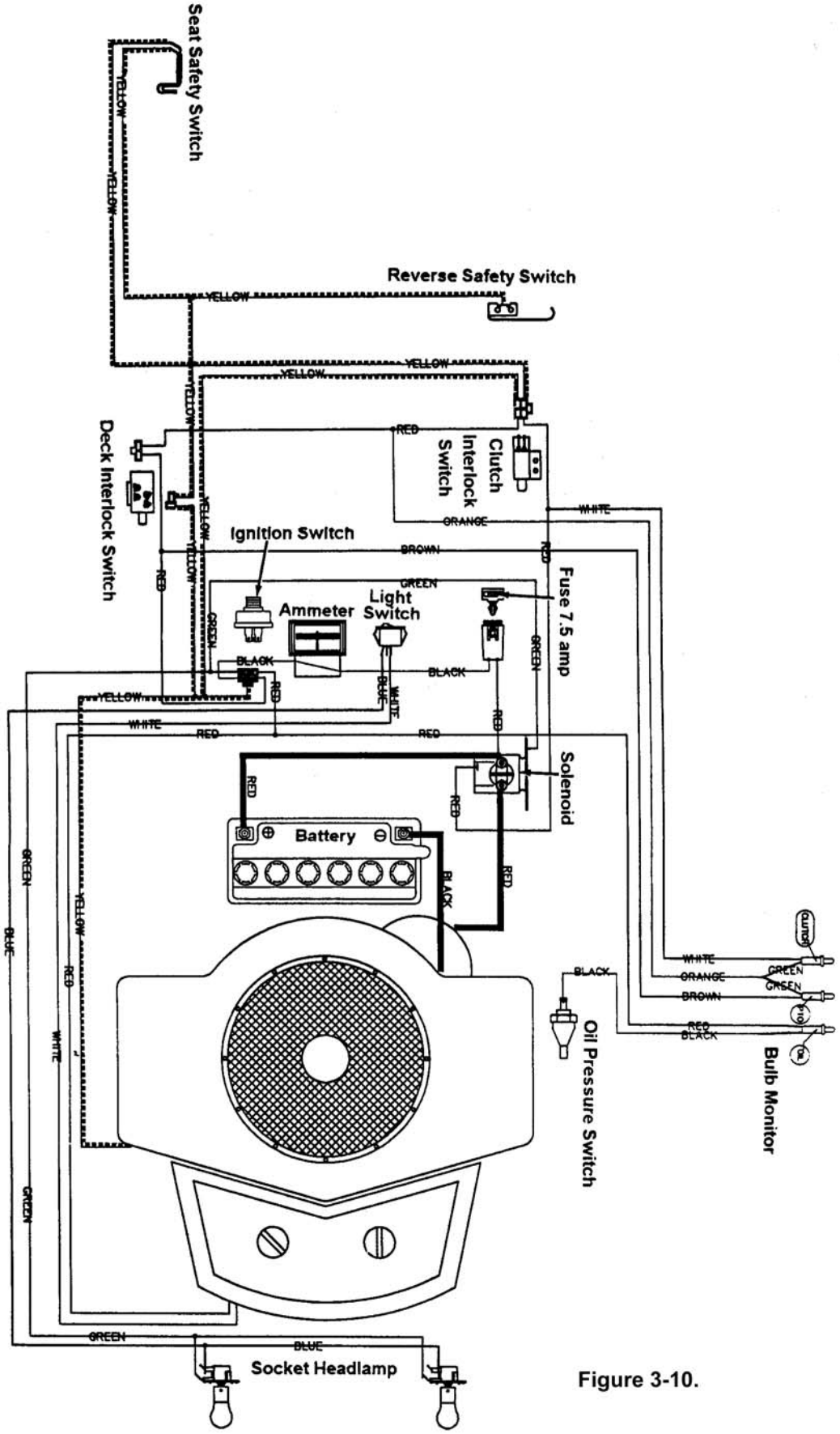


Figure 3-10.

CHARGING CIRCUIT (800 SERIES TWIN)

This schematic illustrates the charging system. With the engine running, current flows from the engine alternator, through the ignition switch and fuse, to the positive terminal.

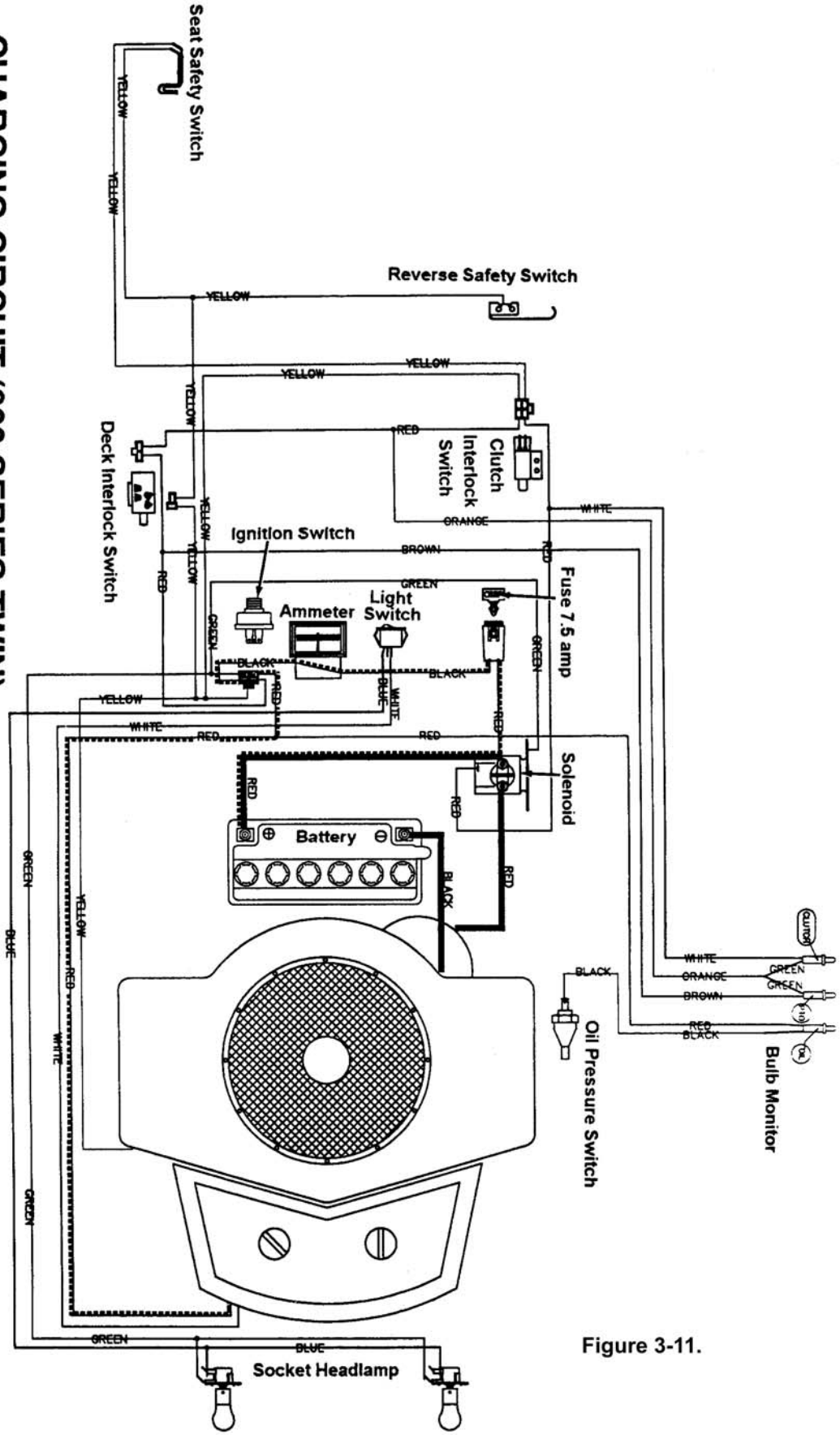


Figure 3-11.

STARTING CIRCUIT (800 SERIES TWIN)

In the starting circuit, the deck lift lever must be in the disengaged position and the clutch/brake pedal depressed to activate the system. With the ignition switch in the start position, current flows in two directions from the positive terminal on the battery almost simultaneously. In the first one, current flows through the fuse, ignition switch, PTO switch and clutch switch to activate the solenoid, thus allowing current to flow in the second line from the battery through the solenoid to the starter.

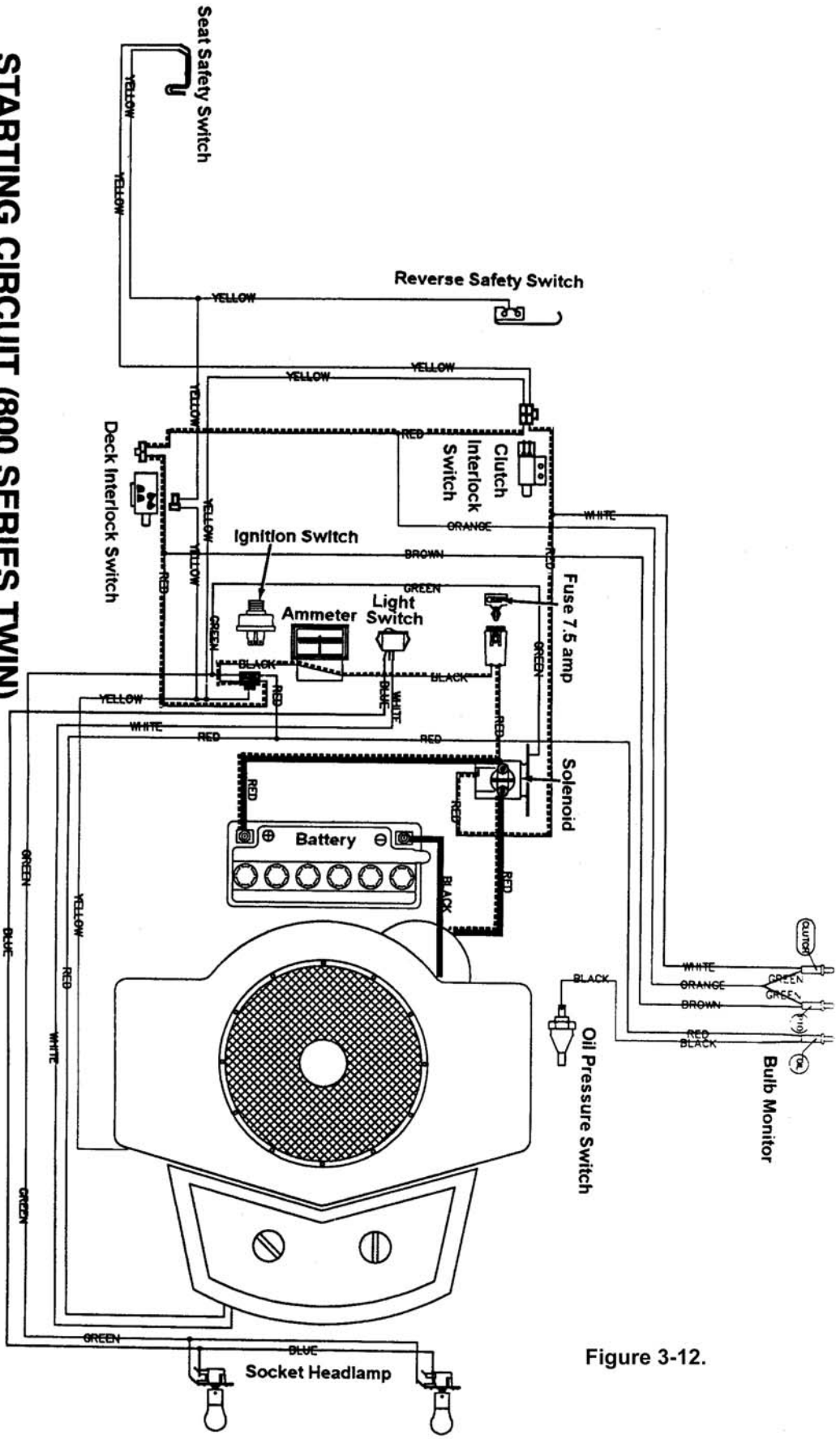


Figure 3-12.

SAFETY CIRCUIT (PTO ENGAGED SWITCH UP) 800 SERIES (ELECT. PTO & MONITOR)

With PTO switch in up position, relays block out the safety switches and engages the PTO.

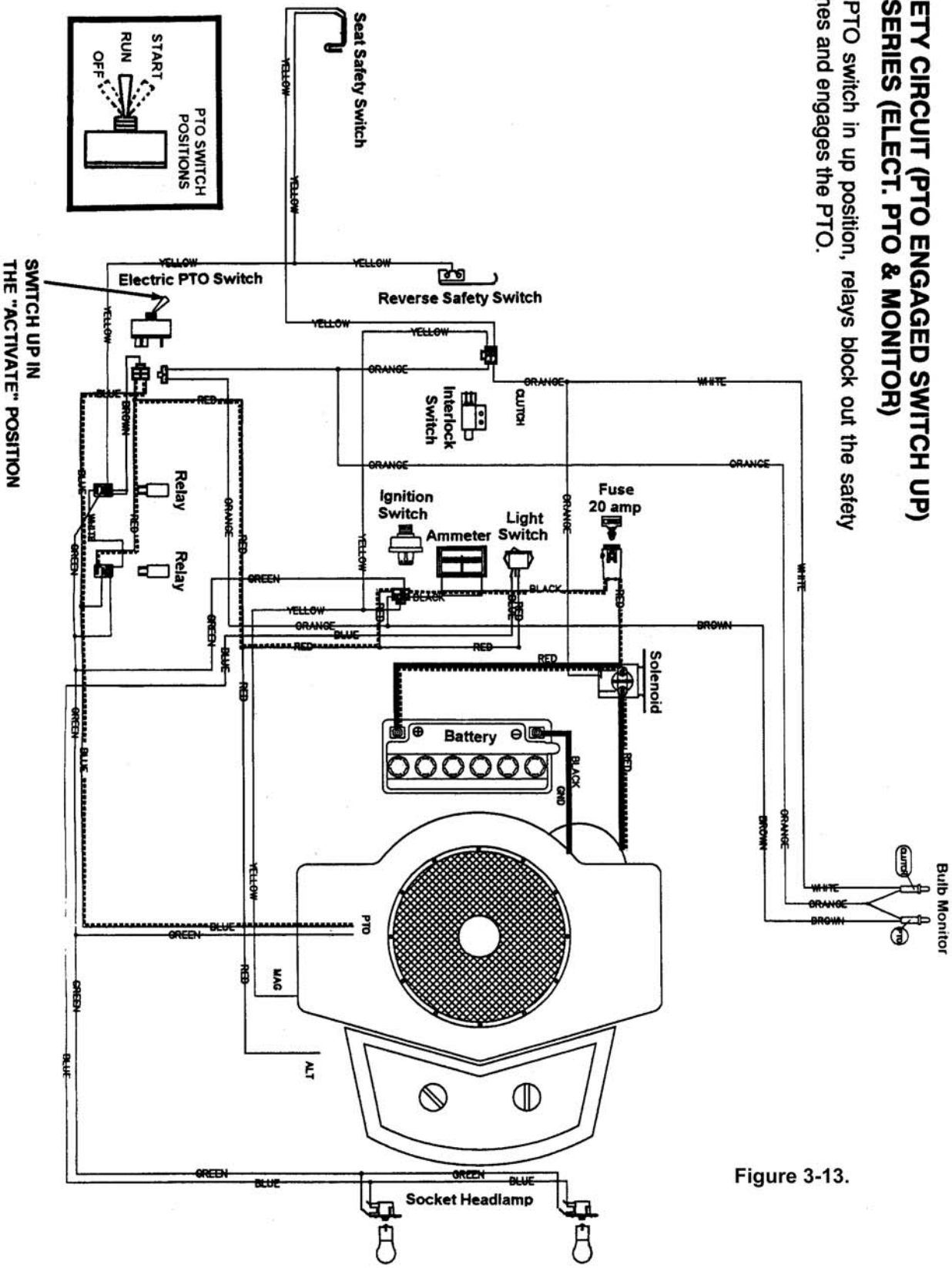


Figure 3-13.

CHARGING CIRCUIT
800 SERIES (ELECT. PTO & MONITOR)

This schematic illustrates the charging system. With the engine running, current flows from the engine alternator, through the ignition switch and fuse, to the positive terminal.

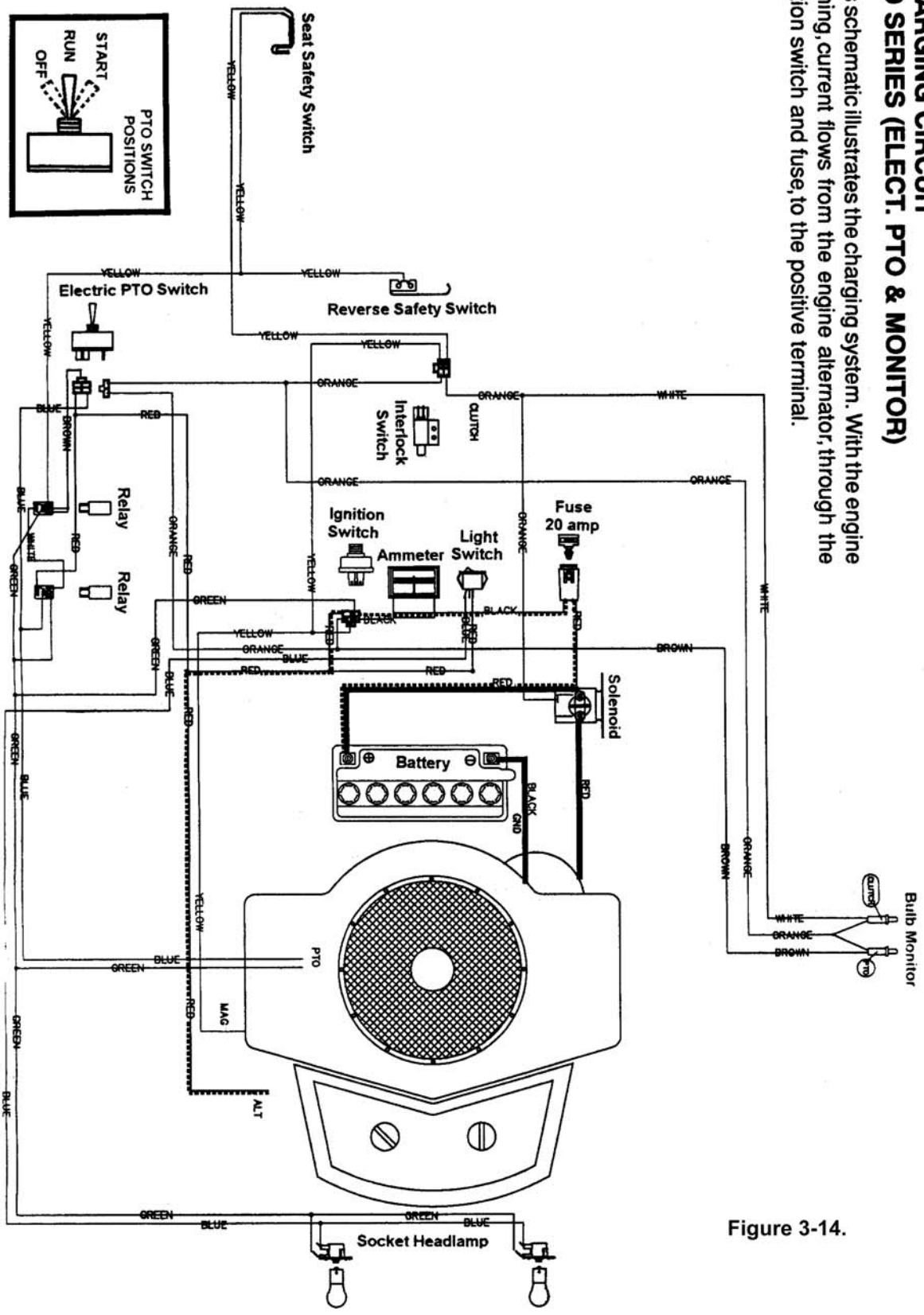


Figure 3-14.

STARTING CIRCUIT
800 SERIES (ELECT. PTO & MONITOR)

In the starting circuit, the deck lift lever must be in the disengaged position and the clutch/brake pedal depressed to activate the system. With the ignition switch in the start position, current flows in two directions from the positive terminal on the battery almost simultaneously. In the first one, current flows through the fuse, ignition switch, PTO switch and clutch switch, to activate the solenoid, thus allowing current to flow in the second line from the battery through the solenoid to the starter.

Also, voltage must exist in the wire from the ignition switch to the after fire solenoid or unit will crank but not run. The fuel supply is shut off.

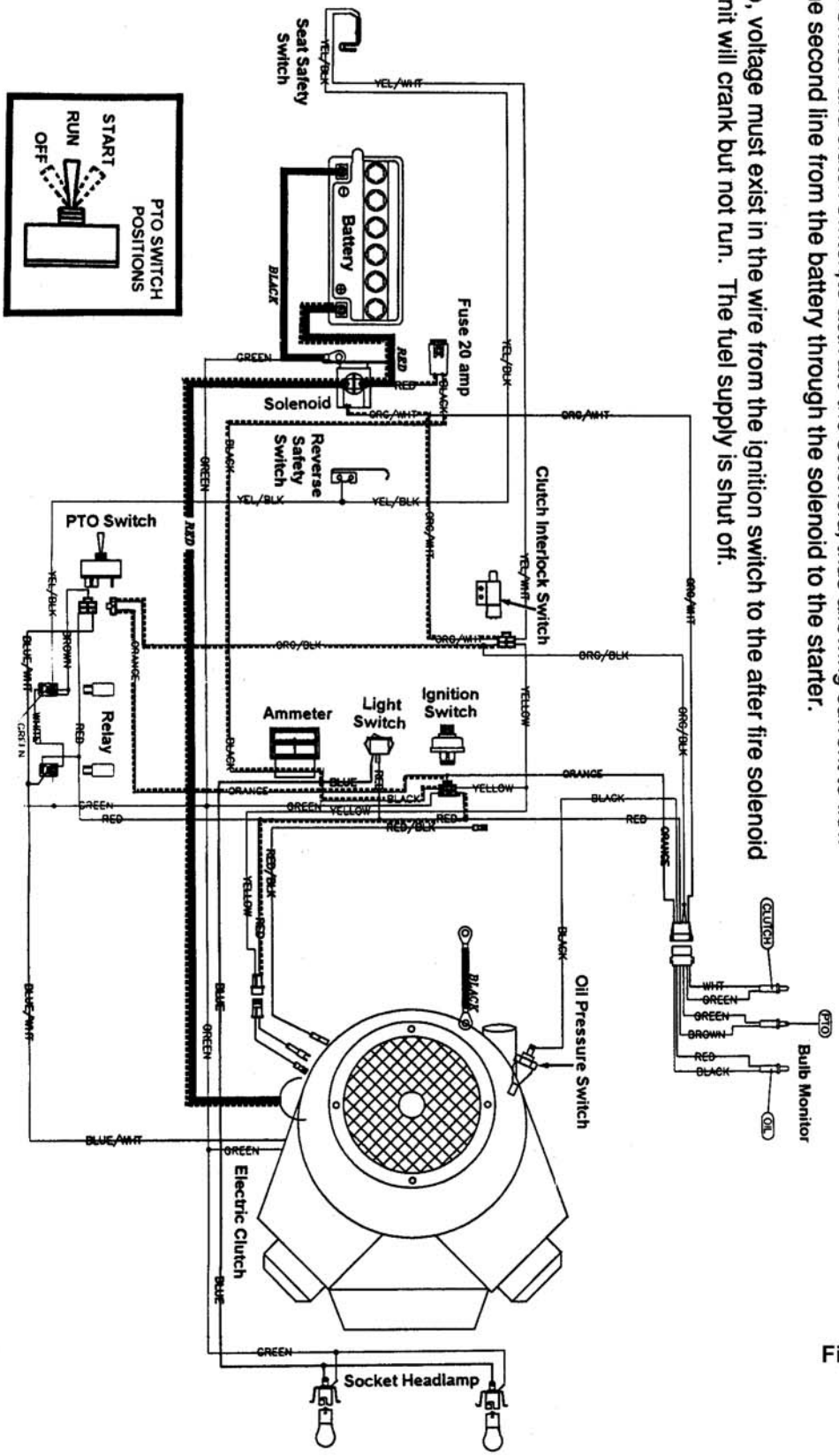


Figure 3-15.

STARTING CIRCUIT
800 SERIES (ELECT. PTO & MONITOR)

In the starting circuit, the deck lift lever must be in the disengaged position and the clutch/brake pedal depressed to activate the system. With the ignition switch in the start position, current flows in two directions from the positive terminal on the battery almost simultaneously. In the first one, current flows through the fuse, ignition switch, PTO switch and clutch switch to activate the solenoid, thus allowing current to flow in the second line from the battery through the solenoid to the starter.

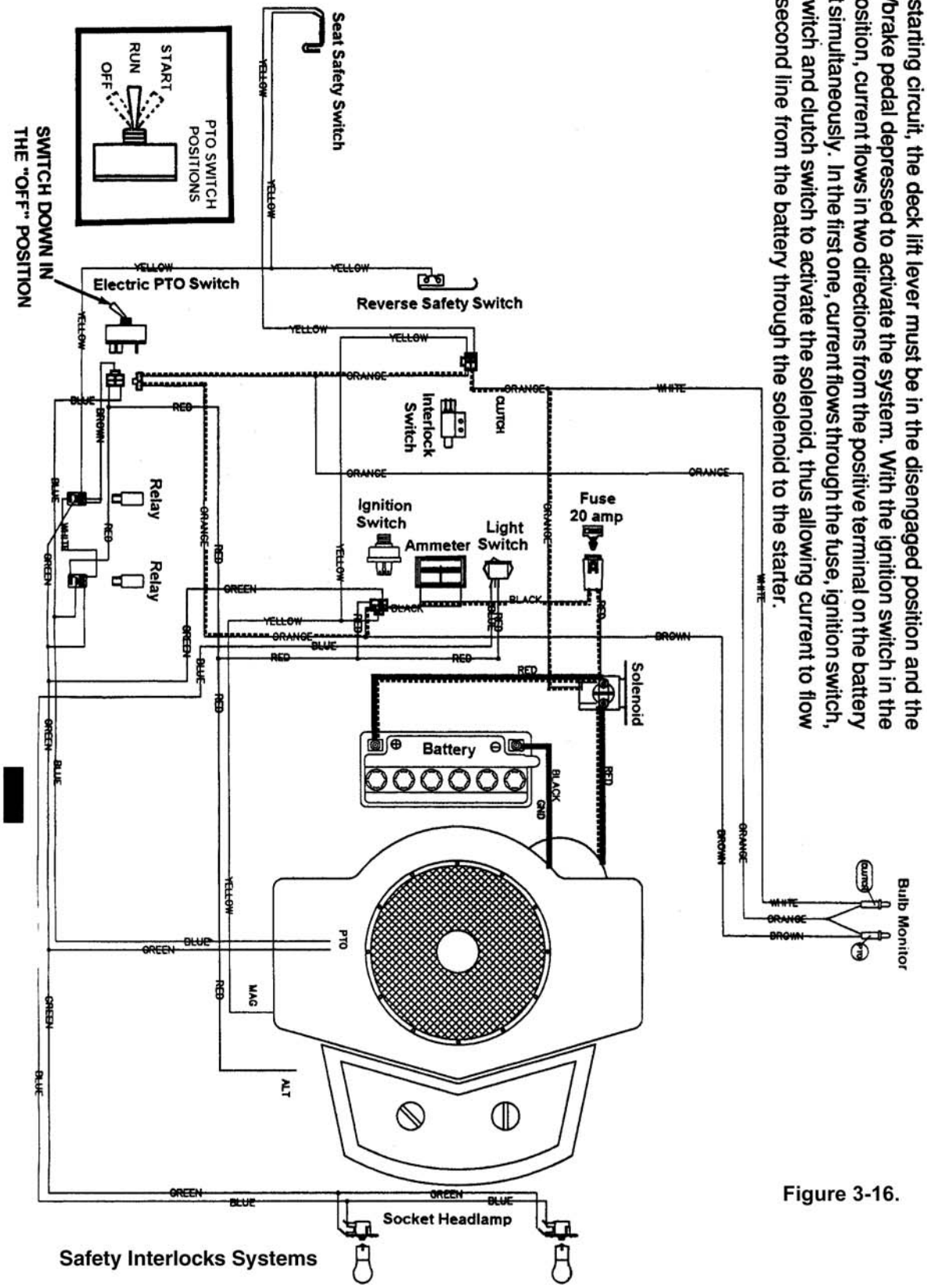


Figure 3-16.

Safety Interlocks Systems

PTO ENGAGED "RUN" POSITION
800 SERIES (ELECT. PTO & MONITOR)

With the PTO switch in the "RUN" position, current flows from the battery through the fuse, ammeter, ignition switch, through the PTO switch and relays, thus engaging the PTO.

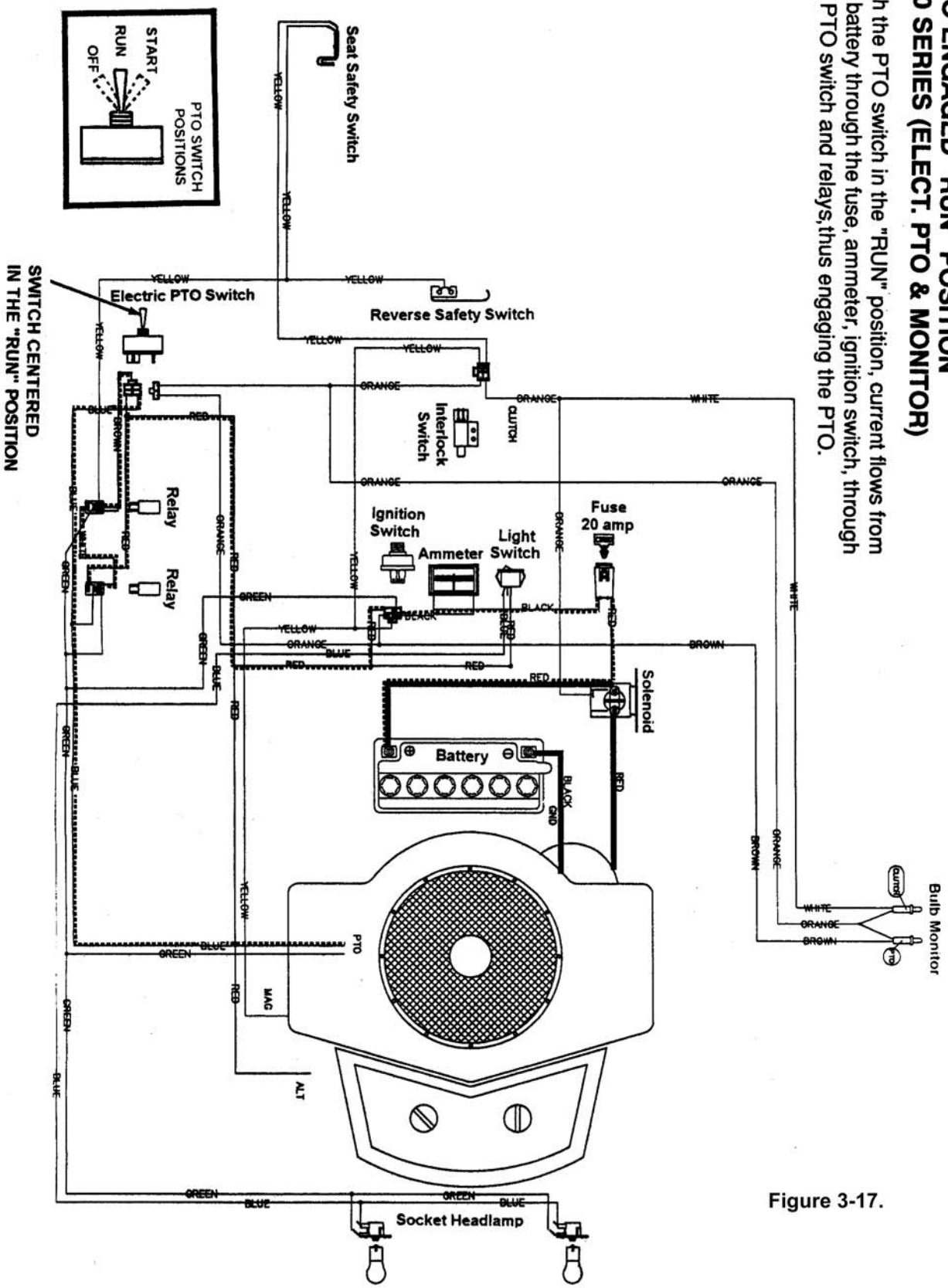


Figure 3-17.

*An “OPEN” circuit indicates solenoid failure.

f. Remove meter leads and reconnect the starter wire.

3.5 TROUBLESHOOTING SAFETY INTERLOCK SYSTEMS.

Problem: The engine will not crank.

1. Check the battery cables to be certain that they are connected properly. The black cable should be connected to the negative terminal on the battery. The red cable should be connected to the positive terminal on the battery. Connections must be tightened securely. See Figure 3-18.

Figure 3-18.

2. Check the battery with a voltage tester. The battery should read approximately 12 volts. Turn the key switch to the start position. If the voltage drops more than 2 volts, refer to the battery video for testing procedures. See Figure 3-19.

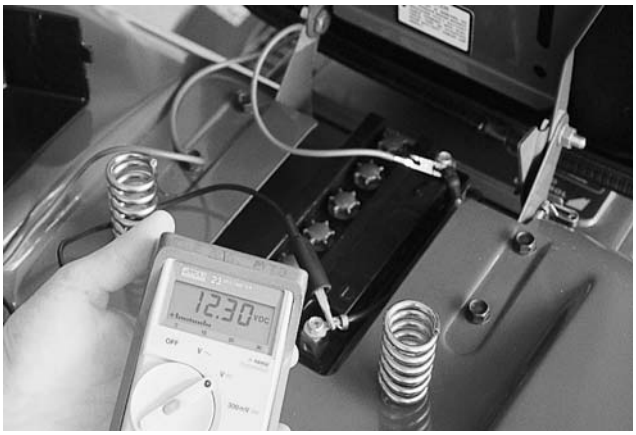


Figure 3-19.

3. Remove the shift panel to gain access to the solenoid and fuse.

   a. Check for a tripped circuit breaker or blown fuse. Circuit breakers seldom open or fuses blow without a reason. The problem must be corrected. See Figure 3-20.

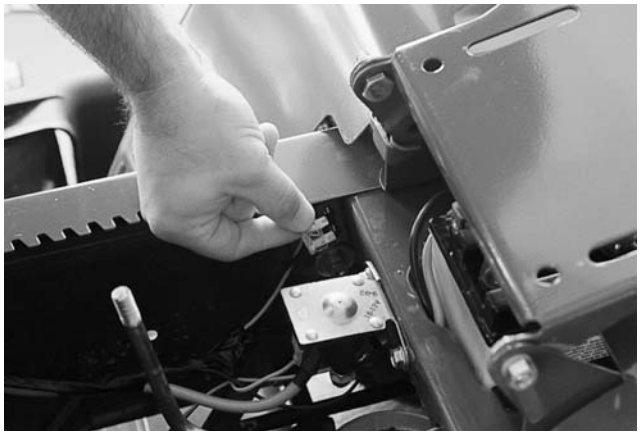


Figure 3-20.

   b. If your unit has a fuse, pull the fuse to determine if it has blown. If it has, you will have to find the fault.

   c. To test a circuit breaker, connect a volt meter or a 12 volt test light between the negative battery terminal and each side of the circuit breaker terminals. If voltage is present at both terminals the breaker is good. If not, replace the breaker.

   d. Check for a short in the wiring. A dead short may be in the cranking or charging circuit where the insulation may have rubbed through and exposed a bare wire. Replace the wire or repair with electrical tape if the wire strands have not been damaged.

   e. Look for a wire pinched between body panels, burned by the exhaust pipe or muffler or rubbed against a moving part.

4. If your unit has a dual circuit alternator and the fuse is blowing or the breaker is tripping, check for proper wiring. If you have a regulated system disregard this section.

   Disconnect the red and white lead connector which goes to the alternator. If the unit cranks, the wires are reversed and a dead short resulted. Reverse the wires to correct the problem. See Figure 3-21.

Figure 3-21.

NOTE

The connector is notched to fit together one way only. The red wires should align with each other.

For more information on charging systems, see the video “Batteries and Charging Systems.”

5. Check to be certain the small orange wire is connected to the small terminal on the solenoid. On some units, this wire may be red instead of orange.

   Using a test light or meter, check for voltage at this wire with the key in the start position. If voltage is present, the key switch and safety circuits are O.K. but the solenoid must be checked further or replaced. See Figure 3-22.

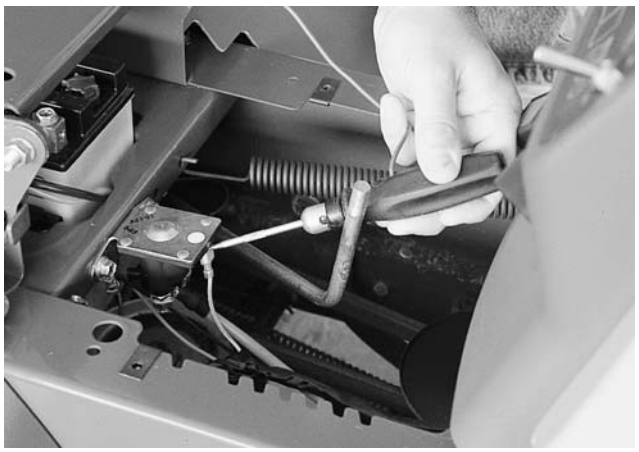


Figure 3-22.

6. Clamp the test light to the base of the solenoid. Touch other probe to the positive terminal of the solenoid. It should show voltage. See Figure 3-23.

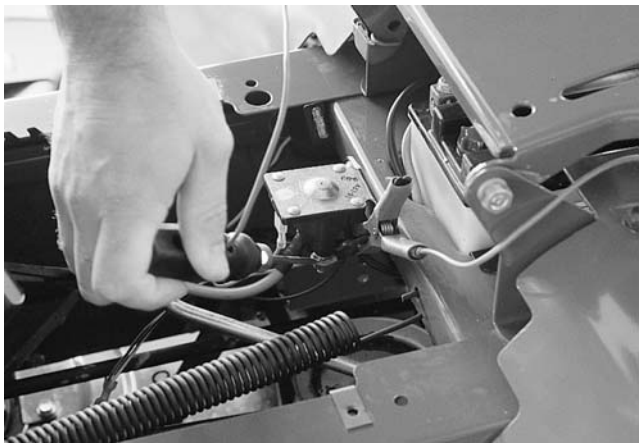


Figure 3-23.

7. Touch probe to terminal on solenoid that goes to starter. Turn ignition key to the start position. If no voltage is present, replace the solenoid. See Figure 3-24.

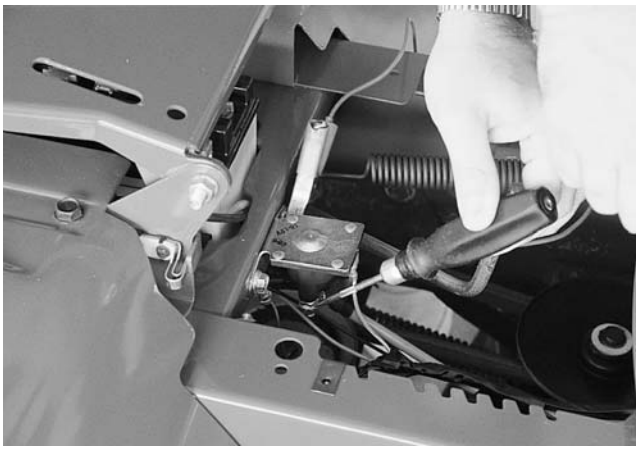


Figure 3-24.

Check to be certain the unit is grounded properly.

The black, or negative, cable coming from the battery must be properly secured to the frame or engine, depending on the model tractor.

8. To check for proper electrical ground, connect one side of your meter or test light to the positive terminal of the battery. See Figure 3-25.

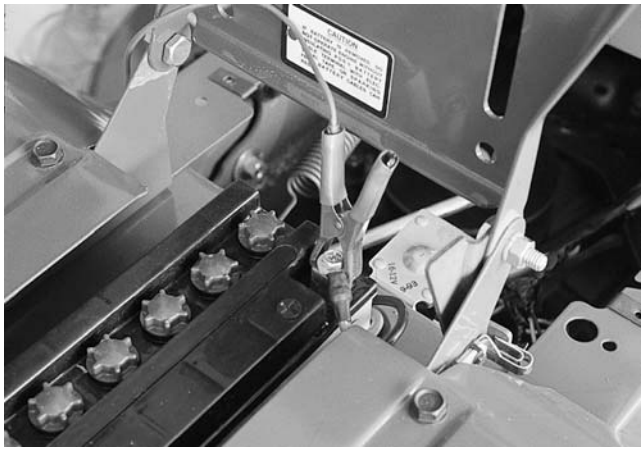


Figure 3-25.

Touch the other lead to the mounting bracket of the solenoid. If voltage is present, the solenoid is properly grounded. See Figure 3-26.

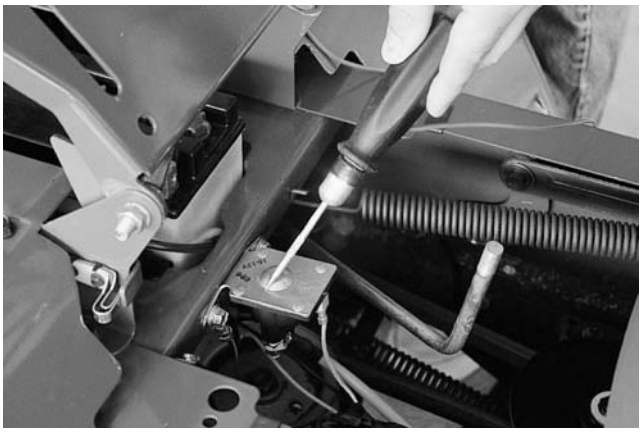


Figure 3-26.

If your unit has a small green wire to the base of the solenoid, make certain that it is securely connected.

9. The engine may have a ground wire located at the base of the engine, attached to the frame. It must be firmly attached to both the engine and the tractor frame. See Figure 3-27.

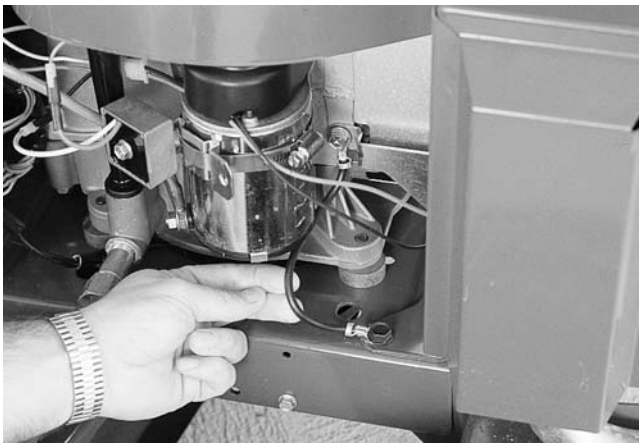


Figure 3-27.

10. To test for ground, connect one test lead to the positive terminal of the battery and the other lead to the engine block. If voltage is present the engine is grounded properly. If not, check that the ground wires are clean and properly connected. See Figure 3-28.

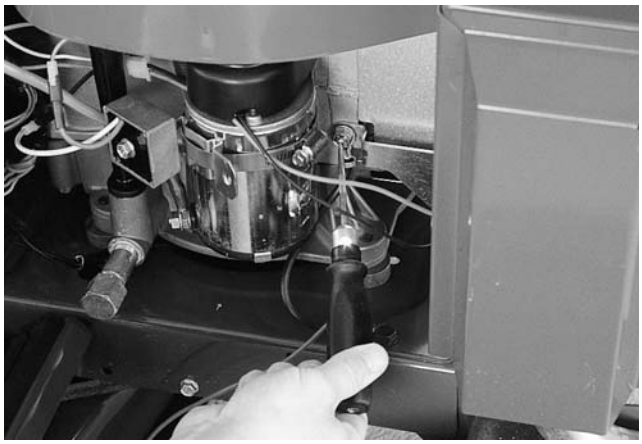


Figure 3-28.

11. Check for voltage at the starter motor by connecting one lead of your tester to the engine ground. Touch the other lead to the starter motor terminal. Turn the key to the start position. If voltage is present and the engine does not crank, all circuits are working properly and the problem is in the engine. Contact your authorized engine service dealer. See Figure 3-29.

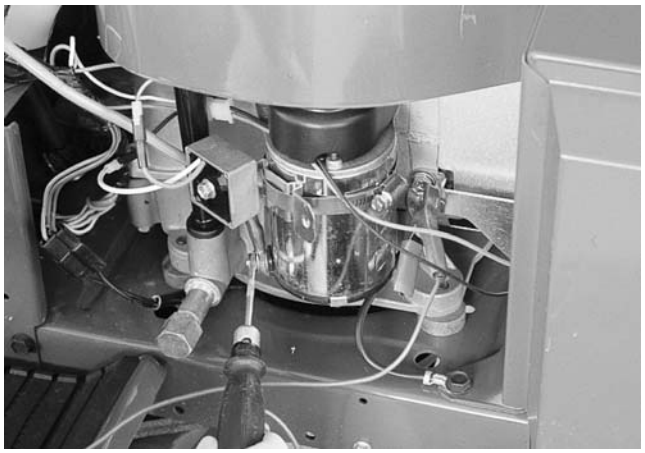


Figure 3-29.

12. If voltage was not present at the orange wire on the solenoid while cranking the engine, you will need to check the ignition switch and safety interlock switches to see if they are being activated properly. There are three switches which must be activated in order to crank the unit: the ignition switch, the clutch/brake pedal switch, and the deck lift lever switch or PTO switch if your unit has an electric PTO.

    Make certain the switch activators are depressing the plungers on the switches. Also, check for proper wire connection at the switch terminals.

    NOTE

    There is a seat safety switch and a reverse safety switch on this unit; however, they are not involved in the cranking circuit.

13. Check the ignition switch to be certain the wire harness connector is completely secured to the ignition switch terminals. Wires on the harness plug at the ignition switch should be installed as illustrated. See Figure 3-30.

    If the unit still fails to start you will need to test the ignition switch further.

14. For clarity we have removed the ignition switch.

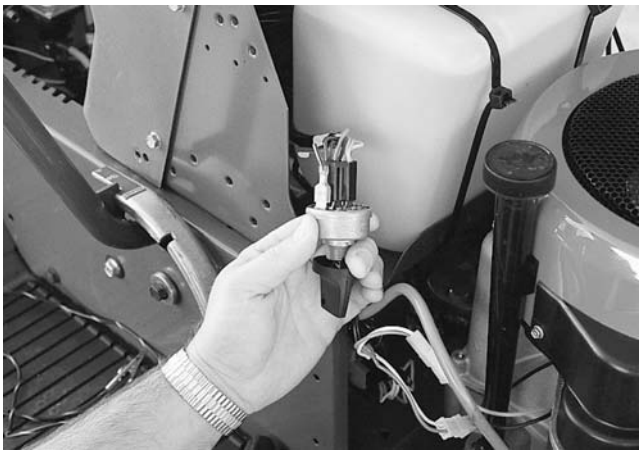


Figure 3-30.

15. Using a test light or meter, connect one lead to ground. Connect the other lead to the black terminal on the ignition switch. Voltage should always be present. See Figure 3-31.

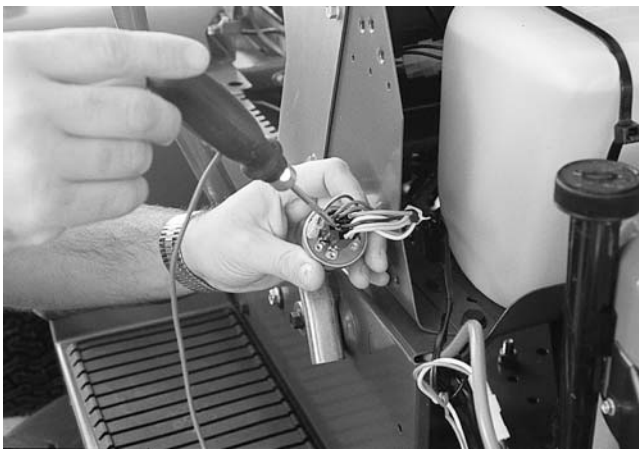


Figure 3-31.

16. Move the tester from the black lead to the orange lead. Turn the ignition key to the start position. If voltage is present, the ignition switch is good. If no voltage is present, replace the ignition switch. See Figure 3-32.

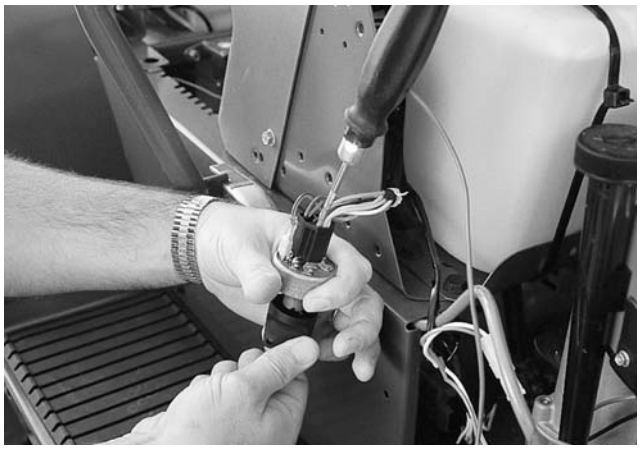


Figure 3-32.

If the unit still fails to crank, continue testing.

17. For units without an electric PTO, raise the deck lift lever fully and make sure the plunger on the safety switch is fully depressed. Attempt to start the unit. If it does not crank, remove the PTO switch. Using a jumper wire, connect between the two orange terminals. If the unit now cranks, replace the deck lift lever safety switch. See Figure 3-33.

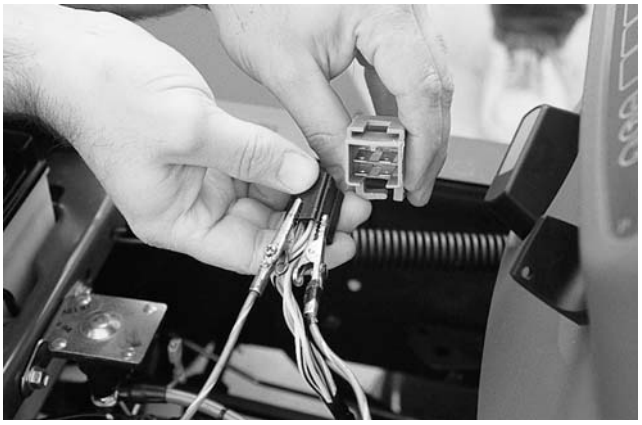


Figure 3-33.

18. If you have an electric PTO, remove the connector from the PTO switch. Jump between the two orange terminals. If the unit now cranks, replace the PTO switch. See Figure 3-34.

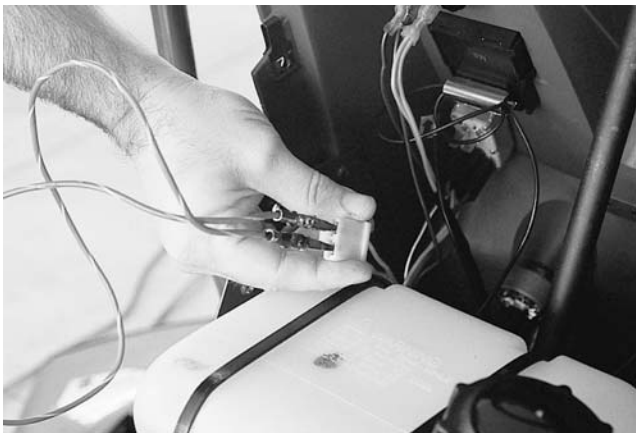


Figure 3-34.

19. If the unit does not crank, make sure the clutch/brake pedal switch is fully depressed. Remove the switch and jump a wire between the two orange terminals. See Figure 3-35.

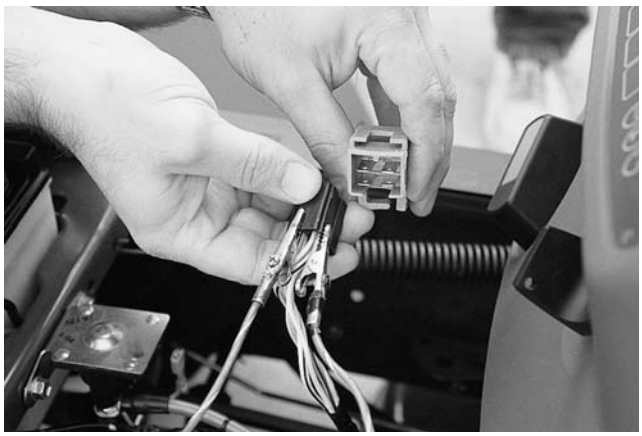


Figure 3-35.

20. If the unit cranks, replace the clutch brake pedal safety switch.

Problem: The engine cranks but will not start.

1. Check the fuel tank for gas.
2. Check to be certain the spark plug wire is firmly connected to the spark plug terminal.
3. Check the throttle and/or choke for proper starting position.
4. Disconnect the yellow ground wire on the engine. If the engine starts, the problem is with the safety switches or wiring harness.

5. If the engine fails to start, and you do not have an afterfire solenoid, the problem is in the engine and must be repaired by an authorized engine service dealer.

6. If you do have an engine with an afterfire solenoid attach your tester to the red wire and ground. Voltage should be present in the start and run positions. If voltage is not present, replace the ignition switch. See Figure 3-36.

Figure 3-36.

7. Disconnect the wires or harness connector from the clutch/brake safety switch. See Figure 3-37.

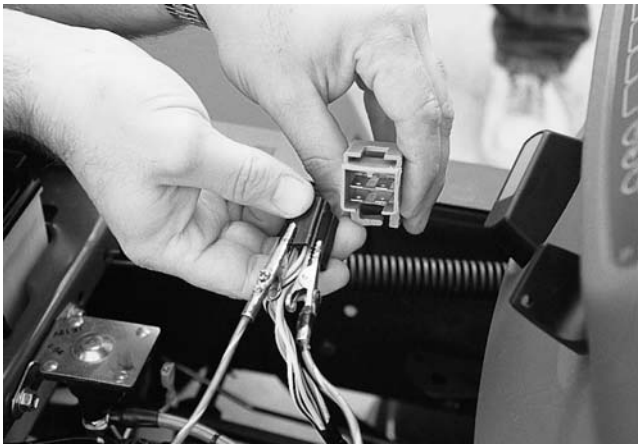


Figure 3-37.

With another wire, jump across the two red or orange wires in the harness connector and start the unit. If unit starts, the switch is defective and must be replaced. See Figure 3-37.

8. Disconnect the yellow wires on the deck lift lever safety switch or PTO safety switch if your unit has an electric PTO. Jump across the red or orange wires. If engine starts, the switch is defective and must be replaced. See Figure 3-38.

Figure 3-38.

9. Check the ignition switch by removing the yellow wire from the switch harness and try to start the unit. If the unit starts, replace the ignition switch. Reinstall the yellow wire to the connector to stop the engine. See Figure 3-39.

Figure 3-39.

Problem: The engine stalls when engaging clutch/brake pedal.

Check both the reverse safety switch and seat safety switch for grounding out conditions.

NOTE

Wires must not come into contact with the unit when checking these connections.

1. Disconnect the yellow wire on the reverse safety switch. With the engine running, place the shift lever in neutral and release the clutch/brake pedal. See Figure 3-40.

Figure 3-40.

If the engine continues to run, the screws on the reverse safety switch are grounding out against the reverse safety switch bracket.

Correct by removing the screws that hold the reverse safety switch to the bracket. Inspect the insulator plate for cracks or distortion, which can occur if the screws are improperly installed. Replace if defective.

2. If the engine stalls when testing the reverse safety switch, check the seat safety switch by disconnecting both yellow wires on the switch. See Figure 3-41.

   With the engine running and the shift lever in neutral, release the clutch/brake pedal. If the engine continues to run, the problem is with the insulator plate on the seat safety switch. Inspect in the same manner as the reverse safety switch. Replace if defective.

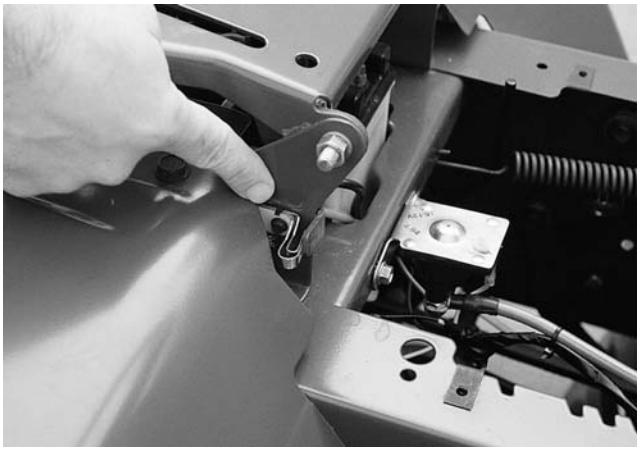


Figure 3-41.

Problem: Your unit has an electric PTO and the blades do not engage when activating the PTO switch.

1. Check for voltage at the PTO connector with the PTO switch in the on position.

   If there is voltage, adjust the PTO clutch or replace it as needed.

2. If there is no voltage, check for voltage at the red wire at the PTO switch. If no voltage, check for voltage at the ignition switch. See Figure 3-42.

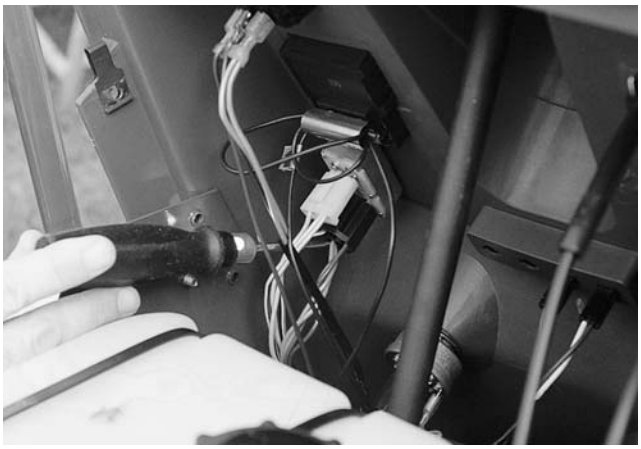


Figure 3-42.

3. If there is voltage at the red wire at the PTO, switch the PTO to the start position and check for voltage at the blue and brown wire. If there is no voltage at either, replace the PTO switch. See Figure 3-43.

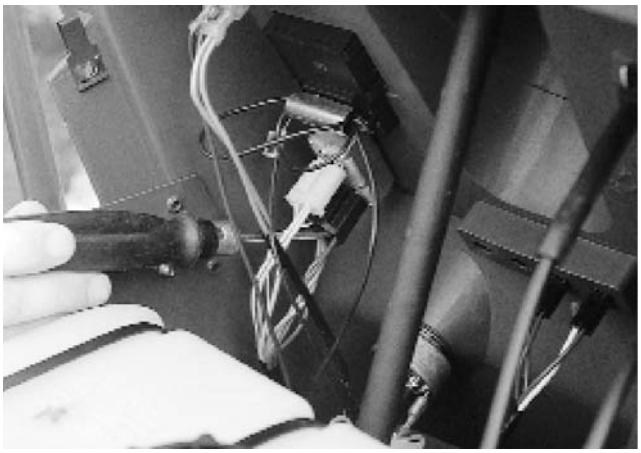


Figure 3-43.

Problem: The engine stalls when engaging blade or the blades do not engage when going into the run position on units with PTO's.

Check both the reverse safety switch and seat safety switch for grounding out conditions.

NOTE

Wires must not come into contact with the unit when checking these connections

1. Disconnect the yellow wire on the reverse safety switch. With the engine running, engage the cutting deck. See Figure 3-44.

Figure 3-44.

If the blades engage without stalling the engine, the screws on the reverse safety switch are grounding out against the support bracket or panel.

Correct by removing the screws that hold the reverse safety switch to the bracket or panel. Inspect the insulator plate for cracks or distortion, which can occur if the screws are improperly installed. Replace if defective.

If the engine stalls, reconnect yellow wires and proceed to the next step.

2. Check the seat safety switch by disconnecting both yellow wires or the harness from the switch. See Figure 3-45.

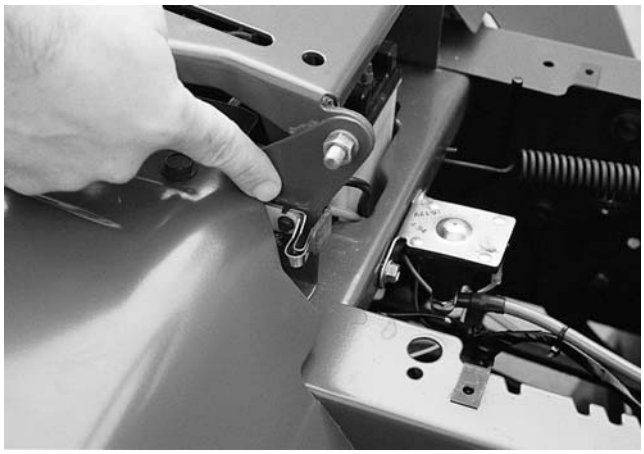


Figure 3-45.

With the engine running, engage the cutting deck. If the engine continues to run with the blades engaged, the problem is with the insulator plate on the seat safety switch. Inspect in the same manner as the reverse safety switch. Replace if defective.

Problem: PTO starts but disengages when the switch is moved to the run position.

1. Check the wiring at the PTO switch. See Figure 3-46.

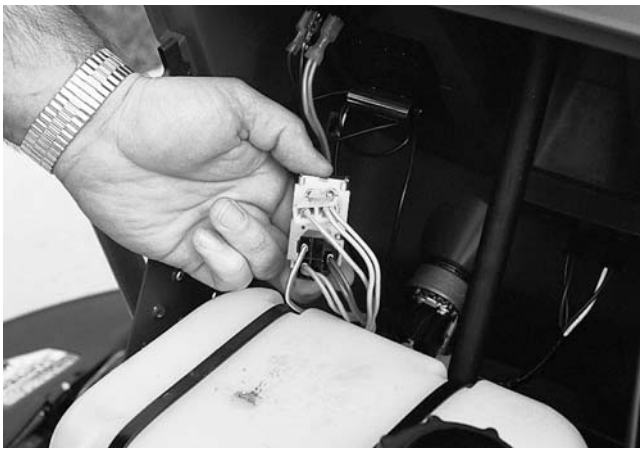


Figure 3-46.

If correct, check voltage at PTO when blade stops turning. If voltage is present and blades are not turning, check the clutch air gap and adjust, retest, and replace the clutch if the test fails. See Figure 3-47.

Figure 3-47.

2. If voltage is not present, disconnect the wires from the seat safety switch and the reverse safety switch.

   Operate the PTO. If it remains running, check the safety switches for shorts or broken insulator plates.

3. If the PTO doesn't operate, test the relays as follows:

NOTE

Relay one has yellow, white, and brown wires. Relay two has red, white, and blue wires.

   a. Test for voltage on relay one at the white wire with the PTO switch in the start posi-

tion. If there is no voltage, replace relay one. See Figure 3-48.

Figure 3-48.

b. If voltage is present in relay one, check for voltage on the red wire of relay two. See Figure 3-49.

Figure 3-49.

c. If voltage is present, replace relay two.

4. If no voltabe is present at relay two, check for voltage at the red wire on the ignition switch. If there is no voltage, replace the ignition switch. See Figure 3-50.

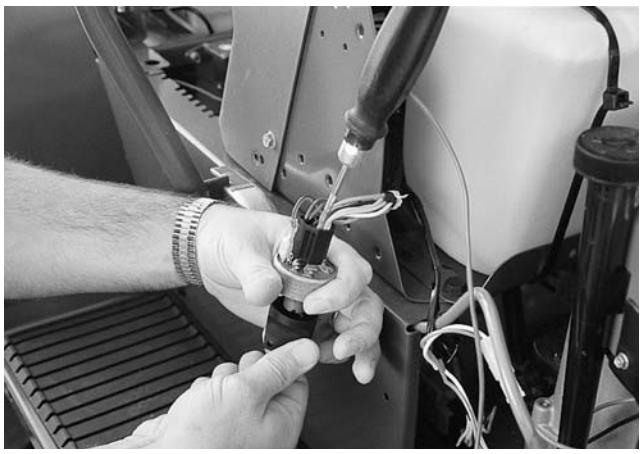


Figure 3-50.

EVALUATING ELECTRIC CLUTCHES

This section will cover how to evaluate electric clutches. You will need a multi meter to perform these tests.

1. To measure the clutch coil resistance, turn off the engine and the PTO switch.

   a. Disconnect the clutch wire connection.

   b. Set the meter to check ohms.

   c. Connect the meter lead wires to the wires in the clutch connector.

Figure 3-51.

   (1) If the meter reads below 2.40 ohms or above 3.40 ohms, the clutch has failed and needs to be replaced.

   (2) If the meter reads between 2.40 and 3.40 ohms, proceed to measuring clutch current draw. See Figure 3-51.

2. Set the meter to check amps using the 10 amp scale.

   a. Connect one meter lead wire to one wire in the clutch connector and the other lead wire to the corresponding wire in the mating connector.

   b. Connect a short wire to the second wire in both connectors.

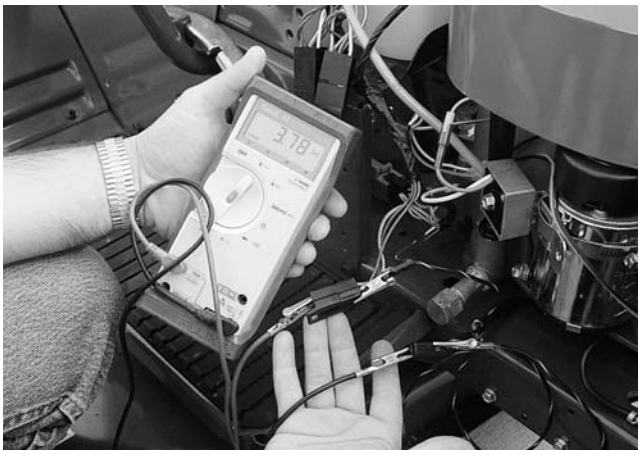


Figure 3-52.

c. Turn the PTO switch on.

3. If the meter reads below 3.5 amps, the problem would be in the electrical system leading to the clutch such as the battery, a relay, or a switch.

4. If the meter reads 3.5 amps or above, proceed to checking the air gap. See Figure 3-52.

   a. Turn off the PTO.

   b. Locate the three windows or notches where the air gap is checked.

   c. Check the gap at three locations using a feeler gauge.

   d. The factory air gap setting is .010 to .025 inch. See Figure 3-53.

Figure 3-53.

   e. If the gap is incorrect, use a .017 feeler gauge and adjust the gap by tightening or loosening the three nuts on the clutch. See Figure 3-54.

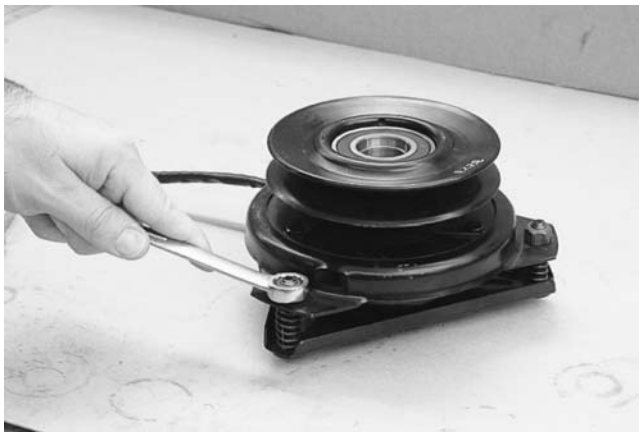


Figure 3-54.

5. The electric clutch initially needs to be burnished before it is used by the owner.

   It is not done at the factory and is the responsibility of the dealer or the customer.

   a. To properly burnish the clutch, run the engine at 50 percent throttle.

   b. Engage and disengage the clutch 5 times, ten seconds on and ten seconds off.

   c. Increase to 75 percent throttle.

   d. Engage and disengage the clutch 5 more times, ten seconds on and ten seconds off.

6. If you have a unit with an electric clutch that operates sporadically, check all wiring around the steering column going to the dash for fraying and shorts.

   a. Check the relays for proper connections. Newer models have in line relays to minimize vibration and reduce failure.

   b. You can remove the relays from the chassis of older models and tape them directly to the wiring harness.

   c. Check the PTO switch for proper connections. The red and blue wires might be reversed. The blue wire should be on top with the red wire directly below it. The brown wire should be on the opposite side.

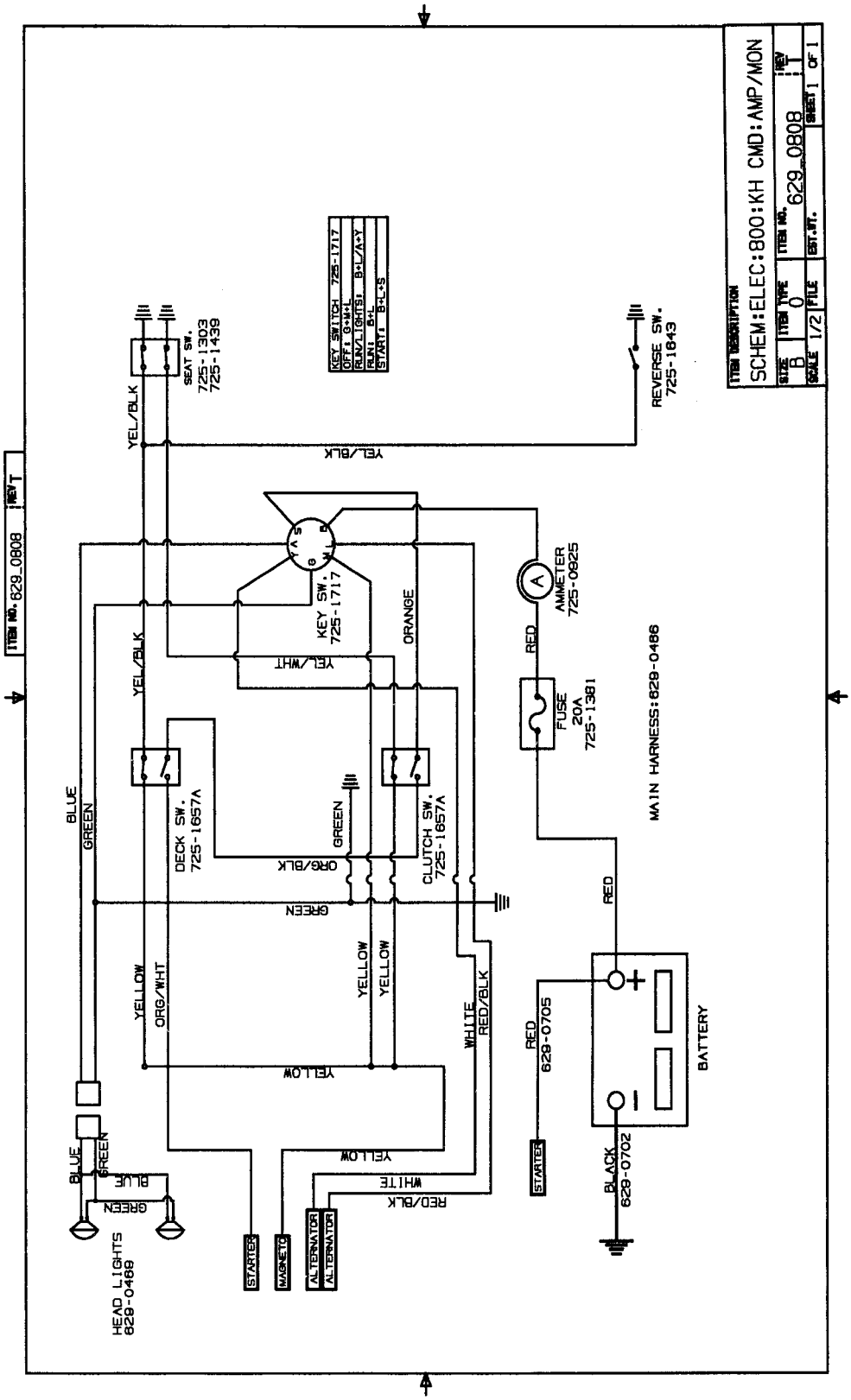
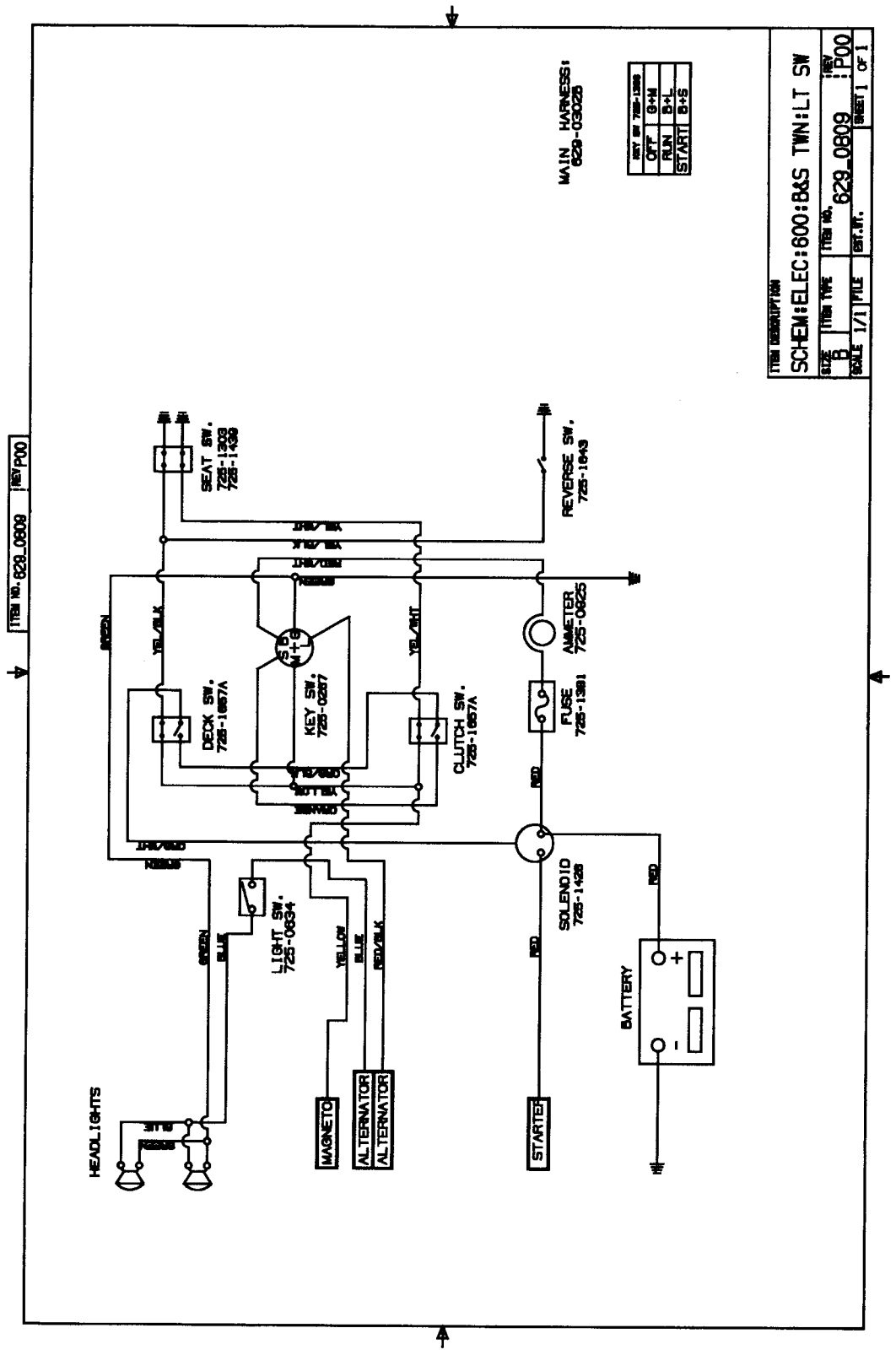


Figure 3-55.



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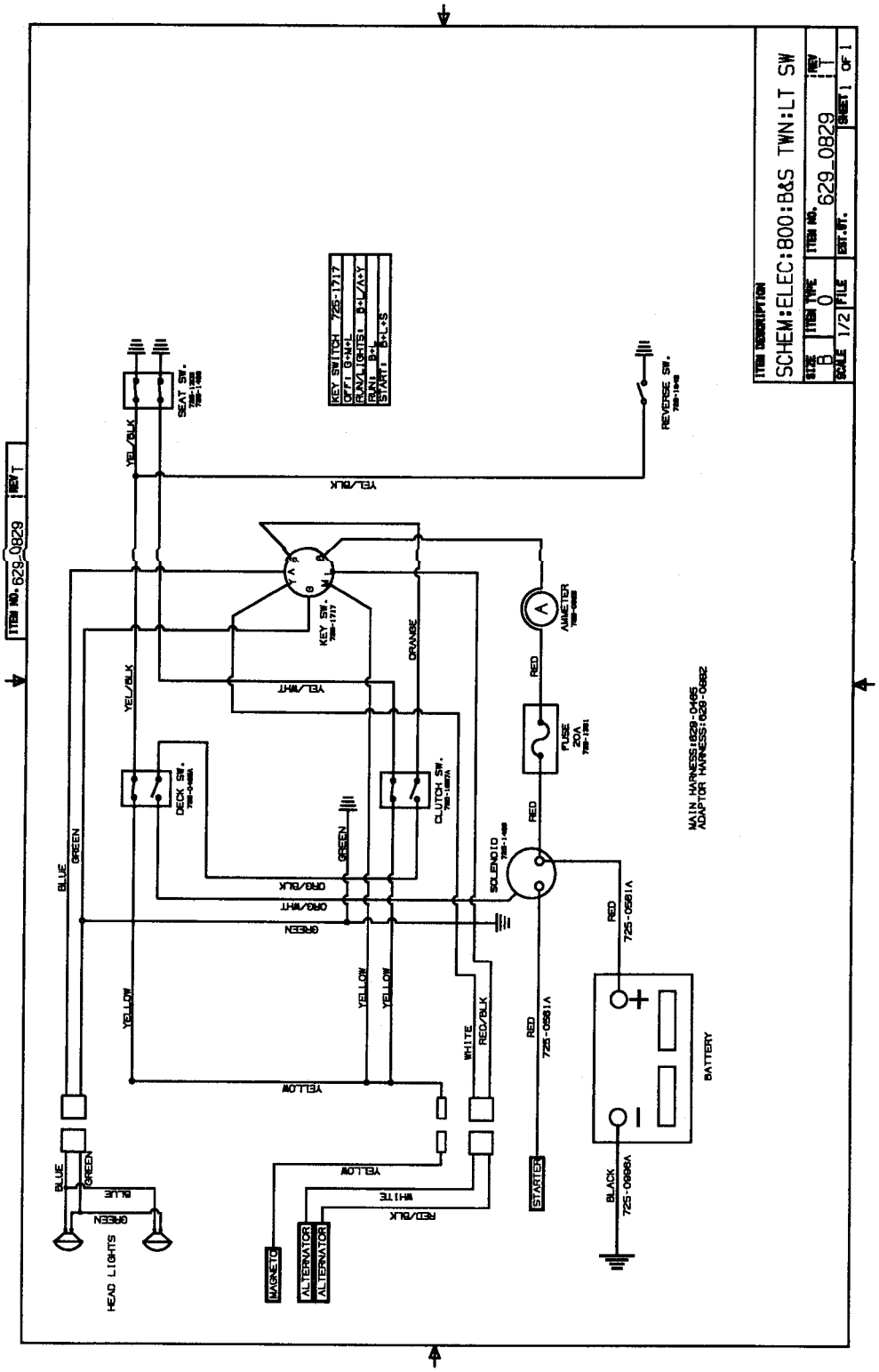

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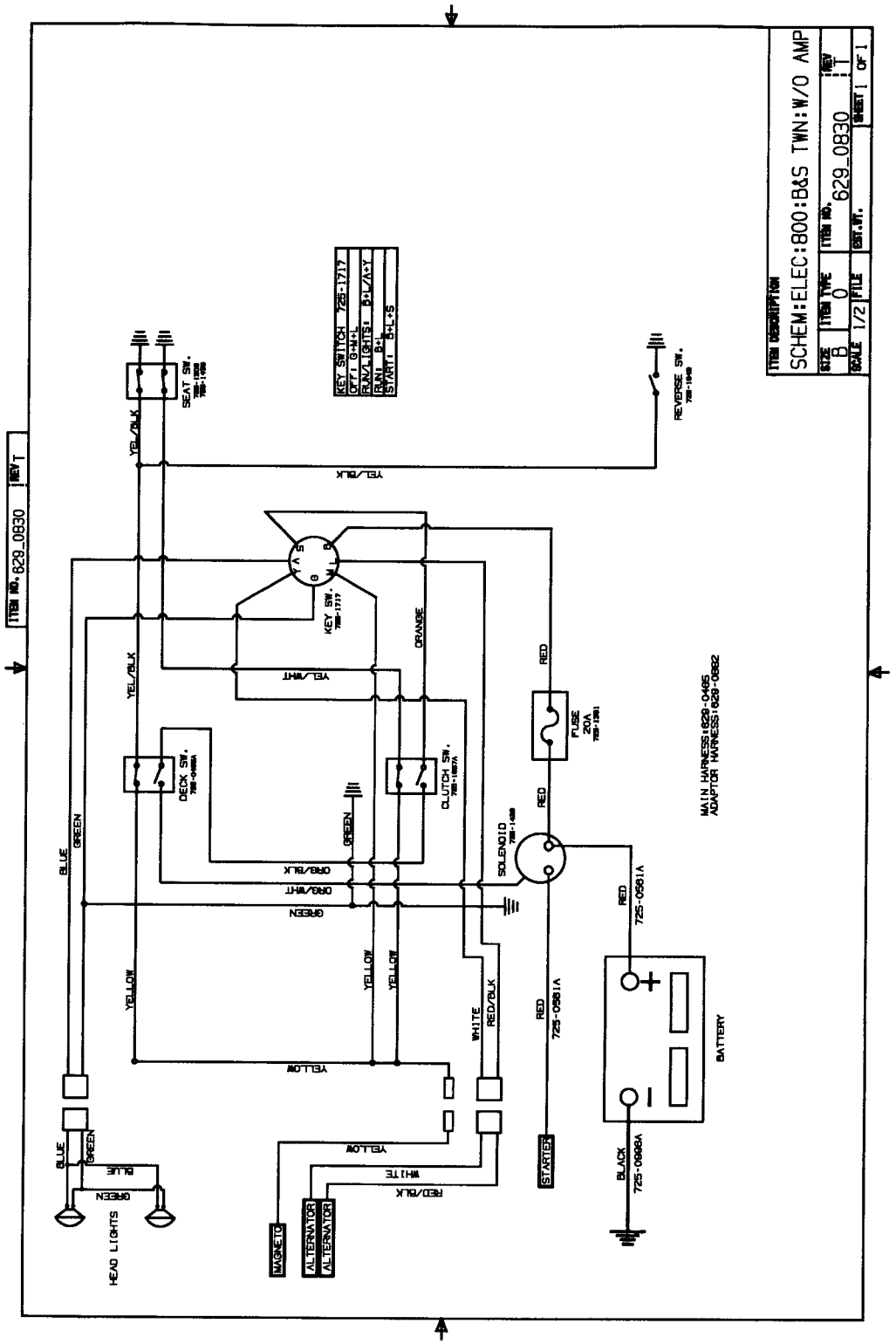

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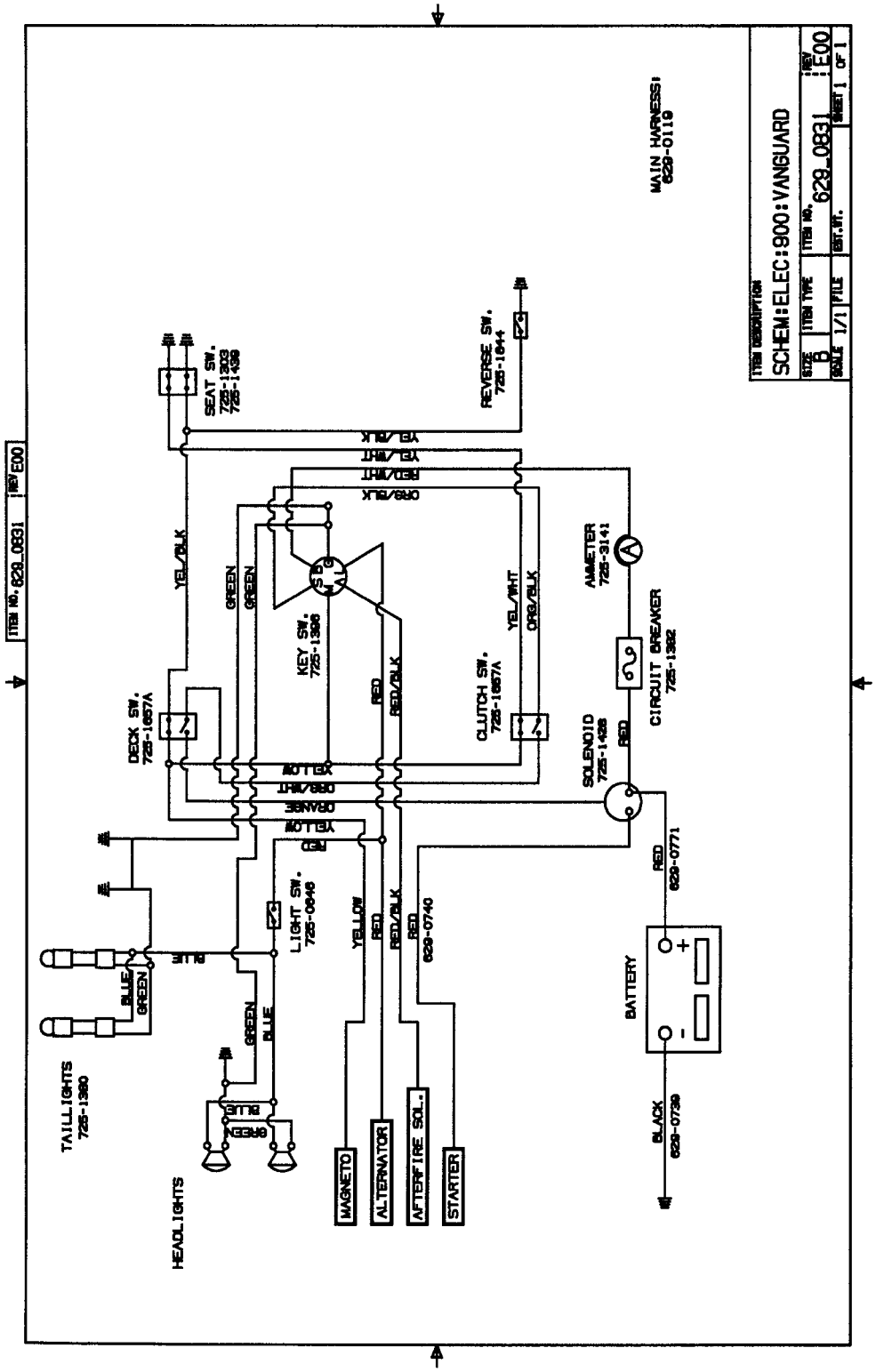

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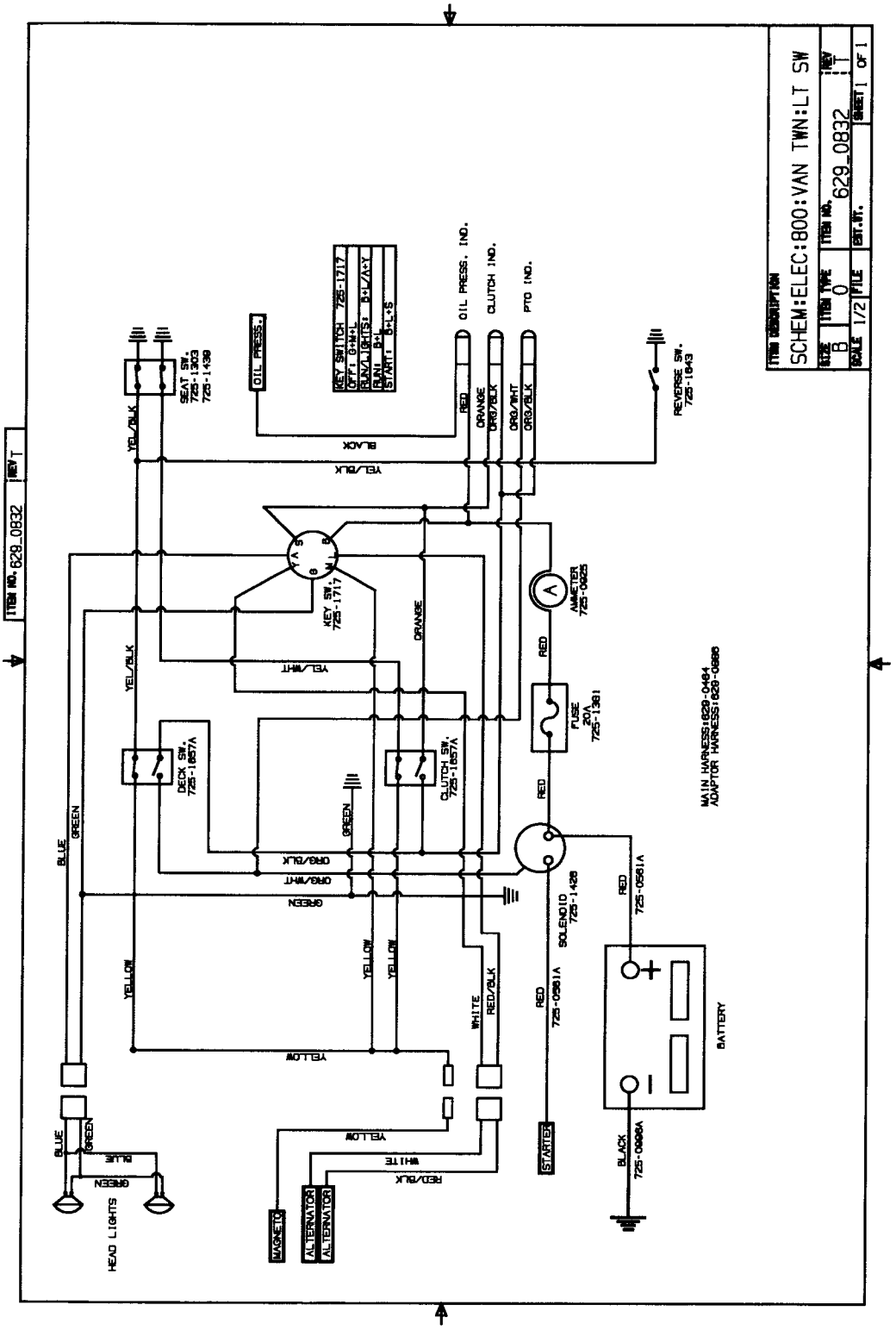

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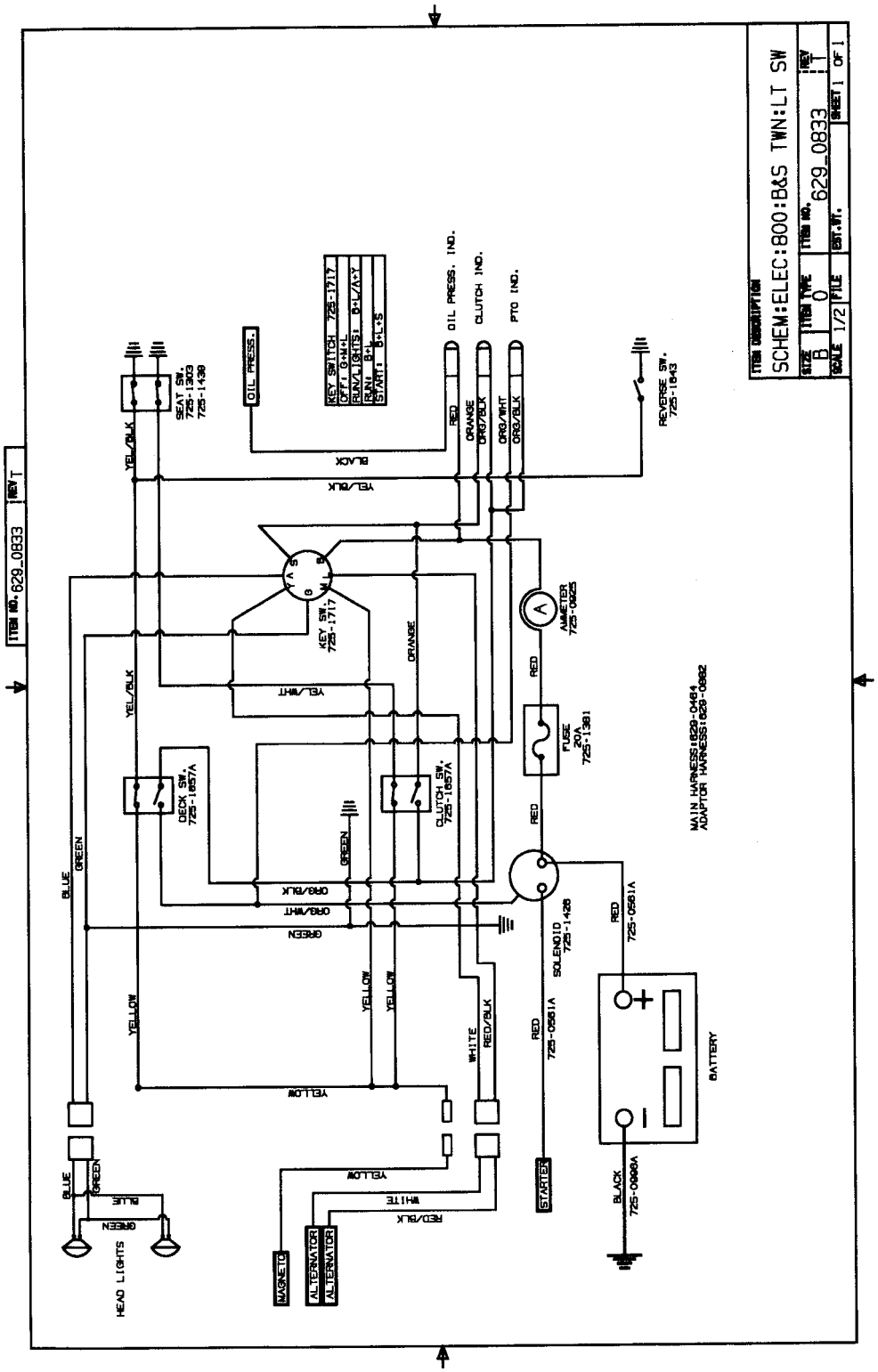

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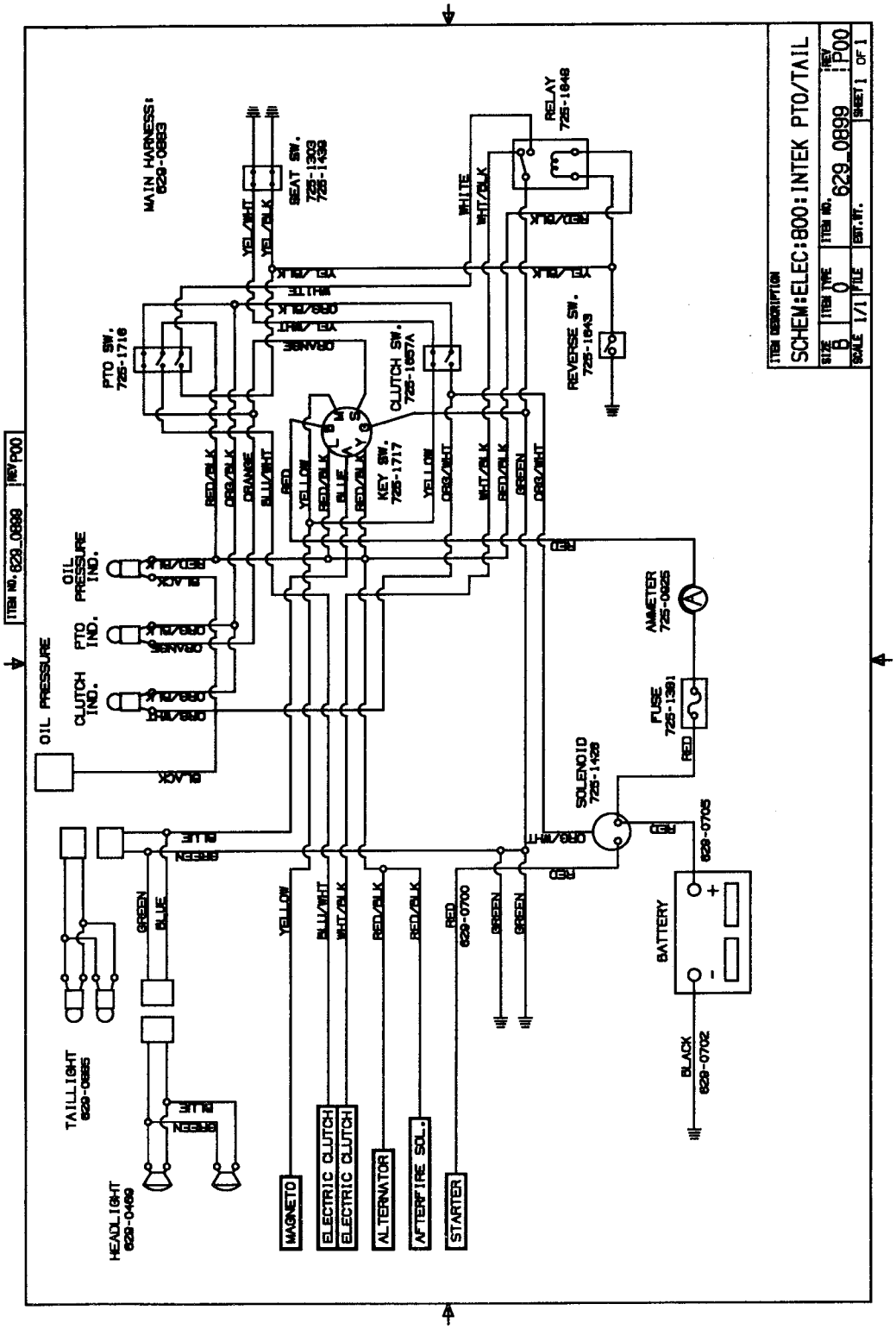

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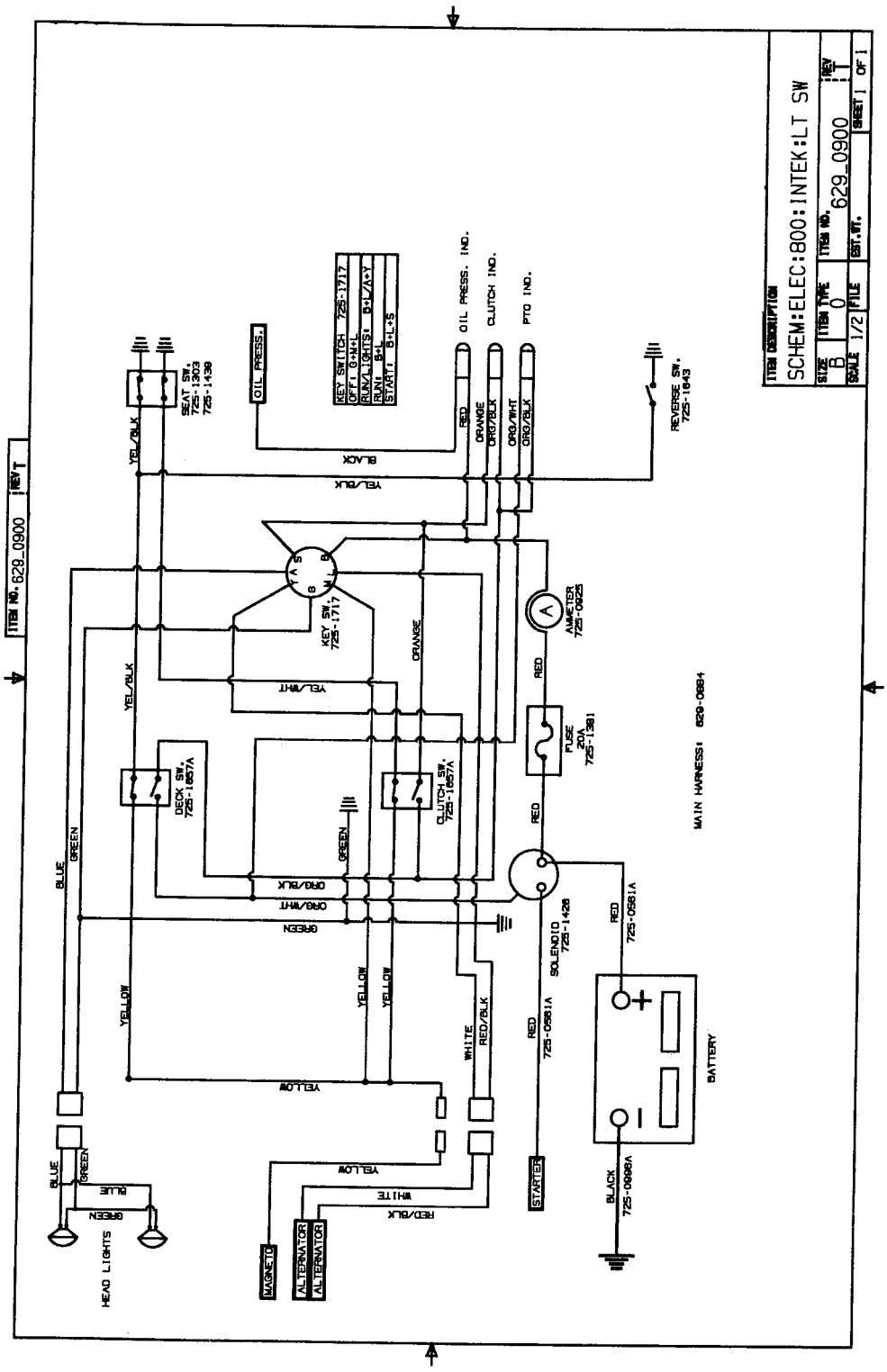

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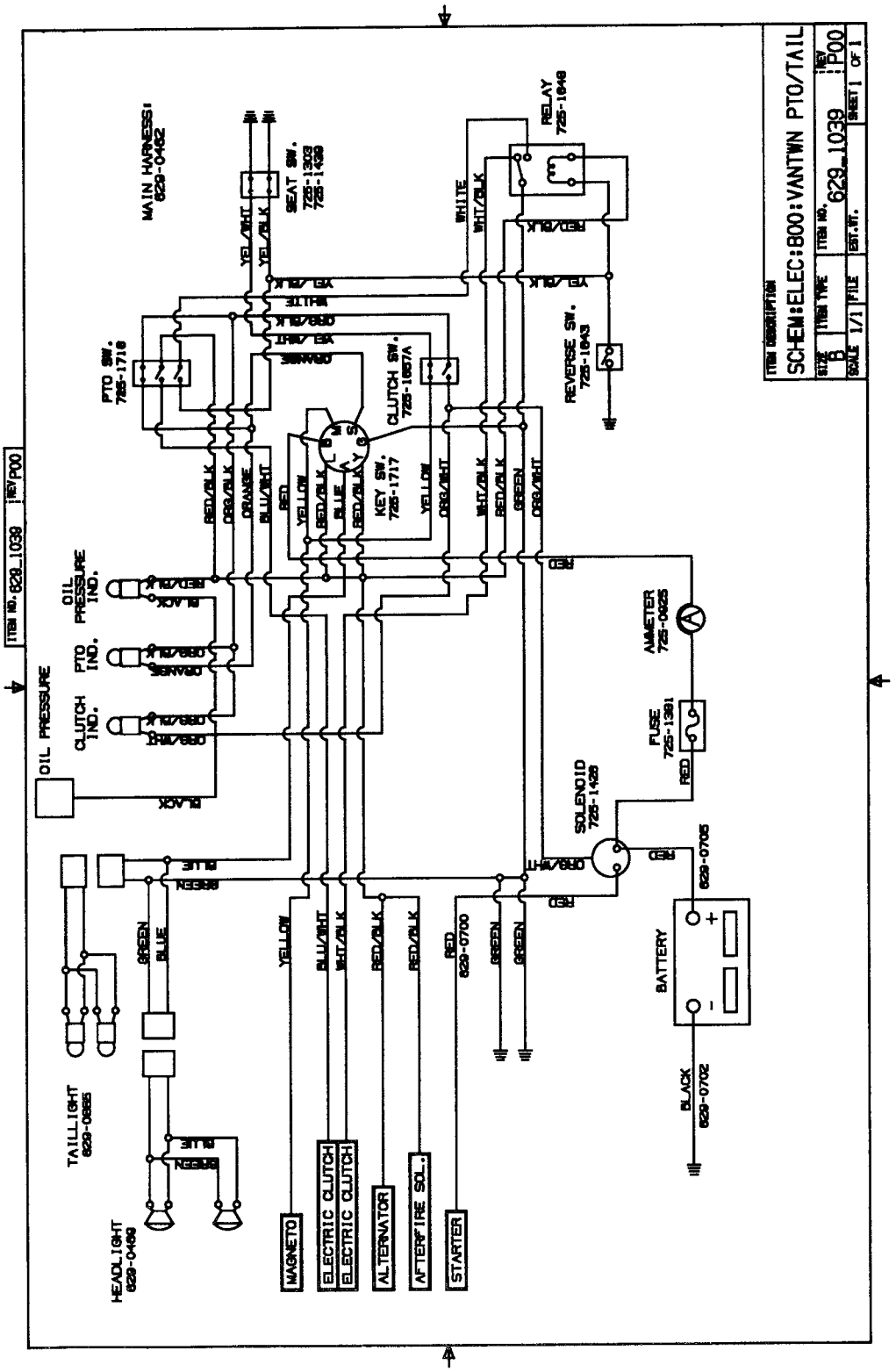

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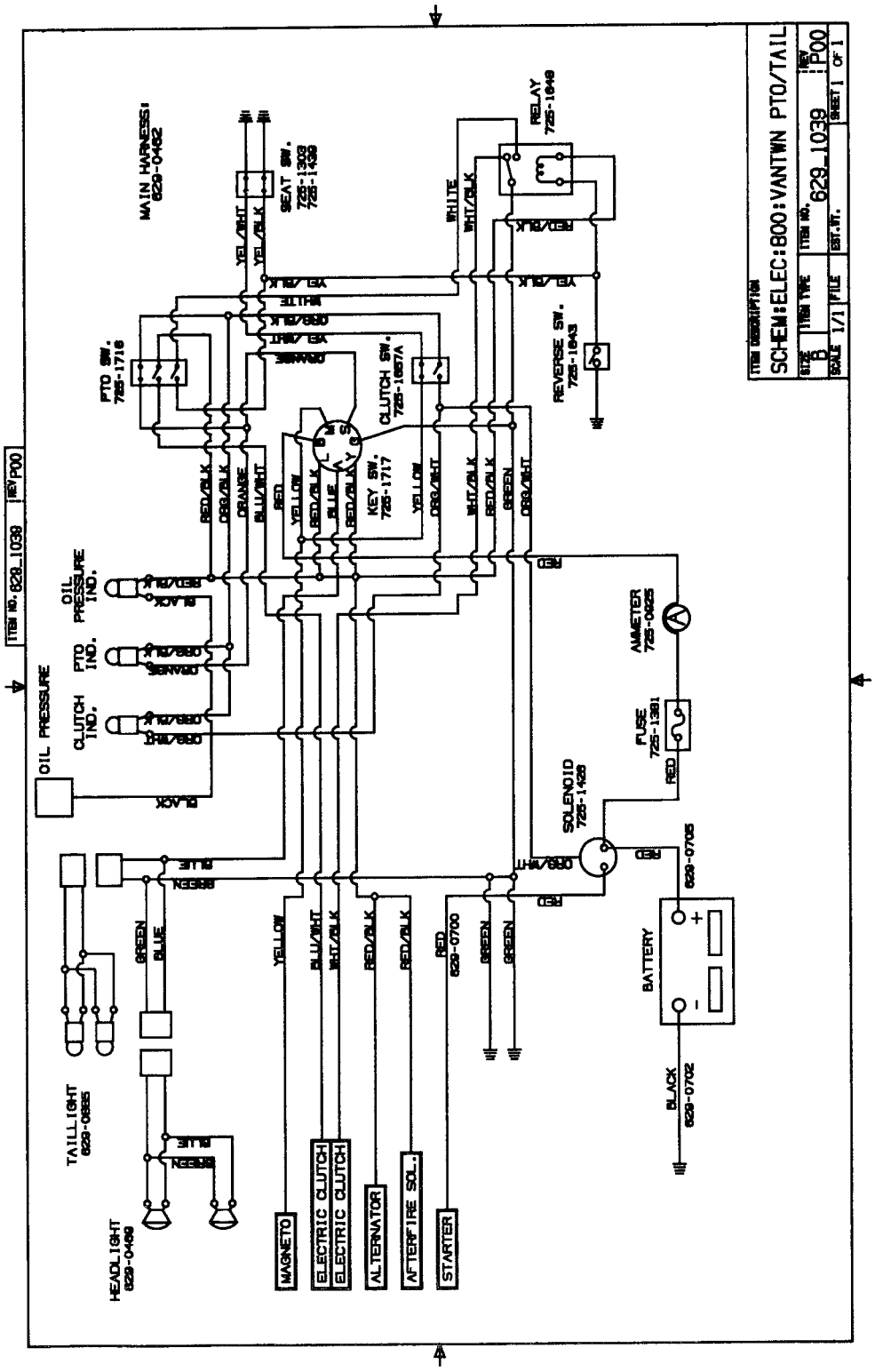

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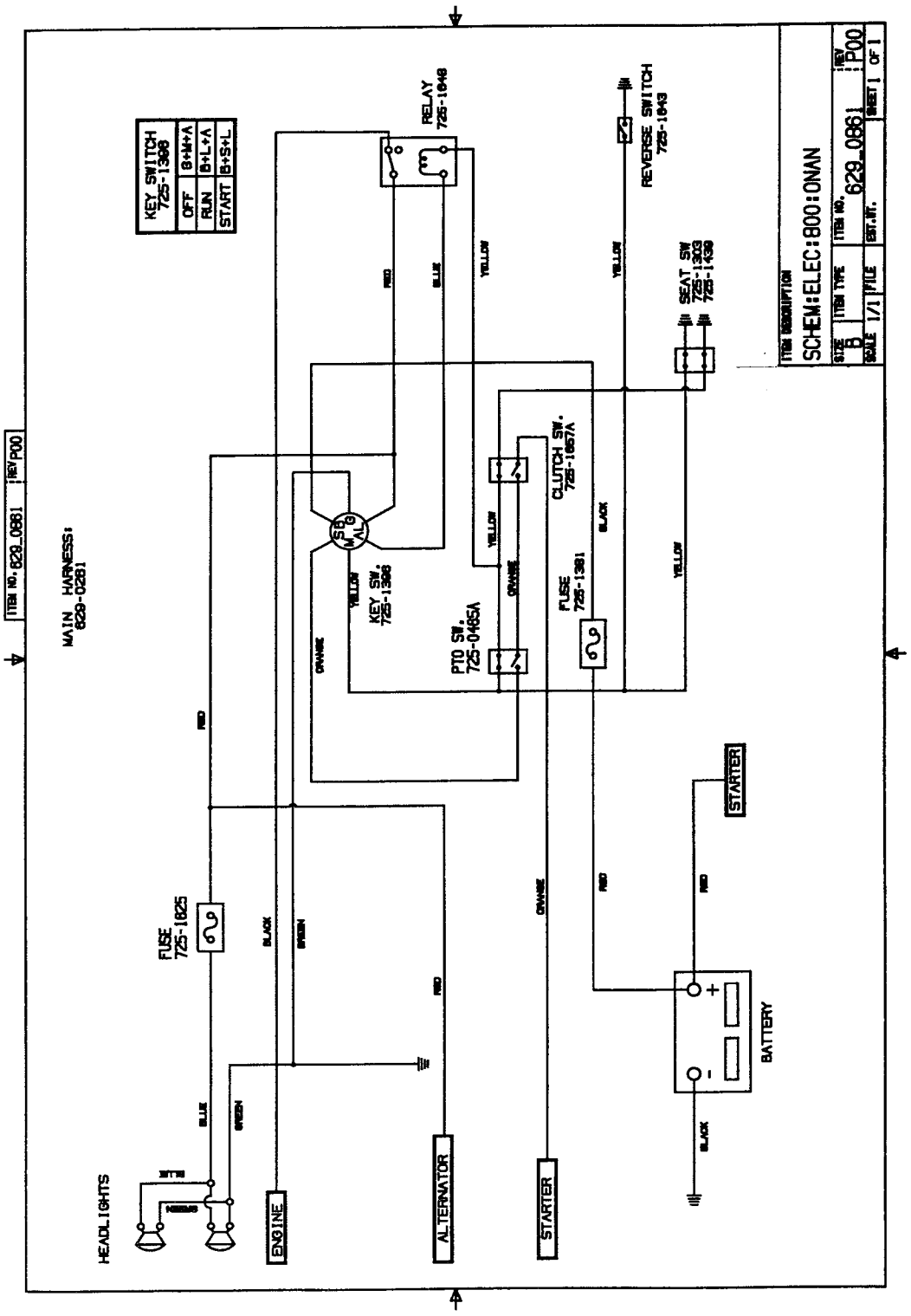

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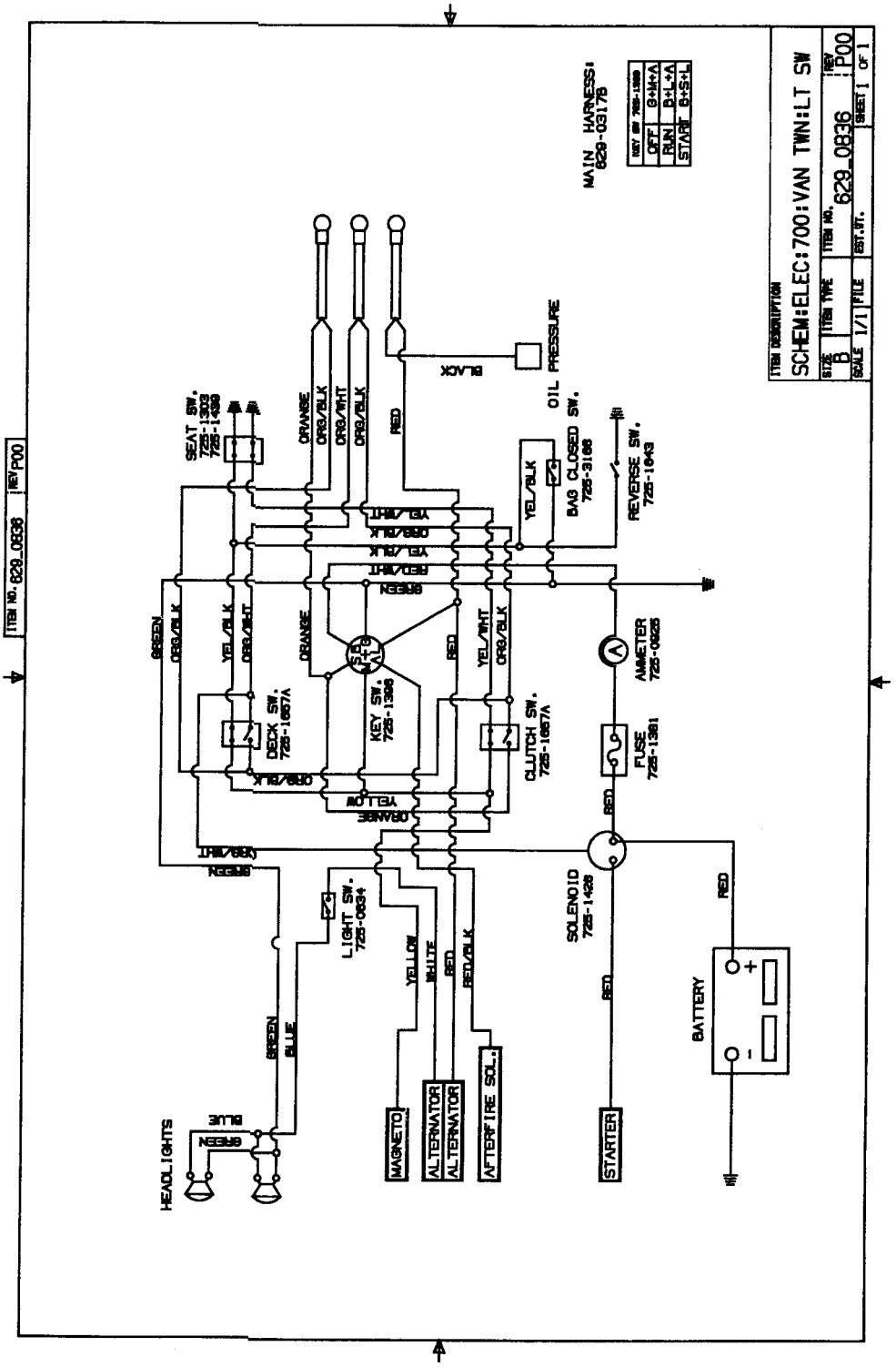

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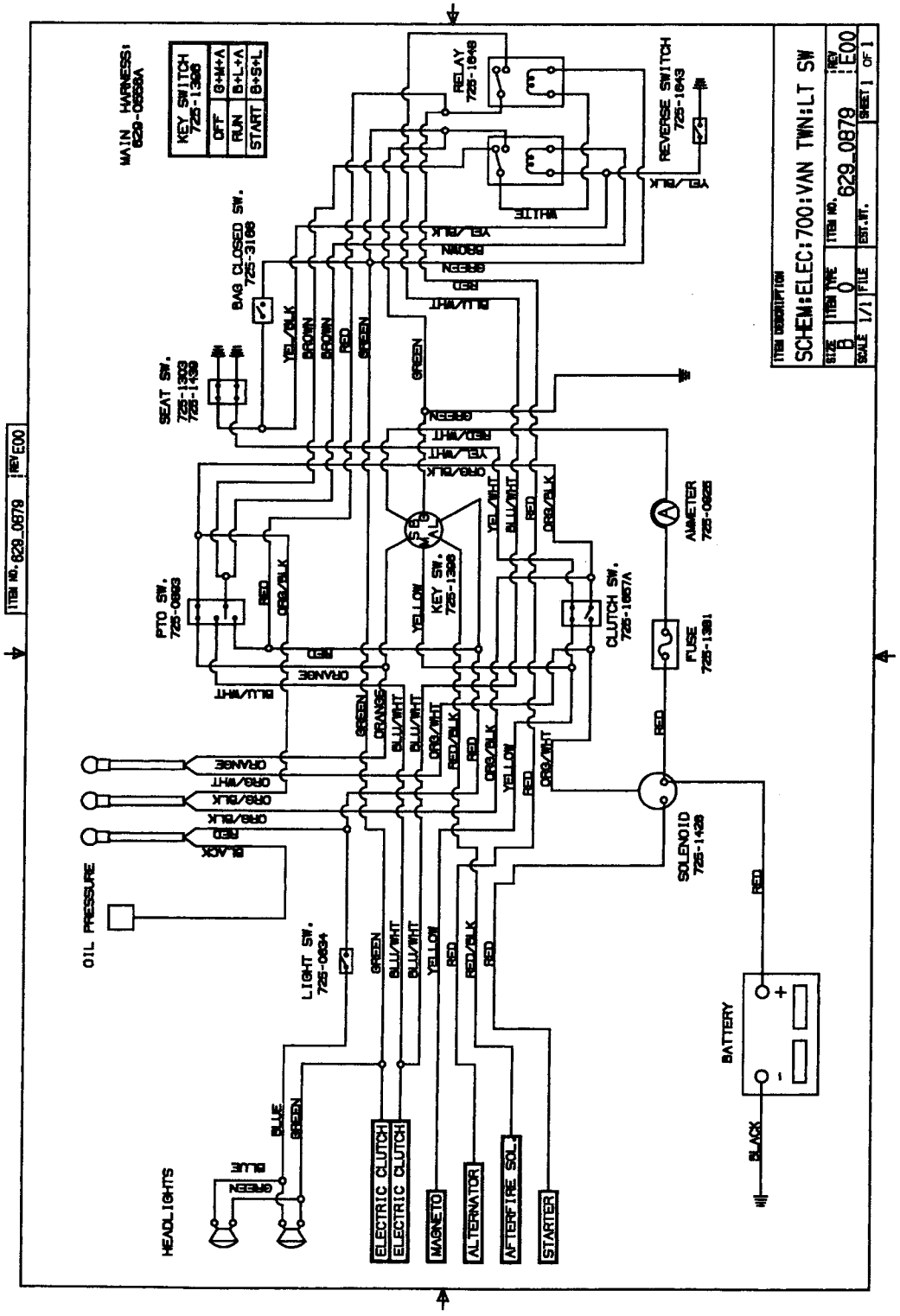

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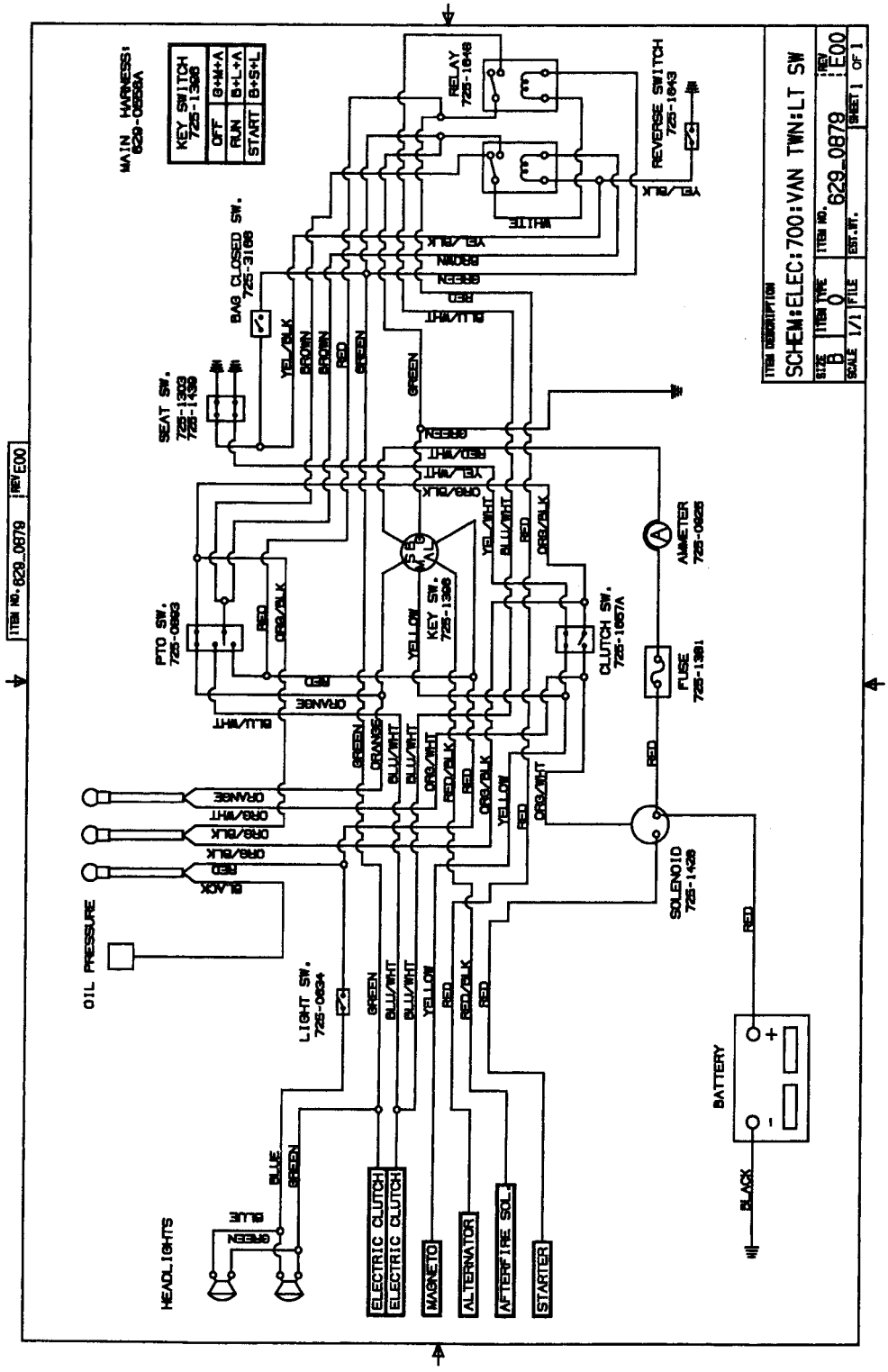

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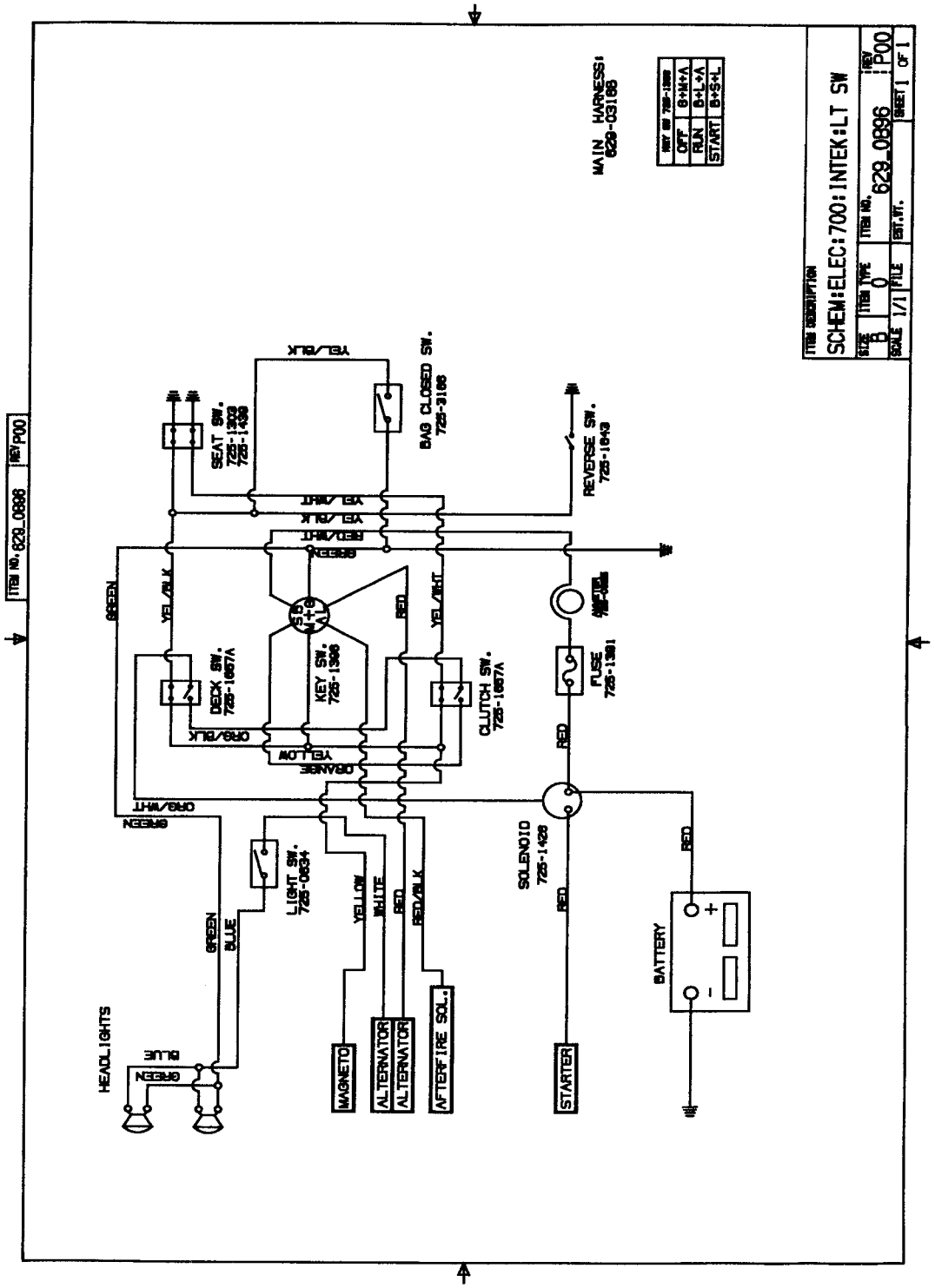


Figure 3-70.

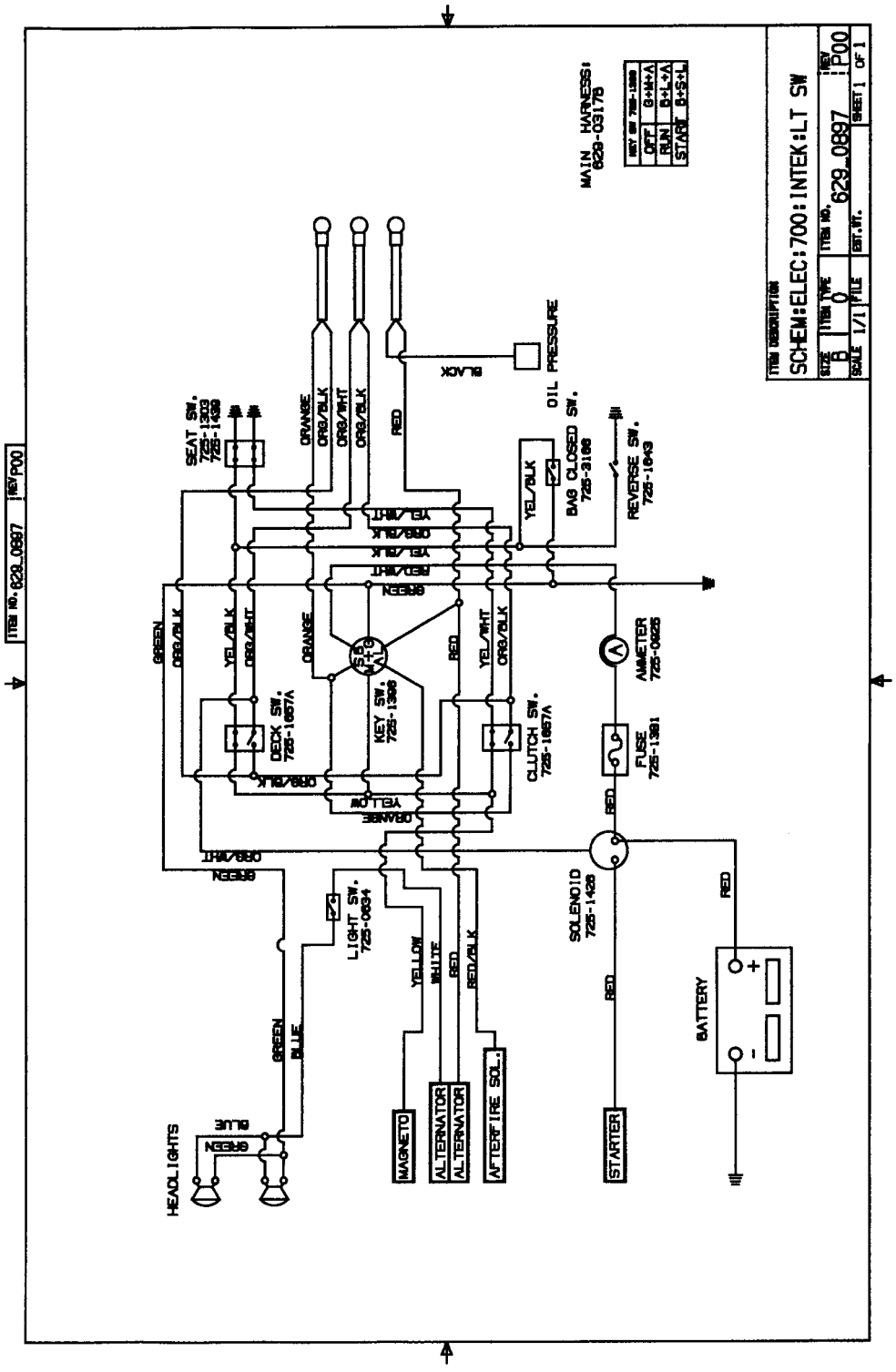


Figure 3-71.

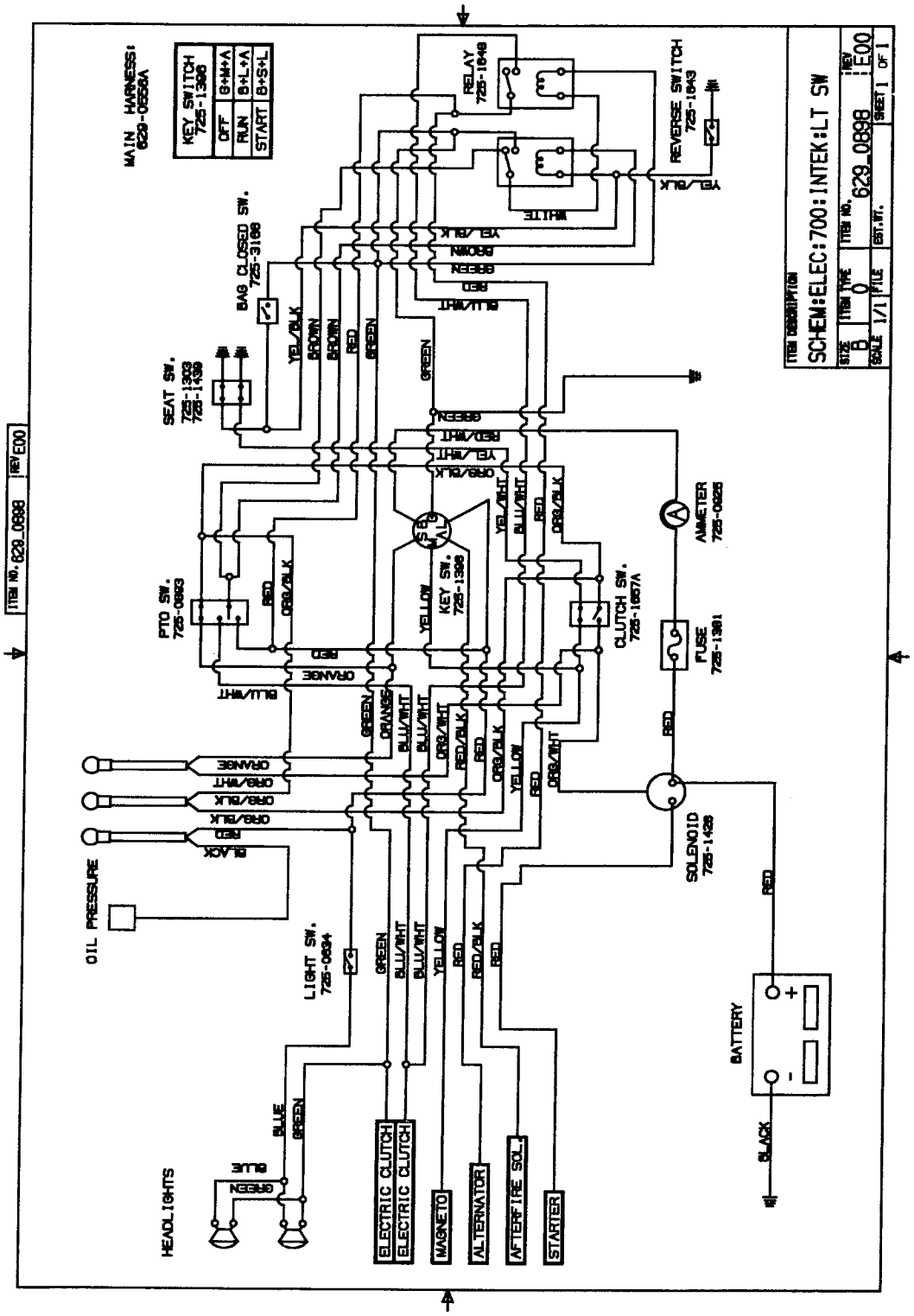


Figure 3-72.

3-4. PROCESS OF ELIMINATION.

3-4.1. The process of elimination is a rapid means of establishing the cause of circuit or component failure. The main requisite is to plan a sequence of tests and follow it. Haphazard circuit testing, with no plan in mind, can be the ultimate of frustration. The general plan in process of elimination is to being where the trouble presents itself and then in a step by step manner, locate the cause of trouble. Electrical current will not leave its source (battery, generator, etc.) unless it has a return path back to the source. This is one of the most important things to remember in troubleshooting. One of the major sources of circuit failure is unwanted resistance. This is resistance to the flow of electrons caused by loose connections, corroded connections and wire and faulty components. A lack of circuit resistance is also a major source of trouble. This is commonly known as a short and is caused by faulty components or wiring returning the flow of electrons back to the power source without going through the designed circuit resistance. The result of this reduction in circuit resistance is an increased flow of electrons causing heat, usually causing the destruction of wire, blowing of fuses, discharge of batteries or generator burnout.

3-5 . RESISTANCE.

3-5.1 Resistance is any restriction to the flow of electrons in an electrical circuit. All electrical circuits contain resistance. All electrical circuits function with a designed resistance. Increasing or decreasing the resistance from the designed resistance will render the electrical circuit inoperative. A loss of resistance will cause the circuit to overheat due to an increase of current flow. An increase of resistance will decrease the current flow and the circuit will cease to function.

3-6. MAGNETO IGNITION.

3-6.1 The magneto ignition also consists of a primary and secondary coil, ignition points and condenser. The magneto ignition is primarily used on small engines, both two and four cycle. It usually operated off flywheel magnets and in its simplest form can be a very economical ignition system.

3-7. GROUNDING.

3-7.1 Grounding is the practice of using a metal chassis, engine block or body as a means of providing a return path for electric current back to its source. This practice is economical and serves to simplify the wiring requirements. The importance of good grounding practice cannot be over emphasized. Virtually all of the direct current circuits in a vehicle are grounded as a means of return path to the power source. A faulty ground connection that may be a common ground point for two different electrical circuits can cause some interesting service problems. A tail lamp circuit with a faulty ground may allow the tail lamp to operate in a satisfactory manner. However, if the brake light circuit shares the same ground connection and the brakes are applied, the resistance of the faulty ground will not allow the added current from the brake light to pass and both tail and brake light may go out. Almost everyone who has ever towed a trailer with lights has been subject to the interesting problems posed by a faulty ground connection to the trailer. The popular use of plastic on dash components requires that a ground wire be connected from electrical devices on the dash to a ground point. If this connection becomes faulty, all dash connected circuits will fail to operate in the prescribed manner. For example: turn on the lights and the gas gauge will cease operation; turn on the directional lights and the radio will go on and off.

3-8 USE OF TEST INSTRUMENTS IN CIRCUIT REPAIR.

3-8.1 The repair of electrical circuits can be simplified by keeping in mind the behavior of electrical circuits as previously discussed, the operation of test instruments and a few simple facts. Unless a return path is provided, electrical current will never leave the source. The resistance to or failure of current to flow will be caused by:

1. Low power or no power at electrical source (dead battery, faulty generator or magneto, etc.).

2. High circuit resistance caused by bad connections or faulty components. A burned out lamp will provide high resistance and no current will flow.

*Information courtesy of Briggs and Stratton Corporation.

3-9. EVALUATING ELECTRIC CLUTCHES.

3-9.1 Measure clutch coil resistance as follows:

1. Turn engine and PTO switch off.
2. Disconnect clutch wire connection.
3. Select meter to check ohms.
4. Connect meter lead wires to the wires in the clutch connector. See Figure 3-73.

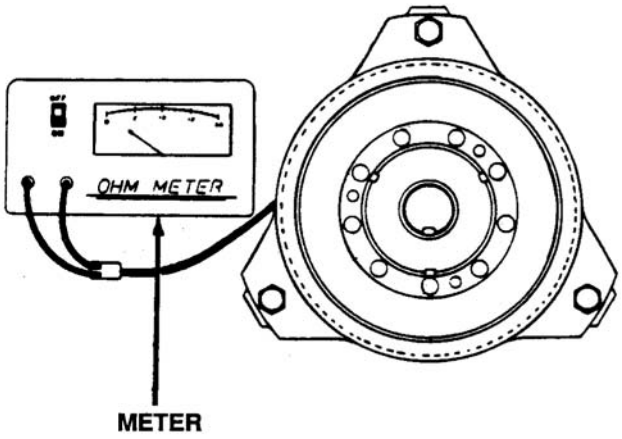


Figure 3-73. Measuring Clutch Coil Resistance

5. If meter reads below 2.40 ohms or above 3.40 ohms then the clutch has failed and needs to be replaced.
6. If meter reads between 2.40 and 3.40 ohms proceed to paragraph 3-9.2.

3-9.2 Measure clutch current draw as follows:

1. Turn engine off.
2. Disconnect clutch wire connection.
3. Select meter to check amps (10 amp scale).
4. Connect one meter lead wire to one wire in clutch connector and the other meter lead wire to the corresponding wire in the mating connector. See Figure 3-74.

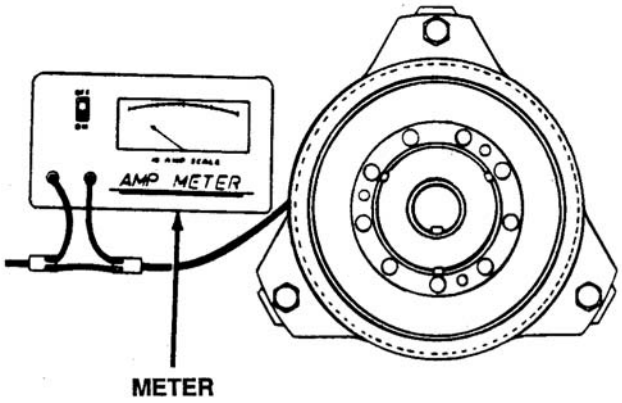


Figure 3-74. Measuring Clutch Current Draw

5. Connect a short wire to the second wire in both connectors.
6. Turn PTO switch on.
7. If meter reads below 3.5 amps, the problem would be in the electrical system leading to the clutch (battery, relay, switch, etc.). If meter reads 3.5 amps or above, proceed to paragraph 3-9.3.

3-9.3 Check air gap setting as follows:

1. Turn engine and PTO switch off.
2. Locate the three windows or notches where the air gap is checked. See Figure 3-75.

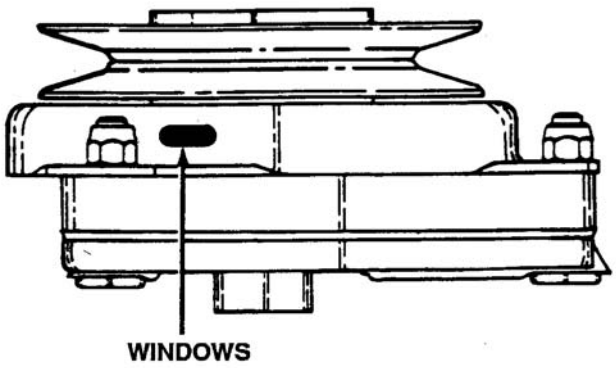


Figure 3-75. Checking Air Gap Setting

3. With feeler gauge check gap at all three locations (minimum of two).
4. Factory air gap setting is .010 to .025 inch.
5. If gap does not fall between .010 and .025 inch then reset using a .017 inch feeler gauge.

6. Changing the air gap is achieved by tightening and/or loosening the three nuts.

NOTE

The electric clutch, part number 717-0983, is used on the 600 and 700 units. The electric clutch, part number 717-0949, is used on the 800 series.

3-10. BURNISHING PROCEDURE FOR ELECTRIC CLUTCH/BRAKE.

NOTE

Burnishing is not done at the factory. It is the responsibility of the customer. It is to be performed after the tractor is completely assembled.

3-10.1 Burnish clutch/brake as follows:

1. Run engine at 50 percent throttle.

2. Engage and disengage the clutch 5 times (10 seconds on/10 seconds off).

3. Increase to 75 percent throttle.

4. Engage and disengage the clutch 5 times (10 seconds on/10 seconds off).

5. If you have a unit with an electric clutch that operates sporadically:

   a. Check all wiring around the steering column going to the dash. 1991 production models have a one piece steering shaft to minimize fraying of wires going to the dash.

   b. Check the relays for proper connections. Newer models have in line relays used to minimize failure due to vibration. If the relays are mounted to the chassis you can remove them and tape them directly to the wiring harness.

   c. Check the PTO switch for proper connections. The red and blue wires might be reversed. The red wire should be on top and the blue wire directly below it. The brown wire would be on the opposite side.

BELTS AND DRIVE SYSTEM

4-1. GENERAL.

4-1.1 V-belts are the most widely used means of power transmission. They are reliable, efficient and economical. This is especially so when they are compared with other methods of power transmission. Because they are so commonly used, they are often taken for granted. They are neglected and abused. Correct installation and maintenance are vitally important to their operating efficiency and life span.

1. The two major suppliers of V-belts are Gates and Dayco. Sometimes a service part will have the supplier's cardboard wrapper around it. Even with the wrapper, it means the V-belt meets our specifications which can vary from a standard V-belt. See Table 4-1.

NOTE

Use original equipment belts for permanent installation. Anything else will only be temporary.

2. MTD Products, Inc. recommends the use of Original Equipment Manufacturer (O.E.M.) V-belts only. They are of special construction involving the type of cord, cord location and length. V-belts other than O.E.M. generally will only provide temporary service. For best results use only factory approved parts.

4-1.2 What is the difference in looks between a rayon cord, fractional horsepower V-belt and a Kevlar cord, oil and heat resistant V-belt designed to run up to 18 HP? To the untrained eye . . . NOTHING. The color of the rubber is just a dye to make the V-belt look different. Whether the V-belt has a cover or is bareback depends on the application not quality of the V-belt.

4-1.3 V-belt failures are normally not caused by a bad V-belt. The failed V-belt is usually the result of another part failing.

1. Prior to about 1974 V-belt problems were prevalent, especially on the cutting decks of the riding mowers. Several changes took place at that time with the design of the V-belt and the layout of the drive train.

2. About 95% of the V-belts used on MTD Products, Inc. units have a Kevlar cord. Kevlar cord was developed by DuPont and it is the strongest man-made fiber. Pound for pound it is stronger than steel. Two other uses of Kevlar are the belts in the nonsteel radial tires and bullet-proof vests.

WARNING

Standard V-belts will not have Kevlar cords. They probably will have a rayon or polyester cord. Rayon will not hold up as long as the Kevlar and the polyester could be dangerous because it SHRINKS when it gets hot. This could cause a clutch to engage when the control is in the disengaged position.

4-1.4 Too often when a drive system fails we want to not working on the mower that comes into your shop, you must look to what has changed.

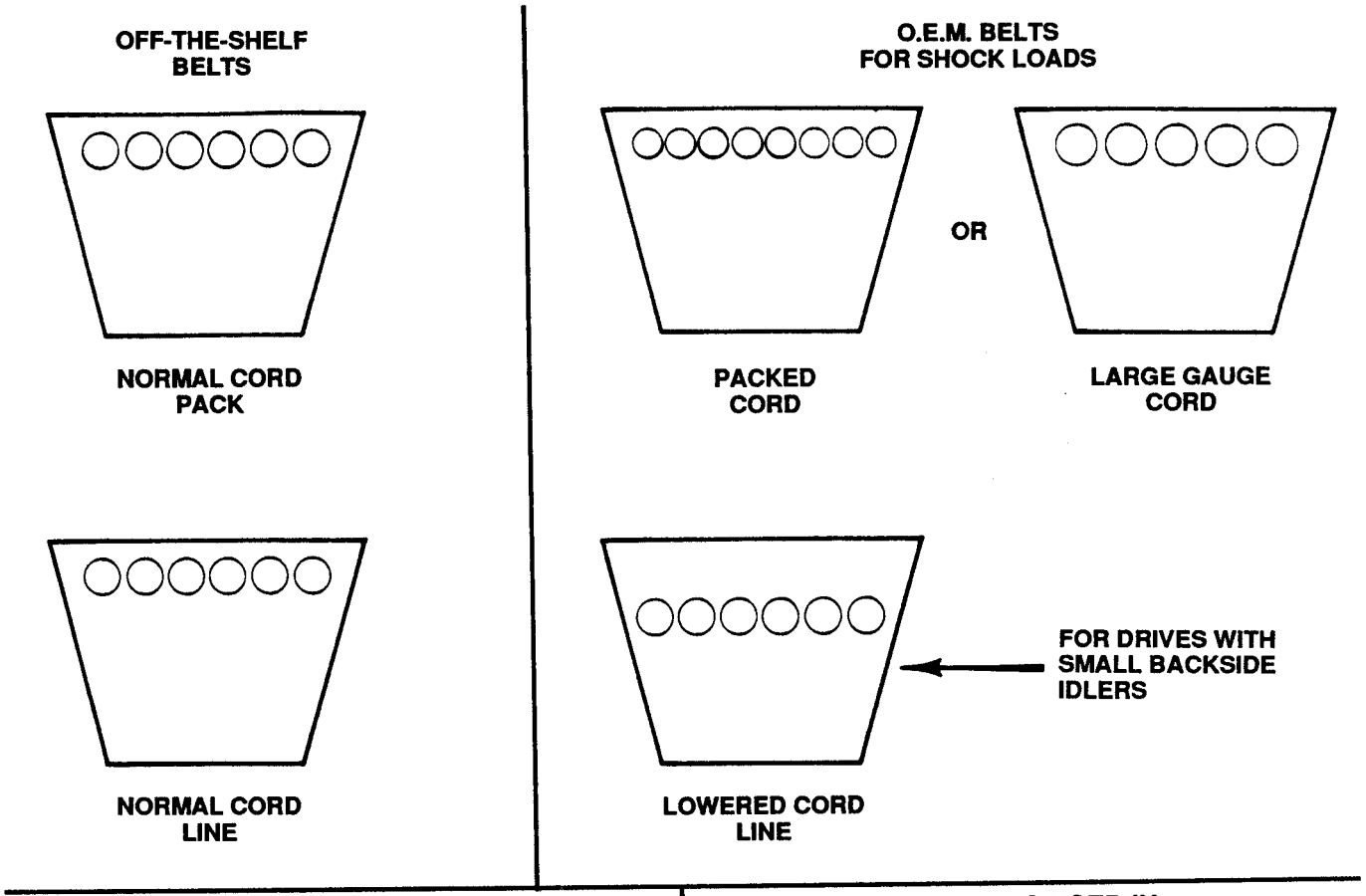
1. The belt may come off due to the pulley being damaged by driving over an obstruction, curb, root, tree stump, etc. Transmission and idler pulleys in particular can cause belts to come off. Also, misaligned idlers may be the cause of belts coming off. The same thing can happen when belts are assembled on the wrong side of a deck hanger or belt keeper, especially when shoulder bolts are used next to a pulley. It is easy to assemble the belt incorrectly on the outside of a belt keeper.

2. As you approach the repair the fact must be accepted that just putting on a new manufacturers original belt may not always solve the problem. There may be other components that are causing the malfunction other than the belt(s).

4-1.5 As you proceed with repair, asking yourself questions may help. For example:

1. Normal wear. How many hours are on the mower? When was it manufactured? While the belt was wearing out, how many other components that the belt travels on were also wearing out? Poor operating habits. Jack rabbit starts and stops. Shifting into forward while unit is still rolling in reverse (every pulley, idler and

Table 4-1. V-Belt Descriptions



MATERIALS USED IN OFF-THE-SHELF BELTS

1. Filament polyester — Tensile Cords
2. Rayon — Tensile Cords
3. Rubber impregnated cover
4. No crack stopper layers
5. Wide length variation
6. Single cover ply
7. General purpose SBR under cord
8. Non-fiber loaded under and over cord

MATERIALS USED IN O.E.M. BELTS

1. Staple clutching polyester — Tensile Cords
2. Kevlar — Tensile Cords
3. Fiberglass — Tensile Cords
4. Bareback non-rubber cover
5. Crack stopper layers
6. Tight length tolerance
7. Two cover plies
8. Full oil and heat resistance neoprene over and under cord
9. Fiber loaded over and under cord

GATES ONLY

	Cord	Color
	Kevlar	Yellow
	Fiberglass	Red
Type I:	Polyester filament (Various shrinkage)	Green/blue
Type II:	Polyester staple (Less shinkage nearer to Kevlar)	Brown
	Rayon (Out)	Tan/brown

gear must suddenly change direction). Incorrectly positioned belt guards: A guard too loose or too far away from a belt can be as bad as one that is adjusted too close. A guard must first be formed at the proper angle and adjusted to be as close as possible to hold a belt from coming out of a pulley but yet far enough, approximately 1/8 inch (as a rule), to allow the belt to trap-out. When the tension is removed from the drive system, it must assume a relaxed position; too tight can make the belt continue to drive for a time even though the drive system has been disengaged.

2. Are there indications that the belt was routed incorrectly? When does the belt come off the pulley? Does it happen only in reverse? The transmission mounts may not be tight or a torque bolt mounted in the front of the transmission may be loose. If the bolt has dropped out, the transmission is free to pivot back and forth. Therefore, when put into reverse, the front of the transmission pivots downward and the belt rolls off because the belt angle changed beyond the recommended specifications.

4-2. PROPER STORAGE OF V-BELTS.

4-2.1 V-belts should be in a cool, dark place away from radiators and out of direct sunlight. Heat will dry out the belts and cause them to become hard and brittle.

1. Belts may be stored either by coiling them on shelves or in cartons—or by uncoiling and hanging them if shelf space is not available. If belts are hung, we recommend using wide support or multiple hooks so that the belts are not damaged by tight bending or excessive weight at a single point.

2. Under normal conditions (temperatures below 85°F, relative humidity below 70% and no direct sunlight) V-belts can be stored as long as six years without damage. Beyond that point, still under normal conditions, a decrease in service life of approximately 10% per year of storage can be expected. Storage limit should be reduced one-half for each 15 degree increase in temperature (three years at 100°, for example).

4-3. CAUSES OF V-BELT PROBLEMS.

4-3.1 V-belts are used on an untold number of different power units. Application varies from manufacturer to manufacturer. Yet, the cause of the belt problems remains basic to all. The following is a list of causes which may help spot potential trouble.

1. Normal wear. If a belt loses its effectiveness after a prolonged period of use, its failure can generally be accepted as normal wear. Replacement of the belt with the correct type and size is all that is required.

2. Poor operating habits. Although V-belt failures can often be attributed to normal wear, many failures are in no way the fault of the belt. Under these circu stances, replacement of the belt will simply result in another rapid belt failure. Failure will continue until the real cause is diagnosed and corrected. One such case is incorrect operation. When an idler pulley is used in the system and excessive and rough clutching occurs, severe reduction of the service life of the belt will be experienced. Failure will continue until the incorrect method of operation is changed.

3. Damaged or worn idlers. Frozen idler bearings will cause much the same results as excessive or rough clutching. When a frozen idler bearing is encountered, it is not only necessary to replace the idler but also the belt. Heat damage will severely reduce the service life of a belt. Where an idler is involved, heat damage will cause polyester belts to shrink considerably.

4. Incorrectly positioned belt guards. Belts frayed or worn on the outside indicate incorrectly mounted belt guards, belt guides or belt clips. Damaged guards should be replaced. Incorrectly positioned guards should be realigned. Guards should be mounted close to the tightened belt but they must never touch the tightened belt.

5. Damaged or worn pulleys. Belts frayed or worn on the inside indicate defective or damaged pulleys. Belts are designed to grip the smooth flat inner sides of a pulley. Pulleys can be the cause of belt failure for the following reasons:

   a. The pulley is too wide for the belt and allows it to bottom. Except on deep groove pulleys, belts should generally ride even with or above the outside edges of the pulley.

b. The inner surface of the pulley is wrinkled, worn, rusted, dirty or nicked. Wrinkled and worn pulleys should be replaced. Rusted, dirty or nicked pulleys should be polished or replaced.

6. Misaligned pulleys. Belts which break or tend to jump from the pulleys indicate incorrect alignment. Although incorrectly adjusted belt guards can contribute to the problem, alignment of the pulleys should be checked. Except where an off-set system is used (on some blade drives) all pulleys and idlers should be on the same level or plane. Offset systems are designed with special pulleys to compensate for a certain amount of misalignment. Where set screws are used for fastening, they must be tightened securely. A nut and bolt sealant applied to the set screws will assure lasting tightness.

7. Incorrect tension. A squealing noise during acceleration, loss or lack of power, belt cover wear, burn spots and overheating all indicate insufficient belt tension. Insufficient belt tensions result in belt slippage. Normally, belt slippage results when a belt stretches excessively due to long hard use. Where this is the case, only replacement of the belt is required. Often, however, the cause is other than normal wear. Insufficient spring tension on the idler bracket is a common problem. The spring may have weakened or it may be an incorrect spring. Replacement should be made with a spring which provides adequate tension. Springs should also be lubricated with light oil to prevent rust and to provide free spring movement. Idler brackets which do not pivot freely can also be a problem. They may be just fastened too tight or they may lack lubrication at the pivot point. Incorrect shoulder screws can also be a cause for idler brackets to be excessively tightened. Failure to recheck adjustment after installation of a new belt can also result in slippage. Some time after the initial adjustment of a new belt, a follow up adjustment may be necessary. The reason for this is that some slack may develop during the 48 hour break-in period. Excess tension is only found in systems which do not use idler pulleys or in systems where too strong an idler pulley spring is used. Broken belt cords, excessive stretch and rapid belt failure can indicate excessive belt tension.

8. Oil and grease damage. Belt damage from oil and grease will be detected as belt slippage. Oil and grease also cause belts to deteriorate. Clean belts with a volatile solution. Oil soaked belts should be replaced immediately. Oil leakage should be eliminated promptly. If oil is a continuing problem, consider oil resistant belts.

9. Heat damage. When belts operate at temperatures of 140°F or higher, heat aging takes place. This condition can be created by belt slippage or by routing belts too close to heat producing assemblies such as mufflers. Polyester belts operating with an idler and subject to a heat problem will shrink severely on cooling. Where the problem cannot be remedied, heat resistant belts should be considered and polyester belts should be avoided.

10. Incorrect installation. Belts must be installed with care. Never use force when installing a belt. Sometimes it becomes necessary to remove a pulley or belt guard to eliminate the use of force but the extra time necessary is well spent. The tension on newly installed belts should be rechecked after 48 hours use. A certain amount of slack can develop during this break-in period.

4-4. V-BELT PROBLEMS WITH ROTARY TILLERS, SELF-PROPELLED MOWERS AND RIDING MOWERS.

4-4.1 One of the most common problems encountered with rotary tillers, self-propelled mowers and riding mowers involves damaged or broken V-belts. Regardless of the type unit involved, the causes of the problem usually remain the same.

1. If a belt fails after an extended period of use, failure is probably due to normal wear. Replacement of the belt is all that is necessary. See Figure 4-1.

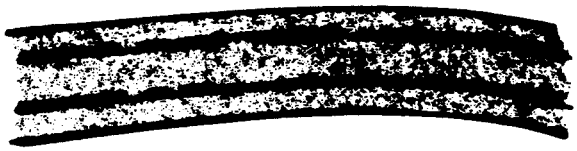


Figure 4-1. Belt Wear Due to Normal Life

2. If a belt becomes inoperative after an insufficient period of service, failure usually is the result of incorrect operation. Excessive engaging and disengaging of the clutch, especially where an idler pulley is used, will definitely

reduce the service life of the belt. Replace belt and correct operational methods. Damaged idlers or frozen idler bearings will cause rapid belt wear. Replace idler or its bearing.

3. If belt frays or wears on the outside, incorrectly mounted belt guards and belt clips usually are at fault. Replace belt and reposition belt guards and belt clips. These should be positioned close to the belt. But when the clutch is engaged and the belt is tightened, belt guards and belt clips must not touch the belt. See Figure 4-2.

Figure 4-2. Belt Wear Due to Interference

4. If belt frays or wears on the inside, defective pulleys are at fault. The V-belt should ride on the smooth inner sides of the pulley. Pulleys which are spread apart allow the belt to ride on the bottom and rapid belt wear is the result. If the belt rides below the outside edges of a pulley, chances are good that the pulley is spread. Replace pulley. Rough spots or nicks on the inside surface of pulley will result in premature belt wear. Polish inside of pulley or replace pulley. See Figure 4-3.

Figure 4-3. Belt Wear Due to Misalignment or Worn Pulley Groove

5. If belt breaks prematurely or tends to jump from pulleys, incorrectly aligned pulleys may be at fault. All pulleys including the idler should be on the same plane. (This does not apply to blade belts on level adjusted floating decks. The misalignment in this case is compensated for by a special engine pulley.) Pulleys should be realigned and set screws fastened securely. A nut and bolt sealant applied to the set screw will assure lasting tightness.

6. Other belt problems are encountered because of excessive shrinkage, excessive stretch or oil and heat damage such as shock load and flex failure. See Figures 4-4 and 4-5.

Figure 4-4. Belt Damage Due to Shock Load

Figure 4-5. Belt Damage Due to Flex Failure

7. All belt replacements should be made with belts of the same size and type as those furnished with the original equipment.

4-5. PULLEY ALIGNMENT.

4-5.1 Check alignment as follows:

1. Make sure that the drive shafts are parallel by using a measuring tape to measure the distance between the shafts both at the outside pulley and the inside of the pulley. Shafts that are parallel will be the same distance apart at both points.

2. Tie a string to the drive shaft and pull taut across the pulleys. If the pulleys are properly lined up, the string will touch them at the points indicated by the arrows. By rotating each pulley through one-half revolution, you can also determine whether pulley is wobbly or the drive shaft is bent. If either of these conditions

exists, the inner rim of the pulley will pull away from the string when the pulley is rotated. See Figure 4-6.

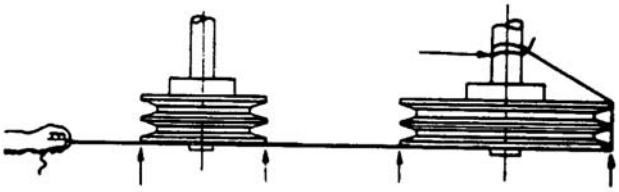


Figure 4-6. Pulley Alignment

NOTE

Pulleys that are not properly aligned cause excessive belt and pulley wear. Where shafts are not parallel, belts on one side are drawn tighter and pull more than their share of the load. As a result, these belts wear out faster, causing the entire set to be replaced before it has given maximum service. If misalignment is in pulley only, belts will enter and leave grooves at an angle, causing excessive cover and pulley wear. See Figure 4-7.

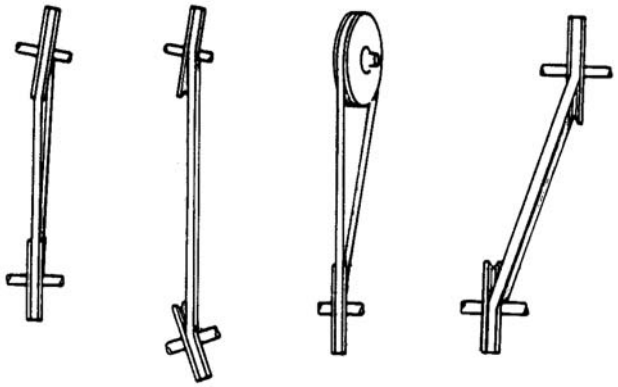


Figure 4-7. Pulley Misalignment

4-6. IDLERS.

4-6.1 Idler Problems. As necessary as idlers are, they tend to be a problem in a drive system. They should be checked frequently. These problems are more or less expected on a mower that has been used for a period of time but what does one look for when a belt problem is experienced on a new rider or tractor? Problems can be more difficult to find on a new unit because alignment appears to be correct, and the wear or age factors of course are not present, but the remaining thoughts expressed are still possibilities. A review of these basic considerations will reveal the problem and save much time.

4-6.2 Damaged or worn idlers.

1. Frozen idler bearings that cause a restriction on the belts building up a heat factor. This can cause a belt to shrink or weaken and stretch. When the belt is hot it will tend to roll over.

2. Wherever there is an idler, it is usually attached to a pivoting idler bracket. The pivot point of the bracket often reflects the problem by being loose. On riding mowers, the pivot points have a bearing or nyliner bushing which may be worn out or restricted by rust or corrosion.

3. Pulley halves can separate because of a defective weld. Pulleys do not run true if the groove is not formed right or is damaged.

4-6.3 Idlers are used for various reasons:

1. To provide an adjustment for fixed central drives.

3. To turn corners.

4. To break up long spans where belt whip may be a problem.

5. Maintain tension when the idler is spring loaded.

6. To increase arc-of-contact on a critical loaded pulley.

7. To clutch certain types of drives (transmission clutching, blade engagement, all types of power take-off on various chore performing equipment).

4-7. GENERAL.

4-7.1 The variable speed pulley can best be described as a torque converter. It is used on some riding mowers, rotary tillers and tractors. The variable speed pulley allows you to vary the ground speed (or the tiller speed) while maintaining a constant engine speed. We use a smaller one on the riders and the larger one on the tractor and rear tine tiller. Coupling the transaxle with the variable drive system you have the ultimate drive train. With this total drive system you can set the speed selector for a given speed, then slow down for a turn (cutting around trees or flower beds), by pushing in on the clutch/brake pedal. Release the pedal and the tractor automatically resumes the set speed. This type of drive system permits no-clutch-on-the-go speed control and enables you to match your ground speed to your mowing conditions without slowing the RPM's of the cutting blade. See Figure 4-8.

4-7.2 The drive principle for the new two speed transmission is similar to the single speed drive system. The variable speed pulley, combined with the two speed transmission, allows 14 ground speeds: 7 low range and 7 high range. Each speed is obtained by the placement of the shift lever and speed control lever. See Figure 4-9.

NOTE

On 1989 and 1990 units only, the shim used under the clutch brake pedal assembly is 5/8 inch instead of 1/2 inch as marked for the speed control adjustment.

4-7.3 Riding Mowers have a variable speed pulley that is used with the single speed transmission. This gives you a multispeed drive, and the transmission gives you reverse as well as changing the plane of the drive. Tractors use a variable speed pulley that is between the engine and the four speed transaxle. This gives you a speed variation in each gear. As the variable speed pulley moves away from the engine pulley, the engine V-belt pulls towards the center of the variable speed pulley, pushing

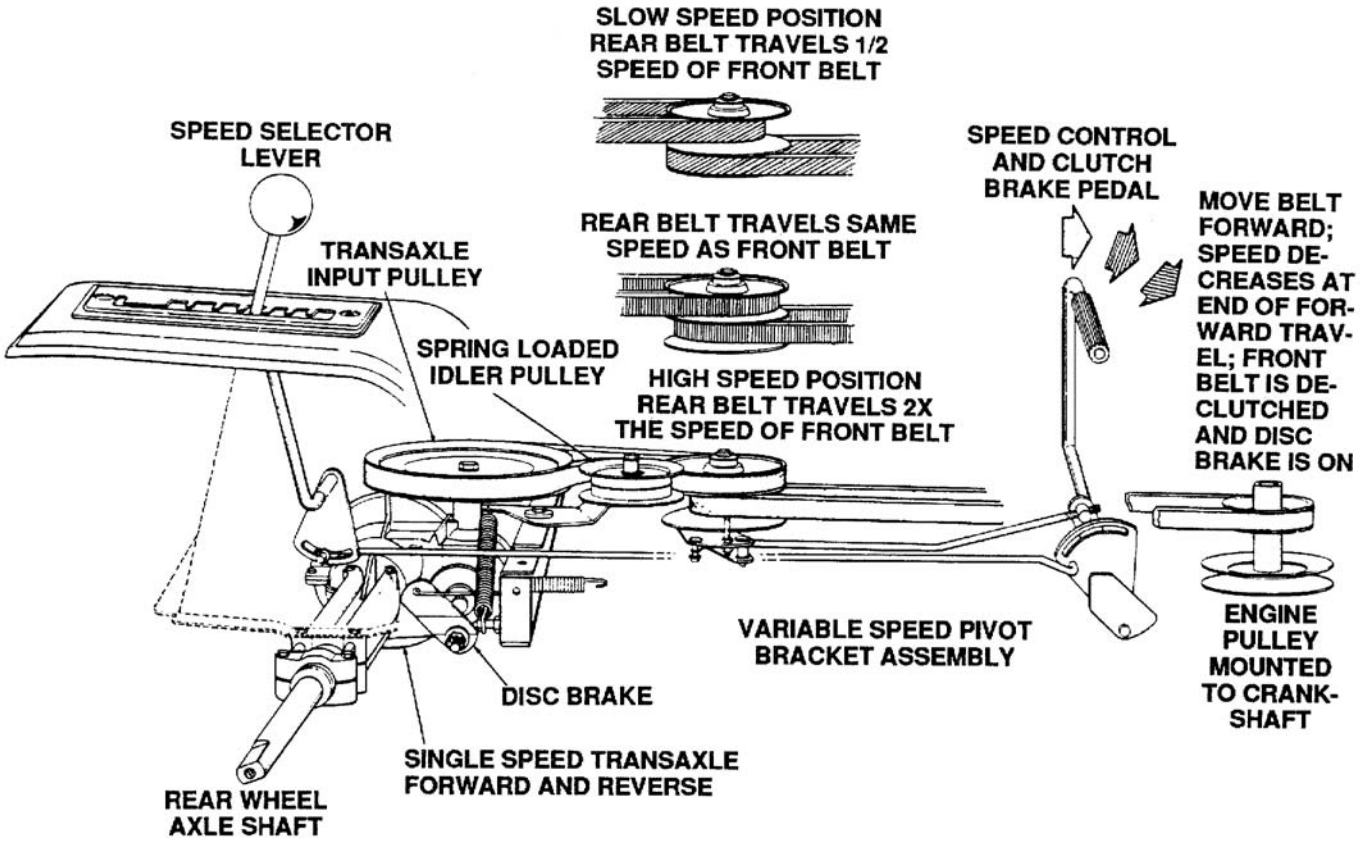


Figure 4-8. Variable Drive System

the movable sheave up. This forces the transmission V-belt to the outside of the variable speed pulley. A mechanical lock of the control linkage can stop the variable speed pulley at any point. See Figure 4-10

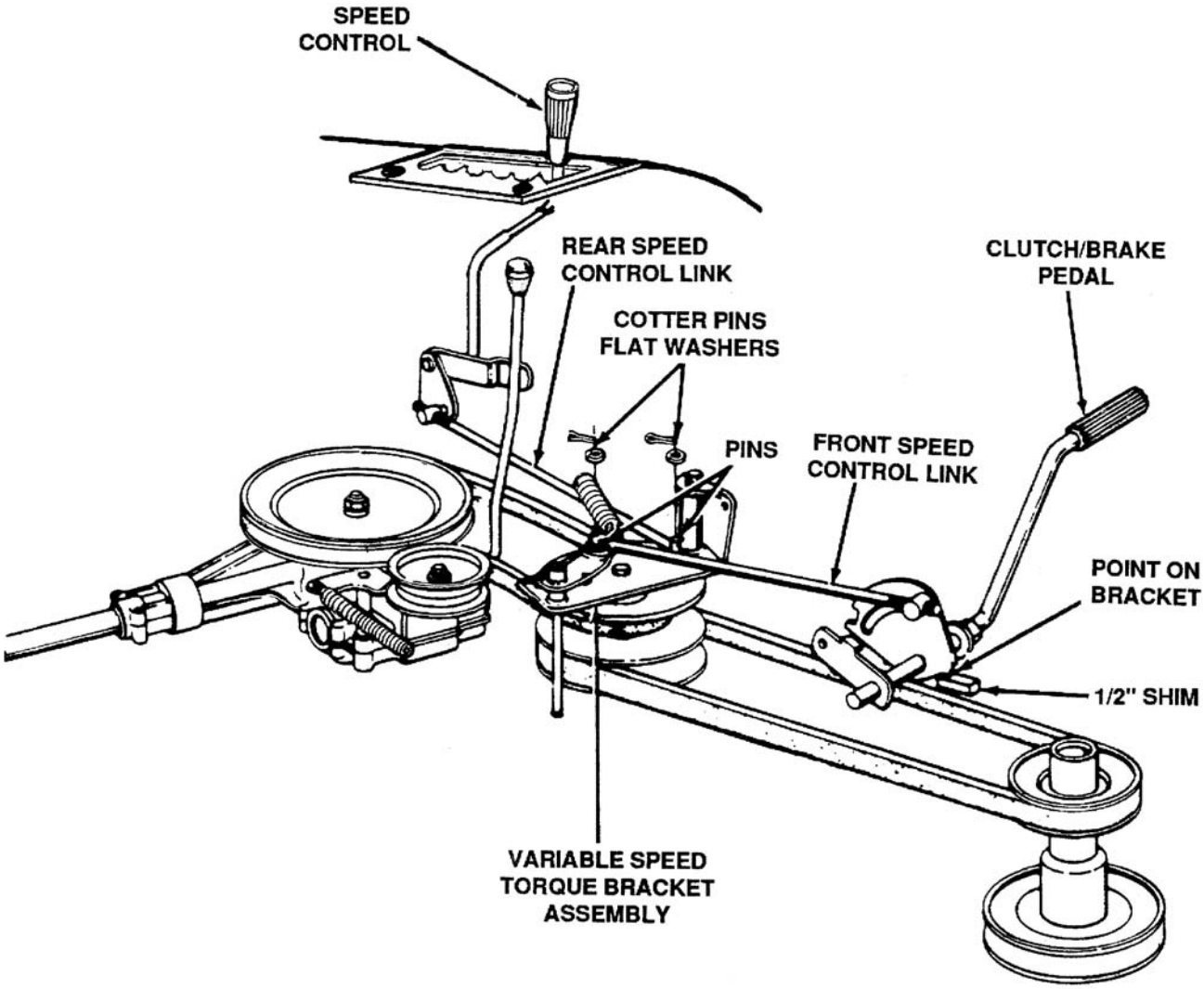


Figure 4-9. Two Speed Transmission

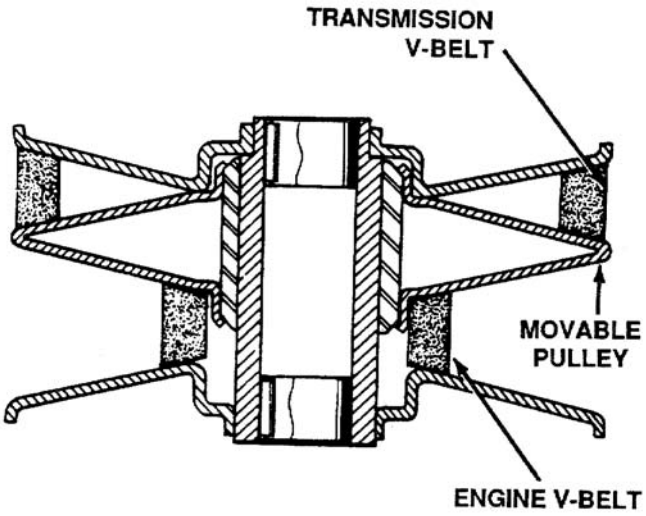


Figure4-10.Horizontal Variable Speed Drive Pulleys

4-7.4 Tillers use a variable speed pulley that is placed between the engine and the chain cage. By moving the control lever you can vary the tine speed. See Figure 4-11.

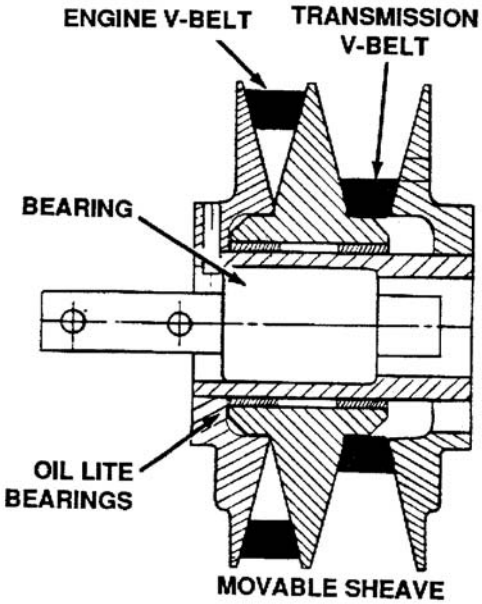


Figure 4-11.Vertical Variable Speed Drive Pulley

NOTE

Notice the difference between the horizontal (Figure 4-10) and the vertical (Figure 4-11) variable speed drive pulleys.

4-7.5 Maintenance of Variable Speed Pulleys.

1. **Testing**. The movable sheave must be able to slide easily sideways but cannot be loose. If the movable sheave is too loose it will cock and will not slide when under load.

2. **Repair.** The needle bearings on the riding mower variable speed pulley can be replaced. These are the only parts available for repair. The part number is 741-0404.

3. **Lubrication.** Lubricate the needle or ball bearings once a year with a few drops of engine oil.

CAUTION

Excessive oiling will get on the V-belts and deteriorate them, or cause slippage.

4. Use a rag to clean dirt and rubber from the V-belt from the groove.

4-7.6 The shift lever generally has three positions: forward, neutral and reverse, except on the new two speed transmission which has high, low, neutral and reverse. The clutch/brake pedal must be depressed and the lawn tractor must not be moving when shifting gears. Do not force the shift lever. Release the clutch/brake pedal slightly to line up the shifting collar in the transmission. Then try to shift gears.

4-7.7 The speed control lever allows you to regulate the ground speed of the lawn tractor. To select the ground speed, depress clutch pedal. Push speed control lever outward and move backward to slow lawn tractor; move forward to increase speed. When desired speed has been obtained, release lever in that position. Whenever clutch is engaged, unit will automatically go to the preset speed.

4-7.8 The clutch/brake pedal is located on the left side of the lawn tractor. Depressing the clutch/brake pedal part way disengages the clutch. Pressing the pedal all the way down disengages the clutch and engages the disc brake.

4-7.9 Install spacer as follows:

1. Lower deck to lowest cutting position.

2. Remove spring from variable speed torque bracket assembly.

3. Remove 4 inch bolt that secures the variable speed bracket assembly.

4. Insert spacer between bracket and frame.

5. Reassemble bolt and spring.

NOTE

On 1992, the idler bracket has two holes that secure the idler pulley. The inner hole is used for the 600 Series rider; the outer hole is used on the 300 and 400 Series riders.

NOTE

When operating the unit initially or after replacing the belts, there will be little difference between the highest two speeds until after the belts have gone through a break-in period and have seated themselves into the pulleys.

4-7.10 See Figure 4-12 and adjust the speed control lever as follows:

1. Place the shift lever in Neutral position.

2. Start the engine.

3. Place the speed control lever in high speed position.

4. Release the clutch-brake pedal completely, then slowly depress the pedal all the way (to disengage position). Hold the pedal in this position.

5. Turn the engine off.

6. After engine stops completely, release the clutch-brake pedal.

7. Disconnect the speed control link from the variable speed bracket by removing the cotter pin and flat washer below the variable speed bracket.

8. Depress the clutch-brake pedal forward until the stop on the clutch-brake pedal assembly hits solidly against the underside of the frame.

9. Remove the hairpin clip and flat washer from the rod attached to the back of the speed control lever.

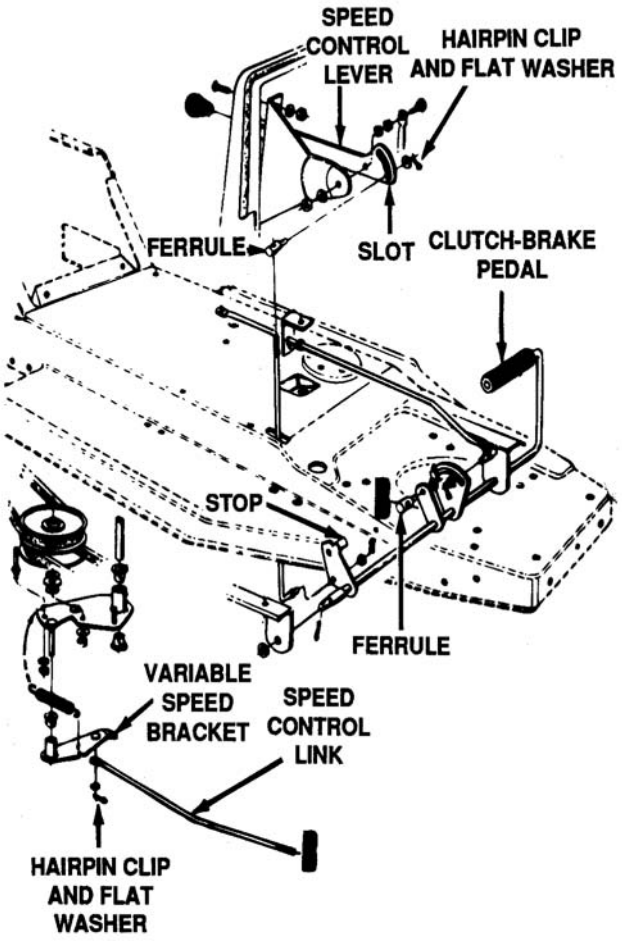


Figure 4-12. Speed Control Adjustment

10. Place the speed control lever in parking brake position.

11. Thread the ferrule on the rod until the ferrule slips into the bottom end of the slot in the speed control lever, then thread the ferrule down on the rod one full turn (to shorten). If the speed control lever is not slotted, thread the ferrule on the rod until the stop on the brake rod is between 1/8 inch and 1/4 inch away from the bracket.

12. Position speed control lever as follows:

    a. 7 + 8-speed units: Place speed control lever in second position.

    b. 5-speed units: Place speed control lever in first position.

13. Place ferrule into speed control lever slot, and secure with flat washer and hair pin clip. Release the clutch-brake pedal.

4-7.11 See Figure 4-12 and adjust the speed control link as follows to obtain the correct neutral adjustment:

1. Push the clutch-brake pedal backward by hand as far as it will go using light pressure. Hold it in this position as you make the following adjustment.

2. Thread the speed control link into or out of the ferrule until it aligns for proper mounting to the variable speed bracket.

3. Secure the speed control link to the variable speed bracket with flat washer and cotter pin.

4-7.12 Adjust shift lever to neutral (wheel drive) as follows:

1. Place the transmission in neutral. (The unit will move freely when pushed forward and backward with the parking brake released.)

2. Loosen the bolt which secures the shift lever assembly to the shift lever adjusting link. See Figure 4-13.

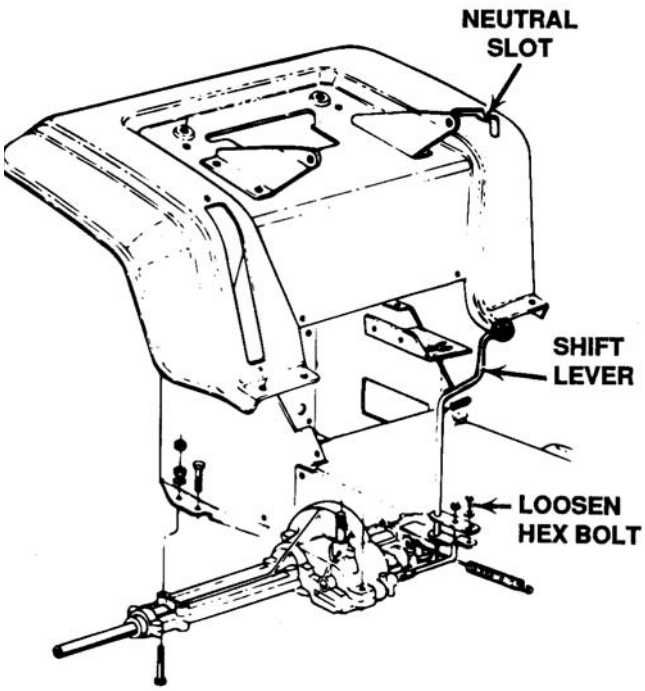


Figure 4-13. Adjusting Shift Lever to Neutral

3. Place the shift lever in the neutral slot.

4. Tighten the bolt to 13 ft.-lbs.

NOTE

If a customer's unit will not release out of forward or reverse gear, first check the drive belts. The transmission pulley must come to a complete stop while clutching. If it doesn't, a speed control adjustment may help. Also check the belt guards. They must be set at 1/8 inch while the belts are engaged.

NOTE

Occasionally in 1987 3000 Series units, the speed control lever will not stay in the selected gear. If this unit jumps out of gear or cannot be fully engaged into gear, install a shift lever modification kit (part number 753-0466).

4-7.13 If unit stalls with speed control in high speed, or if unit will not operate with speed control lever in a low speed position, proceed as follows:

1. Place shift lever in NEUTRAL.

2. Restart engine.

3. Place speed control lever in high speed position.

4. Release clutch/brake pedal fully.

5. Depress clutch/brake pedal.

6. Place speed control lever in desired position.

7. Place shift lever in either FORWARD or REVERSE, and follow normal operating procedures.

4-7.14 Belt Removal and Replacement.

WARNING

Disconnect the spark plug wire and ground it against the engine. Block the wheels of the unit.

1. Remove the deck belt as follows:

   a. Place the lift lever in the disengaged position.

   b. Remove the three hex bolts (belt keepers) from the engine pulley belt guard. See Figure 4-14.

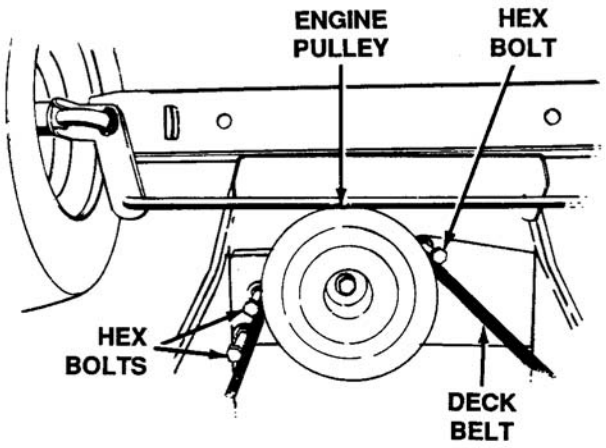


Figure 4-14. Location of Hex Bolts

NOTE

Make certain hex bolts are reassembled as shown.

c. Unhook the deck belt from the engine pulley.

d. Place the lift lever in the engaged (all the way forward) position.

e. Disconnect the spring from the left rear deck bracket. See Figure 4-15.

f. Disconnect the top of the four deck links by removing the hairpin clips and flat washers.

g. Slide the threaded rod out of the tubing. Slide the deck from beneath the lawn tractor.

h. Remove the belt guards at each deck pulley by removing the hex bolts, lock washers and hex nuts. Remove belt. See Figure 4-16.

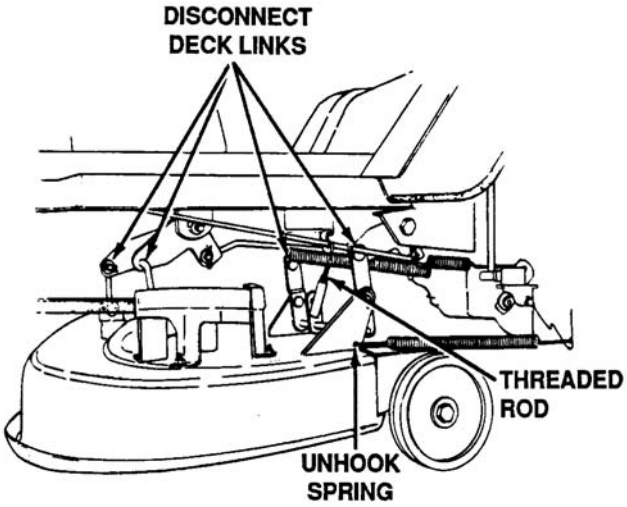


Figure 4-15. Location of Deck Links

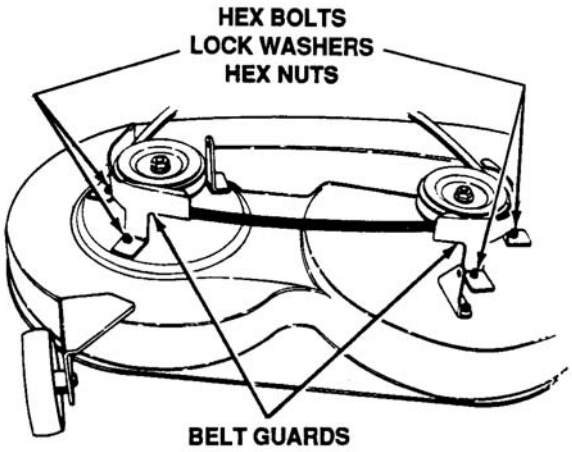


Figure 4-16. Location of Belt Guards

i. Replace the belt following the above instructions in reverse order.

2. Remove the rear drive belt as follows:

NOTE

When changing the rear drive belt, a spring puller or other suitable tool is required to remove an extension spring. A spring puller (part number 732-0571) is available to assist in removal of this spring.

a. Remove the cutting deck by following steps a. through i. of instructions for removing the deck belt.

b. Start the engine. Place shift lever in neutral. Place cruise control lever in high speed position and turn engine off. Engage lift lever (move all the way forward). Do not set parking brake.

c. Disconnect the large spring from the transmission support bracket using a spring puller or other suitable tool. An access hole is provided in the rear of the frame for this purpose. See Figure 4-17.

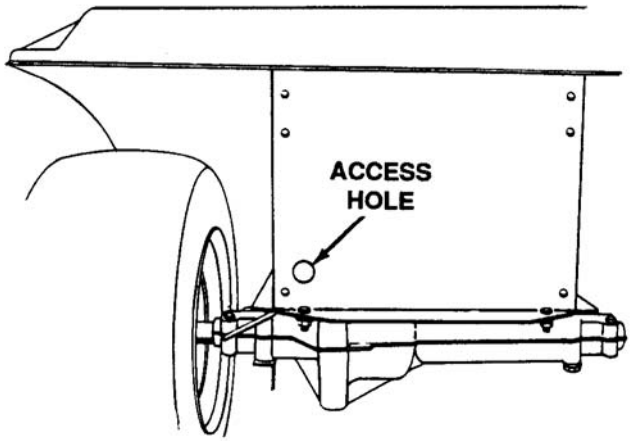


Figure 4-17. Location of Access Hole

NOTE

A spring puller (part number 732-0571) is available to assist in removal of this spring.

d. Disconnect the small spring from the bolt on the right side of the fram and transmission support bracket.

e. Remove the brake rod out of the variable speed pulley bracket.

f. Loosen (do not remove) the bolts (or hex nut) which secure the variable speed pulley bracket to allow clearance in order to remove the belts. A 7/16 inch (or 9/16 inch) socket wrench with extension is required.

g. Reassemble new belt, following the above instructions in reverse order.

h. Remove the rear drive belt from around the top of the variable speed pulley. Remove belt from transmission pulley and idler pulley. See Figure 4-18.

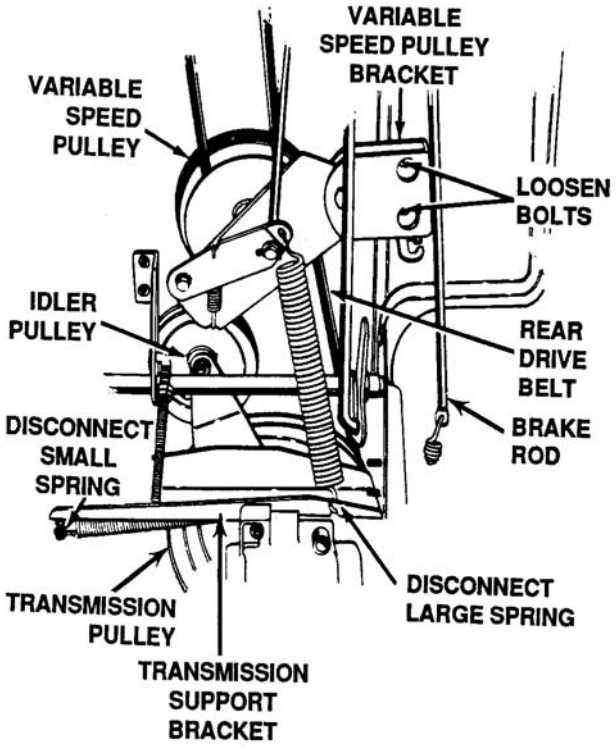


Figure 4-18. Location of Pulleys

3. Remove the forward drive belt as follows:

   a. Follow steps a. through g. of instructions for removing the rear drive belt paragraph 4-7.14 2.Follow steps a. through h. of instructions for removing the deck belt paragraph 4-7.14 .

   b. Remove the engine pulley belt guard by removing two self-tapping screws from each side of the unit. Remove the engine pulley belt guard by moving it back and to the left.

   c. Remove the forward drive belt from the engine pulley and from the variable speed pulley.

   d. Reassemble new belt, following the above instructions in reverse order.

1. Remove the battery from the unit.

2. To prevent gasoline from leaking from the engine, remove the fuel tank cap, place a piece of thin plastic over the neck of the fuel tank and screw on the cap.

WARNING

Disconnect the spark plug wire and ground it against the engine.

3. Remove the deck as described in the separate deck manual.

4. Unhook the idler spring from the rider frame. See Figure 4-19.

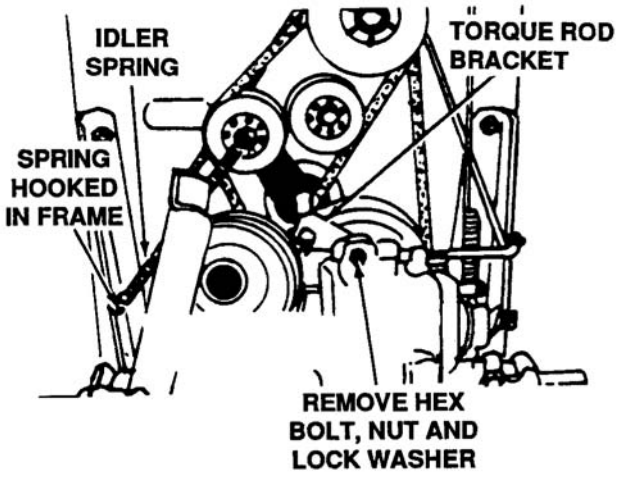


Figure 4-19. Torque Rod Bracket and Transaxle

5. Remove the hex bolt, nut and lock washer at the torque rod bracket and transaxle.

6. Remove the hex bolt which holds the torque rod bracket to the torque rod and remove bracket. See Figure 4-20.

7. Slip the V-belt off the variable speed pulley and transaxle pulley. See Figure 4-21.

8. Remove two hex bolts, nuts and lock washers from the engine pulley belt guard at rider frame to allow the engine pulley belt guard to drop down out of the way. See Figure 4-22.

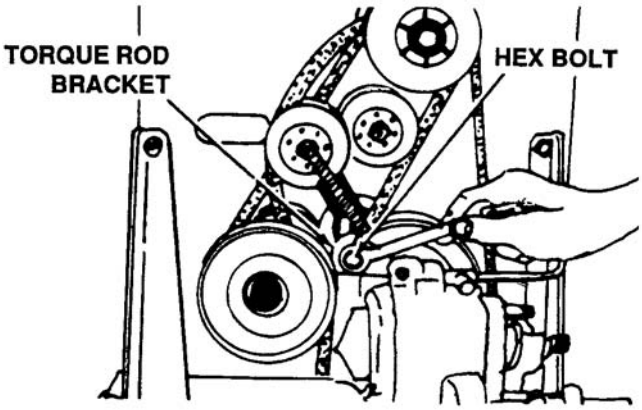


Figure 4-20. Location of Hex Bolt

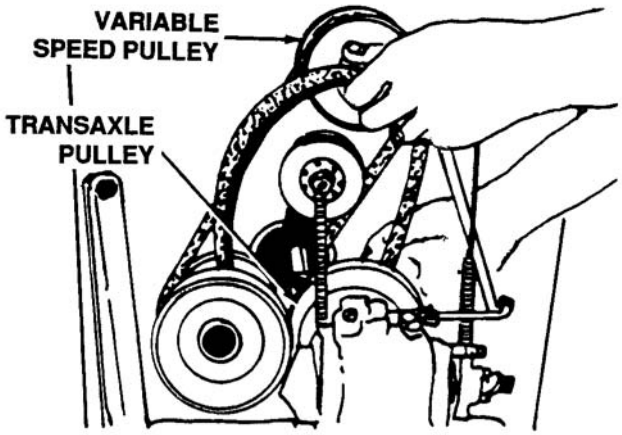


Figure 4-21. Location of V-Belt Pulleys

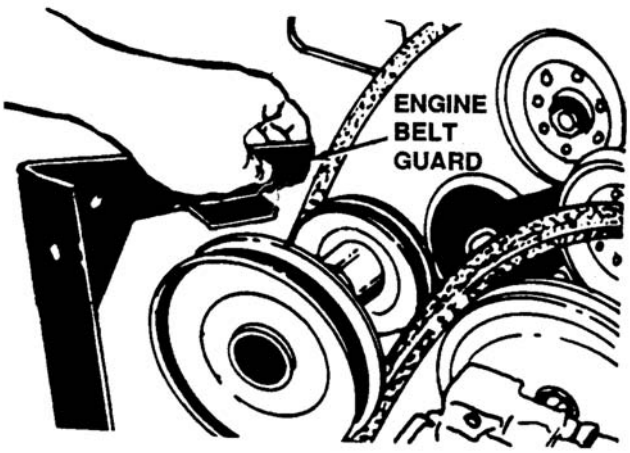


Figure 4-22. Location of Engine Belt Guard

9. Remove the idler pulley by removing the hex lock nut. See Figure 4-23.

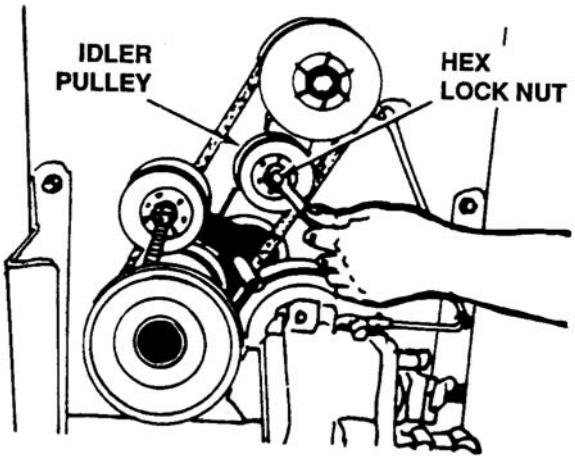


Figure 4-23. Idler Pulley Hex Lock Nut

10. Remove and replace the V-belt. See Figure 4-24.

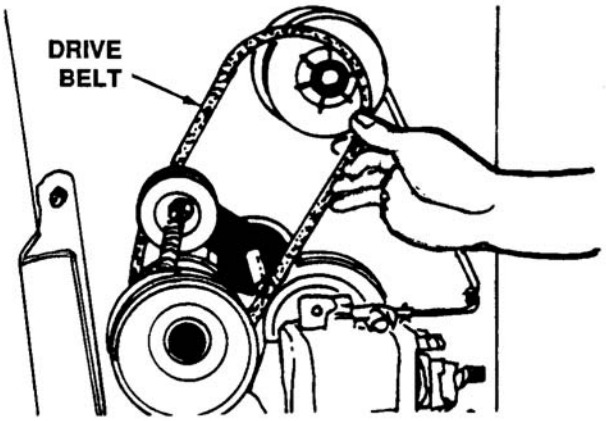


Figure 4-24. Removing Drive V-Belt

11. Upon reassembly of idler pulley, be certain the hub side of idler goes against the idler bracket. See Figure 4-25.

12. When sliding the idler pulley on the idler bracket, be certain the belt is between the pulley and guide pin. See Figure 4-26.

13. Reverse the above steps (paying close attention to steps 12 and 13) when reassembling the new belts.

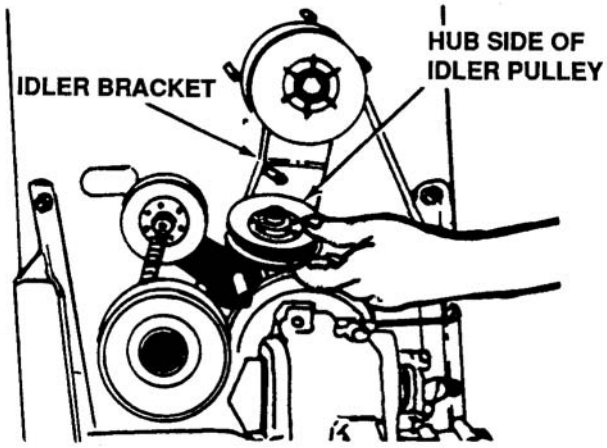


Figure 4-25. Reassembly of Idler Pulley

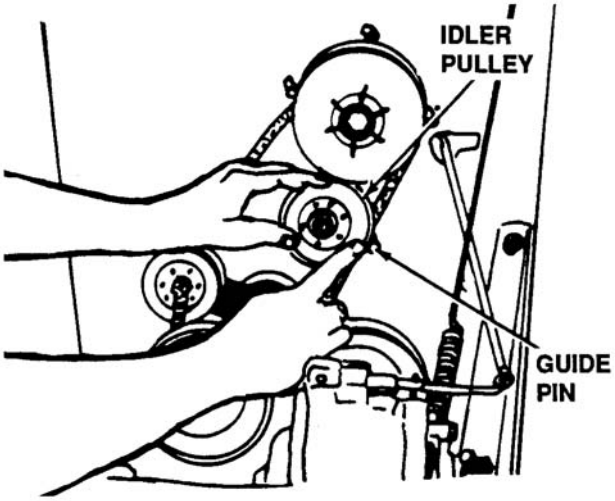


Figure 4-26. Location of Guide Pin

NOTE

Be certain all belts are inside belt guards and keepers. Also, be sure to reassemble the safety wire (yellow) at the deck chute.

4-8. TRANSMATIC LAWN TRACTORS 600 AND 700 SERIES.

4-8.1 The principle of this drive system is basically the same as discussed earlier in the operation of the variable speed pulley. Refer to paragraph 4-7. This paragraph contains specific information applicable to the 600 and 700 transmatic lawn tractors only. The layout of the drive system is somewhat different. On the previously used system, constant tension was maintained on the V-belt from the variable speed pulley to the transaxle pulley through

the movement of the variable speed pulley in an arc like fashion. In the new system the variable speed pulley pivots back and forth. A spring loaded idler pulley is positioned between the variable speed pulley and transaxle pulley to maintain this tension. See Figure 4-27.

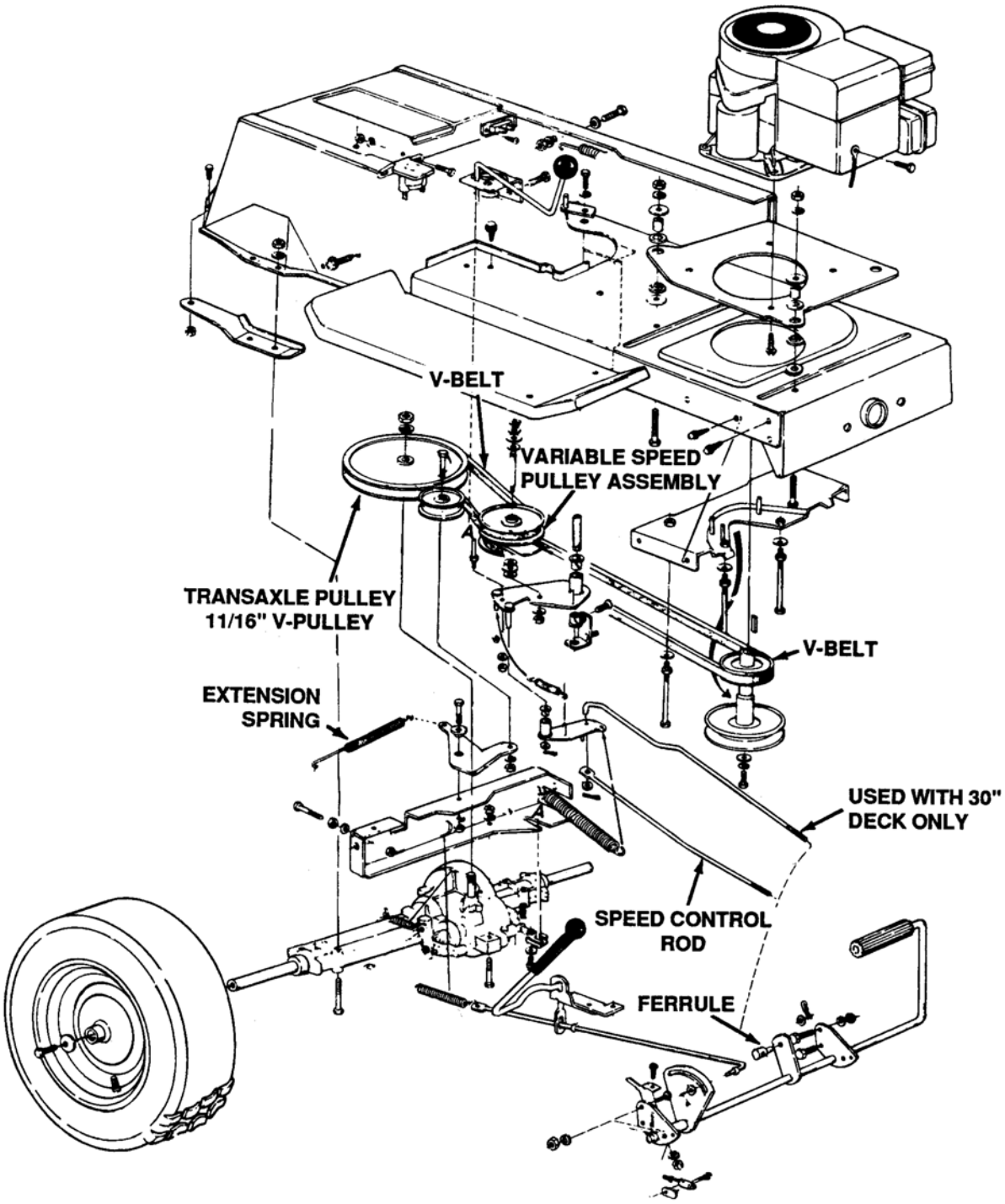


Figure 4-27. Variable Speed Drive System for 600 and 700 Series

Model 600 Series

In many cases, we have found if speeds cannot be obtained after checking major components and performing a variable speed adjustment, the problem usually is between the variable speed bracket assembly and torque bracket assembly not fully pivoting.

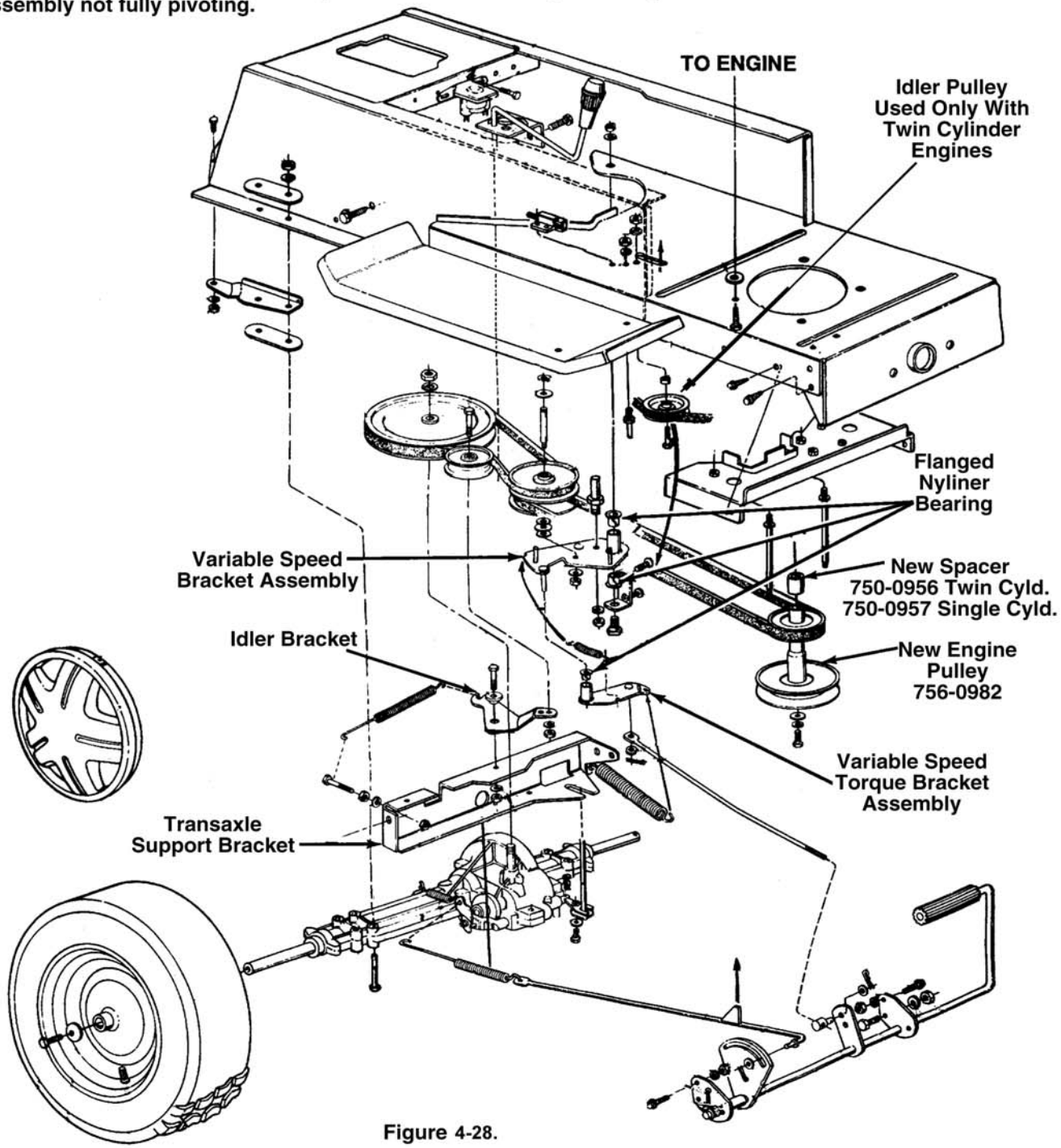


Figure 4-28.

****REAR WHEEL CHART**

Description	18" x 9.50"	18" x 6.50"	20" x 8.0"	20" x 8.0"
Wheel Ass'y. Comp.	734-0817	734-0592	734-1675	634-0104
Tire Only	734-0448	734-0294	734-1596	734-1730
Rim Only	634-0070	634-0069	634-0070	634-0070

SERVICE KIT 753-0635

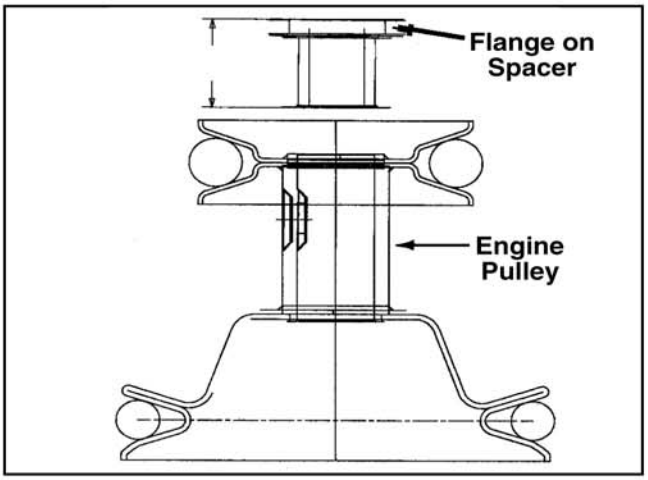
CODE: R-365

DATE: April 25, 1995

SUBJECT: Replacement Engine Pulley—Transmatic Lawn Tractors

Service Kit 753-0635 replaces engine pulley part number 756-0488.

Install the new pulley and spacer. The flange on the spacer **must** be toward the **top** as shown. Tighten the pulley mounting screw to 600-720 in. lbs.



Kit 753-0635 Consists of:

Part No.	Description	Qty.
756-0982	Engine Pulley	1
750-0957	Spacer 1-1/4" Lg.	1

Used on Single Cyld. Engines

FORM NO. 770-8983K

SERVICE KIT 753-0631

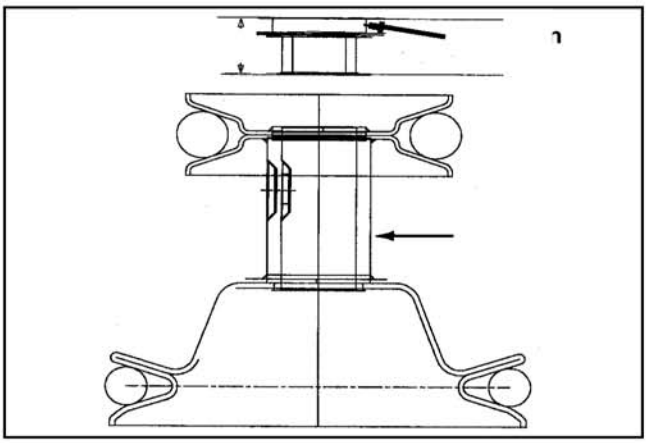
CODE: R-363

DATE: March 1, 1995

SUBJECT: Replacement Engine Pulley—Transmatic Lawn Tractors

Service Kit 753-0631 replaces engine pulley part number 756-0424.

Install the new pulley and spacer. The flange on the spacer **must** be toward the **top** as shown. Tighten the pulley mounting screw to 600-720 in. lbs.



Kit 753-0631 Consists of:

Part No.	Description	Qty.
756-0982	Engine Pulley	1
750-0956	Spacer 13/16" Lg.	1

Used on Twin Cyld. Engines

FORM NO. 770-8979K
(R950425)

1. There may be times when the customer will not be able to obtain a full speed range. This may be caused by the brackets occasionally hanging up after substantial use. You will need to disassemble the variable speed bracket assembly and the variable speed torque bracket assembly, take out the nyliner bushings, clean shafts, grease and reinstall. Perform a variable speed control adjustment.

2. If a unit in the 600 Series sits crooked, raise the right front tire approximately 6 inches and block. Loosen the 4 transaxle bolts which secure the axles to the side frames. The holes in the side frames are slotted. After loosening the bolts the transaxle will shift into position. Tighten the bolts and remove the block from under right front tire. This procedure will reposition the transaxle and level the unit.

3. You may see some problems with the steering arm front axles bending on units with rear bagger and wheel weights. A new steering arm (part number 16481A) is available. It has also been determined that wheel weights are not needed on 600 Series riders with the 063 or 064 rear baggers.

4-8.2 Speed Control Adjustment.

NOTE

When operating the unit initially or after replacing the belts, there will be little difference between the highest two speeds until after the belts have gone through a break-in period and have seated themselves into the pulleys.

1. First, adjust the speed control lever by pushing the clutch/brake pedal forward until the stop on the speed control rod is against the running board rod (or until the stop on the brake rod is against the frame, if so equipped). Have another person hold the pedal in this position as you make the following adjustment. Place the speed control lever in parking brake position. Remove the hairpin cotter and flat washer, and adjust the ferrule on the rod so it is against the back end of the slot. Then lengthen the rod one more turn. Replace the flat washer and hairpin cotter. See Figure 4-29.

2. Adjust speed control link as follows:

   a. Start the engine.

   b. Place the shift lever in neutral position.

   c. Place the speed control lever in high speed position.

   d. Release the clutch/brake pedal completely, then slowly depress the pedal all the way (to park position). Hold the pedal in this position.

   e. Turn the engine off.

   f. After engine stops completely, release the clutch/brake pedal.

   g. Position speed control lever as follows:

      1) 7-speed units—Place speed control lever in second position.

      (2) 6-speed units—Place speed control lever between first and second position (hold in this position).

      (3) 5-speed units—Place speed control lever in first position.

   h. Remove the cotter pin and flat washer which secures the speed control link to the variable speed torque bracket assembly.

   i. Push the clutch/brake pedal backward by hand as far as it will go using light pressure. Hold it in this position as you thread the speed control link in or out of the ferrule until it lines up with the pin on the variable speed torque bracket assembly.

   j. Secure speed control link to variable speed torque bracket assembly with flat washer and pin cotter.

4-8.3 Belt removal and replacement. It is not necessary to tip the unit to remove the belts. However, if tipping the unit is desired, remove the battery from the unit. To prevent gasoline leakage, drain the gasoline, or remove the fuel tank cap, place a thin piece of plastic over the neck of the fuel tank and screw on the cap. Be certain to remove the plastic when finished changing the belts. Block unit securely. Replace belts as follows:

WARNING

Disconnect the spark plug wire and ground it against the engine. Block the wheels of the unit.

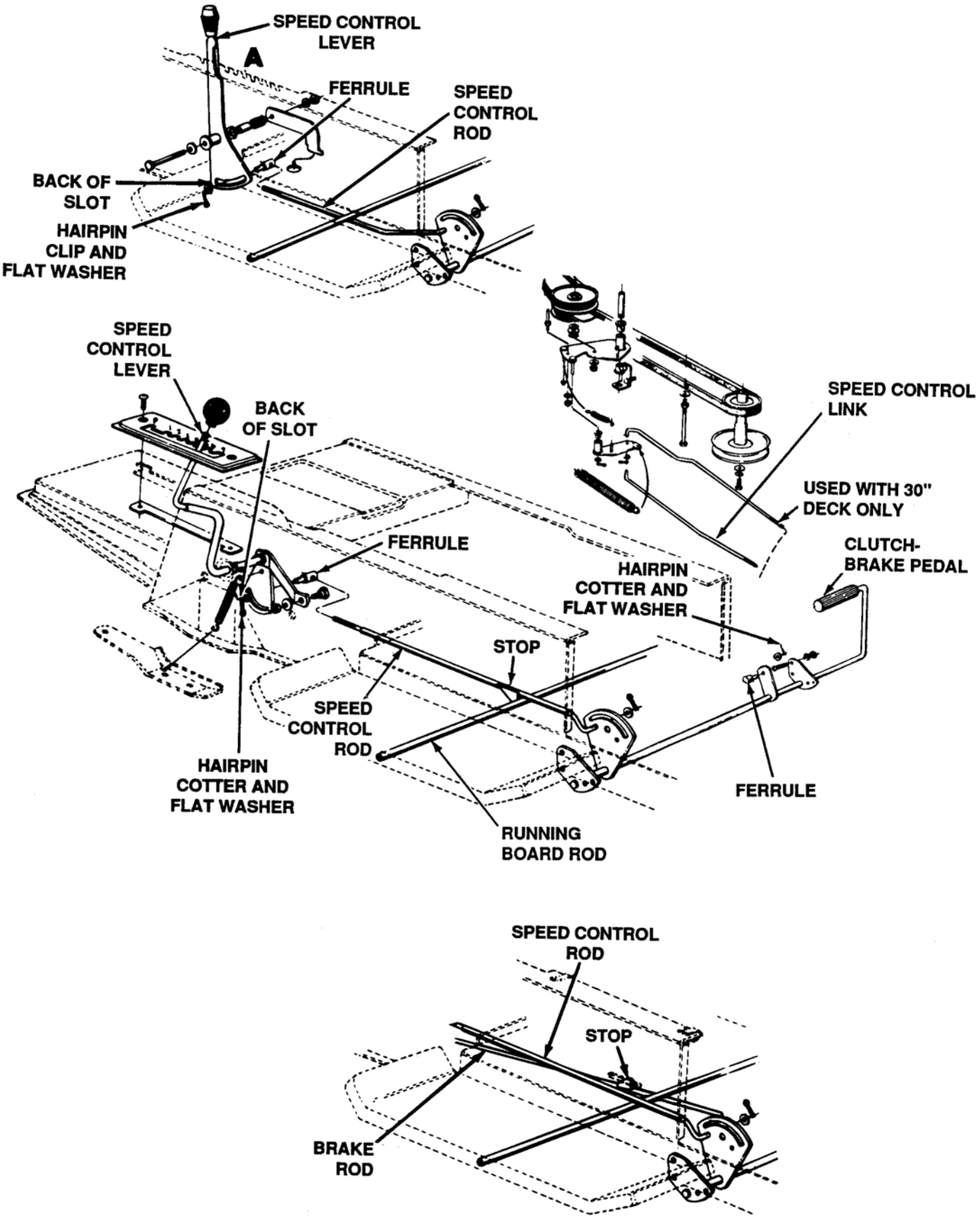


Figure 4-29. Speed Control

1. Rear drive belt. Remove and replace rear belt as follows:

   a. Place shift lever in neutral position. Unscrew the shift knob and the speed control knob (if located on the console). Remove the two truss head screws which secure the transmission cover. See Figure 4-30.

   b. Lift the transmission cover. Unplug the safety wire from beneath the transmission cover. See Figure 4-31. Remove transmission cover.

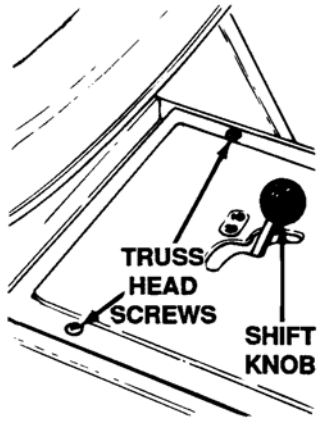


Figure 4-30. Transmission Cover

Figure 4-31. Safety Wire

   c. Push the idler pulley toward the right side of the unit. Lift the belt over the idler pulley. See Figure 4-32.

   d. Remove the belt from the variable speed pulley.

   e. Remove the two bolts which hold the shift lever bracket to the frame on the left side of the unit. Swing the bracket toward the right so the belt can be removed from the transmission pulley. See Figure 4-32.

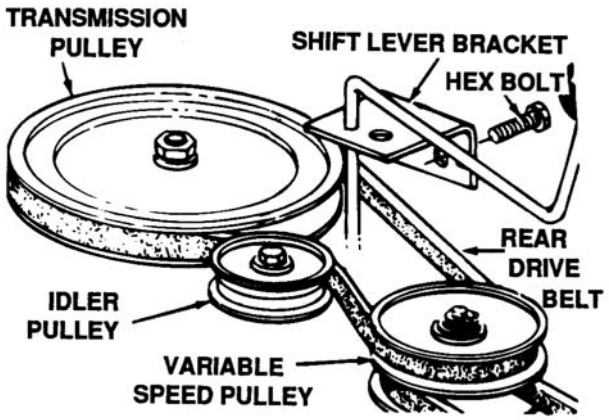


Figure 4-32. Location of Shift Lever

   f. Replace belt, and reassemble in reverse order.

   g. Adjust the speed control as instructed in adjustment section.

2. Front belt drive. Remove and replace front belt as follows:

   a. To remove the front drive belt, first remove the rear drive belt from the idler pulley and variable speed pulley.

   b. Place the lift lever in the disengaged position.

   c. Remove the belt keeper pins from the engine pulley belt guard. Refer to Figure 4-33.

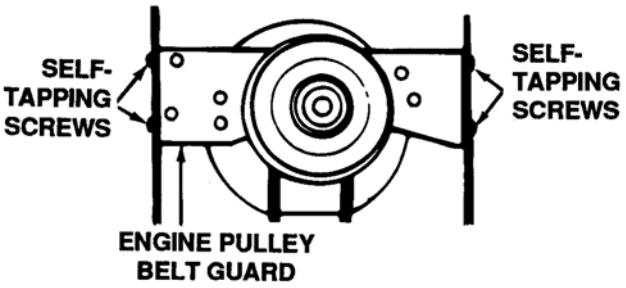


Figure 4-33. Location of Belt Guard

   d. Unhook the deck belt from the engine pulley.

e. Remove the two self-tapping screws on each side of the frame which hold the engine pulley belt guard to the frame. See Figure 4-33. Remove the engine pulley belt guard by slipping it forward and down.

f. Place the clutch-brake pedal in park position.

g. Push forward on the variable speed pulley, and lift the belt off the engine and remove the belt from the engine pulley.

h. Release the clutch-brake pedal. Using the pedal to move the variable speed pulley as necessary, lift the belt up and off the variable speed pulley.

NOTE

When reassembling, make certain belt is inside the pins. See Figure 4-34.

i. Reassemble with a new belt, following instructions in reverse order.

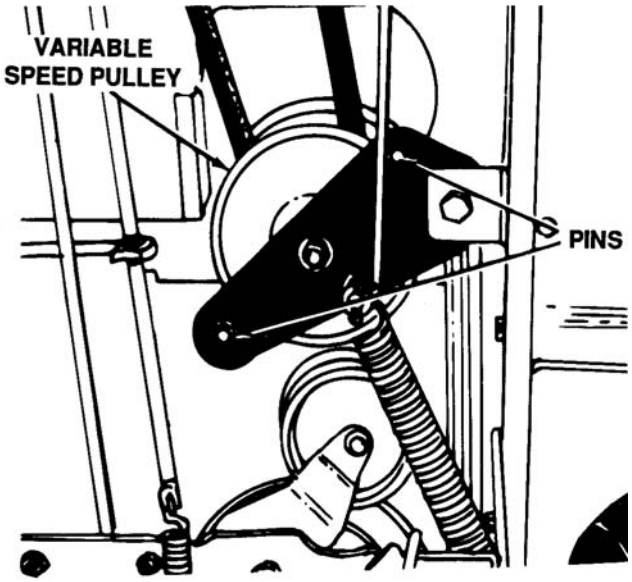


Figure 4-34. Location of Variable Speed Pulley and Pins

j. Adjust the speed control as instructed in adjustment section.

4-8.4 SPEED CONTROL ADJUSTMENT

NOTE

When operating the unit initially or after replacing the belts, there will be little difference between the highest two speeds until after the belts have gone through a break-in period and have seated themselves into the pulleys. If the full range of speeds cannot be obtained on your unit, adjust the speed control as follows.

1. Adjust the speed control lever by pushing the clutch-brake pedal forward until the stop on the brake rod is against the frame. Have another person hold the pedal in this position as you make the following adjustment. Place the speed control lever in parking brake position. Remove the hairpin clip and flat washer, and adjust the ferrule on the rod so it is against the back end of the slot. Then lengthen rod one more turn. Reassemble and secure with the flat washer and hairpin clip. See Figure 4-35.

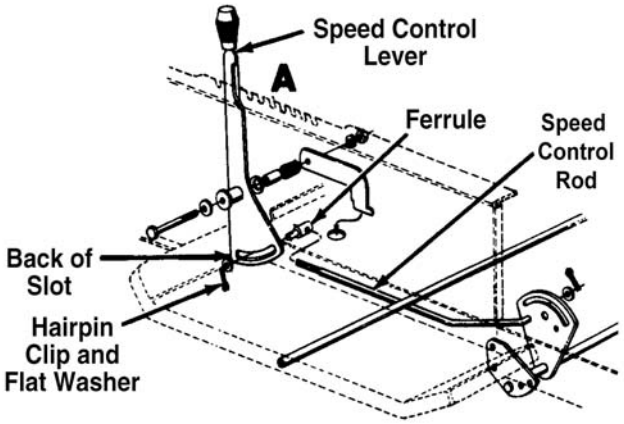


Figure 4-35. Speed Control

2. Adjust the speed control link as follows to obtain the correct neutral adjustment.

   A. Start the engine.

   B. Place the shift lever in Neutral position.

   C. Place the speed control lever in high speed position.

   D. Release the clutch-brake pedal completely, then slowly depress the pedal all the way (to park position). Hold the pedal in this position.

   E. Turn the engine off.

   F. After engine stops completely, release the clutch-brake pedal.

   G. Place speed control lever between first and second position (hold in this position).

   H. Remove the cotter pin and flat washer which secures the speed control link to the variable speed torque bracket assembly.

   I. Push the clutch-brake pedal backward by hand as far as it will go using light pressure. Hold it in this position as you thread the speed control link in or out of the ferrule until it lines up with the pin on the variable speed torque bracket assembly.

   J. Secure speed control link to variable speed torque bracket assembly with flat washer and cotter pin.

4-8.5 REAR DRIVE BELT

1. Place shift lever in neutral position. Unscrew the shift knob and the speed control knob (if located on the console). Remove the two truss head screws which secure the transmission cover.

2. Lift the transmission cover. Unplug the safety wire from beneath the transmission cover. Remove transmission cover.

3. Remove the two screws and hex nut from the variable speed bracket assembly. Remove bracket assembly. See Figure 4-36.

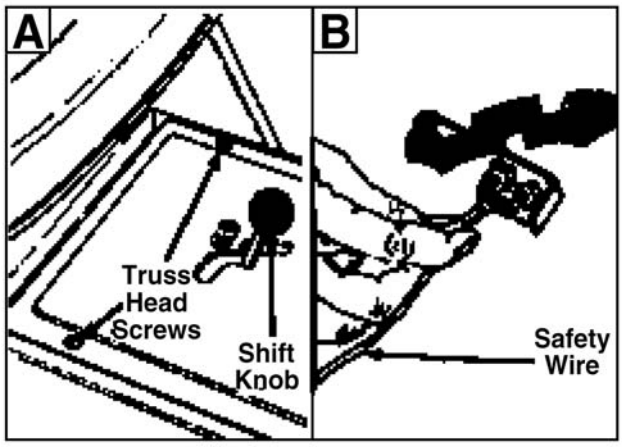


Figure 4-36. Rear Drive Belt

4. Push the idler pulley toward the right side of the unit. Lift the belt over the idler pulley.

5. Remove the belt from the variable speed pulley.

6. Remove the belt from the transmission pulley.

7. Replace belt, and reassemble in reverse order.

8. Adjust the speed control as instructed previously.

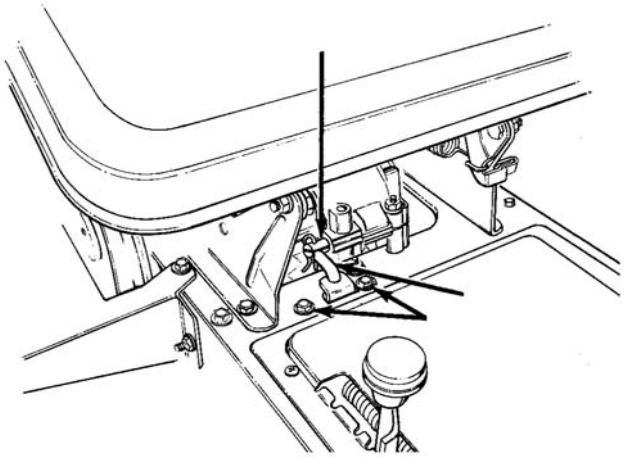


Figure 4-37. Neutral Adjustment

4-8.6 NEUTRAL ADJUSTMENT

1. Place the transmission in neutral. (The unit will move freely when pushed forward and backward with the parking brake released.)

2. Loosen the bolts which secures the shift lever assembly to the shift lever link.

3. Place the shift lever in the neutral slot. Retighten the bolts. See Figure 4-37.

4-8.7 WHEEL ADJUSTMENT

The caster (forward slant of the king pin) and the camber (tilt of the wheels out at the top) require no adjustment. Automotive steering principles have been used to determine the caster and camber on the tractor. The front wheels should toe-in 1/8 inch. Some units have adjustable tie rods so the toe-in can be adjusted. To adjust the toe-in on these units, proceed as follows.

1 . Remove the hex nut and lock washer, and drop the tie rod end from the wheel bracket.

2. Loosen the hex jam nut on tie rod.

3. Adjust the tie rod assembly for correct toe-in. Dimension "B" should be approximately 1/8" less than Dimension "A." See Figure 4-38.

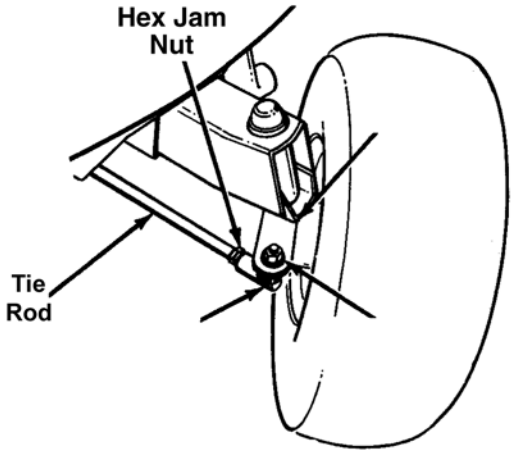


Figure 4-38. Units With Adjustable Tie Rods

A.) To increase Dimension "B," screw tie rod into tie rod end.

B.) To decrease Dimension "B," unscrew tie rod from tie rod end.

C.) Reassemble tie rod. Check dimensions. Readjust if necessary. See Figure 4-39.

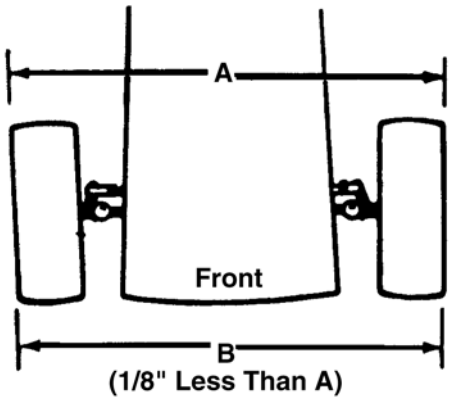


Figure 4-39. Units With Adjustable Tie Rods

4-8.8 BRAKE ADJUSTMENT

The brake is located on the right side, under the seat. During normal operation of this machine, the brake is subject to wear and will require periodic examination and adjustment.

WARNING

Do not have the engine running when you adjust the brake. To adjust the brake, adjust the nut so the brake starts to engage when the brake lever is 1/4" to 5/16" away from the axle housing. An access hole is provided in the seat mounting bracket. See Figure 4-40.

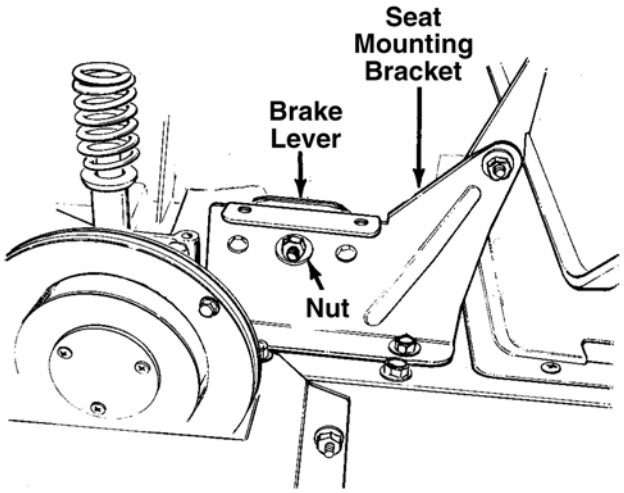


Figure 4-40. Brake Adjustment

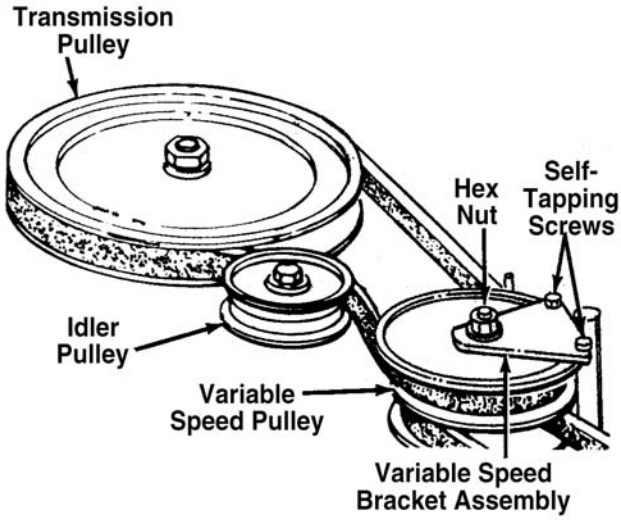


Figure 4-41. Front Drive Belt Removal

4-8.9 FRONT DRIVE BELT

1. To remove the front drive belt, first remove the rear drive belt from the idler pulley and variable speed pulley.

2. Place the lift lever in the BLADES OFF position.

3. Remove the belt keeper pins from the engine pulley belt guard. See Figure 4-41.

NOTE

Make certain belt keeper pins are reassembled.

4. Unhook the deck belt from the engine pulley.

5. Remove the two self-tapping screws on each side of the frame which hold the engine pulley belt guard to the frame. Remove the engine pulley belt guard by slipping it forward and down. See Figure 4-42.

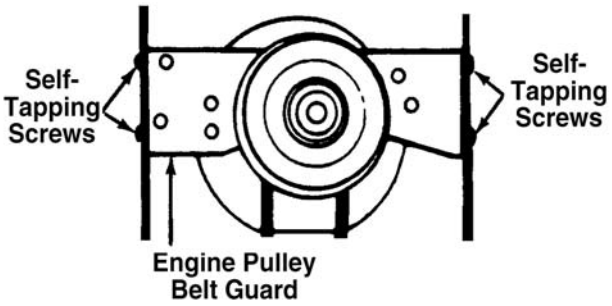


Figure 4-42. Engine Pulley Belt Guard

6. Place the clutch-brake pedal in park position.

7. Push forward on the variable speed pulley, and lift the belt off the engine and remove the belt from the engine pulley.

8. Release the clutch-brake pedal. Using the pedal to move the variable speed pulley as necessary, lift the belt up and off the variable speed pulley.

NOTE

When reassembling, make certain belt is inside the pins. See Figure 4-43.

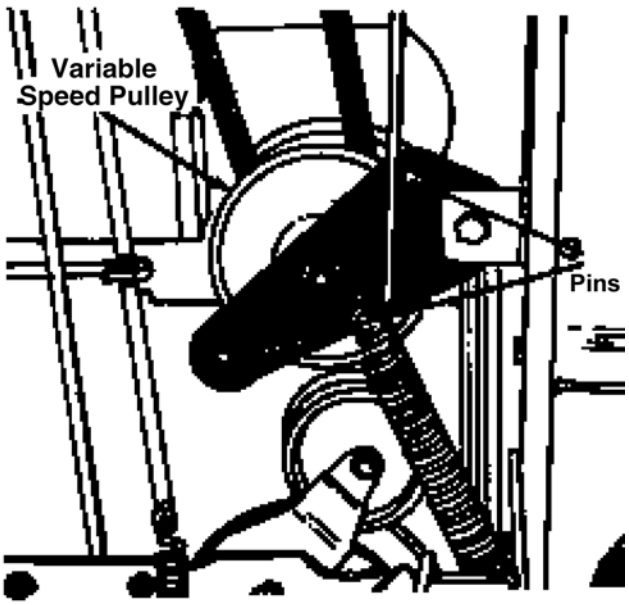


Figure 4-43. Belt Reassembly

9. Reassemble with a new belt, following instructions in reverse order.

10. Adjust the speed control as instructed previously.

4-8.9 Belt Removal and Replacement With Electric Clutch.

It is not necessary to tip the unit to remove the belts. However, if tipping the unit is desired, remove the battery from the unit. To prevent gasoline leakage, drain the gasoline, or remove the fuel tank cap, place a thin piece of plastic over the neck of the fuel tank and screw on the cap. Be certain to remove the plastic when finished changing the belts. Block unit securely. Replace belts as follows:

NOTE

On early 1990 units with an electric clutch, if the unit fails to stop under a heavy load, order a new drive belt (part number 754-0358A). Also, the pitch of the engine pulley may be too narrow causing the belt to bind. Order a new engine pulley using the same part number that is in the Owner's Guide.

WARNING

Disconnect the spark plug wire and ground it against the engine. Block the wheels of the unit.

1. Rear drive belt. Remove and replace rear belt as follows:

   a. Unscrew parking brake knob. Remove the two truss head screws which secure the transmission cover. Remove transmission panel.

   b. Disconnect the speed selector rod from the variable speed pulley by removing the cotter pin and flat washer and lifting rod off the 3/8 inch pin. See Figure 4-44.

   c. Push the idler pulley toward the right side of the unit. Lift the belt over the idler pulley.

   d. Remove the belt from the variable speed pulley and transmission pulley.

   e. Replace belt and reassemble in reverse order.

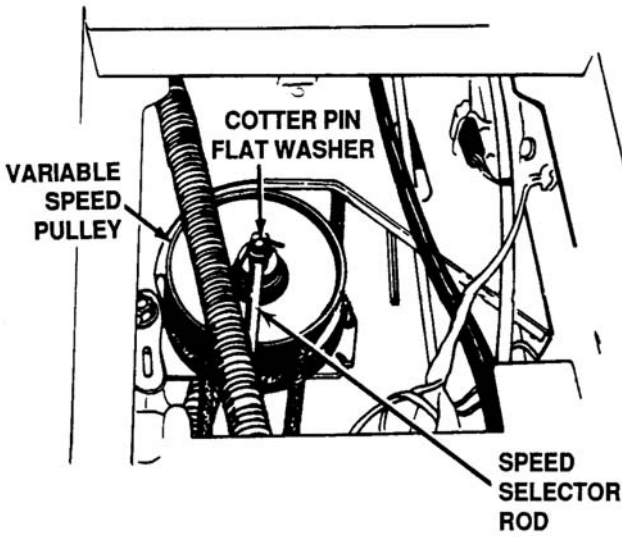


Figure 4-44. Location of Speed Selector Rod

2. Front belt drive. Remove and replace front belt as follows:

   a. To remove the front drive belt, first remove the rear drive belt from the idler pulley and variable speed pulley.

   b. Use the lift lever to raise the deck to its highest position.

   c. Disconnect the spring from the transmission support bracket using a spring puller. See Figure 4-45.

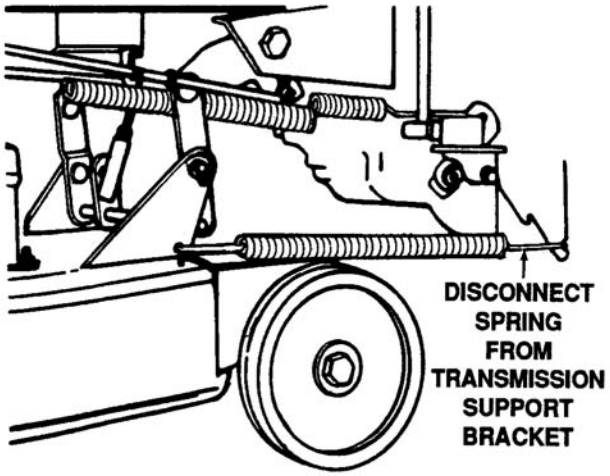


Figure 4-45. Transmission Support Bracket

   d. Unplug the electric PTO.

   e. Remove the torque bracket by removing two hex bolts and washers. See Figure 4-46.

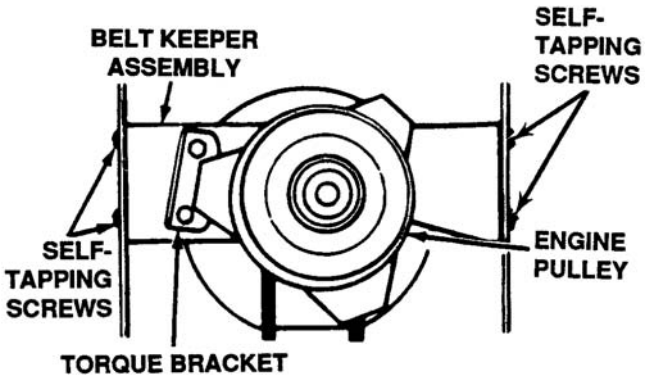


Figure 4-46. Removal of Torque Bracket

f. Remove the belt keeper assembly by removing the four self-tapping screws which hold the belt keeper assembly to the frame at the engine pulley.

g. Loosen the pin at the idler pulley and remove the electric clutch by removing the center bolt and washer. See Figure 4-47.

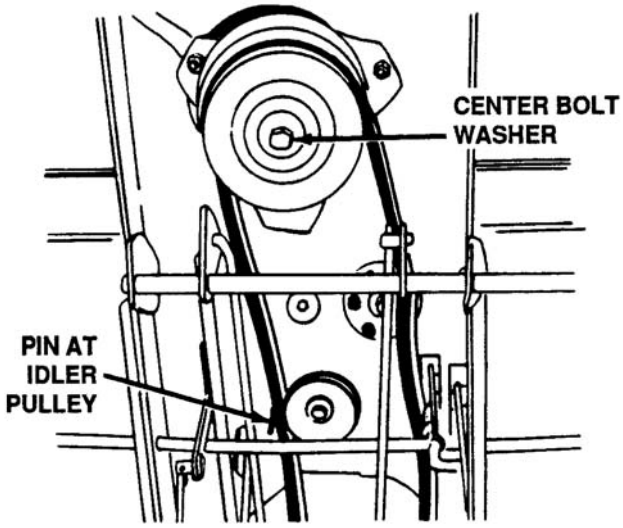


Figure 4-47. Location of Center Bolt and Pin

CAUTION

Be careful not to drop the electric clutch as it is heavy.

h. Place the clutch/brake pedal in park position. Remove the belt from the engine pulley.

i. Move the variable speed pulley as necessary in order to remove the belt.

NOTE

When reassembling, make certain belt is inside the pins. See Figure 4-48.

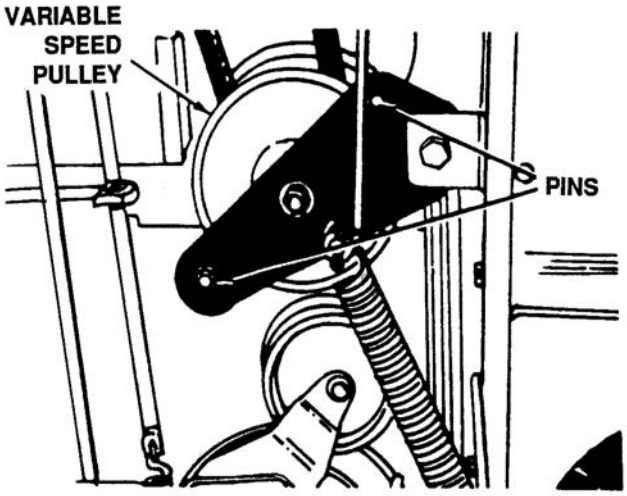


Figure 4-48. Variable Speed Pulley and Pins

j. Reassemble with a new belt following instructions in reverse order.

k. Check the adjustment of the speed control as instructed.

4-9. TRANSMATIC TRACTORS 800 SERIES.

4-9.1 The 800 Series tractor is available with two different drive systems.

1. Yard tractor with the heavy duty single speed transmission. See Figure 4-49.

Continued on page 4-32.

Problem: **Why does my 600 series rider with transmatic drive slow down excessively on moderate grades?**
Note: It is entirely natural for our transmatic drive lawn and garden tractors to slow down while climbing a grade. This is a unique and safe feature of our MTD riding equipment. Once the unit has reached the top of the grade it will immediately resume its pre-set speed. If slow down is excessive you can change the variable speed spring.
Solution: Change variable speed spring 732-0556 7.57" to new spring 732-0459 6.74" lg. approximately 3/4" differential.
Note: Before attempting the above part change, make absolutely sure that both the front and rear drive belts are in good condition and that the variable speed drive components are operating freely and are adjusted properly.
Problem: **My 1996 600 series rider has premature battery failure.**
Solution: Check for proper ground.

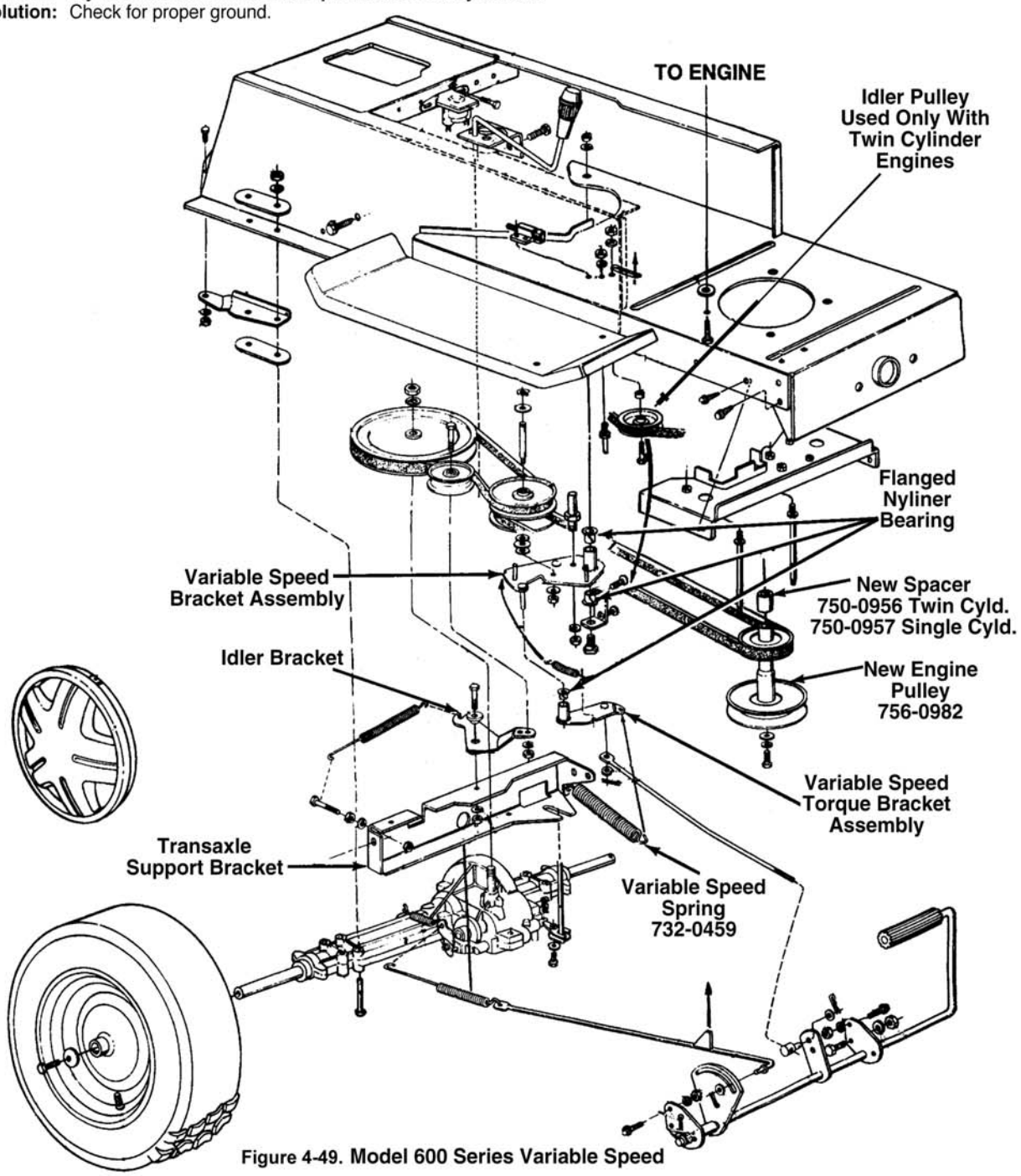


Figure 4-49. Model 600 Series Variable Speed

In many cases, we have found if speeds cannot be obtained after checking major components and performing a variable speed adjustment, the problem usually is between the variable speed bracket assembly and torque bracket assembly not fully pivoting.

Two speed (high/low) gear transmission (part number 717-1150) coupled with a variable speed pulley (part number 717-0946), larger in size but similar to the 500 and 600 drive systems. This allows seven speeds in each range making it a versatile fourteen speed tractor providing all possible speeds for work without compromising PTO speed and efficiency while operating a variety of attachments. See Figure 4-50.

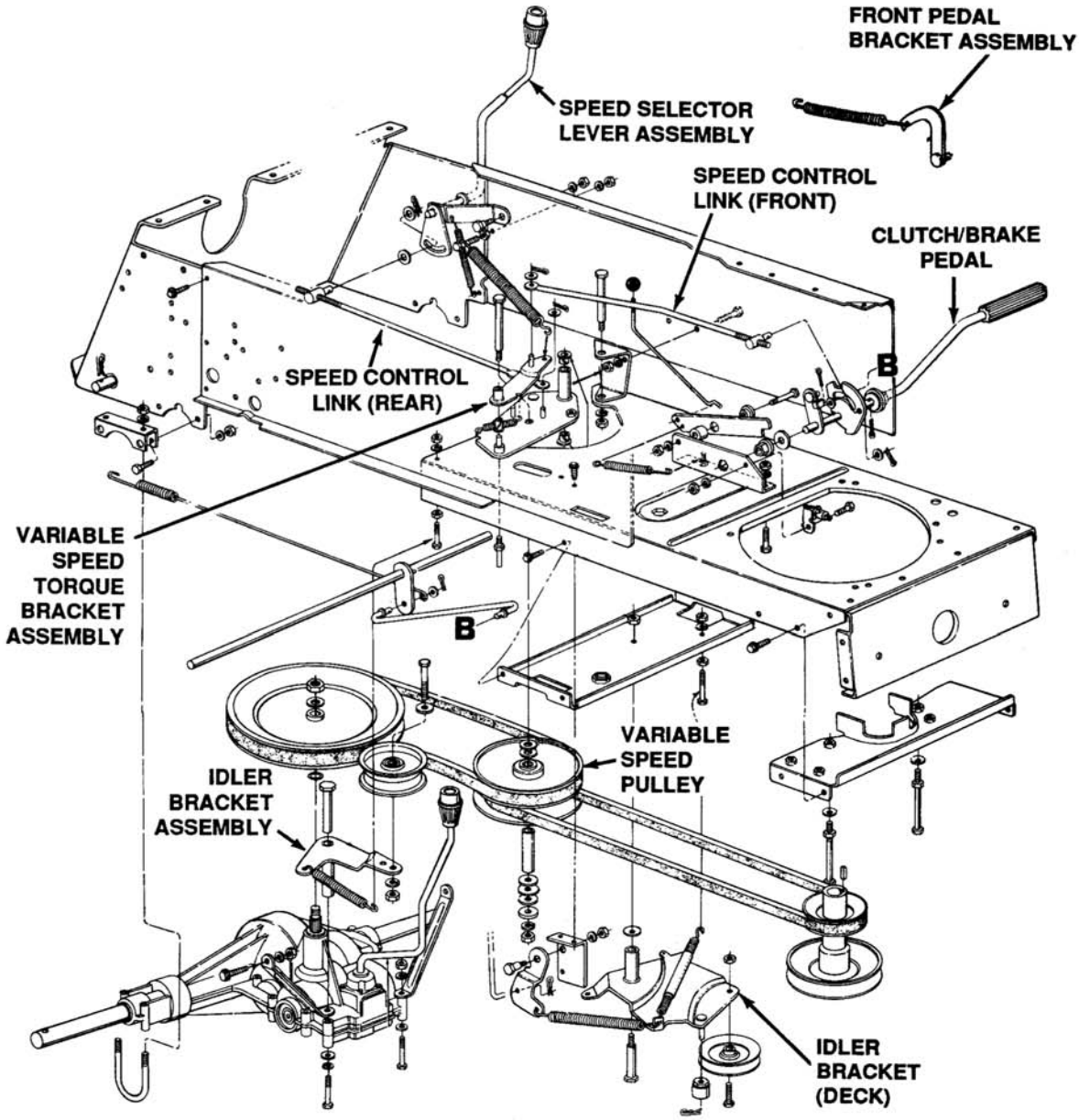


Figure 4-50. Two Speed Transmission

The 800 series with the two speed transaxle shown.

In many cases, we have found speeds cannot be obtained after checking major components and performing a variable speed adjustment, the problem usually is between the variable speed bracket assembly and torque bracket assembly not fully pivoting.

MODELS 600 & 800 SERIES TRACTORS
DRAG LINK INSTALLATION

Subject: Service Kit drag link installation for model 600 & 800 series tractors 1996 production
Problem: The drag link (the rod between the steering segment and the steering arm on the right front wheel) could be installed incorrectly. Note: The end of the drag link with the letter “A” stamped into it must be to the rear 800 series only.

Solution: Remove and reinstall the drag link correctly. Time allowance: 5 hour
Service Kit Drag Link 600 Series Rider 753-0654
Service Kit Drag Link 800 Series Tractor 753-0674

Tools Required: 1/2” and 9/16” open end wrenches.

1. Turn the steering wheel completely to the right until it bottoms out.
2. Loosen the jam nuts on both the front and rear ball joint.
3. Remove the front ball joint by removing the hex nut on the front ball joint.
4. Unscrew the drag link from the rear of the ball joint.
5. Unscrew the drag link from the front ball joint.
6. Verify the letter “A” is towards the rear of the tractor and thread into the rear ball joint approximately 1".
7. Screw in the front ball joint approximately 1/2".
8. With the steering wheel turned as far as it can turn to the right and with the front tractor wheels turned to the right so they bottom out, adjust the front ball joint until it fits into the hole in the steering arm. Note: The spring lock washer must fit on the front ball joint before it is installed into the steering arm.
9. Install and tighten the hex nut on the front ball joint.
10. Using the 1/2" and 9/16" open end wrenches, tighten the jam nuts on the ball joints. Note: The drag link can swing in a short arc. When you tighten the jam nuts be sure that the drag link is near the center of the arc so it does not bind when you turn the steering wheel.

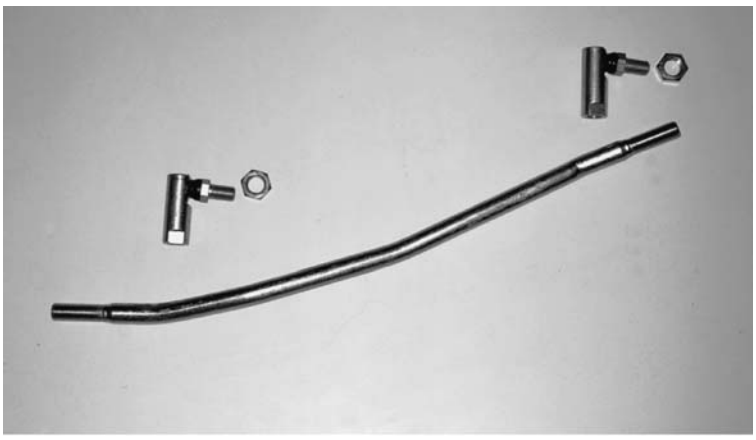


Figure 4-51. Drag Link Installation

Service Kit 753-0641

CODE: T-119
DATE: August 22, 1995
SUBJECT: Light Switch Kit for 800 Series Style "8" equipped with Onan engine.

INSTALLATION INSTRUCTIONS:

1. Lift open hood of tractor.
2. Peel tape back on the wire harness until you expose approximately 4 inches of the wires. See figure 4-52.
3. Cut blue wire in half.
4. Strip wire back approximately 1/2" on both cut ends.
5. Connect leads from service kit to the wire and secure with the wire nut supplied.
6. Route light switch wire harness along left hand side grille support rod and secure with cable ties provided in this kit.

Note: Do not tighten cable ties until switch is installed into dash and wire harness is connected to switch.

7. Drill a 1/2" hole through the left hand side of dash panel above the throttle box. See figure 4-53.
8. Remove nut from light switch and insert switch through hole from back of dash panel. Secure to dash panel with nut.
9. Attach light switch wire harness to terminals of switch and tighten all cable ties. Start engine, test switch.

Kit 753-0641 Consists of:

Part No.	Description	Qty.
725-0773	Wire Nut	2
726-0197	Cable Tie	1
725-0646	Light Switch	1
629-0353	Wire Lead Ass'y.	1

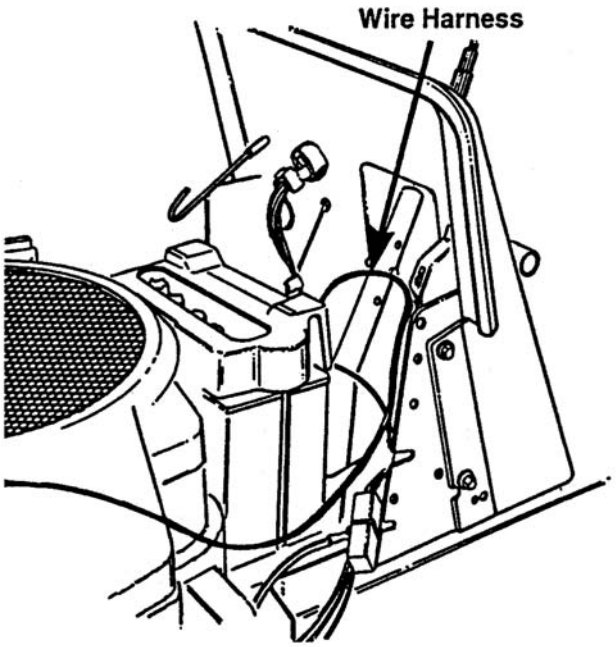


Figure 4-52.

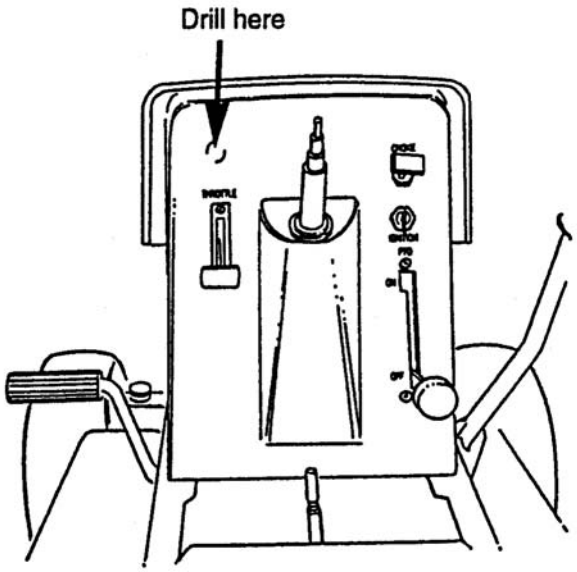


Figure 4-53.

NOTE

Some of these units come equipped with an electric clutch. These units will not need a deck brake since the electric clutch performs that function.

4-9.1 Speed Control Adjustment. See Figure 4-54.

NOTE

When operating the unit initially, or after replacing the belts, there will be little difference between the sixth and seventh speeds until after the belts have gone through a break-in period and have seated themselves into the pulley.

CAUTION

Unit MUST NOT be shifted into LOW, HIGH, or REVERSE GEAR while moving. Shift the speed selector ONLY while the unit is running or the speed control rear link could bend, affecting the speed control adjustment.

1. Proceed with adjustment as follows:

   a. Start the engine.

   b. Place the shift lever in NEUTRAL position.

   c. Place the speed control lever in seventh speed position.

   d. Release the clutch/brake pedal completely and slowly depress the pedal all the way (to park position). Hold the pedal in this position.

   e. Turn the engine off.

   f. After engine stops completely, release the clutch/brake pedal.

   g. Disconnect the rear speed control link from the variable speed torque bracket by removing the cotter pin and flat washer.

   h. Place the speed control lever in the first position.

   i. Disconnect the front speed control link from the variable speed torque bracket by removing the cotter pin and flat washer.

   j. Place a 1/2 inch shim (for 1991 and 1992 units) or a 5/8 inch shim (for 1990 units) under the point of the bracket on the clutch/brake pedal as shown in Figure 4-54.

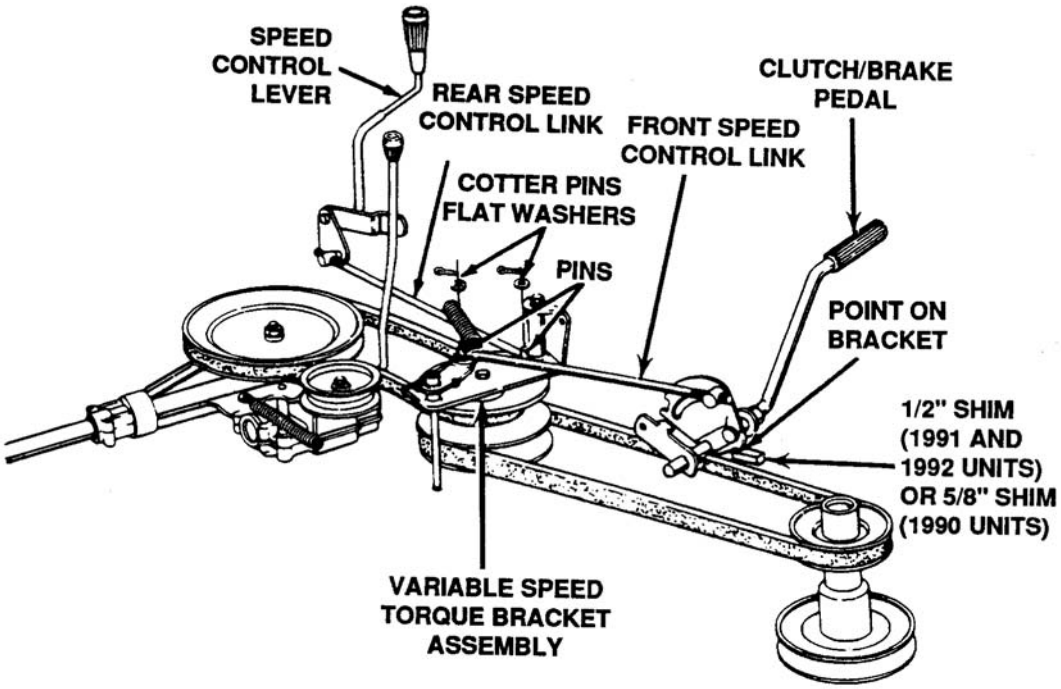


Figure 4-54. Speed Control System

k. Thread the front speed control link in or out of the ferrule until the hole in the link lines up with the pin on the variable speed torque bracket. Secure with the flat washer and cotter pin removed in step i.

l. Push the rear speed control link backward using light pressure, and hold it in this position as you thread it into or out of the ferrule until the hold in the link lines up with the pin on the variable speed torque bracket. Then turn the link clockwise two more times (making it longer).

m. Move the speed selector toward the right so the hole in the rear speed control link fits over the pin on the variable speed torque bracket. Secure with the flat washer and cotter pin removed in step g.

n. Remove the shim from beneath the bracket on the clutch/brake pedal.

NOTE

You might find that the unit jumps out of high gear. Before you get into extensive repair, check to see that the gear shift lever has not been bent. A bent lever could be rubbing against the drive belt causing it to be pushed out of gear by the belt.

4-9.2 Belt Removal and Replacement.

1. Remove and replace front belt as follows:

   a. Depress the clutch pedal and set parking brake.

   b. Remove the deck from the tractor.

   c. Raise and block the front wheels of the tractor so you can work under it.

   d. Remove the four self-tapping screws which hold the belt keeper assembly to the frame at the engine pulley. Push the belt keeper assembly forward, out of the way. See Figure 4-55.

   e. Remove the two pins which act as belt keepers by the variable speed pulley. See Figure 4-56.

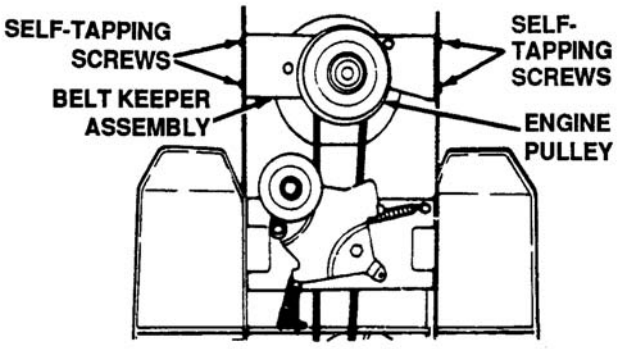


Figure 4-55. Belt Keeper Assembly

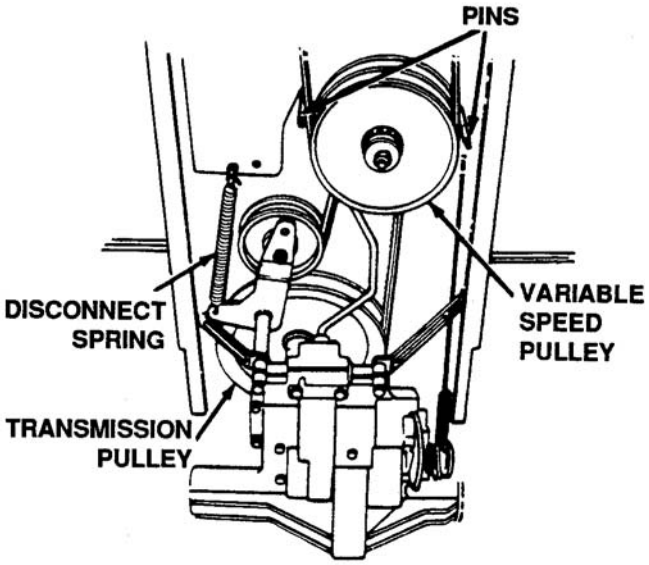


Figure 4-56. Location of Pins

   f. Roll the belt off the variable speed pulley and remove from the engine pulley.

   g. Install the new belt following instructions in reverse order.

2. Remove and replace rear belt as follows:

NOTE

If the rear drive belt comes off, the idler pulley may need to be repositioned to the rear hole of the idler bracket assembly. See Figure 4-54. Another cause for rear drive belt failure is the idler bracket not being in line with the variable speed pulley and transmission pulley. This can be corrected by ordering a new idler bracket assembly or bending the bracket in line.

a. First remove the front drive belt as instructed In the previous section.

b. Disconnect the spring which secures the idler pulley to the frame.

c. Remove the transmission cover by unscrewing the two knobs, and removing two truss machine screws.

d. Roll the belt over the top of the transmission pulley. Remove belt from the variable speed pulley.

e. Install the new belt, following instructions in reverse order.

3. Changes and replacements.

a. For 1991, a bracket was added to the foot pedal assembly to accommodate the foot pedal bracket assembly and spring.This improves the speed control response time by applying backward pressure on the foot pedal assembly.

b. Units in which the rear cog style belts come off or continues to drive when the clutch is disengaged can be repaired by installing kit number 753-0526. This type of condition is due to a bent or distorted variable speed bracket assembly, idler bracket and/or torque bracket. Verify bent condition before installing kit. If bent condition **does not** exist install belt kit listed below.

c. For units produced with the cog style rear belts (part numbers 754-0360 and 754-0358, early 1991 and prior production) which require belt replacement, the belt must be replaced with a smooth style belt. If rear cog belt is ordered, both front and rear belts will be shipped and must be replaced as a set. Order kit number 753-0528. Kit consists of smooth style belts part number 754-0432 (rear) and part number 754-0358 (front).

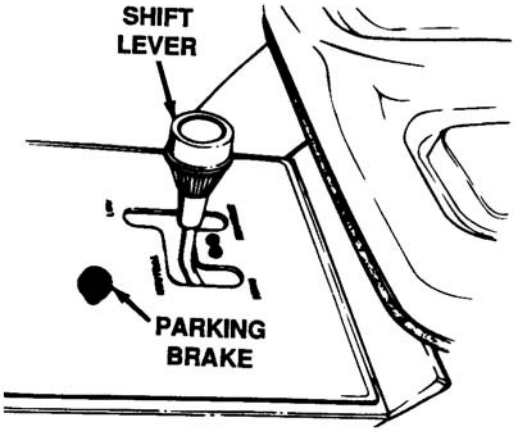


Figure 4-57. Shift Lever

NOTE

On some late 1989 and early 1990 800 Series tractors, under a heavy load such as pushing snow, the unit may not stop because the drive belt hangs up in the engine pulley and does not release. The front and rear drive belts have been changed from cog belts to wrap belts. The new front belt (part number 754- 0358A) will retrofit with no problem. If you need to retrofit the rear belt, you must order a new variable speed pulley (part number 717- 0945) with the new belt (part number 754- 0362).

d. Late production, 1991 units were manufactured with a smooth rear belt (part number 754-0362). When replacement of this belt is necessary, do not order above kit. This smooth style belt should not be confused with the 754-0432 belt. The length of these two belts are different and cannot be interchanged.

4-9.3 Shift Lever. The shift lever is located in the center of the console and has four positions, HIGH, LOW, NEUTRAL and REVERSE. See Figure 4-57. The clutch-brake pedal must be depressed and the lawn tractor must not be moving when shifting gears. Do not force the shift lever. Release the clutch-brake pedal slightly to line up the shifting collar in the transmission. Then try to shift gears.

4-9.4 Speed Control Lever. The speed control lever is located on the left fender. It allows you to regulate the ground speed of the lawn tractor. See Figure 4-58. To select the ground speed, depress clutch pedal. Push speed control lever outward and move backward to slow lawn tractor, move

forward to increase speed. When desired speed has been obtained, release lever in that position. Whenever clutch is engaged, unit will automatically go to the preset speed.

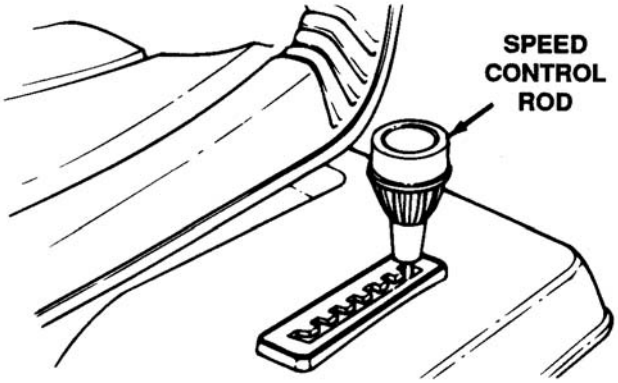


Figure 4-58. Speed Control Lever

4-10. GEAR DRIVE 800 SERIES.

4-10.1 Gear Shift Lever. The transaxle has four forward gears, neutral and reverse. Do not shift through the gears on the transaxle as you would in an automobile. Preselect the gear appropriate for the job you are doing. You must depress the clutch/brake pedal and come to a complete stop before shifting gears. See Figure 4-59.

Clutch/Brake Pedal. The clutch/brake pedal is located on the right side of the tractor. Depressing the clutch-brake pedal part way disengages the clutch. Pressing the pedal all the way down disengages the clutch and engages the disc brake.

NOTE

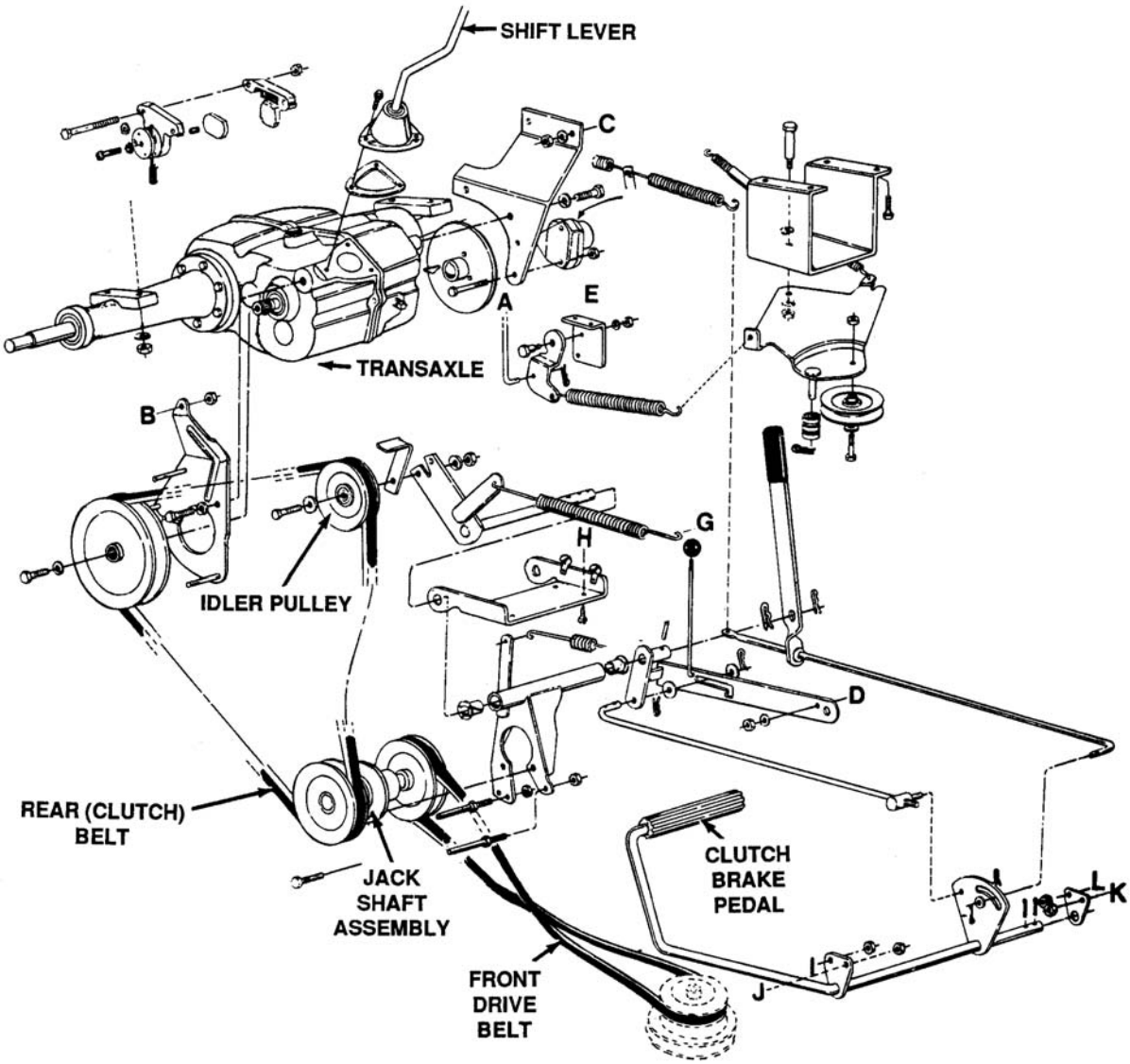


Figure 4-59. Gear Drive 800 Series

The clutch/brake pedal must be depressed to start the engine.

Remove and replace front belt as follows:

1. If a cutting deck is attached to your tractor, remove it. Remove the battery.

2. Raise the block under the front wheels of the tractor so you can work under it.

3. Unscrew the belt guard release next to the engine pulley. See Figure 4-60.

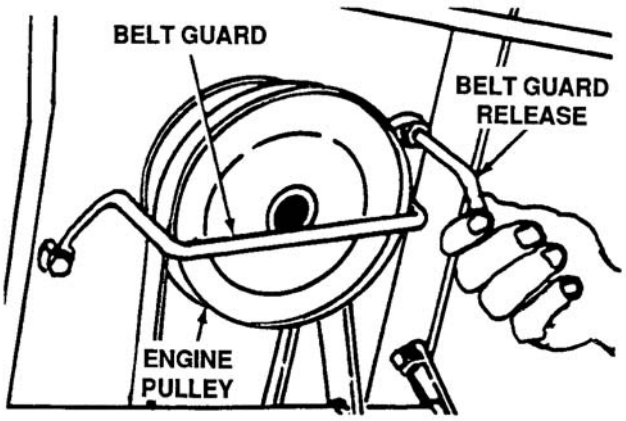


Figure 4-60. Releasing Belt Guard

4. Swing the belt guard forward toward the front of the tractor.

NOTE

Observe the way the belt is twisted. If the new belt is installed backwards, the tractor will run backwards.

5. Using a bar or large screwdriver, pry the pulley assembly towards the front of the tractor and unhook the belt from the pulley. See Figure 4-61.

6. Install the new belt by hooking it over the engine pulley and twisting the belt to the left as you attach it to the pulley.

7. Test the operation of the tractor to make certain the belt has been installed correctly.

Remove and replace rear belt as follows:

1. If a cutting deck is attached to your tractor, remove it. Remove the battery.

2. Raise and block the front wheels of the tractor so you can work under it.

3. Depress the clutch/brake pedal and set the parking brake.

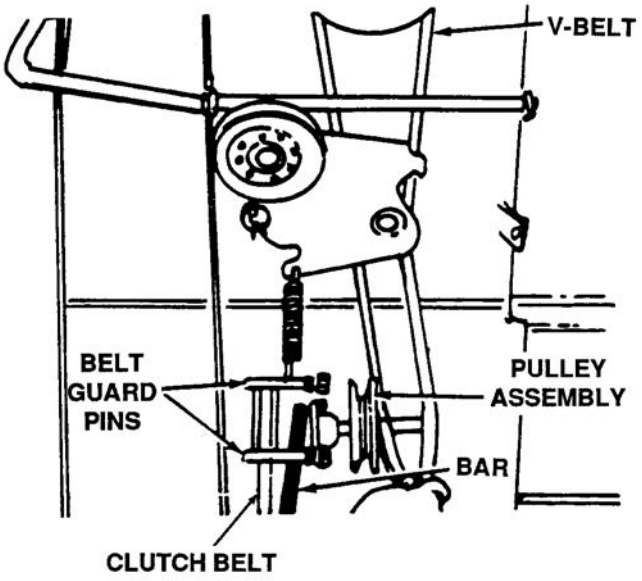


Figure 4-61. Removing Belt From Pulley Assembly

4. Remove the two belt guard pins on the pulley assembly.

5. Remove the idler assembly by removing the center bolt. See Figure 4-62.

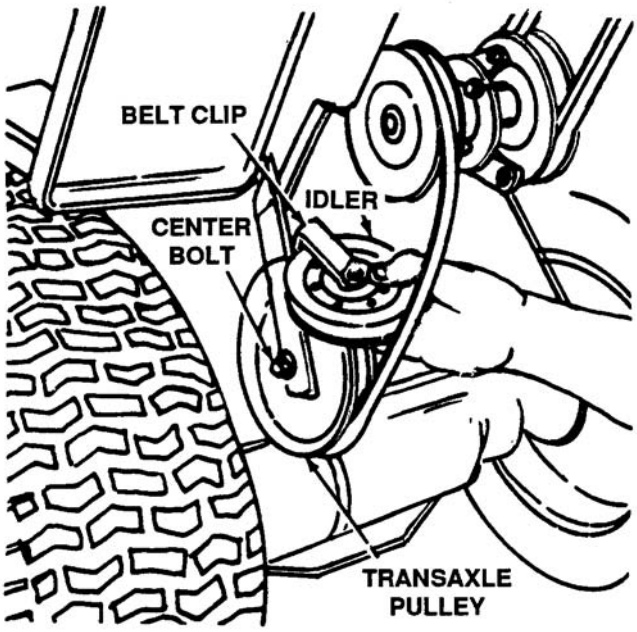


Figure 4-62. Removing Idler Assembly

6. Remove the center bolt and slide the transaxle pulley off.
7. Reassemble in reverse order with a new V-belt.

4-11. HYDROSTATIC DRIVE 800 SERIES.

4-11.1

Adjust Eaton hydrostatic control as follows:

1. Disconnect the control rod from the speed control transfer assembly by removing the hex nut, lock washer and shoulder spacer from the ball joint assembly on the end of the control rod. See Figure 4-63.
2. Loosen the two 1/4 inch hex nuts on the pintle control plate.
3. Push back on the control rod so that the spacer on the pintle drive plate contacts the stop screw.
4. Adjust the stop screw until the shift lever can move freely in the neutral slot (forward to reverse).
5. Move shift lever to forward position, and move pintle control plate to fast forward. Be certain to hold the pintle control plate in this position as you tighten the hex nuts in steps 6 and 7.
6. Using a 3/4 inch wrench, turn the center nut on pintle control plate clockwise until it stops.
7. Tighten securely the two 1/4 inch hex nuts on the pintle control plate.
8. Reassemble the ball joint assembly on the end of the control rod to the speed control transfer assembly.
9. Loosen the two lock nuts on the control rod.
10. Lock out the brake/speed control pedal (all the way forward position).
11. Adjust the control rod so the pintle control assembly firmly contacts the stop screw. Tighten lock nuts on the control rod.
12. Check the brake adjustment.

4-11.2

Eaton Neutral Adjustments. If the tractor creeps with the brake/speed control pedal depressed to the neutral position, adjust as follows:

1. Remove the transmission panel by unscrewing the control knobs, removing two truss machine screws and disconnecting the safety switch.
2. Block up the tractor securely so that the rear wheels are off the ground.
3. Release the brake/speed control pedal.
4. The brake spring is located by the left rear wheel. Disconnect the brake spring from the brake rod by removing the cotter pin and flat washer on the end of the rod. Replace flat washer and cotter pin loosely.
5. Lock out the brake/speed control pedal (all the way forward position).
6. Loosen the two 1/4 inch hex nuts on the pintle control plate.
7. Start the engine.
8. Using a 3/4 inch wrench, turn the center nut on the pintle control plate until both wheels stop.

NOTE

If the wheels turn backward, turn the nut clockwise. If the wheels turn forward, turn the nut counterclockwise.

9. Tighten the two 1/4 inch hex nuts securely.
10. Reassemble the brake spring, and secure with flat washer and cotter pin.
11. Reassemble the transmission cover.

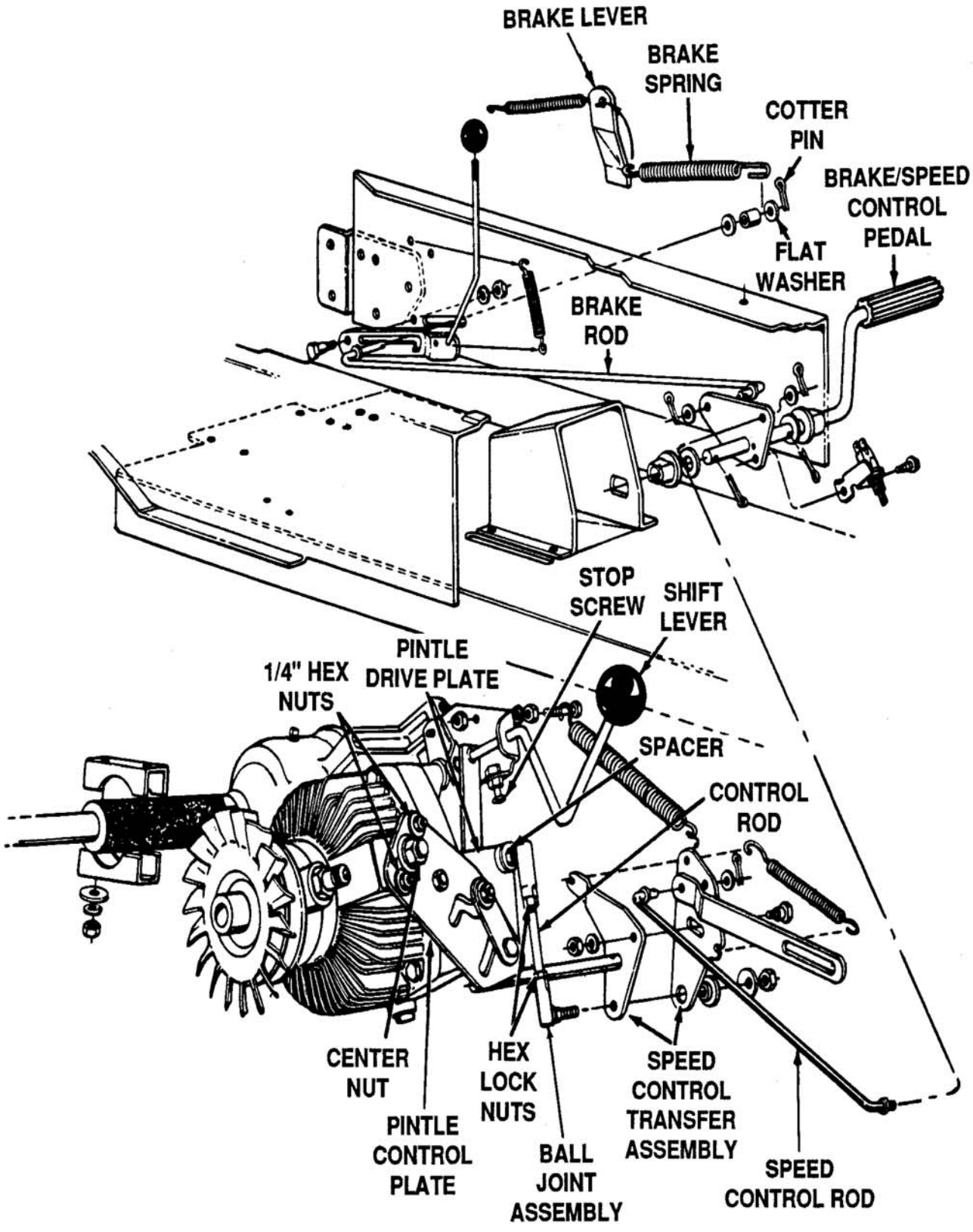


Figure 4-63. Adjusting Eaton Hydrostatic Control

4-11.3

Hydro-Gear Hydrostatic Neutral Control Adjustment. The hydrostatic transmission control is in correct adjustment when the tractor does not move with the engine running, the clutch engaged and the hydrostatic control lever in the neutral position. If adjustment is necessary, follow these steps:

1. Raise one rear wheel off the ground by placing a block under the rear frame.

2. Remove the transmission panel by moving the parking brake knob and truss machine screws.

3. Loosen the hex jam nut on the speed selector adjusting rod. See Figure 4--64.

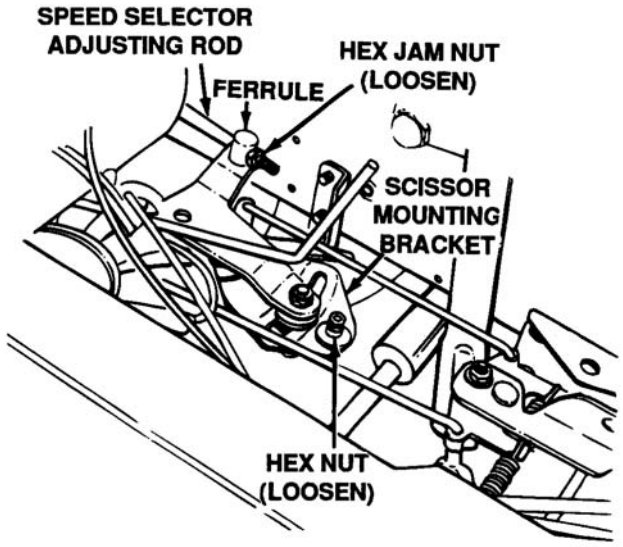


Figure 4-64. Adjusting Hydro-Gear Neutral Control

4. Loosen the hex nut on the scissor mounting bracket. See Figure 4-64.

5. Start the engine and run at full throttle.

6. Move the hydrostatic control lever until you find neutral (rear wheels do not rotate in either direction).

WARNING

Be careful of the cooling fan on the hydrostatic transmission.

7. Depress the clutch-brake pedal until both sides of the scissors touch the spacer on the scissor mounting bracket.
8. Shut off the engine and release the clutch-brake pedal.
9. Tighten the hex nut on the scissor mounting bracket.

10. Thread the speed selector rod in or out of the ferrule until the hydrostatic control lever lines up in the neutral position on the speed control index bracket.

11. Tighten hex jam nut against the ferrule.

12. Replace the transmission panel and parking brake knob.

13. Remove the block from under the frame and test the operation of the tractor.

4

4-11.4

Hydrostatic Control Lever.

The hydrostatic control lever is located on top of the fender on the left side of the tractor. This single control lever, connected to the hydrostatic transmission, controls both the speed and direction of the tractor. Infinite speed control is achieved by moving the control lever forward or backward. The farther forward or backward you move the control lever, the faster you will travel. Pulling the control lever into neutral (N) area will stop the tractor. To increase rear wheel torque (pulling power), move the control lever towards neutral (N) position. The lawn tractor responds similar to shifting to a lower gear with a gear type transmission. See Figure 4-65.

4-11.5

Brake Adjustment (See Figure 4-65). The brake is located by the right rear wheel inside the frame. During normal operation of this machine, the brakes are subject to wear and will require periodic examination and adjustment.

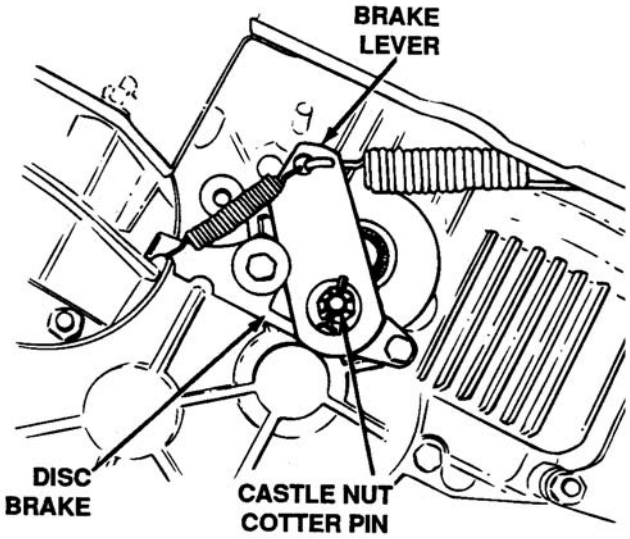


Figure 4-65. Brake Adjustment

1998 800 Series Tractor
HYDROSTATIC NEUTRAL CONTROL ADJUSTMENT

The hydrostatic transmission control is in correct adjustment when the tractor does not move with the engine running, the clutch engaged and the hydrostatic control lever in the neutral position. If unit returns to neutral with the clutch-brake pedal, but does not return with the control lever: If adjustment is necessary, follow these steps:

1 With the engine shut-off, depress the clutch-brake pedal all the way and set the parking brake.

2. Remove the transmission panel by removing the parking brake knob and truss machine screws.

3. Loosen the hex jam nut on the speed selector adjustment rod. See figure 4-66.

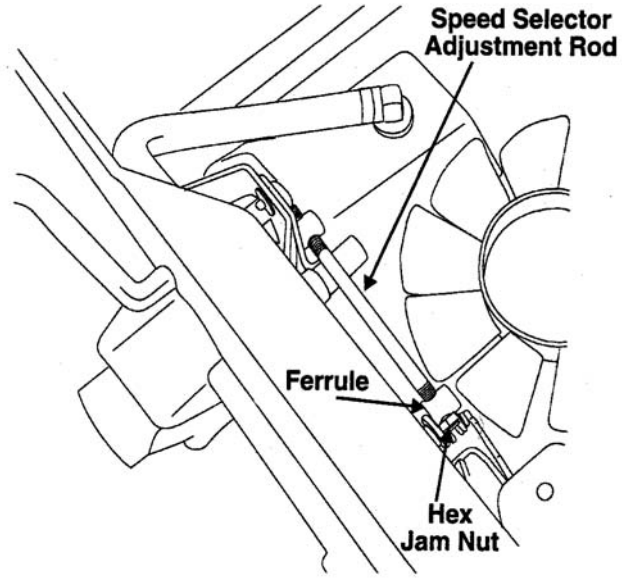


Figure 4-66.

NOTE

The hex jam nut has L.H. threads, turn clock - wise to loosen.

4. Thread speed selector adjustment rod in or out of the ferrule until the control lever lines up in the neutral position on the speed control index bracket.

5. Tighten hex jam nut against ferrule. Be sure adjustment rod does not move when tightening the nut.

6. Replace transmission panel and parking brake knob.

7. Test the operation of the tractor.

If unit does not return to neutral with the clutch brake pedal:

If adjustment is necessary, follow these steps:

1. Raise both rear wheels off the ground by placing blocks under the rear frame.

2. Remove right rear wheel by removing the four lug nuts.

3. Remove cotter pin and flat washer from brake rod and disconnect rod. See figure 4-67.

4. Depress the clutch-brake pedal all the way and set the parking brake.
5. Start the engine and run at full throttle.

6. Loosen the socket head screw on the cam block. See figure 4-67.

7. With a large adjustable wrench or adjustable pliers, rotate cam block until axle stops turning.

8. Tighten socket head screw while holding cam block.

9. Turn off engine.

10. Press the clutch-brake pedal to release the parking brake.

11. Re-install brake rod and secure with flat washer and cotter pin.

NOTE

Do not re-use cotter pin, always install a new cotter pin. Order part number HG-44101.

12. Test operation of tractor, making sure brake works properly.

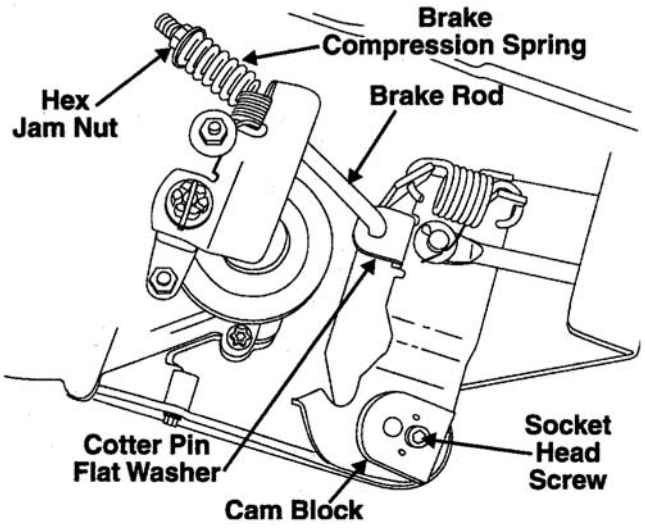


Figure 4-67.

STEERING SHAFT ADJUSTMENT
1998 800 Series Tractor

If the tractor turns tighter in one direction compared to the other, the steering drag link must be adjusted. To adjust the drag link follow these steps. Refer to figure 4-68.

1. Loosen hex jam nut (A) at the rear of the ball joint.
2. Loosen and remove hex nut (B).
3. Lift the threaded portion of the ball joint out of the steering arm. Please do not misplace the hardware used to hold ball joint to steering arm. You will need it again.
4. Set the front wheels facing straight ahead.
5. Turn the steering wheel to the right or the left to match the alignment holes in the steering brace and the steering gear.
6. Once aligned, drop a nail through the steering brace and steering gear alignment holes.
7. Adjust the ball joint in or out on the drag link until the threaded portion of the ball joint slips through the hole in the steering arm. Make sure lock washer (C) is in position between the ball joint and the steering arm.
8. Tighten hex jam nut (A) against the ball joint.
9. Reattach the ball joint to the steering arm with hex nut (B). Finger tighten only at this time.
10. Turn the steering wheel fully to the left and the right to make sure that the drag link does not touch any part of the tractor frame. If the drag link does touch, start at step 1 and redo the adjustment.
11. Tighten hex nut (B).
12. Remove the nail used to align the steering gear.

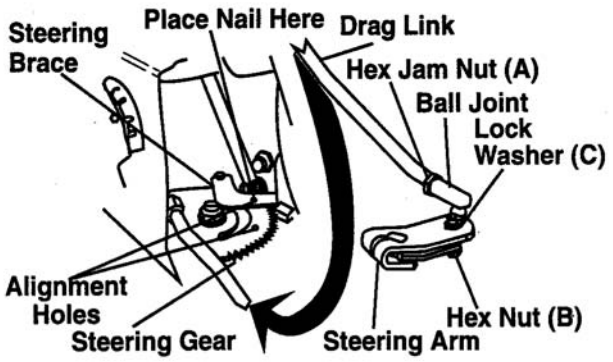


Figure 4-68.

WARNING

Do not adjust the brake while the engine is running. Be sure to block the wheels of the tractor before making the brake adjustment. To adjust the brake, remove the cotter pin. Adjust the castle nut so the brake starts to engage when the brake lever is 1/4 to 5/16 inch away from the axle housing. See Figure 4-69.

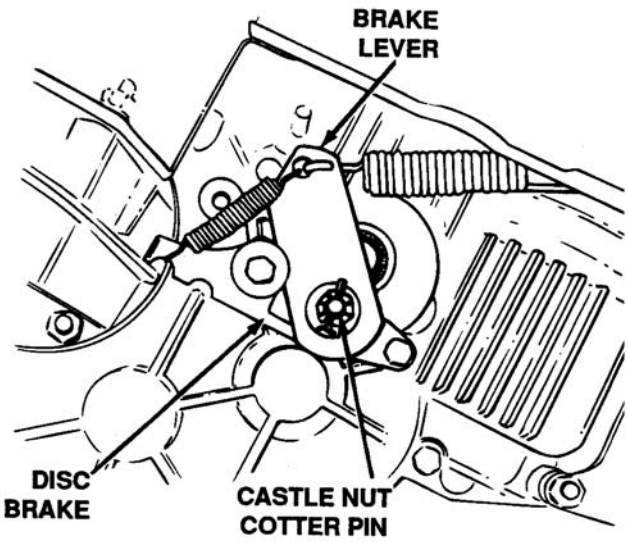


Figure 4-69. Brake Adjustment

4-11.6 Oil Filter.

A full flow replaceable oil filter, located in the oil lines under the frame near the right rear wheel,

should be replaced initially after twenty hours of operation. Thereafter, replace every 100 hours for commercial or industrial applications and yearly for normal usage. It can be removed by turning it counterclockwise by hand. Use Frame filter number PH-16, part number 727-0162. See Figure 4-70.

4-11.7 Checking Hydrostatic Oil Level.

The hydrostatic oil level should be checked prior to initial use and after every 8 hours of operation. To check the hydrostatic oil level, remove the transmission panel by unscrewing the control knobs, removing two truss machine screws and unplugging the safety switch. The oil level must be between the low and high marks on the reservoir tank. See Figure 4-71.

Figure 4-70. Oil Filter

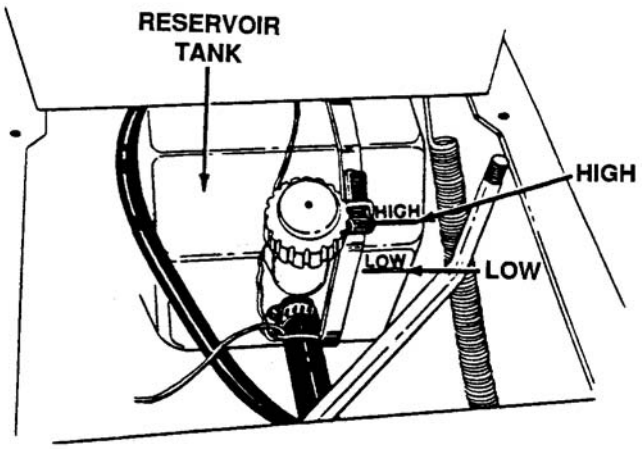


Figure 4-71. Checking Hydrostatic Oil Level

4-11.8

The following fluids are recommended for use in the hydrostatic transmission:

1. Mobil Fluid 300
2. Texaco TL-2209
3. Dextron B (General Motors)
4. M2C-33F and M2B-41A (Ford Motor)
5. Hy-Tran (International Harvester)
6. 10W + Straight Viscosity—SE, CC or CD Rated Engine Oil.

** 7.20W + Straight Viscosity Nondetergent—SE, CC or CD Rated Engine Oil.

8. 30W + Straight Viscosity—SE, CC or CD Rated Engine Oil.

**Preferred.

NOTE

Never use a multi-viscosity oil.

NOTE

You can obtain a cold weather starting kit for 1987 and prior years by ordering kit 753- 0443. This kit includes an idler which will relax the belt to the hydrostatic unit and allow starting of the engine only. This is usually only necessary in extremely cold weather.

4-11.9

Remove and replace rear drive belt as follows:

1. If a cutting deck is attached to your tractor, remove it.
2. Roll the bottom edge of belt off the jackshaft pulley.
3. Slip the belt off the transaxle pulley.

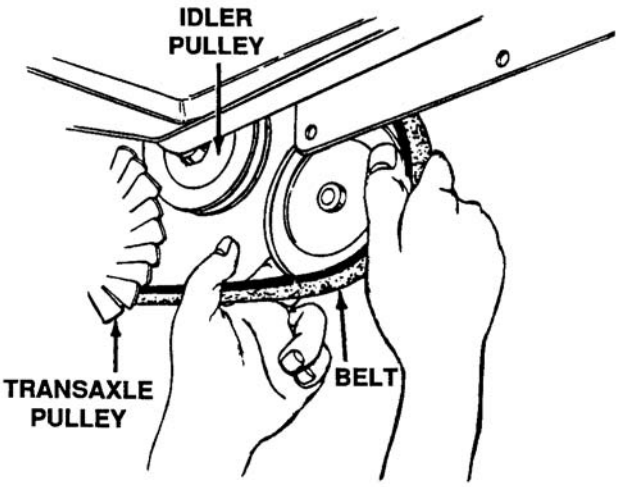


Figure 4-72. Removing Rear Drive Belt

5. Reassemble in reverse order using a new belt.

4-11.10

Remove and replace front drive belt as follows:

1. First remove the rear drive belt as instructed in paragraph 4-11.9.

2. Push forward on the jackshaft assembly. Slip the back of the belt at the jackshaft off the jackshaft pulley. See Figure 4-73.

3. Pull belt through the idler arm mounting bracket.

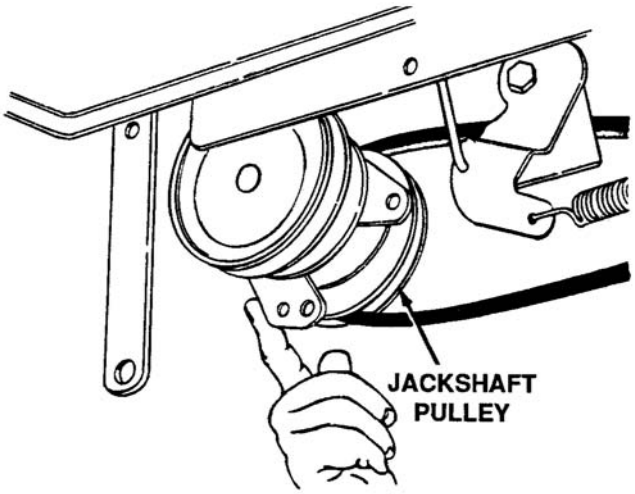


Figure 4-73. Removing Front Drive Belt From Jackshaft Pulley

4. Release the belt guard by unscrewing the L bolt next to the engine pulley. See Figure 4-74.

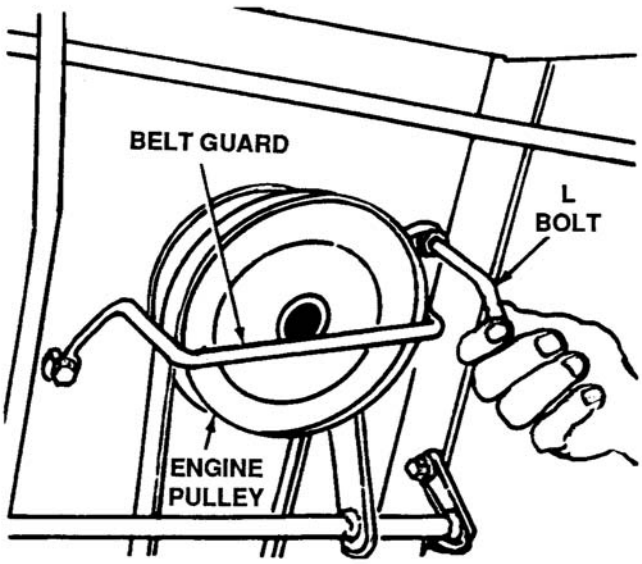


Figure 4-74. Releasing Belt Guard

5. Swing the belt guard forward towards the front of the tractor.

WARNING

Observe the way the belt is twisted. If the new belt is installed backwards, the tractor will run backwards.

6. Slip belt off the engine pulley. See Figure 4-75.

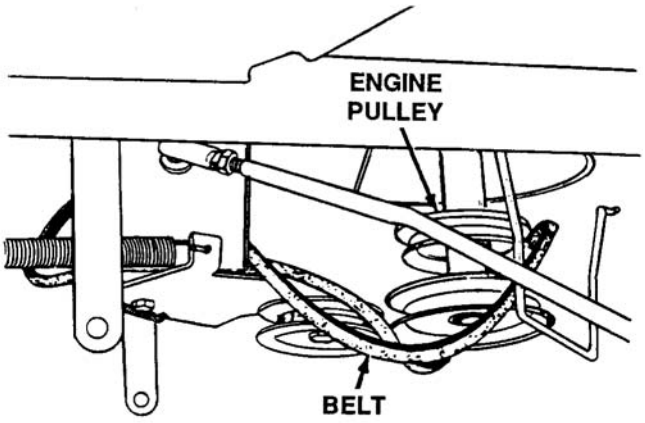


Figure 4-75. Belt Removal From Engine Pulley

7. Install the new belt by hooking it over the engine pulley and twisting the belt to the left as you attach it to the jackshaft pulley.

8. Test the operation of the tractor to make certain the belt has been installed correctly.

4-12. HYDROSTATIC DRIVE 900 SERIES.

4-12.1

General.

The Model 995 hydrostatic garden tractor is equipped with an Eaton hydrostatic drive transmission coupled with a Peerless Model 2526 Transaxle. This tractor is equipped with a two speed rear axle for greater versatility. The LOW range is used when operating the rotary tiller, moldboard plow and should also be used when extra power is required. HIGH range operation is for normal loads, grass cutting and normal use. See Figure 4-76.

4-12.2 Change oil and filter as follows:

1. The dipstick for the hydrostatic transmission is located behind the seat. This dipstick checks the oil level in the hydrostatic transmission, transaxle and hydraulic lift system. Check oil level when the hydrostatic oil is cold. Before checking the oil

oil level in the hydrostatic transmission, transaxle and hydraulic lift system. Check oil level when the hydrostatic oil is cold. Before checking the oil level, clean the area around the dipstick hole to prevent the entry of dirt. Unscrew the dipstick and remove. The oil level should be maintained to the FULL mark on the dipstick. Check the oil level every 8 hours of operation. The capacity of the unit is 5 quarts. However, because the oil will not completely drain from the lift system and hydrostatic transmission, you will only drain approximately 3 quarts. To drain, remove the plug from the bottom of the transaxle. The transmission has been filled at the factory with 20W straight viscosity engine oil (rated SE, CC or SD). Use only this type of oil when adding fluid to the transmission. When the fluid is changed, you may use any of the following fluids; however, do not mix different types of fluid in the transmission.

1. Mobil Fluid 300
2. Texaco TL-2209
3. Dextron B (General Motors)
4. M2C-33F and M2B-41A (Ford Motor)
5. Case IH Hy-Tran (MS 1207)
6. 10W Straight Viscosity SE, CC or CD Rated Engine Oil

**7. 20W Straight Viscosity SE, CC or CD Rated Engine Oil

8. 30W Straight Viscosity SE, CC or CD Rated Engine Oil.

**Preferred.

NOTE

Never use a multi-viscosity oil.

2. The oil filter is a full flow replaceable oil filter, located under the left side of the frame. It should be replaced initially after twenty hours of operation and thereafter every 100 hours for commercial or industrial applications and yearly for normal usage. It can be removed by turning it counter-clockwise by hand. Use Fram filter PH-16 or equivalent.

4-12.3 Neutral Adjustment.

If the hydrostatic control lever does not return to the neutral notch on the hydrostatic control lever guide when the brake pedal is depressed make the following adjustment:

1. Loosen the shoulder bolt and lock nut on the neutral control slide, using a 5/8 inch and 1/2 inch wrench.
2. Depress the brake pedal and set the parking brake with the aid of another person, hold the brake pedal all the way down.
3. Move the hydrostatic control lever into the neutral notch.
4. Tighten the shoulder bolt and lock nut on the neutral control side.

RIDER AND TRACTOR FRAME IDENTIFICATION

400 Series

Step-Thru Frame

Heavy-Duty Uni-Frame construction made of 12 gauge steel. Footrests are built-in as an integral part of the frame. The Uni-Frame has less bolted and welded parts to increase strength and durability.

Frame is not capable of using any front or rear mount attachments other than grass catchers (when used with front wheel weights) or hitch pin attachments. The step thru design makes it convenient. Easy on and off.

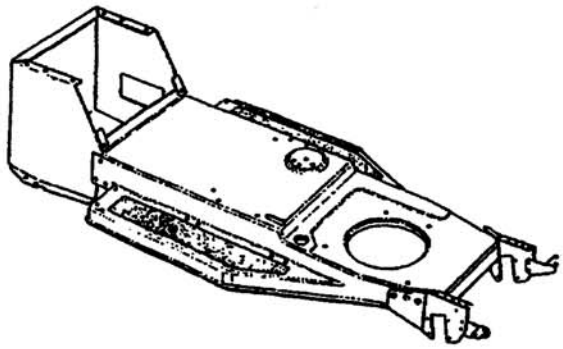


Figure 4-76. 400 Series Frame Identification

600 Series

Lawn Tractor Frame

The Durable Box 600 Series Frame is also made from heavy-duty 12 gauge steel. The box design provides added strength for the use of attachments and accessories such as snow throwers and dozer blades.

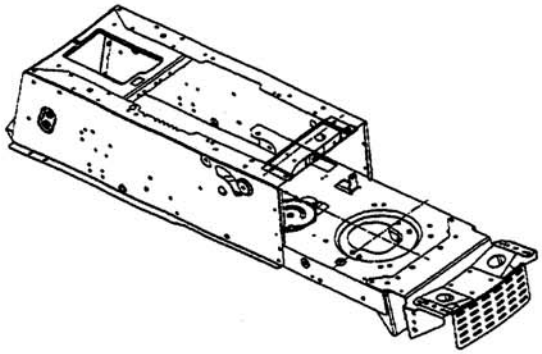


Figure 4-77. 600 Series Frame Identification

800 Series

Garden Tractor Frame

The Garden Tractor Frame is our most durable frame. The 9, 12 and 14 gauge steel frame is designed and constructed to handle the toughest ground engaging jobs such as using front and rear mount dozer/grading blades; discs/harrows; belt and engine driven tow-behind tillers; dual stage snow throwers and much more.

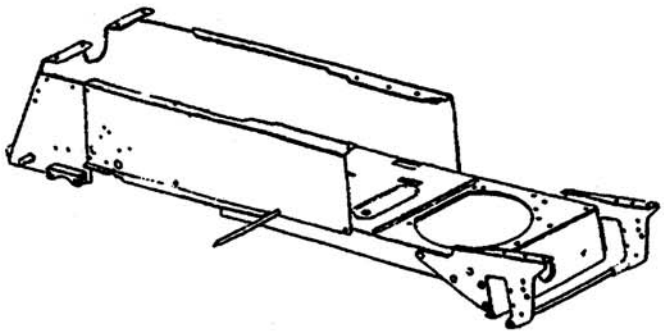


Figure 4-78. 800 Series Frame Identification

TRANSAXLES

5-1. General.

1. The heavy duty single speed transaxle incorporates features that you may recognize found in the model no. 618-002 single speed transaxle with similarity of the differential assembly. This unit also uses the positive spring pin type clutch collar as is used in model no. 618-0009 two speed transaxle. See Figure 5-1.

2. This transaxle model no. 618-0003 has a new feature. The brake disc and brake shoes are enclosed inside of the transaxle for added protection from outside elements such as sand, dirt and rust that create wear on brake assemblies that are exposed on the outside. This inside brake assembly will provide longer life expectancy.

3. The input shaft has needle bearings and also incorporates a thrust washer bearing assembly for higher speeds with minimal wear. The housing is heavy aluminum die cast.

4. The transaxle is lubricated at the factory and does not require checking. If disassembled, for

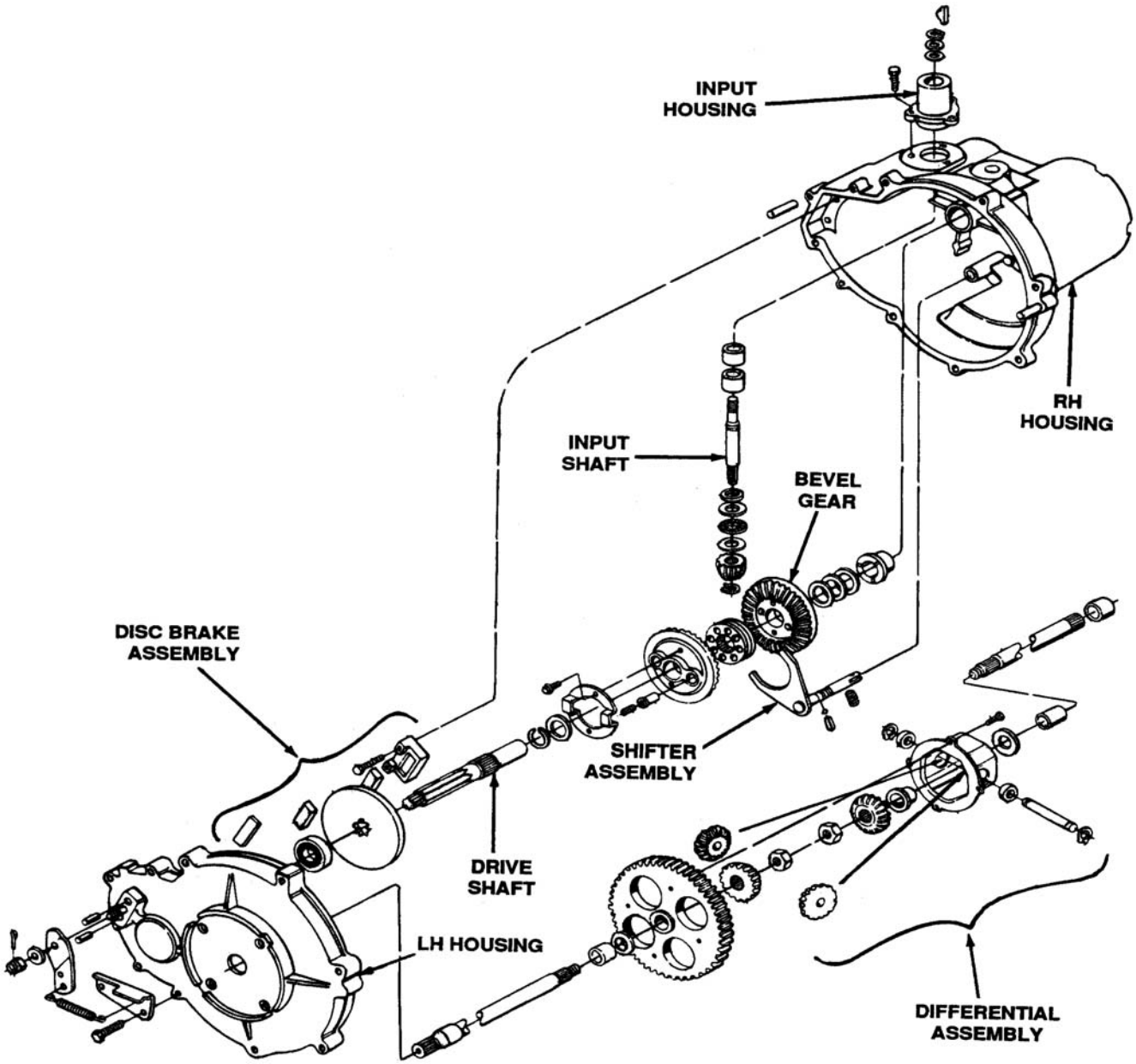


Figure 5-1. Heavy Duty Single Speed Transaxle

any reason, lubricate with 32 ounces of Shell Grease 737-0148.

5-1.1 Disassembly of Heavy Duty Single Speed Transaxle, Model No. 618-0003. Disassemble transaxle as follows:

NOTE

Due to model variations of units, these instructions are intended for service repairs after the transmission has been removed from the unit.

1. Remove the input assembly by removing three hex bolts using a 7/16 inch wrench. See Figure 5-2.

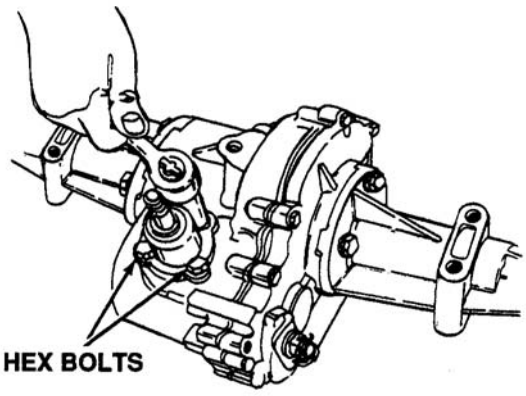


Figure 5-2. Location of Hex Bolts

2. Disassemble the input shaft assembly by removing the two retaining rings on each end of the input shaft. See Figure 5-3.

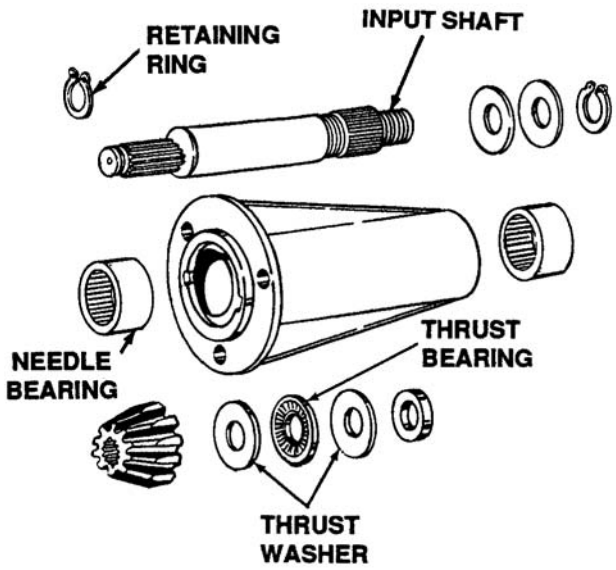


Figure 5-3. Disassembly of Input Shaft

3. Inspect the needle bearings in the input housing for damage and replace if necessary. Check the thrust washers and thrust bearings for wear.

   Replace if necessary. Check the input shaft for grooving, scaling and any wear on the spline end of shaft. Replace if necessary.

4. Inspect the gears and clutch collar in the housing for any wear. See Figure 5-4.

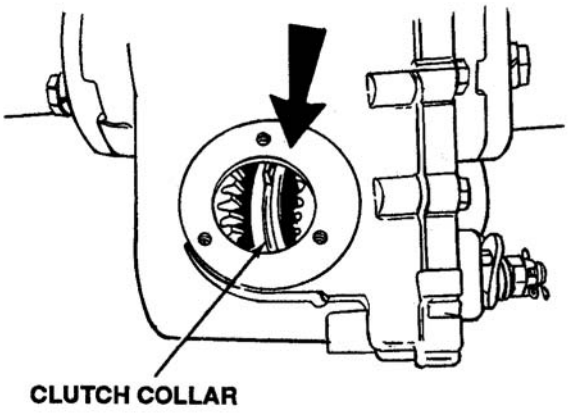


Figure 5-4. Location of Clutch Collar

5. Remove the two axle carriers by removing four hex bolts and lock washers on each axle. A 9/16 inch wrench is required. See Figure 5-5.

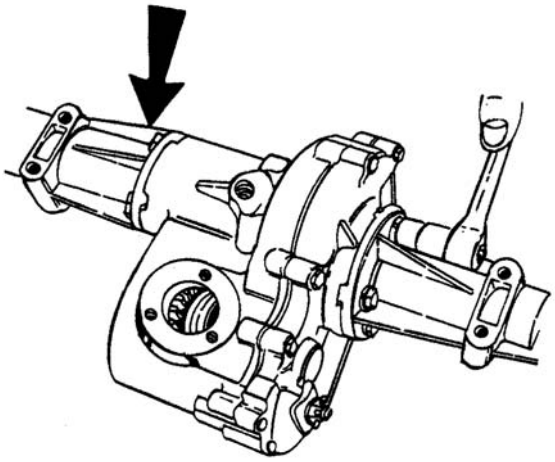


Figure 5-5. Axle Carriers

6. Check the brake spring and brake cam adjustment. The brake cam should have 1/4 to 3/8 inch gap between brake stop bracket and brake cam as shown in Figure 5-6.

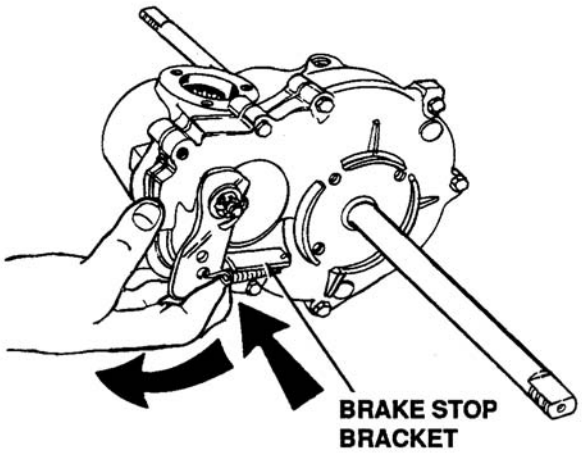


Figure 5-6. Location of Stop Bracket

7. During reassembly remove the cotter pin from castle nut and adjust the castle nut in or out to obtain the 1/4 to 3/8 inch clearance needed. See Figure 5-7.

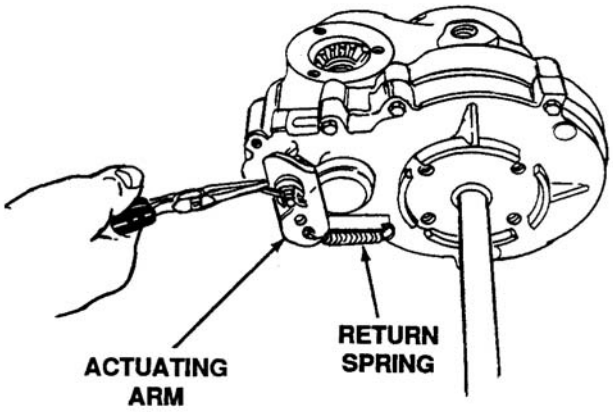


Figure 5-7. Castle Nut Adjustment

8. Loosen the brake, brake return spring and actuating arm.

NOTE

It is not necessary to remove the brake actuating arm or spring during disassembly of the transaxle.

9. Remove the eight hex bolts holding the two housing halves together. A 3/8 inch wrench is required. See Figure 5-8.

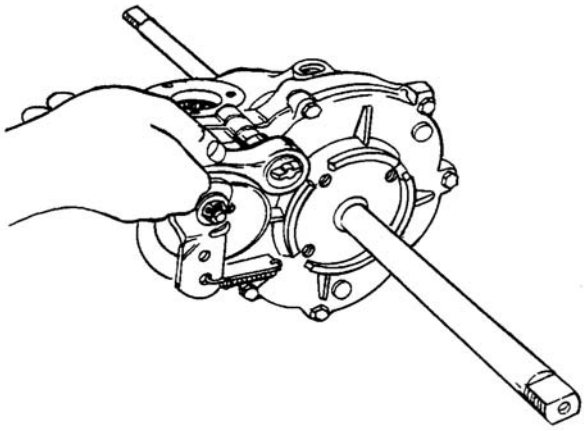


Figure 5-8. Location of Hex Bolts

10. Upon removal of housing halves, inspect the bearings in the housing half and remove the brake puck and inspect for wear. Replace if necessary. See Figure 5-9.

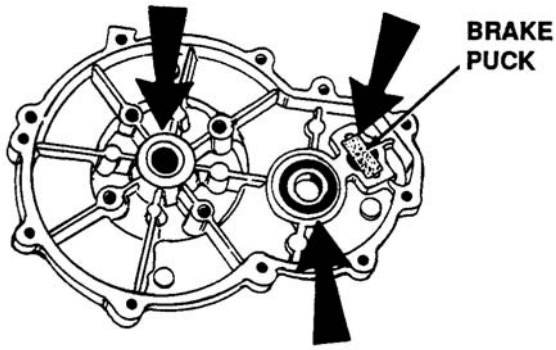


Figure 5-9. Location of Bearings and Brake Puck

a. If the bearing needs to be replaced, you can use an impact puller to remove the bearing from the housing.

b. You can also remove the bearing by first applying an ample amount of grease inside the ID of the bearing. Using a rod of the correct diameter, tap lightly on the end of the rod. This will force grease under the bearing, creating a hydraulic lift and forcing the bearing from the housing.

c. Clean the housing with Locktite primer and reinstall the bearing with Locktite bearing mount B adhesive sealant. Press in place using an arbor press and wipe the bearing clean of excess Locktite.

11. Remove the brake disc from the drive shaft. Inspect the disc for wear and grooving on the brake surface. Replace if necessary. See Figure 5-10.

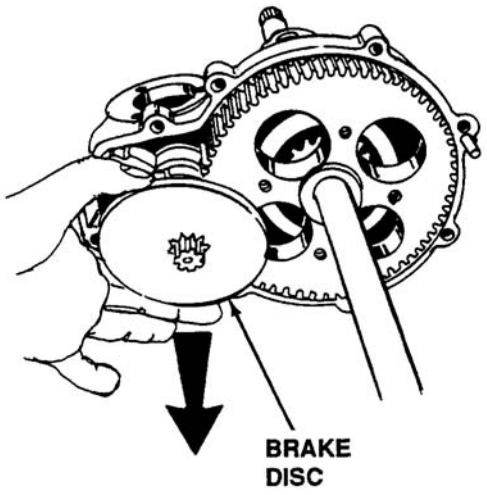


Figure 5-10. Brake Disc

12. Remove the differential assembly by pulling the axle shaft straight out of transaxle housing. See Figure 5-11.

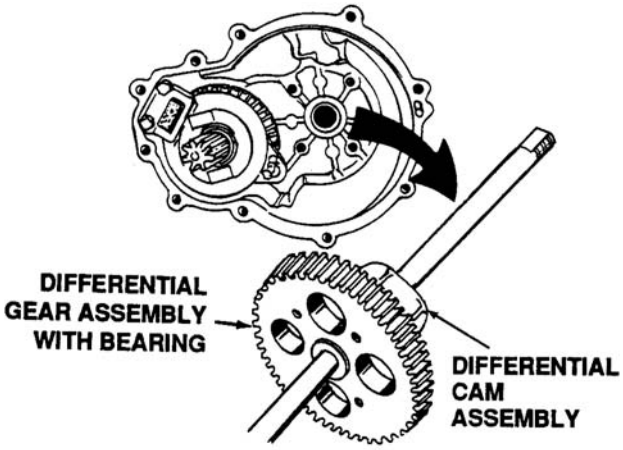


Figure 5-11. Differential Assembly

13. Remove the brake puck holder by removing the two hex bolts with a 3/8 inch wrench. See Figure 5-12.

14. Remove the drive shaft assembly by pulling straight out. See Figure 5-13.

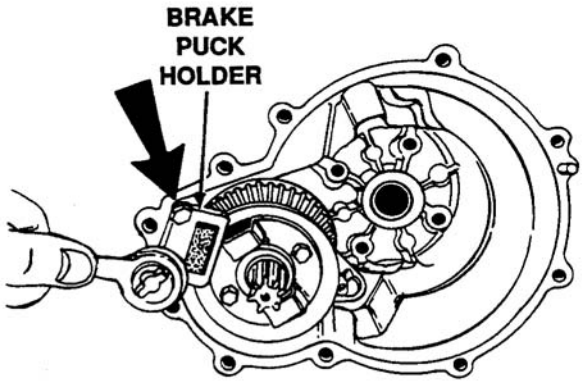


Figure 5-12. Brake Puck Holder

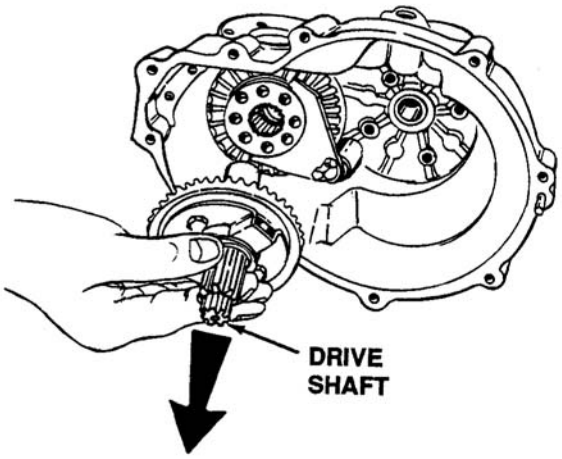


Figure 5-13. Removing Drive Shaft

15. Turn the housing half upside down. Remove the set screw in the housing holding the detent spring and ball in the detent of shifter shaft. See Figure 5-14.

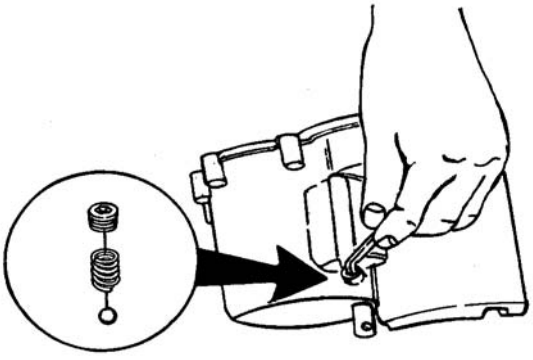


Figure 5-14. Removing Detent Spring and Ball

16. Lift up on the shifter assembly and rotate to remove it from the housing. See Figure 5-15.

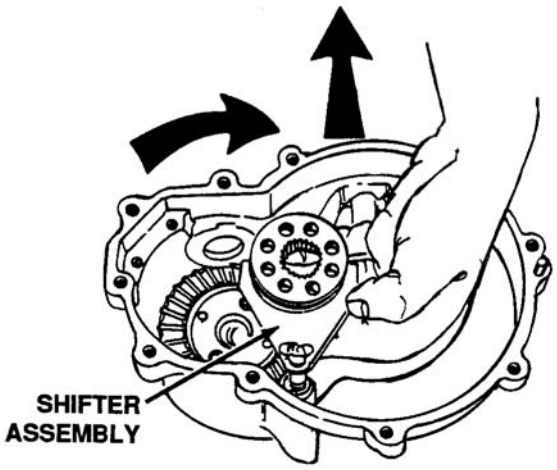


Figure 5-15. Removing Shifter Assembly

17. Remove the retaining ring on the drive shaft and disassemble for inspection.

18. Remove the two bolts holding the spring retaining plate to the bevel gear. See Figure 5-16.

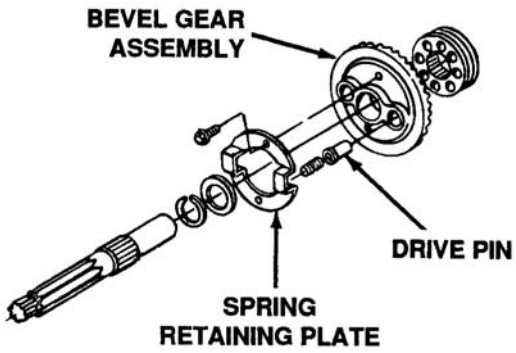


Figure 5-16. Removing Spring Retaining Plate

19. Inspect the splines in shift collar, drive springs and drive pins under the retaining plate and in the bevel gear. Replace if necessary.

20. Inspect the drive shaft. Be sure the splines and gear teeth are in good condition. Replace if necessary.

21. Disassemble the differential by removing four bolts located at differential housing and gear. Inspect the miter gears for damage. If they need replacing, remove the snap ring on the cross shaft and slide the cross shaft and two miter gears out. See Figure 5-17.

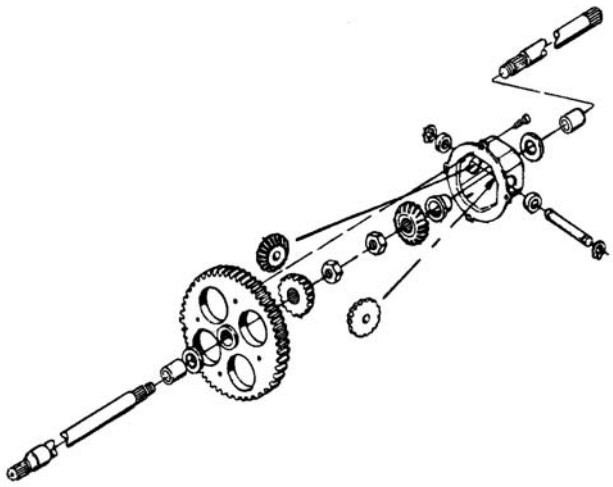


Figure 5-17. Differential

22. If the miter gears on the axle shaft need replacing, remove the hex lock nuts on axle shafts.

5-1.2 For assembly of heavy duty single speed transaxle, reverse steps 1 through 22.

NOTE

There are up to three shim washers before the first bevel gear on the drive shaft. They will vary in thickness, are factory installed and should not be changed. Electronic shimming has determined the tolerance needed. The backlash is factory set on this transaxle to between 6 to 10 thousandths. The factory uses a 40 thousandths washer on each side of the drive shaft and then adds a 10 thousandths washer as needed to arrive at the proper backlash. The 40 thousandths washer is part number 736-0444. The ten thousandths washer is part number 736-0454.

MTD 2 SPEED TRANSMISSION THEORY OF OPERATION

Before starting the disassembly of the transmission, we want to explain its operation. A clear understanding of the MTD 2 speed transaxle, part number 618-0229 and its operation will allow you to better troubleshoot any problems that you may have with it.

Since the tractor must be stopped before changing gears, there is a jog built into the shift lever lockout plate in the neutral position. This hardened steel plate will not allow the operator to skip across gears or double engage the transmission. It allows the shift lever, shift forks, and clutch collars to only move in certain directions as shown in Figure 5-18.

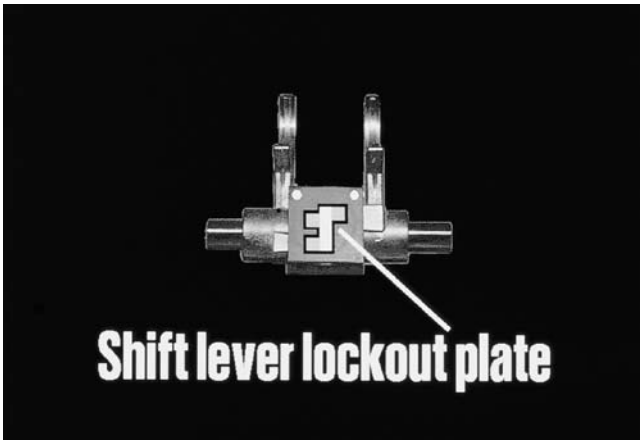


Figure 5-18

In a neutral position the input pulley drives the input shaft and pinion gear, the bevel gear, and the drive shaft. The clutch collars also turn with the drive shaft but do not engage any drive gears. The high/low range clutch collar as shown in Figure 5-19 is on the left and has engagement lugs on both sides of the collar. The reverse clutch collar is on the right and has lugs on the side facing the reverse chain assembly. See Figure 5-19.

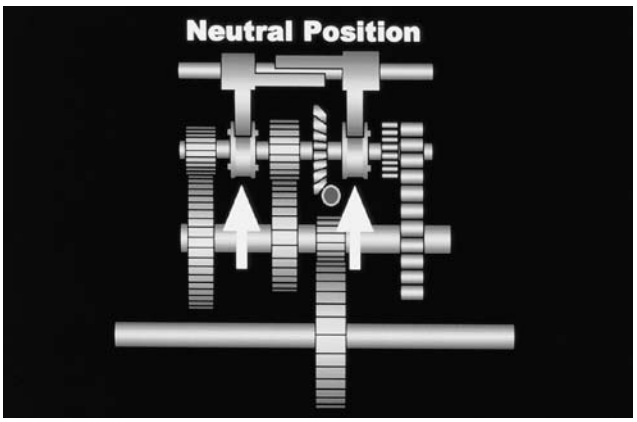


Figure 5-19

Since this is a constant mesh transmission all three gear sets are turning regardless of which gear you are in. Only the gear set that is engaged by the shift collar drives the output shaft and axle. The other two gear sets are free spinning on the drive shaft. See Figure 5-20.

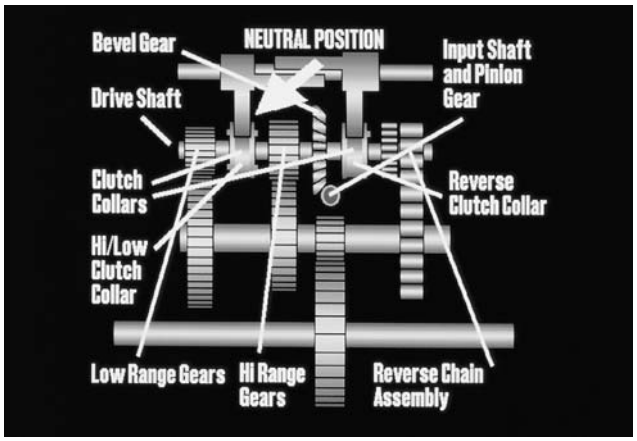


Figure 5-20

To shift into low range the high/low clutch collar is moved to the left by the shift forks and engages the 10 tooth gear. The 10 tooth gear drives the 37 tooth gear on the output shaft that then drives the bull gear, differential assembly, and the axle shafts. See Figure 5-21.

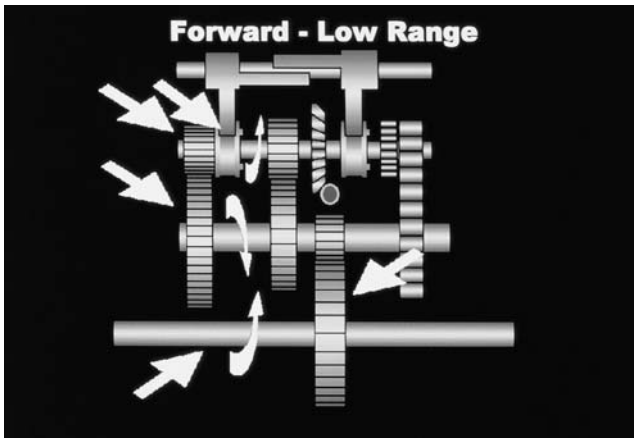


Figure 5-21. Forward - Low Range

To shift into high range the same high/low clutch collar is moved to the right, disengaging the low range gear, moving through the neutral position. See Figure 5-22.

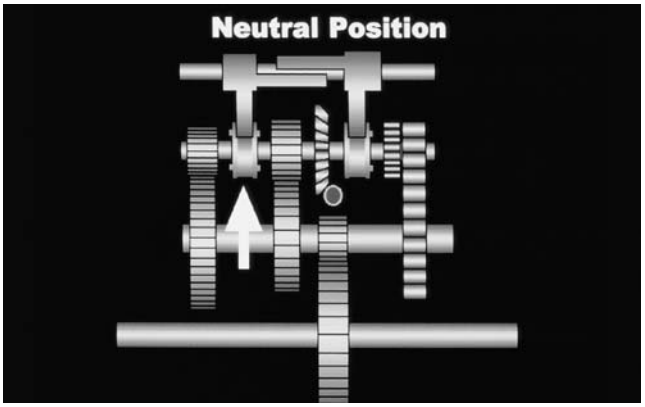


Figure 5-22.

Engage the 20 tooth gear which drives the 27 tooth gear on the output shaft which drives bull gear, differential, and axle shaft. See Figure 5-23.

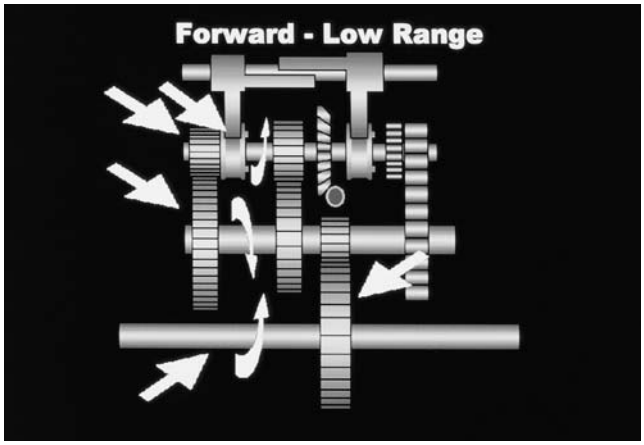


Figure 5-23.

To go into the reverse position the shift lever moves through neutral, assuring that the high/low clutch collar is in the neutral position, (see Figure 5) and engages the reverse clutch collar into the 9 tooth sprocket of the reverse chain assembly. The chain then drives the 16 tooth sprocket on the output shaft, again driving the bull gear, differential, and axle shaft in reverse. See Figure 5-24.

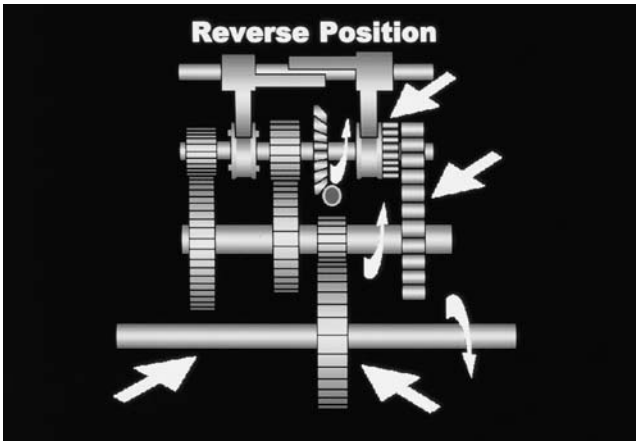


Figure 5-28.

A chain and sprocket assembly allow two shafts to turn in the same direction. This is how reverse is achieved in this transmission. Using gears on two shafts reverses the direction that the shafts turn. This is how the high/low range gears operate, as shown in Figure 5-25.

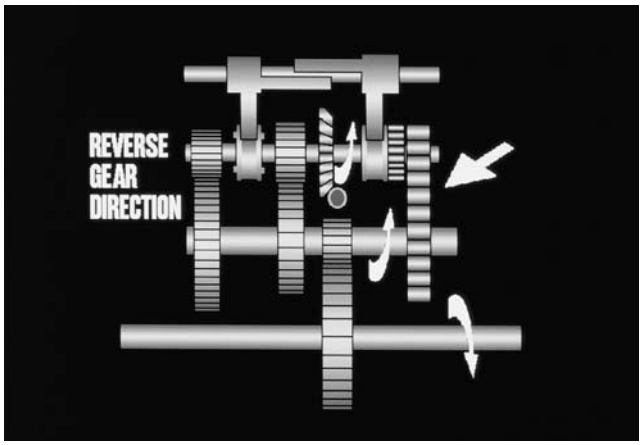


Figure 5-25.

The differential assembly is used to allow the left and right axles to turn at different speeds. This occurs when the tractor turns. The inside axle slows down and the outside axle must speed up. Gears within the differential allow this to happen without changing the ground speed of the unit. Not having a differential would tear up the lawn or the transmission dur-

ing turns. What about shimming? The primary reason for shimming is to set the proper backlash or clearance between gears. This is especially important on bevel gears. In this case it's the backlash between the bevel gears on the input pinion and the drive shaft. Too much backlash can create a noisy transmission and too little backlash creates a tight transmission that will wear very quickly. See Figure 5-26.

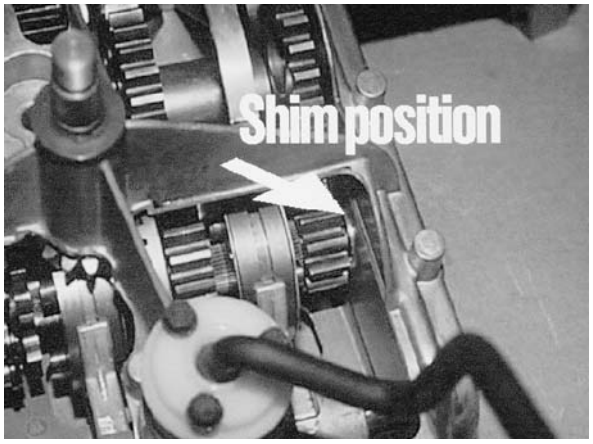


Figure 5-26.

When the transmission is manufactured a shim of the proper thickness is used on the drive shaft between the 10 tooth gear and the transmission housing to set the proper clearance between the input pinion bevel gear and the bevel gear on the drive shaft. See Figure 5-27.

Figure 5-27.

Another shim is used on the input pinion shaft and is placed between the retaining ring and the transmission housing, setting the proper amount of end float for the input shaft bevel gear. See Figure 5-28.

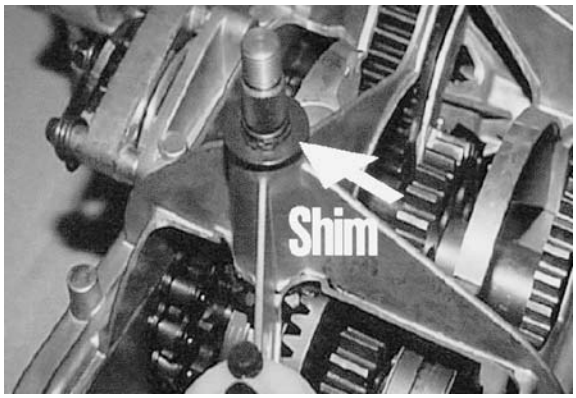


Figure 5-28.

Another shim is used on the input pinion shaft and is placed between the re Thrust washers are also used on the drive shaft, output shaft, and axle shaft to absorb the thrust and side loading of the gears so that they do not rub on the aluminum transmission housing.

This transmission uses a heavy gear oil to lubricate the moving parts. The heavy oil does not stick to the parts as much as grease does, helping to remove heat from the moving parts.

Important Note: Gasket Installation

1. Prior to reassembly of the transmission, make sure that all gasket grooves in the housing halves are clean and dry. The surrounding perimeter must also be free of oil and other fluids.

2. It is not recommended to re-use a rubber molded gasket as it conforms to the irregularities of the casting surface. This condition will cause a leak if the irregularities are not matched during reassembly.

3. The gasket is designed specifically for a snug fit and does not require sealant in the casing groove. RTV sealant will only need to be used where the ends of the gasket meet at the mating surfaces. It is required at the flat ends only. Do not overuse the RTV.

4. Align the locating tabs on the gasket with the proper locations on the casting. The ribs should be facing up.

5. Gently push the gasket into the casing groove. Be certain not to stretch the gasket. Stretching will create surplus material at the end of the groove and a poor seal may result.

5-2. TWO SPEED TRANSAXLE. 1996 AND PRIOR

5-2.1 The two speed transaxle, part number 717-1150, incorporates a differential and high and low range drive gear assemblies in an aluminum die cast housing. The differential consists of an assembly of 6 miter gears for added strength and long life durability. The axles are 1 inch mounted on needle bearings. The input shaft is also mounted on needle bearings and thrust washer assembly for high speed operation. The shift lever is located in the front part of the housing and has 4 positions: high, low, neutral and reverse. The 2 shift forks move 2 shift collars that are unique in design. They have spring loaded pins that make for easier engagement from high to low speed. See Figure 5-29

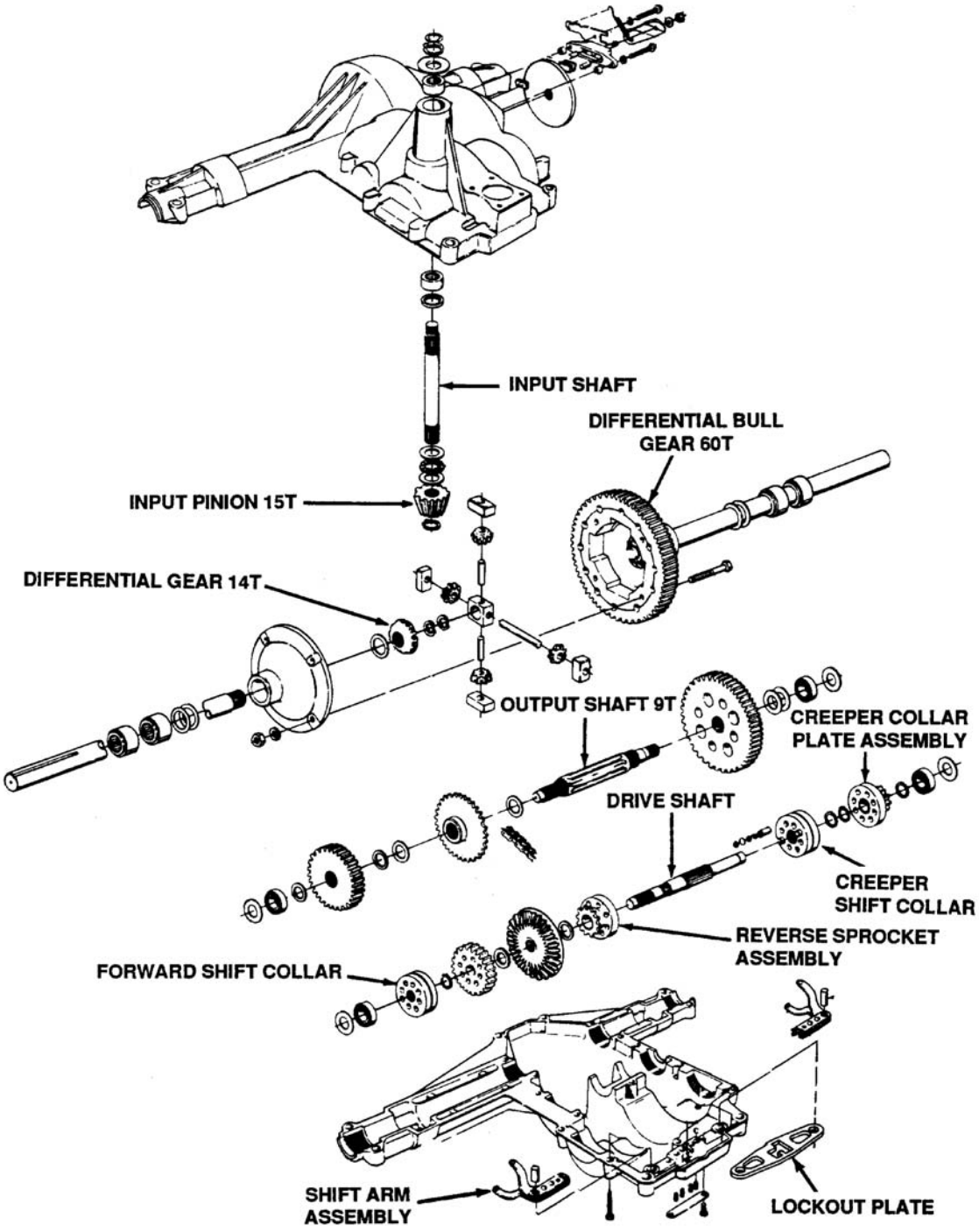


Figure 5-29. Two Speed Transaxle 717-1150

NOTE

New for 1995: A redesigned shifter and lockout plate has been added. To update, use service kit 753-0598.

5-2.2 The creeper collar plate assembly has a steel cut low gear which is for forward-low and reverse gear. The forward shift collar would be for the high speed gear. This transaxle uses a combination of powdered metal and steel cut gears. MTD's minimum specifications for powdered metal gears for strength are 75,000 PSI.

5-2.3 The speed range of this transaxle is low gear through the 7 ranges would be .452 MPH to 1.868 MPH. In high gear the speeds through the 7 ranges would be 1.490 MPH to 6.163 MPH.

5-2.4 The brake disc and actuating assembly is also incorporated for better stopping action.

5-2.5 The transaxle is lubricated and sealed at the factory and does not require checking. If disassembled for any reason, lubricate with 16 ounces of Darina grease part number 737-0148.

5-2.6 Disassembly of Two Speed Transaxle.

NOTE

Due to model variations of units, these instructions are intended for service repairs after the transmission has been removed from the unit.

1. Remove the shift lever assembly which consists of the shift lever, upper snout or block, lower snout, and two O-rings. If your shift lever is the older style, you should replace it with the newer style. Service kit 753-0598.

2. Place the transaxle upside down on a workbench.

NOTE

If you are ordering a complete transaxle kit, part number 753-0497, you will receive everything except the shift lever. Keep your old shift lever.

3. Remove the detent plate cover and shim plate from front edge of transaxle by removing two hex bolts and lock washers. See Figure 5-30.

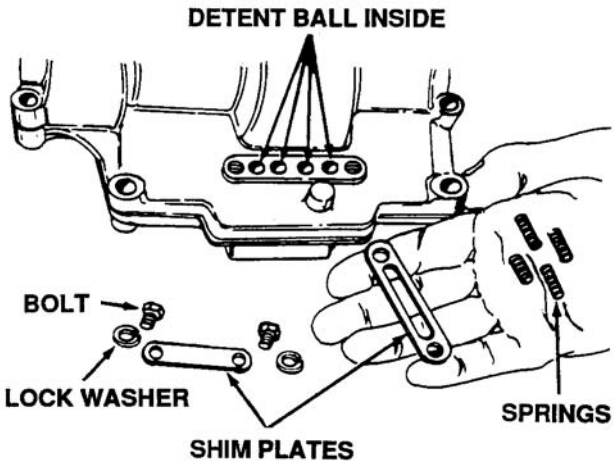


Figure 5-30. Removing Shim Plates

NOTE

Upon reassembly, be sure to replace shim plates.

4. Remove the four detent springs. Remove the four detent balls from the housing using a small magnet.

NOTE

If you have a unit that will not fully go into reverse or pops out of reverse, high or low gear for no reason, you can remove the shim plate that is directly underneath the shim plate cover. This will give you more tension on the detent springs and allow a greater detent on your shifter arm assemblies.

5. Remove eighteen perimeter bolts from transaxle housing. See Figure 5-31.

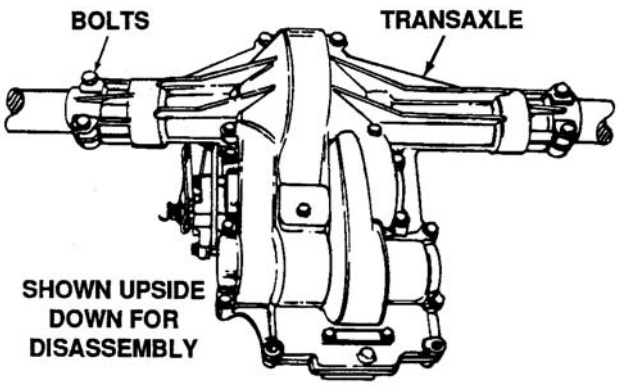


Figure 5-31. Removing Bolts From Transaxle

6. Remove the lower housing. Be sure to retain the four springs and detent balls. See Figure 5-32.

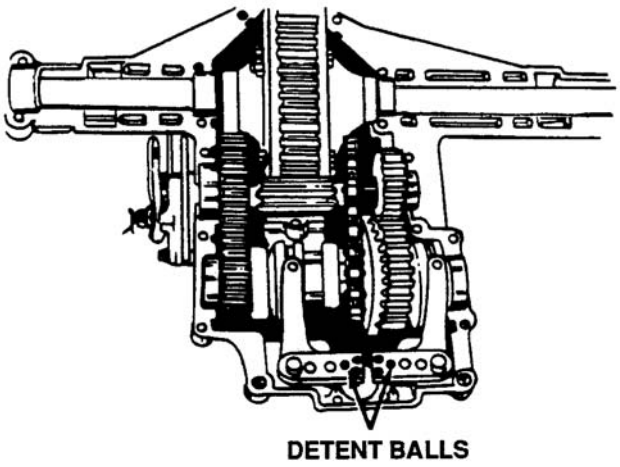


Figure 5-32. Location of Detent Balls

CAUTION

During reassembly, place the detent balls into the detent holes in the shift arm assembly AFTER you have assembled the two halves together. Then, insert the springs followed by the shim plates and the bolts with lock washers. Also, prior to installing this two speed transaxle into a unit, it must be in NEUTRAL position. If not, you will have a high chance of double engagement which will do serious damage to this transmission.

7. Remove the two shifters and lockout plate (if installed in unit) and dowel pins. Inspect for wear on the lockout plate (if so equipped), shift pins, detent surfaces and dowel pins. Replace if necessary. See Figure 5-33.

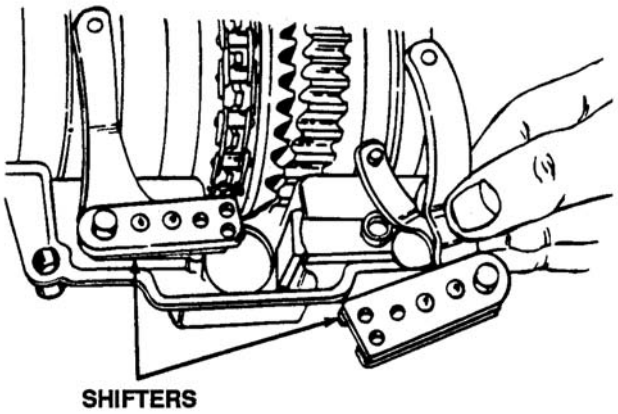


Figure 5-33. Location of Shifters

NOTE

If installing the new upper housing kit, 753-0601, discard the old housing but retain all old hardware.

8. Roll back the drive shaft assembly and remove the shim washers from each end of the drive shaft. See Figure 5-34.

NOTE

It is important to pay close attention to how many shim washers you removed and where you removed them from. They were placed in proper order so that you retain the minimum .004 to .007 thousandths backlash during reassembly.

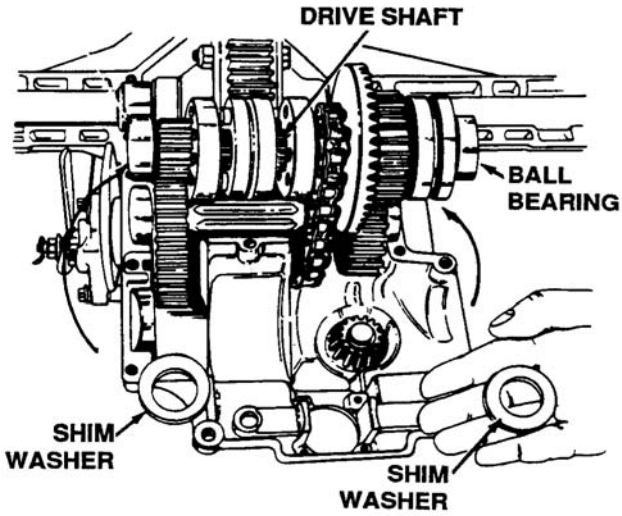


Figure 5-34. Drive Shaft

9. Remove the two ball bearings and shim washers from the drive shaft. See Figure 5-35.

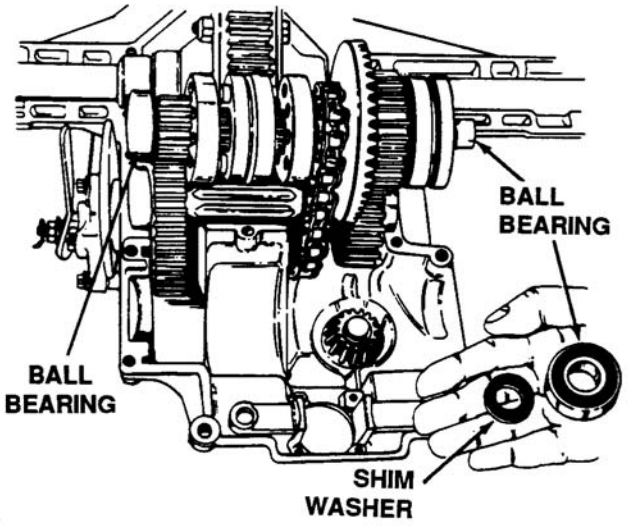


Figure 5-35. Removal of Bearings and Shim Washers

10. Remove the shift collar assembly from the drive shaft. Remove the shift ring plugs from the back of the shift collar. Inspect the position of the retaining rings and check the ends of the pins to see if they are rounded off or broken. Replace if necessary. See Figure 5-36.

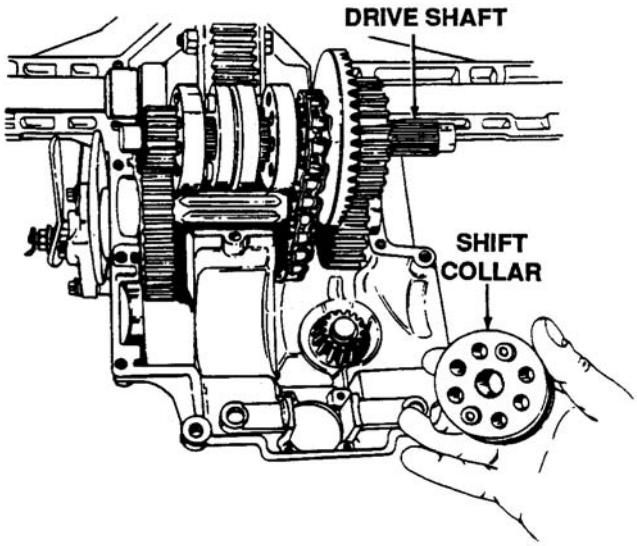


Figure 5-36. Removal of Shift Collar

11. To disassemble the clutch collar, remove the retaining ring, metal stamping, spring and drive pins. The drive pins must move freely. Replace if necessary. See Figure 5-37.

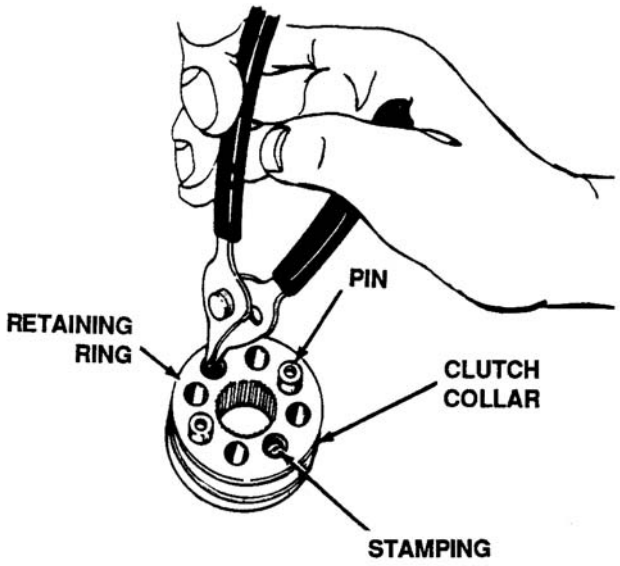


Figure 5-37. Clutch Collar Disassembly

12. Remove the high gear snap ring. See Figure 5-38.

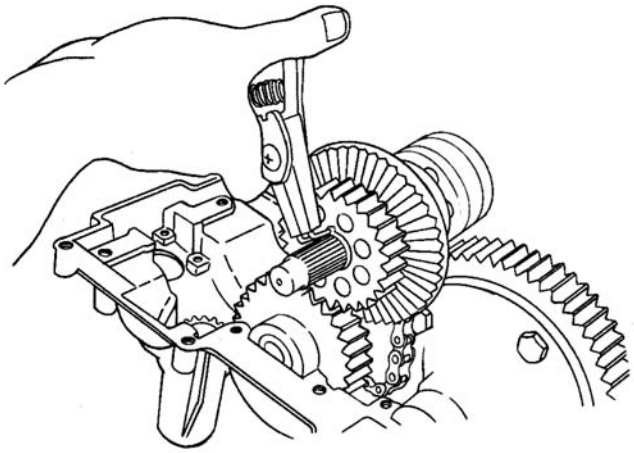


Figure 5-38. Removal of High Gear Snap Ring

NOTE

Be careful not to over spring the snap ring upon removal.

13. Remove high gear from drive shaft. Inspect for wear. Replace if necessary. See Figure 5-39.

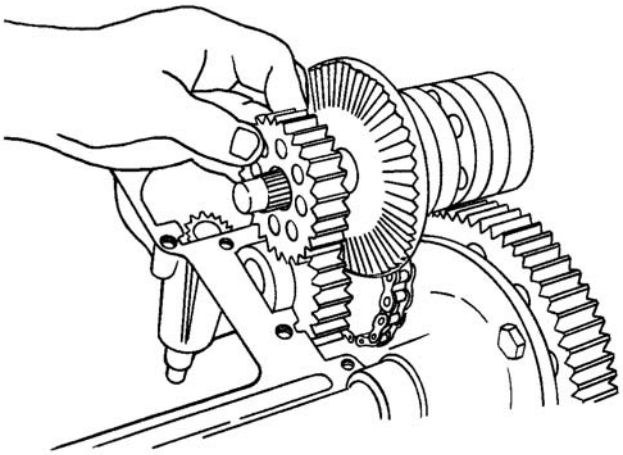


Figure 5-39. Removing High Gear From Shaft

14. Remove the heavy duty retaining ring (snap ring) and washer from drive shaft at 11-tooth low gear. Remove gear and inspect for wear. Replace if necessary. See Figure 5-40.

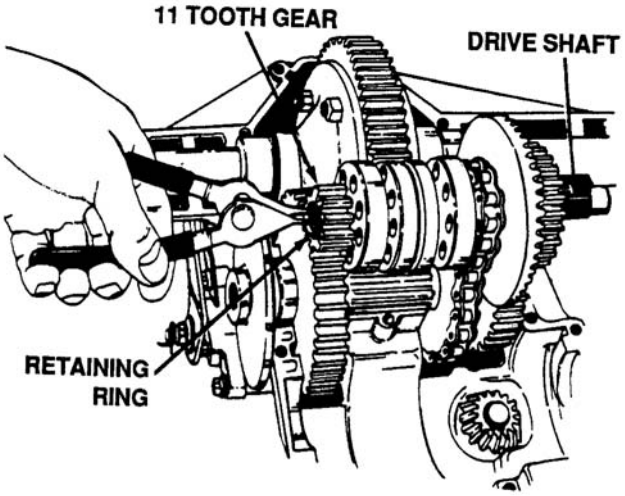


Figure 5-40. Removing Snap Ring

NOTE

When reassembling the transaxle, always use new snap rings.

15. Rotate the drive shaft assembly down into the housing and rotate the output shaft assembly up. Inspect all gear surfaces for wear. Replace if necessary.

16. Remove the ball bearings and shim washers from each end of output shaft. See Figure 5-41.

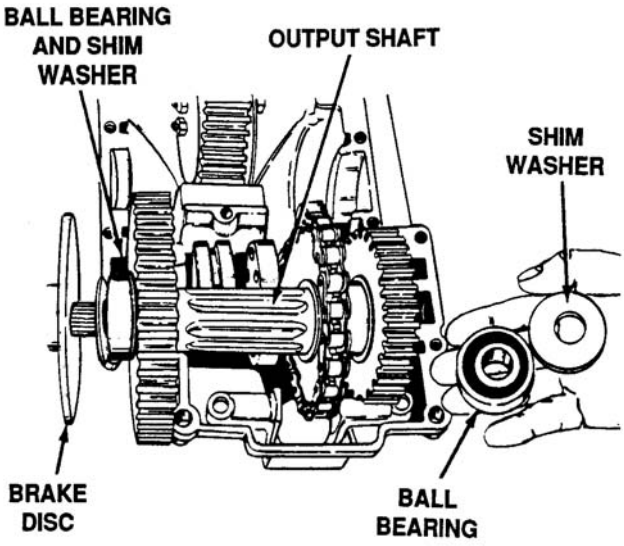


Figure 5-41. Removing Ball Bearings and Shim Washers

NOTE

Shims have to be placed in proper order to retain the minimum 4 to 7 thousandths backlash upon reassembly. Pay close attention to how many you remove and where you removed them from. See Table 5-1.

Table 5-1. Shim Washers

Outer Shim Washers (used between outer bearings and transmission housing):

736-0423—1" ID x .010" thick
736-0431—1" ID x .015" thick
736-0424—1" ID x .020" thick
736-0420—1" ID x .040" thick

Inner Shim Washers (used between the bearing and low gear creeper collar plate assembly):

736-0349—5/8" ID x .020" thick
736-0336—5/8" ID x .030" thick
736-0337—5/8" ID x .040" thick

17. Remove the disc brake and shim from the output shaft and inspect for worn surface, cracks and that the splines are a good fit on the output shaft.

18. Remove the 45 tooth gear from the output shaft and inspect for damage or wear. Replace if necessary. See Figure 5-42.

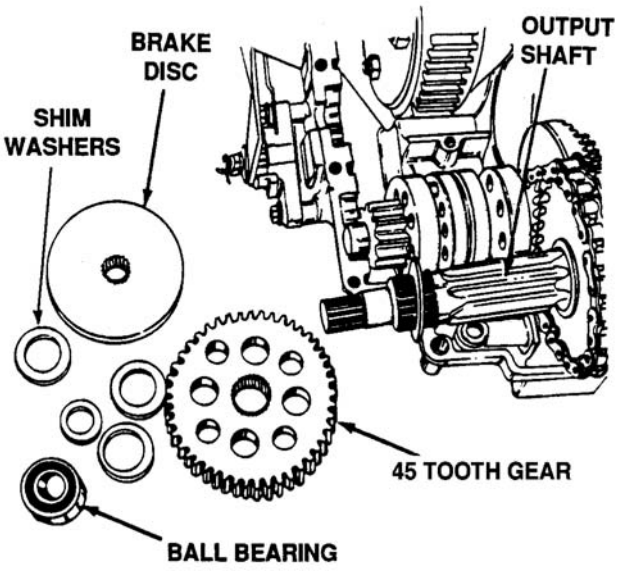


Figure 5-42. Removal of 45 Tooth Gear

19. Remove the 31 tooth gear, shim washer and spacer from the output shaft. Inspect for wear. Replace if necessary. See Figure 5-43.

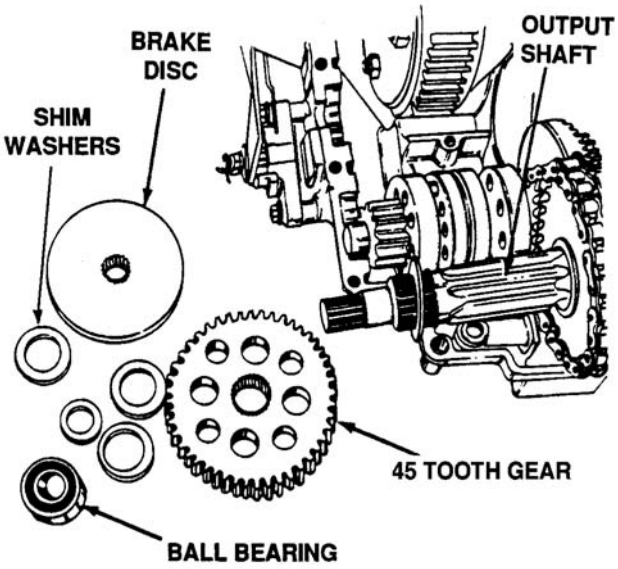


Figure 5-43. Removal of 45 Tooth Gear

NOTE

For purpose of reassembly, note that the spacer goes up against the sprocket assembly and the shim washer goes up against the 31 tooth gear.

20. Remove the output shaft from the 22 tooth sprocket. Note there is an additional shim washer which must be removed. See Figure 5-44.

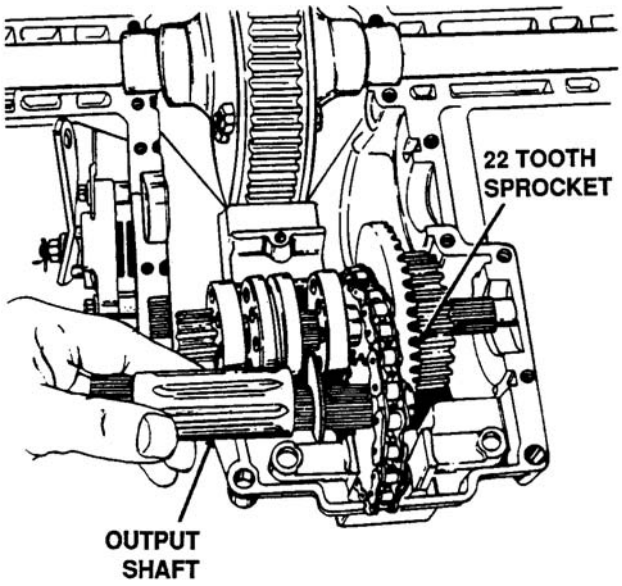


Figure 5-44. Removal of Output Shaft

21. Remove the drive shaft from the housing.

22. Remove the 11 tooth gear and the gold shim washer which protects the bronze bushing. See Figure 5-45.

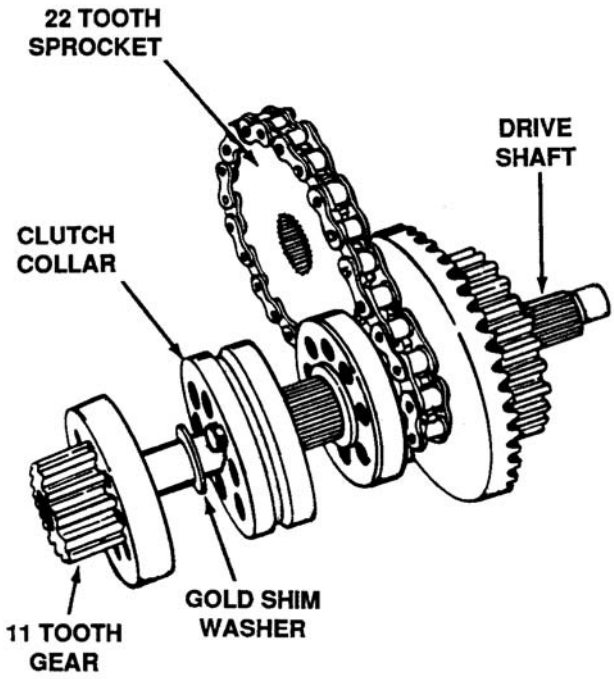


Figure 5-45. Removing 11 Tooth Gear, Shim Washer and Clutch Collar

23. Remove the clutch collar.

24. Remove the retaining ring which holds the 25 tooth gear on the drive shaft. See Figure 5-46.

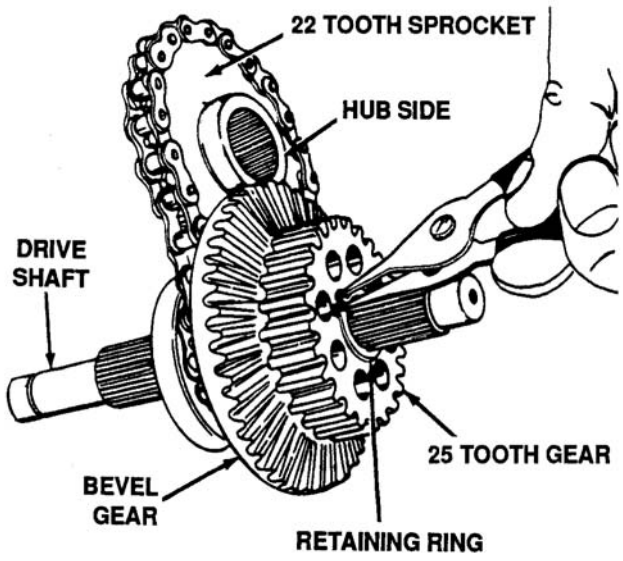


Figure 5-46. Removing Retaining Ring

25. Remove the 25 tooth gear and shim washer. See Figure 5-47.

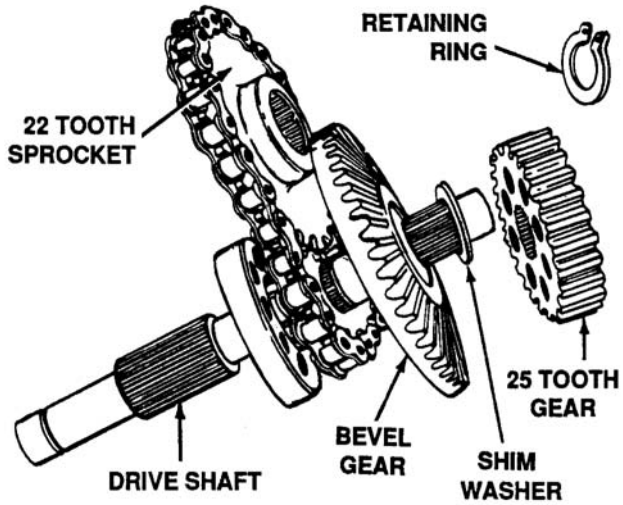


Figure 5-47. Removal of 25 Tooth Gear and Shim Washer

26. Remove the 42 tooth bevel gear and check teeth for wear and any broken teeth. Replace if necessary. See Figure 5-48.

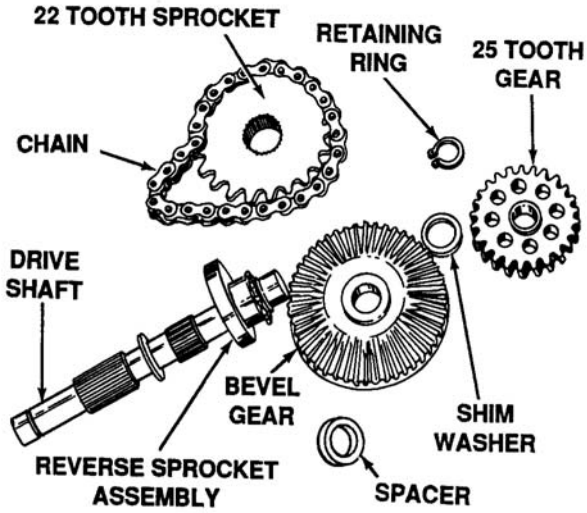


Figure 5-48. Drive Shaft Disassembly

27. Remove the drive shaft, check the bearing locations for wear and check the splines for wear.

28. Disengage the reverse sprocket from the chain and remove spacer with sprocket.

NOTE

Upon reassembly, the hub side of 22 tooth sprocket goes toward the bevel gear.

29. Inspect the chain for rust or any tight links. Clean chain and make sure all links are free.

30. Remove the four needle bearings from the axle shaft. See Figure 5-49.

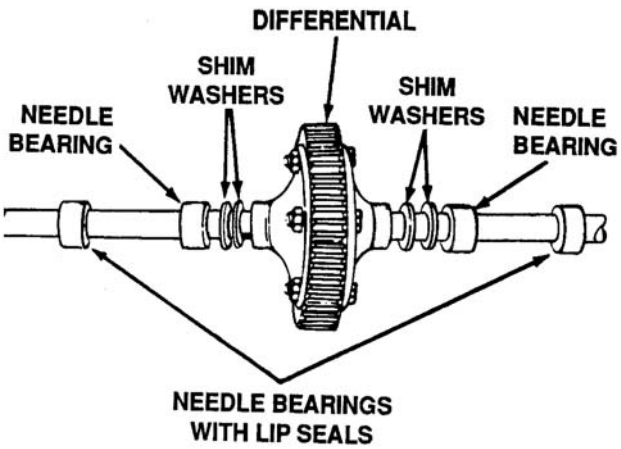


Figure 5-49. Location of Needle Bearings and Seals

NOTE

The two outside bearings have lip seals and MUST be assembled to the outside of housing upon reassembly.

31. Remove the four hex bolts and lock nuts holding the differential assembly together. See Figure 5-50.

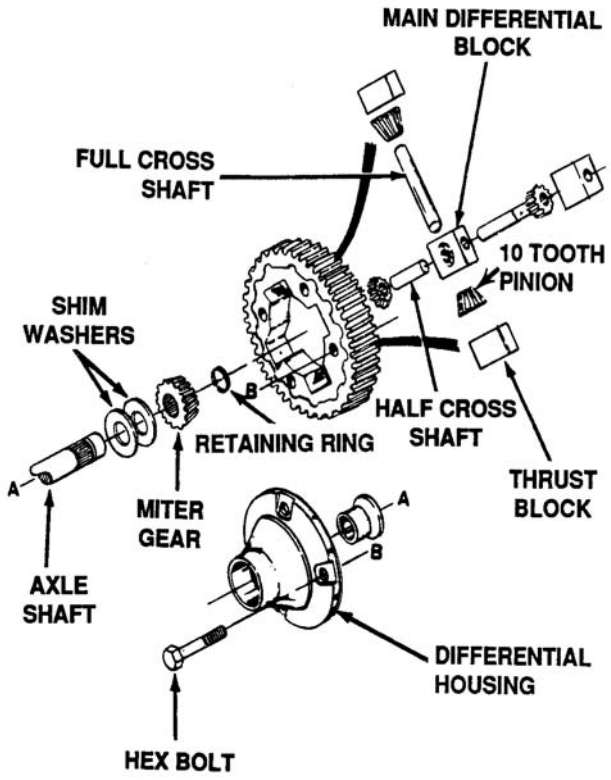


Figure 5-50. Location of Hex Bolts

32. Upon opening the differential assembly, clean and wash all parts.

33. Inspect the miter gears on the axle shafts. If disassembly is required, peel off the two retaining rings with a pocket knife. Sometimes the miter gears are tight on axle shaft and may have to be tapped lightly with a hammer.

34. Inspect the inner parts of differential. Remove the two half cross shafts, one full cross shaft, four 10 tooth pinions, main differential block and four thrust blocks. Inspect parts for wear or damage and replace if necessary.

35. Remove the retaining ring from the input shaft. See Figure 5-51.

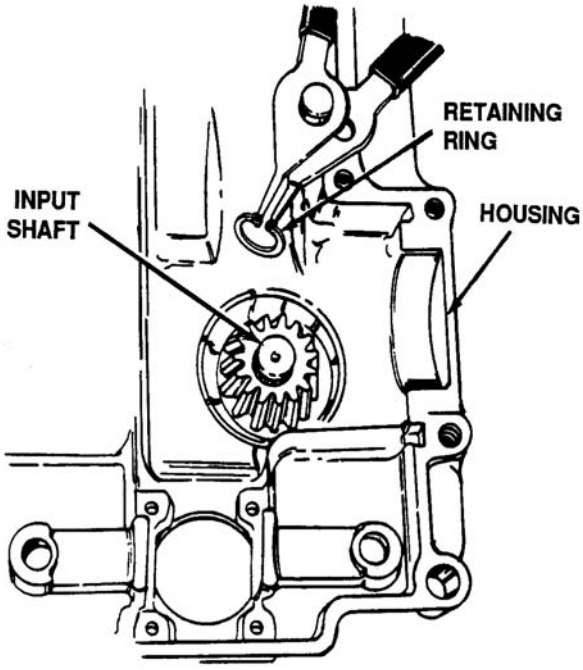


Figure 5-51. Removal of Retaining Ring

36. Remove the pinion gear, 2 flat washers and needle thrust washer and pull the input shaft out of the housing. See Figure 5-52.

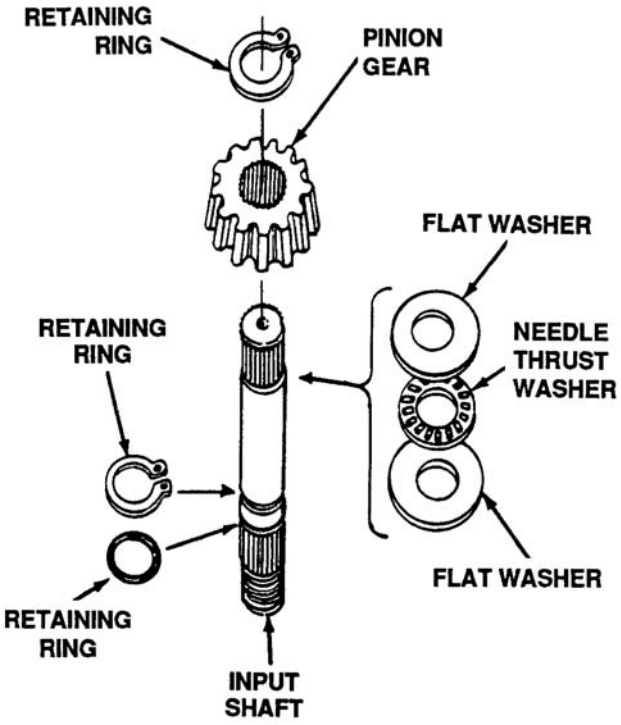


Figure 5-52. Input Shaft Thrust Washer

NOTE

Care MUST be taken upon reassembly of the input shaft into the housing. The two needle bearings have lip seals. Refer to Figures 5-49 and 5-65.

8-5.7 For reassembly, reverse steps 1 through 33.

REASSEMBLY TIPS

1. When replacing the output shaft into the transmission, place the bearings on the shaft ends without the shim washers. See Figure 5-53.

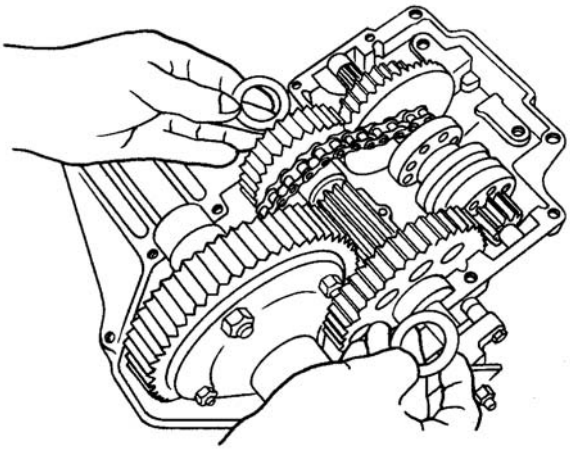


Figure 5-53. Placing Bearings Without Shims

2. Check with a feeler gauge for proper shim requirements. Allow .010 end float and assure correct alignment of gears. See Figure 5-54.

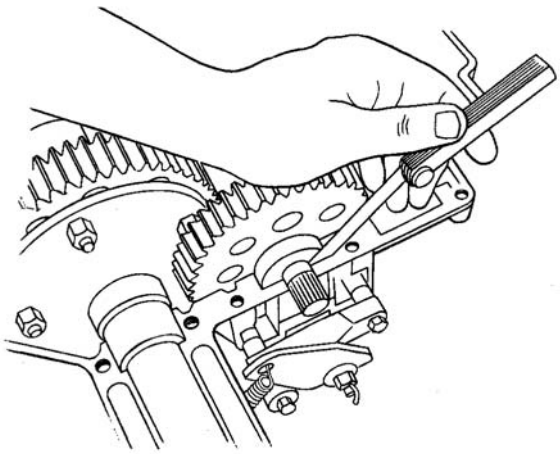


Figure 5-54. Checking for Shim Requirements

3. Reinstall gear cluster and bearings onto drive shaft without shims and slide into housing. See Figure 5-55.

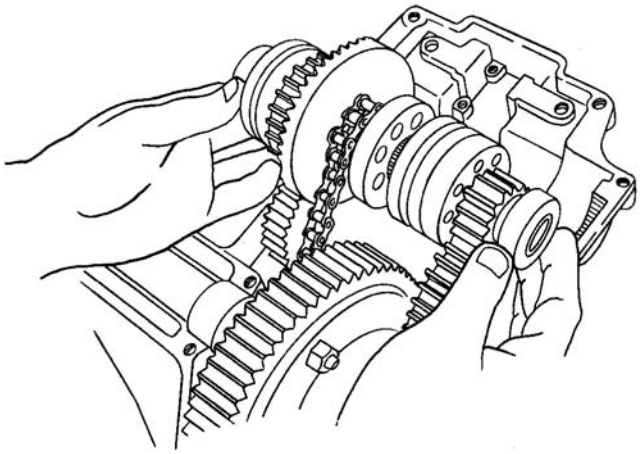


Figure 5-55. Installing Gear Cluster and Bearings

4. Shim drive shaft for .004 to .007 backlash of bevel gear. Shim opposite side for end float only. See Figure 5-56.

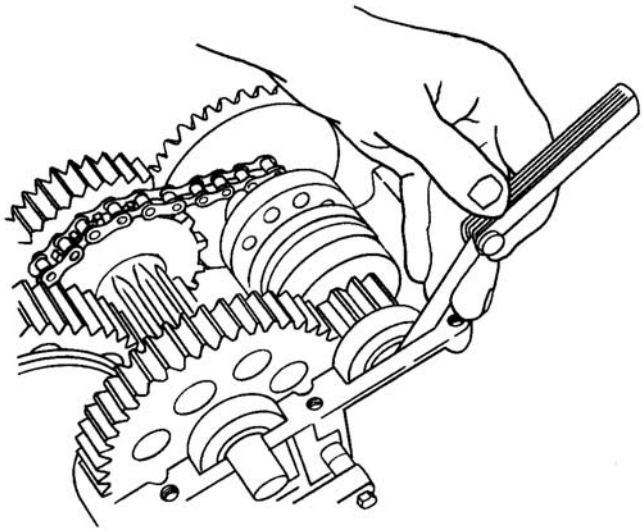


Figure 5-56. Checking Backlash Shimming

5. Using a screwdriver to separate the brake pucks, install the output shaft with the brake disc in place. See Figure 5-57.

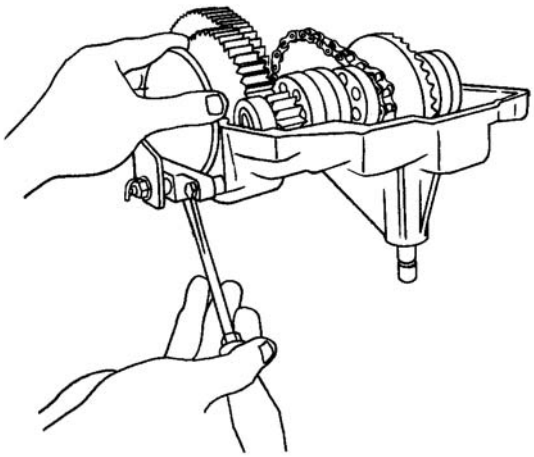


Figure 5-57. Separating Brake Pucks

6. First place the pins into the housing. See Figure 5-58.

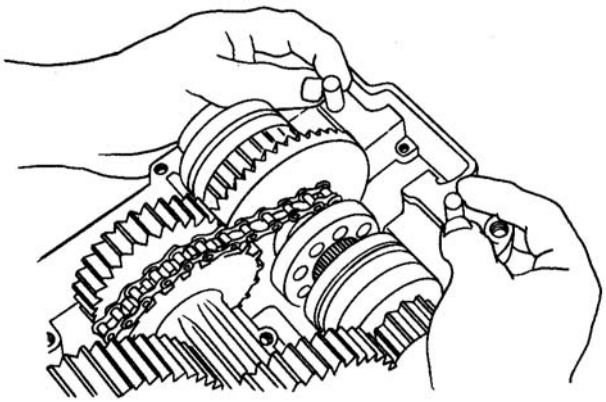


Figure 5-58. Placing Pins in Housing

NOTE

The shift forks are replaced in a slightly different order.

7. Then the lockplate. See Figure 5-59.

NOTE

The lockout plate must be installed with the tab behind the bevel gear.

8. Install shift forks. Secure transmission housing halves together with 1/4-20 screws. See Figure 5-60.

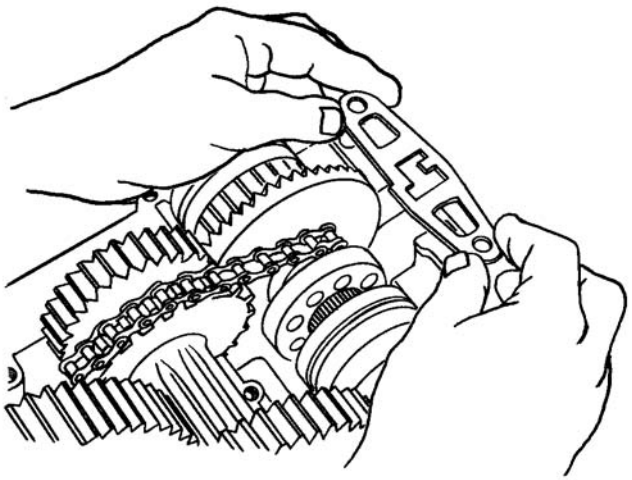


Figure 5-59. Placing Lockout Plate

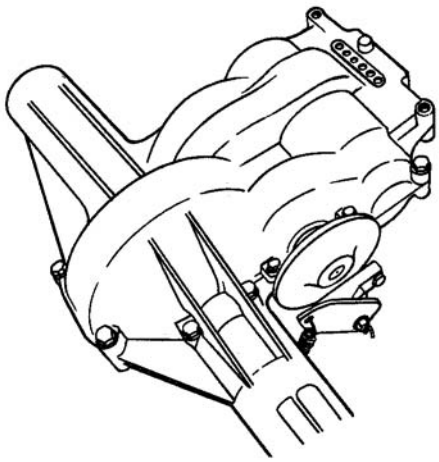


Figure 5-60. Securing Housing Halves Together

9. Install detent balls into lower housing. See Figure 5-61.

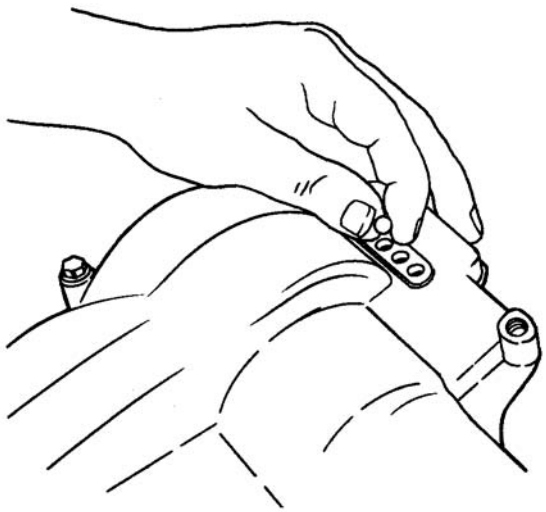


Figure 5-61. Installing Detent Balls

10. Install detent springs into lower housing. See Figure 5-62.

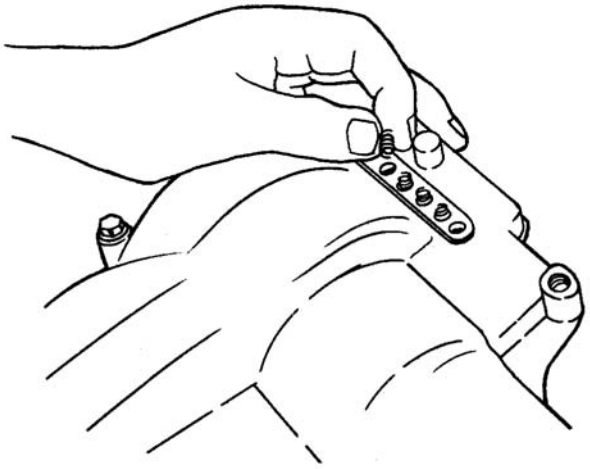


Figure 5-62. Installing Detent Springs

11. Install the shim plate and cover over detent screws. See Figure 5-63.

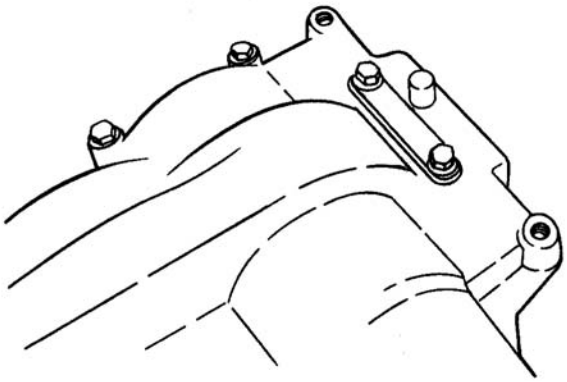


Figure 5-63. Installed Shim Plate and Cover

12. Install the shifter assembly by placing the O-ring in the lower snout groove.

13. Install the O-ring into the upper snout and make sure it stays in position during installation.

14. Apply "Never Seize" to the ball on the shifter.

15. Install the lower snout onto the shifter.

16. Make sure that both shift forks are in the neutral position before installing the shift lever.

17. From a front position with the shift lever on your left, insert the shifter into the transmission with the lever to the left of the neutral position and in the low range quadrant. See Figure 5-64.

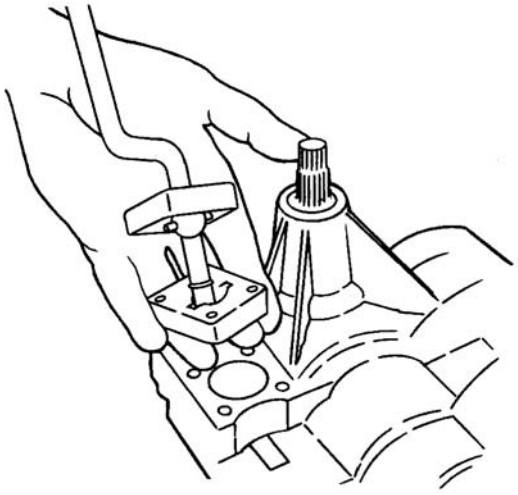


Figure 5-64. Installing Shifter

18. Secure the shifter with the four screws and tighten to 60 to 90 in-lbs.

19. After installation of the shifter, make sure you can shift into all three gears.

20. Install the transmission into the unit.

NOTE

Attach the yellow wire to the reverse safety switch and secure the shift cover.

21. Install the parking brake rod through the shift cover.

22. Install the shift knob and parking brake knob.

23. Test the unit for proper operation.

24. Test the reverse safety switch for proper operation.

5-3. DISASSEMBLY OF 4-WHEEL STEER TRANSAXLE, MODEL NO. 717-1287.

5-3.1 General.

1. The 4 wheel steer transaxle incorporates features that you may recognize found in the model number 717-1050, single speed transaxle with similarity of the differential assembly. This unit also uses the positive spring pin type clutch collar as is used in model number 717-1150 two speed transaxle.

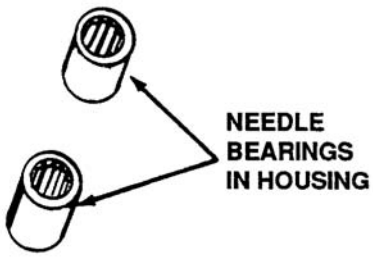


Figure 5-65. Needle Bearings

2. This transaxle, model number 717-1287, has a new feature: the brake disc and brake shoes are enclosed inside of the transaxle for added protection from outside elements such as sand, dirt and rust that create wear on brake assemblies that are exposed on the outside. This inside brake assembly will provide longer life expectancy.

3. The input shaft has needle bearings and also incorporates a thrust washer bearing assembly for higher speeds with minimal wear. See Figure 5-52 and 5-65. The housing is heavy aluminum die cast.
   This section will demonstrate the disassembly, inspection, and reassembly of the MTD 2 speed transaxle, part number 618-0229.

1. Place the shift lever in the neutral position and remove the three screws attaching the shift lever cover.

2. Remove the shift lever cover.

3. Pull the shift lever straight up to remove it from the transmission.

4. Remove the shifter insert and inspect for wear or damage.

SERVICING THE 618-0229 MTD 2 SPEED TRANSAXLE

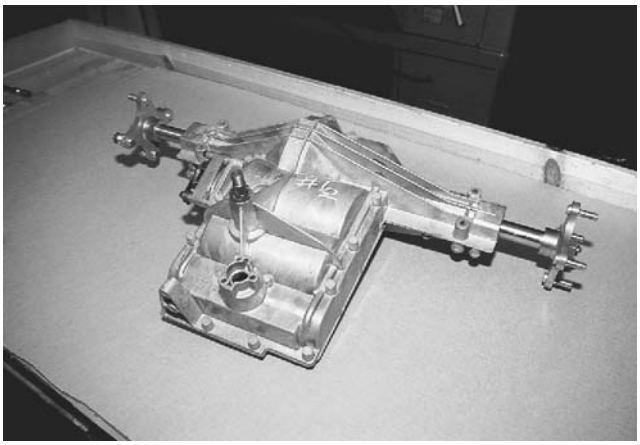


Figure 5-66.

5. Turn the transmission over to allow access to the perimeter bolts. There are two sizes of perimeter bolts. Most will be 3/4 inch long. One is in the center of the transmission. See Figure 5-67.

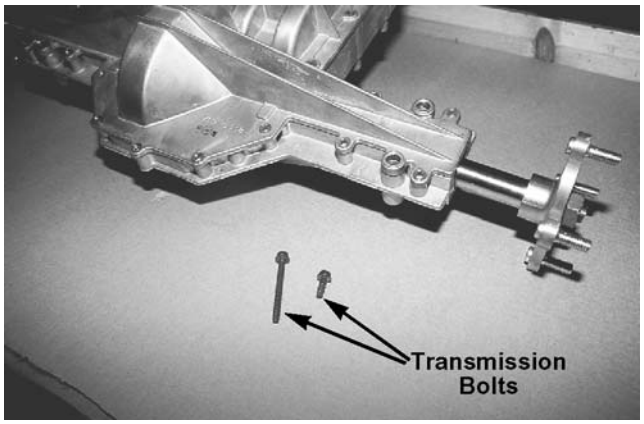


Figure 5-67.

6. Six bolts, three on each side of the housing, are 2 and 5/8 inches long. See Figure 5-68.

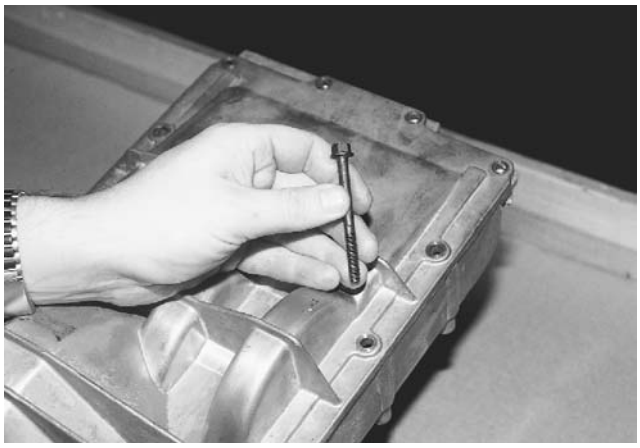


Figure 5-68.

7. Remove all perimeter bolts.

8. Separate the housing halves and inspect the two gaskets on the lower housing half for damage. See Figure 5-69.

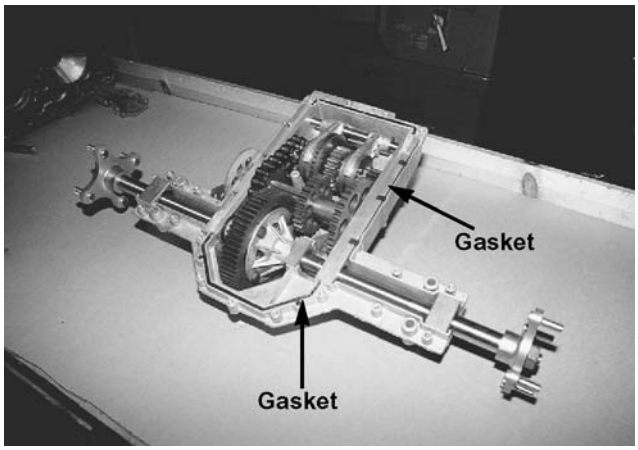


Figure 5-69.

9. Inspect the gaskets on the upper housing half for damage. See Figure 5-70.

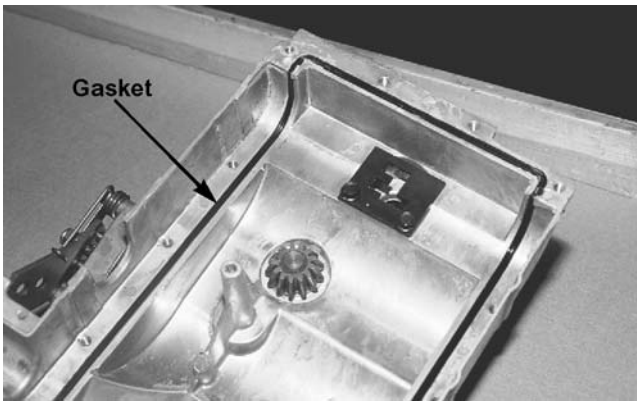


Figure 5-70.

10. Remove the entire drive train by grabbing the axles with two fingers and pushing down on the housing with your thumbs to release the axles from the housing. Then, with one hand under the differential and the other on the front shaft, remove the entire gear train from the housing and place it on the workbench. See Figure 5-71.

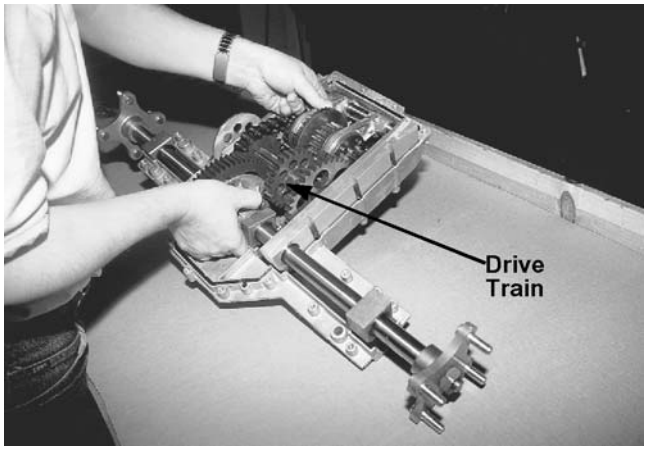


Figure 5-71.

11. Inspect the remaining housing gasket for any damage. Replace any damaged gaskets before reassembly.

12. Inspect the shifter lockout plate for damage. You do not need to remove it unless it is damaged.

13. Inspect the pinion gear for any nicks or extreme wear. If damaged, replace the gear, input shaft, and seal. See Figure 5-72.

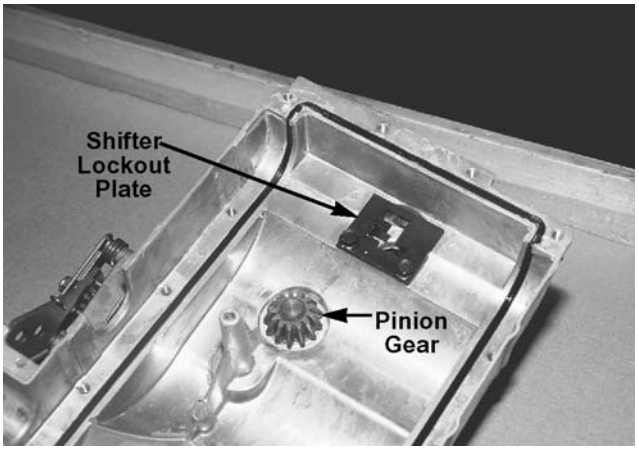


Figure 5-72.

14. Inspect the brake. Make sure the actuating arm is working properly and that the brake

pucks are not excessively worn. Replace if necessary. See Figure 5-73..

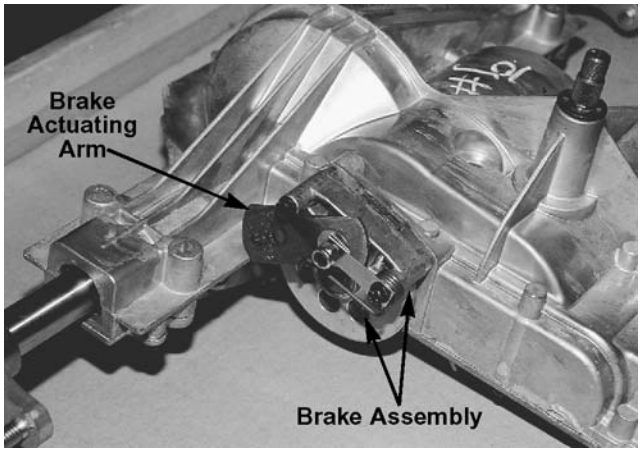


Figure 5-73.

15. Next remove the right hand bearing block. Remove the washer on the drive shaft. Remove the shift fork assembly and inspect the shift fork tabs for wear or damage. Inspect the slots for damage. See Figure 5-74.

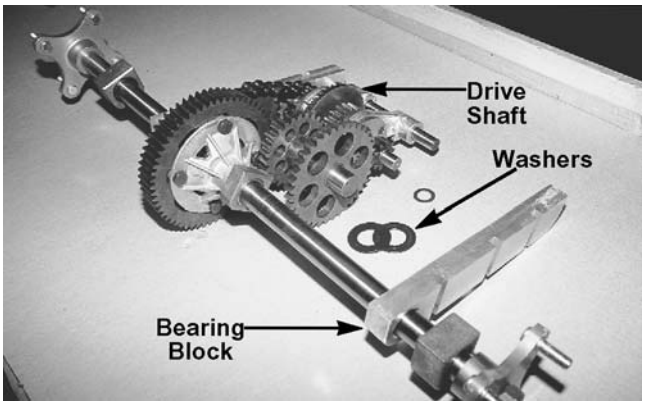


Figure 5-74.

16. Remove the brake disc and inspect for any damage. See Figure 5-75.

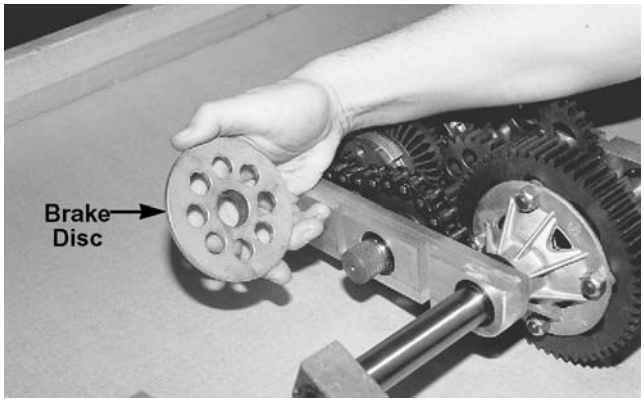


Figure 5-75.

17. Remove the left side bearing block. This allows the output shaft and drive shaft assembly to come loose from the transmission. Remove the large washer from the output shaft. Remove the smaller washer from the drive shaft. Remove the chain and both sprockets as one unit. See Figures 5-76 and 5-77.

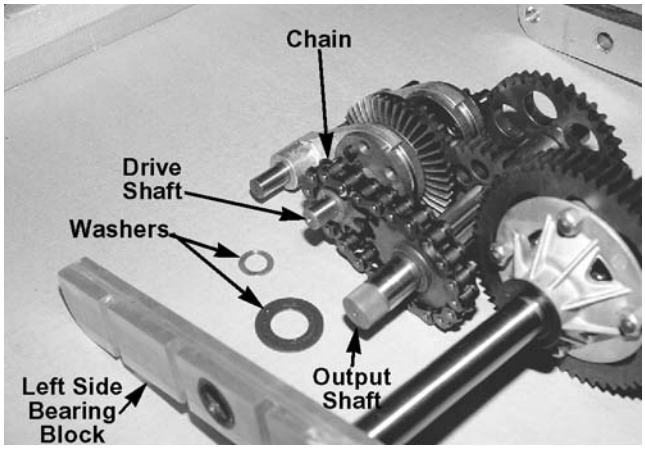


Figure 5-76.

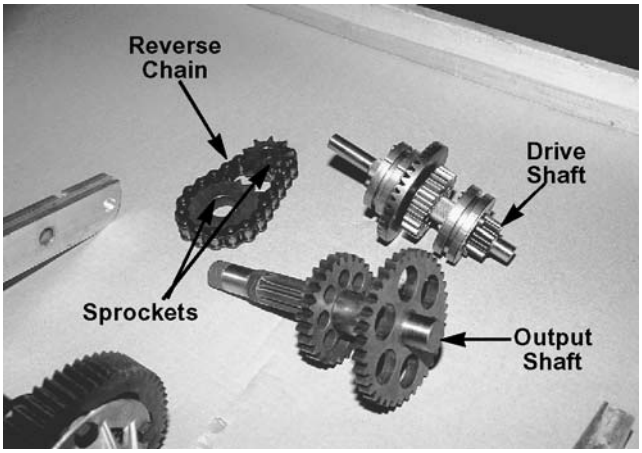


Figure 5-77.

18. Remove the large sprocket and inspect the teeth for any damage. Remove the smaller sprocket. Notice that there are two sprockets. The teeth that are on the end of the part are for drive engagement and the teeth that are on the center of the part and are beveled on both sides are for the chain.

    Inspect the chain for damage. See Figure 5-78.

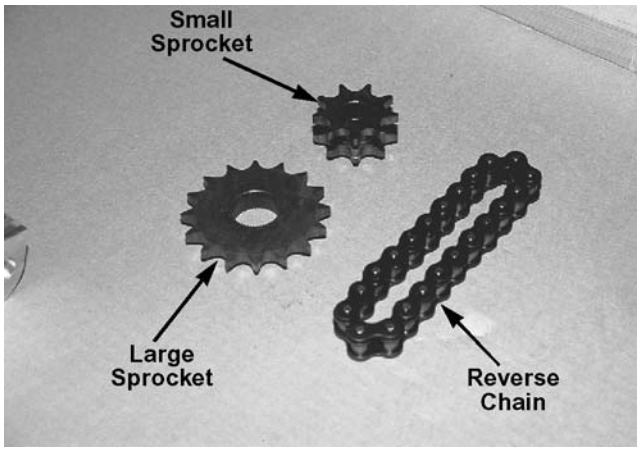


Figure 5-78.

19. Remove the low range gear and inspect for any damage. Remove the spacer. Then remove the high range gear and inspect for damage. See Figure 5-79.

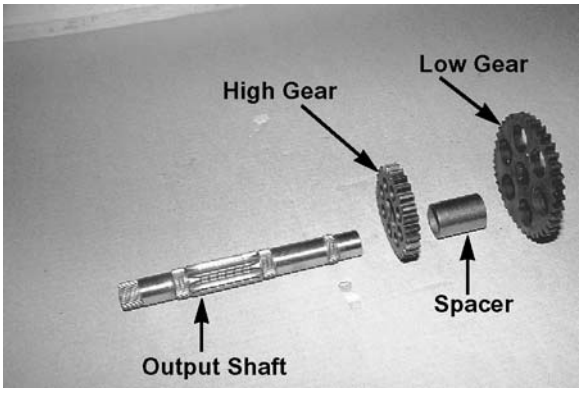


Figure 5-79.

20. Inspect the output shaft and gear area for any damage.

21. Remove the reverse clutch collar from the drive shaft and inspect the pins for any damage.

22. Remove the bevel gear and inspect the teeth.

23. Remove the high range drive gear. Inspect the teeth for damage and the inside holes for any pin damage.
24. Remove the high low range clutch collar and inspect the pins on both sides for any damage.

25. Inspect the drive shaft and splines for any damage. Inspect the low range gear. It should spin freely. If the gear is damaged you will need to replace the entire drive shaft and gear as one assembly.

NOTE

You can remove and inspect most of the internal parts of the transmission without having to remove the wheel flanges. See Figure 5-80.

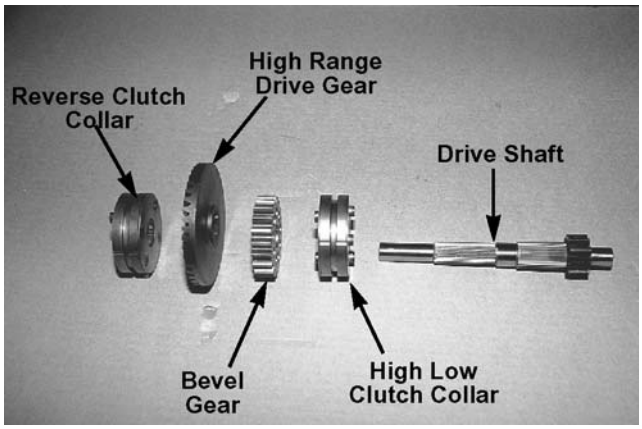


Figure 5-80.

NOTE

If you need to inspect and repair the differential, start by removing the flange nut. Then remove the wheel flange. A puller may be needed to remove the flange.

26. Inspect the studs for wear or stripped threads.

27. Remove the outer axle bearing block assembly and inspect the seals and bearing for damage. This bearing should be greased internally.

28. Remove the right hand bearing block and inspect the bearings, bushings, and seals.

29. Remove the inner bearing block and inspect the bearing. There are no seals on this block.

30. Remove the differential washer. See Figure 5-81.

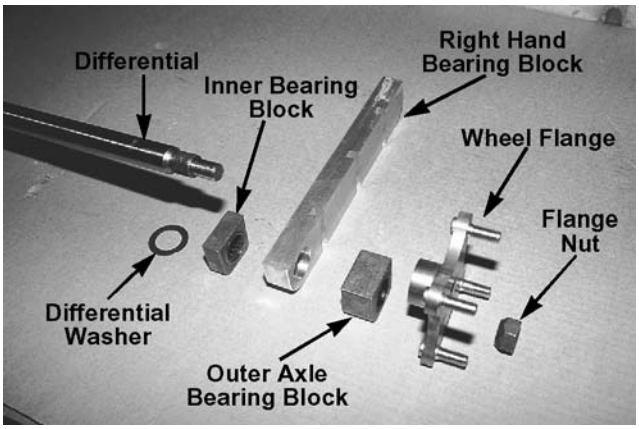


Figure 5-81.

31. Remove the four differential bolts and separate the differential half.

32. Inspect the side gear for any damage.

33. Remove the cluster of miter gears.

34. Inspect the gear teeth for damage or wear. Separate the shafts. Both shafts and gears are identical.

35. Remove the bull gear and inspect the teeth and lug areas for any damage. See Figure 5-82.

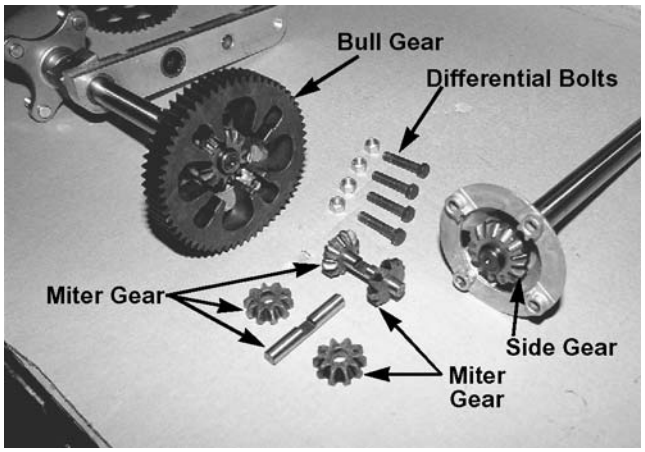


Figure 5-82.

36. Inspect the left hand side gear for any damage.

37. Inspect the components of the left side of the axle shaft for any damage. You will not need to disassemble these components unless there is damage.

    This completes the disassembly of the 2 speed transmission.

To reassemble the transmission install the bull gear, making sure that you line up the tabs with the slots on the gear.

38. Assemble the cluster gears by aligning the grooves on the two shafts. Insert the assembly into the bull gear.

39. Line up the right hand axle with the differential tabs and insert it into the bull gear assembly. Install the four bolts and lock nuts and torque to 120 inch pounds. See Figure 5-83.

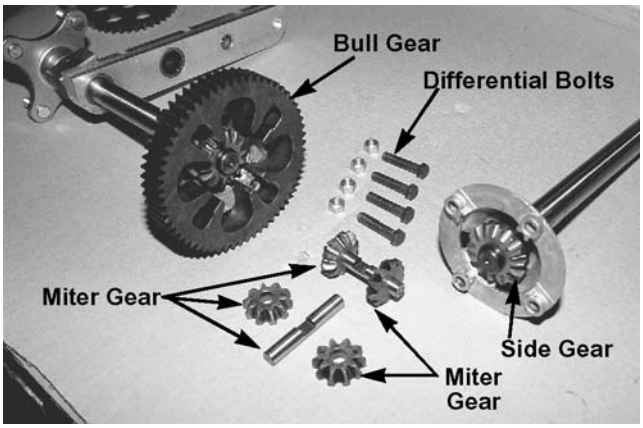


Figure 5-83.

Install the differential washer.

40. Install the inner bearing block. This is the thinner bearing block.

41. Install the right hand main bearing block.

42. Install the outer axle block.

43. Install the wheel flange with the hub facing in. Attach the axle retaining nut, using locktite #242 and torque to 80-100 ft. lbs., with the tapered side toward the flange. See Figure 5-84.

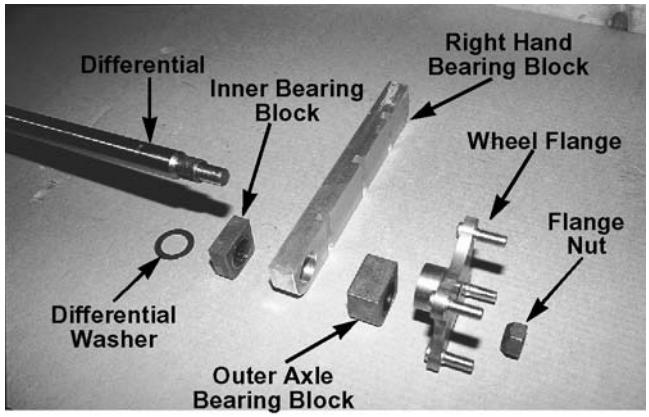


Figure 5-84.

NOTE

Make sure the hub assembly nut is part number 712-0364A, which is a lock nut and should be torqued 80-100 ft. lbs. Refer to Bulletin #T-133 if in question and be sure when installing the nut the threads are clean. Overtorquing can damage the hub assembly.

44. Install the high low clutch collar onto the drive shaft making sure that the pins line up with the gear teeth. Install the high range gear. Install the bevel gear with the hub towards the high range gear. Install the reverse clutch collar with the pins facing away from the bevel gear. See Figure 5-85.

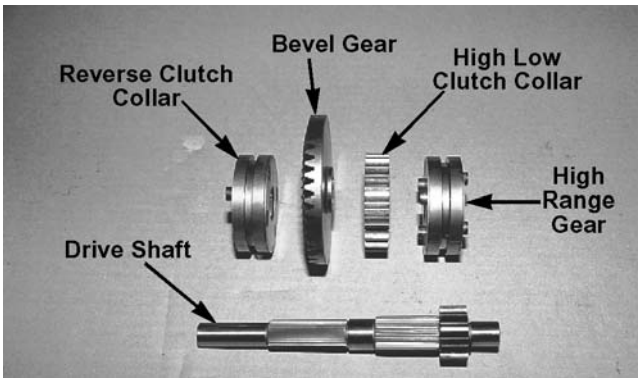


Figure 5-85

45. Next assemble the output shaft assembly by installing the high range gear, followed by the spacer, then the low range gear, and then the two washers See Figure 5-86.

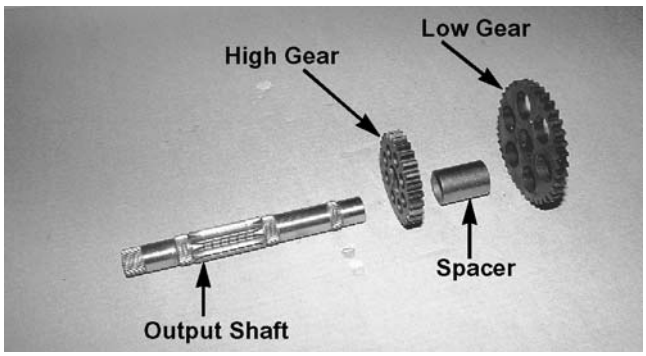
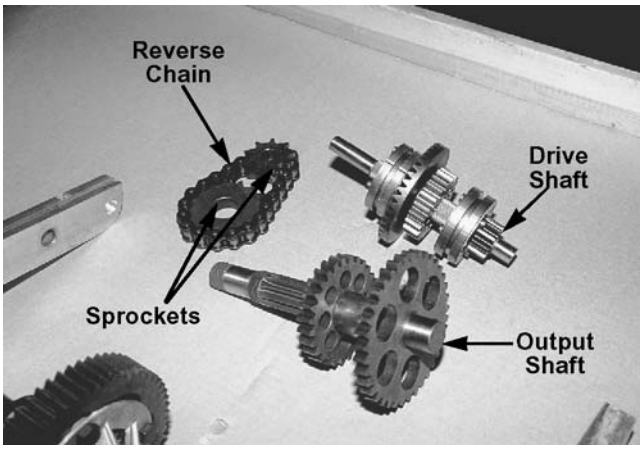


Figure 5-86

46. Take the chain and install the nine tooth sprocket from underneath. Install the 16 tooth sprocket shift fork. Slide the assembly onto the output shaft and drive shaft as one unit. See Figures 5-87, 5-88 and 5-89.



Figures 5-87.

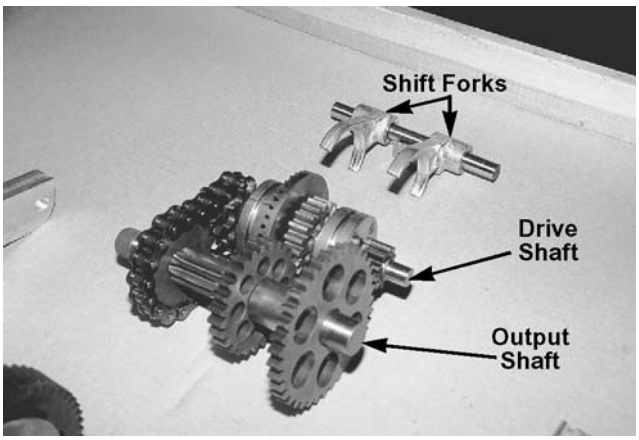


Figure 5-88.

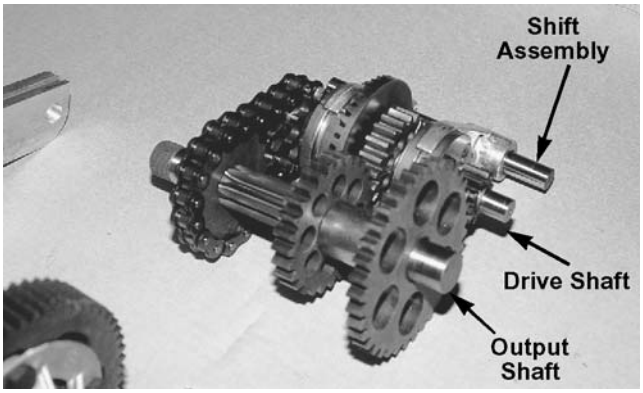


Figure 5-89.

47. Install the large washer onto the left side of the output shaft.

48. Install the smaller washer on the spur gear side of the drive shaft.

49. Slide the entire gear train assembly against the differential gear.

50. Slide the left hand bearing block over the output shaft and drive shaft. Being cautious with the seal of the output shaft. See Figure 5-90.

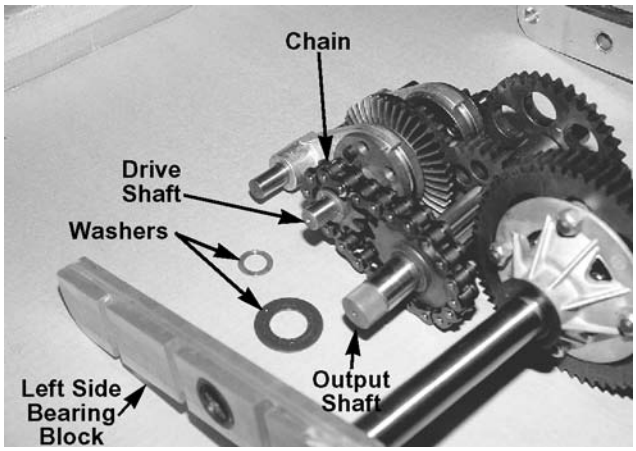


Figure 5-90.

51. Install the shift fork assembly onto the drive train and into the bearing block.

52. Slide the right hand bearing block over the output shaft, drive shaft, and shift fork assembly. See Figure 5-91.

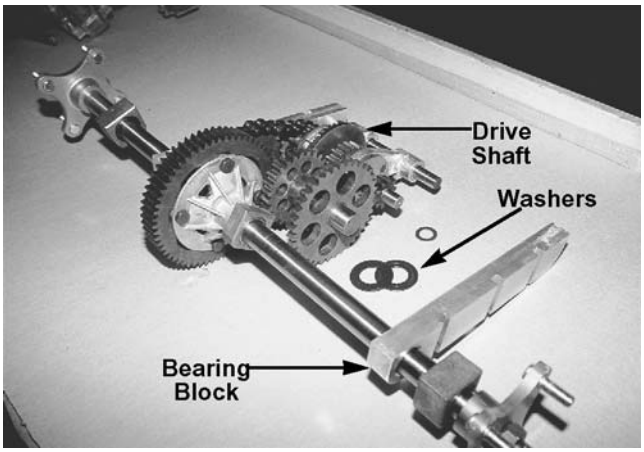


Figure 5-91.

53. Install the brake disc with the hub facing out. See Figure 5-92.

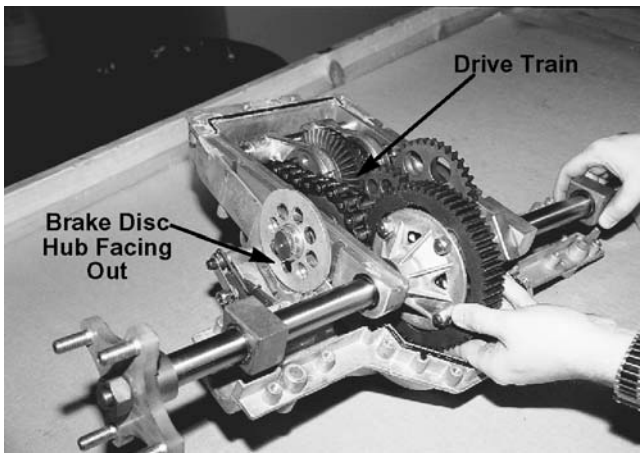


Figure 5-92.

54. Set the entire drive train into the upper housing starting with the top portion. Line up all axle bearing blocks with the housing, align the brake disc with the brake pucks, using a screwdriver if necessary, and set the axle into the housing. See Figures 5-92 and 5-93.

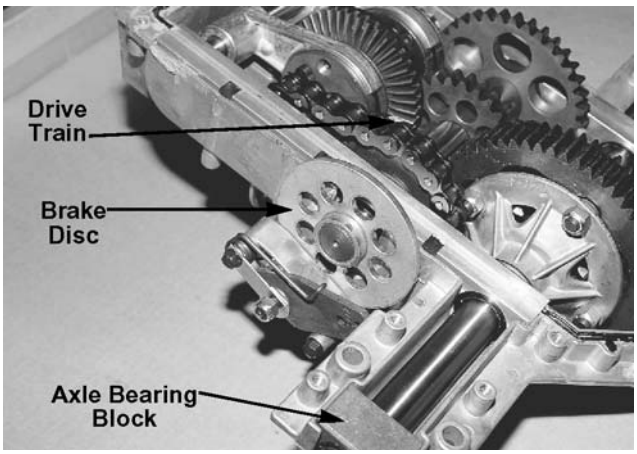


Figure 5-93.

55. All bearing blocks should be just above flush with the housing.

56. Place a small amount of RTV sealant at the corners of the main bearing block where the gaskets will overlap. Also place a small amount around the center bolt hole. See Figure 5-94.

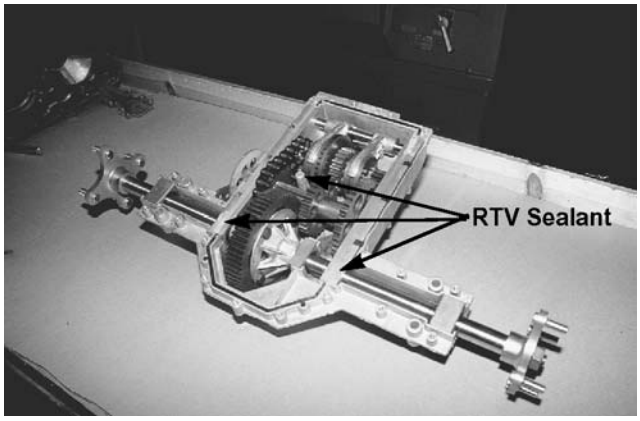


Figure 5-94.

NOTE

Make sure the gaskets are in place on the lower housing and install it over the upper housing. At this point in reassembly, install lubrication approximately one quart of 90W lube oil or it can be installed later through the shifter hole.

57. Place the six long screws through the main bearing block in the housing, three on each side, and tighten by hand. This aligns the housing halves. See Figure 5-95.

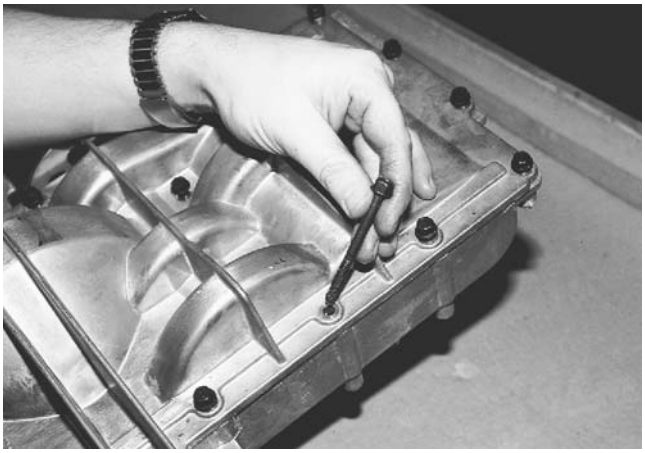


Figure 5-95.

58. Install the center screw, followed by all the remaining screws.

59. Tighten the center bolt first, followed by the six bearing block screws, and then the remaining perimeter screws. Torque to between 90 and 120 inch pounds. See Figure 5-96.

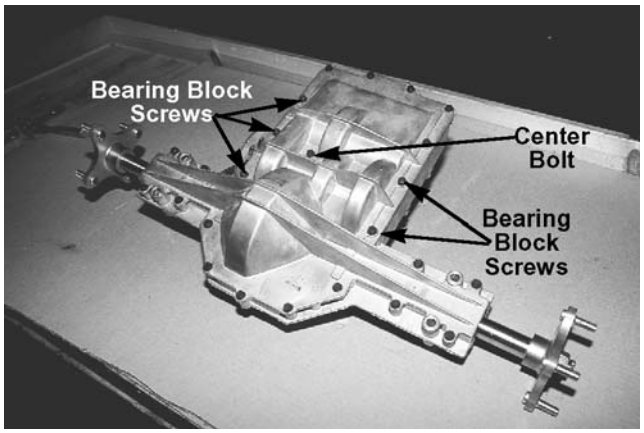


Figure 5-96.

60. Turn the transmission over.

NOTE

Make sure both shift forks are in a neutral position before installing the shift lever. See Figure 5-97.

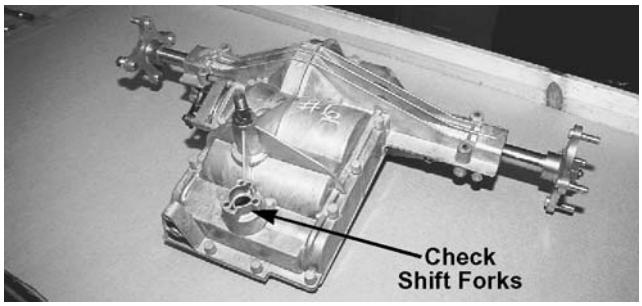


Figure 5-97.

Install the shifter insert with the groove up. Then the shift lever. Followed by the shift lever cover, making sure that the slot is vertical and the mounting holes line up with the housing.

Slide the cover over the shift lever. Hold the shift cover down, install the three mounting screws.

Torque to between 90 and 120 inch pounds.

This completes the servicing of the MTD 2 speed transaxle.

5-4. HYDROSTATIC TRANSAXLE.

5-4.1 General.

1. The 717-0950 transaxle incorporates differential and gear reduction assemblies. See Figure 5-98. It must be used with part number 717-0940 BDU-10S-Sunstrand Hydrostatic Pump. (See Section 6.) All internal drive and axle shafts are resting/turning on heavy duty ball bearings designed for longer life expectancy. The input shaft has needle bearings and also incorporates a thrust bearing assembly for higher speeds with minimal wear. The housing is aluminum die-cast and specially designed for use on lawn and garden tractors.

2. This heavy duty transmission guides the lawn and garden tractor smoothly forward no matter what type of ground is being covered without shifting or any clutching. A control lever is used to regulate the hydrostatic pump to increase or decrease the speed in either forward or reverse directions. The transaxle also houses the complete disc brake assembly with provision for easy adjustment.

NOTE

The transaxle is lubricated and sealed at the factory. It does not require checking. If disassembled for any reason, lubricate with 16 oz. of Shell Durina #O grease, part number 737-3047.

5-4.2 **Disassembly of Transaxle**

1. Remove transaxle and pump from tractor. See Figure 5-99.

2. Remove pump from transaxle by removing two bolts and nuts from front of transaxle using a 1/2 inch wrench. See Figure 5-100.

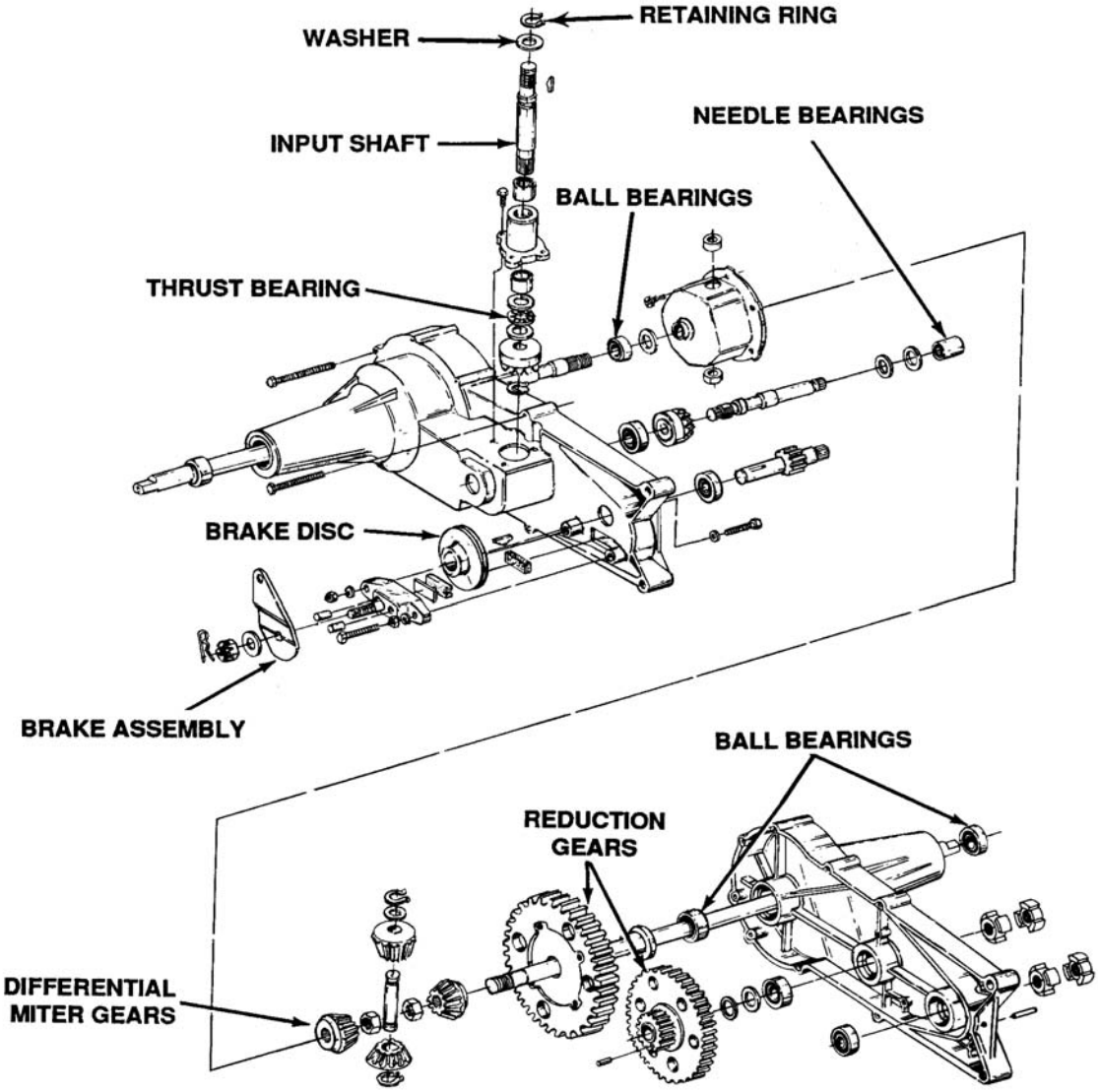


Figure 5-98. Hydrostatic Transaxle 717-0950

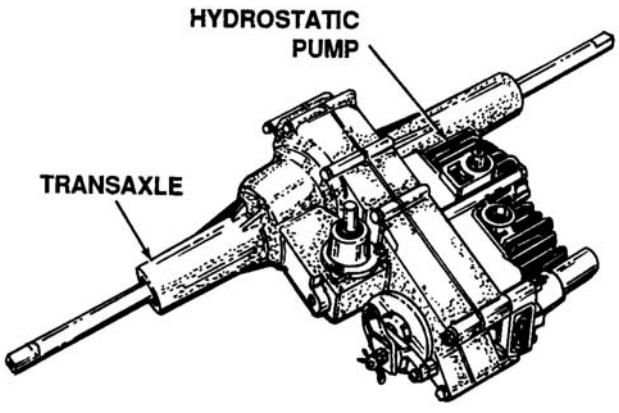


Figure 5-99. Transaxle and Pump

3. Remove retaining ring from input shaft. See Figure 5-101.

NOTE

The washer under the retaining ring is factory selected. If you are repairing the unit, the maximum end play is .010 and is adjusted with shim washers and checked with a feeler gauge under the retaining ring.

4. You must remove the input housing bearing and shaft from the top of transaxle in order to remove all of the bolts holding the transaxle together.

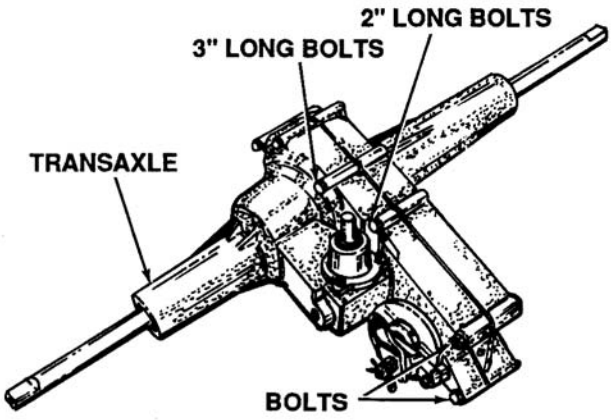


Figure 5-100. Pump Removal

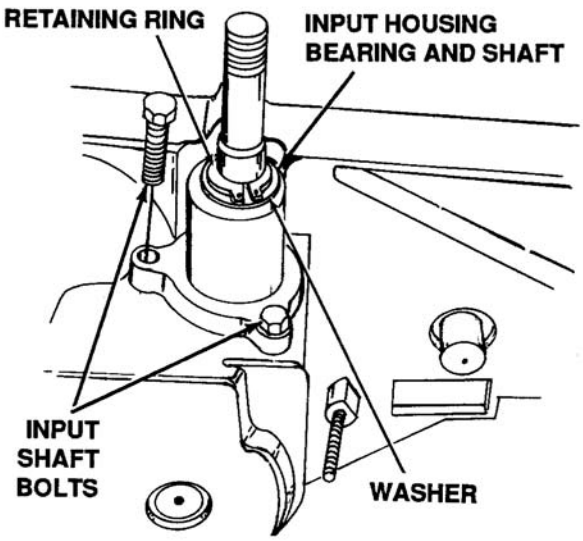


Figure 5-101. Input Housing Bearing and Shaft

NOTE

Use an impact puller to remove the bearings from the housing or tap out using a rod of the correct diameter. Reinstall the bearings with Locktite Bearing adhesive sealant. Press in place using an arbor press and wipe bearing clean of excess Locktite.

5. Remove three input shaft bolts.

NOTE

When reassembling use Locktite on input shaft bolts and torque to 80-120 in-lbs.

6. Remove six bolts 3 inches long and two bolts 2 inches long from transaxle housing halves. A 3/8 inch wrench is required.

NOTE

Housing couplings may seize to shaft splines. Use a puller to remove or GENTLY tap them for removal.

7. Remove disc brake and disc by removing a hex nut and lock washer on the rear of brake. Loosen hex nut on brake stop bolt. Remove the brake stop bolt, nut and lock washer. See Figure 5-102.

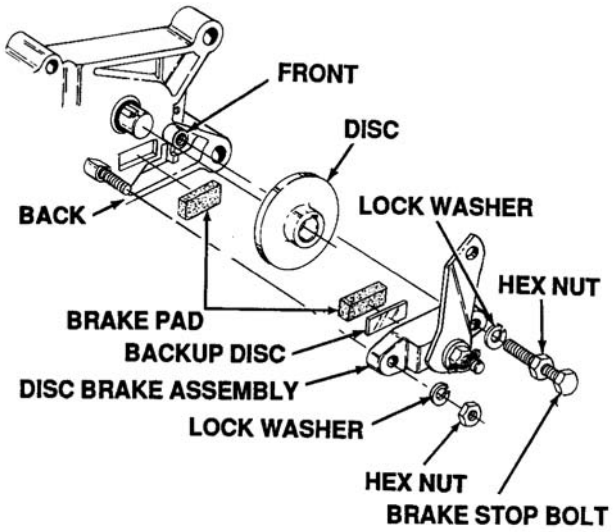


Figure 5-102. Disc Brake and Disc

NOTE

When you remove the disc brake, the backup disc and one brake pad will fall out. Also when removing the disc the second brake disc will fall out.

NOTE

You do not have to remove the brake assembly to split housing halves. This is done only if you are going to remove the pinion shaft with the 11 tooth gear.

8. Before pulling housing halves apart, axle shaft ends must be free of rust and nicks for ease of disassembly. With a piece of fine emery cloth clean shafts and inspect for good clean surfaces. See Figure 5-103.

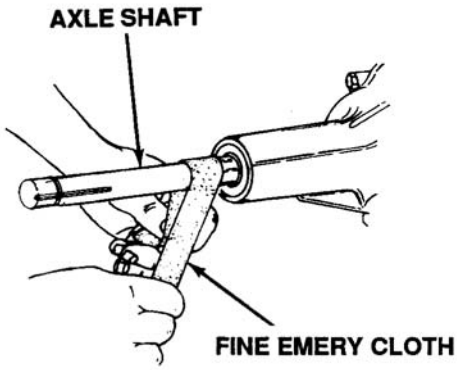


Figure 5-103. Cleaning Axle Shaft

9. Carefully pry halves apart in areas shown in Figure 5-104.

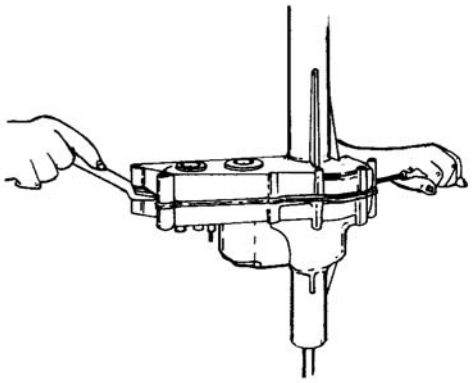


Figure 5-104. Prying Halves Apart

CAUTION

DO NOT nick mating surfaces. Tap lightly on drive shaft with a brass hammer as needed. See Figure 5-105.

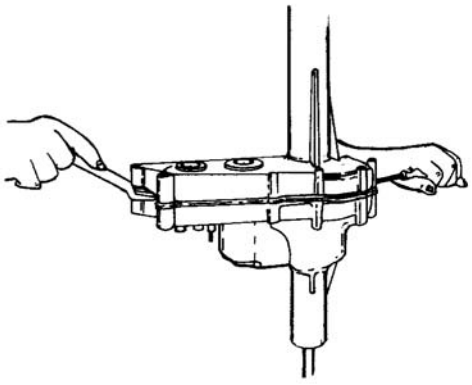


Figure 5-105. Prying Halves Apart

10. After transaxle housing halves have been separated, clean all grease from parts. See Figure 5-106.

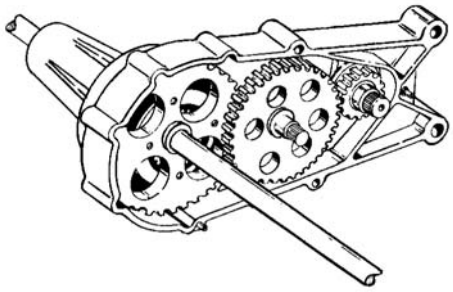


Figure 5-106. Clean Parts

NOTE

When reinstalling screws into aluminum housings, you should turn the screws counterclockwise until they click into place and seat themselves before tightening them in the usual manner. This will avoid cross threading and damage to the housing.

11. Remove reduction gear (60 and 17 tooth) from drive shaft. See Figure 5-107.

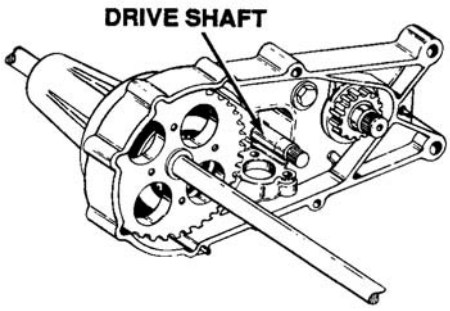


Figure 5-107. Reduction Gear Removal

NOTE

The washers between reduction gears and ball bearings are factory selected to insure proper clearance between the gears. A .040 shim washer is used on the small reduction gear side and either a .050 or .060 shim washer is used on the large gear side.

12. Inspect reduction gear for any damaged teeth. Also inspect needle bearing in the center of gear. Replace if necessary. See Figure 5-108.

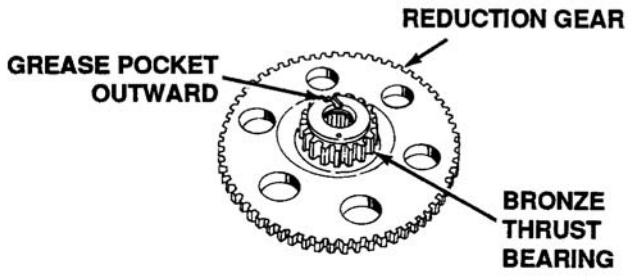


Figure 5-108. Reduction Gear Inspection and Replacement

NOTE

The reduction gear also has a grease pocket. Upon reassembly, press bronze thrust bearing on reduction gear dowel pin. It is important that bronze thrust bearing grease pocket FACE OUTWARD as shown in Figure 8-91. The grease pocket is pressed on to reduction gear to insure grease movement. When replacing, make sure that it is installed properly. 14 oz. of Shell Durina #O grease is used in this transaxle.

13. Remove differential assembly from housing half. See Figure 5-109.

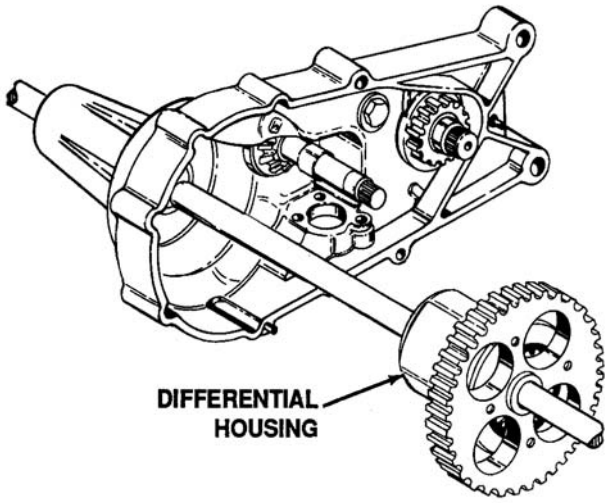


Figure 5-109. Differential Removal

14. Disassemble differential by removing four socket head bolts and lock washers. See Figure 5-110. Inspect differential gear (72 teeth) for any damage. Replace if necessary.

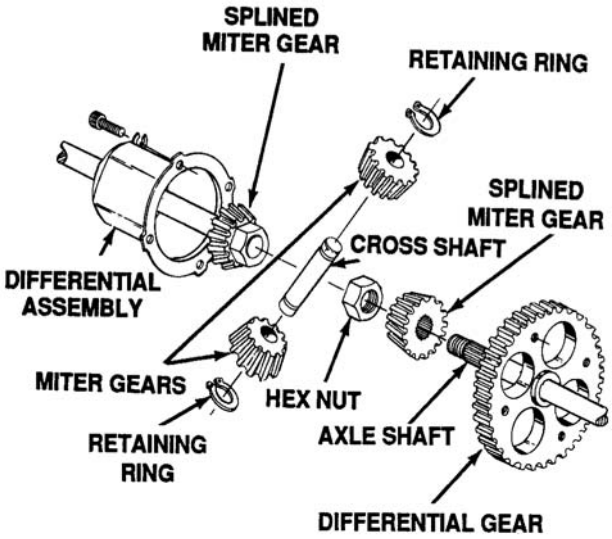


Figure 5-110. Differential Disassembly

15. Inspect two miter gears on axle shafts for any wear or damage. Replace if necessary.

16. Remove retaining ring.

CAUTION

DO NOT REUSE RETAINING RINGS from the cross shaft and slide shaft through miter gears.

17. Remove miter gears and inspect for damage. Replace if necessary.

18. Remove pinion shaft with 11 tooth gears, first remove the hi-pro key from shaft. Then pull gear and shaft out of housing. See Figure 5-111. Inspect gear teeth for any damage and inspect shaft for any damage on splines. Replace if necessary.

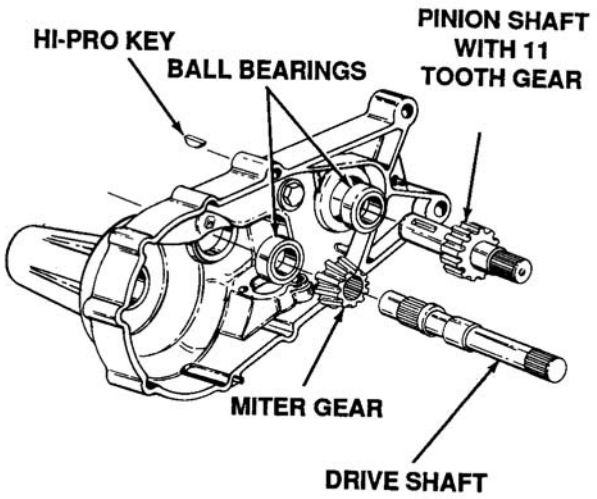


Figure 5-111. Pinion Shaft With 11 Tooth Gear Removal

19. Remove drive shaft and drive pinion (17 tooth) from housing. Inspect gear teeth for any damage. Replace if necessary. Also inspect splines on drive shaft for wear or damage. Replace if necessary.

20. Reassembly is the reverse order of disassembly. Bolts securing both housing halves are self-tapping bolts and must be torqued to 80 to 120 in-lbs. Over torquing bolts will strip out threads. If any of these threads are stripped, drill (using 1/4 inch drill) through damaged boss. Reinstall a 1/4-20 Grade 5 bolt and nut reaching through both housings. Use Locktite #242 on nut and torque to 80 to 120 in-lbs.

HYDROSTATIC TRANSMISSIONS

6-1. GENERAL.

For further information regarding this section, refer to the technical service video “Hydrostatic Drive Systems.”

6-1.1 The Eaton Light Duty Hydrostatic Transmission consists of a variable displacement radial ball piston hydraulic pump, a fixed displacement radial ball piston hydraulic motor and a system of valves all contained in one housing. It can be used in many different types of applications where variable output speed is a requirement. It has many advantages over other variable speed drives (electric and mechanical) and gear type transmissions.

1. Response. These transmissions respond faster than other type of power-transmitting system.

2. Precise speed. Has the capability of maintaining precise speed under varying load conditions.

3. Ease of operation. One lever controls direction and speed smoothly without gear change.

4. Low maintenance. Simple design keeps maintenance to a minimum.

5. Increased productivity and versatility. It allows complete matching or power to load.

6. Self contained. There are no external pressure lines, separate drive components, etc.

7. Simplified final product design. It reduces the number of mechanical drive components.

8. Positive braking action. The lever that controls speed also provides braking. The output shaft speed decreases as lever is moved toward neutral. With lever in neutral, output stops.

6-1.2 Smooth Performance. This graph shows the difference in operation of the hydrostatic transmission compared to a speed gear transmission. The smooth curve represents the uniform matching of torque and speed requirements by the hydrostatic transmission.

The gear transmission has only three points of peak power while the hydrostatic transmission offers a continuous curve without peaks and valleys. You do not have to stop and shift down to gain more torque, just move the control lever toward neutral and the output torque capability increases. See Figure 6-1.

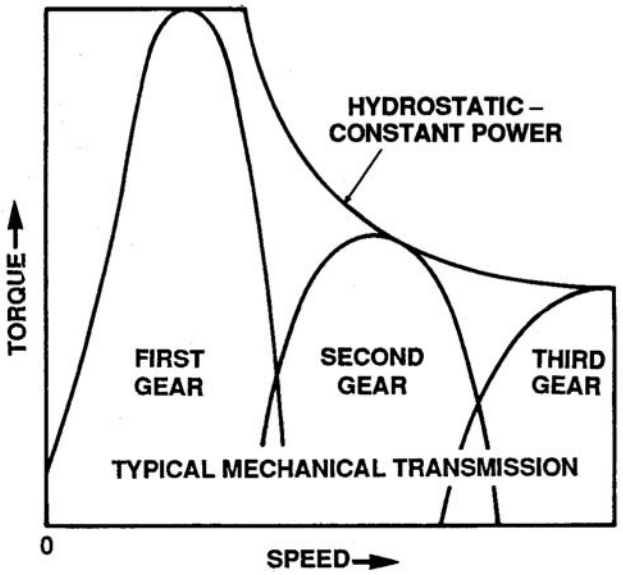


Figure 6-1. Hydrostatic/Mechanical Transmission Performance Graph

6-1.3 Simplified Operation. A single control lever connected to the pump section controls both speed and direction of the transmission output shaft. Infinite speed control is achieved by varying the displacement ratios between the pump and motor. Moving the control lever from neutral to forward produces one direction of output shaft rotation. When the lever is in neutral position, output shaft rotation stops. Moving the lever from neutral to reverse produces the opposite output shaft rotation from the forward position. Output shaft speed increases as the lever is moved from neutral.

6-1.4 Factors That May Affect Neutral Settings.

1. Unit efficiency. The more efficient a unit is, the narrower the neutral band width will be in a direct acting control swashplate, unless some neutral valving device is used.

2. Input speed. Faster input speeds have the capability to pump more fluid at the same swashplate angle.

3. Axle ratio. A higher ratio will take less pressure to make a vehicle move than one with a lower ratio, assuming similar vehicles.

4. Ground conditions. On flat smooth concrete, a vehicle will have less rolling resistance than on a rough or grassy surface.

5. Tire size, style, and pressure, along with vehicle weight, will have an effect on the coefficient of surface friction.

6. Temperature. A hydrostatic unit with oil at room temperature will generally be more efficient (less leakage) than one that is running at normal operating temperatures.

6-2. MODEL 7 HYDROSTATIC TRANSMISSION.

6-2.1 Fluid Flow.

1. Fluid flows through an internal closed loop between the pump and the motor. The flow is directed by the pump to the motor and then back to the pump. Because of leakage, the amount of fluid driven back of the motor is slightly less than that required by the pump. See Figure 6-2.

2. Check valves on the inlet side of the pump are open to the reservoir enabling the pump to draw fluid as needed. Speed control is achieved by changing the amount of oil delivered by the variable displacement pump to the fixed displacement motor by moving the control lever. See Figure 6-3.

3. The Model 7 hydrostatic pump is not a self purging pump and must be manually purged if it gets air in the system or is repaired. To purge the pump you would remove the air vent plug that is next to the expansion tank and fill the tank until fluid comes out of the vent opening. Replace the plug. With the hydrostatic pump cold, fill the expansion tank to the cold line. Run the unit to see that it is operating properly. If not, check the vent plug again for more air and repeat the procedure.

6-2.2 Fluid Level. The transmission fluid level should be checked prior to initial use. The level should not be above the COLD mark which is about 1/4 inch from the bottom of the reservoir/expansion tank. See Figure 6-4.

CAUTION

Overfilling reduces the expansion area in the reservoir/expansion tank and fluid will spill at operating temperatures.

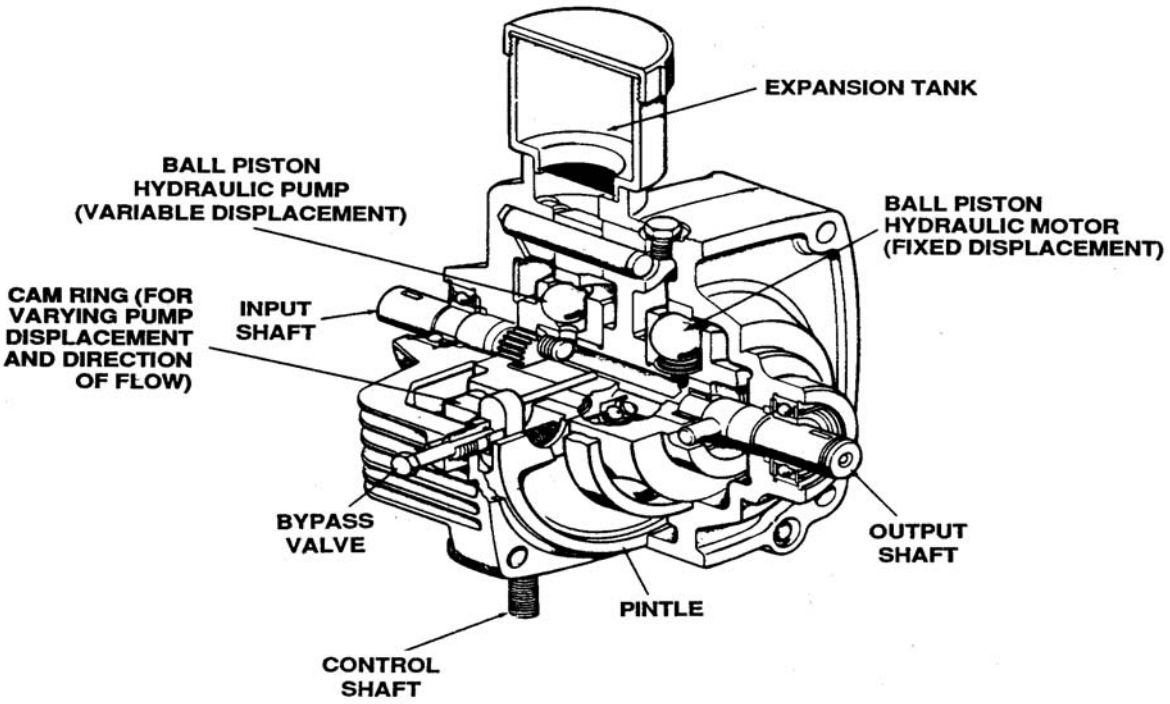


Figure 6-2. Model 7 Hydrostatic Transmission

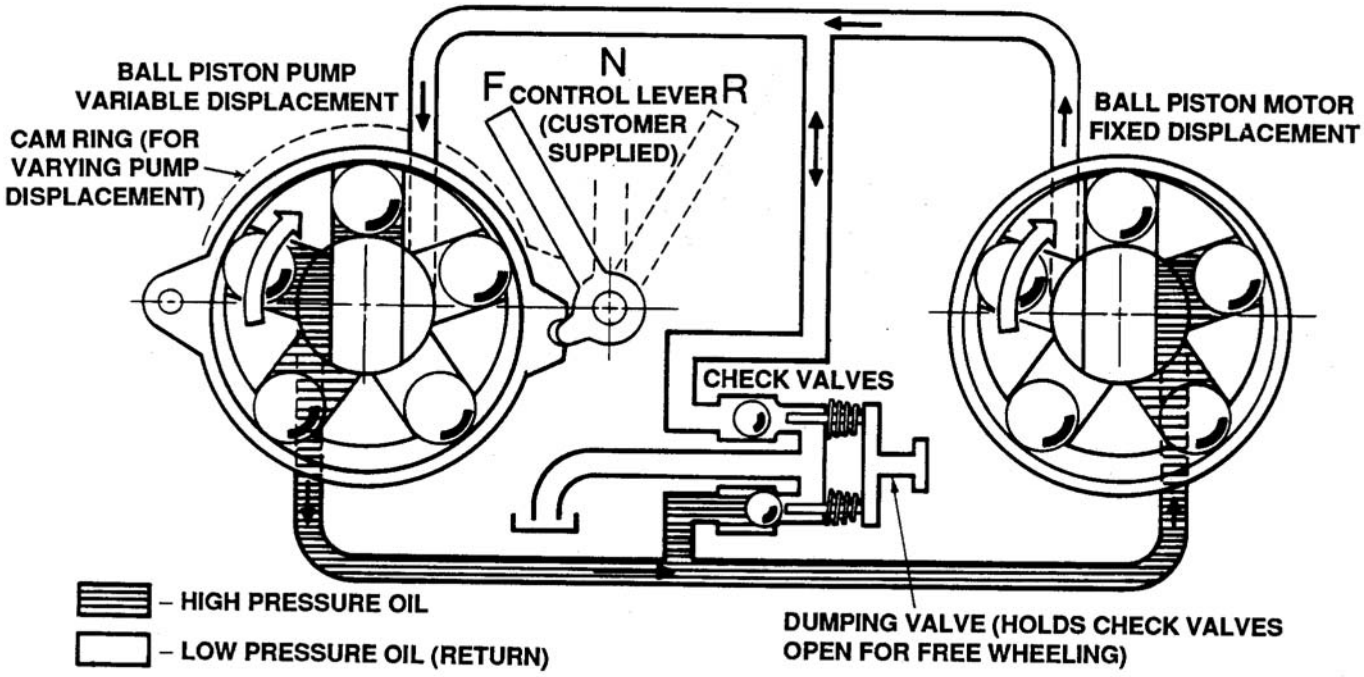


Figure 6-3. Fluid Flow Diagram

6-2.3 Transmission Fluid. Check or add fluid to transmission as follows:

1. Unscrew the parking brake and relief valve knobs.

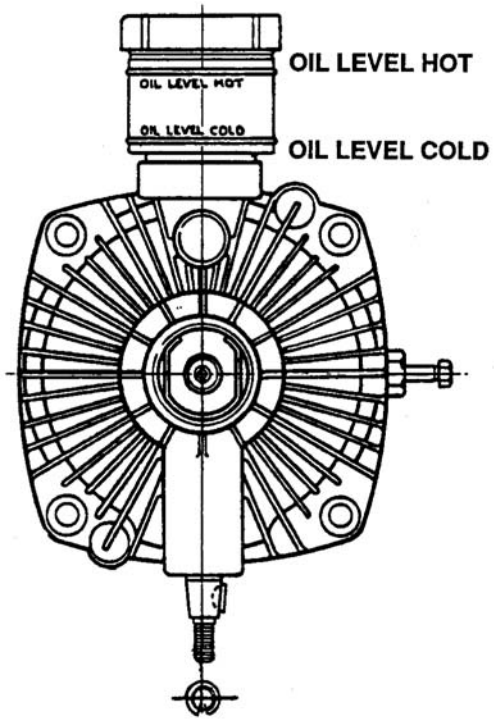


Figure 6-4. Reservoir/Expansion Tank

2. Unscrew the two screws holding the access cover located in front of the seat.

3. Check the oil level in the reservoir/expansion tank.

4. If it is necessary to add oil, remove the plastic plug, unscrew the cap on the reservoir/expansion tank and add oil through the hole with a funnel. Do not overfill.

NOTE

The threads on the reservoir/expansion tank are left-hand threads.

NOTE

If the improved cap and body are not on the lawn tractor, order reservoir kit, part number ET-990077-000. The kit will include the revised cover, revised body and an O-ring. To prevent moisture from mixing with the oil, order part number ET-107068. This part is a bladder which allows the oil to expand in the reservoir while sealing it from the atmosphere. See Service Bulletin R-228/YM-224.

6-2.4 Fluid Problems. Correct fluid problems as follows:

1. If frequent additions are required, locate the leak and correct. Inadequate supply of fluid may result in permanent internal damage.

2. If contaminate is observed on the reservoir/expansion tank screen, poor maintenance is indicated. Remove the reservoir/expansion tank, wash clean, dry and reinstall. If the screen is pierced, the reservoir/expansion tank should be replaced.

3. If the natural color of the transmission fluid has changed to black or milky, overheating and/or water contaminate is indicated. The fluid should be drained and replaced with new transmission fluid.

NOTE

The bladder prevents moisture from entering the hydrostatic pump by expanding and maintaining pressure. Unless the unit is repaired or the oil somehow becomes contaminated, this unit does not require any oil change for the life of the unit.

6-2.5 Changing Fluid. Change fluid as follows:

1. To drain the hydrostatic transmission, remove the hex plug on the bottom of the hydrostatic transmission.

2. To fill the hydrostatic transmission, remove the vent plug located next to reservoir/expansion tank to prevent an air lock. Fill transmission through reservoir until fluid overflows from vent plug, and fill to cold mark on reservoir/expansion tank (fluid capacity 22 ounces).

6-2.6 Hydrostatic Transmission Cooling. The hydrostatic transmission is cooled by the oil, fan and fins. Normal operating temperature is 180°F. If the hydrostatic transmission runs hot check to see if the fan is in operating condition, the oil level is correct and the fins are clean.

CAUTION

Do not use high pressure water spray or steam to clean the hydrostatic transmission.

6-2.7 Fluid Conditions. For satisfactory operation, the following fluid conditions apply:

1. Accurate level readings can be checked only when the fluid is cold.

2. If the natural color of the fluid has become black or milky, it is possible that an overheating or water contaminant problem exists.

3. Proper viscosity is essential. At normal operating temperatures, the optimum range is between 80° to 180° SUS (16-40 CS) and it should never fall below 60 SUS (10 CS).

4. The fluid should be chemically stable, incorporating rust and oxidation inhibitors.

6-2.8 Recommended Fluids for Models 7 and 11 Pumps. The following fluids are recommended:

1. Mobil Fluid 300
2. Texaco TL-2209
3. Dextron B (General Motors)
4. M2C-33F and M2B-41A (Ford Motor)
5. Hy-Tran (International Harvester)
6. 10W + Straight Viscosity __SE, CC or CD Rated Engine Oil

**7. 20W + Straight Viscosity __SE, CC or CD Rated Engine Oil

8. 30W + Straight Viscosity __SE, CC or CD Rated Engine Oil

**Supplied in M-6 and M-7 assemblies shipped from factory and preferred for applications using M-10 or M-11.

Figure 6-5. Hydrostatic Transmission Repair Service

Model 7 Hydrostatic Transmission Troubleshooting

No output torque (power) in either direction, cold start	1. Recheck relief valve position, control linkage, input drive. 2. Oil level in reservoir low. 3. Broken control shaft dowel pin. Transmission must be repaired or replaced.
Loss of output torque, continuous load.	1. Operating at conditions approaching hydraulic stall. The transmission fluid has exceeded 180°F. 2. Internal leakage due to wear. Transmission should be repaired or replaced. 3. Water in transmission fluid. Purge system of all fluid and replace with new transmission fluid. Replacement of the transmission is generally not necessary.
No output torque in one direction	1. One of the directional valves is stuck. Transmission should be repaired or replaced. 2. Low oil level.
Riding mower cannot be pushed with engine off.	1. Relief valve control not set. 2. Relief valve travel not adjusted. 3. Motor piston or rotor seized. Transmission must be repaired or replaced.
No neutral.	1. Recheck linkage. Loose linkage creates an adjustment problem NOTE: The hydraulic neutral band is very narrow. Deflection in the linkage may make it difficult to obtain neutral from both directions. It is recommended that neutral should be positive from forward drive.
Oil leakage at the relief valve.	1. Check O-ring for damage. Apply loctite PST5924 to threads and torque to 13 to 17 ft-lbs.
Oil leakage at the control shaft seal.	1. Spillage when fluid has been added to the reservoir. 2. Spillage at the vent in the reservoir at operating temperatures due to cold level being too high or water in the fluid. Reduce fluid level or replace fluid in the event there is water in it (milky color). 3. Loose oil reservoir or cover. 4. Loose vent bolt. 5. Damaged control shaft seal. Transmission should be repaired.
Noisy operation	1. Operating at part throttle. Hydrostatic transmission is designed to operate with the engine running at full throttle. 2. Water in transmission fluid. Replace transmission fluid. 3. Air in transmission fluid. Bleed air from vent.
Output shaft rotates in the opposite direction.	1. The transmission body is 180° out of position. Transmission has to be removed and reassembled correctly.

CAUTION

NEVER use a multiviscosity oil and ALWAYS use a nondetergent oil.

6-2.9 Troubleshooting. For troubleshooting Model 7 hydrostatic transmission, see Table 10-1.

6-3. BDU-10S HYDROSTATIC TRANSMISSION.

6-3.1 The Sundstrand Pump, part number 717-0940 is the help mate to the transmission, part number 717-0950. It is designed to worldwide standards; compact with a low noise rating. It is also highly efficient and meets the requirements of lawn and garden equipment.

6-3.2 The BDU-10S hydrostatic transmission draws fluid from the transmission housing and reservoir. An inlet filter is incorporated into the unit to insure that only clean fluid enters the system. See Figure 6-6.

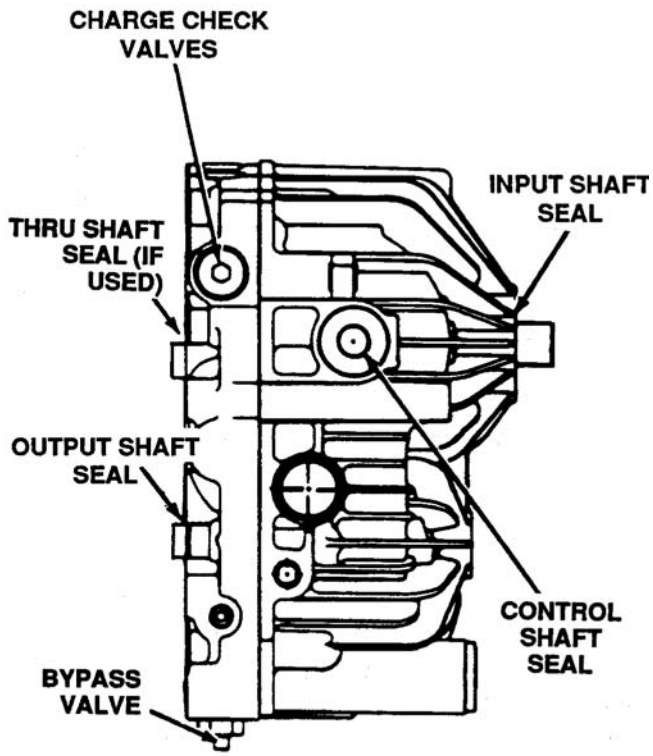


Figure 6-6. BDU-10S Hydrostatic Transmission

10-3.3 The combination of atmospheric pressure and a partial vacuum on the low pressure side of the closed loop forces fluid to flow through the filter and charge check valves. A charge pump is not used on the BDU-10S.

6-3.4 Typically a control lever, located on the top of the left fender, is connected to this pump and controls both the speed and direction of the tractor. A fail safe device is built into the tractor providing a force in its control system that will return the pintle shift lever to neutral position. A fan, mounted on top of the mating transmission input shaft cools the pump as air is dispersed by blowing through the fins mounted on the housing. See Figure 6-7.

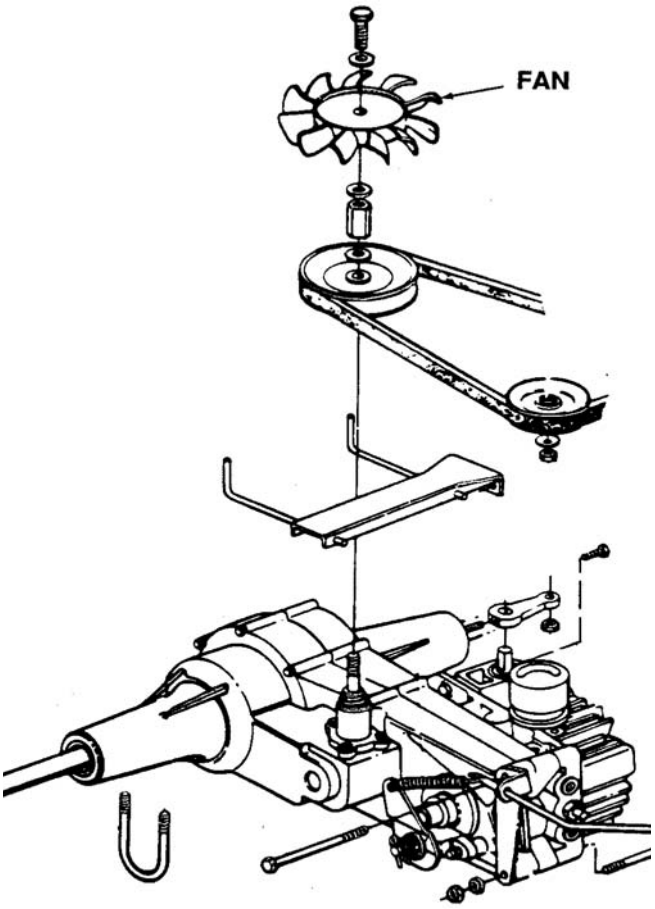


Figure 6-7. Cooling Fan

6-3.5 The hydrostatic transmission fluid is installed at the factory and should not require changing for the life of the unit. If transmission fluid is needed, use only 10W30 engine oil rated SF or CD.

NOTE

For 1990 production Sundstrand BDU-10S hydrostatic units, the inlet filter access plug has been removed and blocked off. The only way to change this filter is by splitting the housing halves. This should only be done if the fluid becomes contaminated.

6-3.6 To check or add fluid to the transmission:

1. Unscrew the parking brake and relief valve knobs.
2. Unscrew the two screws holding the access cover located in front of the seat.
3. Check the fluid level in the expansion tank.
4. If it is necessary to add fluid, unscrew the cap on the expansion tank. The cap has left-hand threads. Remove the rubber bladder. Add fluid, using a funnel, to bring level to LOWER mark of expansion tank. Do not overfill. See Figure 6-8.
5. Reassemble parts.

NOTE

The expansion tank has left-hand threads.

6-3.7 Fluid Problems. Correct fluid problems as follows:

1. If frequent additions are required, locate the leak and correct. Inadequate supply of fluid may result in permanent internal damage.
2. If the natural color of the transmission fluid has changed, black or milky, overheating and/or water contaminate is indicated. The fluid should be drained and replaced with new transmission fluid.

NOTE

The bladder in the reservoir prevents moisture from entering the hydrostatic pump by expanding and maintaining pressure.

3. If fluid contains air bubbles, it is critical that the air be purged from the system. Resulting symptoms include: noisier operation, lack of power after short term of operation, high operating temperature, or excessive fluid expansion.

6-3.8 Changing Transmission Fluid. To drain the hydrostatic transmission, remove the hex plug on the bottom of the hydrostatic transmission.

6-3.9 Purging the Sundstrand Pump. Purge the pump as follows:

1. Ensure that the fluid level is visible in the expansion tank. If fluid is not visible, add fluid to bring level to the LOWER mark of the expansion tank. It may be necessary to tilt the transmission and expel any air that may be trapped in the housing. Refill to the LOWER mark of the expansion tank. Do not overfill. See Figure 6-8 on page 6-9.
2. Raise and secure both rear wheels and run the engine at low idle.
3. With the bypass valve closed, cycle the pump by slowly moving the shifter forward and reverse several times. As air is purged from the system, the fluid level in the expansion tank will drop, and air bubbles may appear in the fluid. Stop the engine, and add fluid to bring level to the LOWER mark of the expansion tank. Do not overfill.
4. Open the bypass valve and cycle the pump again with engine running at low idle. When the air purges out of the pump, oil will take its place. Stop the engine, and add fluid to bring level to the LOWER mark of the expansion tank. Do not overfill.
5. Check the reservoir periodically. If the fluid drops below the reservoir, air will recycle in the pump.
6. Repeat the procedures until all air is purged. The air vents through the reservoir cap.

CAUTION

If the gas tank has been removed or changed, the mounting strap can be put on backward, causing the tank to tilt down into the fan. Newer models have a smaller gas tank and smaller diameter fan installed. If you replace the old gas tank with the newer tank, the gas gauge also will have to be replaced with an 11 inch gas gauge, part number 751-0226.

6-3.10 Fluid Level. The transmission fluid level should be checked prior to initial use. The level should not be above the LOWER mark which is about 1/4 inch from the bottom of the expansion tank. Overfilling reduces the expansion area in the expansion tank and fluid will spill at operating temperatures. See Figure 6-8 on page 6-9.

6-3.11 Expolded view of Sundstrand BDU-10S Transmission (Part Number 717-0940). See Figure 6-9.

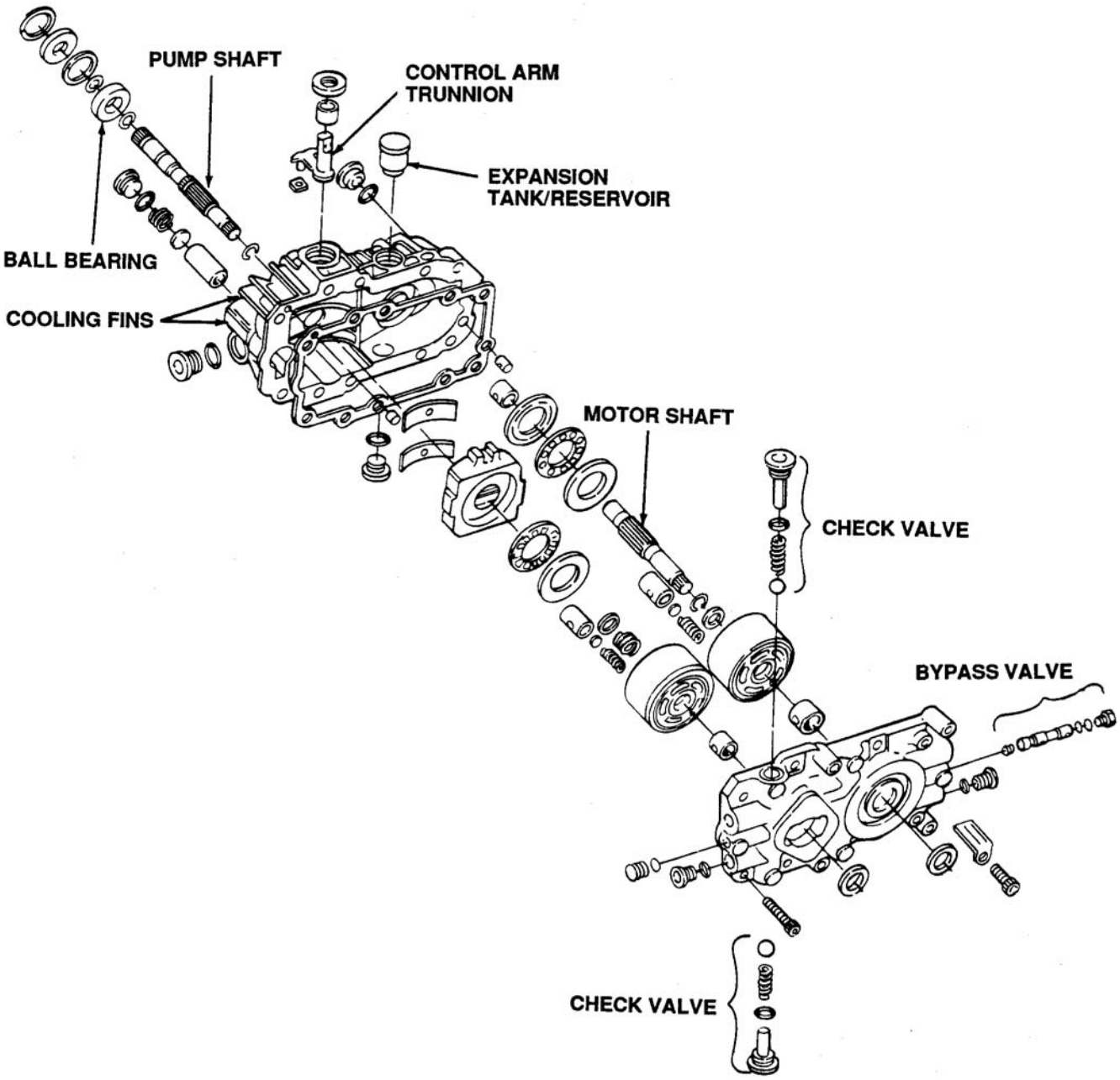


Figure 6-9. Sundstrand BDU-10S Transmission

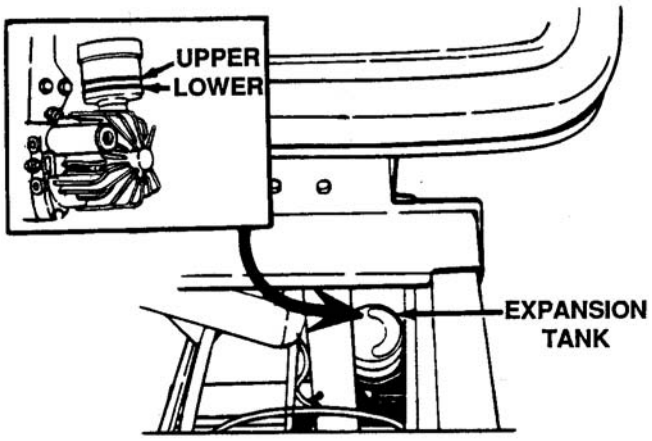


Figure 6-8. Expansion Tank

1. Oil tank disassembly.

   a. Unscrew the cap. (This cap has a left-hand thread.) See Figure 6-10.

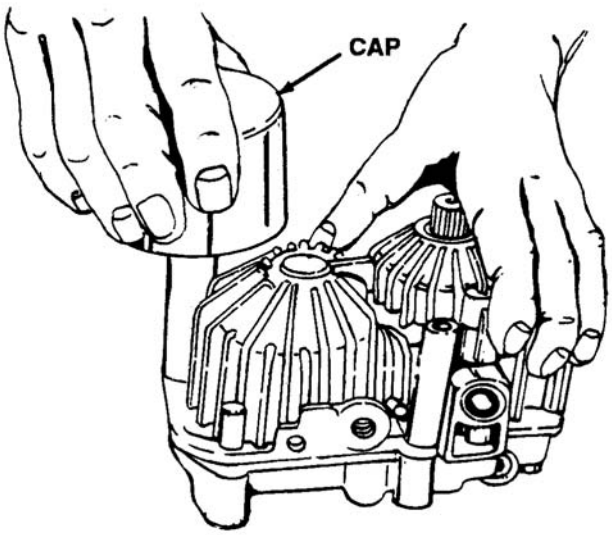


Figure 6-10. Oil Tank Cap Removal

   b. Unscrew oil tank. See Figure 6-11.

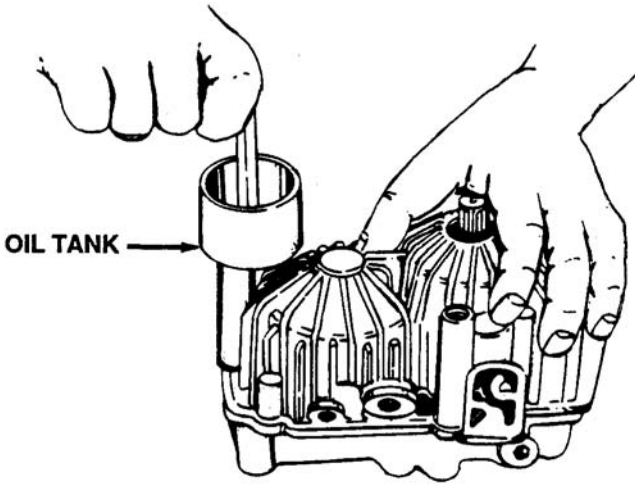


Figure 6-11. Oil Tank Removal

2. Center section disassembly.

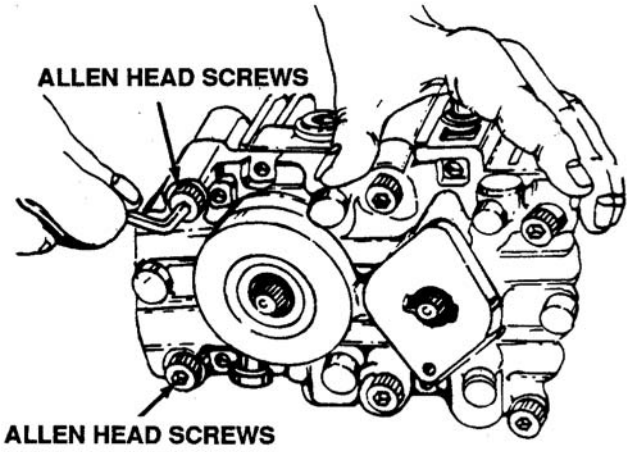


Figure 6-12. Location of Allen Head Screws

   a. Remove the allen head screws. See Figure 6-12.

   b. Lift the center section off the transmission. Take care not to damage the surface of the center section and cylinder blocks. See Figure 6-13.

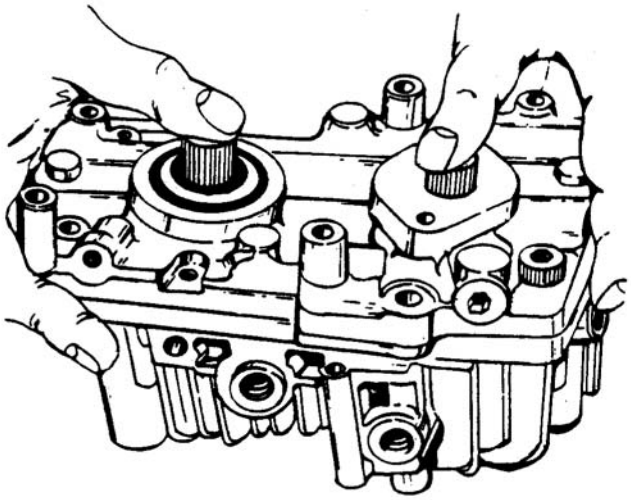


Figure 6-13. Removal of Center Section

c. Remove the gasket. See Figure 6-14.

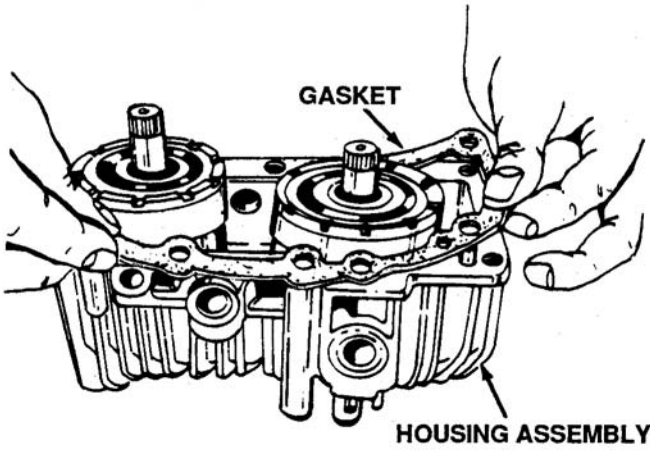


Figure 6-14. Removing Gasket

d. Remove locating pins. See Figure 6-15.

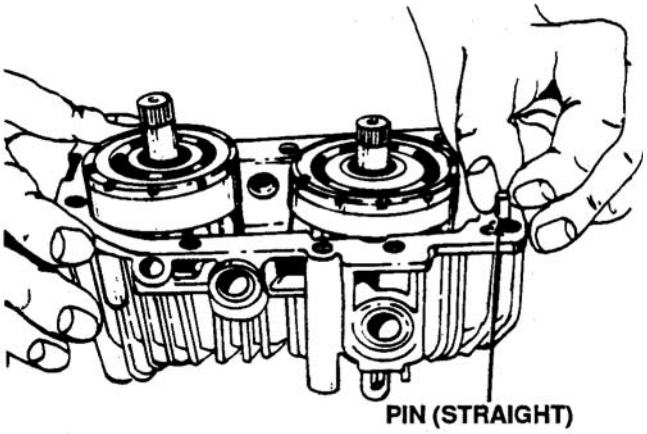


Figure 6-15. Removing Pins

3. Cylinder block kit and thrust ball bearing disassembly. See Figure 6-16.

a. Lay the housing on its side.

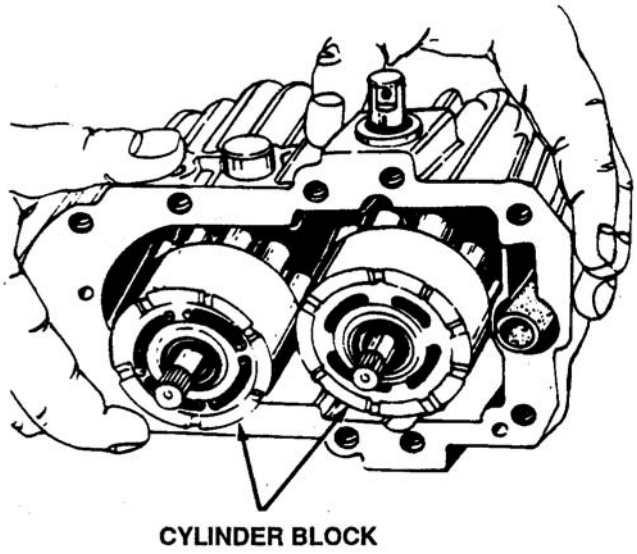


Figure 6-16. Cylinder Block

b. Slide out cylinder block kits (pump motor). The motor shaft will slide out with the cylinder block kit. Take care not to damage the sur-face of cylinder blocks. See Figure 6-17.

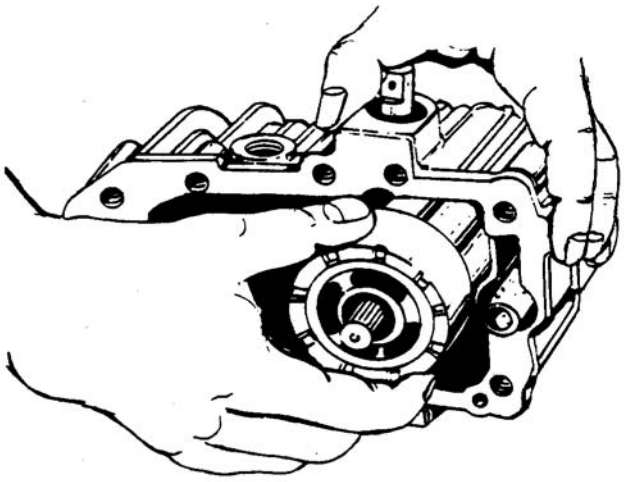


Figure 6-17. Removing Pump and Motor

c. Remove the thrust ball bearings. See Figure 6-18.

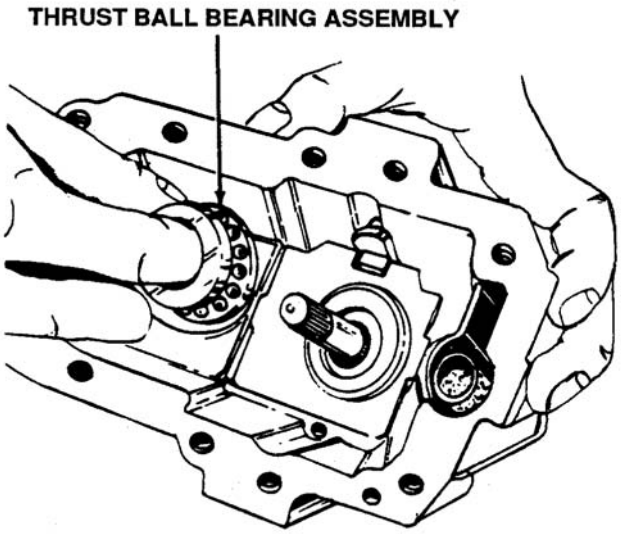


Figure 6-18. Removing Ball Bearings

4. Swashplate and filter disassembly.

a. Remove the spring and washer. See Figure 6-19.

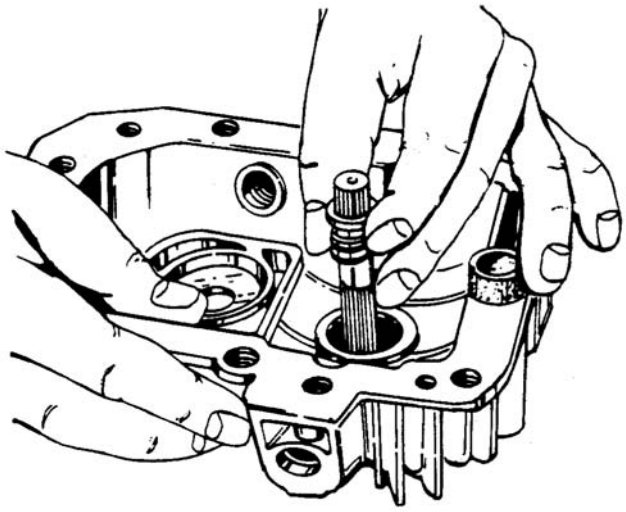


Figure 6-19. Removing Spring and Washer

b. Remove the swashplate from the housing. See Figure 6-20.

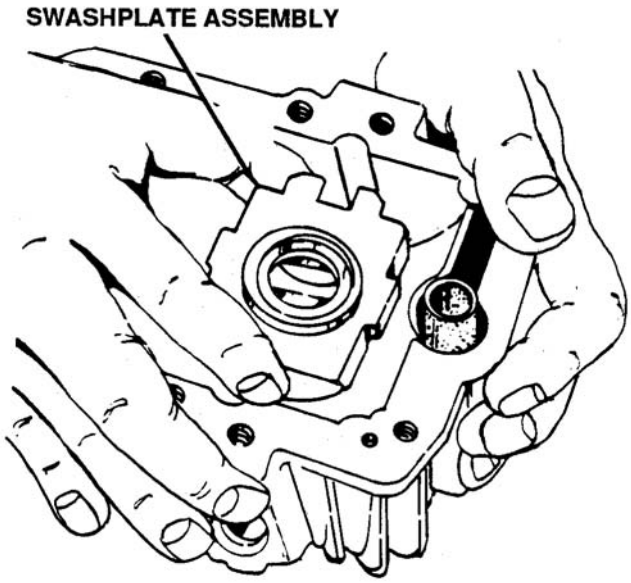


Figure 6-20. Swashplate Assembly

c. Remove the thrust plate and thrust roller from the swashplate. See Figure 6-21.

6

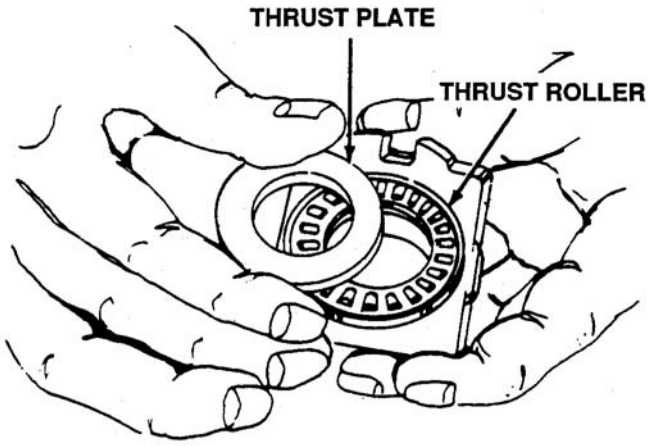


Figure 6-21. Thrust Plate and Thrust Roller

d. Remove the slot guide and cradle bearings. See Figure 6-22.

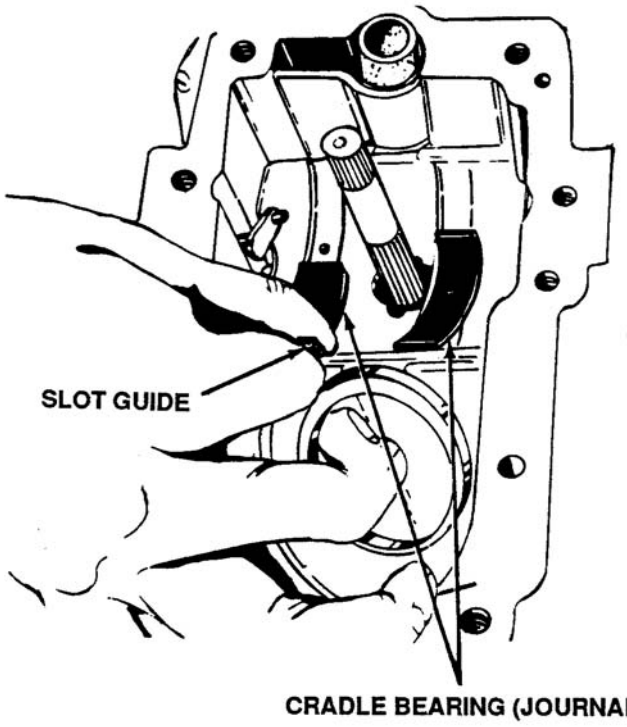


Figure 6-22. Removing Slot Guide and Cradle Bearings

e. Remove the filter, washer and spring. See Figure 6-23.

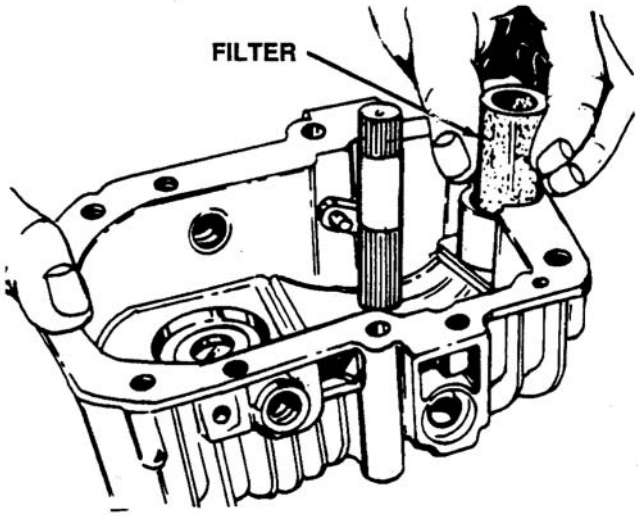


Figure 6-23. Removal of Filter

5. Pump shaft and trunnion arm disassembly.

a. Remove retaining ring. See Figure 6-24.

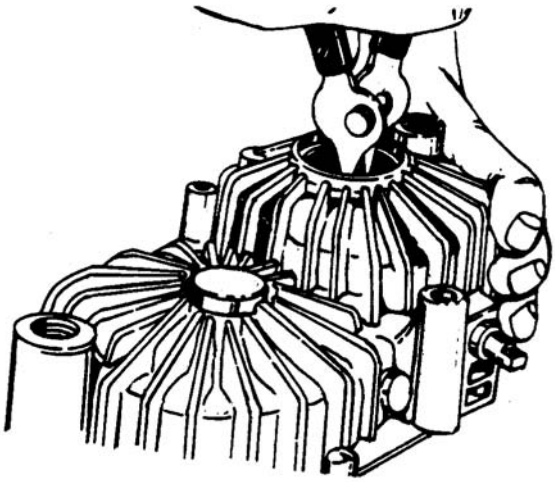


Figure 6-24. Retaining Ring Removal

b. Puncture oil seal and pry it out with screwdriver. Take care not to damage the shaft and housing. See Figure 6-25.

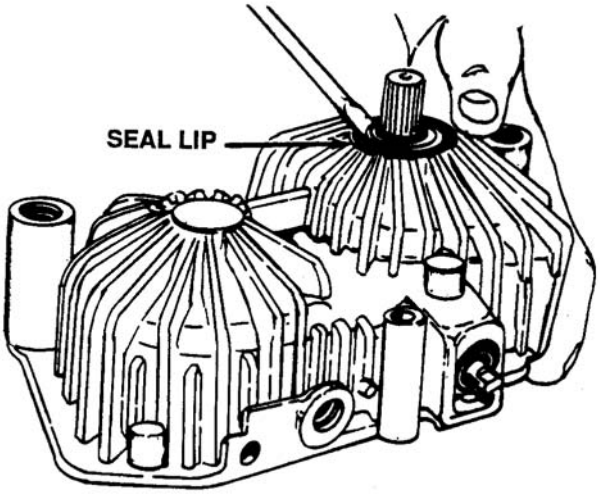


Figure 6-25. Oil Seal Removal

c. Remove spacer. See Figure 6-26.

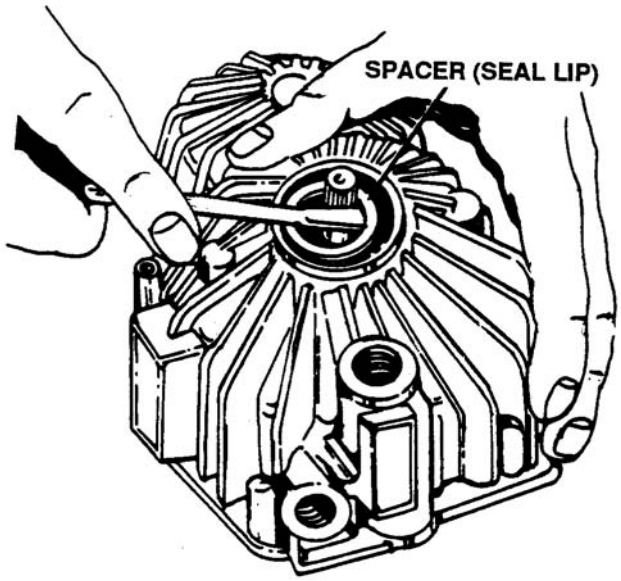


Figure 6-26. Removal of Spacer

d. Tap the end of the pump shaft with a soft hammer lightly to slide it out from the housing. See Figure 6-27.

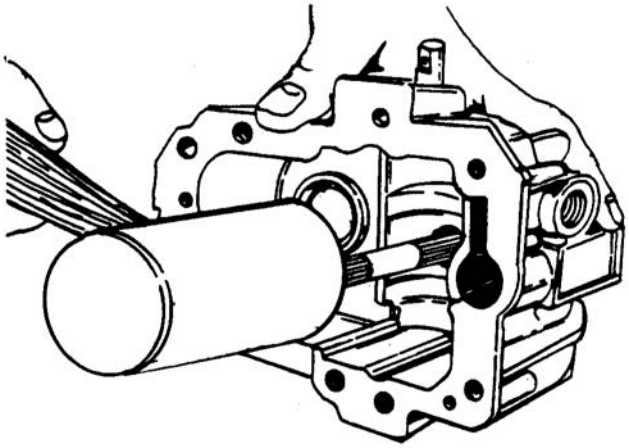


Figure 6-27. Removal of Pump Shaft

e. Remove trunnion arm. See Figure 6-28.

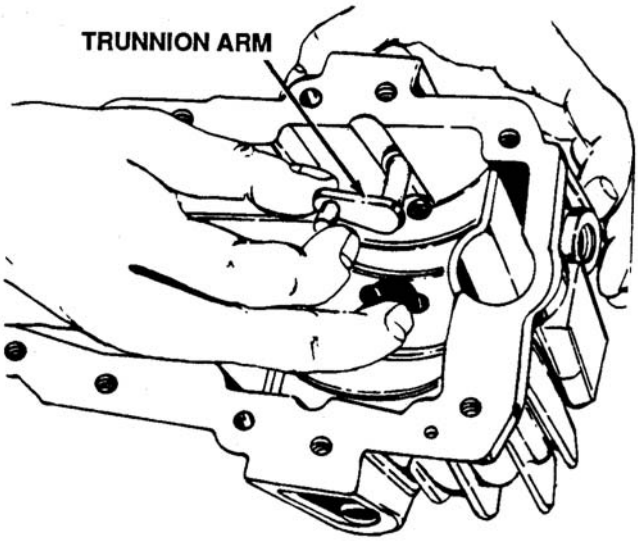


Figure 6-28. Removal of Trunnion Arm

f. Pry oil seal out with screwdriver. Take care not to damage the housing. See Figure 6-29.

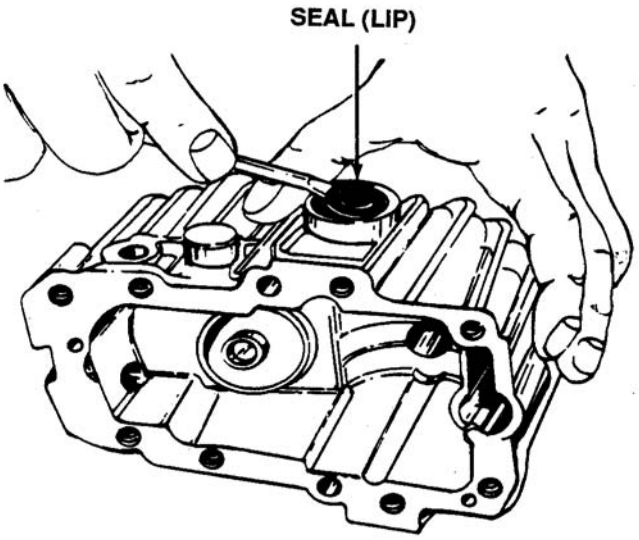


Figure 6-29. Oil Seal Removal

g. Press out journal bearing with soft hammer. See Figure 6-30.

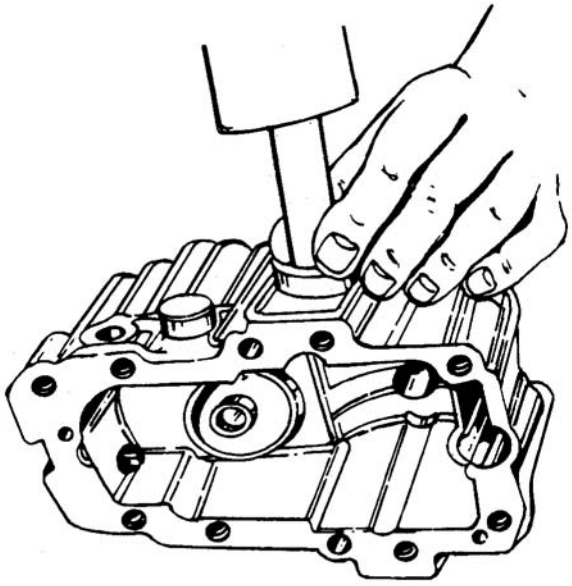


Figure 6-30. Pressing Out Journal Bearing

6. Check valve disassembly.

   a. Remove plug. See Figure 6-31.

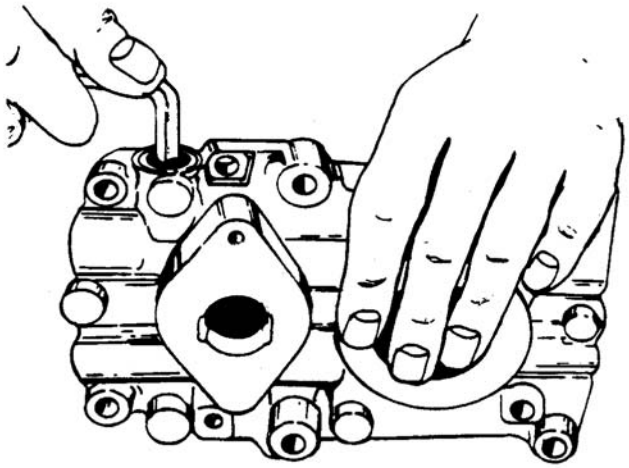


Figure 6-31. Plug Removal

b. Remove spring and check valve (ball) from bore in center section. In removing check valve (ball), care should be taken that it does not fall into the closed loop passage. See Figure 6-32.

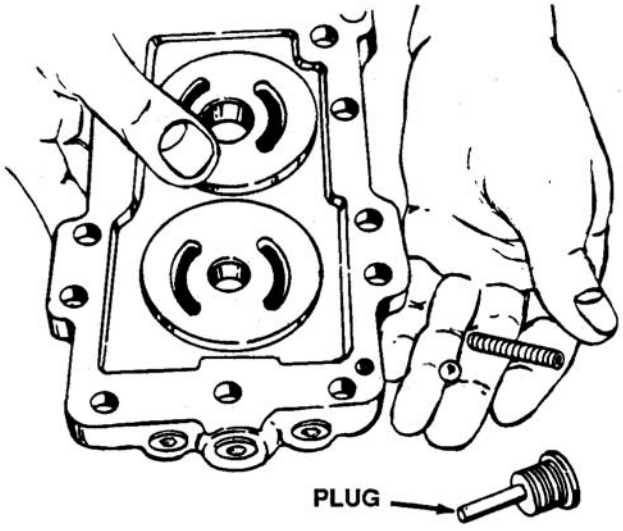


Figure 6-32. Ball and Spring Removal

c. Remove balls and springs from both sides. See Figure 6-33.

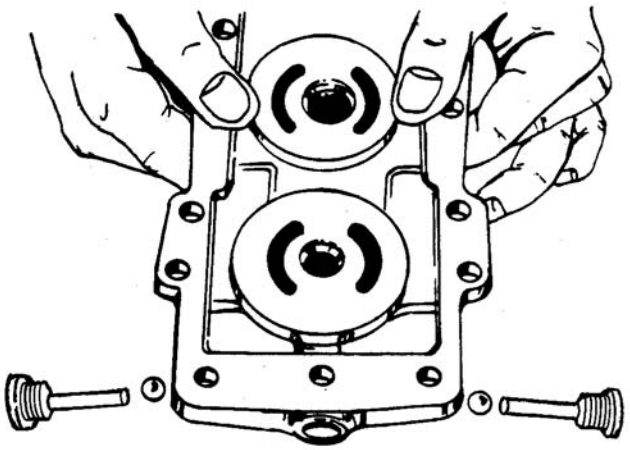


Figure 6-33. Ball and Spring Removal

7. Bypass valve disassembly.

   a. Remove plug and bypass spool. See Figure 6-34.

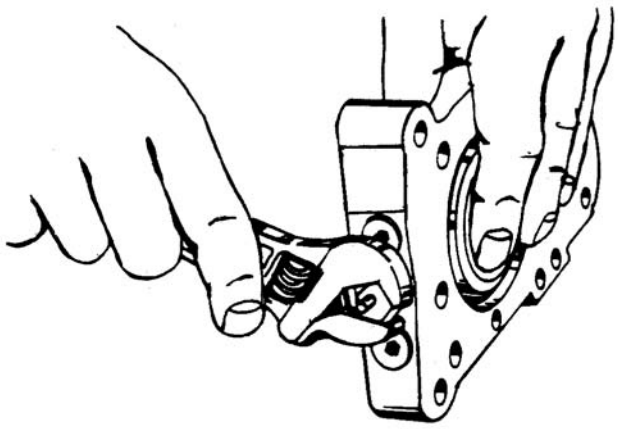


Figure 6-34. Removing Plug

   b. Remove spring from center section. See Figure 6-35.

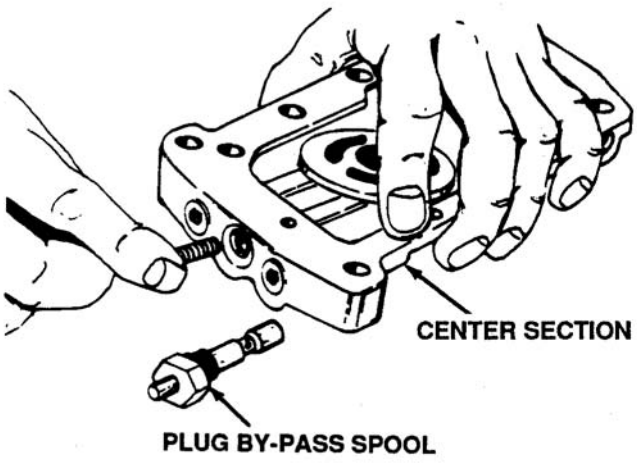


Figure 6-35. Removal of Spring

8. Oil seal (center section) removal. Pry oil seal out with screwdriver. Take care not to damage center section. See Figure 6-36.

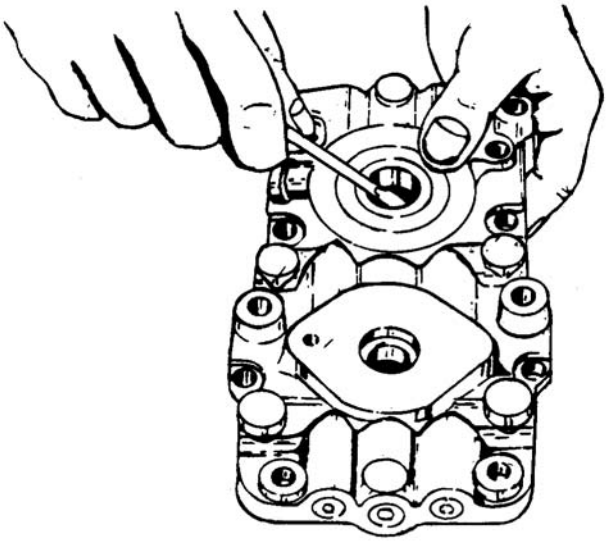


Figure 6-36. Removal of Oil Seal

9. Press out needle bearing. See Figure 6-37.

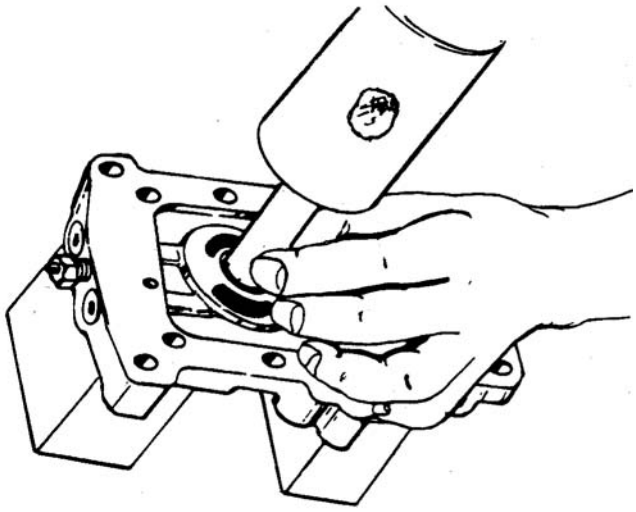


Figure 6-37. Removal of Needle Bearing

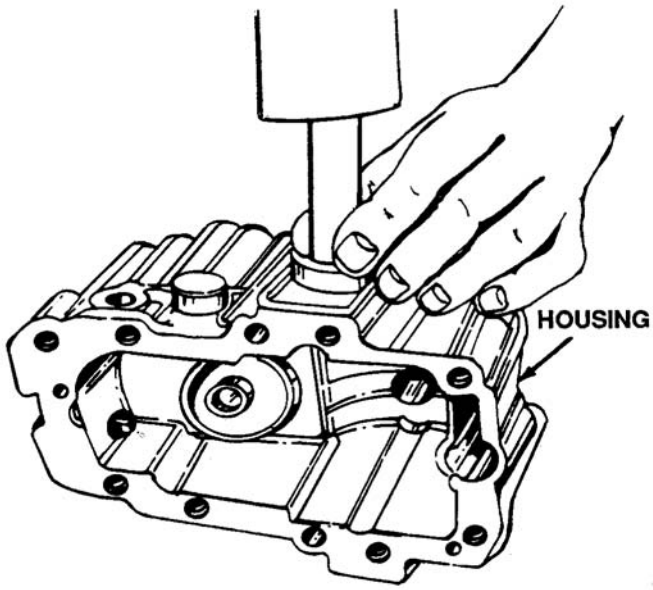


Figure 6-38. Pressing Journal Bearing Into Housing

6-3.12 Assembly of Sundstrand BDU-10S.

CAUTION

Cleanliness is the primary means of insuring satisfactory transmission life. Take care to clean parts when assembling them. Pay attention to protect each part, especially all exposed sealing surfaces, from damage.

1. Trunnion arm assembly.

   a. Press journal bearing into the housing. See Figure 6-38.

   b. Install trunnion arm. See Figure 6-39.

   c. Pump shaft inspection.

   (1 Check seal surface, bearing surface, spline and bearing for damage (pump, motor). See Figure 6-40.

   d. Press shaft into the housing. See Figure 6-41.

   e. Place spacer on bearing. See Figure 6-42.

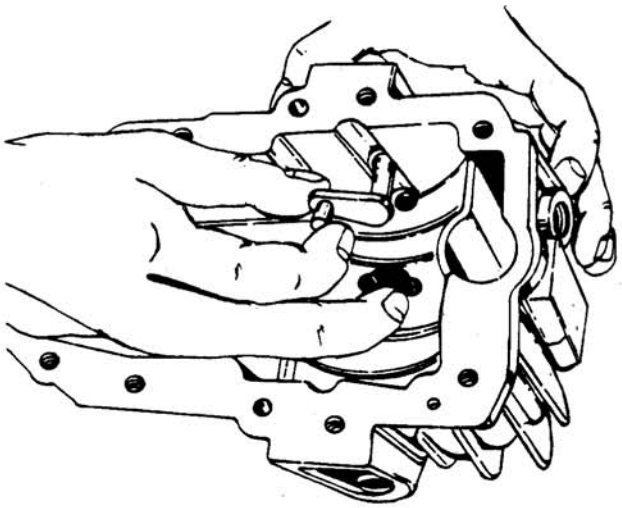


Figure 6-39. Installing Trunnion Arm

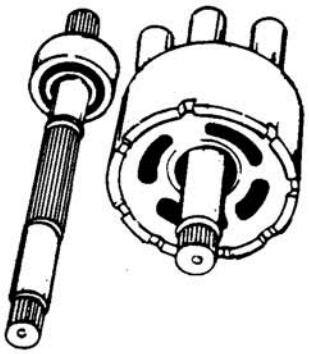


Figure 6-40. Pump and Motor Inspection

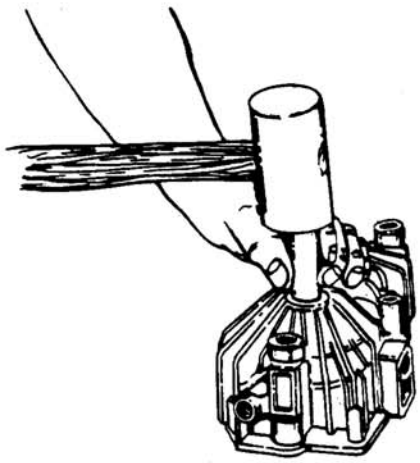


Figure 6-41. Pressing Shaft Into Housing

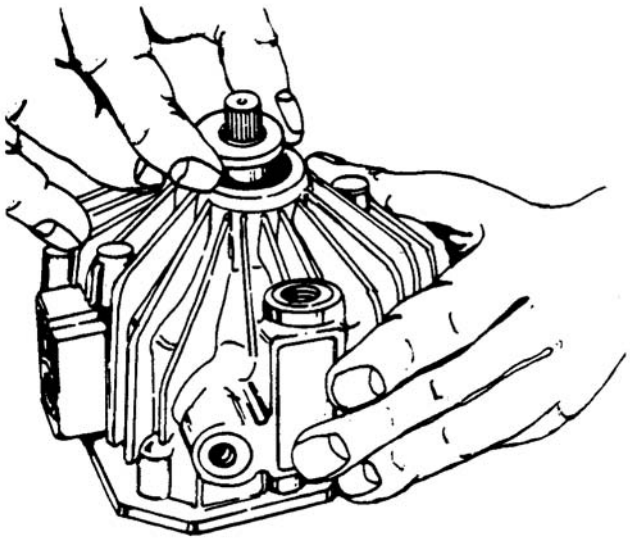


Figure 6-42. Installing Spacer

f. Coat new oil seal lip with grease. See Figure 10-43.

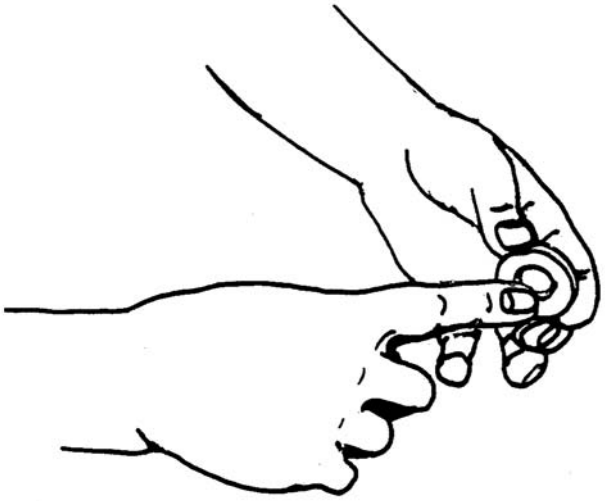


Figure 6-43. Greasing Oil Seal Lip

g. Cover pump shaft with thin tape to protect oil seal lip. See Figure 10-44.

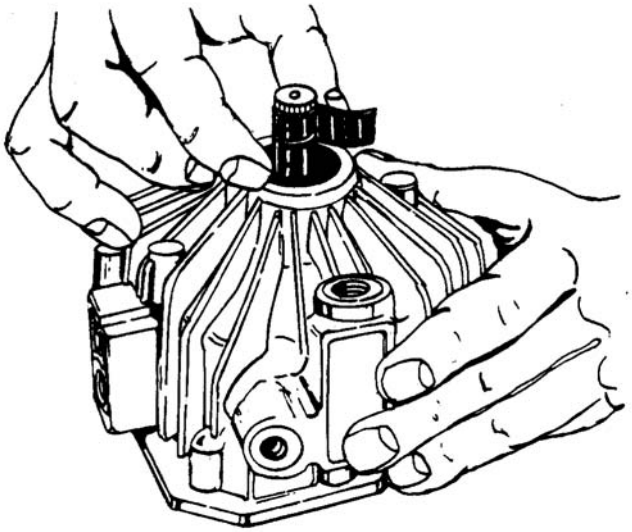


Figure 6-44. Covering Pump Shaft With Tape

h. Press seal into housing bore. See Figure 6-45.

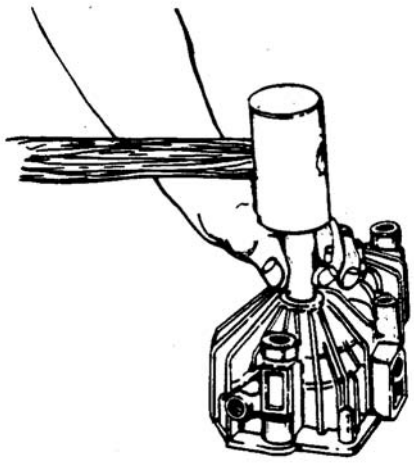


Figure 6-45. Pressing Seal Into Housing

i. Install retaining ring in groove in housing. See Figure 6-46.

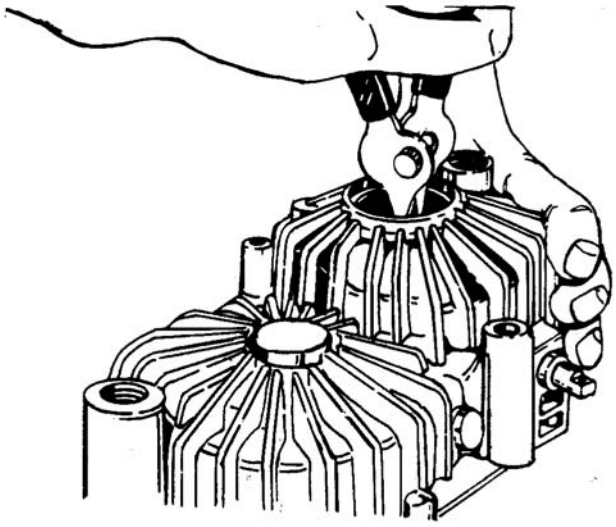


Figure 6-46. Installing Retaining Ring

2. Swashplate and filter assembly.

a. Check filter. Replace spring, washer and filter. See Figure 6-47.

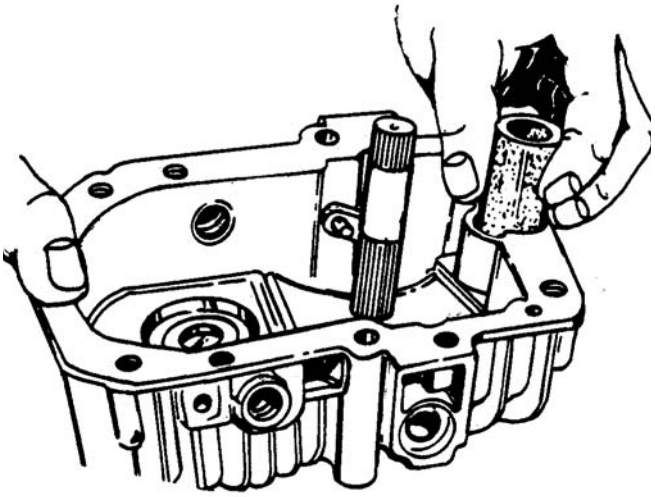


Figure 6-47. Installing Filter

b. Slide slot guide on trunnion arm. See Figure 6-48.

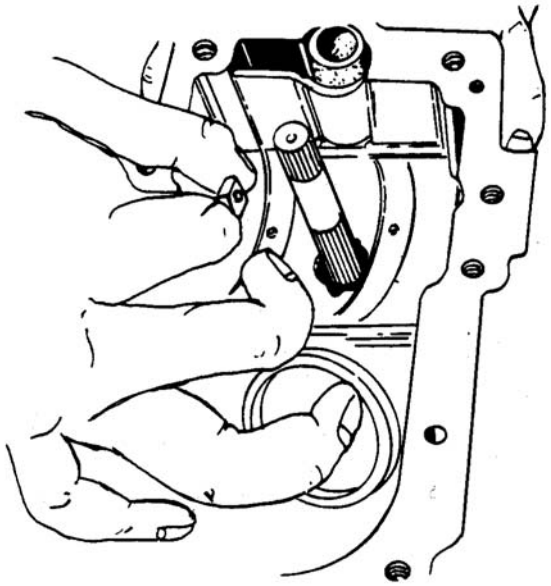


Figure 6-48. Installing Slot Guide

c. Place swashplate into housing keeping slot guide from moving with screwdriver. See Figure 6-49.

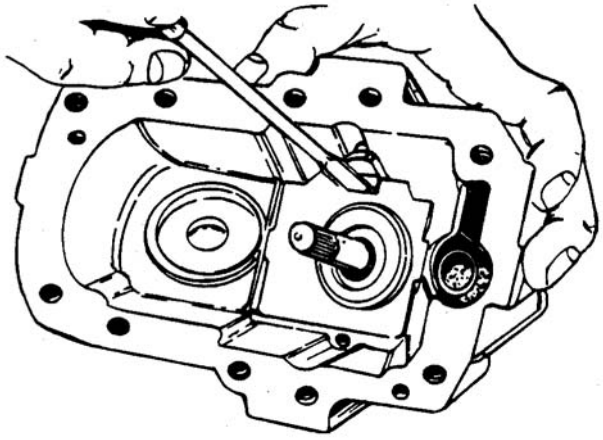


Figure 6-49. Install Swashplate

3. Thrust plate, roller and bearing assembly.

   a. Place thrust plate and thrust roller into swash plate. See Figure 6-50.

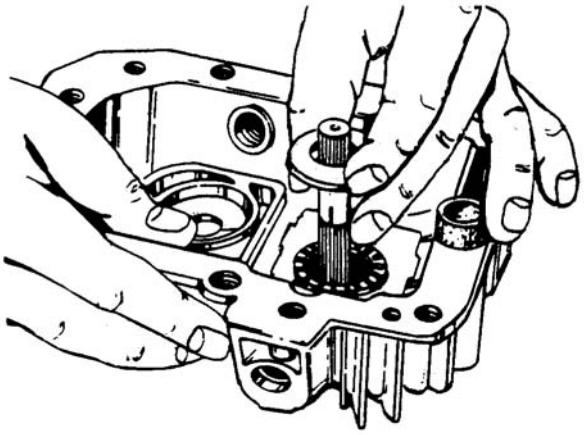


Figure 6-50. Installing Thrust Plate and Thrust Roller

   b. Place washer and spring on swashplate. See Figure 6-51.

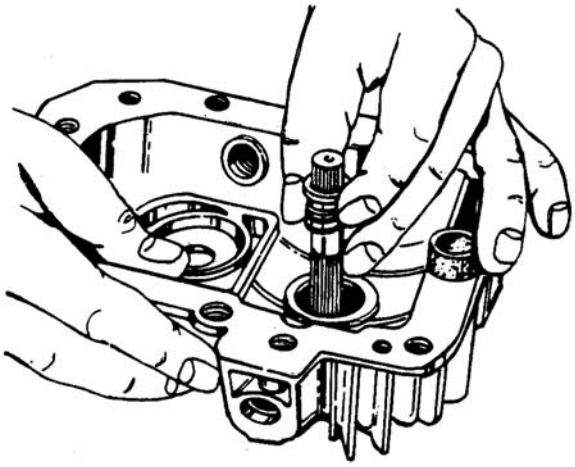


Figure 6-51. Installing Washer and Spring

   c. Replace thrust ball bearing (motor). See Figure 6-52.

4. Cylinder block kit inspection.

   a. Check cylinder blocks and pistons for scratches and wear. See Figure 6-53. When the surface of cylinder block is worn down more than .01 mm, replace cylinder block kit with new one (pump, motor).

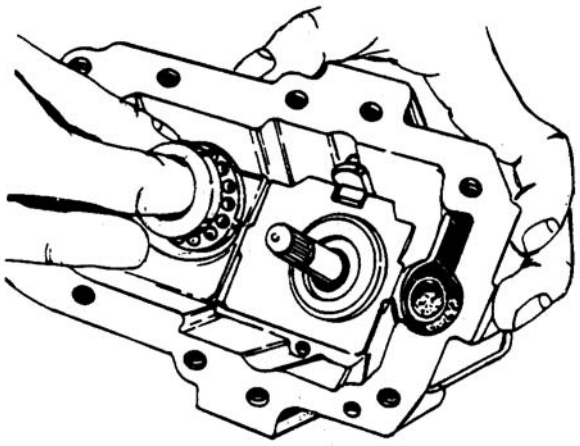


Figure 6-52. Replacing Thrust Ball Bearing

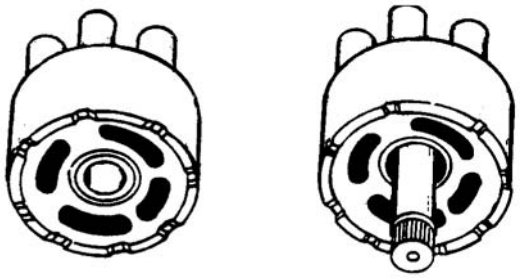


Figure 6-53. Inspecting Cylinder Block and Pistons

b. Check to be sure pistons are free in bores (pump, motor). See Figure 6-54. Figure 6-50. Installing Thrust Plate and Thrust Roller

Figure 6-54. Checking Movement of Pistons in Bores

c. Lay housing on its side and slide cylinder block kits into housing (pump, motor). See Figure 6-55.

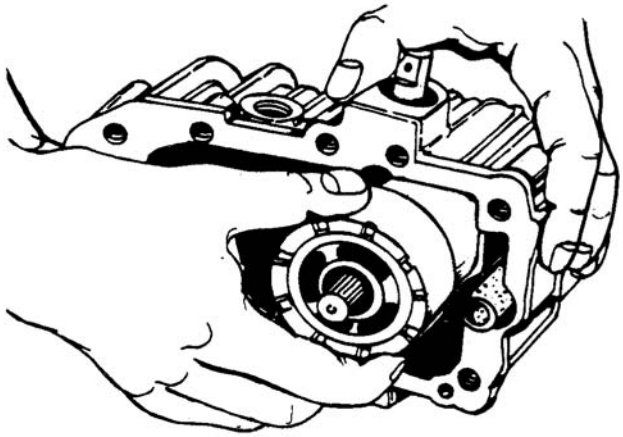


Figure 6-55. Installing Cylinder Block Kits in Housing

d. Check cylinder block kits for free rotation. See Figure 6-56.

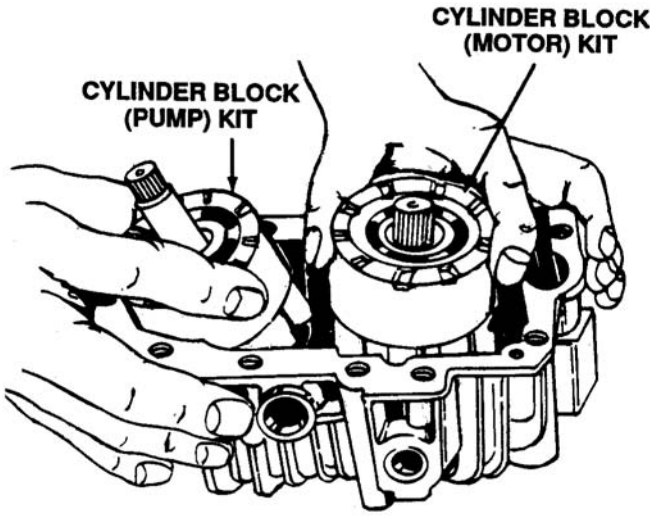


Figure 6-56. Checking Rotation of Cylinder Block Kits

e. Check piston springs for correct placement. If they are out of place, correct placement with small screwdriver. See Figure 6-57.

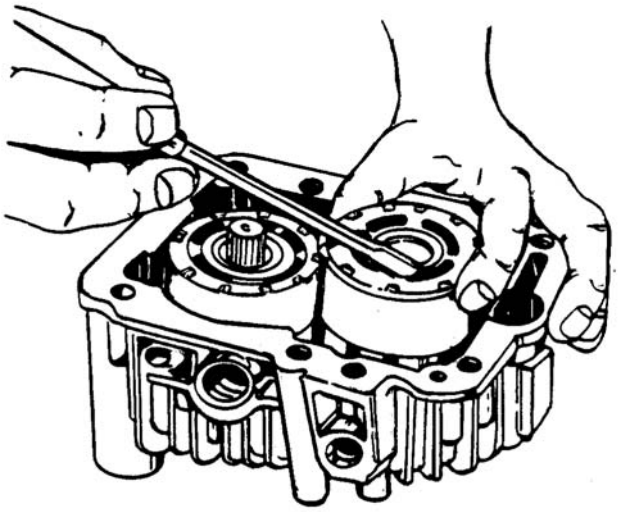


Figure 6-57. Positioning Piston Springs

5. Center section inspection.

   a. Examine wear surface of center section for excessive scratching or heavy wear patterns. When surface of center section is worn down more than .01 mm, replace center section with new one. See Figure 6-58.

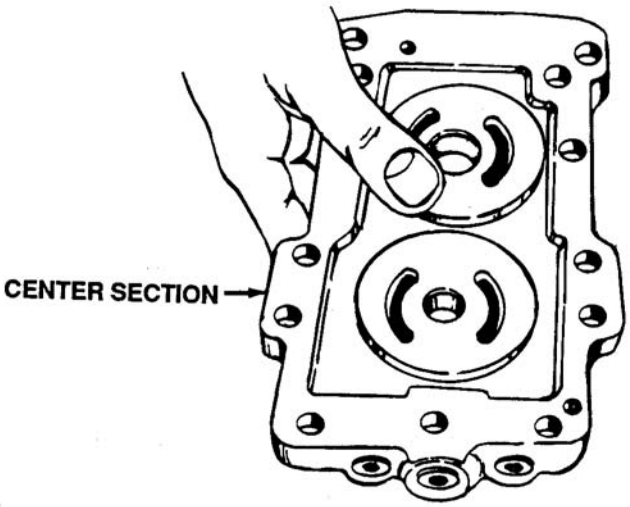


Figure 6-58. Inspection of Center Section

   b. Press needle bearing into center section. See Figure 6-59.

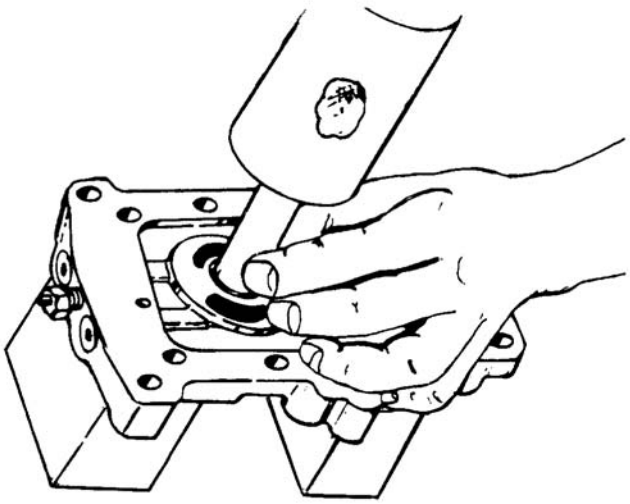


Figure 6-59. Pressing Needle Bearing Into Center Section

   c. Lubricate exposed face of cylinder block with clean hydraulic oil. See Figure 6-60. Check locating pins (2 places) to place in the housing.

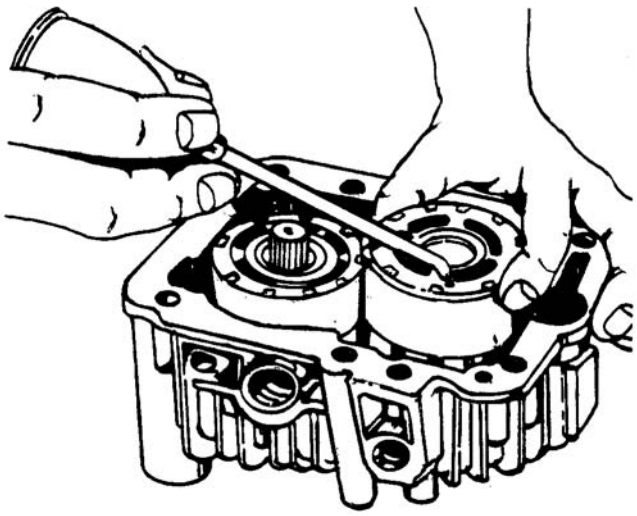


Figure 6-60. Lubricating Cylinder Block

   d. Place a new gasket on housing. See Figure 6-61.

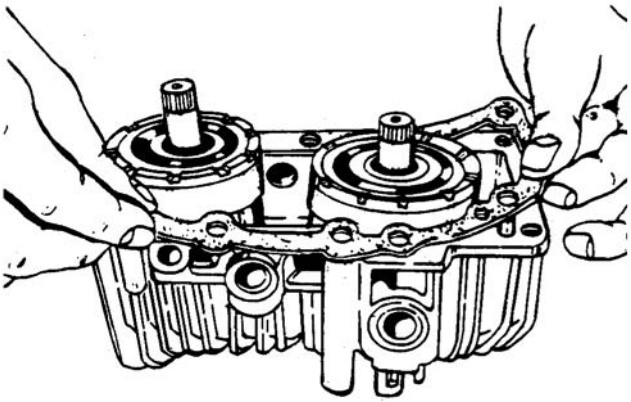


Figure 6-61. Installing Gasket

e. Place center section onto housing. Take care not to damage center section and housing. See Figure 6-62.

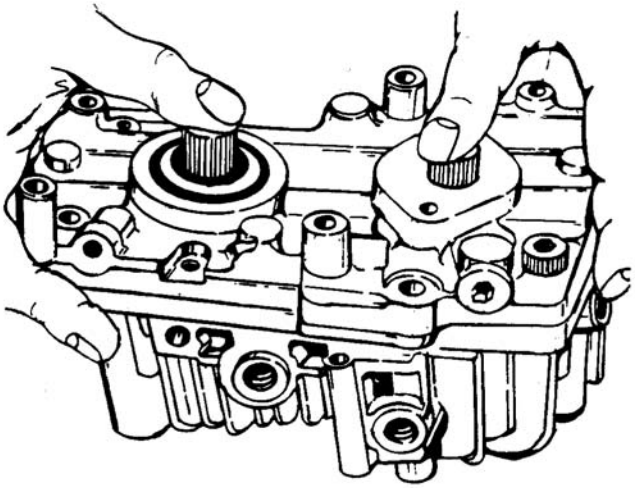


Figure 6-62. Installing Center Section

f. Insert eight allen head screws. See Figure 6-63.

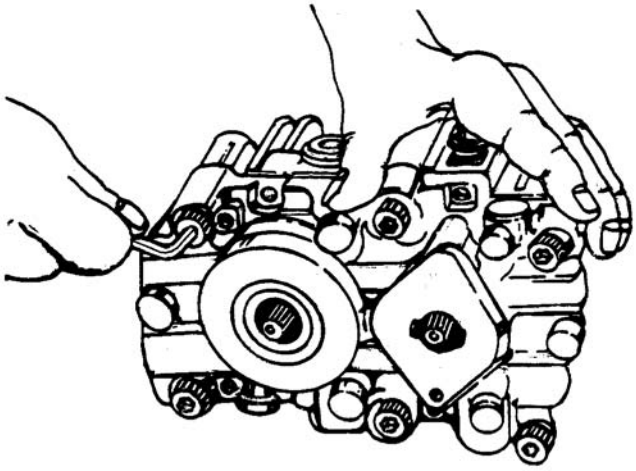


Figure 6-63. Location of Allen Head Screws

NOTE

Longer screws are inserted in outer bores of center section.

g. Tighten these screws equally and pull two sections (housing and center section) together completely. Apply 120-180 in-lbs (10-15 ft-lbs) torque.

h. Coat new oil seal lip with grease. See Figure 6-64.

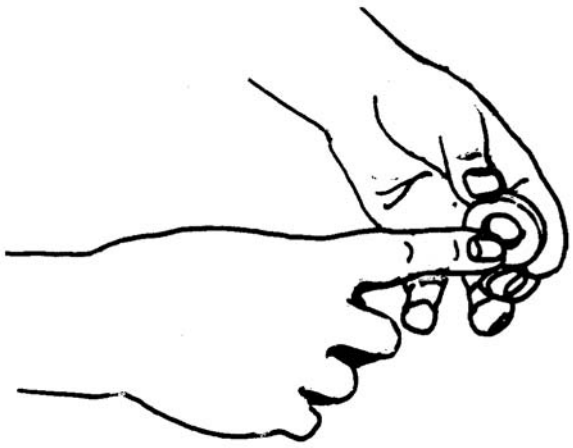


Figure 6-64. Greasing Oil Seal Lip

i. Cover shaft with thin tape to protect oil seal lip. See Figure 6-65.

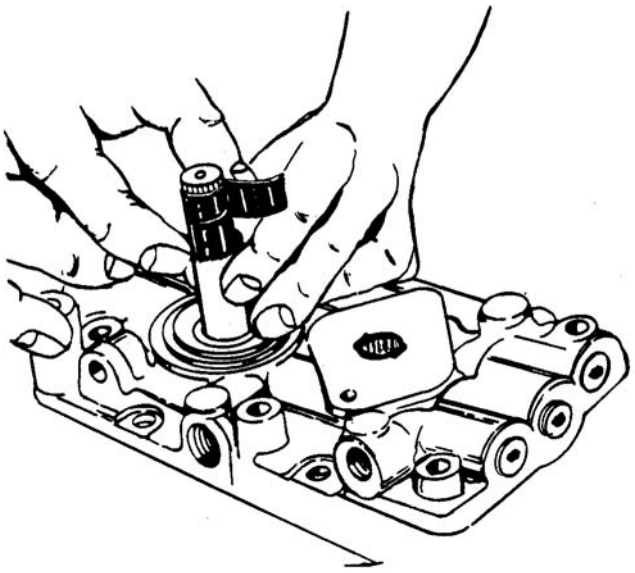


Figure 6-65. Covering Pump Shaft With Tape

j. Press seal into center section. See Figure 6-66.

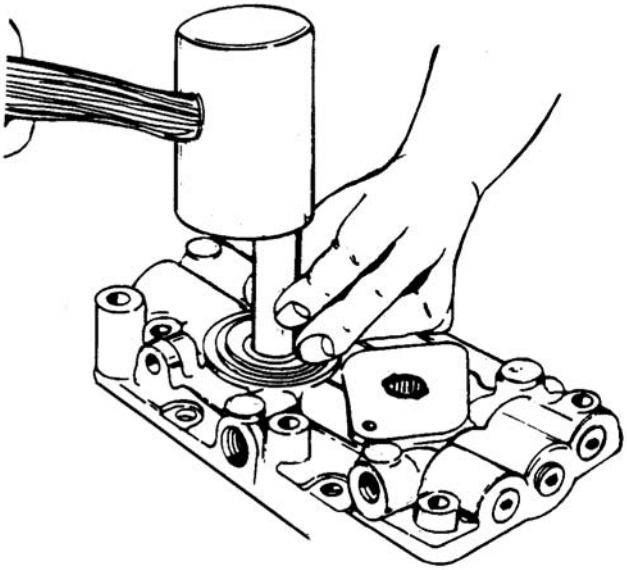


Figure 6-66. Pressing Seal Into Center Section

6. Trunnion arm seal installation.

   a. Coat new oil seal lip with grease. See Figure 6-67.

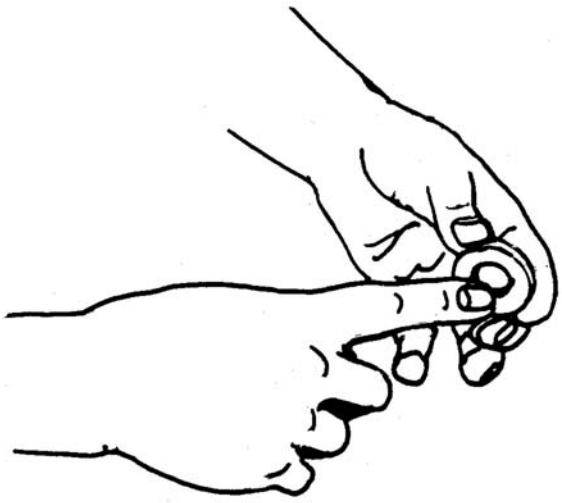


Figure 6-67. Greasing Oil Seal Lip

   b. Cover trunnion arm with thin tape to protect oil seal lip. See Figure 6-68.

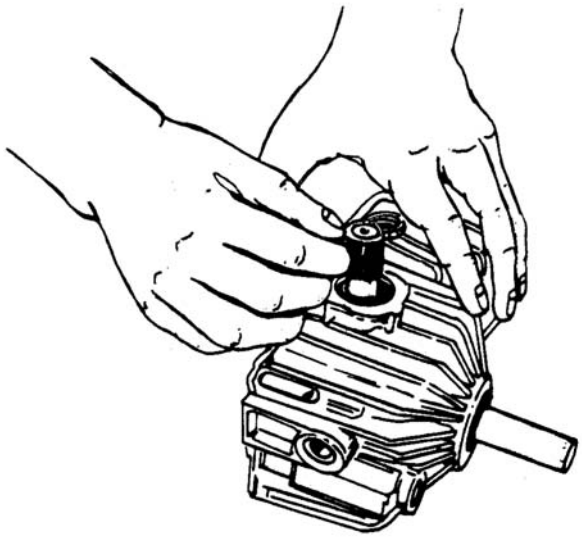


Figure 6-68. Covering Trunnion Arm With Tape

   c. Press seal into housing. See Figure 6-69.

7. Check valve installation.

   a. Lay the transmission on its side. See Figure 6-70.

   b. Install ball, spring and plug. See Figure 6-71.

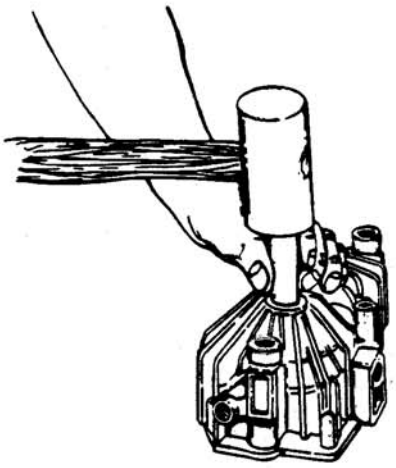


Figure 6-69. Pressing Seal Into Housing

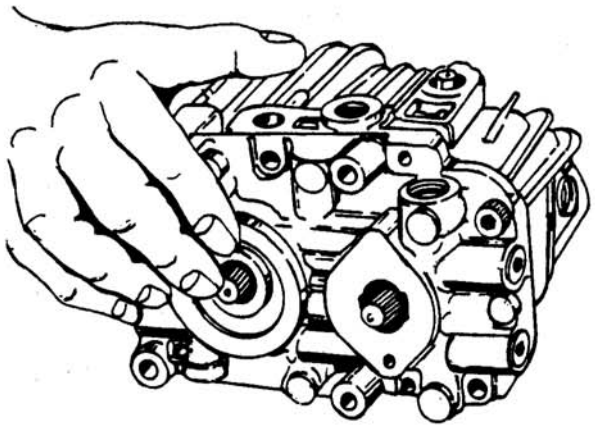


Figure 6-70. Positioning Transmission to Install Check Valve

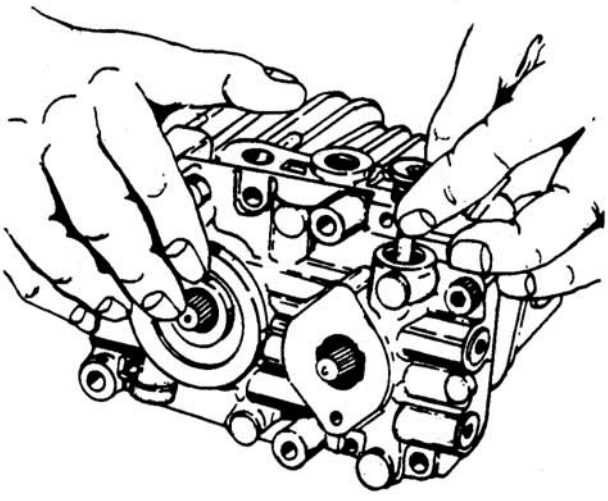


Figure 6-71. Installing Ball, Spring and Plug

c. Tighten plug. See Figure 6-72.

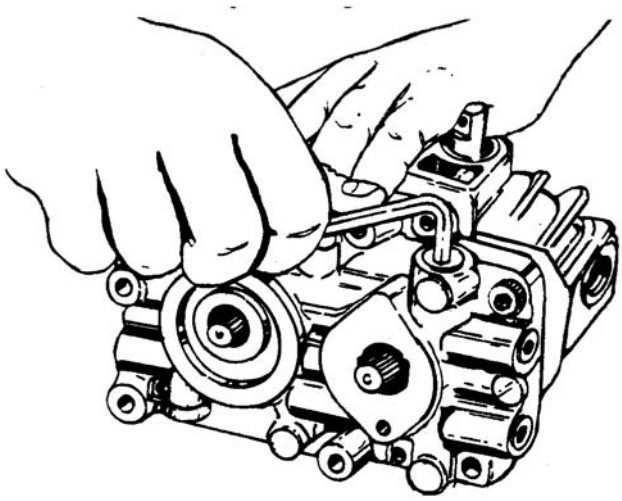


Figure 6-72. Tightening Plug

8 Bypass valve installation.

a. Replace O-ring if necessary. See Figure 6-73.

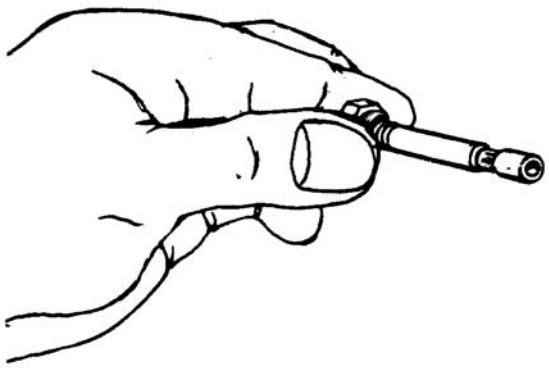


Figure 6-73. Replacing O-Ring

b. Install spring, bypass spool and plug in that order. See Figure 6-74.

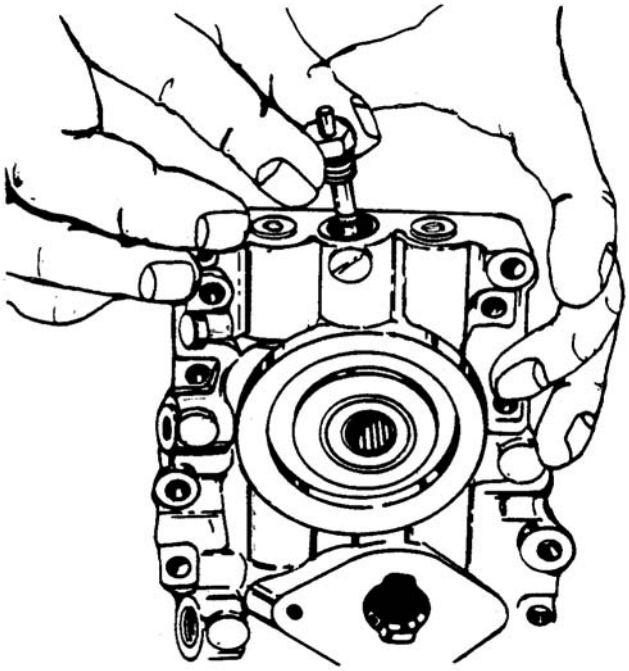


Figure 6-74. Installation of Bypass Valve

c. Tighten plug. See Figure 6-75.

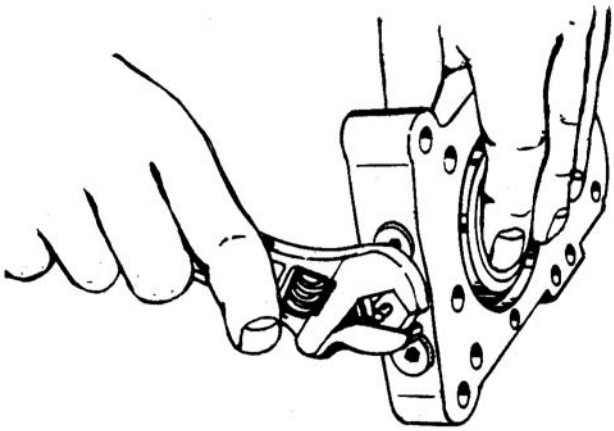


Figure 6-75. Tightening Plug

9. Oil tank assembly installation.

   a. Screw oil tank onto the housing. See Figure 6-76.

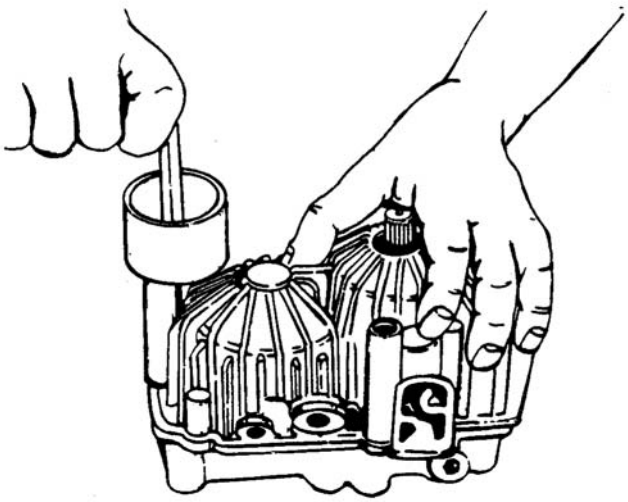


Figure 6-76. Installing Oil Tank Assembly

   b. Screw cap onto the housing. (This cap has a left-hand thread.) See Figure 6-77.

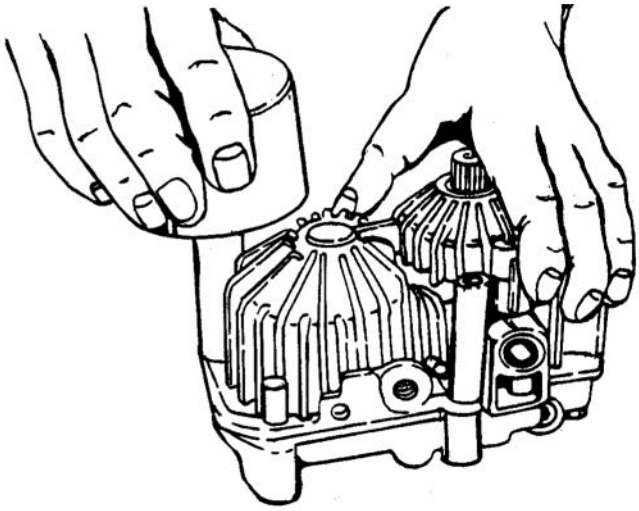


Figure 6-77. Installing Cap Onto Housing

6-4. MODEL 310-0500/0750 INTEGRATED HYDROSTATIC TRANSMISSION.

6-4.1 General Description. A transaxle normally will not require servicing during the life of the vehicle in which it is installed. Should servicing be required, the unit must be removed from its installed location and thoroughly cleaned before beginning most procedures.

1. The Integrated Hydrostatic Transaxle (IHT) is a self-contained unit designed for the transfer and control of power. It provides an infinitely variable speed range between zero and maxi-

mum in both forward and reverse modes of operation.

2. The IHT uses a variable pump with a maximum displacement of 10cc per revolution, and a motor with a fixed displacement of 21cc per revolution. The variable displacement pump features a cradle swashplate with a direct-proportional displacement control. Reversing the direction of tilt of the swashplate reverses the flow of oil from the pump to the motor and thus reverses the direction of the motor output rotation. The fixed displacement motor uses a fixed swashplate. The pump and motor are of the axial piston design, and both utilize spherical nosed pistons which are held against a thrust race by internal compression springs.

3. The IHT has a self-contained fluid supply and an integral filter. The fluid is forced through the filter by a positive “head” on the fluid in the housing/reservoir with an assist by the negative pressure created in the pump pistons as they operate.

4. Charge check valves in the center section are used to control the makeup flow of fluid to the low pressure side of the loop.

5. The IHT is filled and tested at the factory and should not require fluid or filter changes unless the fluid becomes contaminated.

6. A cam style, block lifting bypass is utilized in the IHT to permit moving the vehicle for short distances at a maximum of 2 mph without starting the engine.

WARNING

Actuating the bypass will result in the loss of hydrostatic braking capacity. The machine must be stationary and on a level surface and in neutral when actuating the bypass.

7. The IHT includes an integral differential which utilizes heavy duty heat treated bevel gears.

8. A “cam” style arm is utilized to actuate an in line floating multi disc parking brake. The brake discs are enclosed in a cavity that is sealed from the oil supply.

6-5. MODEL 11 HYDROSTATIC TRANSMISSION.

6-5.1 The following paragraphs contain information necessary for the disassembly, repair and reassembly of the Eaton hydrostatic transmission, Model 11. Some procedures may not be necessary due to application. This information is provided courtesy of Eaton Fluid Power Products, Hydraulic Division. See Figure 6-78.

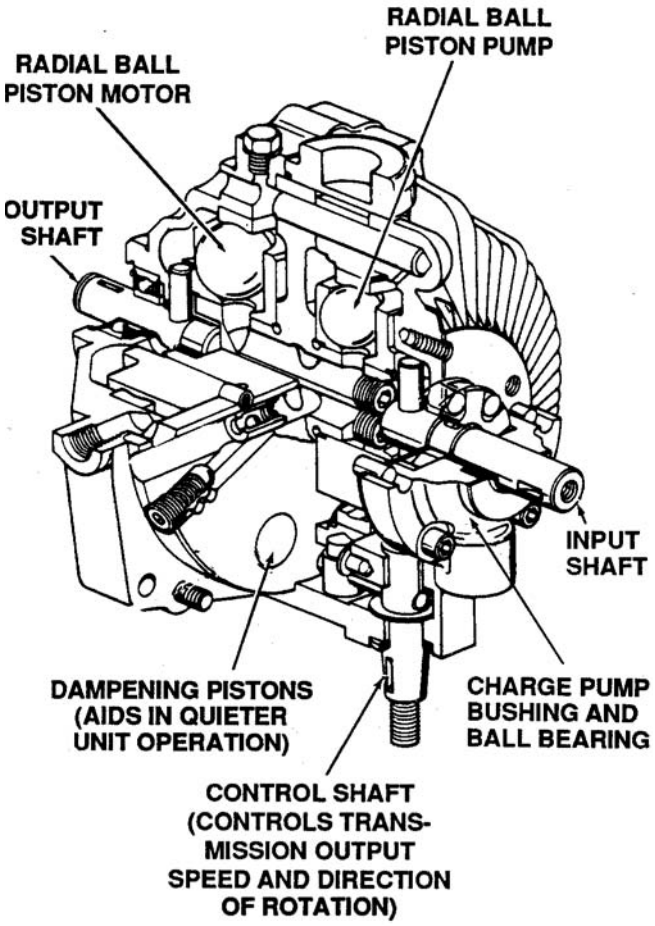


Figure 6-78. Model 11 Hydrostatic Transmission

6-5.2 Fluid Flow.

1 . The motor is driven by fluid directed through a closed loop system by the hydraulic pump. Speed control is achieved by changing the amount of oil delivered by the variable displacement pump to the fixed displacement motor by rotating the control shaft. Because of leakage, the amount of fluid driven back by the motor is slightly less than that required by the pump. Check valves on the inlet side of the pump are open to charge pump flow, enabling the pump to receive fluid as needed to make up for leakage. See Figure 6-79.

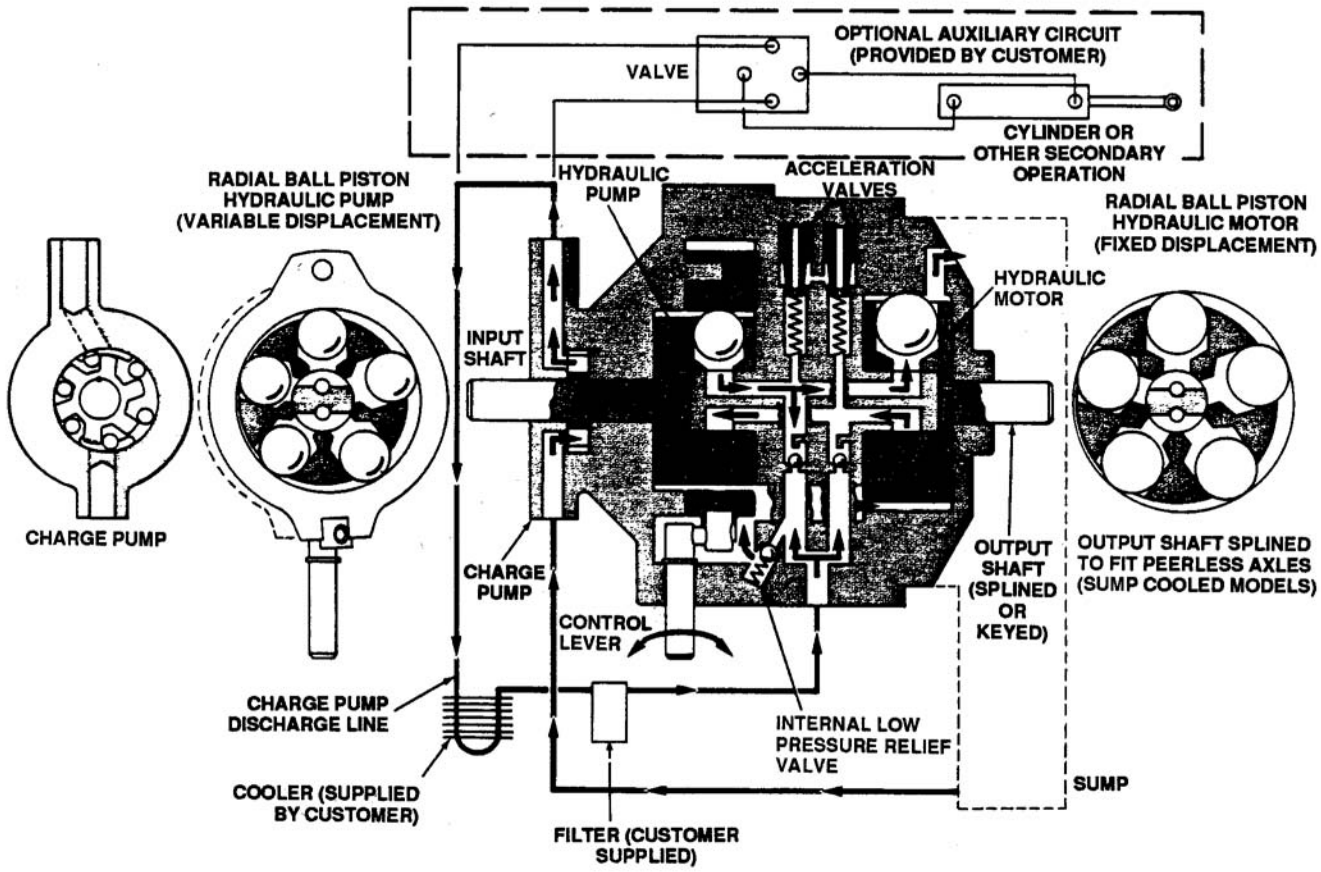


Figure 6-79. Fluid Flow Diagram

NOTE

The Eaton Model 11 is a self-purging pump.

2. The charge pump draws oil from the reservoir or the final drive housing when the final drive and transmission use a common fluid. The charge pump performs five functions:

   a. Maintains pressure (30-50 PSI) on the low pressure side of the circuit to supercharge the variable displacement pump.

   b. Supplies oil lost due to internal leakage to the circuit.

   c. Provides a means of moving the hydraulic fluid through a cooler when needed to maintain fluid temperature less than 180°F.

   d. Provides a source of auxiliary hydraulic power for secondary operations such as a hydraulic motor or cylinder used to power attachments on vehicles. (If a cylinder is used, be sure it is a double acting type.)

   e. A charged pump option is available with a ball bearing input which is recommended for overhung loads such as couplings, pulleys, etc.

3. The acceleration valves are open in neutral position. The valve in the side of the circuit being used closes gradually as the pressure increases, cushioning load acceleration. On deceleration, when pressure is decreased below a certain point the valve opens, by passing the pump flow and allowing the output shaft to coast to a stop.

4. An external filter, customer supplied, is also required and should be the last component in the charge pump discharge line before the transmission. It should have a rating of 10 microns or less and be filtering up to 4-1/2 GPM.

5. The filtered fluid then flows into the transmission, past one of the check valves and into the low pressure circuit. Excess oil not needed for the system makeup is relieved into the trans-

mission case past the low pressure relief valve.

6. In the auxiliary circuit the fluid flows from the charge pump to a valve. This valve is an open center type and has an internal pressure relief valve set at no more than (800 PSI). At this pressure, the flow will be approximately 1.5 GPM with an input speed of 3600 RPM.

7. Proper cooling is essential to both performance and life of the transmission. The recommended maximum oil operation temperature is 180°F. Cooling is dependent upon the fan and cast fins in the aluminum cover.

8. On transmissions that incorporate sealed output shaft bearings, fill through the reservoir to the manufacturer's specified fluid level. Start the engine and run the transmission in both directions at low engine speed for a short time to purge trapped air from the system. Stop, shut off engine and recheck fluid level. The transmission is now ready for use.

6-5.3 Special tools to aid in disassembly/reassembly.

1. 2 x 6 x 10 inch wooden block with 3/4 inch diameter hole in the center

2. 2 large, wide rubber bands

3. 5/16-18 tap

4. 3/16 inch diameter rod—10 to 12 inches long

5. Two-jaw bearing puller, modified slightly if necessary to fit notches in charge pump with ball bearing

6. Light petroleum jelly (such as Vaseline)

7. Steel bar stock or piece of wood—2 inches diameter x 2-1/2 inches long.

6-5.4 Product identification and ordering information. See Figure 6-80. When ordering parts, please include the following:

1. Model number

2. Date code

3. Part number

4. Part name

5. Quantity of parts

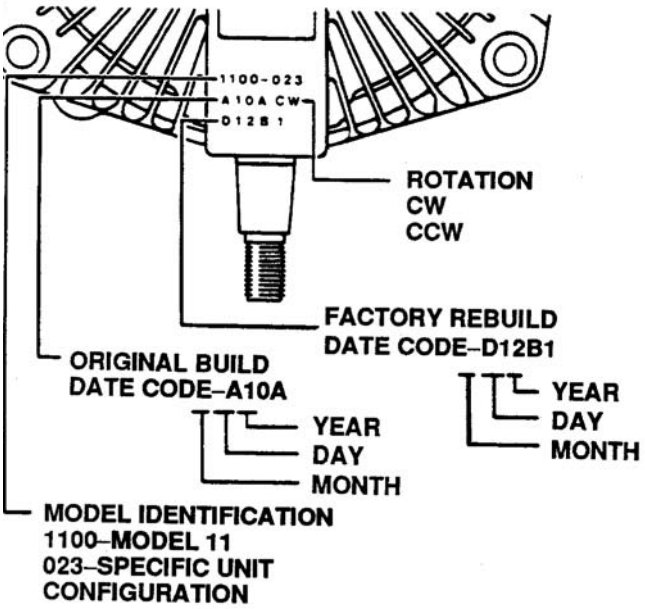


Figure 6-80. Location of Transmission Identification

NOTE

Refer to specific listing covering your Eaton transmission. Parts listings are available from the Hydraulics Division, Minneapolis Plant.

6-5.5 Disassembly of Model 11 transmission. See Figure 6-81.

Legend for Figure 6-81

1. **Socket Head Cap Screw**
2. **Socket Head Cap Screw**
3 **Oil Seal**

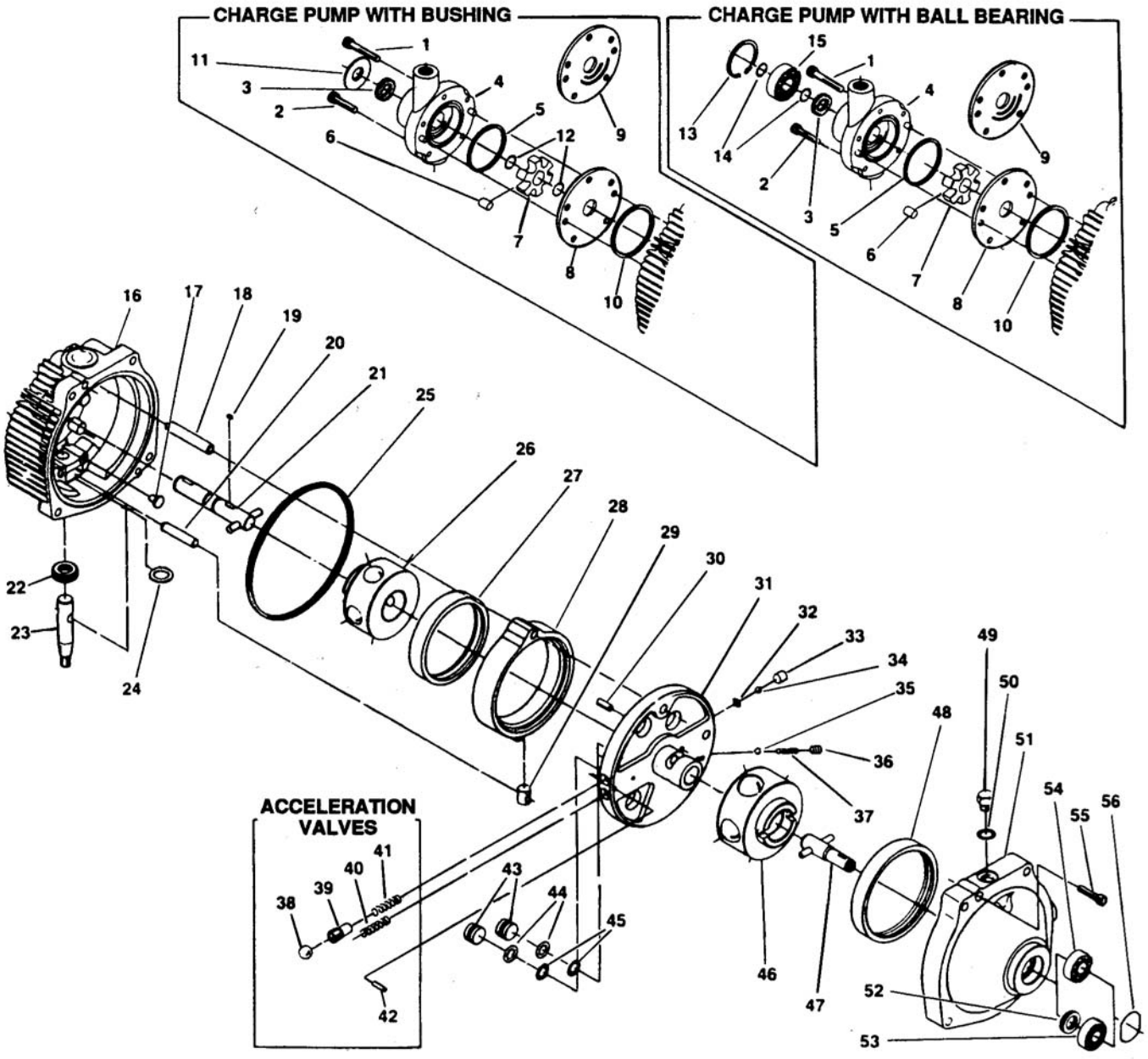


Figure 6-81. Model 11 Transmission

Legend For Figure 6-81.

1. Socket Head Cap Screw
2. Socket Head Cap Screw
3. Oil Seal
4. Charge Pump Body
5. Square Cut Seal Ring
6. Roll
7. Carrier
8. Pump Plate
9. Port Plate
10. Square Cut Seal Ring
11. Shield
12. Snap Ring
13. Retaining Ring
14. Snap Ring
15. Bearing (Input)
16. Cover
17. Button
18. Pivot Pin Dowel
19. Drive Pin
20. Dowel (7/16 Dia. x 2" Lg)
21. Input Shaft
22. Oil Seal
23. Control Shaft
24. Control Shaft Washer
25. Square Cut Seal Ring
26. Pump Rotor and Ball Assembly
27. Pump Race
28. Cam Ring
29. Cam Ring Insert
30. Coil Pin (5/16 Dia. x 3/84" Lg)
31. Pintle
32. Retaining Ring
33. Check Valve Body
34. Check Valve Ball (5/16 Dia.)
35. Check Valve Ball (7/16 Dia.)
36. Relief Valve Plug
37. Relief Valve Spring
38. Acceleration Valve Ball
39. Acceleration Valve Body
40. Acceleration Valve Spring (lower)
41. Acceleration Valve Spring (upper)
42. Dowel Pin
43. Dampening Piston
44. Backup Ring
45. O-Ring
46. Motor Rotor and Ball Assembly
47. Output Shaft
48. Motor Race
49. Hex Head Plug
50. Plug Tube Fitting O-Ring
51. Body
52. Oil Seal
53. Sealed Bearing (output)
54. Flow Through Bearing (output)
55. Socket Head Cap Screw
56. Retaining Ring

NOTE

The parts list is for identification of parts only. To insure the correct replacement parts for your transmission, it will be necessary to order the replacement parts by part number. For part numbers, consult your supplier for a parts list for your specific model number.

CAUTION

Clean the transmission exterior thoroughly before repairs are begun. Use a cleaning solution that will not affect paint, gaskets, rubber seals and plastic. If compressed air is used DO NOT expose lip seals of bearing surfaces to high pressure.

NOTE

A 2 x 6 x 10 inch wooden block with a 3/4 inch hole in the center is recommended for a suitable bench fixture.

1. Use a 1/4 inch allen wrench to remove the two socket head cap screws and separate the body from the cover. If the cover does not separate easily from the body because of fluid seal, tap the body and/or cover with plastic hammer to break the seal. See Figure 10-82.

CAUTION

The motor ball piston assembly must remain intact as the ball pistons are matched to the motor rotor. A large rubber band may be used to retain the ball pistons in place during handling.

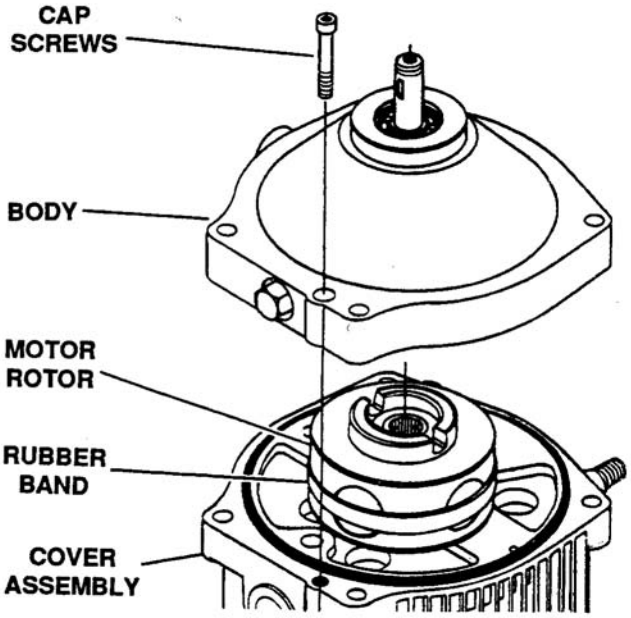


Figure 6-82. Removing Transmission Cover

2. Remove the bearing retaining ring and tap or press the output shaft inward. Drive or press the output bearing out from the motor body. Two types of output shaft bearings are used on Eaton light-duty transmissions—flow through or sealed. Sealed bearings have an oil seal located under the bearing. If your transmission has a seal, remove it by driving or pressing it out from the motor body. See Figure 6-83.

3. Inspect the contact line of the motor ball pistons on the motor race located in body. This contact area must be smooth and completely free of any irregularities if any irregularities are noted, replace the motor race. See Figure 6-84.

NOTE

If irregularities are noted in the motor race, it is reasonable to assume that one or more ball pistons and rotor bores will also be damaged.

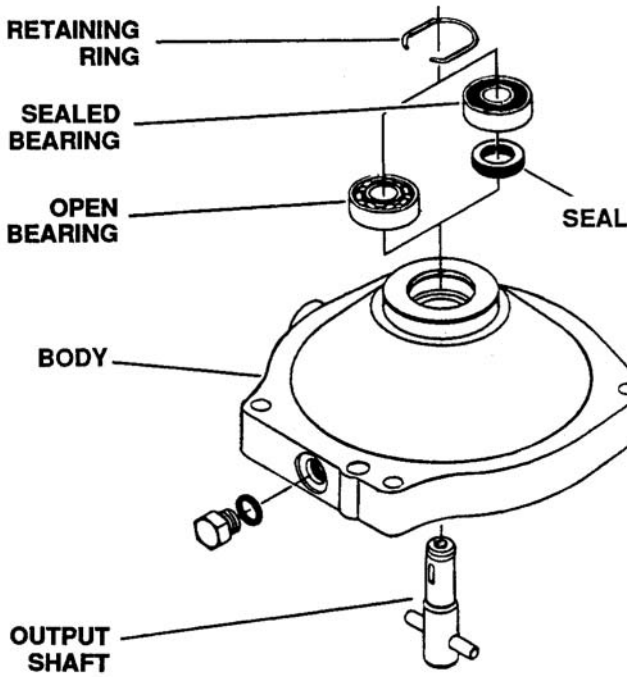


Figure 6-83. Removal of Output Bearing

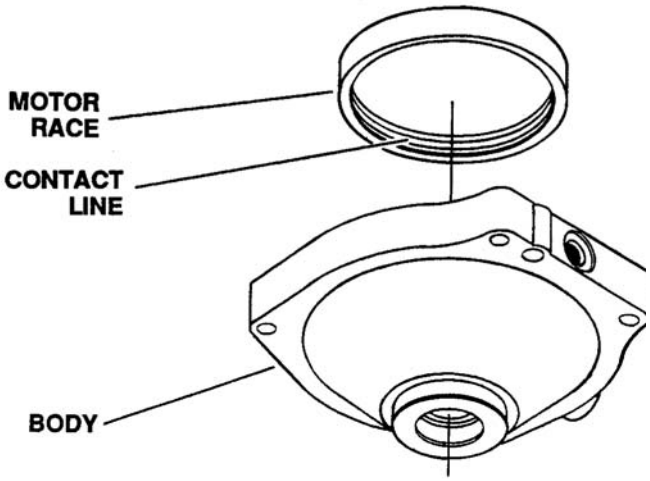


Figure 6-84. Inspecting Motor Race

4. Hold the pintle assembly in position against the cover and remove the motor rotor assembly intact. See Figure 6-85.

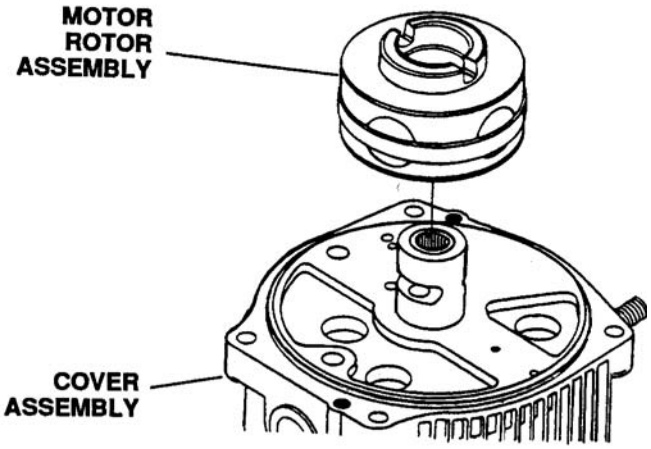


Figure 6-85. Removing Motor Rotor Assembly

NOTE

Each ball must be replaced in the same bore from which it was removed. Use a suitable container for piston ball storage such as an egg carton or ice cube tray.

5. Inspect the rotor assembly. Remove the piston balls from the rotor one at a time by working clockwise from the letter stamped in the face of the rotor. Place balls in a prepared container. See Figure 6-86.

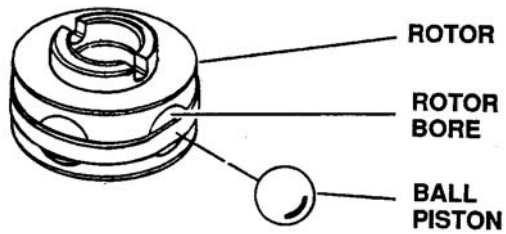


Figure 6-86. Inspecting Motor Rotor Assembly

6. Inspect the piston balls. They must be smooth and completely free of any irregularities.

7. Inspect rotor bores, bushings and pintle journals for irregularities or excessive clearance. The ball piston to rotor bore clearance is select fit electronically to .0002 to .0006 of an inch. When irregularities or excessive clearance are noted, replace the complete rotor assembly.

8. Install motor ball pistons in their matching bores. Hold them in place with a rubber band.

9. Hold the pump assembly in the bottom position and tap lightly on the cover. Use a wood or plastic hammer so as not to damage aluminum cover. Lift the pintle assembly out. See Figure 6-87.

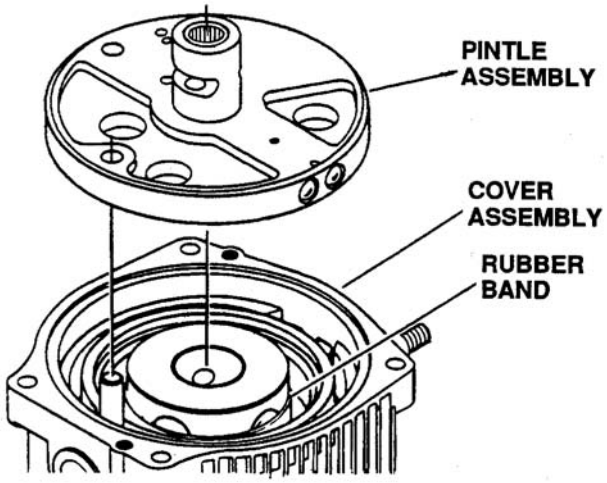


Figure 6-87. Removing Pintle Assembly

NOTE

We do not recommend complete disassembly of the pintle assembly for cleaning. Normal flushing should be all that is required. However, if complete disassembly is required, use the following procedures.

10. Disassemble pintle assembly as follows:

NOTE

DO NOT remove the two large plugs located on the pintle journal. See Figure 6-88.

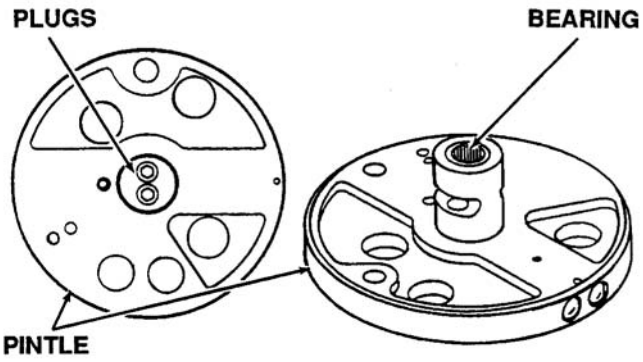


Figure 6-88. Location of Pintle Assembly Plugs

a. Using a 1/4 inch allen wrench, remove relief valve plug. Remove ball and spring. See Figure 6-89.

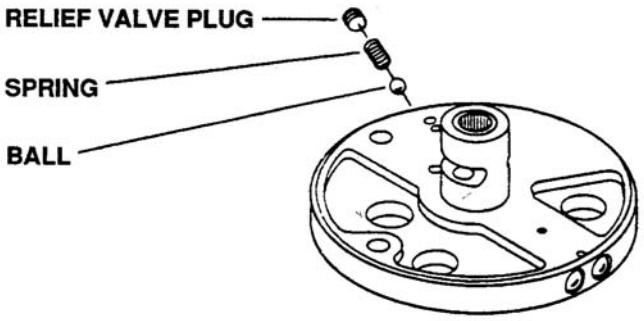


Figure 6-89. Removing Relief Valve Plug Spring and Ball

b. Inspect for any irregularities. Replace any defective parts.

c. Reinstall ball, spring and plug into pintle. Do not tighten.

NOTE

Remove dampening pistons only if the surfaces are scored.

CAUTION

When dislodging dampening pistons, do not hit pintle journals or the pintle housing will be ruined.

d. To remove pistons, firmly tap the outside edge of pintle on a work surface. Remove backup ring and O-ring from pistons. See Figure 6-90.

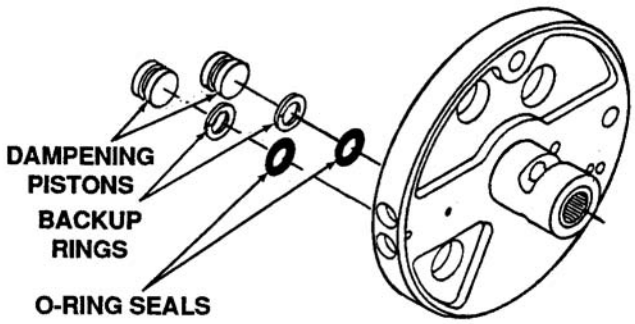


Figure 6-90. Removing Dampening Pistons

NOTE

If tapping of pintle does not dislodge the pistons, use adhesive to cement a bolt or similar object to the pistons and pull them from the bore. See Figure 6-91.

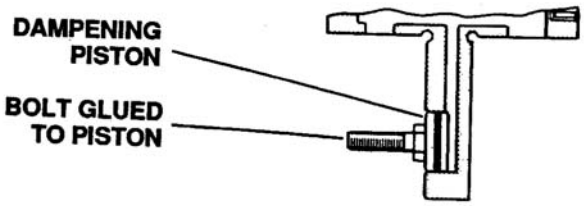


Figure 6-91. Pulling Dampening Piston From Bores

e. Install new backup rings nearest to the smooth piston face and O-rings in groove on a new piston.

f. Lubricate outer surface of pistons and press (smooth face up) into bores of pintle to the bottom position.

g. To remove check valves, press or drive out the coil pin. See Figure 6-92.

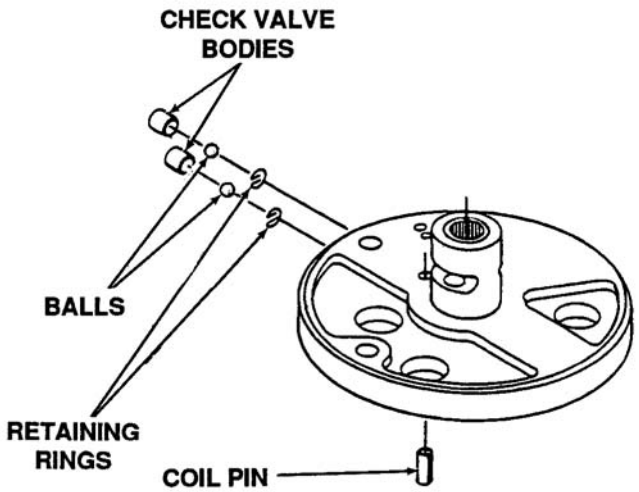


Figure 6-92. Removing Coil Pin

NOTE

Removal of check valves is not necessary if check valve balls move freely and seat properly.

h. Using a four blade 5/16-18 tap, tap holes in the check valve bodies. Insert a long bolt or a puller to remove them from the pintle housing and discard. See Figure 6-93.

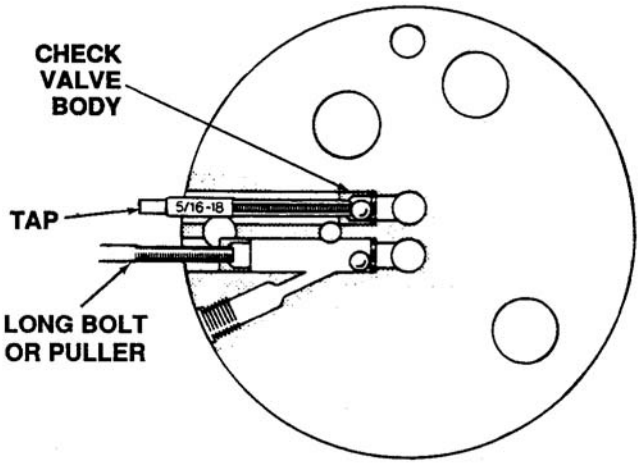


Figure 6-93. Removing Check Valve Bodies

i. Remove check balls and retaining rings. See Figure 6-92.

NOTE

On units with acceleration valves, see steps for check valve removal.

j. Inspect check valve balls and retaining rings. Replace any defective parts.

k. Install retaining rings and check valve balls in bores of pintle. Press new check valve bodies in bores. Press far enough in for coil pin clearance.

CAUTION

To prevent dislodging of retaining rings, do not drive check valve bodies into bores.

l. Press coil pin into pintle until flush with or slightly below surface.

NOTE

Not all models have acceleration valves. If your model has them they are located directly opposite the check valves.

m. To remove the acceleration valves, start by removing the solid pin from the pintle housing. See Figure 6-94.

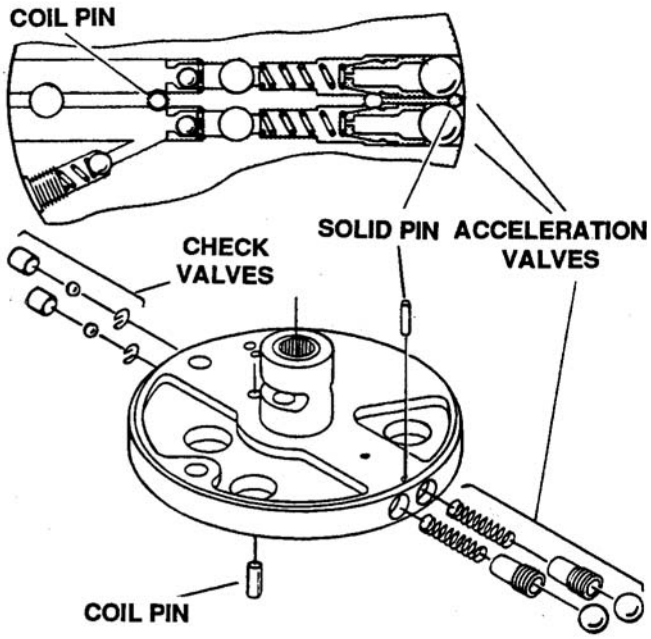


Figure 6-94. Removing Acceleration Valves

n. Insert 3/16 inch diameter rod through the check valve body. Tap the rod against the check valve ball to dislodge the retaining rings. Repeat for the second check valve ball and ring. Shake dislodged rings and balls out the large port area of pintle journal. See Figure 6-95.

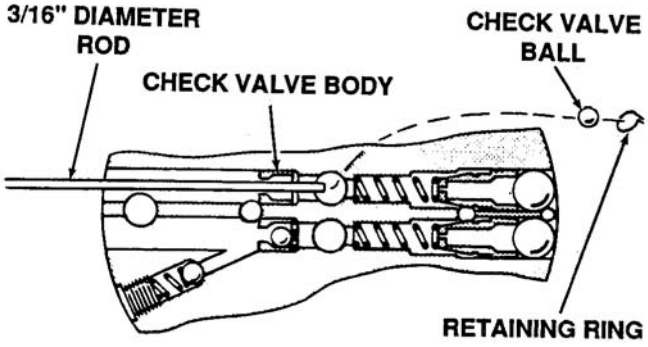


Figure 6-95. Removing Check Valve Ball

o. Insert the rod through the check valve body against the acceleration valve body, and drive both the valve body and ball out of the bore. Repeat method for second valve body and ball. Remove springs. See Figure 6-96.

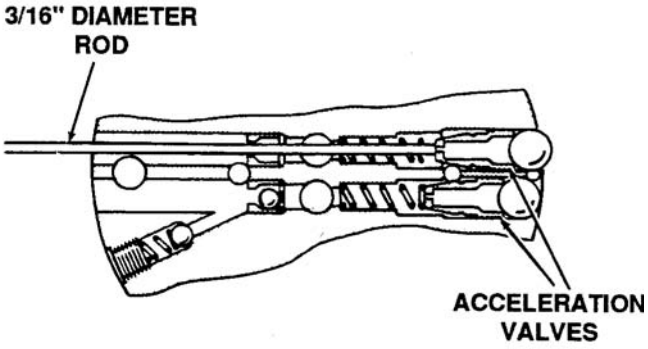


Figure 6-96. Removing Acceleration Valve Body

NOTE

Some models use different springs for forward and reverse. Be sure to identify the springs with the acceleration valve so they can be replaced in the same bore from which they were removed.

p. Press or drive coil pins from pintle housing. See Figure 6-94. Replace the ball through the port into the check valve body. Place 3/16 inch diameter rod through the acceleration valve body against the check valve ball and drive check valve body and ball from the pintle housing. Repeat this method for the second check valve body. See Figure 6-97.

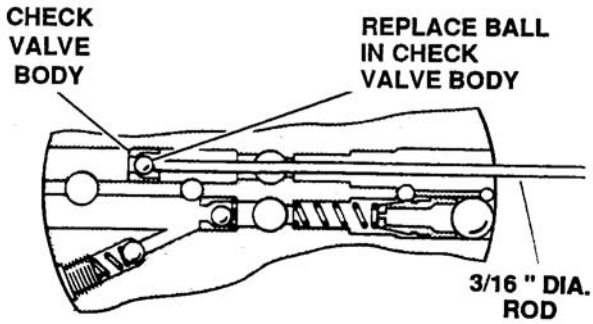


Figure 6-97. Driving Check Valve Body and Ball From Pintle Housing

q. Clean all parts thoroughly. Inspect parts for defects. Replace all defective parts, including retaining rings which were damaged when driven out of their seats.

r. Install acceleration valve springs and acceleration valves. Be sure that both acceleration valve bodies slide freely in the bores and that the orifices are clear.

s. Press the two balls against the acceleration valve bodies until the solid pin will clear. Press or drive the solid pin in so it is flush with or slightly below the pintle surface.

t. Install new check valve retaining rings and balls in pintle bores.

u. Press new check valve bodies into bores until coil pin will clear.

CAUTION

Use a press to install check valve bodies. Driving them into position may dislodge the retaining rings.

v. Press or drive the coil pin in flush with or slightly below pintle surface.

11. Remove seal from cover, lift pump rotor assembly intact from the cover assembly. See Figure 6-98.

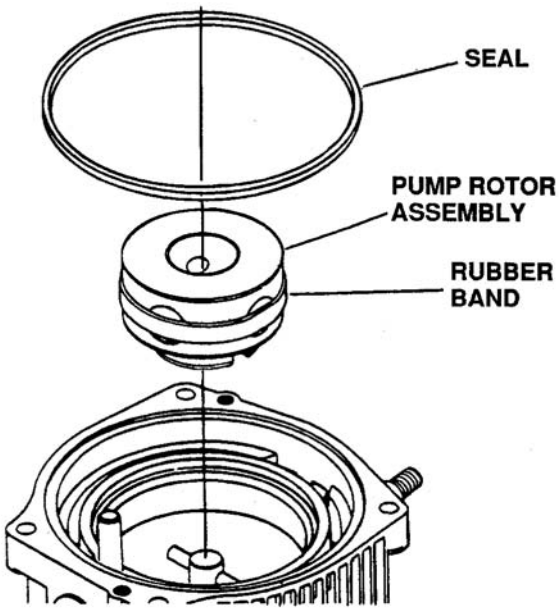


Figure 6-98. Removing Pump Rotor Assembly

CAUTION

Use a wide rubber band to retain the ball pistons in place during handling. The pump ball

piston assembly must remain intact as the ball pistons are matched to the pump rotor.

NOTE

If complete disassembly, inspection and reassembly of pump rotor is necessary. Follow same procedures as for motor rotor, paragraph 6-5.5, steps 5 through 7.

12. Slide the cam ring from the pivot pin and control shaft in the cover. Lift ring from the cover and remove the control shaft insert. See Figure 6-99.

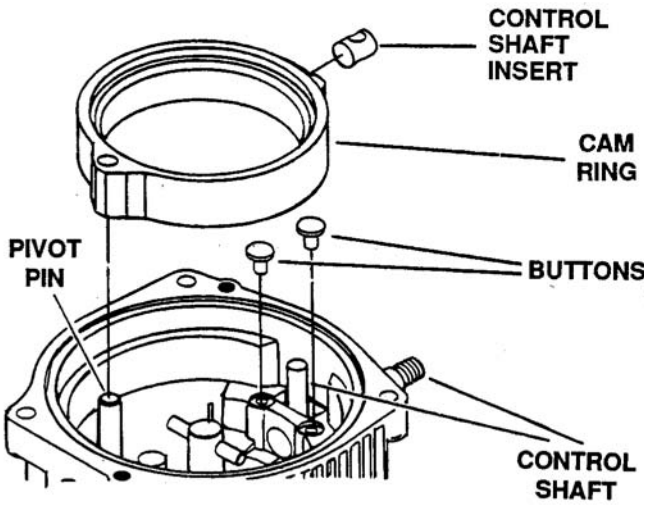


Figure 6-99. Removal of Cam Ring and Control Shaft Insert

NOTE

The pump race is press fit in the cam ring and will require a press to remove it. The cam ring and pump race are available as an assembly.

13. Inspect area where the ball pistons contact the race. This area must be smooth and completely free of irregularities. If it is not, replace the pump race. See Figure 6-100.

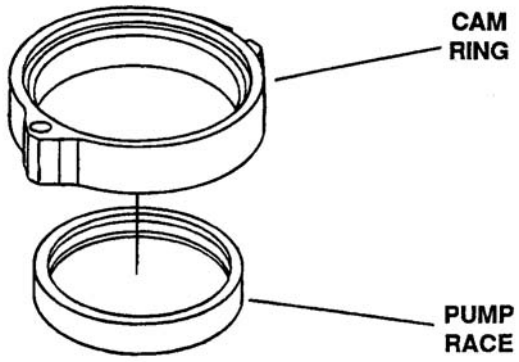


Figure 6-100. Inspecting Pump Race

14. Remove the two buttons from the cover. See Figure 6-99.

15. Remove charge pump with bushing, disassemble and inspect as follows:

NOTE

For charge pump with ball bearing, refer to step 16 of this paragraph.

a. Before removing the charge pump polish the input shaft to remove paint, burrs, nicks, etc.

b. Remove the shield and using a 1/4 inch allen wrench remove the five socket head cap screws. Carefully remove the charge pump. See Figure 6-101.

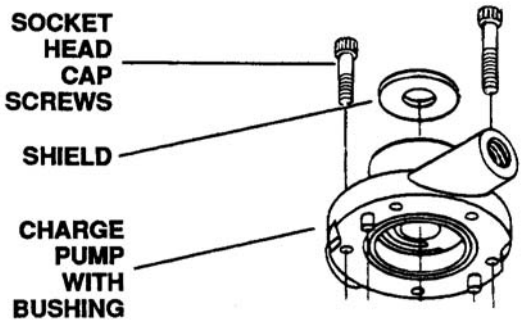


Figure 6-101. Removing Charge Pump

c. Remove the square cut seal from the charge pump housing. See Figure 6-102.

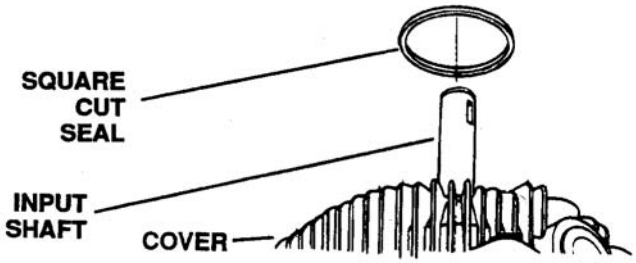


Figure 6-102. Removing Square Cut Seal

CAUTION

Be careful not to damage the input shaft bushing when removing the oil seal.

d. Press or drive the oil seal from the charge pump. See Figure 6-103.

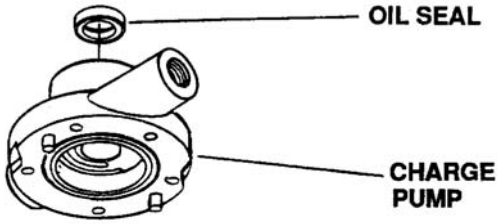


Figure 6-103. Removing Oil Seal

e. Remove the six carrier rolls and top snap ring from the input shaft. See Figure 6-104.

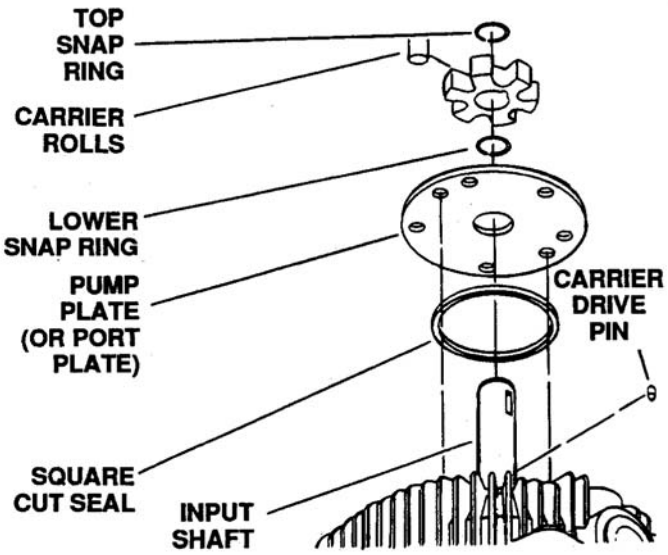


Figure 6-104. Input Shaft Disassembly

CAUTION

Do not mark the roll carrier in such a manner that would damage the carrier surface.

f. Mark the top of carrier indicating which side is up.

g. Remove the carrier, carrier drive pin, lower snap ring and pump plate. See Figure 6-104.

h. Inspect the input shaft bushing, carrier, rolls and inner race contact areas in the charge pump. If any irregularities are found, replace the complete pump assembly.

i. Remove square cut seal from cover.

16. Remove charge pump with ball bearing, disassemble and inspect as follows:

a. Remove the pump retaining and shaft retaining ring. See Figure 6-105.

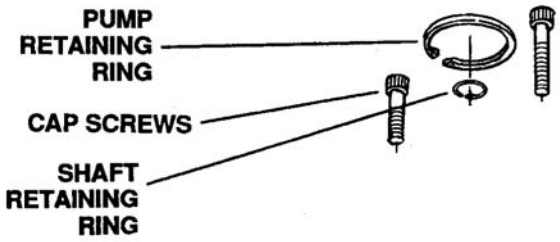


Figure 6-105. Removing Retaining Rings and Cap Screws

b. Using a 1/4 inch allen wrench remove the five cap screws.

c. Use a modified 2-jaw bearing puller pulling against the two notches machined into the housing. Remove the charge pump assembly. See Figures 6-106 and 6-107.

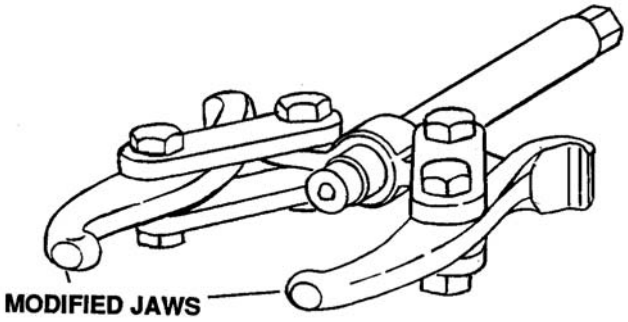


Figure 6-106. 2-Jaw Bearing Puller

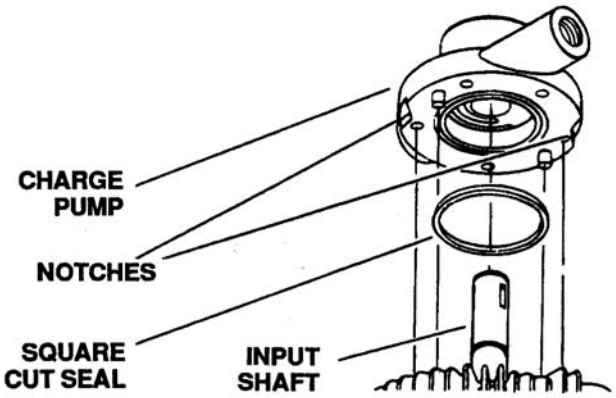


Figure 6-107. Removing Charge Pump Assembly

CAUTION

Do not pound on the bearing puller while removing the charge pump body. Apply a steady pull only, do not damage the bore for the input shaft during removal of charge pump.

d. Remove the square cut seal from the pump assembly.

e. Remove the bearing and the oil seal from the charge pump. Discard the oil seal. See Figure 6-108.

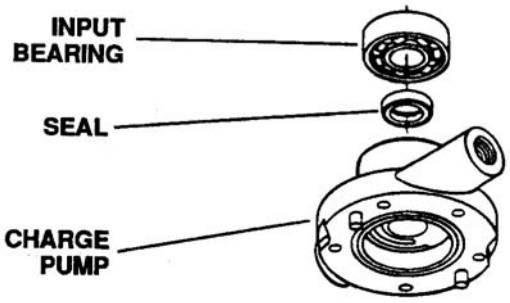


Figure 6-108. Removing Bearing and Oil Seal From Charge Pump

f. Remove the six carrier rolls and top snap ring from the input shaft. See Figure 6-109.

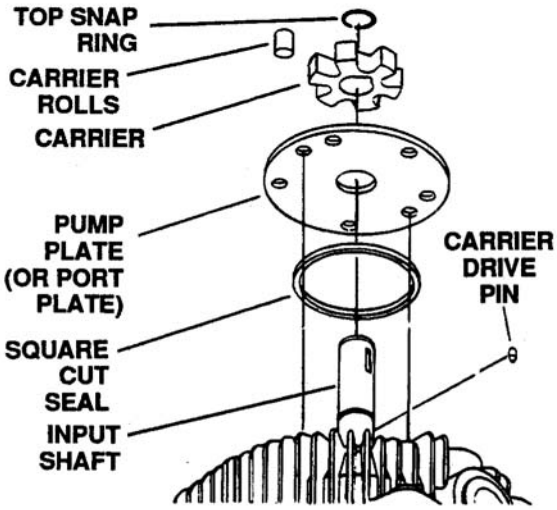


Figure 6-109. Removing Carrier Rolls and Snap Ring From Input Shaft

g. Mark the top of carrier indicating which side is up.

CAUTION

Do not mark the roll carrier in a way that would damage the carrier surface.

h. Remove the carrier, carrier drive pin, lower snap ring and pump plate. See Figure 6-109.

i. Remove square cut seal from cover and discard.

j. Inspect the ball bearing. If any irregularities are present, replace the bearing.

k. Inspect the carrier, rolls, inner race contact areas in the charge pump housing and pump plate. If any irregularities are found, replace the complete charge pump assembly.

17. Disassemble cover assembly as follows:

a. Reposition cover assembly as shown and remove the input shaft. See Figure 6-110.

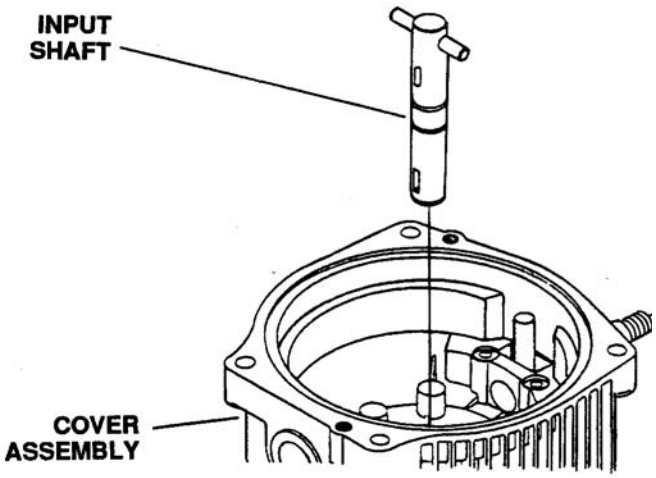


Figure 6-110. Removing Input Shaft From Cover Assembly

CAUTION

Be careful not to damage the input shaft buying in the cover.

b. Inspect input shaft for stripped keyways or other irregularities. If found, replace the input shaft.

c. Inspect bushing located in face of cover. If found to be broken or having any other irregularities, replace cover.

d. Inspect cover assembly, especially around the control shaft area. Replace the cover assembly if it is broken, cracked or if side clearance between control shaft and cover exceeds .006 inch.

CAUTION

Do not scratch the control shaft or distort the seal counterbore when removing seal.

e. Use a sharp, narrow edged tool to pierce the top metal part of the oil seal. Remove seal from the cover. See Figure 6-111.

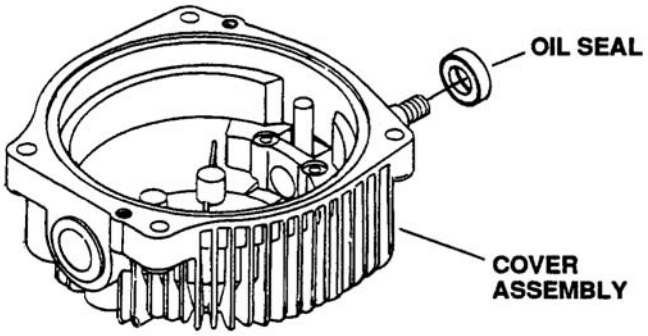


Figure 6-111. Removing Oil Seal From Cover

f. In most cases, it will not be necessary to remove the control shaft from the cover. If the dowel is loose or broken in the control shaft, remove the shaft using the following procedures:

(1) Measure the distance between the center of the dowel pin and the end of the control shaft. See Figure 6-112.

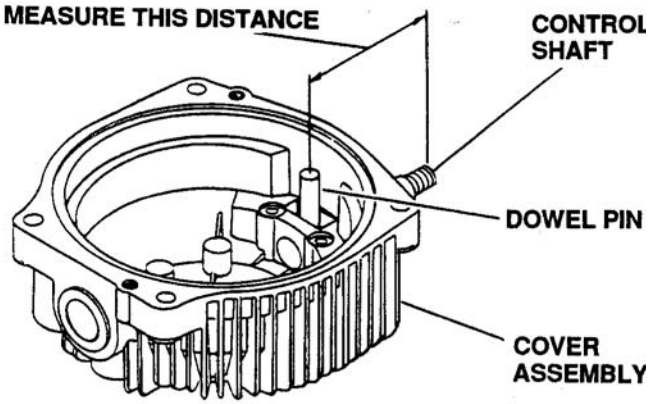


Figure 6-112. Removal of Control Shaft

(2) Turn cover over. Use dimension obtained in step (1) to locate dowel pin in cover face. Drill 11/32 inch diameter access hole at center point of dowel pin. Drill hole exactly in line with center of shaft. See Figure 6-113.

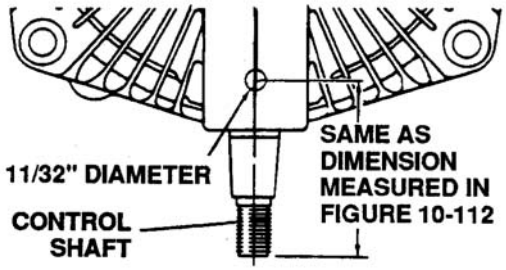


Figure 6-113. Locating Dowel Pin

(3) Press out damaged dowel pin through access hole, and remove control shaft and washer.

(4) Tap hole drilled in step (2) with a 1/8 inch pipe tap and install a flush type pipe plug. See Figure 6-114.

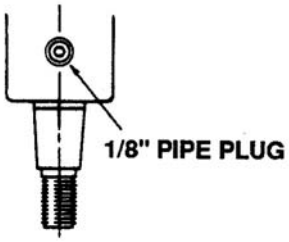


Figure 6-114. Install Pipe Plug

10-5.6 Assembly of Model 11 transmission.

1. Install new control shaft and washer in cover. See Figure 6-115.

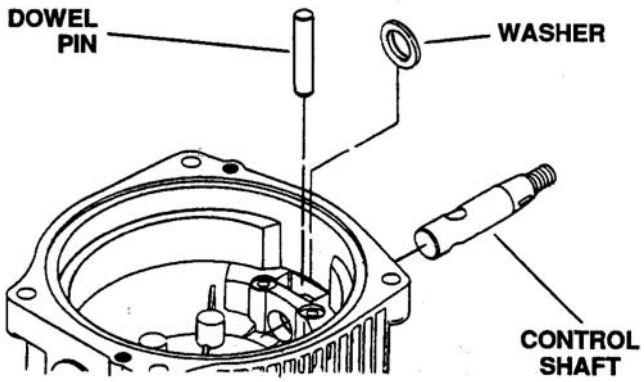


Figure 6-115. Install Control Shaft and Washer

2. Press new dowel pin through the shaft leaving 1-1/4 inch of dowel extending from control shaft. See Figure 6-116.

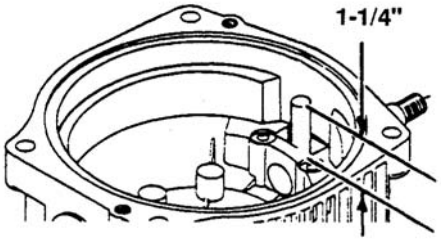


Figure 6-116. Install Dowel Pin

CAUTION

Be careful not to damage the inner portion of the oil seal. Excessive pressing or driving of the oil seal will damage the rubber portion of the oil seal.

3. Lubricate ID of new oil seal with clean lubricant. Press or tap seal in bore until completely seated. See Figure 6-117.

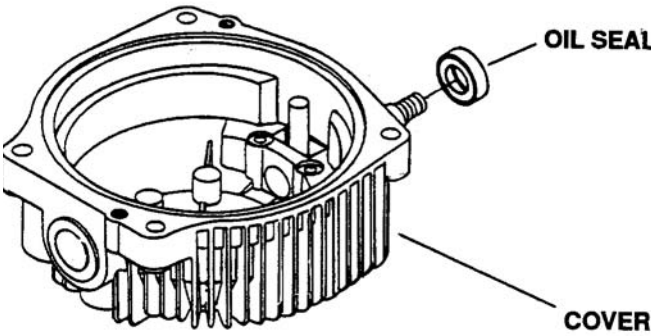


Figure 6-117. Installing Oil Seal

4. Install input shaft in cover. See Figure 10-118.

5. Turn cover over. Support input shaft from underneath. Use a piece of steel bar stock or hard wood — 2 inches in diameter by at least 2-1/2 inches long to keep the shaft cross pin against the cover. See Figure 6-119.

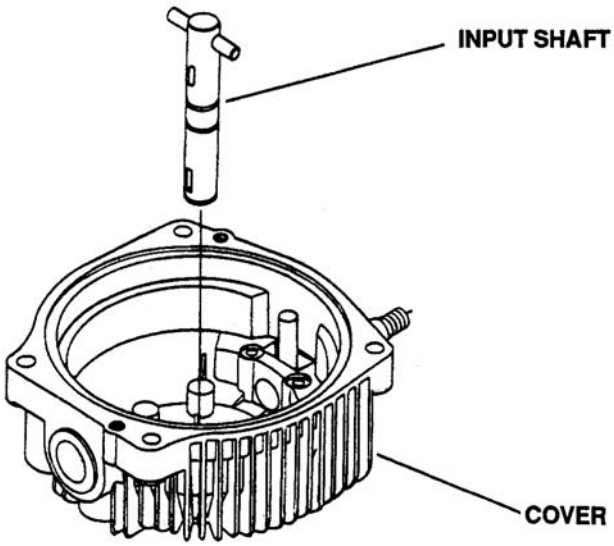


Figure 6-118. Installing Input Shaft

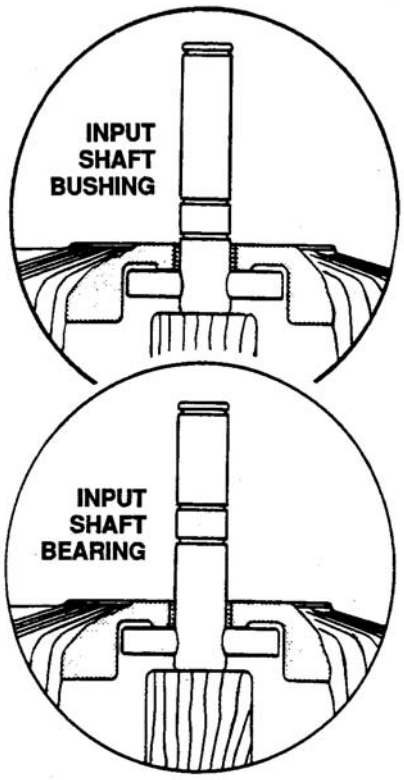


Figure 6-119. Input Shaft Support

6. Lightly lubricate new square cut seal and install in seal groove in cover. See Figure 6-120.

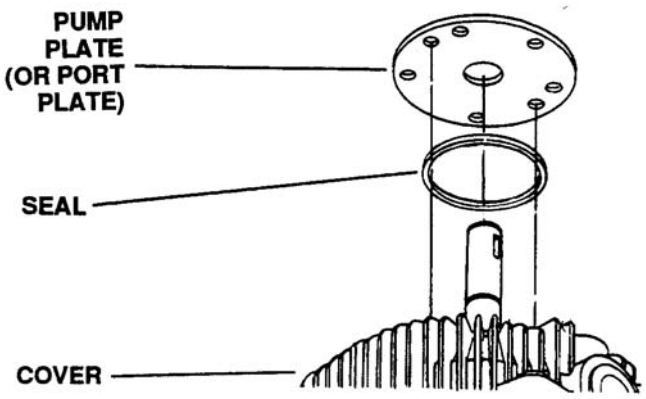


Figure 6-120. Installing Square Cut Seal

NOTE

Stamping on cover indicates if charge pump rotation is clockwise or counterclockwise.

7. Install pump plate or port plate on cover. Either side of the pump plate may face the cover regardless of input rotation. However, the port plate must be installed per specific input rotation.

8. For counterclockwise (CCW) rotation, the letter A must be up facing the charge pump. For clockwise (CW) rotation, the letter A must face down toward the cover. See Figure 6-121.

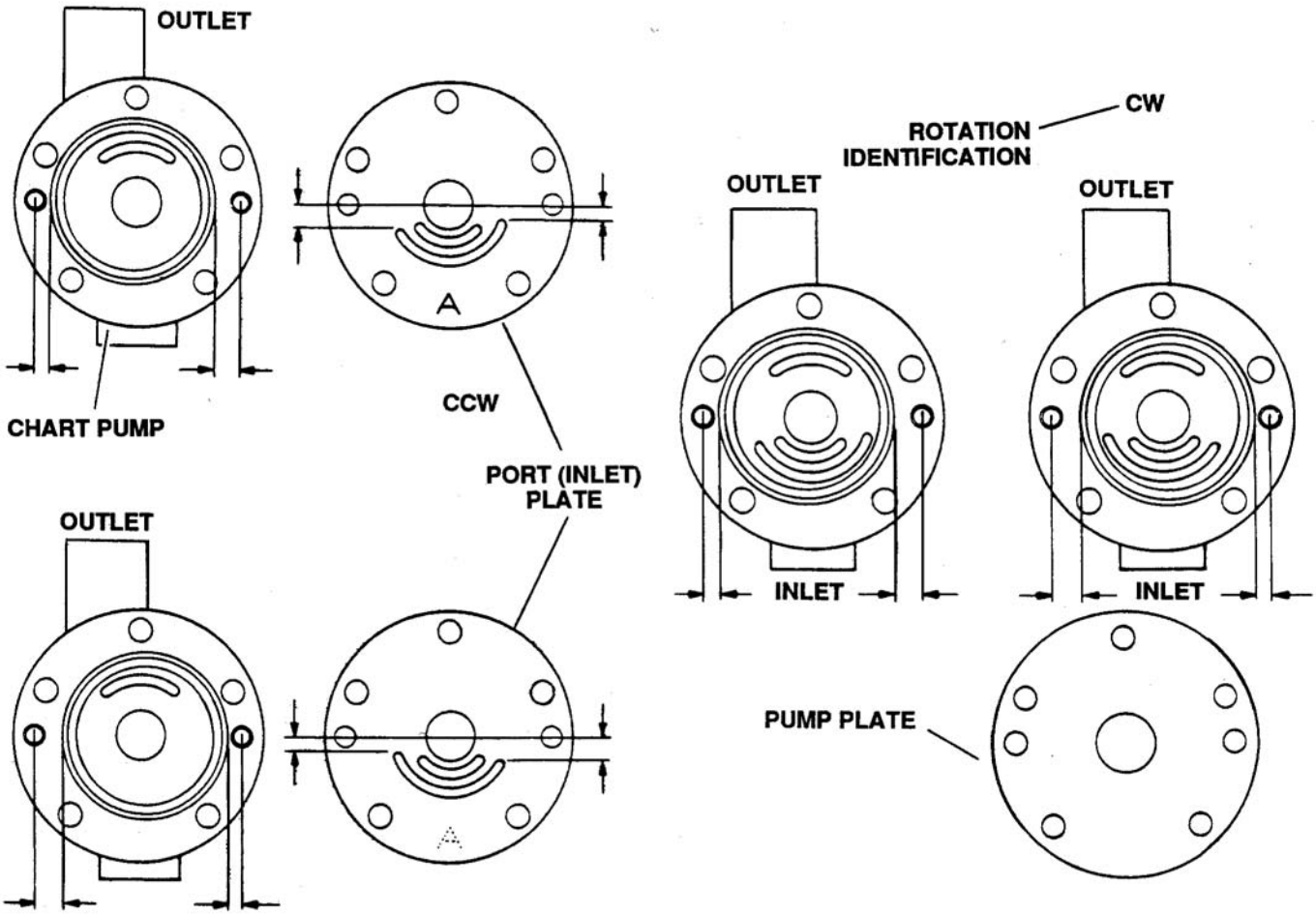


Figure 6-121. Installing Pump Plate

9. For charge pumps with bushings, install snap ring in lower groove (against plate) of input shaft. See Figure 6-122.

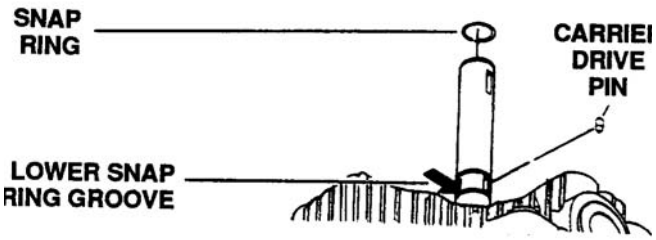


Figure 6-122. Installing Lower Snap Ring

10. Lubricate carrier drive pin and install in keyway of input shaft. Use a small amount of petroleum jelly or equivalent to hold pin in place. See Figure 6-123.

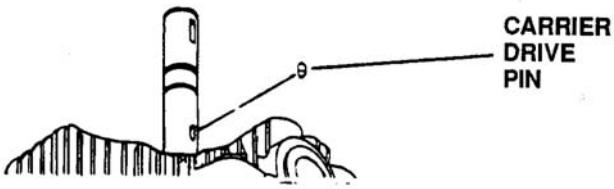


Figure 6-123. Installing Carrier Drive Pin

NOTE

For correct carrier rotation the leading edge of carrier must rotate in the same direction as the input shaft. See Figure 6-124.

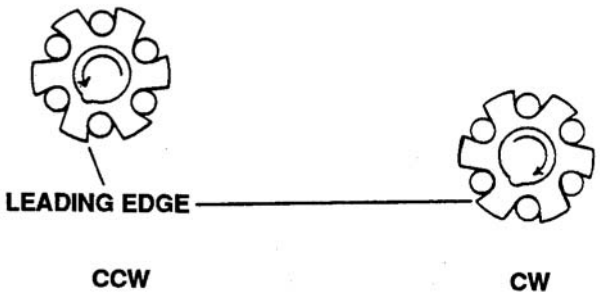


Figure 6-124. Carrier Rotation

11. Install carrier over input shaft with side marked up facing up. Be sure keyway in carrier fits over carrier drive pin in input shaft. See Figure 6-125.

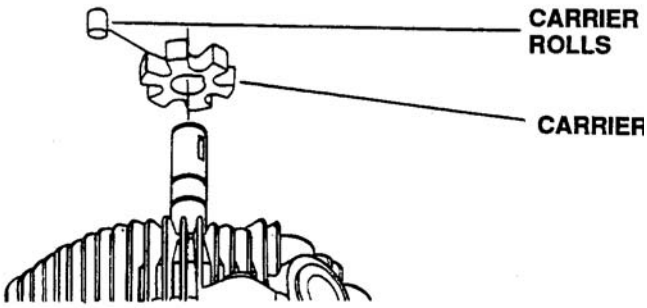


Figure 6-125. Installation of Carrier

12. Lightly lubricate and install the six carrier rolls in carrier. Use a small amount of petroleum jelly or equivalent to hold the rolls in place. See Figure 6-124.

13. On charge pumps with bushings, install the snap ring in the upper groove of the input shaft (against carrier). See Figure 6-126.

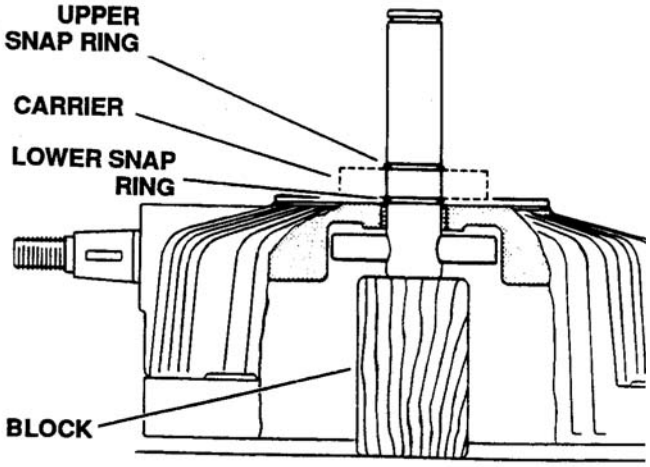


Figure 6-126. Installing Upper Snap Ring

CAUTION

Excessive pressing or force on oil seal may cause damage to rubber sealing portion or may distort counterbore of housing.

14. Lubricate inner surface of new oil seal and install in charge pump housing with the rubber lip toward the bore. Make sure seal is completely seated. See Figure 6-127.

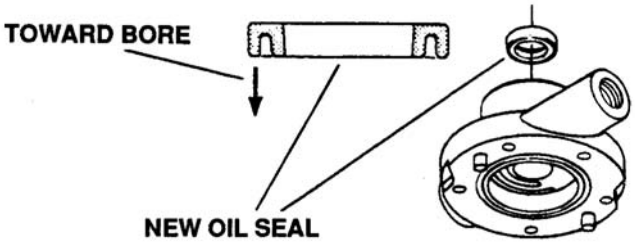


Figure 6-127. Oil Seal Installation

15. Lightly lubricate new square cut seal with petroleum jelly and install in seal groove of pump housing. See Figure 6-128.

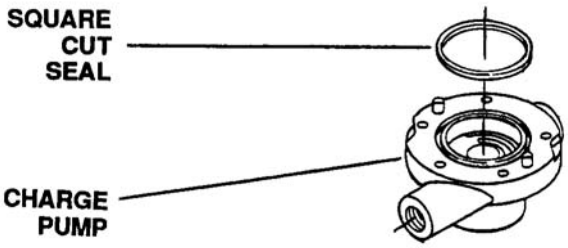


Figure 6-128. Installing Square Cut Seal

NOTE

If an elbow fitting is used in the pump inlet, it must be installed before mounting charge pump.

16. Align charge pump dowel pins with holes in cover. Protect oil seal lip from keyways, snap ring grooves and shaft splines. Guide pump over shaft, carrier and rolls until pins engage holes. See Figure 6-129.

CAUTION

Install 1-3/4 inch screws in thicker section of charge pump body. If installed and tightened in any of the other four holes, internal damage could occur.

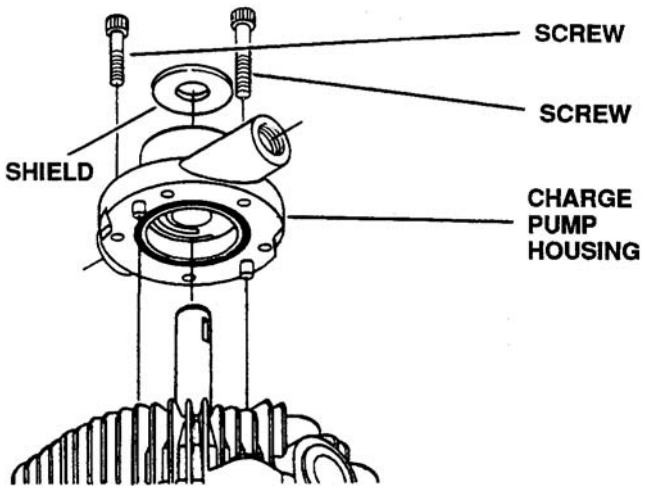


Figure 6-129. Charge Pump Installation

17. Install 4 screws (5/16 x 1-1/4 inch) and one screw (5/16 x 1-3/4 inch) in pump housing. Torque to 15 ft-lbs.

18. On charge pumps with ball bearings, install the lower snap ring. With the cover assembly separated from the body and the input shaft properly supported, press the input shaft bearing into position against the lower snap ring. Install the upper snap ring against the inner bearing race. See Figure 6-130.

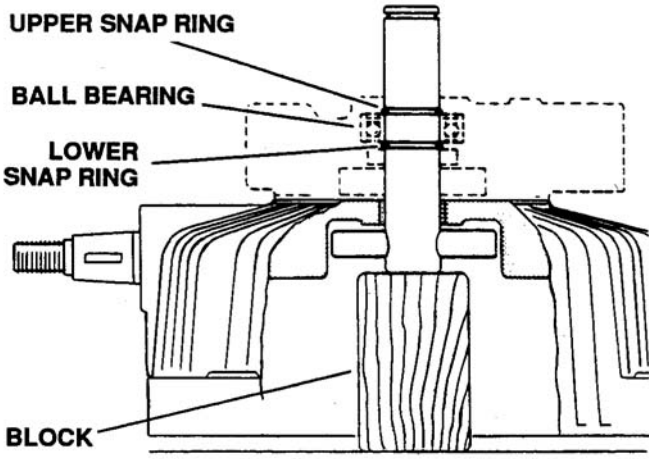


Figure 6-130. Ball Bearing Installation

19. On charge pumps with ball bearings, install the large retaining ring. See Figure 6-131.

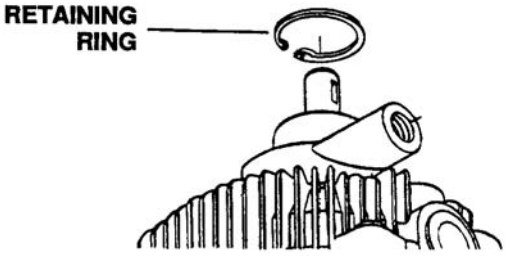


Figure 6-131. Installing Large Retaining Ring

20. Install protective shield on housing.

21. Install two buttons in cover. See Figure 6-132.

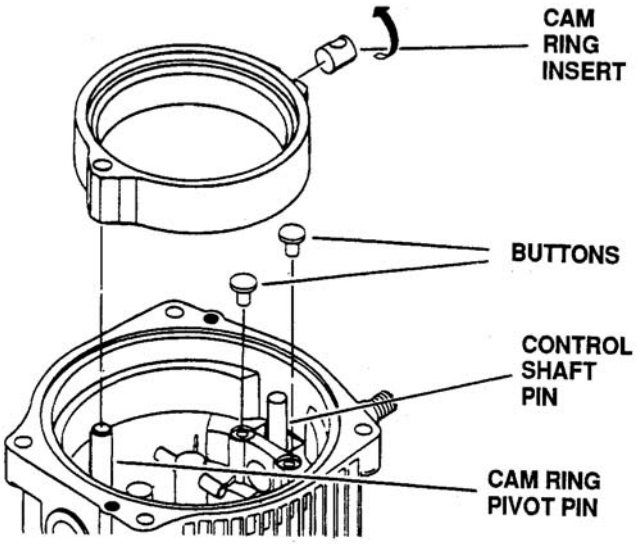


Figure 6-132. Cam Ring Installation

22. Install cam ring insert with the hole away from the cam ring.

23. With the flush side of the bearing race facing the cover, align the cam ring with the control shaft dowel pin and cam ring pivot pin. Press firmly until the cam ring has bottomed into the cover assembly.

NOTE

Cam ring must move freely from stop to stop. If binding occurs at either stop rotate the cam ring insert 180 degrees. Check the cam ring movement again.

NOTE

Keep rotor assembly intact with wide rubber band. Remove rubber band after installing rotor assembly in cover assembly.

24. Install pump rotor by aligning the slot in the pump rotor with the input shaft cross pin. See Figure 6-133.

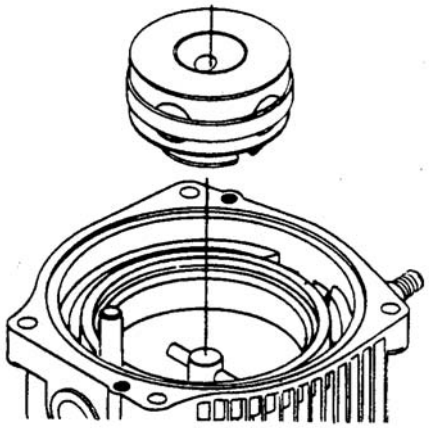


Figure 6-133. Pump Rotor Installation

CAUTION

Do not force pintle over rotor assembly. It is a slip fit and the pintle must turn freely by hand. If it does not, recheck the pintle installation.

NOTE

To determine pintle rotation, place a small ruler or straight edge in the porting slot.

25. Install the pintle by aligning the dowel pin hole in the pintle assembly with the cam ring pivot pin. Install over pump rotor assembly. See Figure 6-134.

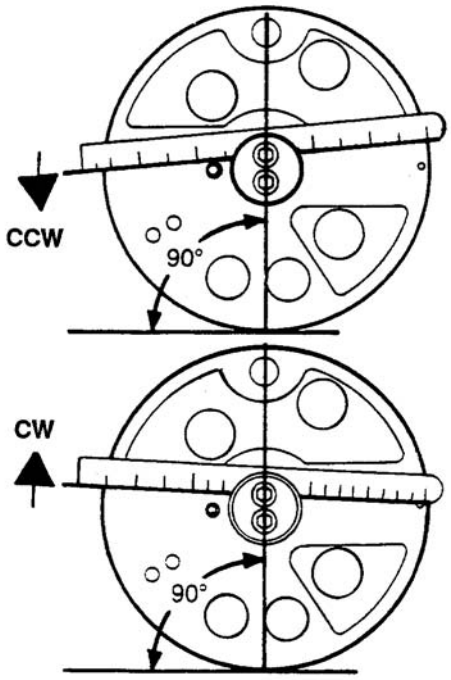


Figure 6-134. Determining Pintle Rotation

26. Lightly grease a new square cut seal and install it in the groove in the housing. See Figure 6-135.

27. Install motor rotor assembly onto pintle.

NOTE

Transmissions with sealed bearings incorporate an oil seal under the output bearing.

CAUTION

Do not over press or drive the oil seal. This may damage the rubber sealing portion of the oil seal.

28. When applicable, install oil seal in body with the rubber lip toward the counterbore in the body. Press or tap the seal into the bottom position in the counterbore. See Figure 6-136.

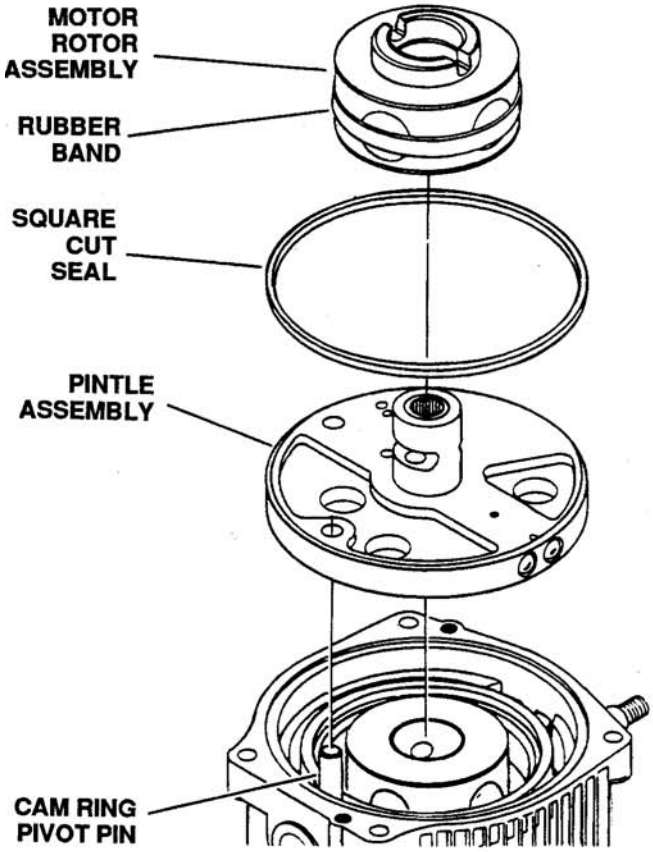


Figure 6-135. Installation of Square Cut Seal and Rotor Assembly

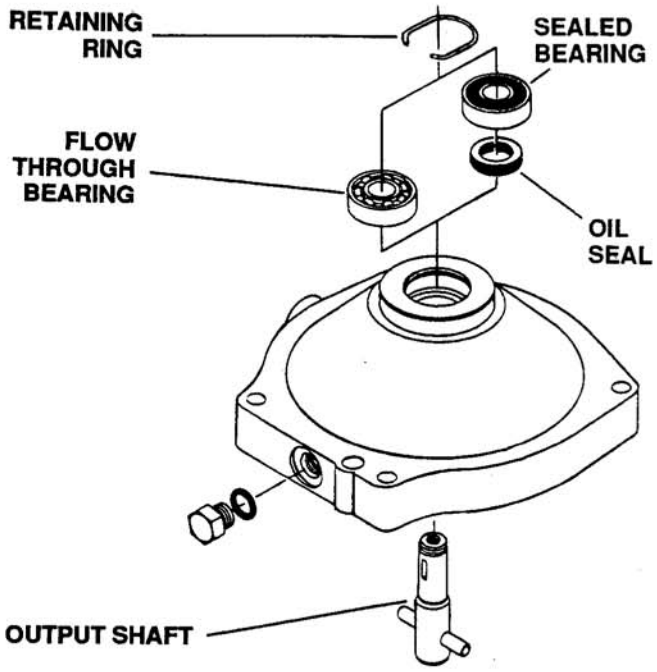


Figure 6-136. Assembly of Bearings, Oil Seal, Retainer Ring and Body

TROUBLESHOOTING HYDROSTATIC TRANSMISSION

No output torque (power) in either direction, cold start.	1. Recheck relief valve position, control linkage, input drive. 2. Oil level in reservoir low. 3. Broken control shaft dowel pin. Transmission must be repaired or replaced.
Loss of output torque, continuous load.	1. Operating at conditions approaching hydraulic stall. The transmission fluid has exceeded 180° F. 2. Internal leakage due to wear. Transmission should be repaired or replaced. 3. Water in transmission fluid. Purge system of all fluid and replace with new transmission fluid. Replacement of the transmission is generally not necessary.
No output torque in one direction.	1. One of the directional valves is stuck. Transmission should be repaired or replaced. 2. Low oil level.
Tractor cannot be pushed with engine off.	1. Relief valve control not set. 2. Relief valve travel not adjusted. 3. Motor piston or rotor seized. Transmission must be repaired or replaced.
No neutral.	Recheck linkage. Loose linkage creates an adjustment problem. Note: The hydraulic neutral band is very narrow. Deflection in the linkage may make it difficult to obtain neutral from both directions. It is recommended that neutral should be positive from forward drive.
Oil leakage at the control shaft seal.	1. Spillage when fluid has been added to the reservoir. 2. Spillage at the vent in the reservoir at operating temperatures due to cold level being too high or water in the fluid. Reduce fluid level or replace fluid in the event there is water in it (milky color). 3. Loose oil reservoir or cover. 4. Loose vent bolt. 5. Damaged control shaft seal. Transmission should be repaired.
Noisy operation.	1. Operating at part throttle. Hydrostatic transmission is designed to operate with the engine running at full throttle. 2. Water in transmission fluid. Replace transmission fluid. 3. Air in transmission fluid. Bleed air from vent.
Output shaft rotates in the opposite direction.	The transmission body is 180° out of position. Transmission has to be removed and reassembled correctly.

29. Install the output bearing by positioning bearing on the body and pressing on the outer bearing race to the bottom position in the body. Install the bearing retaining ring.

30 Install the body by aligning the output shaft with the bearing located in pintle and shaft cross pin with the slot in the motor rotor assembly. Install two 5/16 x 1-1/4 socket head cap screws. Torque to 15 ft-lbs. See Figure 6-137.

CAUTION

Be sure the output shaft rotates freely by hand. If it does not, recheck body installation.

31. Fill with transmission fluid.

    a. On transmission that incorporates flow through output bearing, fill through the axle to the manufacturer's specified fluid level.

    b. On transmissions that incorporate sealed output shaft bearing, fill through the reservoir to the manufacturer's specified fluid level. Start engine and run the transmission in both directions at low engine speed for a short time to purge trapped air from the system. Stop, shut off engine and recheck fluid level. The transmission is now ready for use.

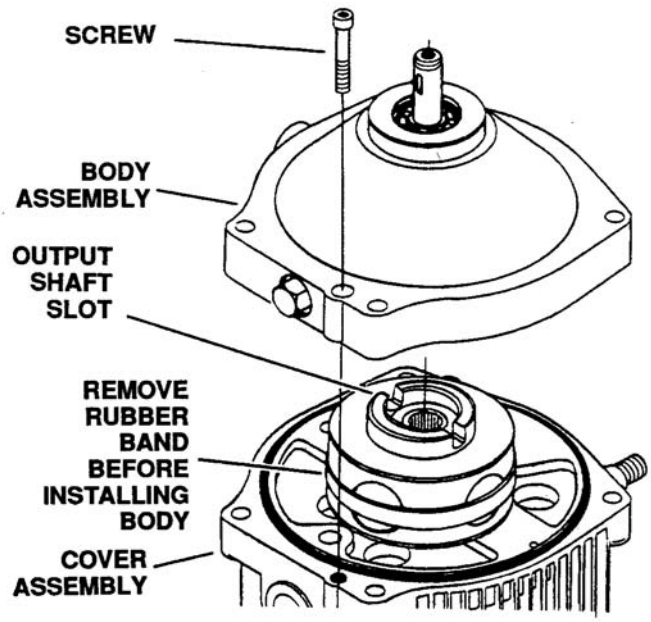


Figure 6-137. Body Installation

Hydrostatic Transmission Removal and Installation

1. Raise the rear wheels off the ground
2. Support the bottom of the hydrostatic transmission.
3. Remove the center hub caps
4. Remove the lug nuts securing the rear wheel assemblies to the rear axle hubs using a 3/4" socket and extension.
5. Remove the rear wheel assemblies.
6. Raise the seat.
7. Remove the battery cables from the battery terminals using a 7/16 wrench.
8. Remove the battery and battery tray from the tractor.
9. Remove all three self tapping screws securing the hydrostatic fan to the hydrostatic drive pulley using a 5/16 socket. See figure 6-138.

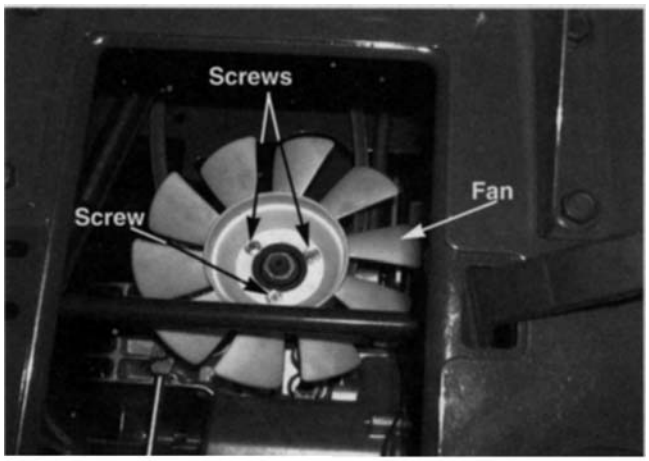


Figure 6-138.

10. Remove the hydrostatic fan.
11. Coming in from below the left foot board, locate the stationary “V” idler.
12. Grasp the left frame rail and “V” belt on both sides of the “V” idler.
13. Squeeze both hands and release the “V” belt from the “V” idler.
14. Release the “V” belt slowly.
15. Roll the “V” belt off of the hydrostatic drive pulley.
16. Remove the self tapping screw securing the ground wire to the neutral return plate using a 3/8 socket.
17. Remove the hairpin securing the hydrostatic foot control rod ferrule and reverse safety bracket to the neutral return plate.

NOTE

Make certain the small extension spring is properly installed during reinstallation. See figure 6-139 and 6-140.

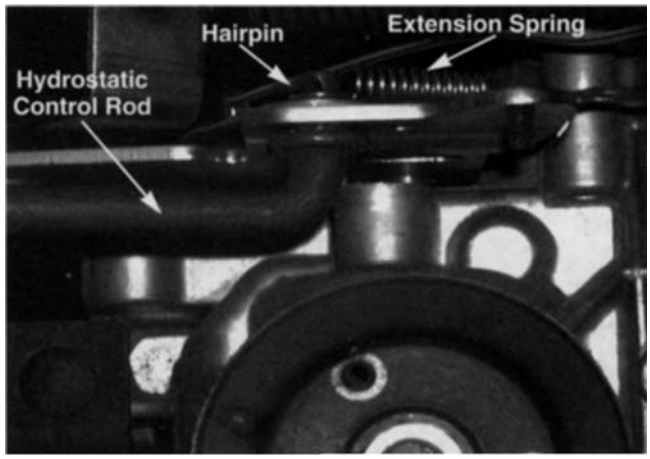


Figure 6-139.

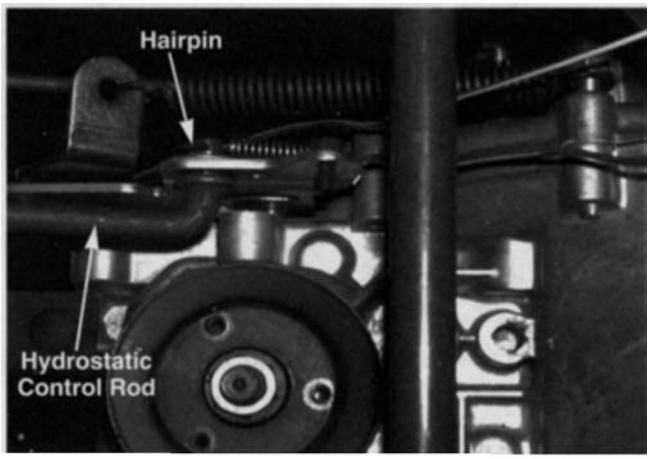


Figure 6-140.

18. Set the reverse safety bracket aside.

19. Remove the hairpin securing the hydrostatic relief lever to the hydrostatic transmission. See figures 6-141 and 6-142.

20. Set the hydrostatic relief lever aside. See figures 6-141 and 6-142.

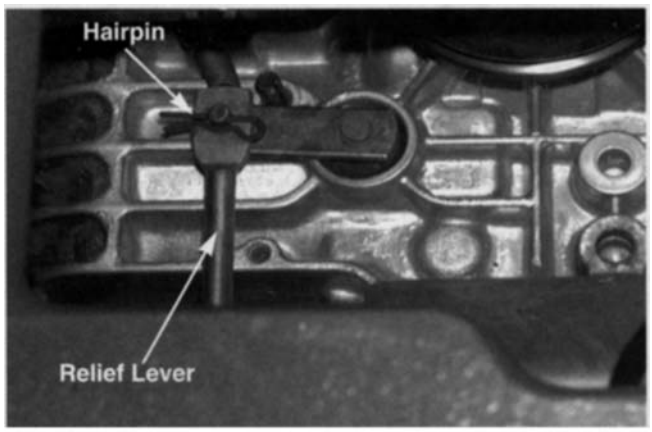


Figure 6-141.

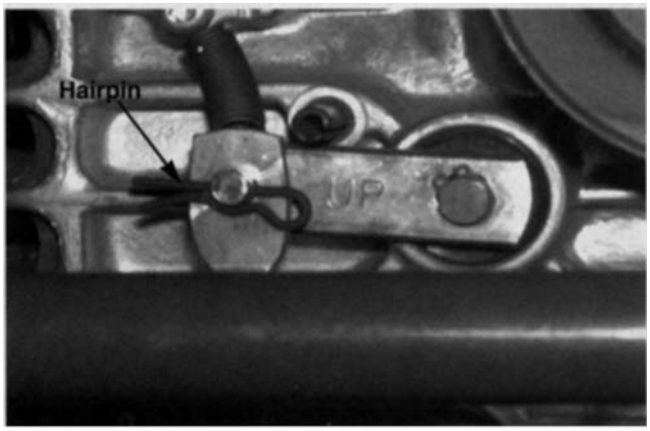


Figure 6-142

21. Snip the zip tie that secures the hydrostatic vent tube to the frame. See figure 6-143.

NOTE

Make certain the hydrostatic vent tube is zip tied back into place during reinstallation. See figure 6-143.

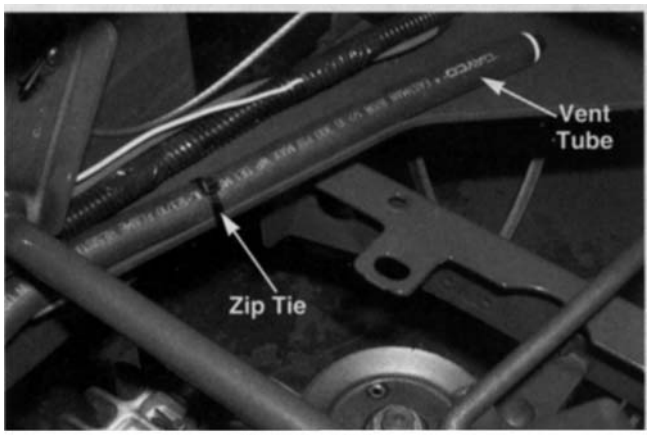


Figure 6-143.

22. Remove both self tapping screws securing the front of the hydrostatic transmission to the front hydrostatic support bracket using 1/2" socket. See figure 6-144.

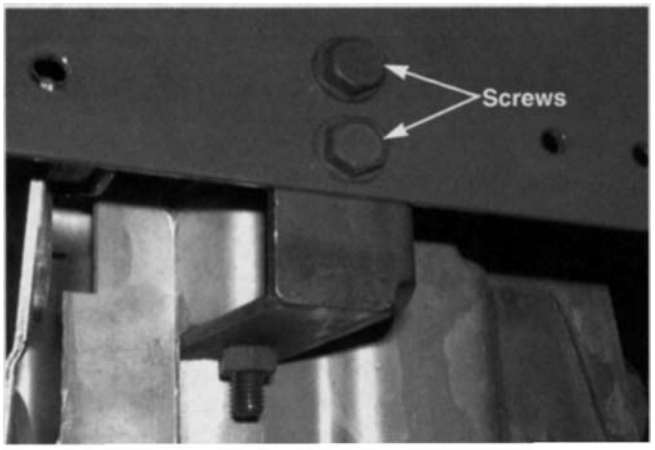


Figure 6-144.

23. Secure the front of the hydrostatic transmission to make certain it does not tip forward during lowering.

24. Remove all four of the hex bolts and lock nuts securing the hydrostatic transmission to the side transmission support brackets using a 1/2" socket and a 1/2" wrench. See figure 6-145..

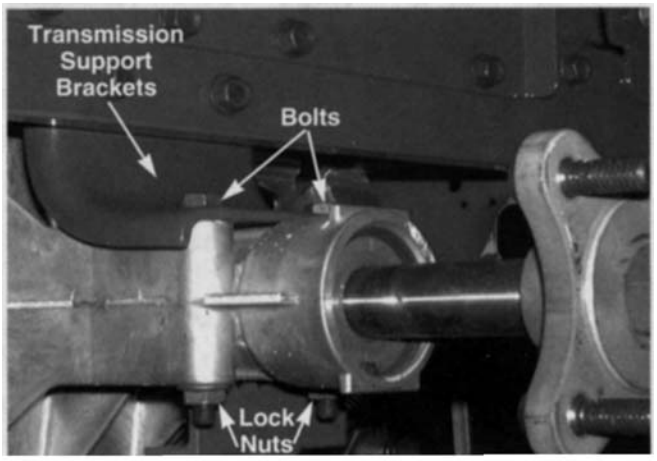


Figure 6-145.

25. Remove the brake extension spring from the brake rod using a pair of vice grips.

NOTE

The hydrostatic transmission can be tilted to assist brake spring removal. See figure 6-146.

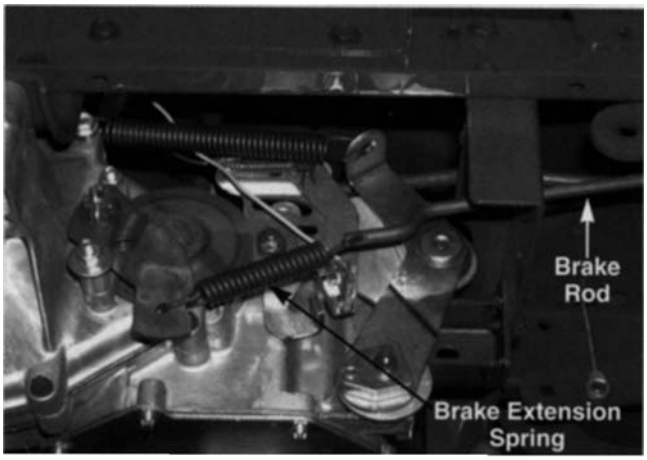


Figure 6-146.

26. Secure the tractor frame.

27. Slowly lower the hydrostatic transmission from the tractor. See figure 6-147.

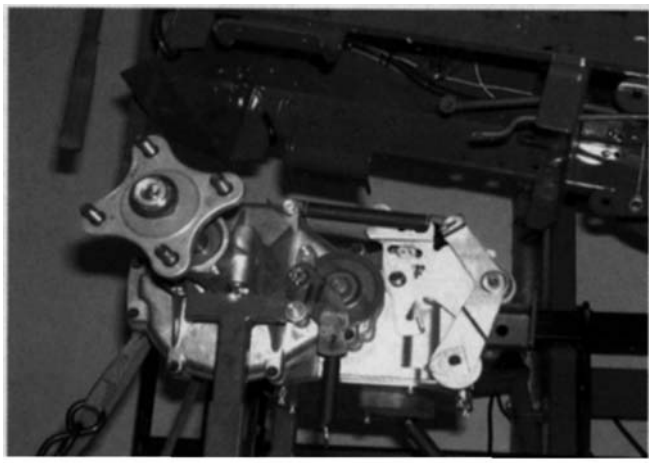


Figure 6-147.

REINSTALL THE HYDROSTATIC IN THE REVERSE ORDER ABOVE.

6-6. BRAKE ADJUSTMENT 700 AND 800 SERIES HYDROSTATIC.

6-6.1 The brake is located inside the frame next to the right rear wheel.

6-6.2 To adjust the brake, remove the cotter pin. Adjust the castle nut so the brake starts to engage when the brake lever is 1/4 to 5/16 inch away from the axle housing. See Figure 6-148.

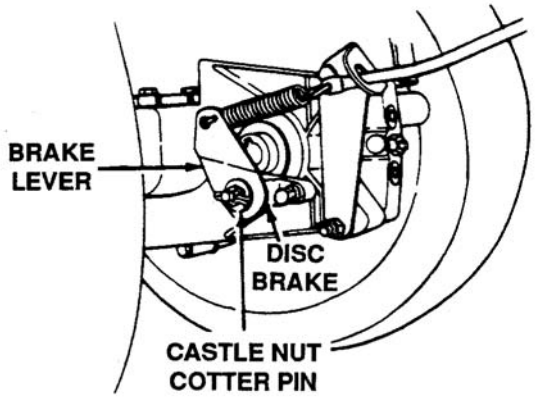


Figure 6-148. Brake Adjustment 700 and 800 Series Hydrostatic

6-7. BRAKE ADJUSTMENT 800 SERIES.

6-7.1 Adjust brake as follows:

1. Loosen lock nut. See Figure 6-149..

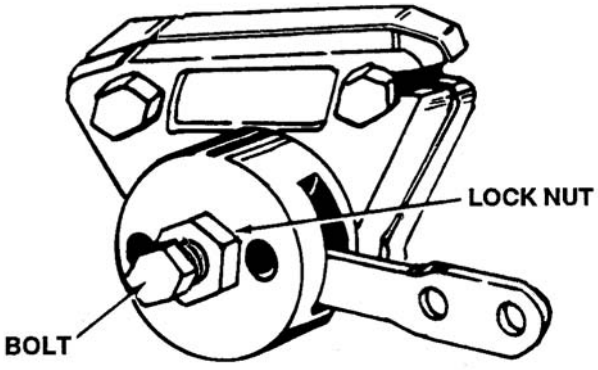


Figure 6-149. Brake Adjustment 800 Series

2. Tighten center bolt all the way in.
3. Unscrew center bolt one complete turn.
4. Test brakes and repeat step 3 if necessary.
5. Tighten lock nut.

6-8. BRAKE ADJUSTMENT 800 SERIES TRANSAXLE.

6-8.1 The brake is located on the left side of the transaxle.

6-8.2 To adjust the brake, remove the cotter pin. Adjust the castle nut so the brake starts to engage when the brake lever is 1/4 to 5/16 inch away from the axle housing. See Figure 6-150.

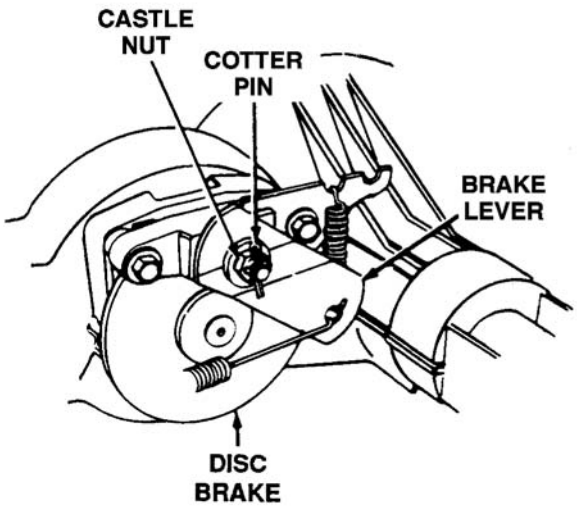


Figure 6-150. Brake Adjustment 800 Series Transaxle

6-9. BRAKE ADJUSTMENT 900 SERIES TRANSAXLE.

6-9.1 The brake is located on the left side of the transaxle. The adjustment access hole is above the left rear axle mounting bracket.

6-9.2 Adjust brake as follows:

1. Loosen lock nut with an 11/16 inch wrench.
2. With a 7/16 inch socket and extension, tighten center bolt until the pads are pushed against brake disc.
3. Back off center bolt one half turn and tighten lock nut.
4. Test the brake operation.

BRAKE ADJUSTMENT

1998 800 Series Hydrostatic (See figure 6-151)

The brake is located by the right rear wheel inside the frame. During normal operation of this machine, the brakes are subject to wear and will require periodic examination and adjustment.

WARNING

Do not adjust the brake while the engine is running. Be sure to block the wheels of the tractor before making the brake adjustment. If adjustment is necessary, follow these steps:

1. Measure the length of the brake compression spring. See figure 6-151.
2. Depress the clutch-brake pedal all the way and set the parking brake.
3. Remeasure the length of the brake compression spring.
4. If the measurement is not 1/4" shorter then the first measurement, tighten the hex jam nut until you have a 1/4" difference in the two measurements. See figure 6-151.

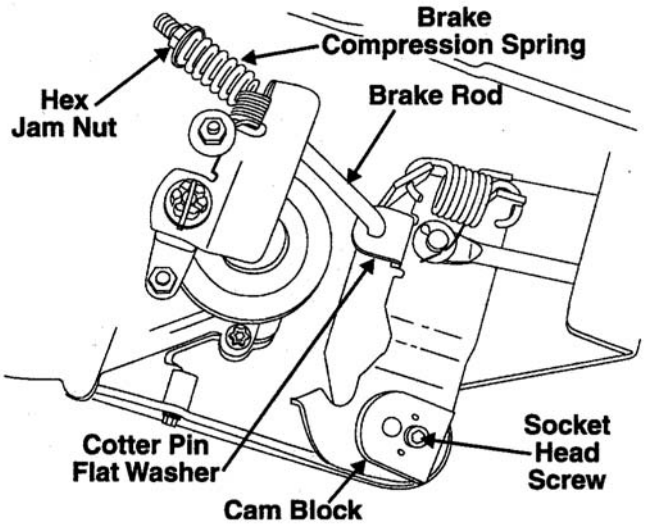


Figure 6-151. Brake Adjustment

900 SERIES

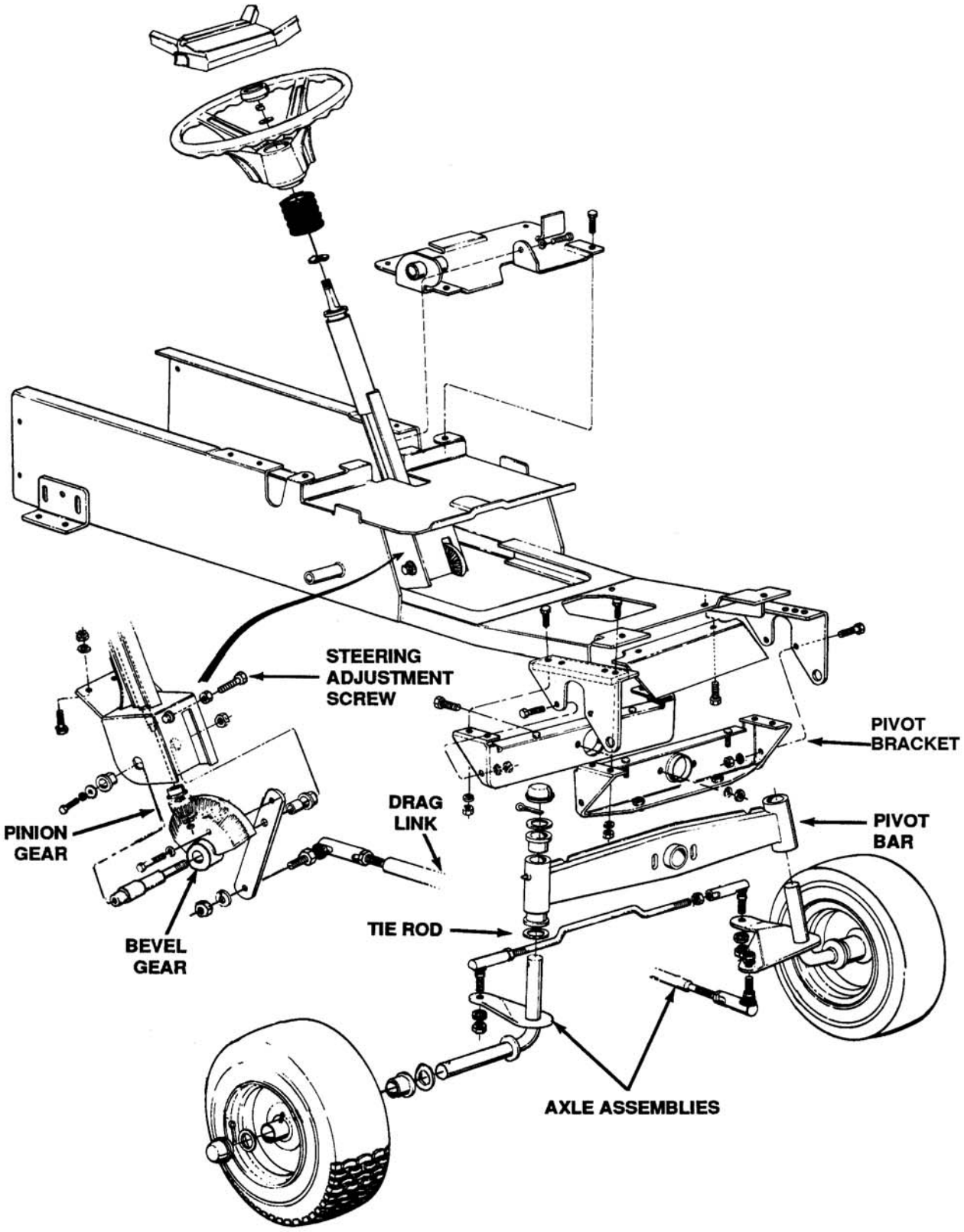


Figure 7-1. Model 900 Series Garden Tractor

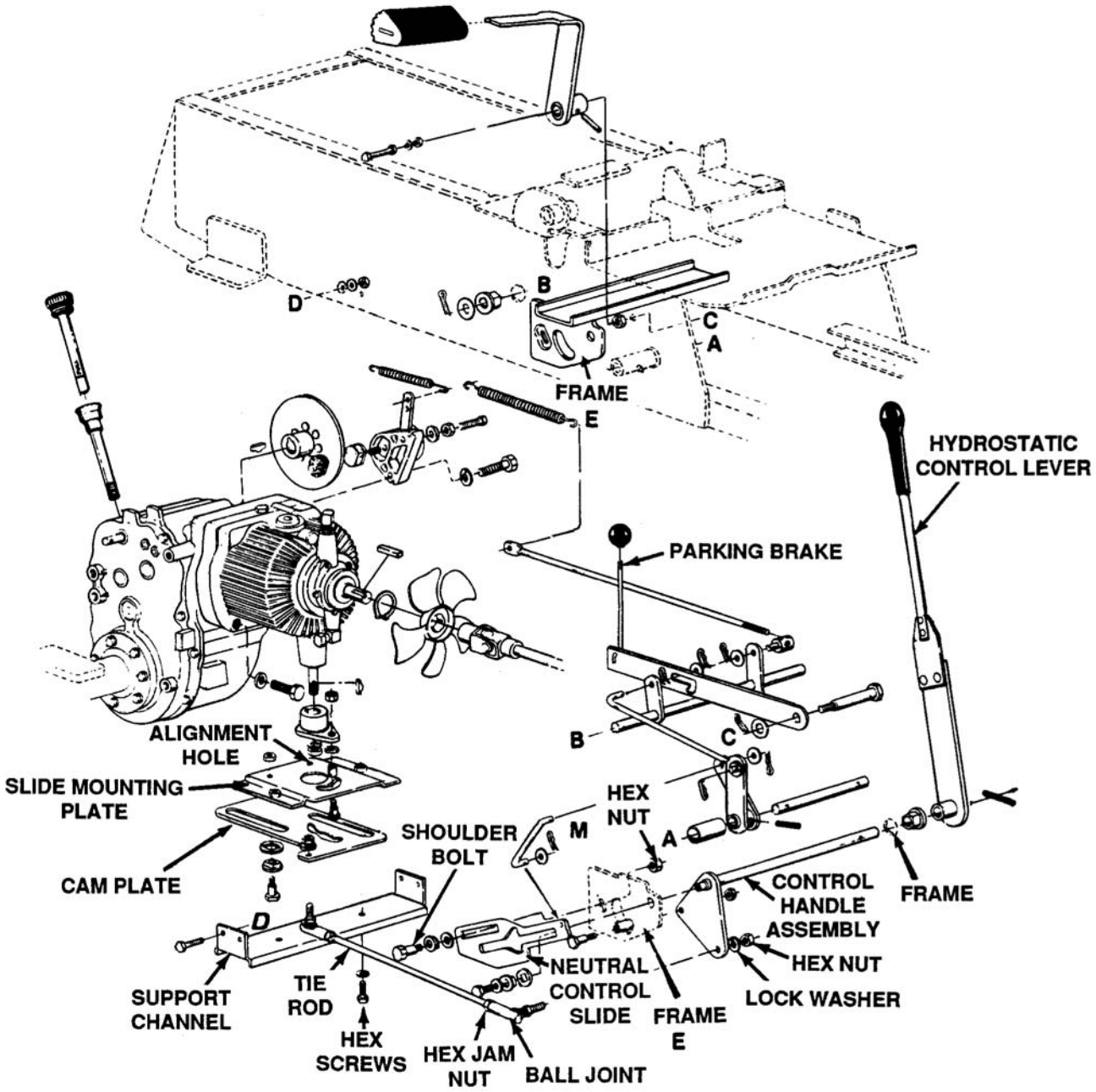


Figure 7-2. Hydrostatic Drive 900 Series

NOTE

If the tractor creeps while the hydrostatic control lever is in neutral the controls at the hydrostatic transmission must be adjusted.

7-1 Hydrostatic Transmission Control Adjustment.

Refer to Figures 7-2 and 7-3.

1. Block the rear of the tractor up so both rear wheels are off the ground.

2. Loosen the hex jam nut on the tie rod at both front ball joints.

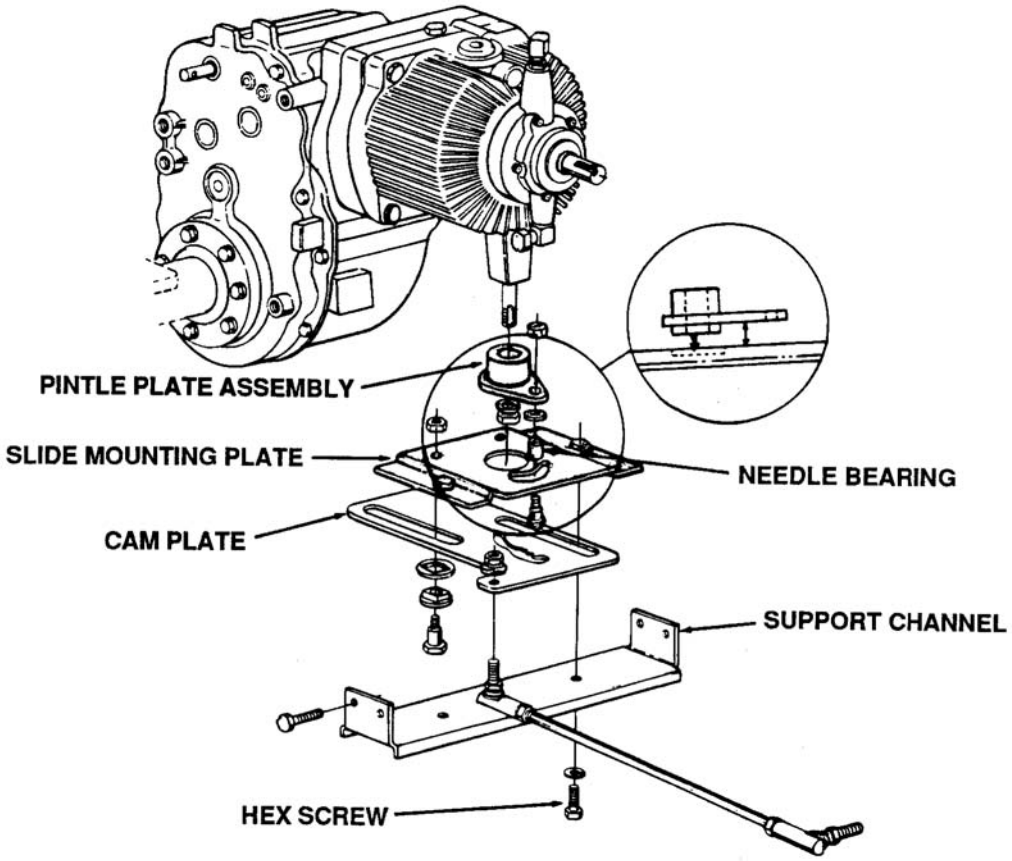


Figure 7-3. Hydrostatic Control Adjustment

3. Move the cam plate forward or backward by turning the tie rod clockwise or counterclockwise until the alignment hole in the slide mounting plate and cam plate line up.

4. Loosen (do not remove) the two hex screws which hold the support channel to the cam plate.

5. Start the engine and run at full throttle.

NOTE

Proper adjustment of the hydrostatic transmission control cannot be obtained unless the engine is running at full throttle. Running the engine at a lower rpm will result in an inaccurate adjustment of the control.

6. Adjust for neutral by rotating the slide mounting plate until no movement of the rear wheels can be detected.

7. Retighten the two hex screws in the support channel which were loosened in step 4.

8. Recheck the hole alignment in the cam plate and slide mounting plate for proper positioning as instructed in step 3. Readjust if necessary.

9. Tighten both jam nuts on the tie rod ends.

10. With the unit still on blocks, start the engine and run at full throttle. With the engine brake released, move the control lever to the full forward position. Return the control lever to the neutral position. The wheels should stop moving. Proceed in the same manner for reverse. When moving the control lever to either the forward or reverse position, the wheels must stop moving. If the wheels fail to stop, repeat steps 2 through 10.

11. After the proper adjustment is reached, and the wheels stop as indicated, move the control lever to the full forward position. Fully depress the brake pedal and release. At this time, the control lever should return to the neutral position, and the wheels should stop. Repeat this procedure, this time moving the control lever to the reverse position.

    When the control lever is moved by handle to the neutral position from either forward or reverse, the wheels should stop moving. The wheels should also stop moving if the control lever is in either forward or reverse and the brake pedal is depressed.

NOTE

Some 955 hydrostatic tractors have been found to have a variance in ground speed, especially on uneven terrain. This variation in ground speed is usually caused by surging of the hydrostatic pump. This is caused by incorrect seating of the slide mounting plate during assembly. To correct the problem, readjust the hydrostatic transmission control as previously described, making sure the hub of the pintle plate assembly is aligned and will drop into the hole in the slide mounting plate. When correctly positioned, the small hub on the pintle plate assembly will fit in the hole of the slide mounting plate and the needle bearing will extend below the cam plate.

7-1.1 Hydraulic Lift Valve Adjustment.

1. The valve is located under the left side of the tractor frame under the hydraulic lift lever. See Figure 7-4.

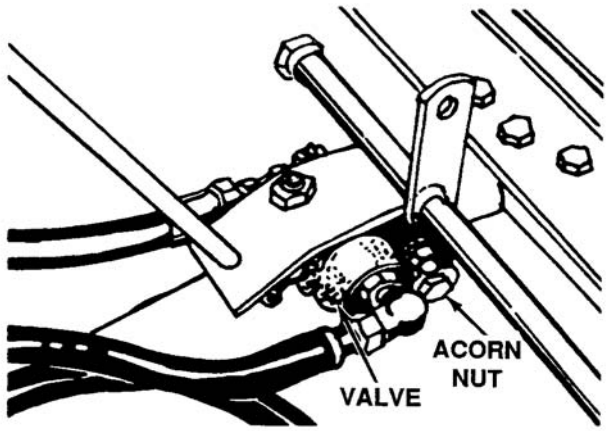


Figure 7-4. Location of Hydraulic Lift Valve

2. The hydraulic lift valve is adjustable. Before making adjustments to the valve, be sure the engine is running at a maximum speed of 3600 RPM. If the hydraulic lift will not raise your attachments, especially the heavier ones, you can increase the pressure. The pressure has been preset at the factory to 700 psi. The equipment being used should be attached to the tractor while adjusting the lift valve.

3. Insert a “T” fitting between the charge pump on the hydrostatic transmission and the valve. Secure a 1000 psi pressure gauge to the “T” fitting. Proceed as follows:

   a. Start the engine and run at full throttle.

   b. Check the engine speed with a tachometer. Engine should be running at 3500 to 3600 RPM.

   c. Move the hydraulic lift lever all the way either direction and hold it until the relief valve opens. The gauge should read 700 psi.

   d. If necessary, adjust relief valve as follows. Do not, under any circumstances, exceed 700 psi.

4. If necessary, adjust valve as follows:

   a. Remove the acorn nut and washer. See Figure 7-5.

   b. Back off the lock nut at least three complete turns.

   c. Turn the screw one complete turn in.

   d. Tighten the lock nut.

   e. Reassemble acorn nut and tighten.

   f. Test the operation of the lift valve with the attachment on the tractor and the tractor engine running at full throttle.

   g. If necessary, repeat the above steps.

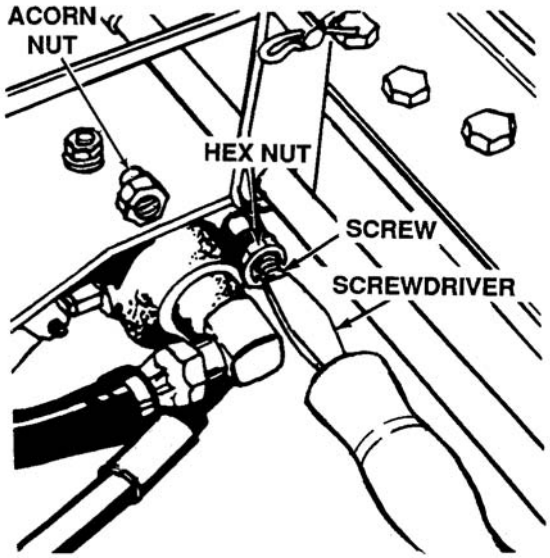


Figure 7-5. Adjusting Hydraulic Lift Valve

7-1.2 Power Takeoff (PTO) Adjustment.

The PTO cable can be adjusted at either end. To adjust, loosen the nut on the inside and tighten the nut on the outside to compensate for cable stretch. Adjust until the idler depresses the safety switch plunger within 1/8 inch of bottoming out in the switch when the PTO is in the OFF position. See Figure 7-6.

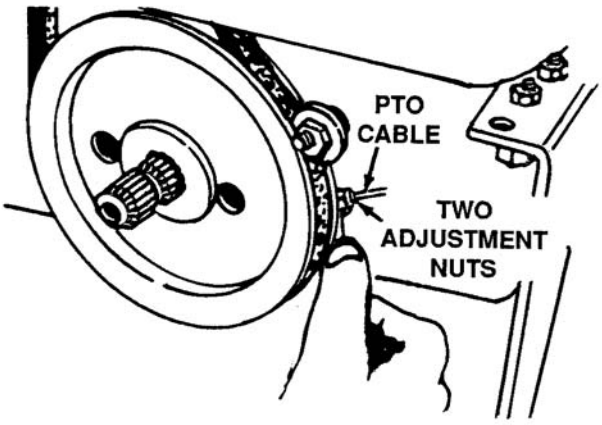


Figure 7-6. PTO Adjustment

7-1.3 PTO Belt Removal.

1. Take off the front PTO belt guard assembly by removing four hex screws. See Figure 7-7.

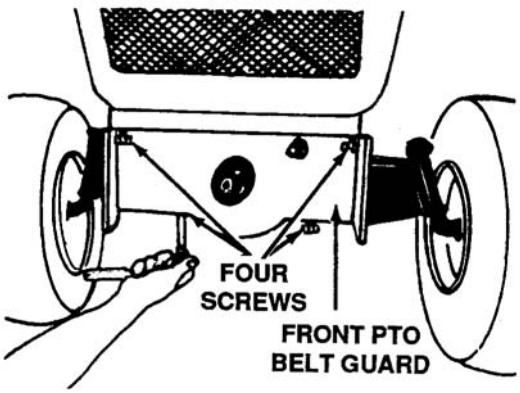


Figure 7-7. Removing PTO Belt Guard Assembly

2. Put the PTO lever in the OFF position.

3. Loosen two screws on inner belt guard. See Figure 7-8.

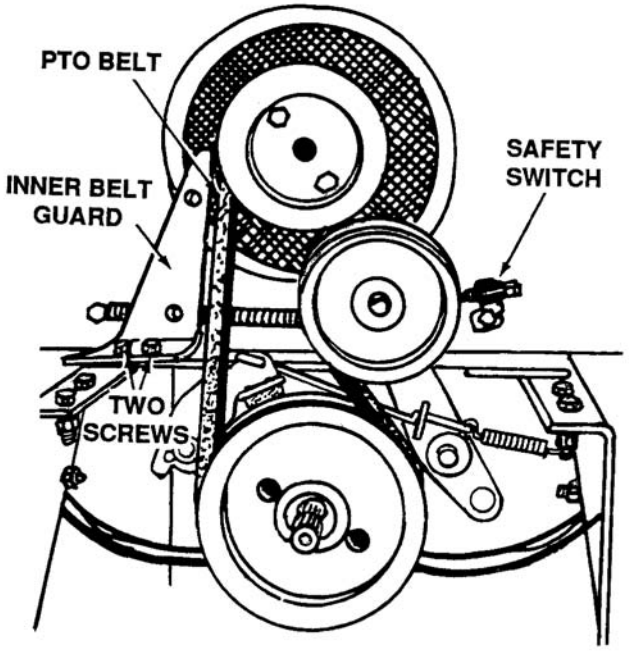


Figure 7-8. Removing PTO Belt

4. Remove V-belt. Reassemble using a new OEM V-belt, part number 754-0234.

NOTE

If the PTO belt does not stop, replace the brake bracket.

12-6.8 Rear Wheel Track Adjustment.

The rear wheels may be adjusted wider for more stability by reversing the wheels and rims on the hubs.

With the rear wheels in the narrow position, their outside is even with the outside of the front wheels. With the rear wheels in the wide position, their inside is even with the outside of the front wheels.

Use this chart to determine the rear wheel setting.

ATTACHMENT	MODEL NO.	WHEEL SET
50" Mowing Deck	190-993	N
12" Moldboard Plow	190-920	W/N
Tandem Disc Harrow	190-921	N
Spring Tooth Cult.	190-922	N
54" Snow Blade	190-985	N
45" Snow Thrower	190-990	N
35" Rotary Tiller	190-960	N
N—Narrow W—Wide		
Rear Wheel Chains		190-965
75 pound (each) Wheel Weights		190-784

7-1.2 Undercarriage Locks.

The maximum down position can be set on the undercarriage for the mowing deck. See Figure 7-9. There are six positions. This adjustment should be used with the deck roller adjustment so the mowing deck is always cutting parallel to the ground. To change the locks, remove the hairpin cotter, clevis pin and spacer and install in the desired hole. Both locks must be adjusted in the same position.

When setting the cutting height, lower the deck with the hydraulic lift until the undercarriage bottoms out against the locks.

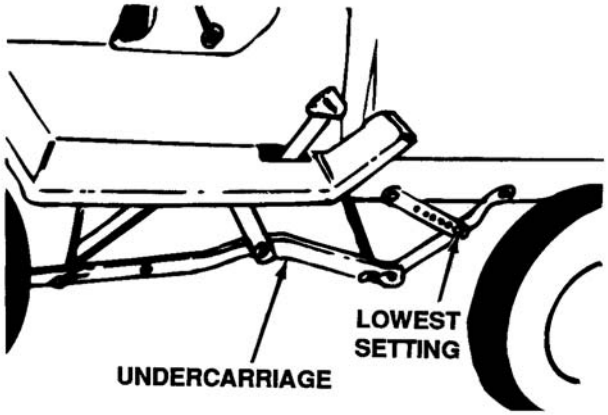


Figure 7-9. Undercarriage Lock Adjustment

The undercarriage locks are also used to hold the undercarriage in the completely raised position when using any of the rear mounted attachment or to prevent the undercarriage from moving up and down. See Figure 7-10.

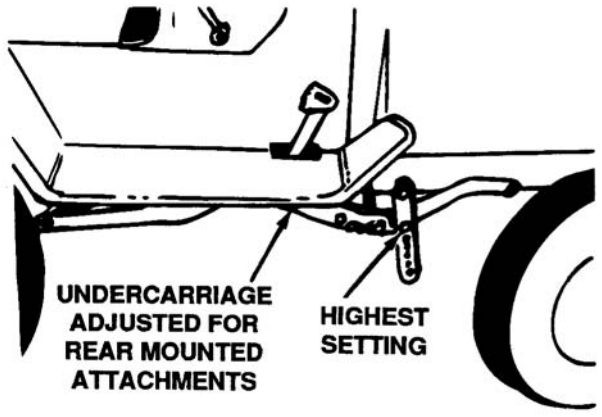


Figure 7-10. Undercarriage Lock Raised Position

7-1.6 Drive Shaft Removal.

1. Loosen the square head set screw on the front universal joint. See Figure 7-11.

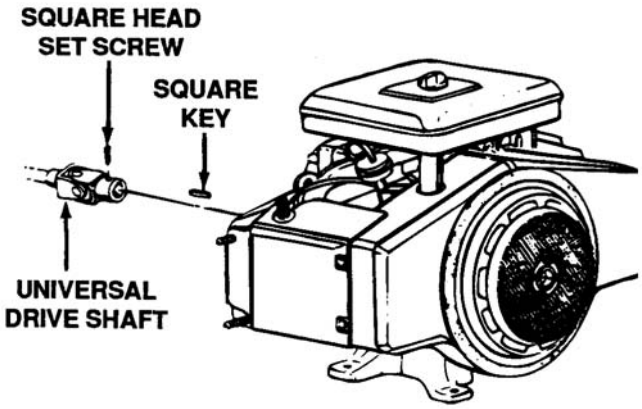


Figure 7-11. Removing the Drive Shaft

2. Slide the drive shaft assembly forward as far as it will go. The rear universal joint can be removed from the input shaft of the hydrostatic transmission. See Figure 7-12.

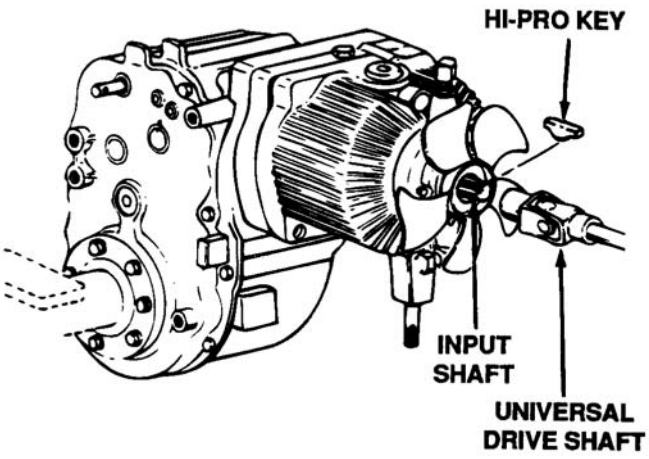


Figure 7-12. Drive Shaft Removal

3. Remove the drive shaft assembly from the tractor.

NOTE

There is a square key at the engine crankshaft and a hi-pro key at input shaft of transmission. Do not lose.

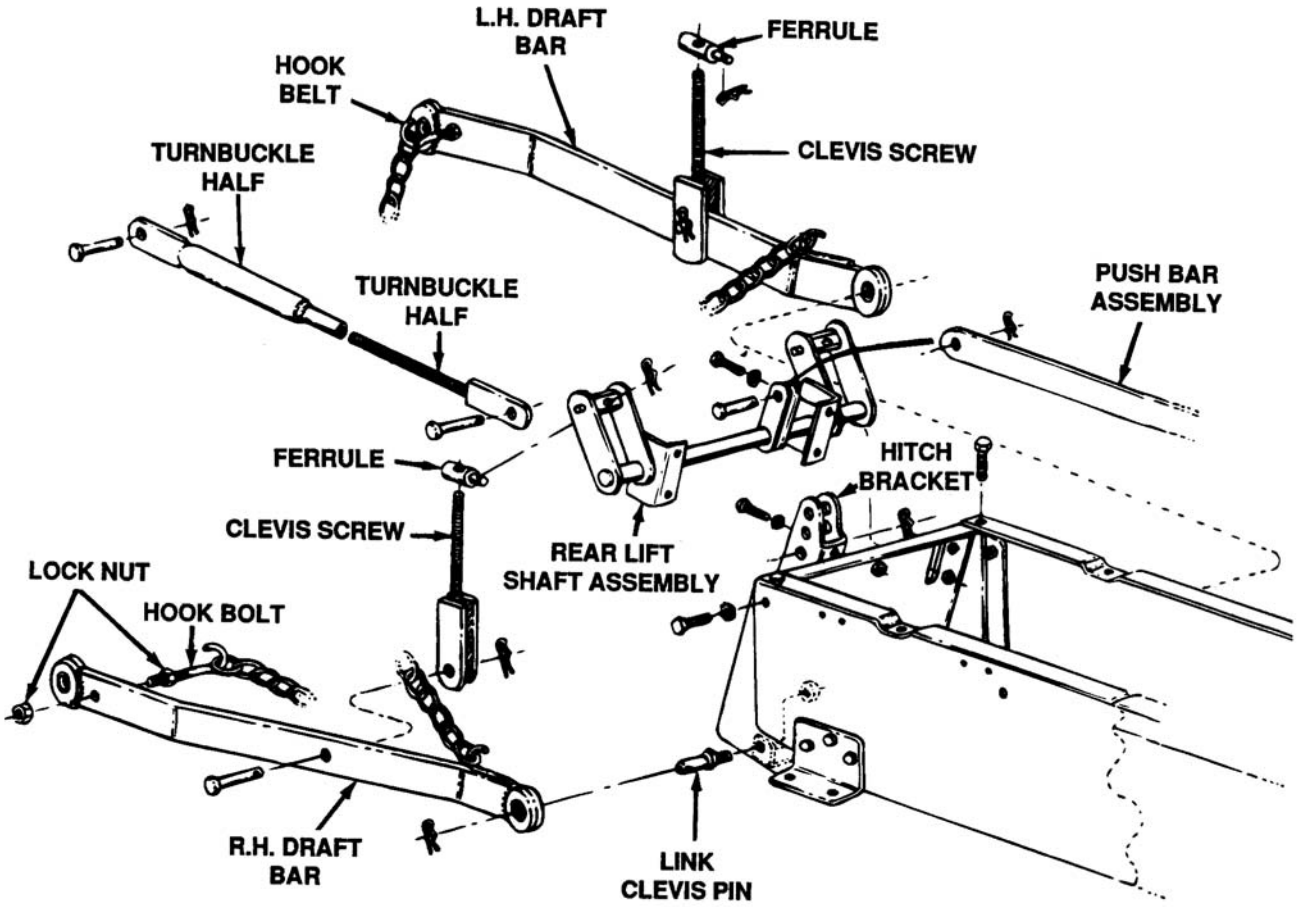


Figure 7-13. Three Point Hitch Assembly

7-1.7 Three Point Hitch Assembly (See Figure 7-13).

The three point hitch is needed for the rotary tiller, disc, cultivator and moldboard plow. To use the mowing deck, snow thrower or snow plow, it is not necessary to install the three point hitch.

1. Raise the lift shaft assembly until the hole lines up with the slot in the push bar assembly.

2. Secure with clevis pin and hairpin cotter provided in the hardware pack.

3. Assemble the two draft bars to the link clevis pins in the frame of the tractor with two hairpin cotters.

NOTE

Refer to Figure 7-13 to determine right and left hand draft bars.

4. Thread the ferrule onto the clevis screw until approximately a half inch of thread is showing above the ferrule.

5. Attach the ferrules to the rear lift shaft assembly and secure with two hairpin cotters.

6. Attach the lower end of the clevis screw to the draft bars with the two clevis pins and hairpin cotters.

7. Screw the two halves of the center turnbuckle together. Attach either end to any hole in the hitch bracket mounted in the center of the rear frame or the tractor with a clevis pin and hairpin cotter.

8. Screw one hex nut all the way on to each of the hook bolts.

9. Insert the hook bolt through the inside of the draft bars. Secure with a second nut. Do not tighten.

10. Fasten the chains to the hooks welded on the draft bars. Cross the chains over and attach to the opposite hook bolts.

11. Tighten the outside nuts on the hook bolts until there is approximately one inch of play in the center of the chains.

NOTE

Pull the chains to make them as tight as pos-sible.

12. Make certain all nuts and bolts are tightened securely.

7-1.8 Leveling the Deck (Optional Equipment).

With unit on hard, level surface, measure the distance from the bottom edge of the center of the left side of deck to the ground. Measure the same distance just behind the chute area on the right side of the deck. Or, place the blades in a straight line, and measure the distance from the outside edge of the blade tips to the ground.

If adjustment is needed, proceed as follows:

1. Remove the hairpin clip and flat washer from the bottom of the adjustable lift link on the right side of the deck. Pull the adjustable lift link out of the lift arm link.

2. Turn the adjustable lift link up or down as necessary to level the deck. Usually only one or two turns are needed.

3. Insert the end of the adjustable lift link into the hole in the lift arm link. Recheck the adjustment as instructed above. Readjust if necessary.

4. When deck is level, secure the end of the adjustable lift link with flat washer and hairpin clip.

MODEL 999

Problem: It has been reported on a few units that after approximately 20 minutes of operation a hydraulic hose part number 727-0218 located at the filter base and extending to the valve assembly may slip off the fitting.

Solution: Replace defective hose by ordering part number 727-0218 or place hose clamps on each end of the hose under warranty. See “Hose Diagram”.

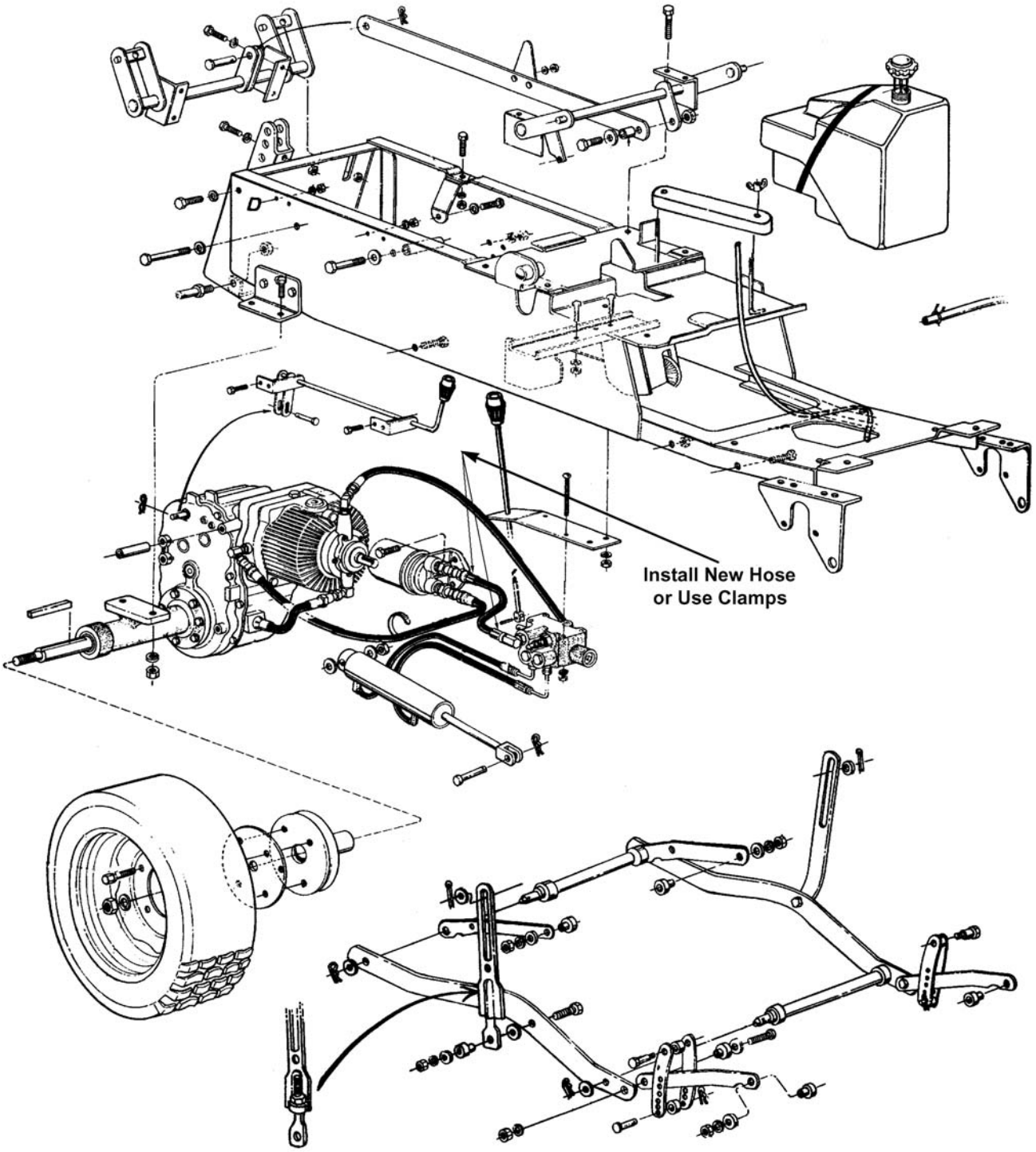


Figure 7-14. Model 999

CUTTING DECKS
CUTTING DECK PERFORMANCE
Operation * Problems * Solutions
WALK-BEHINDS AND LAWN AND GARDEN TRACTORS
THE FOLLOWING CONDITIONS CAN AFFECT THE QUALITY OF CUTTING GRASS

TIRE PRESSURE VARIATION: The air pressure should be equal on both front and rear tires, approximately 12-13 lbs. air pressure regardless of the size tire on lawn and garden tractors.

DECK WHEELS INCORRECTLY SET: The deck wheels should be set evenly so that the pitch of the cutting blades will not be affected. If any difference is required for a better cut on some walk-behind mowers, the front height adjuster can be one position lower to assure that you are cutting with the front of the blade. If the deck is slightly lower in the rear you will tend to cut the grass at the rear of the mower. This causes the grass to be thrown to the rear wheels and causes a rough or irregular cut.

DECK WHEEL ADJUSTMENT: The deck wheels on all lawn and garden tractors should be adjusted so they will be 1/2" to 1" off the ground at all times. All cutting decks are floating so that they can cut evenly over the ground. The angle from front to rear is built into the assembly on lawn tractors. Check to be certain the distance from the bottom edge of the deck to the ground is the same on both sides of the deck. If it is not, adjust the links on the left side of the unit. The linkage is adjustable on garden tractors. After you have leveled the deck to the ground, you must adjust the linkage up 1/2" to 1" above the ground.

Check to be certain the front of the deck is 1/4" to 3/8" lower in the front of the deck than from the rear of the deck. If it is not, adjust the two front links to obtain this distance. This is of most importance. You must keep in mind that if the deck is riding on the ground and you want to make a turn with the tractor the cutting deck still wants to travel straight if the wheels are on the ground and then as you turn, the cutting deck will be dragged sideways. This then damages the wheels or the rollers.

The deck doesn't turn because there is no differential on the rear axle assembly. This condition will also damage or bend the deck hangers or deck links. From then on till the problems are corrected the quality of cut is affected. When the wheels are set to run on the ground, the deck drive belt is also subjected to excessive load conditions. This causes the belt to become very tight and then loose repeatedly during the course of mowing and again this condition is magnified when making turns, causing premature wearing on the belt. Bent or uneven deck links can cause cutting problems. Deck links should move freely and not bind against the frame of the tractor or other component parts.

CUTTING BLADES: First of all the blades must be the correct part number for the mower and original equipment style, according to the owner's manual. The blade part number is stamped and is found stamped into the back side of the blade. MTD blades are tempered and designed only to bend on impact and not to break. They are tested for this properly and upon impact with an object. Nothing can come off the mower. The only time a blade breaks is when first it is bent and the person operating the mower chooses not to do anything about it. With the blade now vibrating it will crack at the mounting bolt holes. You may vision this as to when you take a piece of metal and bend it back and forth. Many times it will break in two pieces. This condition on a mower blade can easily be detected by looking at the crack. The first part of the crack will be rusting and the final stage of breaking will be shining and not rusted.

The blade adapter will often also show evidence as either being cracked or one of the mounting ears bent upward. Blades are designed to be high lift, therefore meaning that they are made with a raised area, behind the cutting tips which create a lifting action, pulling the grass up to the blade. The proper lift is more important to the cutting quality than even a sharp edge. The blades must be run at full throttle position on the mower. To assure this,

the engine should be checked and running at 3400 to 3600 RPM. This should be checked with a tachometer by a qualified dealer.

The blades running at the proper RPM develop a vacuum lift action. This is created by a combination of things, mainly a deck designed with baffles in the front and rear of the deck. The deck depth and controlled flow design helps to develop a deep vacuum action lifting the grass for cleaner, sharper cutting and efficient discharge of the grass out the side or to the rear for bagging. This then brings us to understand the importance of discharging the grass. To accomplish this most effectively a full baffled deck housing is needed. That is also why the most effective decks for mulching are designed like a donut. The depth is important because after the grass is cut it must rise into the dome of the housing and as it falls to the ground the grass is cut many more times by the inner angles and edges of a special mulching blade.

Most of our walk behind mowers are designed to be what we call three-in-one mowers, meaning that they will mulch, side-discharge and side or rear bag grass. Blades must be properly sharpened, following the original angle and then checked for balance. If the blades are dull and nicked on the cutting edge this will tend to tear the grass rather than cut it. Mulching blades are more critical and most often it would be better to replace the blade rather than trying to sharpen the varying angles and possibly lose its effectiveness. If blades are in question, measure from a level surface to the blade tip, using a rule or tape measure. The blade should be checked and then rotated to the other end 90 degrees. The measurements between the blades should be the same and no more than 3/16" height difference when the blades are tip to tip. If more than the 3/16" is discovered and the deck is hanging properly from the tractor, the blades should be removed and checked for straightness.

The sharpened edges should lie flat against the surface plate. If they do not, it is possible the blade is bent or warped. The blade can be placed in a vise and straightened or replaced. If the edge of the blades are found to be straight, it is then possible that the spindles or spindle area in the deck is bent or warped from hitting an object, root or curb. Each blade spindle can be checked and removed from the deck and placed in a vise by the bearing housings. By rotating the blade by hand a bent spindle can be detected by wobble. If this is found, the spindle should be replaced. Often this is checked when it is felt that bearings have worn out prematurely. Bearings and spindles often take damaging shocks that the user is now aware of, or quickly forgets that a few roots etc., have been hit.

MISSILE DEFLECTORS: All of our mower decks are equipped with a missile deflector to direct the flow of grass out the side of the deck at a safe angle and mowers should only be operated with the deflector in the down position. During our testing procedures we inject steel balls and nails under the deck while the mower is running so that we can determine the angle that these objects will be discharged. The regulated height that any item can come out is no higher than the knee.

Decks should always have this deflector properly installed on the mower housing. If for some reason that this deflector is off the mower during the warranty servicing, a claim can be submitted for replacement. A mower without a deflector can project STONES from the driveway, and the NAILS that fell into the lawn when the roofer was installing the new roof and of course, no one could find them, but the lawn mower does find them when you least expect.

DECK BELT GUARDS: Belt guards must be properly adjusted and kept in place. The belt guards (hex bolts) on the engine pulley and belt guards on the deck pulleys should have a minimum of 1/8" clearance. Belt guards which are rubbing the pulleys and/or belts can cause the belt to be subjected to excessive heat. The possibility of a belt rolling over is greatly increased when this type of condition exists. The engine pulley and the deck pulleys should be free of any nicks or dents and the pulley sheaves edges should be smooth and free of burrs.

It is also important to then understand that these belt guards are not only to keep the belt on the pulley, but that they are also needed so that the belts trap-out against them. When the belt is disengaged, the belts then are prevented from continuing to travel. Understanding this, it is then easy to understand the importance of the proper belt size and construction. All MTD belts are constructed

according to engineered drawings for the proper performance, not by chance to size.

To begin a repair on any mower the first thing to determine is, does it have the original type belts installed on it? If it does not, that is the place to start your repair. The belts must be to the manufacturers specifications. The results of the wrong belt on a deck can also cause poor cutting quality because the belt could be slipping on the blade spindle pulley and this can cause too slow of a blade speed. Grass in the spring has a high moisture content and sometimes it is just too wet. This too can affect the quality of cut. Grass should be relatively dry when cutting and a moderate ground speed be selected. Use the transmission to select the speed. Do not change the throttle control from the full throttle position. For further information on individual decks, check the Technical Service Handbook #770-8640L.

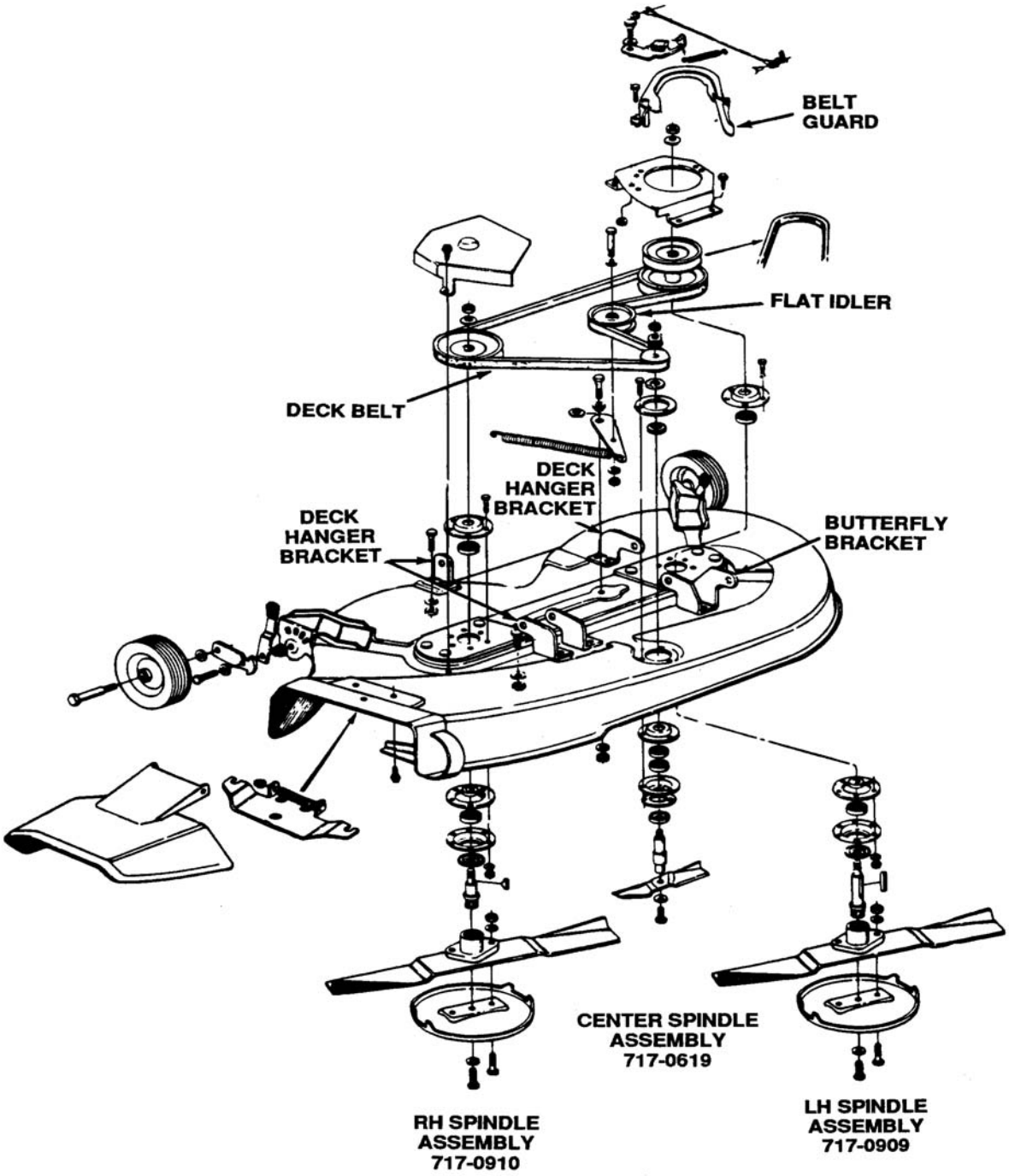


Figure 8-1. Model 803 44-Inch Side Discharge Deck

8-1 Attaching the Deck. Proceed as follows:

1. Assemble deck wheels.

2. Move cutting deck wheels to the lowest cutting height position (move levers all the way forward).

3. Move blade engagement lever to the disengaged position (all the way back). Place lift lever in the highest position (all the way back).

4. Holding lift links on the tractor out of the way, slide the deck underneath the tractor from the right hand side.

5. The stabilizer rod and diagonal brace are secured to the tractor with plastic ties for shipping purposes only. Cut and remove plastic ties.

6. Place belt above diagonal brace. Route one side of the belt between the left hand lift link and deck link, and the other side outside of the deck link. Roll belt onto engine pulley. See Figure 8-2.

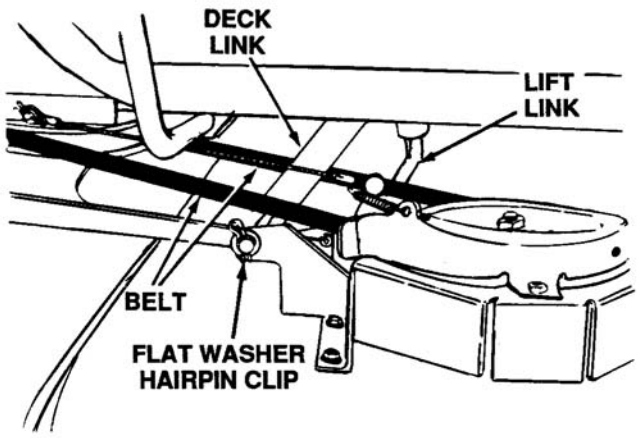


Figure 8-2. Belt Installation

7. Thread 5/16 inch hex nuts onto hex bolts 4 and 4-1/2 inch long. Place cupped washers 5/16 inch ID on hex bolts (crown side of washers goes against the nuts). See Figure 8-3.

8. Attach hex bolts 4 and 4-1/2 inch long to the engine pulley belt guard bracket to act as belt guards. Assemble in the locations shown. Be certain the belt is inside the bolts as shown.

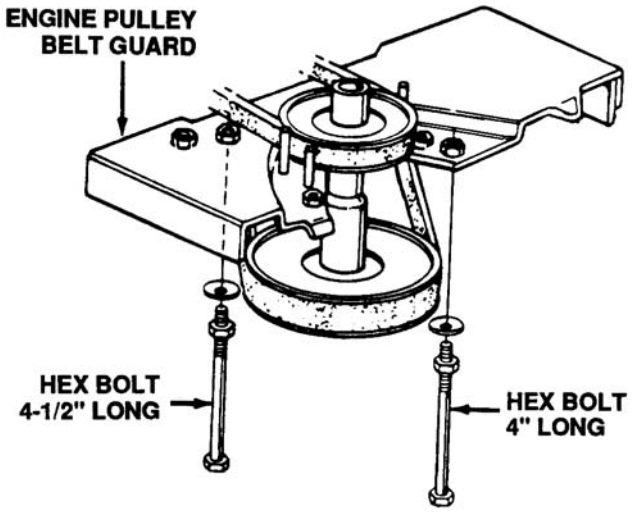


Figure 8-3. Location of Hex Bolts (Belt Guards)

9. Attach diagonal brace to the deck as shown using shoulder bolt, 3/8 inch lock washer and hex nut. Be certain shoulder bolt is through diagonal brace. See Figure 8-4.

10. Attach stabilizer rod to the deck using flat washer 3/8 inch ID and small hairpin clip.

WARNING

The deck blade brake cable must be attached as described in step 13.

11. Move blade engagement lever to the engaged position (all the way forward). Place lift lever in the lowest position (all the way forward).

12. Lifting the deck slightly to align the holes, attach two lift links to the deck using flat washers 1/2 inch ID and larger hairpin clips. Attach front deck links then rear deck links using flat washers 1/2 inch ID and hairpin clips.

13. Adjust deck blade cable as follows (make certain engine is off):

    a. Place blade engagement lever in the disengaged position.

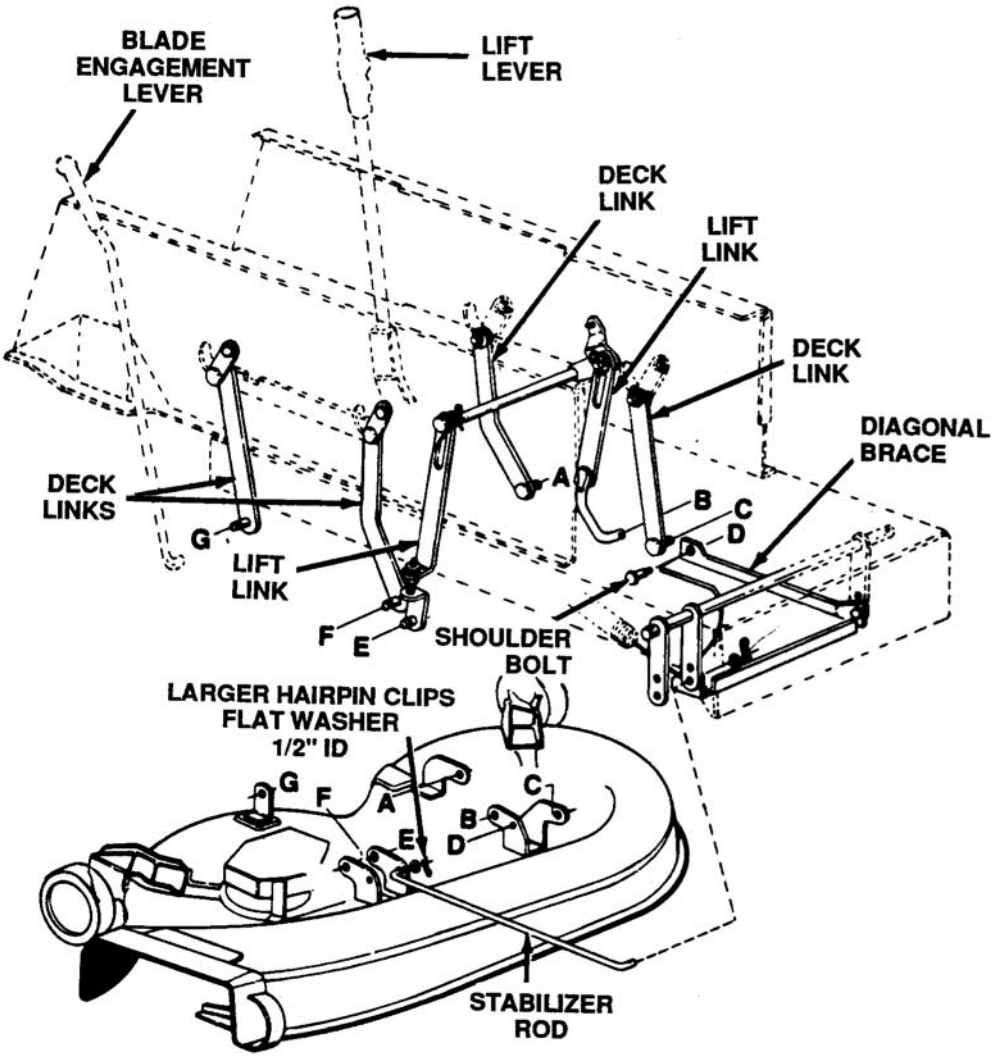


Figure 8-4. Location of Diagonal Brace

b. Pull brake cable toward the front of the tractor and line it up with a hole in the brake bracket. Attach cable to the next hole toward the rear of the tractor using clevis pin, flat washer 1/4 inch ID and hair-pin clip. There should be some slack in the cable as shown. See Figure 8-5.

c. Place blade engagement lever in the engaged position. Place lift lever in the highest position (all the way back). The brake cable should now be straight and the brake pad should be pulled away from the deck pulley groove.

14. Readjust the deck wheels to the position desired.

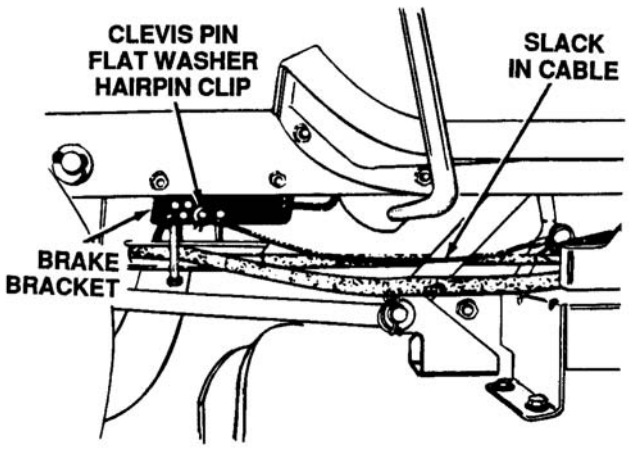


Figure 8-5. Connecting the Brake Cable

8

8-1.1 Deck Belt Removal and Replacement.

WARNING

Disconnect spark plug wire and ground it against engine. Block the wheels of the unit.

1. Remove deck. Refer to previous section and follow instructions in reverse order.

2. Remove belt guard by unhooking spring and removing two self-tapping screws. See Figure 8-6.

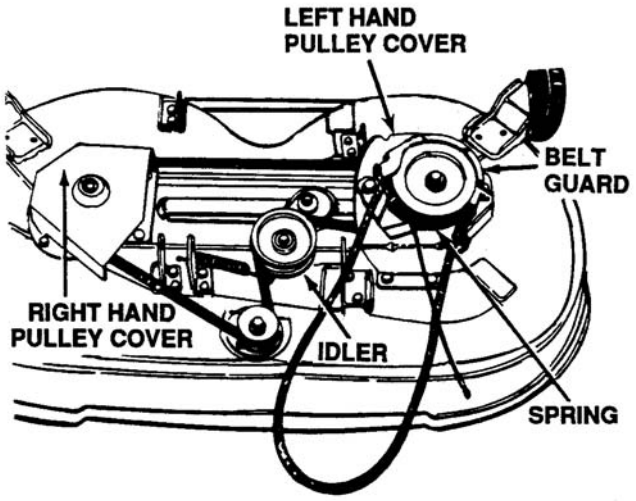


Figure 8-6. Removing Belt Guard

3. Remove first drive belt.

4. Remove both right and left hand pulley covers by removing self-tapping screws.

5. Pivot spring-loaded idler and lift belt off.

6. Remove belt from around the three deck pulleys.

7. Reassemble in reverse order.

8-2. MODEL 931 44-INCH REAR DISCHARGE MOWING DECK (See Figure 8-7).

8-2.1 Timing the Blades.

1. Remove center blade bolt on either blade assembly.

2. Rotate blade assembly on the cutting deck and reassemble the other blade assembly at 90° exactly as shown. See Figure 8-9 on page 8-9. For blade mounting torques, see Table 8-1.

Table 8-1. Model 194-935 Blade Mounting Torques

BOLT SIZE	MINIMUM INCH POUNDS	MAXIMUM INCH POUNDS
3/8-inch diameter	375	450
5/26-inch diameter	150	250

NOTE

If the blade assemblies are not timed, it will affect the cut of the grass and the discharge.

WARNING

The blades should be at right angles to each other for proper timing position. If the blade assemblies are timed improperly, it will affect the cut of the grass and the discharge. SERIOUS DAMAGE TO THE BLADES, SPINDLES, BELT AND DECK CAN OCCUR IF THE BLADES HIT EACH OTHER.

WARNING

Blades cannot be placed in the two additional spots provided on the blade disc. This is a timed deck and the blades will hit each other and destroy themselves and the deck assembly.

NOTE

Swing back blades are beneficial to the customer in that if he or she hits something the blades will absorb some shock as they swing back. These blades must not be torqued down too tight—if they are, you could possibly lessen your cutting diameter if the blades are only partially swinging out. Blades must be in the fully out position or you will not get the full 44 inch cut. Blades need to swing back and forth freely.

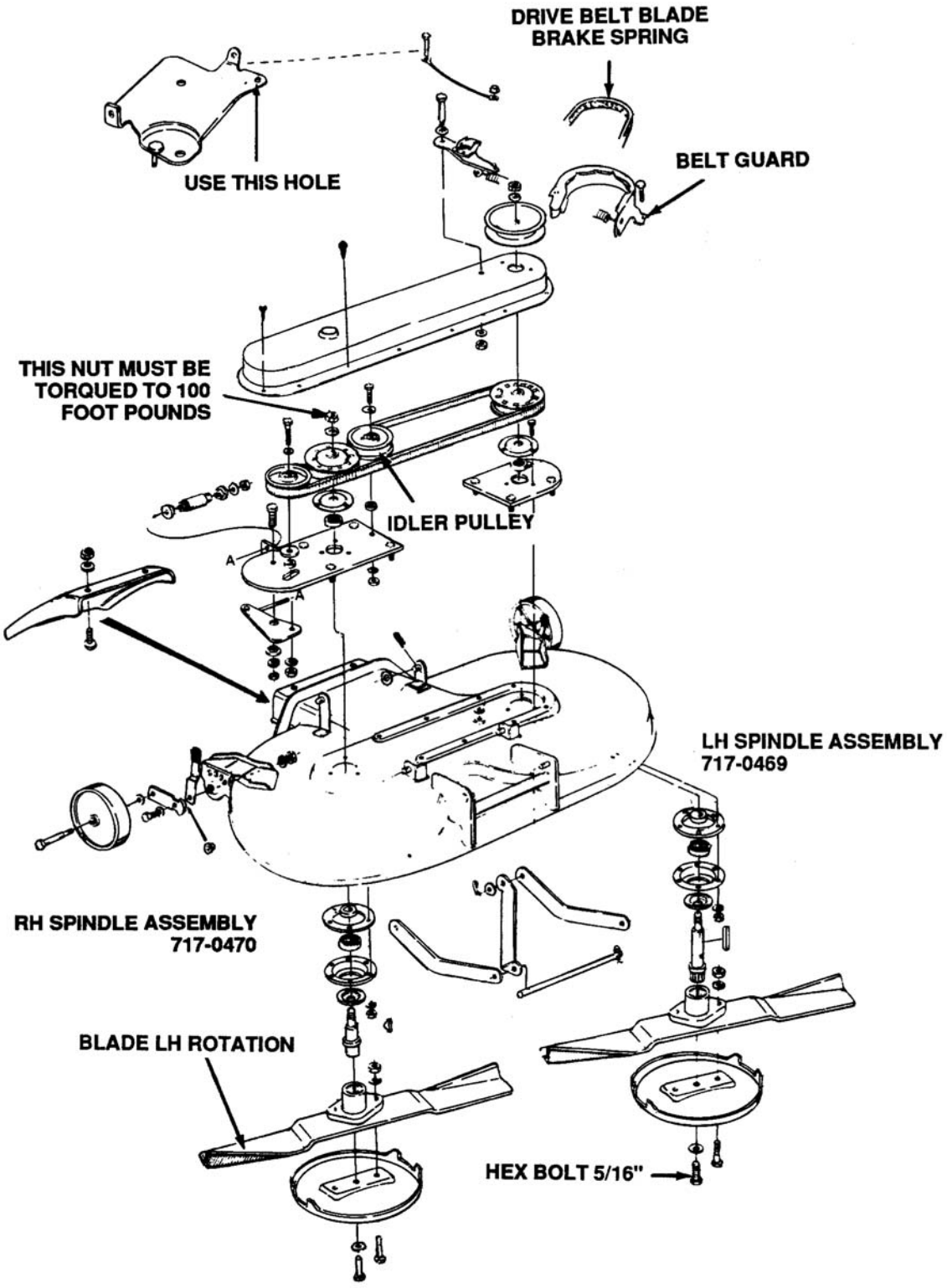


Figure 8-7. Model 931 44-Inch Rear Discharge Deck.

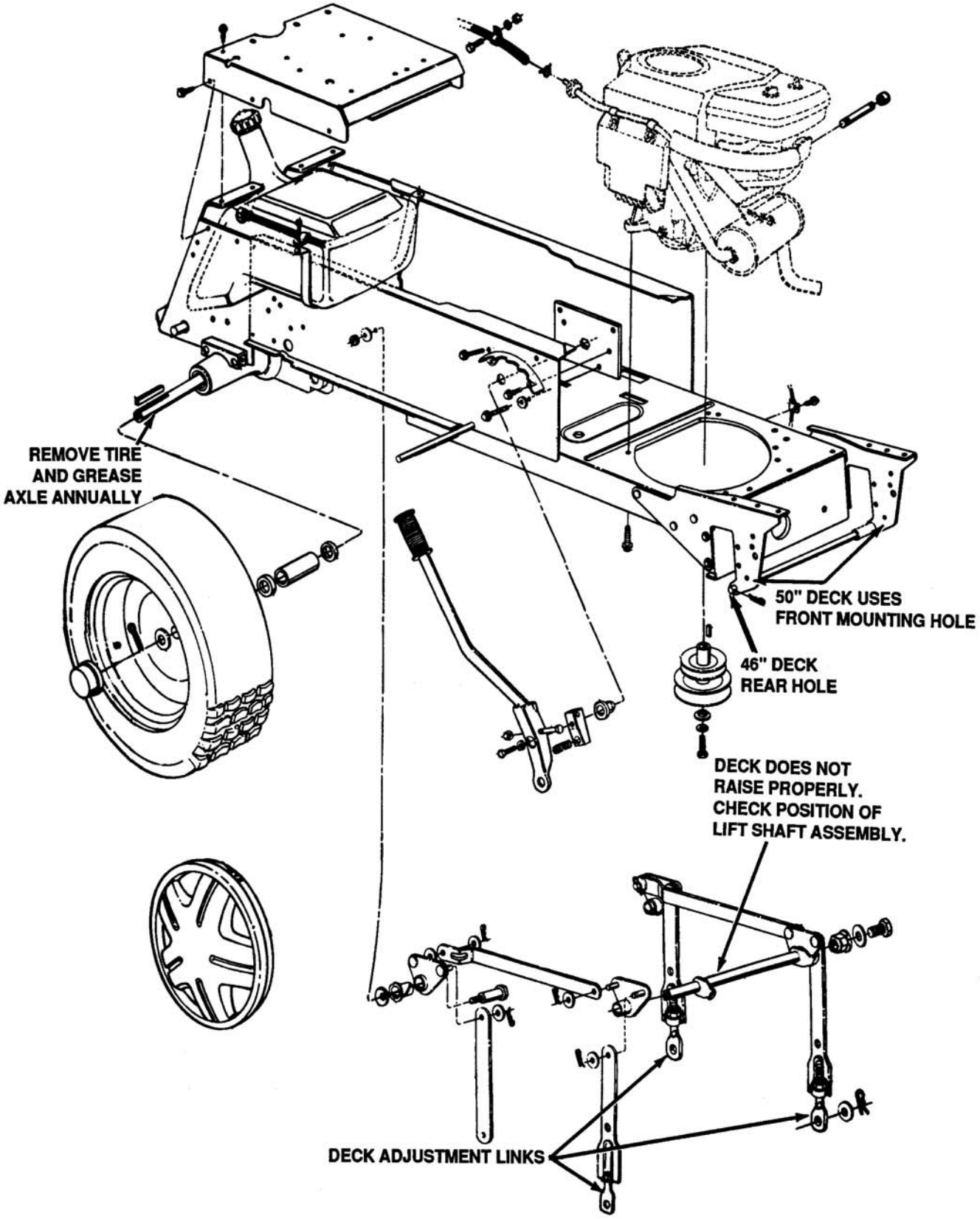


Figure 8-8. 44-Inch, 46-Inch, and "P" 50-Inch Deck Mounting

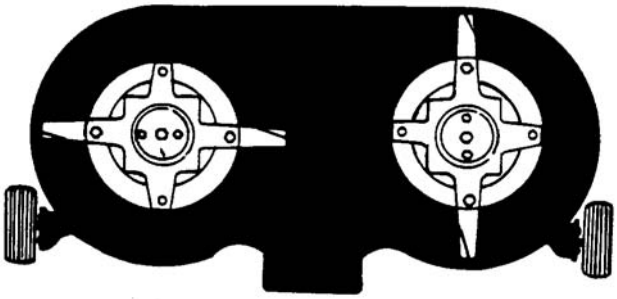


Figure 8-9. Timing Blades

NOTE

Swing blades are available for the 44-inch side or the 44-inch rear discharge deck, Model 931 or 935.

8-2.2 Attaching the Deck Links (if so equipped). The three adjustable deck links have been shipped unassembled. Attach as follows.

1. Start 1/2 inch hex nuts on eyebolts provided. Insert the hex nuts and eyebolts into the adjustable lift links. See Figure 8-10.

2. Thread eyebolts into the lift links and hex nuts. All three links should be adjusted so the eyebolt is to the lower mark as shown.

NOTE

This adjustment is for 44 inch decks only.

8-2.3 Attaching the Deck.

1. Assemble deck wheels.

2. Remove round belt keeper from idler by removing cotter hairpin. See Figure 8-11.

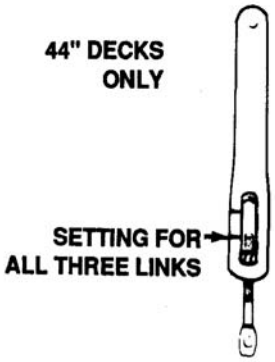
3. Unscrew L bolt and swing the wire belt guard on the engine pulley forward.

4. Adjust deck wheels to their lowest cutting position.

5. Move tractor lift handle all the way back to the full raised position.

6. Turn tractor steering wheel all the way to the left.

7. The two deck stabilizers and diagonal brace which are attached to the front of the deck are folded back over the deck for shipping purposes. Unfold them at this time.



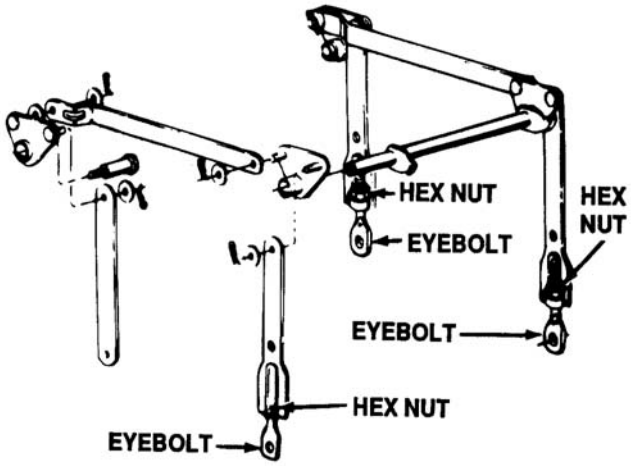


Figure 8-10. Deck Link Installation for 44-Inch Decks

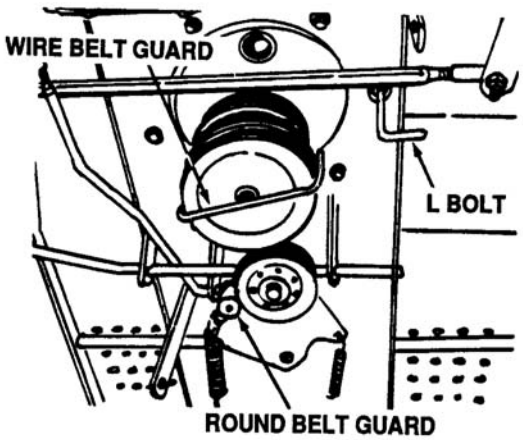


Figure 8-11. Removing Round Belt Keeper

8. Slide deck under the tractor from the right side.

NOTE

If the two front hanger brackets on your unit are adjustable, adjust them to be the same length as the rear.

9. Move tractor lift lever all the way forward to the lowest position.

10. Attach four tractor hanger brackets to the deck with four 1/2 inch ID washers and four medium cotter hairpins. The left front tractor hanger bracket goes through the center of the V-belt. Attach the rear hanger brackets first, then the front hanger brackets. See Figure 8-12.

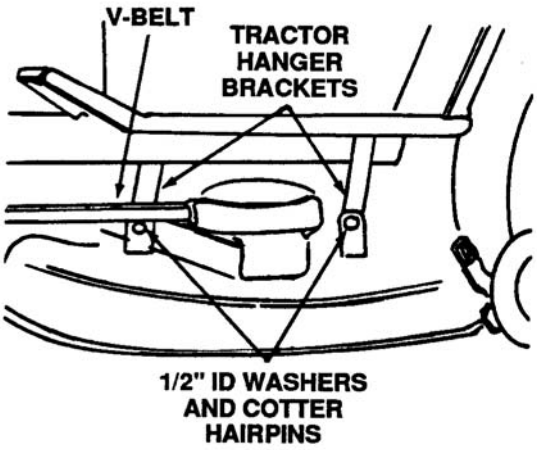


Figure 8-12. Location of Hanger Brackets

11. Disassemble front cross bar from the tractor then reassemble using two large cotter hairpins to attach the deck linkage to the tractor frame. See Figure 8-13.

12. Place deck belt around engine pulley and idler.

13. Replace round belt guard. Swing wire belt guard over the engine pulley and secure it with L bolt.

NOTE

If there are two holes in the frame, assemble the L bolt in the rear hole.

14. Check all belt guards for clearance. The belt guards must be between 1/16 and 1/8 inch away from the belt when the PTO lever is in the engaged position.

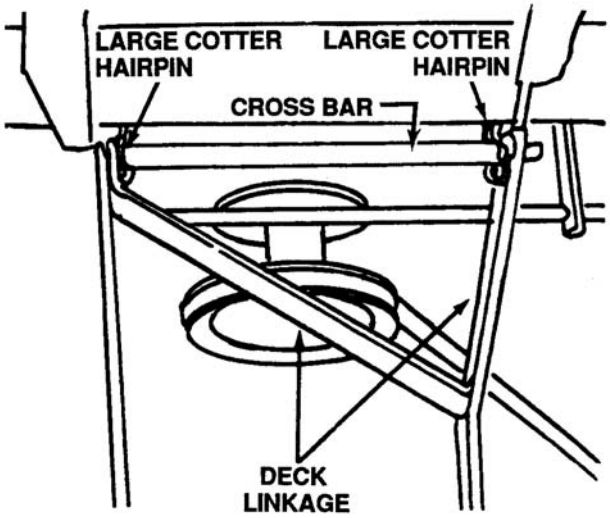


Figure 8-13. Disassemble/Reassemble Cross Bar

15. Secure with brake release cable to the tractor idler bracket with small clevis pin and small cotter hairpin. Use the outside hole in the bracket. See Figure 8-14.

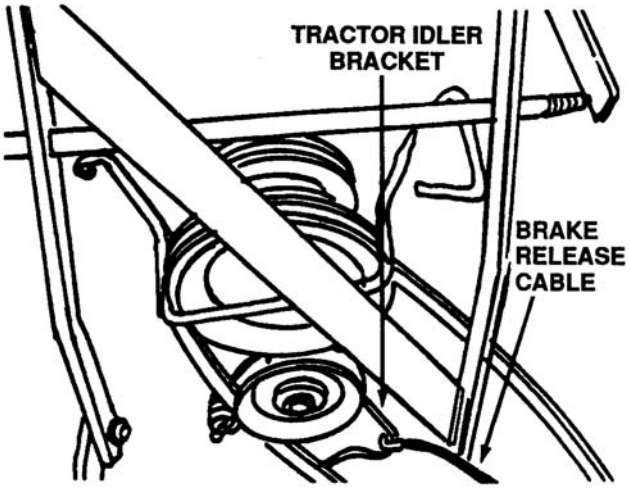


Figure 8-14. Securing Brake Release Cable

8-2.4 Leveling the Deck (if equipped with adjustable deck links). After attaching the deck to the tractor, check to be certain it is adjusted properly.

1. Check tire pressure in all four tires. Recommended pressure is 12 psi.

2. On a level surface, engage the PTO and lower the deck until it is 1/2 to 1 inch above the ground.

3. Check to be certain the distance from the bottom edge of the deck to the ground is the same on both sides of the deck. If it is not, adjust the links on the left side of the unit.

NOTE

When adjusting the deck links, disengage the PTO. Remove the hairpin clip and washer from the weld bolt. Thread eyebolt up or down the link as necessary, and reassemble.

4. Check to be certain the front of the deck is 1/4 to 3/8 inch lower than the rear of the deck. If it is not, adjust the two front links to obtain this distance.

8-2.5 Setting the Cutting Height. Select the position for the tractor lift lever which gives the desired cutting height. Then move the wheels on the deck so that the wheels are 1/4 to 1/2 inch above the ground.

NOTE

To obtain the best, uniform cut, the deck is designed to be suspended from the tractor at the desired cutting height. The deck wheels should be just off the ground to smooth out the cut and guard against gouging.

WARNING

Keep hands and feet away from the chute area on cutting deck.

8-2.6 Deck Belt Removal and Replacement.

1. Remove two hex screws holding belt guard to timing belt cover. See Figure 8-15.

2. Replace belt and reassemble.

8-2.7 Blade Belt Removal and Replacement.

1. Remove belt guard and drive pulley.

2. Remove blade belt cover.

3. Loosen tension adjusting nut. See Figure 8-16.

4. Loosen idler pulley enough so that the belt can be removed from between the two pulleys.

5. Remove and replace blade belt.

6. Reassemble and adjust belt tension. To adjust belt tension, tighten lock nut until the flat washer contacts the shoulder spacer.

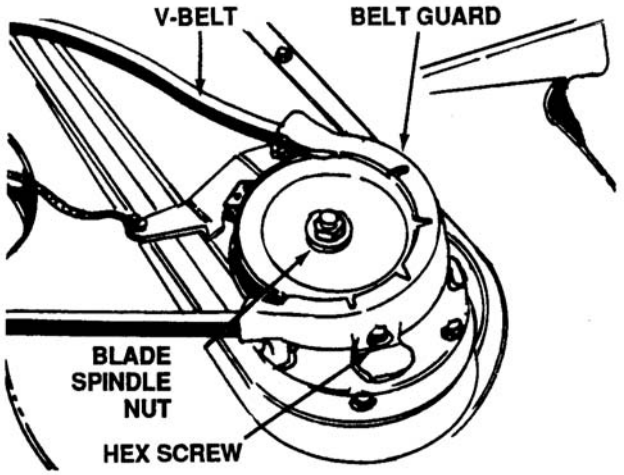


Figure 8-15. Removal and Replacement of Deck Belt

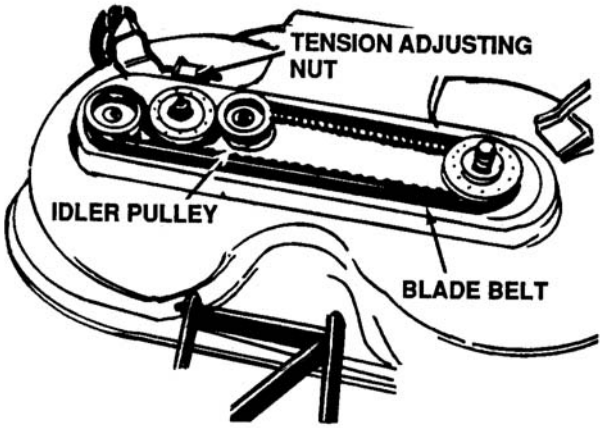


Figure 8-16. Removing Blade Belt

NOTE

Do not overtighten lock nut. You should be able to just slightly turn spacer.

7. Adjust belt tension after the first 10 hours of operation and every 25 hours of operation thereafter.

8.3. MODEL 194-935 44-INCH SIDE DISCHARGE MOWING DECK (See Figure 8-17).

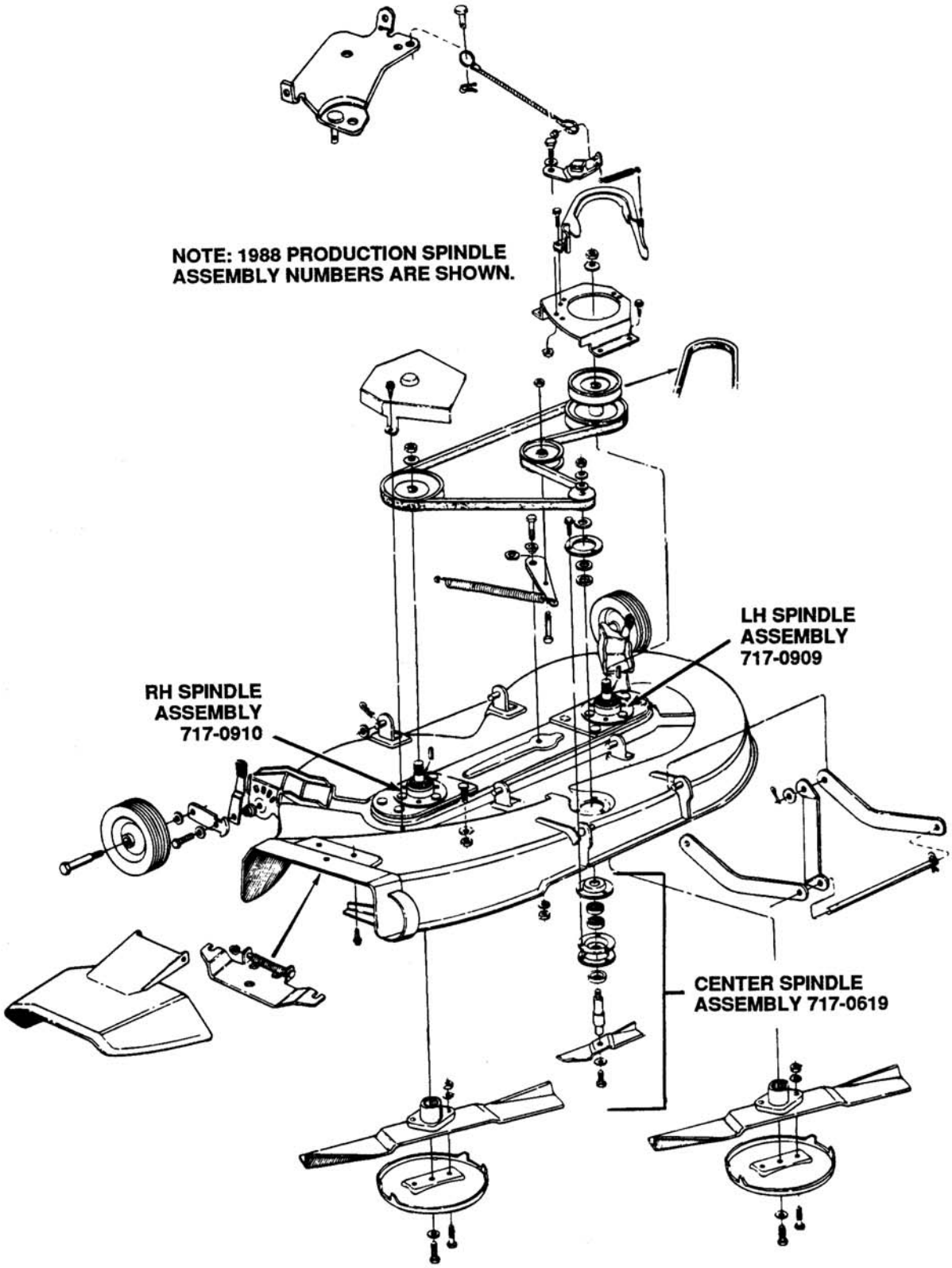


Figure 8-17. Model 935 44-Inch Side Discharge Deck

8-3.1 **Timing the Blades.** For blade timing, refer to paragraph 8-2, Model 931.

8-3.2 Attaching the Deck Links (if so equipped). For deck links attachment, refer to paragraph 8-2, Model 931.

8-3.3 Attaching the Deck. For deck attachment, refer to paragraph 8-2, Model 931.

8-3.4 Leveling the Deck (if equipped with adjustable deck links). For deck leveling adjustment, refer to paragraph 8-2, Model 931.

8-3.5 Setting the Cutting Height. For cutting height setting, refer to paragraph 8-2, Model 931.

8-3.6 Deck Belt Removal and Replacement. For removal and replacement of the deck belt, refer to paragraph 8-2, Model 931.

8-3.7 Blade Belt Removal and Replacement. For removal and replacement of the blade belt, refer to paragraph 8-2, Model 931.

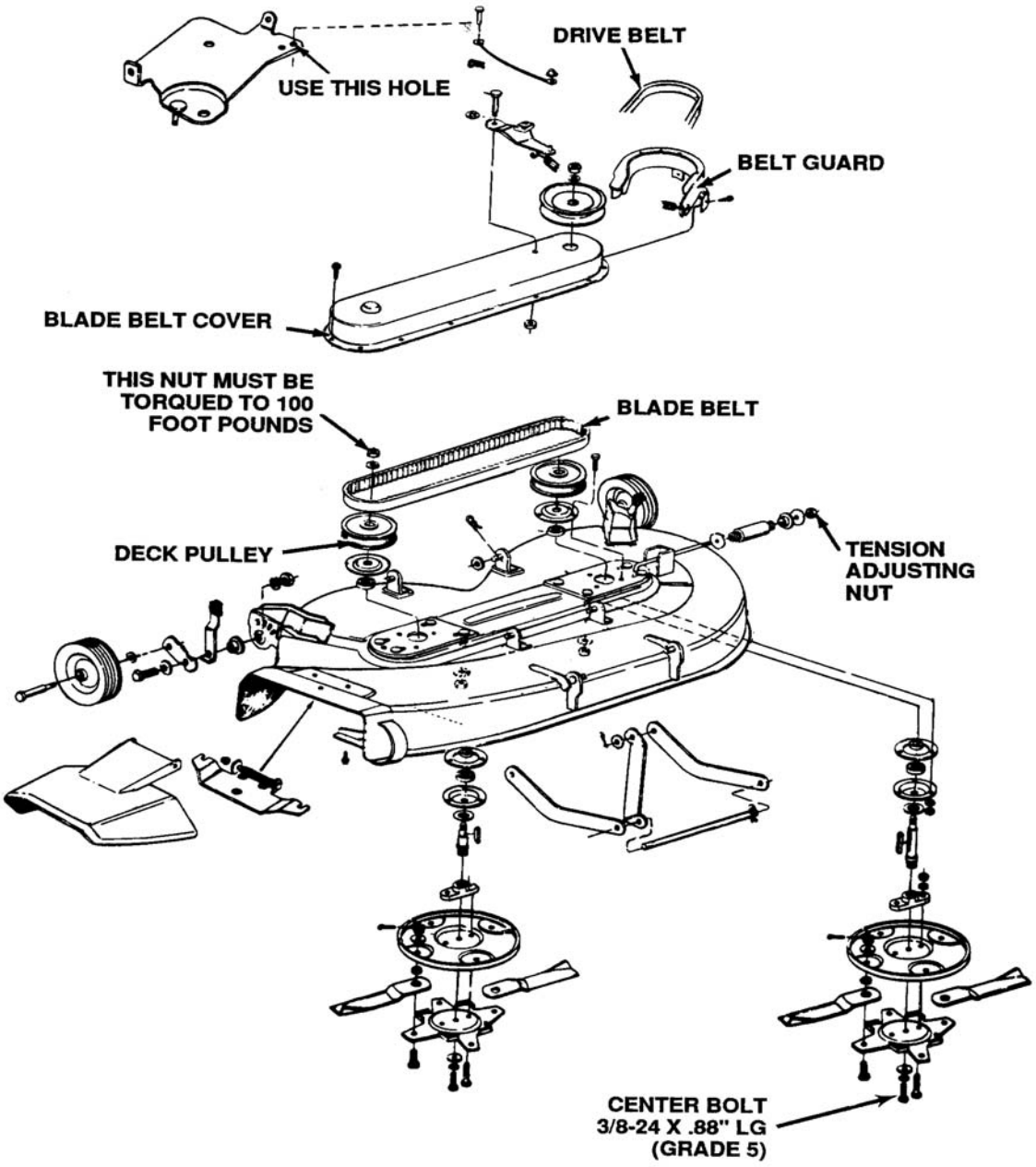


Figure 8-18. Model 194-935 44-Inch Side Discharge Deck

NOTE

If disassembled for any reason, tighten blade spindle nuts for the 22 inch blades to between 80 and 100 ft-lbs. Tighten blade spindle nut for the smaller center blade to between 40 and 45 ft-lbs. For components of typical blade spindle assembly, see Table 8-2.

Table 8-2 Blade Spindle Part Number 717-0619

PART NO.	DESCRIPTION	QTY.
712-0922	Hex Jam Nut, 1/2-20 Thd.	1
736-0253	Bell Washer, 1 2" ID x 1" OD	2
736-0162	Flat Washer, .635" ID x 1.04" ID	1
710-0947	Hex B-Tap Screw, .25" x .75" Lg	3
15348	Reinforcement Plate	1
736-0302	Flat Washer, 5/8" ID x 15/16" OD	2
15319	Bearing Housing	2
741-0155	Ball Bearing	2
15319	Bearing Housing	1
16348	Reinforcement Plate	1
16400	Bearing Shield	1
738-0627	6.5 Blade Spindle	1

NOTE

This is not a timed deck.

8-4 Attaching the Deck Links (if so equipped). For deck links attachment, refer to paragraph 8-2, Model 931.

8-4.1 Attaching the Deck. For deck attachment, refer to paragraph 8-2, Model 931.

8-4.2 Leveling the Deck (if equipped with adjustable deck links). For deck leveling adjustment, refer to paragraph 8-2, Model 931.

8-4.3 Setting the Cutting Height. For cutting height setting, refer to paragraph 8-2, Model 931.

8-4.4 Deck Belt Removal and Replacement. For removal and replacement of the deck belt, refer to paragraph 8-2, Model 931.

8-4.5 Blade Belt Removal and Replacement. For removal and replacement of the blade belt, refer to paragraph 8-2, Model 931.

8-4.6 Deck Belt Removal and Replacement.

1. Remove two hex screws holding belt guard to timing belt cover.
2. Replace belt and reassemble.

8-4.7 Blade Belt Removal and Replacement.

1. Remove belt guard and drive pulley.
2. Remove blade belt cover.
3. Loosen four hub bolts.
4. Loosen tension adjusting nut.
5. Remove and replace blade belt.
6. Reassemble and adjust belt tension.

NOTE

Scalping the ground or running over a clump of dirt can knock the blades out of timing. Stop the tractor, align and retime the blades.

NOTE

If the PTO belt is loose, check to see that the diagonal deck mounting brace is not bent. This might be caused by the deck wheels running on the ground. The deck wheels are used as an antiscalping device only and should be set at 1/4 to 1/2 inch above ground level.

8-4.8 Belt Tension Adjustment.

NOTE

Adjust belt tension after the first 10 hours of operation and every 25 hours of operation thereafter.

1. Loosen four spindle nuts on the bottom of the cutting deck. See Figure 8-19.
2. Tap the deck with a hammer handle to loosen washers on four spindle nuts.
3. Tighten tension adjustment nut.
4. Tighten four spindle nuts.

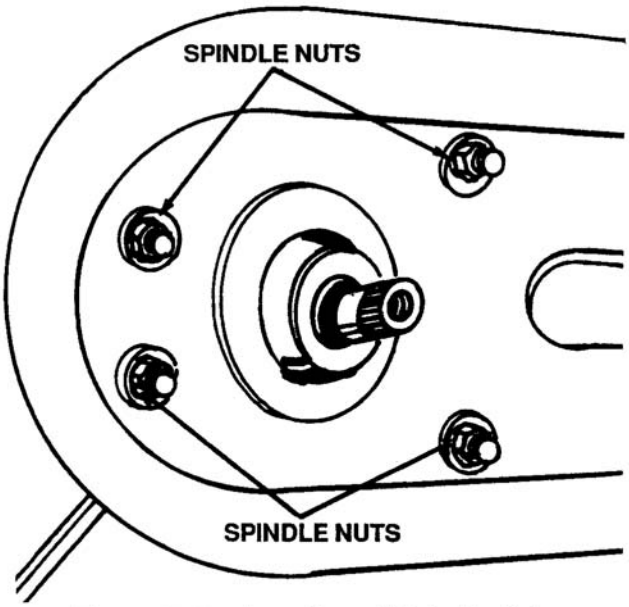


Figure 8-19. Location of Spindle Nuts

8-4.9 Belt Removal and Replacement.

1. Remove deck.
2. Remove belt guard by unhooking spring and removing two self-tapping screws.
3. Remove first drive belt.
4. Remove both right and left hand pulley covers by removing self-tapping screws.
5. Pivot spring-loaded idler and lift belt off.
6. Remove belt from around the three deck pulleys.
7. Reassemble new belts in reverse order.

8-5 MODELS 806, 846, AND SERIES 800 "H" 46-INCH SIDE DISCHARGE MOWING DECK (See Figure 8-20).

8-5.1 Model 846 deck was introduced in 1989 due to a style variation in the frame on the 700 and 800 series tractors. This style variation required a change in the front linkage on the deck. The 846 deck replaced the Model 806 for 1988 productions. A conversion kit is available. To convert an 806 deck to the current Model 846, order kit number 753-0486. To convert an 846 deck to the earlier Model 806, order kit number 753-0487.

8-5.2 The major difference between the 846 and 806 decks is that the front crossbar is larger on the 846. It is now 5/8 inch diameter and includes spacers on the outer edges of the rod.

8-5.3 The 9 style unit with a 46-inch deck uses a 12.75 inch cable, part number 727-0445; the other 46-inch decks use a 12.56 inch cable, part number 727-0426.

8-5.4 In 1988 units you might see some problems with the older 806 deck clogging up instead of bagging. This was a baffle problem and can be repaired by ordering a new deck shell, part number 17218C.

NOTE

To change over a 44-inch nonbagging deck to the new style 46-inch bagging deck, order kit number 190-807-000 and deck number 190-806-000.

CAUTION

To prevent damage to the deck linkage the deck wheels must be approximately 1/4 to 1/2 inch above ground level.

8-5.5 Sharpening Cutting Blades.

WARNING

Protect hands by using heavy gloves or a rag to grasp the cutting blades.

1. The blades may be removed for sharpening or replacement as follows:
   a. Remove the 3/8 inch bolt and lock washer holding blade and adapter to blade spindle.
   b. Remove blade and adapter from blade spindle.
   c. Remove the two 5/16 inch bolts, lock washers and nuts holding blade to adapter.
2. When sharpening blades, follow the original angle of grind as a guide. It is extremely important that each cutting edge be ground equally to prevent an unbalanced blade. An unbalanced blade will cause excessive vibration when rotating at high speeds, may cause damage to the mower and could break, causing personal injury.

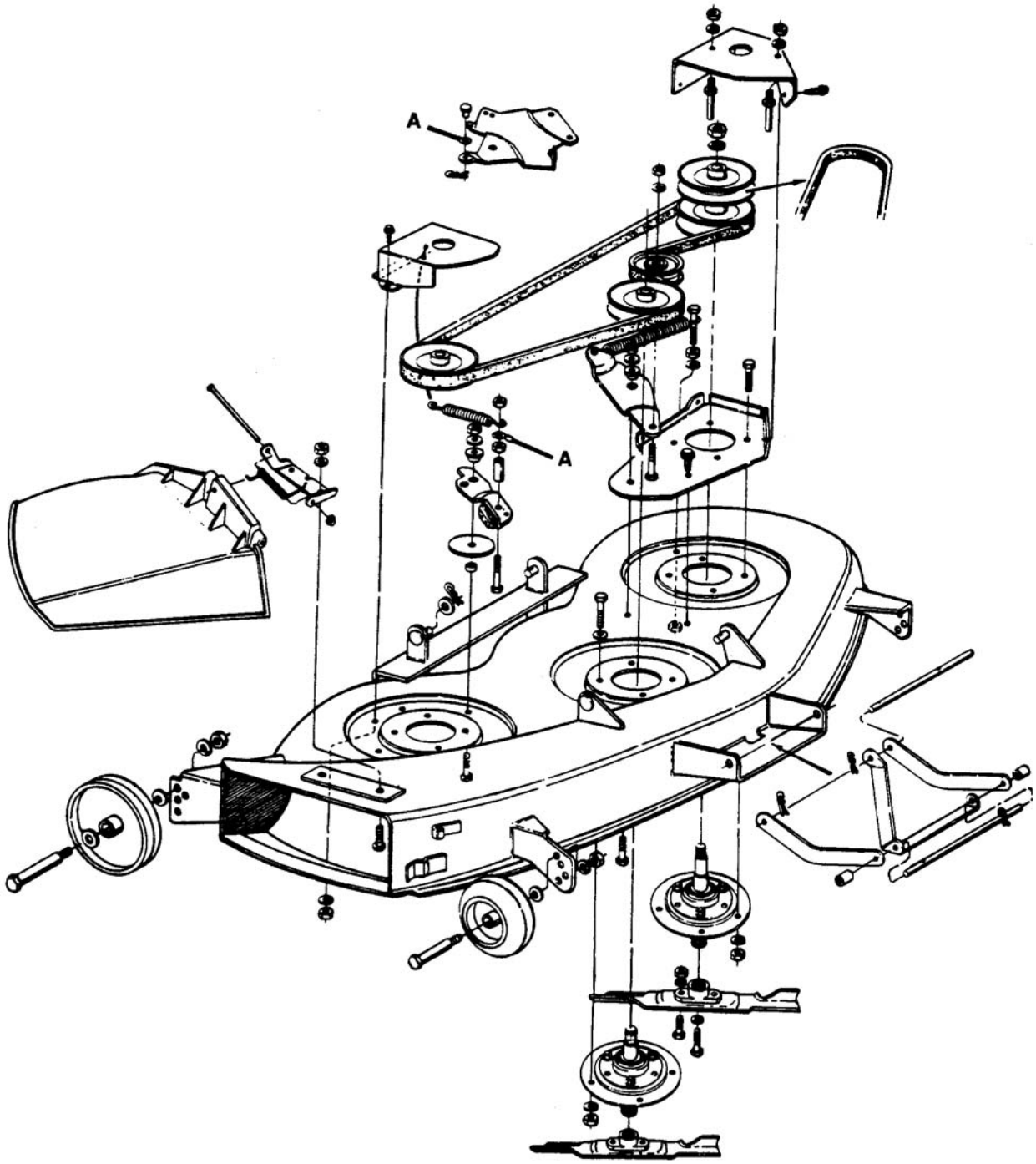


Figure 8-20. Models 806, 846, and Series 800 "H" Side Discharge Deck

3. Optional sand blades are available as follows:

   a. Center blade part number 742-0497 (1 per unit).

   b. Outside blades part number 742-0498 (2 per unit).

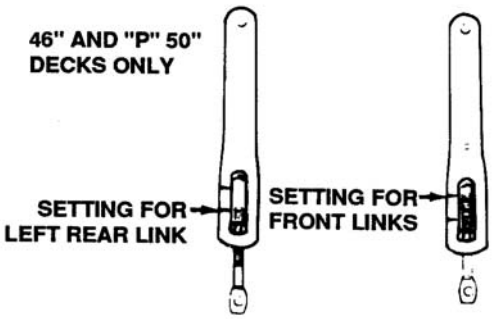
8-5.6 Attaching the Deck Links. The three adjustable deck links have been shipped unassembled. Attach as follows.

1. Start 1/2 inch hex nuts on eyebolts provided. Insert the hex nuts and eyebolts into the adjustable lift links. See Figure 8-21.

2. Thread eyebolts into the lift links and hex nuts. The left rear link should be adjusted so the eyebolt is to the lower mark as shown. The two front links should be adjusted to the higher mark.

NOTE

This adjustment is for 46 inch decks only. For 44 inch decks, the eyebolts should be at the lower marks for all three links.



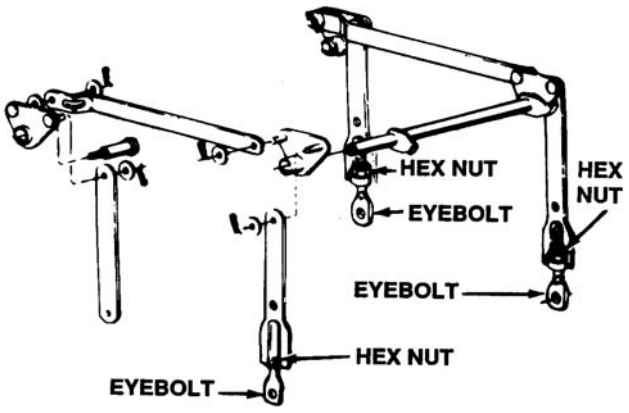


Figure 8-21. Deck Link Installation for 46-Inch Decks

8-5.7 Attaching the Deck.

NOTE

If your unit has an electric clutch, disregard steps 1, 8 and 10.

1. Working beneath the tractor, remove round belt guard from idler by removing hairpin clip. Remove two hex bolts which act as belt keepers by engine pulley. See Figure 8-22.

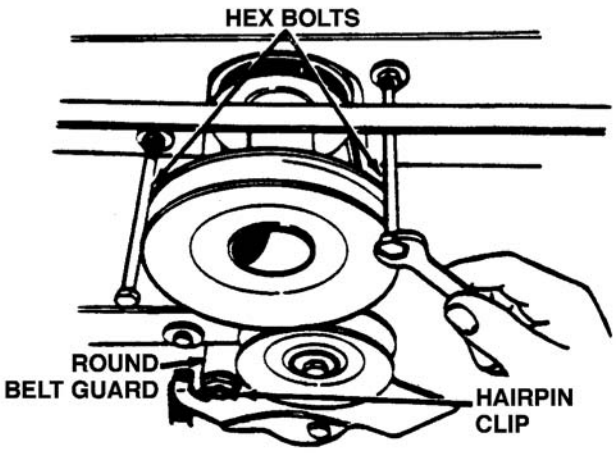


Figure 8-22. Removing Belt Guard

2. Move tractor lift handle all the way back to the full raised position. Turn the tractor steering wheel all the way to the left.

3. The two deck stabilizers and the diagonal brace which are attached to the front of the deck are folded back over the deck for shipping purposes. Unfold them at this time. See Figure 8-23.

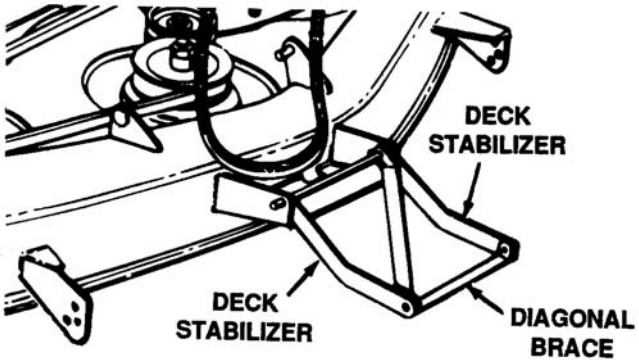


Figure 8-23. Deck Stabilizers and Diagonal Brace

4. Slide the deck under the tractor from the right side as you lift the stabilizers and diagonal brace over the right front wheel.

5. Move tractor lift handle forward to the lowest position.

6. Attach four tractor hanger brackets to the deck with four flat washers and four hairpin clips. The left front tractor hanger bracket goes through the center of the V-belt. Attach the rear hanger brackets first, then the front hanger brackets. See Figure 8-24.

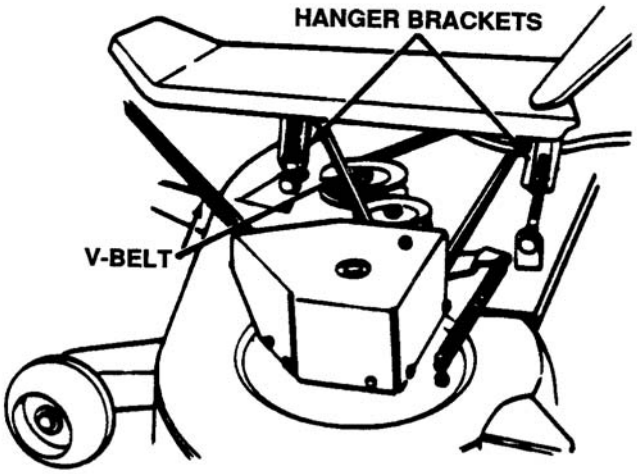


Figure 8-24. Attaching Hanger Brackets

7. Disassemble front cross bar from the tractor by removing two hairpin clips. Use the cross bar to attach deck stabilizers, diagonal brace and two spacers to tractor frame, using the rearward set of holes. Secure with two hairpin clips just removed. See Figure 8-25.

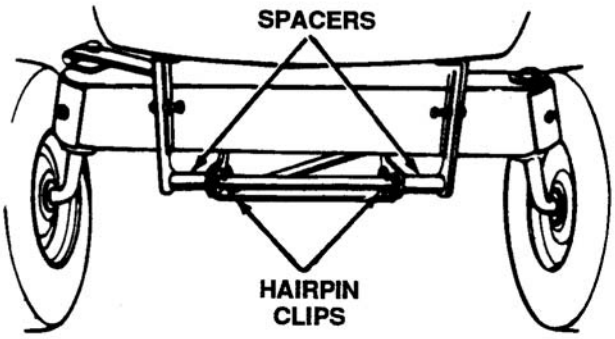


Figure 8-25. Disassembling Cross Bar

8. Place deck belt around engine pulley and idler pulley.

9. Replace round belt guard by idler pulley (hex side down). Replace hex bolts (belt keepers) by engine pulley.

10. Check all belt guards for clearance. The belt guards must be between 1/16 and 1/8 inch away from the belt when the PTO lever or switch is in the engaged or on position. Be certain to disengage the PTO after checking.

11. Secure brake release cable to tractor idler bracket with clevis pin and small hairpin clip using the hole in the idler bracket. See Figure 8-26.

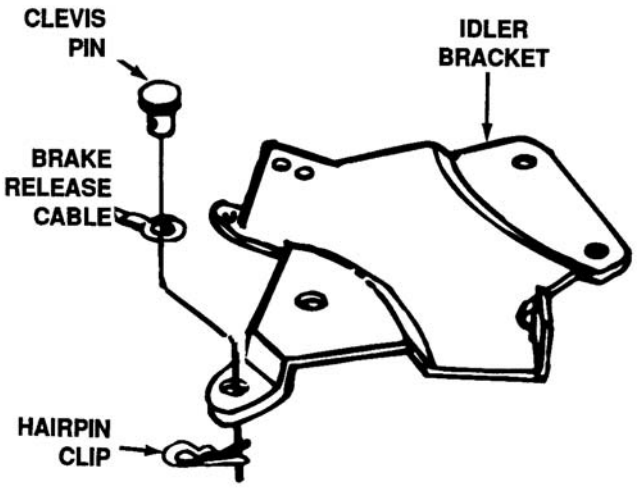


Figure 8-26. Tractor Idler Bracket

8-5.8 Leveling the Deck. After attaching the deck adjust as follows:

1. Check tire pressure in all four tires. Recommended pressure is 12 psi.

2. Make certain all deck wheels are mounted in same relative location.

3. On a level surface, engage the PTO and lower the deck until it reaches the ground. All four deck wheels should reach the ground at the same time. If they do not, adjust the deck links as necessary.

NOTE

When adjusting the deck links, disengage the PTO. Remove the hairpin clip and washer from the weld bolt. Thread eyebolt up or down the link as necessary and reassemble.

4. Release the deck 1/2 to 1 inch above the ground.

5. Check to be certain the distance from the bottom edge of the deck to the ground is the same on both sides of the deck. If it is not, adjust the links on the left side of the unit.

6. Check to be certain the front of the deck is 1/4 to 3/8 inch lower than the rear of the deck. If it is not, adjust the two front links to obtain this distance.

8-5.9 Setting the Cutting Height. Select the position for the tractor lift lever which gives the desired cutting height. Then move the wheels on the deck so that the wheels are 1/4 to 1/2 inch above the ground.

NOTE

To obtain the best, uniform cut, the deck is designed to be suspended from the tractor at the desired cutting height. The deck wheels should be just off the ground to smooth out the cut and guard against gouging.

WARNING

Keep hands and feet away from the chute area on cutting deck.

8-5.10 Belt Removal and Replacement.

1. Remove the deck by following instructions in reverse order.
2. Remove left hand pulley cover by unhooking spring and removing five self-tapping screws. See Figure 8-27.
3. Remove first drive belt.
4. Remove left hand pulley cover by removing three self-tapping screws.
5. Pivot spring-loaded idler and lift belt off.
6. Remove belt from around three deck pulleys.
7. Reassemble new belts in reverse order.

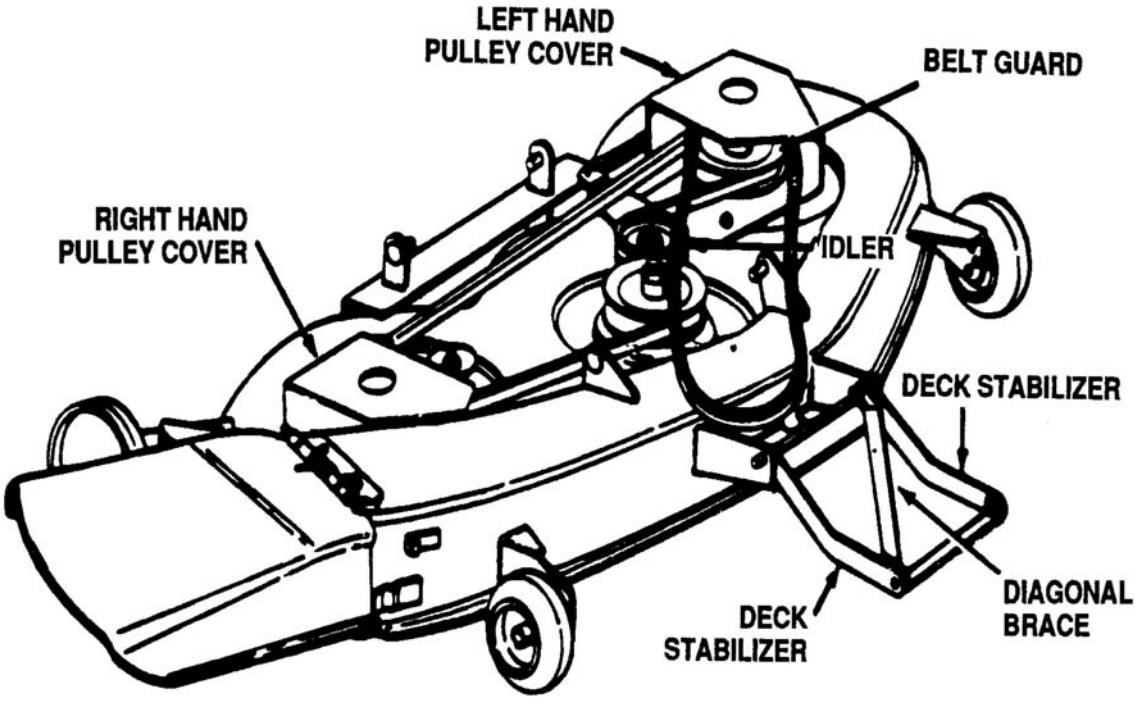


Figure 8-27. Removing Pulley Covers

8-6 MODEL SERIES 800 "P" 50-INCH SIDE DISCHARGE DECK (See Figure 8-28).

18-6.1 Attaching the Deck Links. For deck links attachment, refer to paragraph 8-5, 46-inch deck.

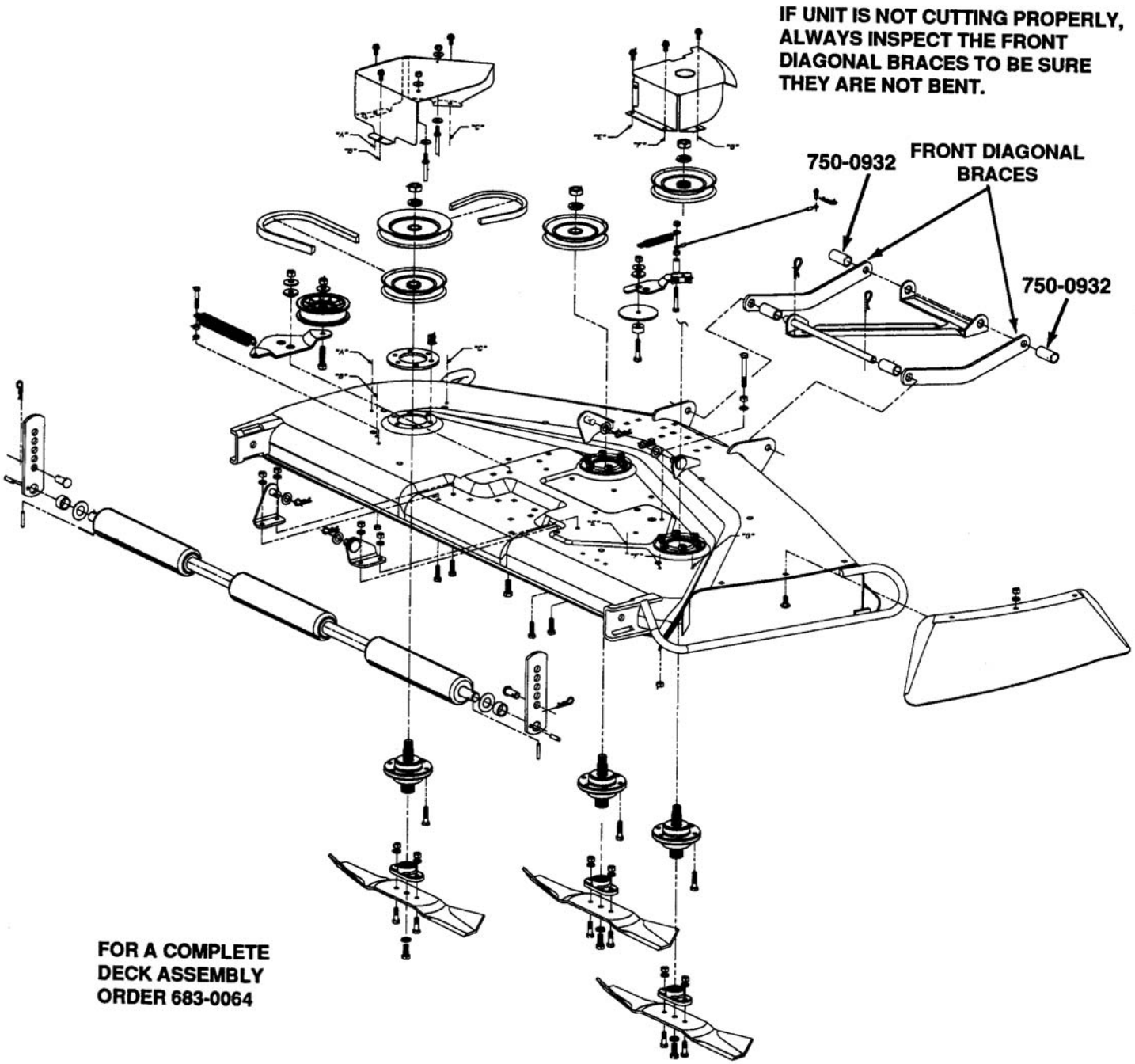


Figure 8-28. Model Series 800 "P" 50-Inch Deck

8-6.2 Attaching the Deck.

NOTE

If your unit has an electric clutch, disregard steps 1, 10 and 12.

1. Working beneath the tractor, remove the round belt guard from the idler by removing the hairpin clip. See Figure 8-29. Remove two hex bolts which act as belt keepers by the engine pulley.

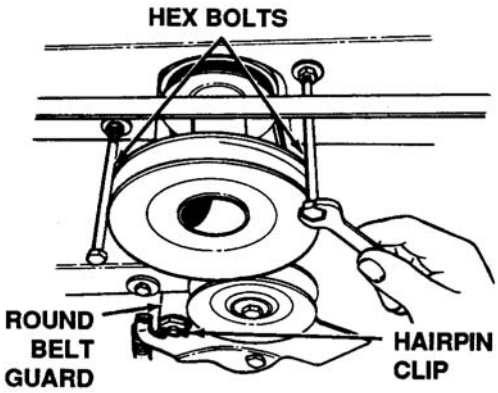


Figure 8-29. Removing Belt Guard

2. Move the tractor lift handle all the way back to the full raised position. Turn the tractor steering wheel all the way to the left.

3. The two deck stabilizers and the diagonal brace which are attached to the front of the deck are folded back over the deck for shipping purposes. Unfold them at this time. See Figure 8-30.

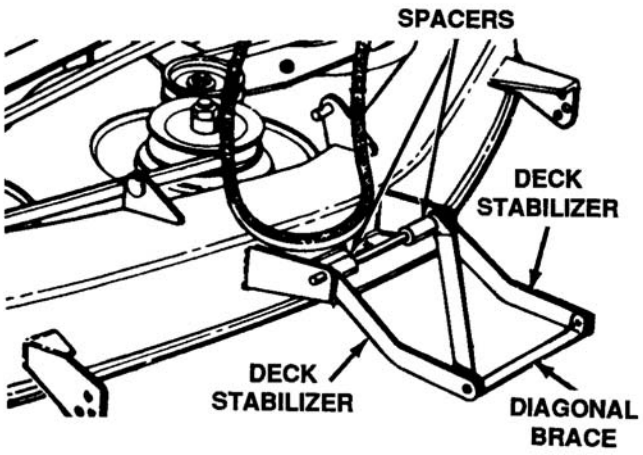


Figure 8-30. Deck Stabilizers and Diagonal Brace

4. Remove the hairpin clips and flat washers from each deck bracket. Remove the spacers from the rod which is through the deck stabilizer by removing the hairpin clips and sliding out the rod. Replace the rod and hairpin clips. See Figure 8-30.

5. Slide the deck under the tractor from the right side as you lift the stabilizers and diagonal brace of the right front wheel.

6. Move tractor lift handle forward to the lowest position.

7. Attach the four tractor hanger brackets to the deck as follows. The left front tractor hanger bracket goes through the center of the V-belt. See Figure 8-31. Attach the rear hanger brackets first, then the front, using four flat washers and hairpin clips.

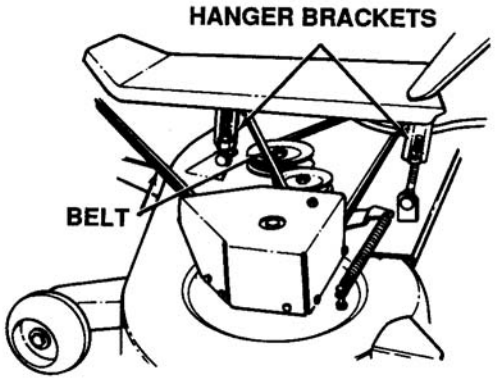


Figure 8-31. Attaching Hanger Brackets

8. Disassemble the front cross bar from the tractor by removing two hairpin clips. Use the cross bar to attach the deck stabilizers, the diagonal brace and two spacers to the tractor frame, using the forward set of holes. Secure with the two hairpin clips just removed. See Figure 8-32.

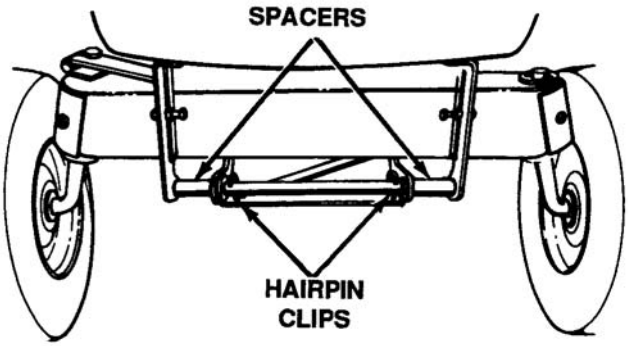


Figure 8-32. Disassembling Cross Bar

9. Place the deck belt around the engine pulley and idler pulley.

10. Replace the round belt guard by the idler pulley (hex side down). Replace the hex bolts (belt keepers) by the engine pulley. See Figure 8-29.

11. Check all belt guards for clearance. The belt guards must be between 1/16 and 1/8 inch away from the belt when the PTO lever or switch is in the engaged or on position (be certain to disengage the PTO lever after checking).

12. Secure the brake release cable to the tractor idler bracket with clevis pin and small hairpin clip, using the hole in the idler bracket as shown in Figure 8-33.

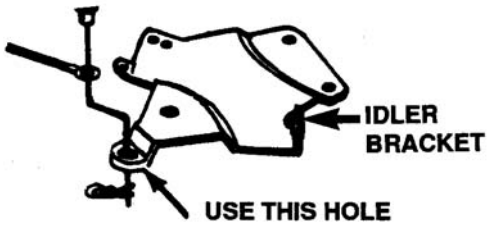


Figure 8-33. Tractor Idler Bracket

8-6.3 Leveling the Deck. After attaching the deck to the tractor, check to be certain it is adjusted properly.

1. Check tire pressure in all four tires. Recommended pressure is 12 psi.

2. Make certain both ends of the deck roller are mounted in same hole location.

3. On a level surface, engage the PTO and lower the deck until it is 1/2 to 1 inch above the ground.

4. Check to be certain the distance from the bottom edge of the deck to the ground is the same on both sides of the deck. If it is not, adjust the links on the left side of the unit.

NOTE

When adjusting the deck links, disengage the PTO. Remove the hairpin clip and washer from the weld bolt. Thread eyebolt up or down the link as necessary, and reassemble.

5. Check to be certain the front of the deck is 1/4 to 3/8 inch lower than the rear of the deck. If it is not, adjust the two front links to obtain this distance.

8-6.4 Setting the Cutting Height. Select the position for the tractor lift lever which gives the desired cutting height. Then move the deck roller so that it is 1/4 to 1/2 inch above the ground.

NOTE

To obtain the best, uniform cut, the deck is designed to be suspended from the tractor at the desired cutting height. The deck roller should be just off the ground, to smooth out the cut and guard against gouging.

WARNING

Keep hands and feet away from the chute area on cutting deck.

8-6.5 Belt Removal and Replacement.

1. Remove the deck by following instructions on page 8-21 in reverse order.

2. Remove the left hand pulley cover by unhooking the spring and removing five self-tapping screws. See Figure 8-34.

3. Remove the first drive belt.

4. Remove the right hand pulley cover by removing three self-tapping screws.

5. Pivot the spring-loaded idler, and lift belt off.

6. Remove the belt from around the three deck pulleys.

7. Reassemble new belts in reverse order.

8-6.6 Sharpening Cutting Blades.

WARNING

Protect hands by using heavy gloves or a rag to grasp the cutting blades.

1. The blades may be removed for sharpening or replacement as follows:

   a. Remove the 3/8 inch bolt and lock washer holding the blade and adapter to the blade spindle.

   b. Remove the blade and adapter from the blade spindle.

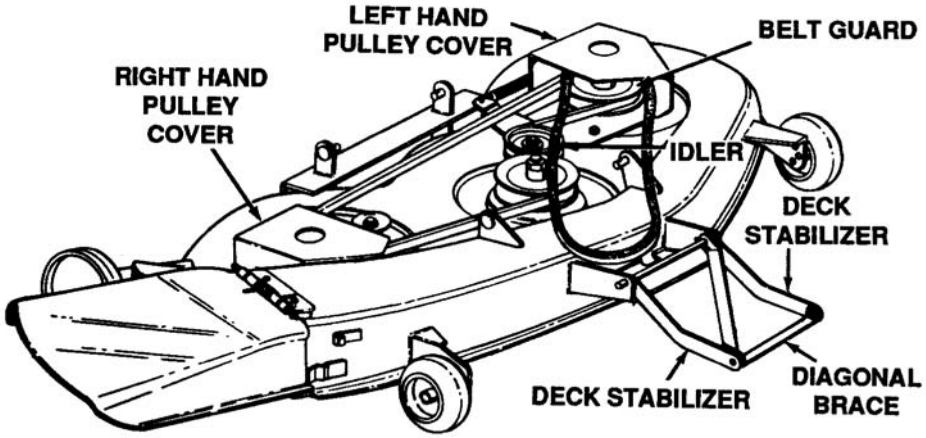


Figure 8-34. Removing Pulley Covers

c. Remove the two 5/16 inch bolts, lock washers and nuts holding the blade to the adapter. See Figure 8-35.

2. When sharpening the blades, follow the original angle of grind as a guide. It is extremely important that each cutting edge be ground equally to prevent an unbalanced blade. An unbalanced blade will cause excessive vibration when rotating at high speeds, may cause damage to the mower and could break, causing personal injury.

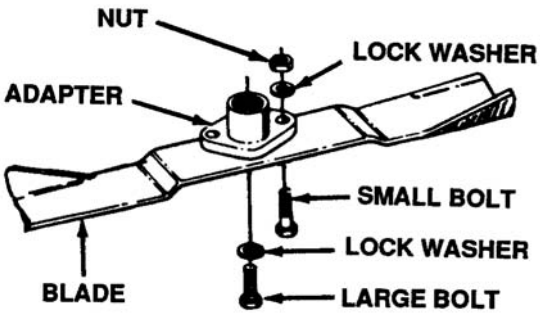


Figure 8-35. Cutting Blade

3. The blade can be tested for balance by balancing it on a round shaft screwdriver. Removal metal from the heavy side until it balances evenly.

4. When replacing the blade, be sure to install the blade with the side of the blade marked “Bottom” (or with part number) facing the ground when the mower is in the operating position.

Blade Mounting Torque

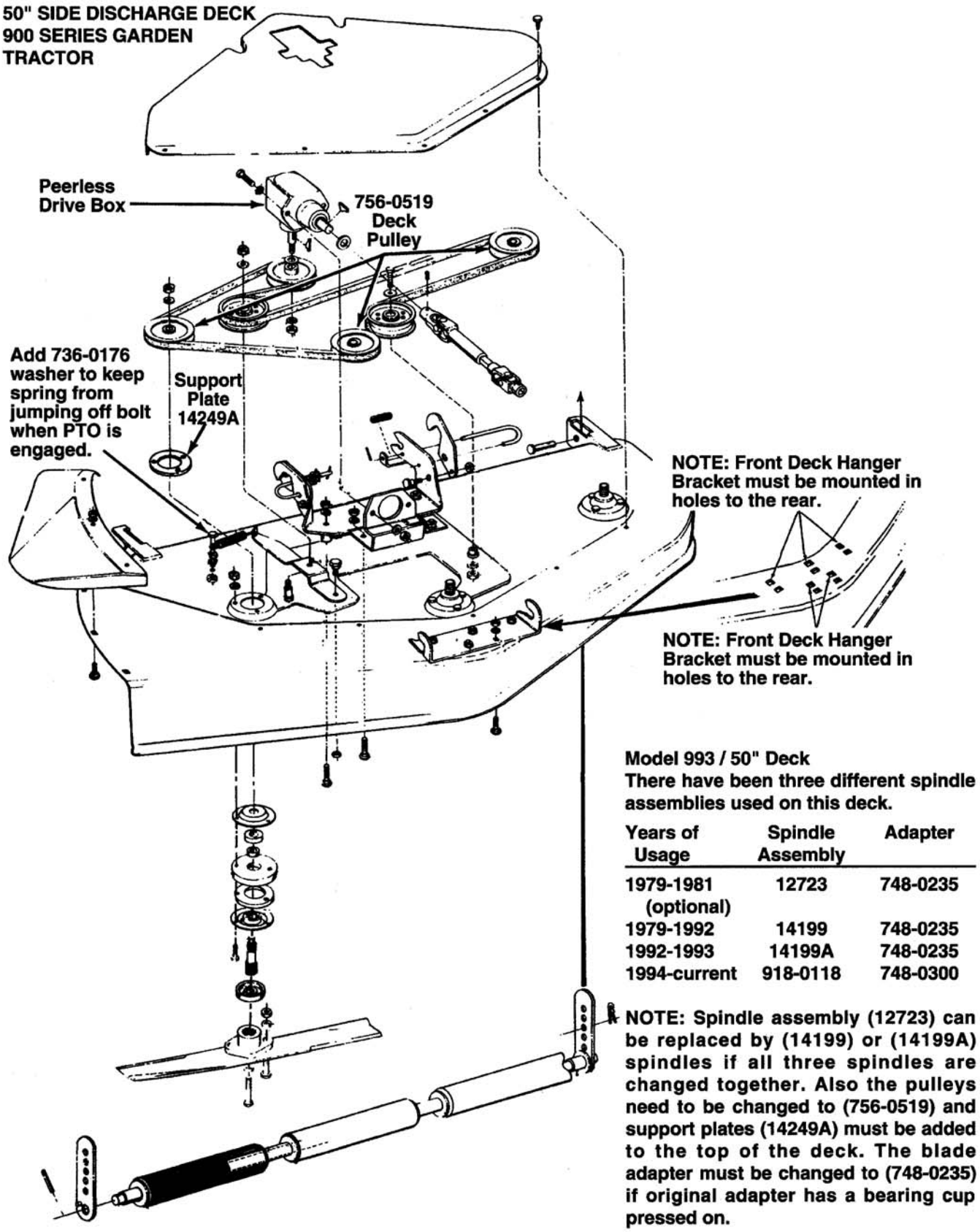
3/8 Dia. Bolt 375 in-lb min., 450 in-lb max.
5/16 inch Dia. Bolt 150 in-lb min., 250 in-lb max.

Blade Spindle Nuts

If disassembled for any reason, tighten the blade spindle nuts between 80 and 100 foot pounds.

To insure safe operation of your unit, all nuts and bolts must be checked periodically for correct tightness.

8-7 50-INCH SIDE DISCHARGE DECK FOR 900 SERIES GARDEN TRACTOR (See Figure 8-36.



Model 993 / 50" Deck
There have been three different spindle assemblies used on this deck.

Years of Usage	Spindle Assembly	Adapter
1979-1981 (optional)	12723	748-0235
1979-1992	14199	748-0235
1992-1993	14199A	748-0235
1994-current	918-0118	748-0300

NOTE: Spindle assembly (12723) can be replaced by (14199) or (14199A) spindles if all three spindles are changed together. Also the pulleys need to be changed to (756-0519) and support plates (14249A) must be added to the top of the deck. The blade adapter must be changed to (748-0235) if original adapter has a bearing cup pressed on.

Figure 8-36. 50-Inch Side Discharge Deck

8-7.1 The 50 inch tri-blade rotary mower cutting deck assembly for the 995 series garden tractor is classified as a quick connect version and comes completely assembled ready to attach with a universal drive shaft. All you have to do is mount the missile deflector and follow the mounting instructions. The deck is easily disconnected when using other ground engaging accessories. It measures 50-3/4 inches long x 32-3/4 inches wide. The right angle gear box is made by Peerless and is lubricated with 4 ounces of E.P. Lithium Grease, part number 727-0166.

CAUTION

The front deck hanger bracket must be mounted in the holes furthest to the rear.

8-7.2 Attaching the Deck.

1. The clevis pins, spacers and hairpin cotters on the front of the undercarriage must be set in the lowest position. See Figure 8-37.

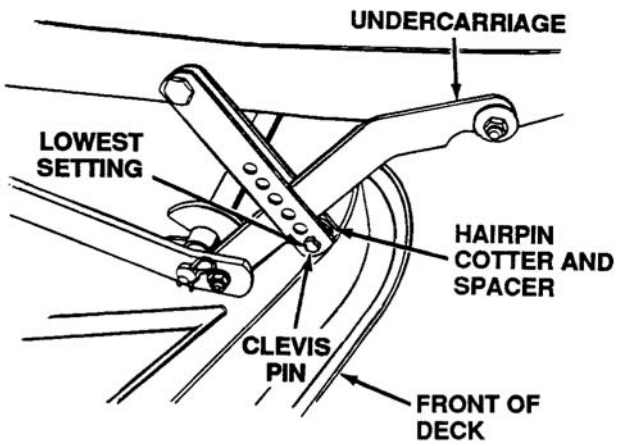


Figure 8-37. Deck Undercarriage

NOTE

Service the engine with gasoline and oil before starting the tractor.

2. Start tractor and move the hydraulic lift lever all the way backward (raised position). Stop tractor.

3. Turn tractor steering wheel all the way to the left. Slide mowing deck underneath the tractor from right hand side.

4. Slide square end of universal drive shaft into universal on the deck.

5. Remove hairpin cotters and clevis pins from each side of the deck roller bracket. Raise deck one notch on each side. Secure with hairpin cotters and clevis pins just removed. See Figure 8-38.

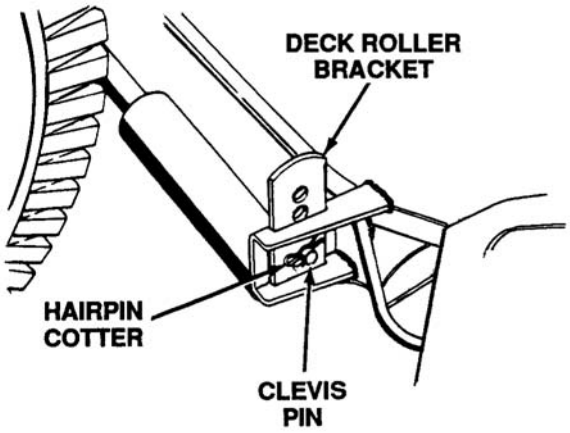


Figure 8-38. Deck Roller Bracket

6. Pull release pins and raise rear hanger locks. See Figure 8-39.

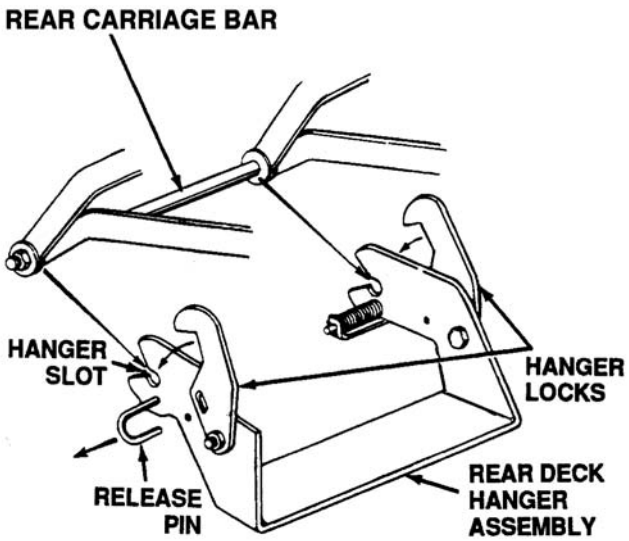


Figure 8-39. Pulling Release Pins

7. Start tractor and lower undercarriage as far as it will go by moving hydraulic lift lever all the way forward. Stop tractor.

8. Lift front of mowing deck and push back, making sure the front deck handle slots go over front cross bars and between the spacers. See Figure 8-40.

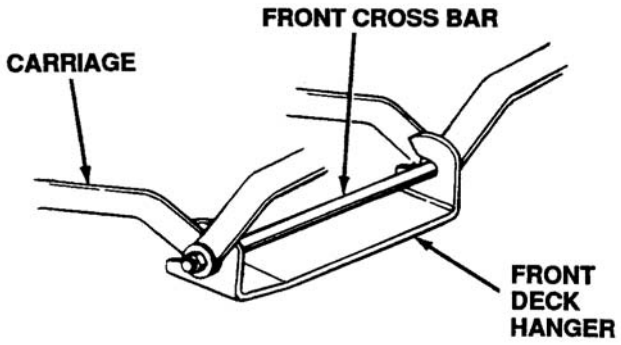


Figure 8-40. Location of Cross Bar

9. Pull release pins and push hanger locks down. Lock in place on both sides.

10. Attach front quick-disconnect universal to PTO shaft on the tractor. Apply a small amount of grease to the square shaft on the universal shaft.

8-7.3 Belt Removal and Replacement.

NOTE

When replacing the belt, use only an O.E.M. belt. Order part number 754-0197 from your nearest authorized service dealer.

1. Remove mowing deck cover.

2. Disconnect spring from idler to obtain slack on the belt. Remove belt.

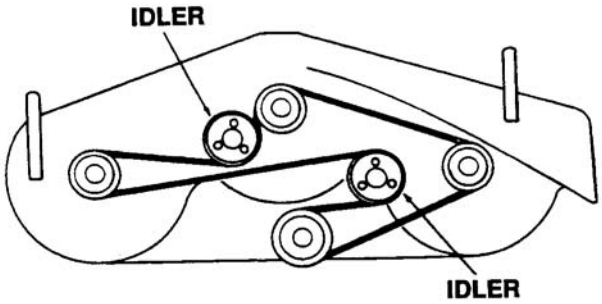


Figure 8-41. Belt Installation

3. Install new belt. See Figure 8-41.

MODEL 824 ELECTRIC SLEEVE HITCH

FastAttach™ Compatible Garden Tractors

Preparation

The Model 824 Electric Sleeve Hitch is designed for use on FastAttach™ compatible Garden Tractors only. See Figure 8-42.

Figure 8-42.

Before installation, place the tractor on a firm and level surface. Place the PTO in the off position, turn off the tractor engine and set the parking brake.

Remove all parts from the carton and make certain that all components are accounted for.

The cartons contents are listed in your owner's manual.

Read and understand your owner's manual. Follow all safety instructions.

References to left and right indicate the left and right sides of the tractor when facing forward in the operators seat.

Attaching the sleeve hitch to the tractor

1. Pivot the tractor seat forward to expose the battery. See Figure 8-43.

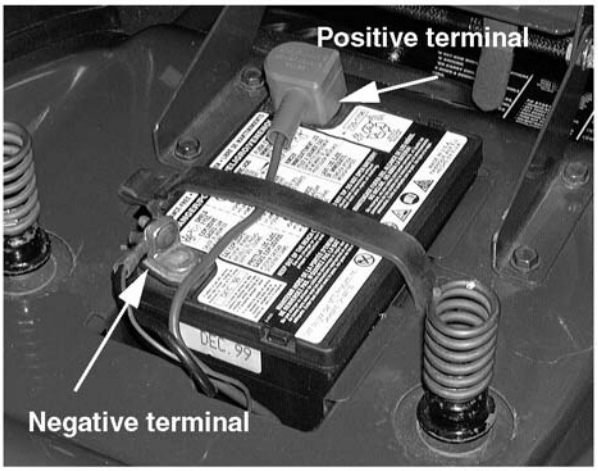


Figure 8-43.

2. Remove the battery hold down strap.

3. Disconnect the negative battery cable from the battery terminal by removing the carriage bolt and wing nut

4 Disconnect the positive battery cable from the battery terminal using a 7/16" socket and a 7/16" wrench.

5. Remove the battery from the tractor.

6. Remove the battery tray from the tractor.

7. If the tractor comes equipped with shoulders bolts attached to the rear hitch plate, you must remove them using an 11/16" and a 15/16" socket. Set them aside. See Figure 8-44.

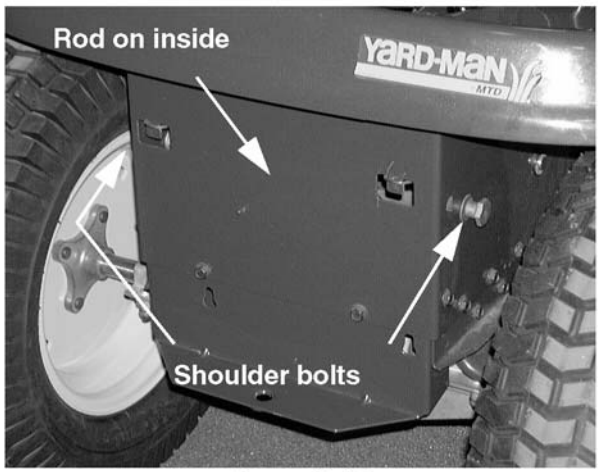


Figure 8-44.

8. Reaching through the battery tray opening, position the 13" support rod between the holes where the shoulder bolts attached.

9. Fasten the support rod to the tractor frame by passing each shoulder bolt through a bellville washer, side frame and into each end of the support rod using two 15/16" wrenches.

NOTE

Make certain the cupped edge of the bellville washer faces the tractor frame.

10. Remove the hairpin clip and clevis pin from the hole at the bottom of the sleeve hitch assembly.

11. Position the hooked ends of the sleeve hitch assembly to the outside of the hitch plate and over the shoulder bolts. See Figure 8-45.

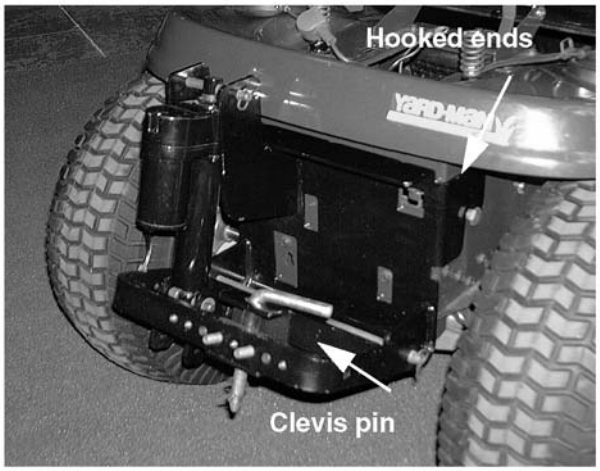


Figure 8-45.

12. Insert a clevis pin through the aligned holes in both the sleeve hitch and the tractor hitch plate and secure with a hairpin clip.

Installing the toggle switch and routing the harness

1. Identify what style dash the tractor has.

2. Raise the tractor hood.

3. Remove the four hex bolts securing the fuel tank to the tractor frame using a 9/16" socket and extension. See Figure 8-46.

Figure 8-46.

4. Carefully move the fuel tank away from the dash panel and set it towards the front of the engine.

NOTE

Keep the fuel tank upright to avoid leak-age from the filler vent.

5. Mark the dash to indicate the placement of the hole. See Figure 8-47.

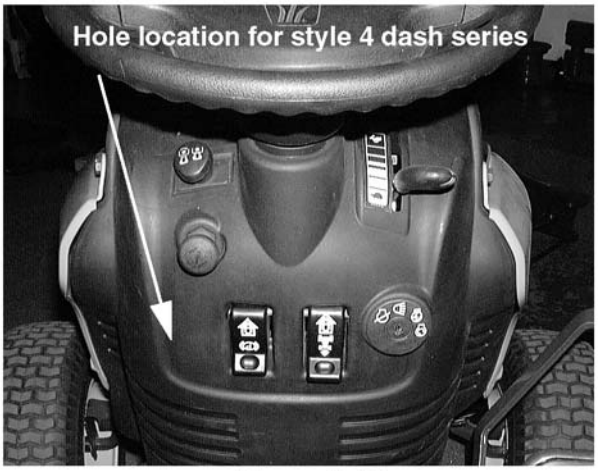


Figure 8-47.

NOTE

You will be drilling a hole through the dash to install the toggle switch. On the style 4 dash, the hole will be approximately three inches below the choke knob (or plastic plug) and to the left of the parking brake button. On the style 8 and 9 dash, the hole will be approximately two inches below the ignition switch, on the right side of the dash.

6. Detent the dash with a punch, and form a pilot hole.
7. Drill a 1/2" hole through the dash.

NOTE

Make certain the wiring harness is not damaged while drilling.

8. Clean any burrs from the hole.
9. Remove the jam nut from the toggle switch.
10. Position the switch so the lettering stamped on the side of the switch is facing toward the left. See Figure 8-48.

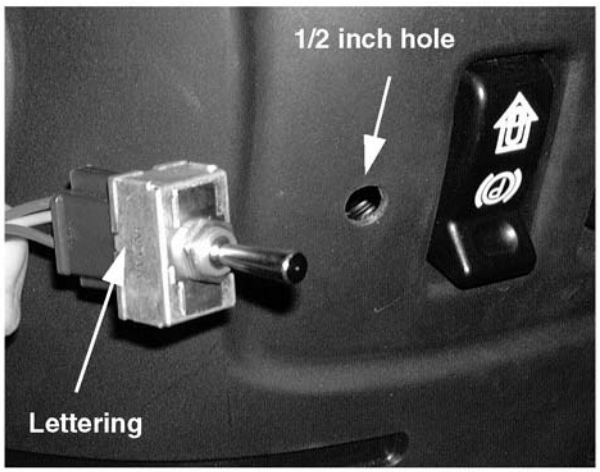


Figure 8-48.

11. Insert the switch from the back side of the dash.
12. Secure the toggle switch to the dash with the jam nut removed earlier, using an adjustable wrench.
13. Route the wire harness down along the left dash support tube through the frame near the running board. See Figure 8-49.

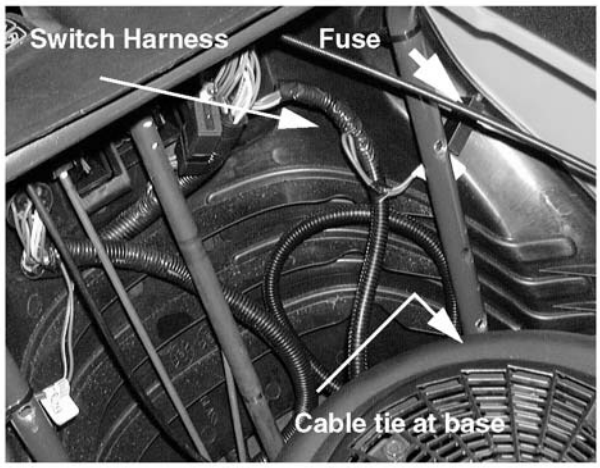


Figure 8-49.

14. Insert the fuse holder clip into the hole in the left dash support tube.
15. Loosely attach a cable tie around the harness and support tube.

NOTE

Do not tighten at this time.

16. Continue to route the wire harness beneath the left side of the fender running board along the tractor's frame. See Figure 8-50.

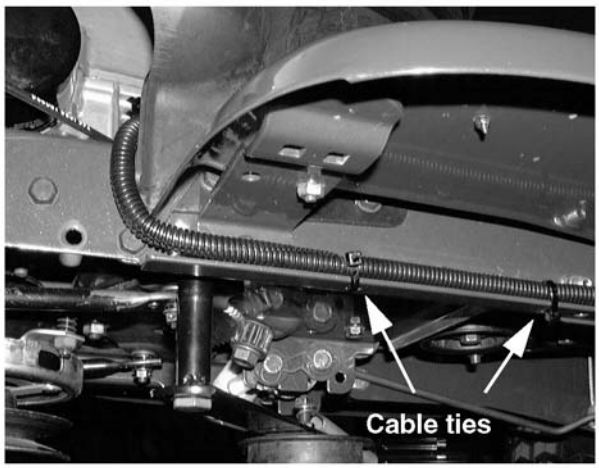


Figure 8-50.

17. Use cable ties to fasten the harness loosely to the frame.

NOTE

If a hydraulic tiller attachment is to be mounted to the sleeve hitch, do not place cable ties through the pair of holes immediately in front of the rear cross member, or through the pair of holes directly above the lift arm pivot bolts.

These holes will be used to mount the undercarriage for the hydraulic pump.

18. Route the harness up the inside edge of the fender and pass it through the hitch plate opening on the left side of the frame, adjacent to the underside of the cup holder. See Figure 8-51.

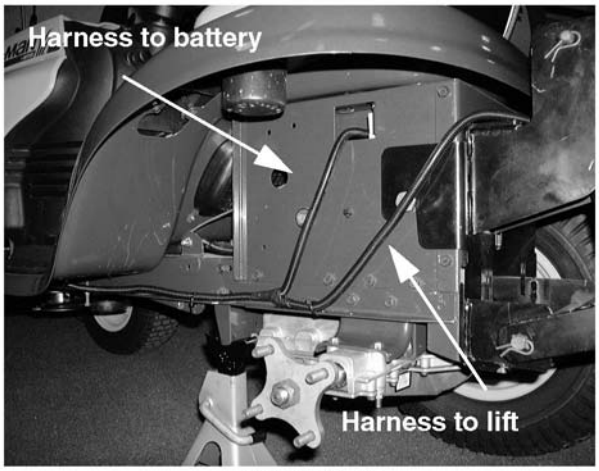


Figure 8-51.

19. Reach through the battery tray opening and locate the black and red wires of the hitch harness. Pull them up and towards the rear of the tractor.

20. Attach the wires loosely to the existing wiring harness with cable ties. Align the connectors and match their colors to the existing harness.

21. Install the battery tray, making certain both sets of battery cables are positioned through the rear slot between the frame and the battery tray.

22. Place the battery in the battery tray.

23. Pass the red cable of the sleeve hitch harness through the protective rubber boot which covers the positive battery cable eyelet.

24. Install the pair of red cables to the positive battery post with the original hardware, using two 7/16" wrenches. See Figure 8-52.

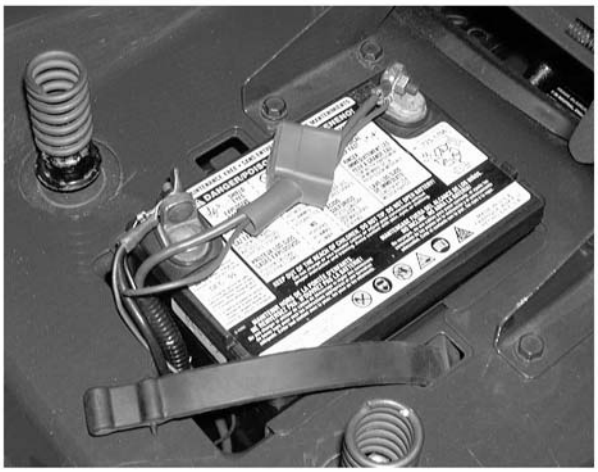


Figure 8-52.

25. Slide the rubber boot over the positive terminal.

26. Secure both black cable eyelets to the negative terminal of the battery with the original bolt and wing nut.

27. Install the battery hold down strap.

28. Snap the molded plastic plug (coming from the lift motor) into the new sleeve hitch harness female connector at the rear of the tractor. See Figure 8-53.

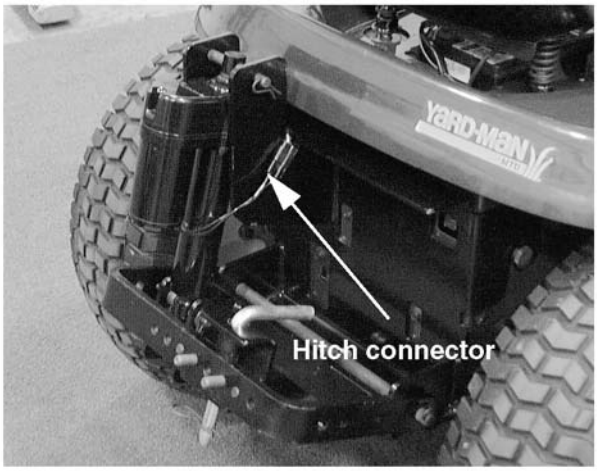


Figure 8-53.

29. Use a cable tie to attach this portion of the harness to the frame behind the left rear tire. See Figure 8-54.

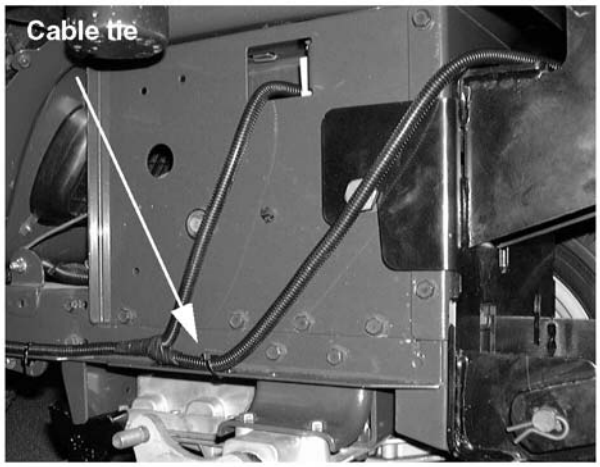


Figure 8-54.

30. Gently pull the hitch harness forward, removing all excess slack.

31. Tuck the excess slack of the hitch harness between the dash and the side panel of the tractor.

NOTE

This will prevent the hitch harness from being snagged while operating the tractor.

32. Tighten all cable ties securely, and cut off the excess length.

33. Re-install the fuel tank using a 9/16" wrench.

34. Test the electric hitch.

30-INCH HYDRAULIC TILLER ATTACHMENT

OEM-190-825 For FastAttach™ Compatible Garden Tractors Only

Figure 8-55.

The Model OEM-190-825 hydraulic tiller attachment is designed for use on FastAttach™ compatible Garden Tractors (800 Series) only. It will NOT fit nor operate properly or safely on ANY other tractor. See Figure 8-55.

This hydraulic tiller attachment must be mounted on the tractor together with an electric sleeve hitch (Model OEM-190-824) that must be purchased separately.

The use of front weights (included with the tiller) is required for safe operation of the tiller attachment.

Carefully read all sections of the Owner's Manual and study the illustrations to ensure proper installation and operation of this attachment.

Read and observe all WARNING statements. They are there to provide protection to the equipment installer and operator, and to ensure the prolonged service life of the equipment.

References to LEFT and RIGHT indicate the left and right sides of the tractor and tiller attachment when facing forward in the operator's position. Reference to the FRONT indicates the grille end of the tractor and reference to the REAR indicates the draw bar end where the tiller attaches.

Contents of Carton

1. Remove all loose components from the carton. Refer to the Owner's Manual for the parts list. See Figure 8-56.

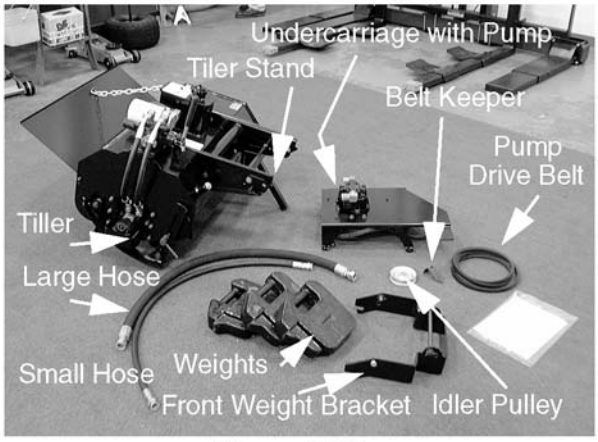


Figure 8-56.

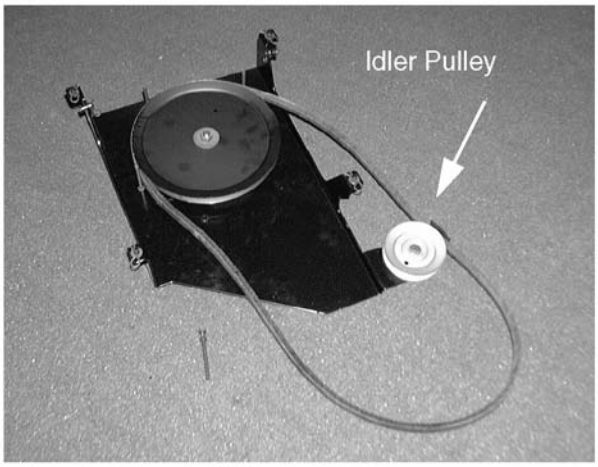


Figure 8-57.

Component Layout

1. Position the tiller assembly on a smooth and level surface about 10' to the rear of the tractor, with the tines facing away from the tractor.

2. Extend the tiller stand to support the tiller.

3. Position the undercarriage assembly between the tiller assembly and the tractor.

4. Select the proper belt for your unit.

NOTE

Two upper drive belts are included with the tiller attachment. The belt packaged with the undercarriage assembly in the separate box is for use on tractor's equipped with an electric PTO. It is part number 754-0490. The other upper drive belt is for use on tractors with a manual PTO. It is part number 754-0341. The belt part numbers are stamped on the outer edge of the belts.

Preparing the Undercarriage and Tiller

1. Install the idler pulley and belt keeper 0n to the bracket at the front left corner of the undercarriage assembly using the 3/8" bolt and self-locking nut.

NOTE

Do not tighten at this time. See Figure 8-57.

NOTE

The shouldered side of the idler pulley should face the undercarriage. The belt keeper should be installed from beneath the undercarriage, with it's index tab in the hole adjacent to the bolt hole.)

2. Route the belt between the belt keeper and the idler pulley.

3. Tighten the nut and bolt using two 9/16" wrenches.

4. If your tractor is equipped with an electric PTO, remove the right front belt keeper pin from the undercarriage using a 7/16" wrench.

Attaching Hoses

GENERAL NOTES

No sealant is required when connecting hydraulic flare fittings such as the ones used on the hydraulic hoses of this tiller.

Remove the plastic shipping caps prior to connecting the fitting which is capped, to minimize the possibility of contamination.

NOTE

Clean the area around the shipping caps before removing them. This will prevent contamination to the hydraulic system.

Make certain not to cross thread the connectors when attaching the hoses.

Each hose has female flare fittings on both ends. One end of each hose will attach to the male flare fittings on the hydraulic pump.

1. Install one end of the larger diameter hose onto the larger male flare fitting of the hydraulic pump using a 1-1/8" wrench and a 1-1/4" wrench. See Figure 8-58.

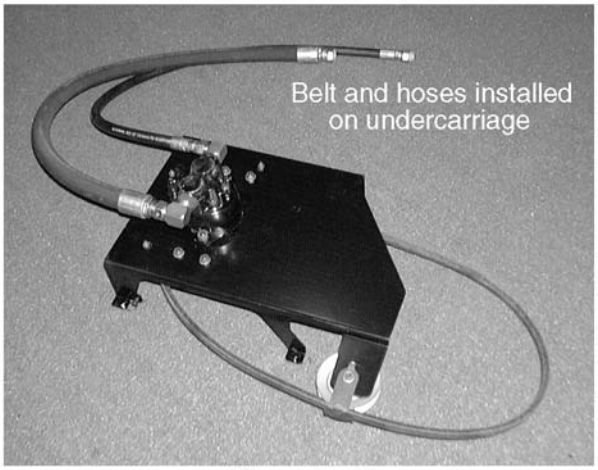


Figure 8-58.

NOTE

Hold the larger male fitting on the pump stationary and tighten the female fitting.

2. Install one end of the smaller diameter hose onto the smaller male fitting of the hydraulic pump using an 11/16" wrench and a 1" wrench.

NOTE

Hold the smaller male fitting on the pump stationary and tighten the female fitting.

3. Using a pair of 1" wrenches, disconnect the front hydraulic hose from the male fitting on the control valve. See Figure 8-59.

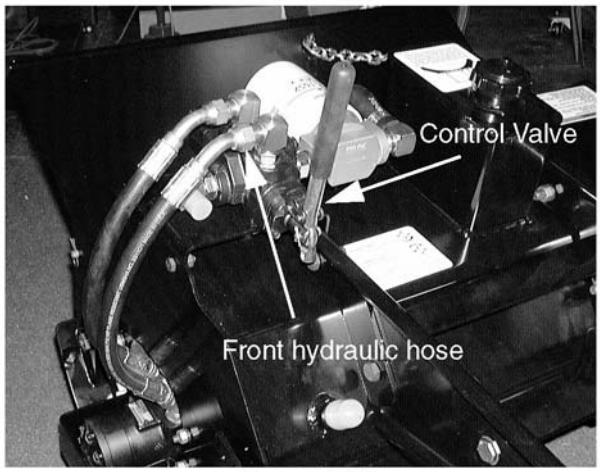


Figure 8-59.

NOTE

Use two plastic shipping caps removed from the fittings you have already connected to prevent dirt from entering the valve and the front hydraulic hose.

4. Install the loose end of the smaller hydraulic hose to the male fitting which extends from the side of the control valve.

NOTE

Hand tighten the hose to the fitting. See Figure 8-60.

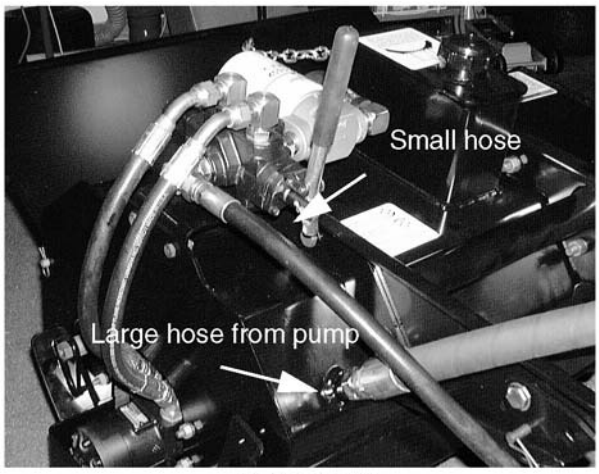


Figure 8-60.

5. Install and hand tighten the larger hydraulic hose to the male fitting on the front surface of the tiller assembly. The fitting is located forward of the control valve, level with the bottom edge of the tiller's mounting bracket.

GENERAL

Place the PTO in the disengaged or OFF position and set the parking brake. Allow the engine to cool if it has been run recently.

The tractor cutting deck, PTO belt and front deck stabilizer bracket must be removed prior to mounting the tiller attachment. Refer to the tractor Operator's Manual for detailed instructions.

If the tractor is equipped with front-end accessories, such as a front bumper kit, it must also be removed.

NOTE

Record the belt routing, particularly if the tractor is equipped with a manual PTO.

The use of this tiller attachment requires the installation of the weight bracket and three 45 lb. weights on the front of the tractor.

Never operate the tractor with the tiller attachment mounted without the weights in place.

NOTE

Doing so could result in serious injury to the operator.

Attaching the Weights

1. Remove the clevis pins, flat washers and hairpin clips found on each side of the weight bracket. See Figure 8-61.

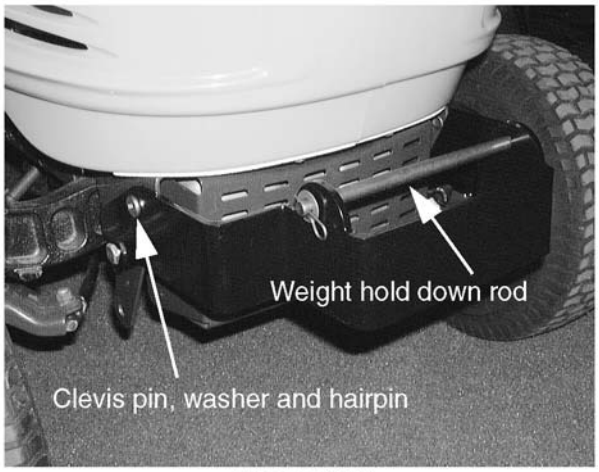


Figure 8-61.

2. With the weight hold down rod facing up, position the slotted portions of the weight bracket over the shoulder bolts found on the out side surfaces of the tractor's front pivot support brackets.

3. Secure the weight bracket to the tractor's front pivot support brackets by installing the clevis pins in the holes above and in front of the shoulder bolts.

4. Secure the clevis pins with the washers and hairpin clips.

5. Remove the hairpin clip and washer from one end of the hold down rod on the weight bracket and slide the rod out the opposite side.

6. Carefully place the weights onto the bracket.

NOTE

Exercise caution when lifting the weights and placing them onto the front weight bracket, they are heavy.

7. After all three weights are mounted, insert the hold down rod into the weight bracket and secure it with the washer and hairpin clip. See Figure 8-62.

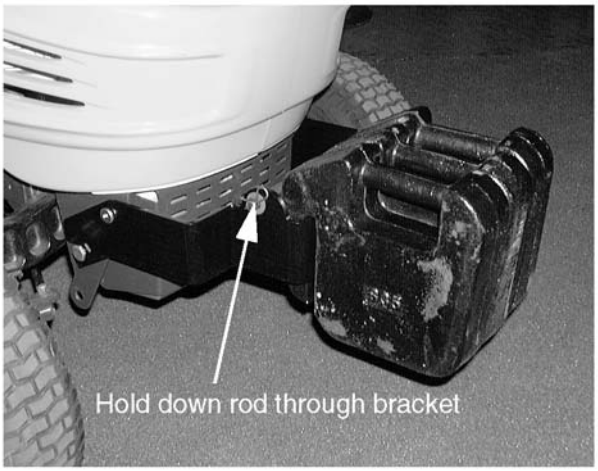


Figure 8-62.

Preparing the Sleeve Hitch

GENERAL

Install the electric sleeve hitch kit using the instructions which are included with it. Additional installation instructions and a video are available from MTD.

The sleeve hitch "U" bracket and hitch bracket assembly will need to be removed from the

sleeve hitch in order to attach the hydraulic tiller.

1. If the hitch is installed on the tractor, disconnect the motor pigtail from the sleeve hitch harness. See Figure 8-63.

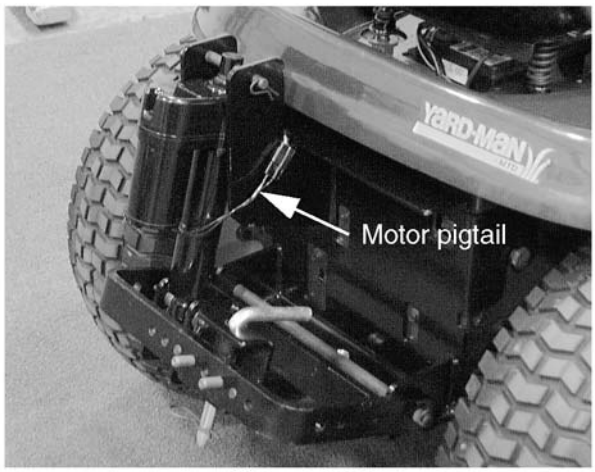


Figure 8-63.

2. Remove the hairpin clip and clevis pin that secures the bottom of the sleeve hitch assembly to the tractor's hitch plate.

3. Carefully lift the sleeve hitch assembly up and off of the shoulder bolts, and place it on the ground.

4. Support the pivoting arm of sleeve hitch assembly.

5. Remove the hairpin clip from the left side of the lower cylinder support rod. See Figure 8-64.

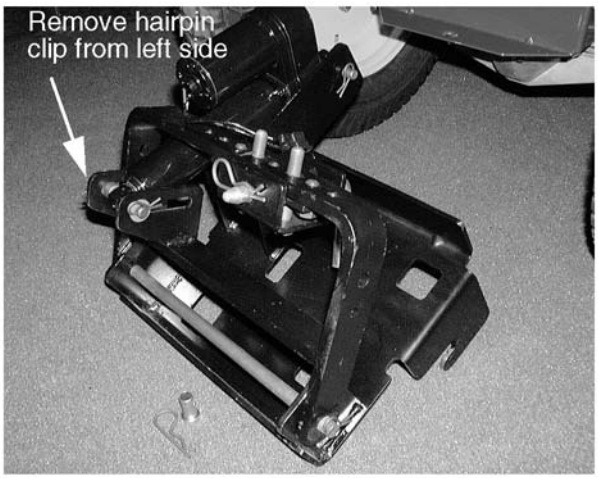


Figure 8-64.

NOTE

Take note of the positions of the spacers and washers.

6. Remove the rod from it's slotted bracket and lower the pivot arm to the ground. Set the hardware aside for later use.

7. Remove a hairpin clip from one end of the hitch rod.

8. Remove the hitch rod from the sleeve hitch bracket assembly.

9. Remove and store the pivoting arm for future use.

NOTE

It will not be used in this application.

10. Reinstall the hitch rod through the sleeve hitch bracket assembly, and secure it with the hairpin clip.

11. Hook the sleeve hitch assembly over the shoulder bolts of the tractor. See Figure 8-65.

Figure 8-65.

12. Reinstall the clevis pin and hairpin clip that attaches the bottom of the sleeve hitch assembly to the tractor's hitch plate.

13. Attach the motor connector to the hitch wiring harness.

14. Retract the motor lift assembly completely using the toggle switch.

Tiller Installation to the Tractor

1. Set the deck height lever to it's highest position.

2. Remove the six hairpin clips and four washers from the mounting points of the undercarriage. See Figure 8-66.

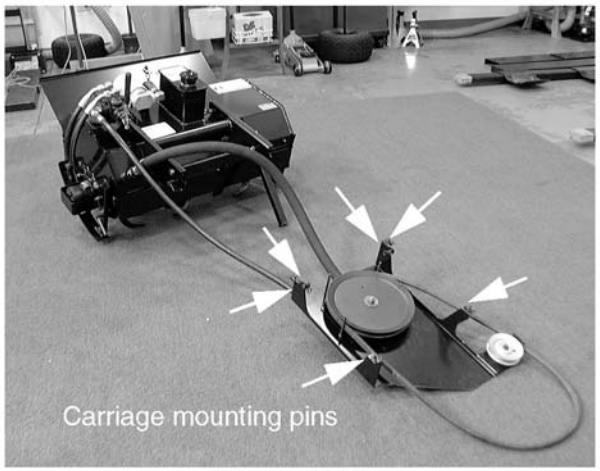


Figure 8-66.

3. Identify the four holes in the bottom lip of the tractor frame that the undercarriage mounting pins match up to. The rear holes in the tractor frame are just in front of the rear cross-member. The front holes are 13-3/8" forward of the rear holes.

NOTE

Make certain that all mounting holes are free of any burrs or other obstructions.

4. Push the tractor backward over the undercarriage assembly, being careful not to run over the hydraulic hoses.

5. Set the deck height lever to it's lowest position.

6. Connect the two horizontal mounting pins to the deck hanger links, and secure them with hairpin clips. See Figure 8-67.

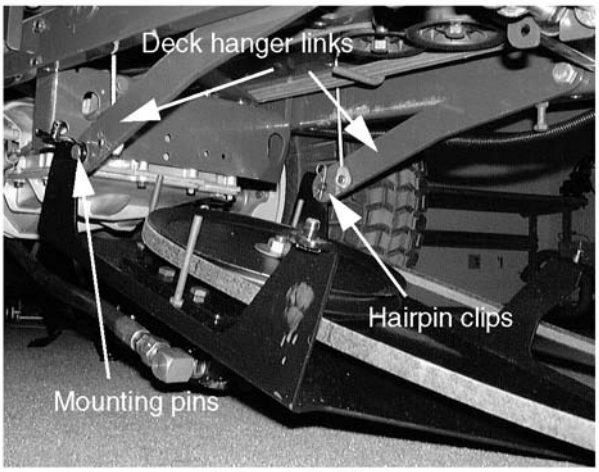


Figure 8-67.

7. Make certain the belt is routed to the outside of the front left mounting leg of the undercarriage.
8. Use the height selector lever to raise the undercarriage into position.

9. Fasten the four mounting pins into their holes with the washers and hairpin clips. See Figure 8-68.

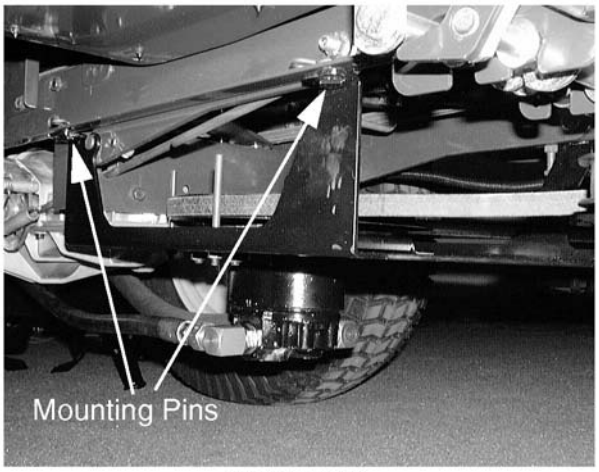


Figure 8-68.

10. Attach the belt to the engine pulley.

NOTE

Make certain the belt is routed the same as the deck belt.

11. Route the hoses between the two latches on the tiller hitch link assembly.

12. Align the tractor so the tiller hitch link assembly slips over the hitch rod, slightly outside of the bracket arms on the sleeve hitch.

NOTE

If necessary, adjust the tiller stand rod until the correct height is achieved.

13. Remove the hairpin clips and clevis pins which lock the latches into position on the tiller hitch link assembly.

14. Reinstall the left clevis pin through the rear-most hole, in order to hold the latch open. See Figure 8-69.

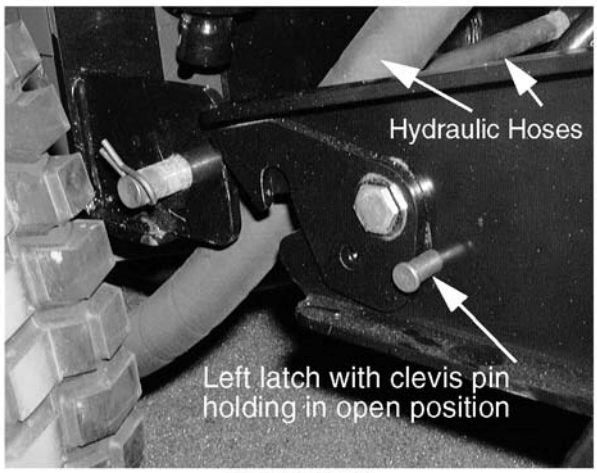


Figure 8-69.

15. Release the parking brake.

16. Pivot the lift motor assembly upward, in order to clear the front cross-member of the tiller hitch link assembly. Begin to roll the tractor back.

17. When the lift motor clears the front cross-member, slowly lower it and lift the latch on the right side of the tiller hitch link assembly.

18. Continue pushing the tractor back. When the right latch engages the hitch rod, close the latch, and secure it with the clevis pin and hairpin clip. See Figure 8-70.

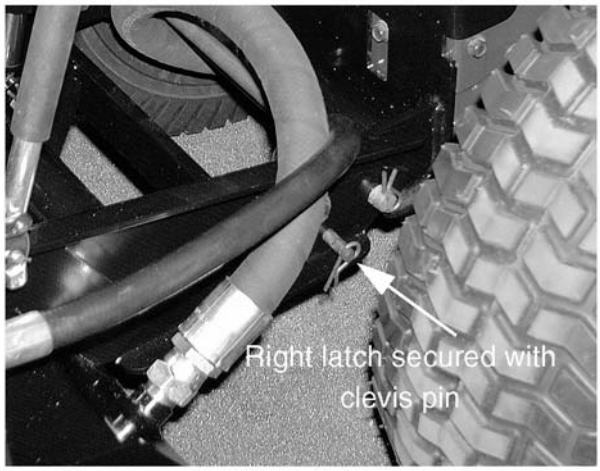


Figure 8-70.

19. Remove the clevis pin from the left latch on the hitch link assembly.

20. Engage the hitch rod into the left latch.

21. Secure the left latch with the clevis pin and hairpin clip.

22. Set the parking brake.

23. Extend the lift cylinder, with the toggle switch, until the lower hole is aligned with the mounting slot in the hitch link assembly.

24. Install the lower cylinder support rod. See Figure 8-71.

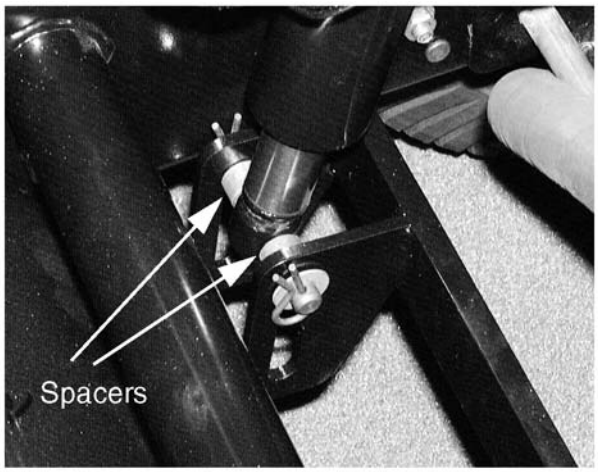


Figure 8-71.

NOTE

The spacers should center the lift motor assembly between the slotted brackets, and

the washers should be held in place outside of the slotted brackets by the hairpin clips.

25. Check both hydraulic hoses where they pass through the hitch assembly. Make certain that they are relaxed and not binding or kinked.

NOTE

Make certain that the hoses will not be damaged by the movement of the sleeve hitch, or by interference with any other moving parts.

26. Tighten the larger hydraulic hose at the front face of the tiller, using a 1-1/4" wrench.

27. Tighten the smaller hydraulic hose to the fitting on the side of the control valve using a 11/16" wrench on the hose, and a 1" wrench to hold the fitting.

28. Install the hydraulic hose (which was removed earlier) to the front fitting on the top of the control valve using two 1" wrenches.

29. Check all fittings to make certain that they are

Checking Oil Level

1. Raise the tiller using the toggle switch.

2. Raise the rear wheels of the tractor, and lower the tiller until the reservoir tank is level with the ground. See Figure 8-72.

Figure 8-72.

3. Fill the tiller's hydraulic reservoir to the "FULL" mark on the dipstick. Use hydraulic fluid P/N 737-3121. The reservoir should hold 4-1/2" gallons of fluid. See Figure 8-73.

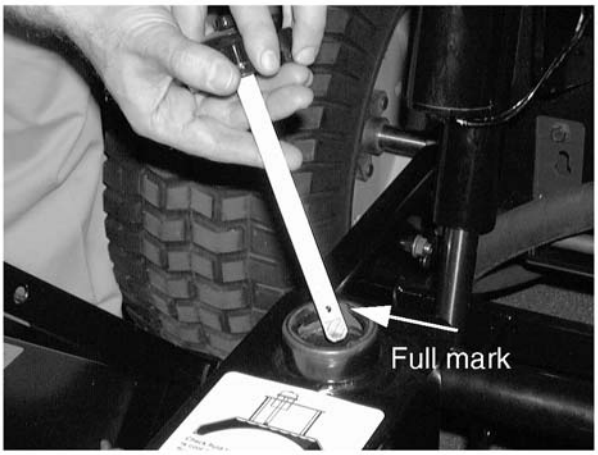


Figure 8-73.

IMPORTANT: Use ONLY a premium grade, petroleum based hydraulic fluid. The hydraulic fluid must meet 100-200 SUS, and ISO 18/13 standards. Using hydraulic fluid that fails to

HYDRAULIC TILLER COMPONENT REPLACEMENT

meet these standards WILL void the tiller's warranty.

4. Raise the tiller completely, start the tractor, drive it to level ground.

5. Run the tiller briefly to test it and purge the hydraulic system.

6. Inspect for leaks and check the hydraulic fluid level. Add more fluid if necessary

IMPORTANT: Cleanliness is essential to the longevity of all hydraulic components. The following practices will help prevent damage to expensive items. Damage to hydraulic components caused by contamination is not covered under the warranty.

Do not use contaminated hydraulic fluid. See Figure 8-74.

Figure 8-74.

Cover or cap any fittings that are disconnected to prevent contamination. See Figure 8-75.

Figure 8-75.

Make certain that the area surrounding the hydraulic fittings or components to be disconnected are clean enough to prevent contamination.

When disconnecting any hydraulic fittings, have catch pans is place to prevent the spillage of fluid.

Keep hands, tools, and work surfaces clean. See Figure 8-76.

Figure 8-76.

Do not use high pressure cleaning equipment.

Only use sealant approved for high pressure hydraulic applications. See Figure 8-77.

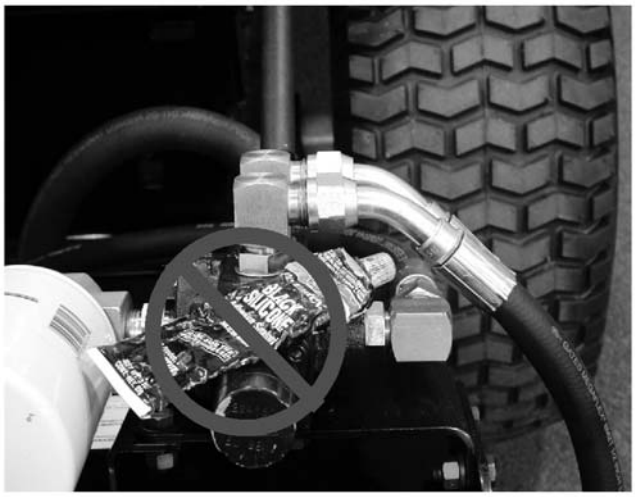


Figure 8-77.

Do NOT use sealant when joining flare fittings.

Do NOT use Teflon TM (PTFE based) sealant (tape or paste) on pipe thread fittings. These sealants can be blown out of high pressure joints and may damage the hydraulic components. See Figure 8-78.

Figure 8-78.

High pressure hydraulic sealant such as Loctite TM product 545 is the only suitable product for sealing pipe thread fittings on this tiller.

Proper fluid for this tiller attachment is a premium grade, anti-wear petroleum based hydraulic fluid which meets ISO AW-32/SAE 10W viscosity rating or MTD part number 737-3121 (one-gallon container).

Always use two wrenches to separate flare fittings; one to hold the fixed side stationary and one to rotate the part to be removed. See Figure 8-79.

Figure 8-79.

Hydraulic component policy

The warranty period for the hydraulic pump, control valve, and motor is one year from the date of purchase for non-commercial users. There is no warranty for commercial use. The rest of the tiller attachment (including the hoses) is covered under MTD's two year warranty with a 90 day no-fault clause. Beyond the first 90 days, hoses are not covered against damage other than defects in material or workmanship.

If the pump, valve, or motor suffer a warrantable failure, it is to be replaced as a unit. Component parts are not available through MTD. The only exception to this is the lever bracket on the control valve. See Figure 8-80.

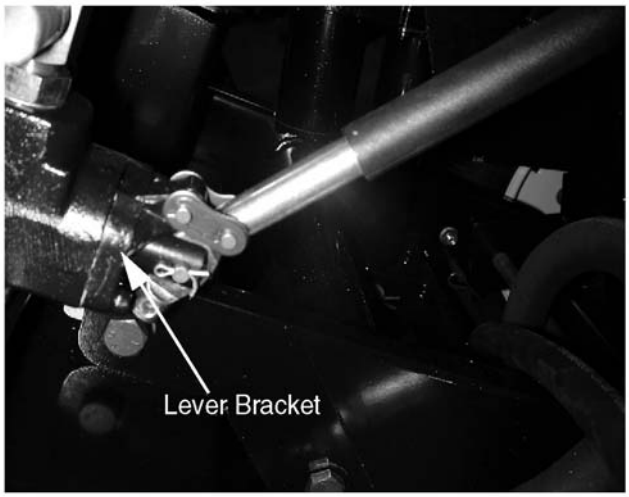


Figure 8-80.

The bracket is available as MTD part number 718-0523 and is secured to the valve with two

screws and thread lock compound, part number 710-1503.

MTD will call back replaced components for inspection. The component will be tested by its manufacturer to determine the cause of the failure. If the failure is not due to a defect in material or workmanship from MTD or the component manufacturer, the warranty claim will not be paid.

Test, don't guess.

Due to the expense of the components, unless the failure is quite obvious, such as a fluid leak, perform the tests detailed in the following set of instructions.

A test kit is available through MTD and its Central Distributors. A security deposit and small fee will be charged. See Figure 8-81.

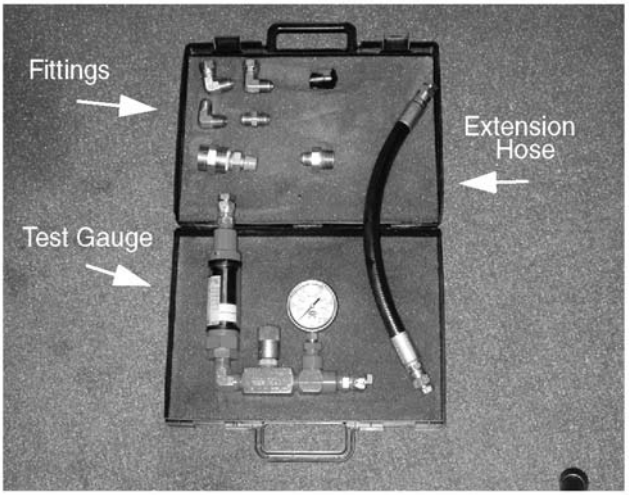


Figure 8-81.

Once the hydraulic components are out of warranty, repairs and/or replacements are at the dealers discretion. MTD does not stock hydraulic component parts. These must be purchased through distributors of Eaton or Energy Manufacturing products.

Safety is a primary concern when servicing power equipment. In addition to the dangers inherent to heavy components with rotating parts, there are other dangers inherent to hydraulic equipment.

Read and follow the hydraulic fluid manufacturer's instructions and precautions.

Work neatly. Spilled hydraulic fluid is a slipping hazard, and may contaminate soil and groundwater if not properly attended to.

A high-pressure leak concentrated on a small area may penetrate the skin, resulting in serious injury or death.

Wear appropriate eye and face protection whenever working with a pressurized hydraulic system.

Do not operate a hydraulic system that has leaks (or damage that may result in a sudden leak) such as a distorted flare fitting or a hose with obvious damage to it's outer layer.

Some of the diagnostic tests described here put the system under a heavy load. This load should be maintained long enough to complete the test, then promptly relieved.

Pressure may be maintained in the system even after the engine is turned off. Especially if a component is jammed, and fluid pressure can not be relieved. This is important to remember should a foreign object get lodged in the tines. The tines may turn with considerable force when the object is removed. A fitting that is disconnected under this pressure would expel fluid under high pressure, and may cause injury.

Never perform any service to the tiller while the engine is running or when the system is under pressure.

Control Valve Removal

1. Disconnect the three pressure lines from the valve using two 1" wrenches. See Figure 8-82.

Figure 8-82.

2. Hold each 90-degree elbow with one wrench while loosening the fitting that is attached to it with the other wrench.

3. Loosen the hose clamp that secures the return hose to the reservoir. It may be necessary to remove the filter if it is blocking access to the tightening screw on the hose clamp. See Figure 8-83.

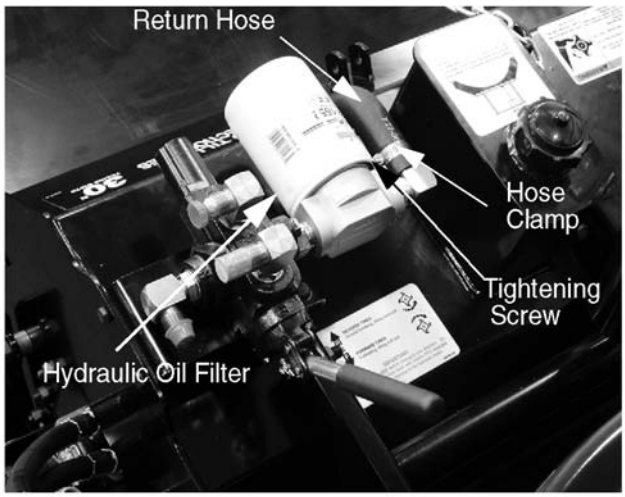


Figure 8-83.

4. Pry the return hose off of the hose barb on the reservoir. See Figure 8-84.

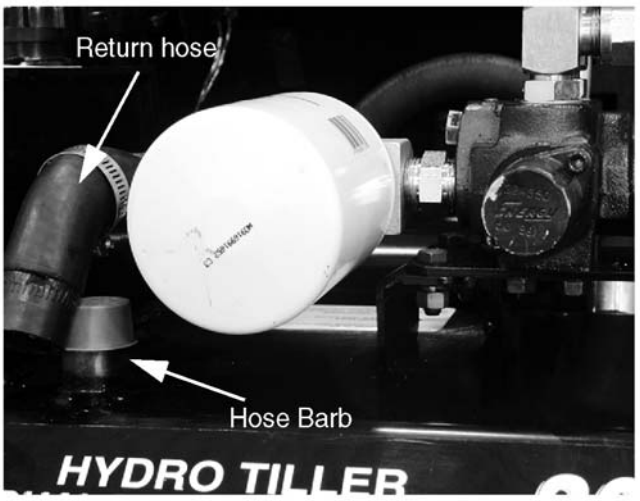


Figure 8-84.

NOTE

Record the orientations of the valve, filter head, and 90 degree elbows.

5. Loosen all three 90-degree elbows using a 1" wrench.

6. Loosen the adapter, located between the control valve and filter head, from the filter head using a 1" wrench. See Figure 8-85.

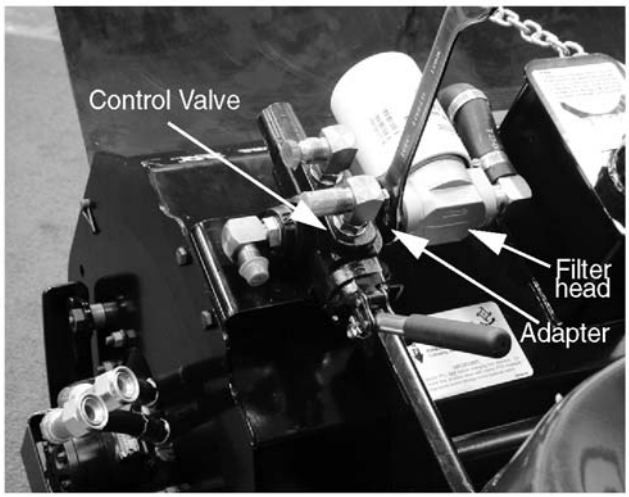


Figure 8-85.

7. Remove the four bolts which secure the control valve to the valve mounting bracket using a 1/2" wrench. See Figure 8-86.

Figure 8-86.

8. Remove the control valve and filter head.

9. Remove the filter head and adapter from the control valve. Carefully clamp the control valve in a vice, using soft jaws if necessary.

10. Install the control valve in the reverse order above.

11. Check the hydraulic fluid level and fill as necessary. Run the tiller briefly to purge any air from the system. Check the hydraulic fluid level and fill as necessary.

Filter Head Removal

1. Loosen the hose clamp securing the return hose to the reservoir. Remove the spin-off filter.

2. Remove the return hose from the hose barb on the reservoir.

3. Loosen the adapter, located between the control valve and filter head, from the control valve using a 1" wrench.

4. Remove the four bolts which hold the control valve to the valve mounting bracket using a 1/2" wrench.

5. Thread the filter head off of the control valve adapter.

6. Install the filter head in the reverse order above.

7. Check the hydraulic fluid level and fill as necessary. Run the tiller briefly to purge any air from the system. Check the hydraulic fluid level and fill as necessary.

Hydraulic Pump Removal

1. With the tractor on a firm, level surface, with at least six feet of clearance in front of it, lower the tiller until it rests on the ground.

NOTE

Allow the engine to cool if it has been run recently.

2. Remove one hairpin clip that secures the lower cylinder support rod in the slot in the hitch link assembly. See Figure 8-87.

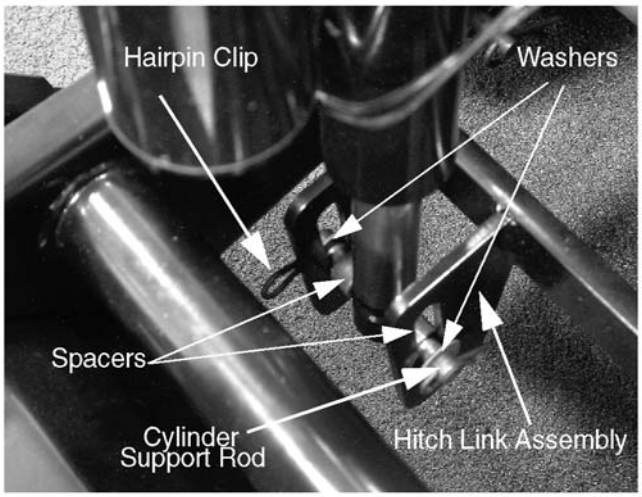


Figure 8-87.

NOTE

Record the positions of the spacers and washers that locate the lower cylinder support rod.

3. Remove the lower cylinder support rod.

4. Remove the hairpin clip and clevis pin that hold the tiller stand rod in the retracted position. See Figure 8-88.

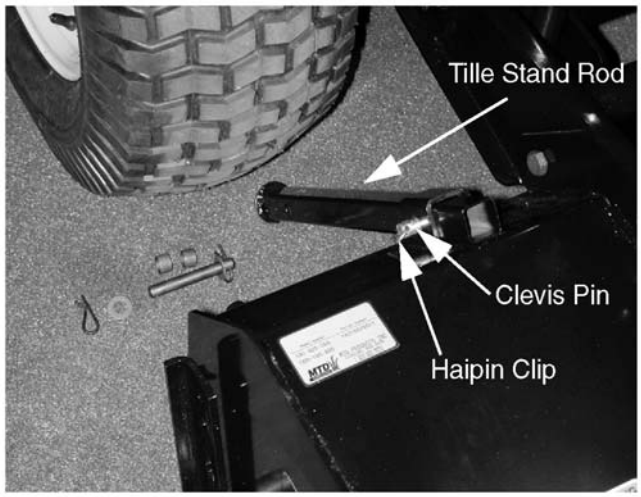


Figure 8-88.

5. Extend the tiller stand rod and lock it into position using the hairpin clip and clevis pin.

6. Remove the hairpin clips and clevis pins that lock the latches into position on the tiller hitch link assembly. See Figure 8-89.

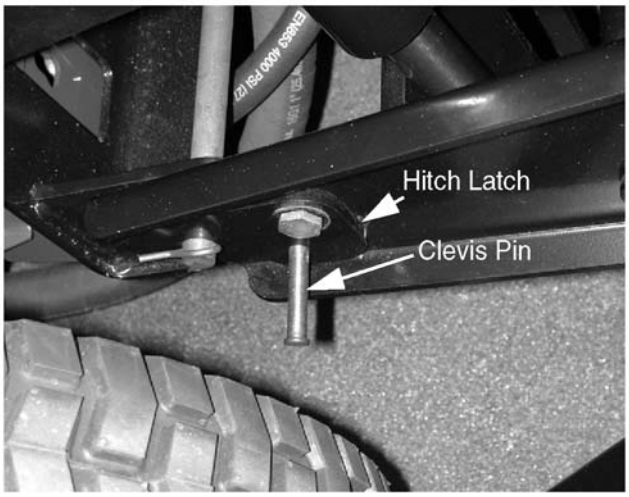


Figure 8-89.

7. Install the left clevis pin through the rear-most hole so that it holds the latch open. See Figure 8-90.

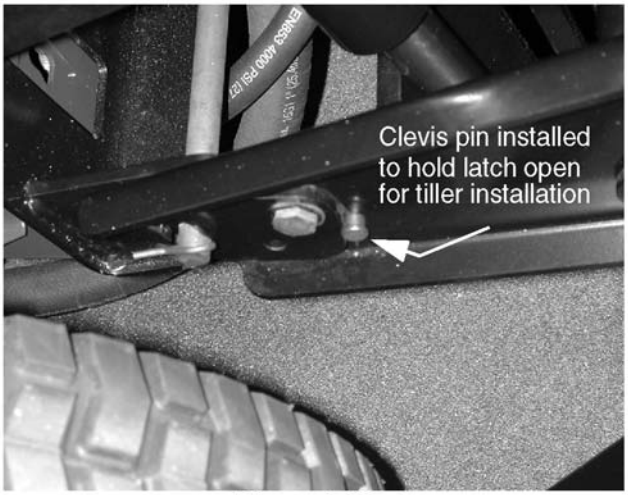


Figure 8-90.

8. Release the right side latch and push the tractor forward until the right side latch releases from the hitch link assembly. See Figure 8-91.

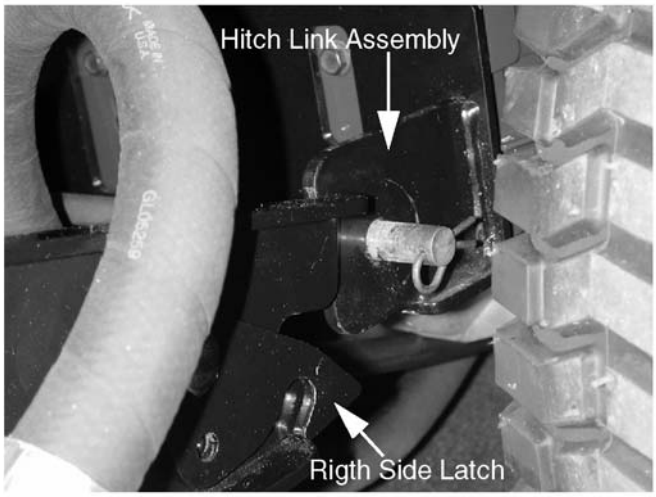


Figure 8-91.

9. Remove the four hairpin clips that fasten the undercarriage to the tractor frame. See Figure 8-92.

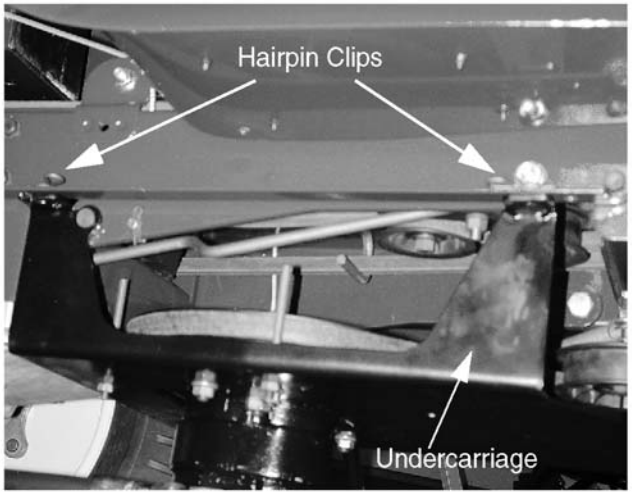


Figure 8-92.

10. Lower the deck height lever to its lowest position. See Figure 8-93.

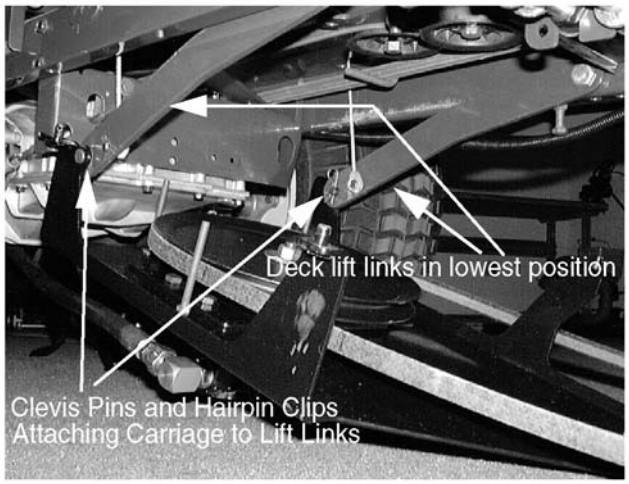


Figure 8-93.

11. Remove the two hairpin clips and clevis pins securing the undercarriage to the lift links.

12. Lower the undercarriage to the ground. See Figure 8-94.

Figure 8-94.

13. Pivot the lift motor assembly upward so that it clears the front cross member of the hitch link assembly. Push the tractor forward until the lift motor assembly clears the cross member then gently lower the lift motor assembly.

14. Push the tractor clear of the undercarriage. See Figure 8-95.

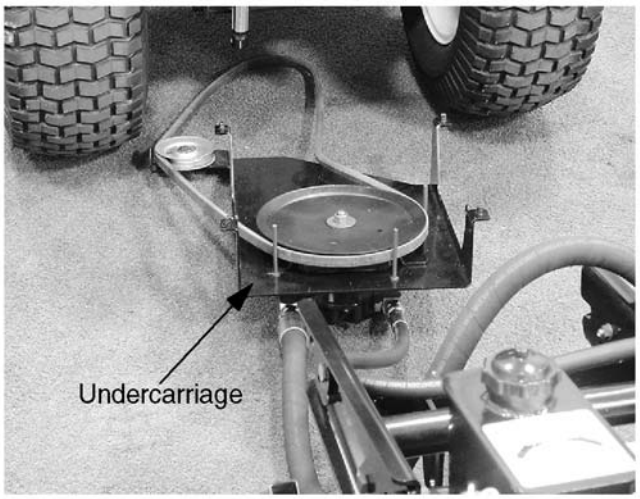


Figure 8-95.

15. Loosen the nut that secures the pulley to the pump shaft, using a 3/4" wrench. Loosen the nut until the top of the nut is flush with the top of the pump shaft. See Figure 8-96.

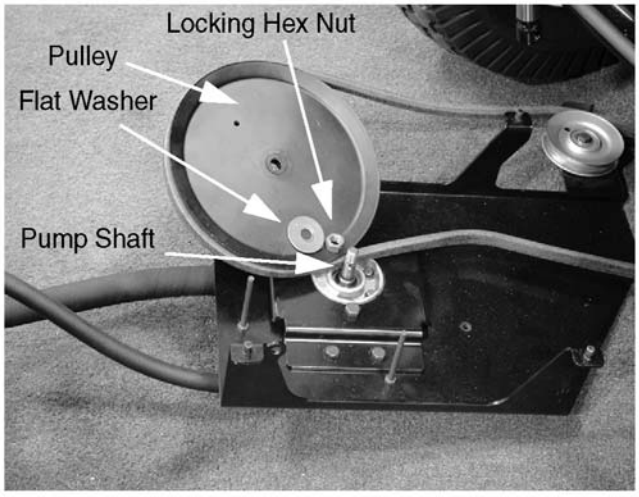


Figure 8-96.

16. Apply upward force to the pulley as near to the center as possible, and strike the end of the shaft sharply with a soft hammer or drift. This should free the pulley from its tapered seat on the shaft.

17. Remove the nut, washer, pulley, and key.

18. Remove both bolts securing the pump to the undercarriage using a 5/8" wrench and a 11/16" wrench. See Figure 8-97.

Figure 8-97.

NOTE

The hoses and pump are filled with hydraulic fluid. Elevate the pump when disconnecting the hoses and collect any spilled fluid in a catch pan.

19. Remove the large hose from the pump using a 1-1/8" wrench and a 1-1/4" wrench.

20. Remove the small hose from the pump using a 1" wrench and a 11/16" wrench. See Figure 8-98.

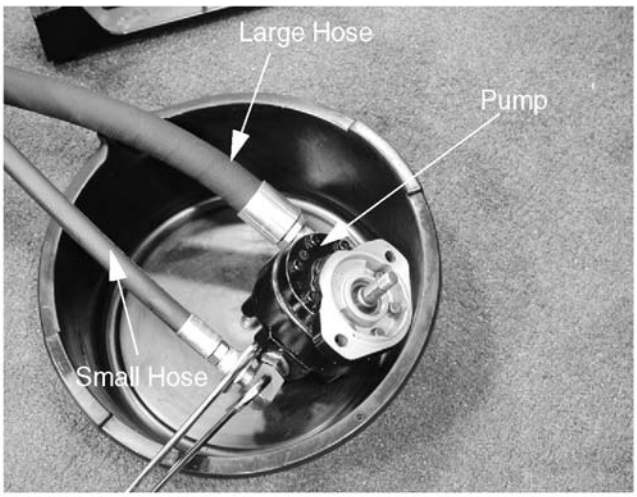


Figure 8-98.

21. Remove the 90-degree elbow fittings from the pump using a 1" wrench and a 11/8" wrench.

22. Install the pump in the reverse order above.

23. Check the hydraulic fluid level and fill as necessary. Run the tiller briefly to purge any air from the system. Check the hydraulic fluid level and fill as necessary.

Hydraulic Tine Motor Removal

1. Park the tractor with the tiller attached on a firm, level surface.

2. Raise the tiller to the full up position.

3. Support the tine adapter assembly with a one foot 2x4 with a “V” notch in one end. See Figure 8-99.

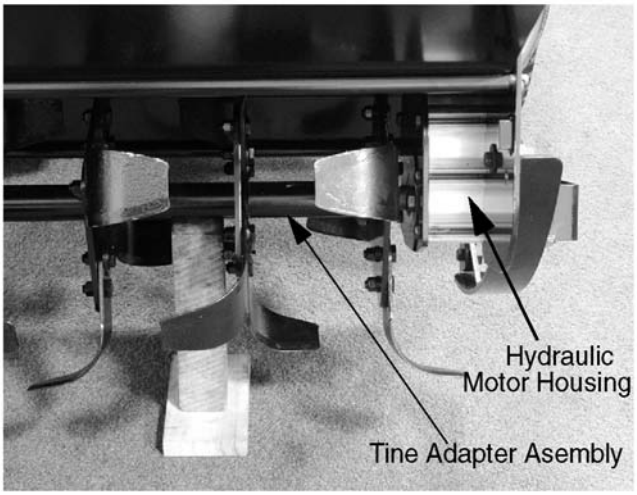


Figure 8-99.

NOTE

Elevate the hoses when disconnecting and collect any spilled fluid in a catch pan.

4. Disconnect both hoses from the hydraulic tine motor using a 7/8" wrench and a 11/16" wrench. See Figure 8-100.

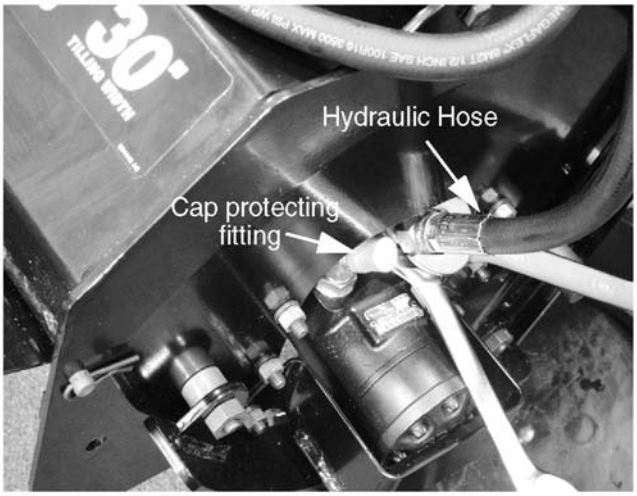


Figure 8-100.

5. Remove the hydraulic motor guard using two 9/16" wrenches.

6. Loosen the two 45-degree elbow fittings on the hydraulic motor using a 1" wrench. See Figure 8-101.

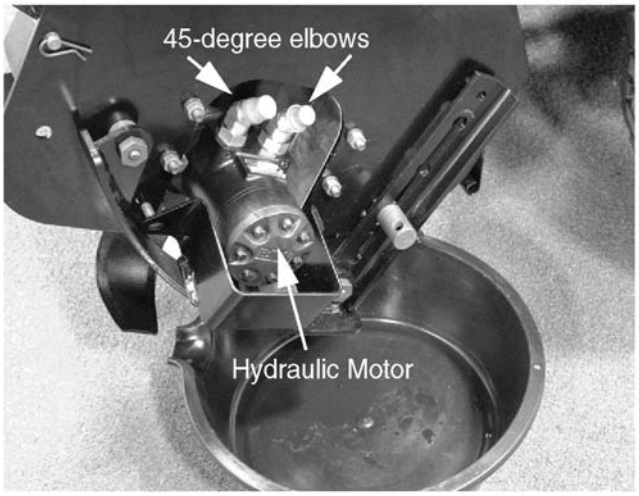


Figure 8-101.

7. Remove the two large nuts that hold the hydraulic motor to the tiller assembly using two 3/4" wrenches. See Figure 8-102.

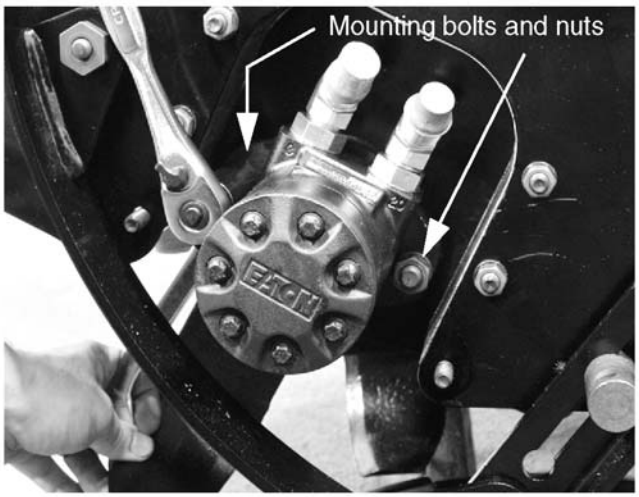


Figure 8-102.

8. Remove the through-bolts securing the tine adapter assembly to the output shaft of the hydraulic motor. See Figure 8-103.

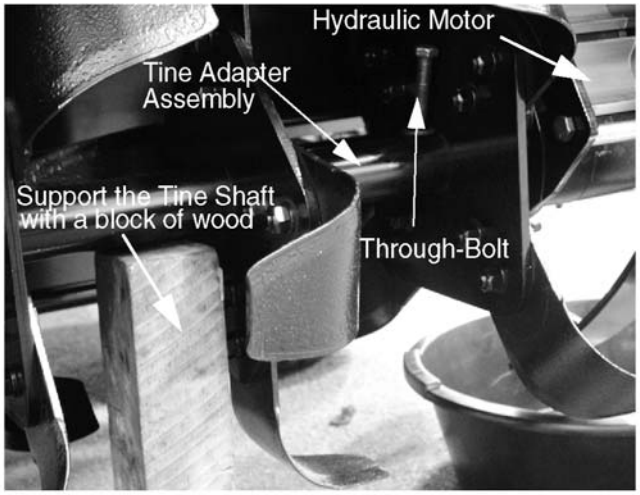


Figure 8-103.

9. Remove the hydraulic motor and place it in an oil pan. See Figure 8-104.

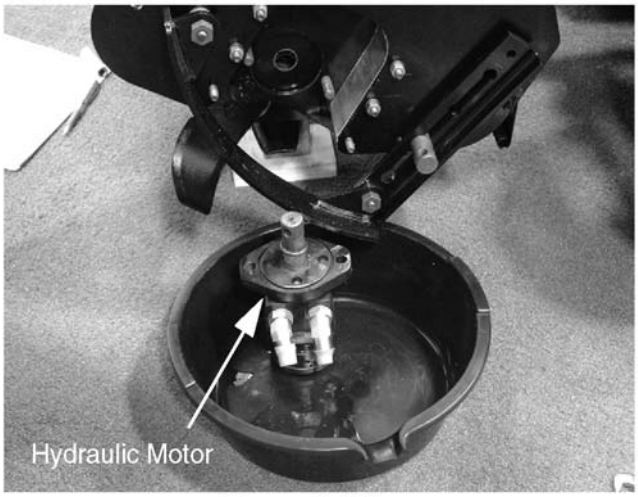


Figure 8-104.

10. Remove both 45-degree elbow fittings.

11. Install the motor in the reverse order above.

NOTE

Lubricate the pump shaft with anti-seize compound before assembly.

12 Check the hydraulic fluid level and fill as necessary. Run the tiller briefly to purge any air from the system. Check the hydraulic fluid level and fill as necessary.

Removing the Tine Adapter Assembly

1. Remove both through-bolts securing the tine adapter assembly to the tine shaft and hydraulic motor using a pair of 9/16" wrenches. See Figure 8-105.

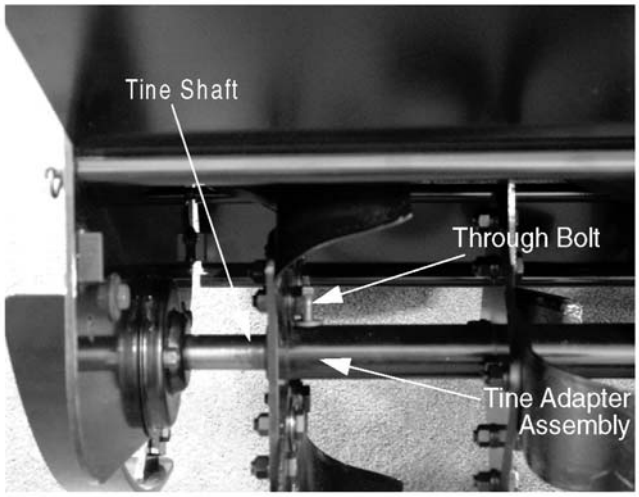


Figure 8-105.

2. Support the tine adapter assembly using a one foot 2x4 with a “V” notch in one end. Remove the outer shoulder bolts, lock washers, and hex nuts from the tines that bend toward the left side plate of the tiller housing.

NOTE

This will allow the tines to drop beneath the bottom edge of the tiller housing, providing clearance for the tine adapter assembly to slide to the left.

3. Remove the nuts securing the inner bearing cover to the tiller housing using two 1/2" wrenches. See Figure 8-106.

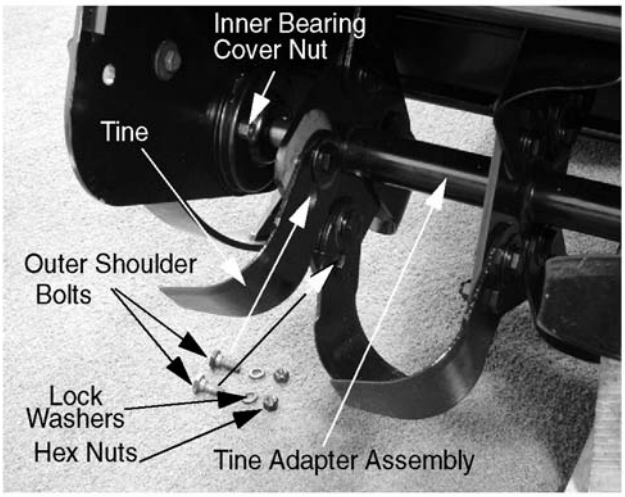


Figure 8-106.

4. Slide the inner bearing cover to the right to access the two hex nuts securing the bearing flange to the tiller housing.

5. Remove both hex nuts securing the bearing flange to the tiller housing using two 1/2" wrenches. See Figure 8-107.

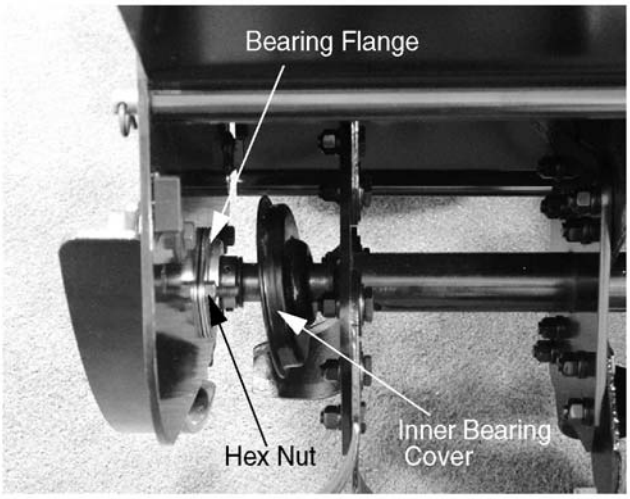


Figure 8-107.

6. Push the tine shaft into the tine adapter assembly and remove the bearing flange and outer dust cap cover. See Figure 8-108.

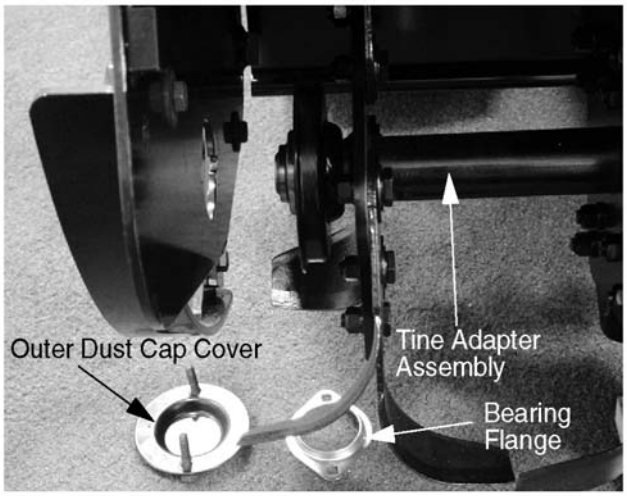


Figure 8-108.

7. Remove the bearing, O ring seal, and tine shaft. See Figure 8-109.

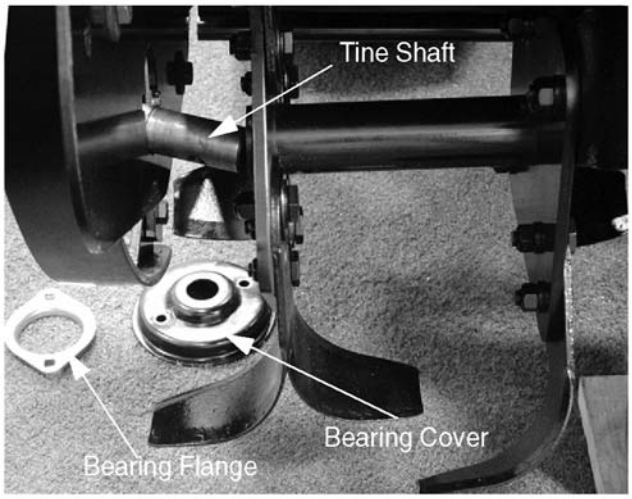


Figure 8-109.

8. Slide the tine adapter assembly to the left, lower and remove it from the tiller housing. See Figure 8-110.

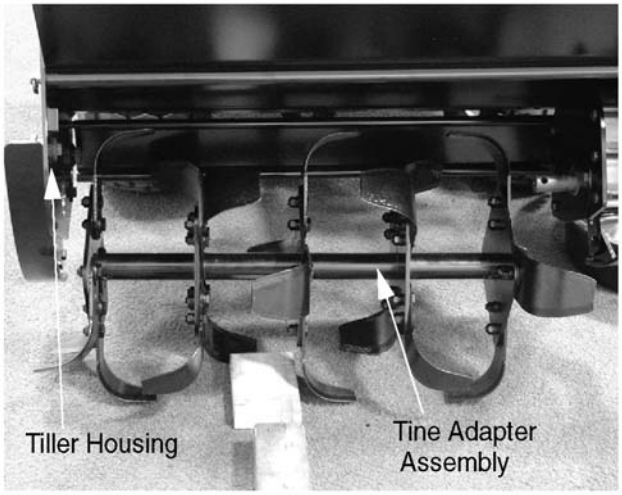


Figure 8-110.

9. Install the tine adapter assembly in the reverse order above.

NOTE

Lubricate the pump shaft and tine shaft with anti-seize compound before assembly.

Removing the Flange Bearing Assembly

1. Park the tractor, with the tiller attached, on firm level ground.

2. Raise the tiller to the full up position.

3. Support the tine adapter assembly using a one foot 2x4 with a “V” notch in one end.

4. Remove the through-bolt that holds the tine adapter assembly to the tine shaft using two 9/16" wrenches. See Figure 8-111.

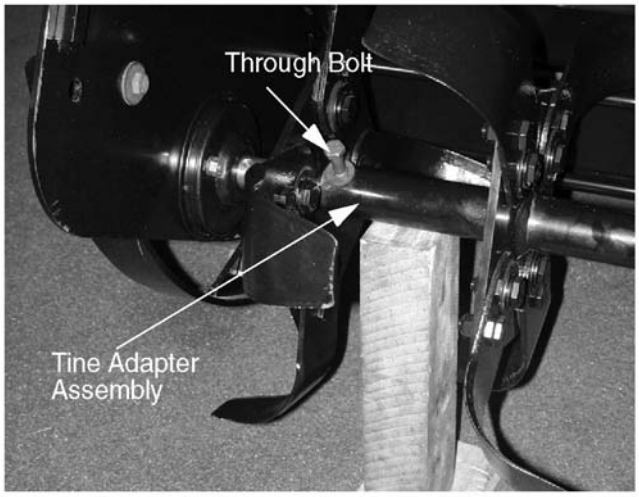


Figure 8-111.

5. Remove the inner bearing cover using two 1/2" wrenches.

6. Slide the inner bearing cover to the right to access the two hex nuts securing the bearing flange to the tiller housing. See Figure 8-112.

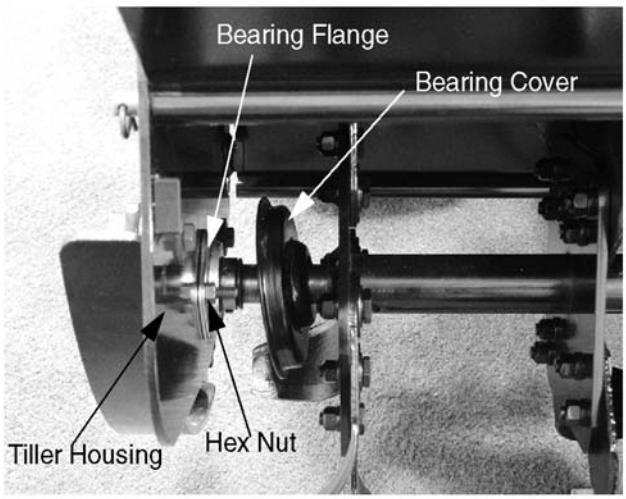


Figure 8-112.

7. Remove the second set of nuts using two 1/2" wrenches.

8. Remove the bearing cap cover and push the tine shaft into the tine adapter assembly. See Figure 8-113.

NOTE

The outer bearing flange will slide off the tine shaft.

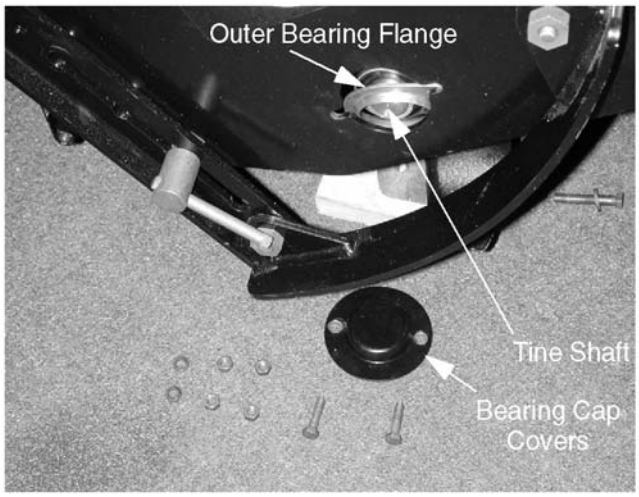


Figure 8-113.

9. Remove the bearing, O ring seal, and tine shaft from the tiller housing.

10. Remove the set screw that holds the bearing to the tine shaft using a 1/8" allen wrench. See Figure 8-114.

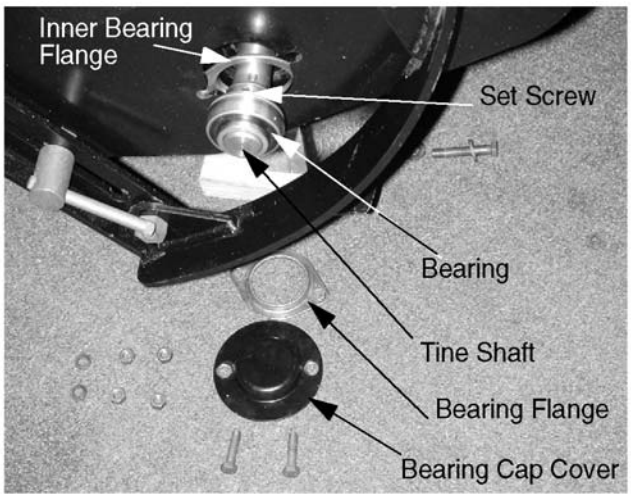


Figure 8-114.

11. Install the flange bearing in the reverse order above.

NOTE

Lubricate the tine shaft with anti-seize compound before assembly.

46" DOZER BLADE

OEM-190-822

1. Identify the different components. See Figure 8-115.

Figure 8-115.

2. Hooked the notched ends of the high assembly onto the shoulder bolts on the front of the tractor frame. Secure with the attachment pins. See Figure 8-116.

Figure 8-116.

3. Remove the pivot shaft from the welded brackets on the back of the blade by removing the hairpin clips. See Figure 8-117.

Figure 8-117.

4. Align the holes in the pivot plate with the holes in the welded brackets. Insert the pivot shaft through the holes and secure with hairpin clips. See Figure 8-118.

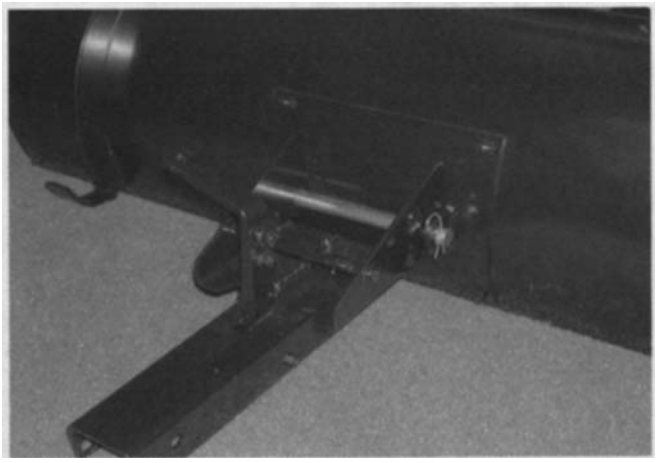


Figure 8-118.

5. Remove the plastic cap, knob, and washer from the blade adjusting spring bolt. Adjust the hex nut on the bolt so that it is threaded approximately 1" onto the bolt. Hook the spring over the spring mount rod. See Figures 8-119 and 8-120.

Figure 8-119.

6. Insert the bolt through the hole in the top of the blade and reassemble the washer and the knob onto the bolt. See Figure 8-120.

Figure 8-120.

7. Tighten the knob until it is secure against the blade and hex nut.

8. Place the plastic cap over the end of the bolt.

9. Remove the channel pivot pin, washer, and hairpin clip from the pivot support bracket. See Figure 8-121.

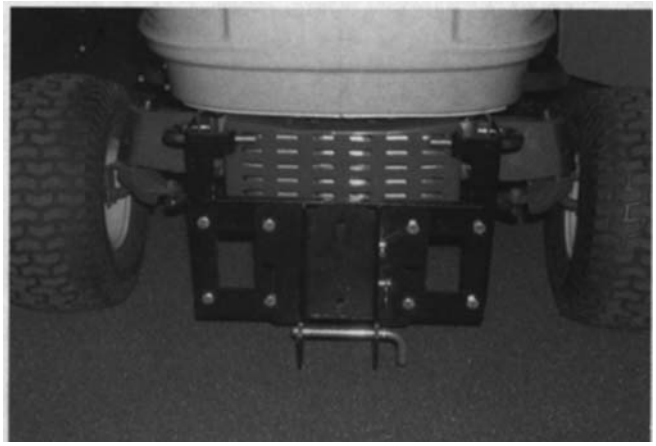


Figure 8-121.

10. Attach the channel assembly to the tractor by placing the end of the channel into the pivot support bracket. Insert the channel pivot pin through the holes in the pivot support bracket and channel. Secure with the hairpin clip. See Figure 8-122.

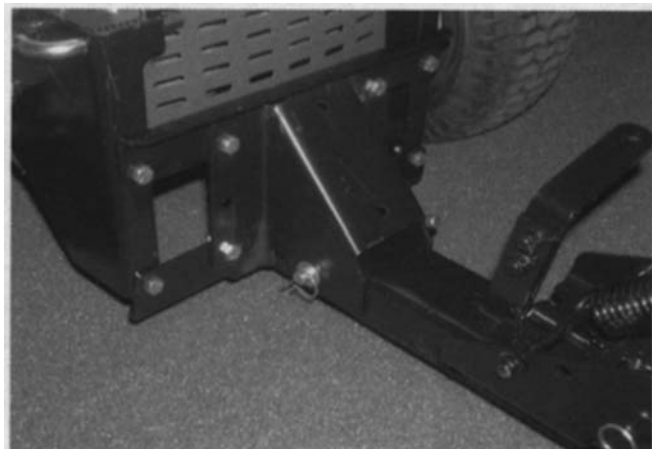


Figure 8-122.

11. Remove the hairpin clip from the lift link pin which is assembled to the pivot support bracket. Insert the end of the lower lift handle assembly through the notch in the pivot support bracket and through the holes in the channel. Align the lift link pin with the hole in the welded bracket on the lower lift handle assembly. Insert the lift link pin through the hole in the bracket and secure with the hairpin clip. See Figure 8-123.

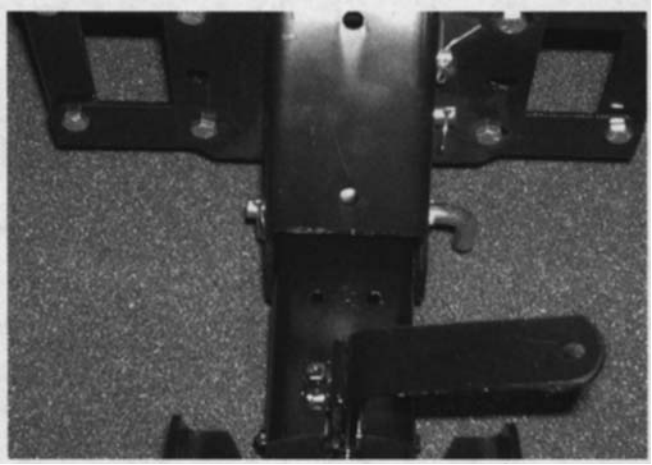


Figure 8-123.

12. Remove the clevis pin and hairpin clip from the upper lift handle. Place the upper lift handle over the lower lift handle assembly. Align the holes and secure with the clevis pin and hair-pin clip. See Figure 8-124.

Figure 8-124.

ADJUSTMENTS:

Skid Shoes:

1. Loosen the two nuts securing the skid shoes to the blade.

2. Set the shoes to the desired position and retighten. See Figure 8-125.

Figure 8-125.

To Stiffen the Blade Trip Action:

1. Loosen the hex nut on the spring bolt.

2. Tighten the knob. See Figure 8-126.

Figure 8-126.

The normal adjustment of the spring tension is for the spring bolt to extend 1" through the hex nut.

NOTES

POWER EQUIPMENT DICTIONARY

MOWER TERMS

Full Baffled Housing: A front and rear welded housing underneath the deck to create an entire circular deck. This increases the air flow to effectively discharge grass.

Blade Lift: A raised area, behind the cutting tips, which creates a lift and pulls the grass up to the blade. The proper lift is more important to the cutting quality than even a sharp edge.

Vacuum Lift Action: This is created by a combination of a baffled deck design and the rear lift of the blade. The deep vacuum action lifts the grass for cleaner, sharper cutting and efficient discharge.

Cloth Catcher: These wide-mouth easy dump catchers offer superior bagging performance because of excellent air flow during cutting and allow for maximum fill of the catcher.

Hard Top Catcher: More durable than cloth-type is vented downward and drives its dust into the grass instead of the operator. The hard plastic top provides durability, stability and balance.

Hi-Vac Deck: For excellent cutting and bagging performance. Brings grass into catcher from top thus creating better air flow plus easy bag fill.

Steel Housing: Sheet steel, stamped and formed into a housing configuration (won't crack or chip).

Cast Aluminum Deck: Lightweight and easy to maneuver. Aluminum provides a no rust material extended unit life.

Rolled Deck (Tapered): Bottom edge of steel housing is rolled under the inside for better control of grass flow and cutting, additional strength, won't snag or damage shrubbery.

9-Position Individual Height Adjustment: A lever at each wheel allows setting height of cut for taper cuts, cut trimming, and cutting extra high grass. The rear wheels should be set one notch higher than the front for extra high grass conditions.

Single Lever Height Adjuster: Adjusts all four wheels with one lever. This spring loaded system is our most convenient and easy to operate height adjust system. Synchronized all wheel adjustment.

CPSC Mandatory Blade Safety Standards: Since July 1, 1982, all manufacturers produce only mowers that comply with the Consumer Products Safety Commission mandatory requirements. Basically, the blade must stop (either with the engine continuing to run or stopping) within 3 seconds of the user releasing a handle-mounted control. There are three acceptable alternatives:

1. **Extended Rope Start, or Manual Restart (ERS):** When user releases handle control, blade and engine stop within 3 seconds. To start or restart, operator must engage handle control and pull starter rope, which is mounted on the handle.

2. **Battery/Electric Start (EAS):** Self recharging battery start eliminates manual type starting. Simply engage handle controls to start. Engine and blade stop when handle control is released. An alternator recharges the battery as mower is being used. Starter normally requires recharging only first time each season and prior to winter storage. 110 volt recharger included.

3. **Blade Brake Clutch (BBC):** When user releases handle control, blade stops within 3 seconds but engine continues to run. Requires starting the engine only once.

Rear Drive: A multi-speed drive system. Changing drive speeds is made easy by fingertip controls located on the upper handle. The operator maintains full traction/drive control without letting go of the handle.

Internal Rear Belt to Gear/Chain Drive: An enclosed system to power-propel the mower where power is transferred to both drive wheels from the engine through a belt to a geared transmission.

Rear Baggers: Rear bag catchers allow grass cutting closer to fences, buildings, trees and shrubs from either side of the mower, and can get into narrower areas.

Cog Drive: Plastic pinion that engages cog tire. Convertible Mower: Converts from rear bagging to

Convertible Mower: Converts from rear bagging to side discharge style mower. Gives the versatility of two mowers in one. If a mulching kit were available the mower would be a three-in-one

Deluxe Throttle Control: Allows operator to set engine speed without slipping out of position. Has ratchet-setting throttle adjustment. Handle-Mounted Clutch: Makes engagement of self-propelled mechanism easier. Engages self-propelled mechanism with one hand.

Handle-Mounted Clutch: Makes engagement of self-propelled mechanism easier. Engages self-propelled mechanism with one hand.

Internal Drive: Results in better straight line cutting with less fatigue. Propels chain internally to rear axle.

Knurl Drive: Provides positive control and good traction on wet grass while mowing uphill without clogging. Steel pinion engages a smooth tire.

Steel Ball Bearings Wheels: Provides easier maneuverability while operating unit. Steel bushing is comprised of steel bearings. Promotes longer life.

Self Starter: Mechanical device that runs of the recoil spring. No battery or electric cords required.

Tractor Terms

Auto Drive: Foot pedal drive control that drives like a car.

Austempered Steel Blade: A special heat treated process which increases life, durability, and keeps steel from being brittle.

Clutch/Brake Pedal: Eliminates the need for two pedals. Synchronized clutch and brake on one pedal.

In-Line Shift: Makes shifting gears easier. Straight-line pattern.

Transmatic: Combination of transaxle and multi-speed drive means effortless, no clutch on the go shifting with virtually an infinite number of speeds available between high and low.

Hydrostatic Transmission: System which utilizes a self lubricating oil propulsion design mounted on a hydrostatic drive transmission. Hydrostatic drives hold preset constant speeds even on hills and uneven terrain. Eliminates clutching for safer operation. Changing forward/reverse direction without clutching.

4-Wheel Steering (All Wheel Steer): Provides maximum maneuverability by allowing all four wheels to turn while steering. Permits near hairpin turns, the tractor neatly pivots to allow close trimming around small areas. Allows more stability on slopes, less turf defacement in tight turns.

Pivoting Front Axle: Center mounted pivot on rear engine riders, lawn tractors and garden tractors which provides better stability. The pivoting action acts like an automotive shock absorber which allow the wheels to adjust to uneven ground contour while maintaining an even uniform cut. Helps prevent scalping.

Ammeter: A gauge that shows whether the battery is being charged (+) or discharged (–).

Belt PTO: PTO stands for power take-off. A belt is the driving force to whatever is to be driven.

Electric Assist: Allows the customer to raise or lower attachments by just a flip or a switch.

Floating Deck: Instead of being bolted rigidly to the tractor, the deck is mounted so that it will move up and down with the contour of the lawn to prevent scalping and insure an even cut.

Hour Meter: Records the running time of the tractor. Also called Hobbs meter. Should be used in conjunction with the maintenance schedule in the owner's manual.

Height Adjustment with Memory: Use the height control lever to set the cutting height you want. Set the memory latch. Then, each time you go out to cut grass and lower the mower, it will be the same height until you change it.

Manual Hitch: A hitch system that is operated manually. Takes more effort to raise attachments than the electric assist system.

Single Lever Lift System: Tractor comes with lift lever that will raise and lower certain attachments, including the mower deck and snow/dozer blade, reducing operator effort.

PTO (Power Take Off): A means of powering an attachment using a belt, with the engine as a power source.

Gear and Pinion Steering: A very smooth type steering where a gear on the end of the steering shaft meets another gear called a sector gear.

Reduces steering effort compared with conventional steering.

Shift-on-the-Go: A shifting system where you do not have to push in the clutch every time you change speeds. You simply move the shift lever from one gear to another.

Sleeve Hitch: Used on garden tractors. After mounting hitch to tractor, attachments mount to the hitch with a single pin.

3 Point Hitch: Used on garden tractors. After mounting hitch, attachments mount to hitch at three points.

Rear Engine Rider: Used strictly for mowing and some lawn care. You can use light weight pull attachments. Will not accept snow removal equipment. Offers excellent frontal visibility.

Lawn Tractor: Used for lawn care, but will also take snow removal equipment such as a snow blade and snow thrower.

Garden Tractor: Will accept ground engaging equipment, such as a plow. It will also take the large pull-type attachments. Usually contains heavy duty transmissions for stamina in towing and other chores.

Transaxle: A gear box that combines both the transmission and differential in the same housing. Driven by a belt rather than a chain (as used on a transmission). Usually has larger gears for heavier jobs.

Transmission: A gear box with a separate drive chain that drives a differential attached to rear wheels.

Turf-Saver Tires: Won't skid in the grass, thus improving traction and helping to avoid scuff marks on the lawn.

Turning Radius: When making a hard left turn with mower engaged, the amount of uncut grass when the circle is complete. Take 1/2 the diameter, and that would be the turning radius.

Universal Hitch Pin: 1/2 inch diameter for use with all tractors and riders.

MISC. TERMS

Bolo Tines: Provides better tine wear in hard or rocky soil. Steel tines are heat treated.

Flails: "Free floating" steel hammer knives, sharpened on all edges to cut and pulverize. Chipper Shredder component.

MPH: Miles per hour speed of air flowing out of the unit.

CFM: Cubic feet of air per minute flowing out of the blower chute. This is a better measure of blower effectiveness. High MPH can be generated through a straw, but CFM, or volume of air per minute, is more indicative of the units ability to move objects.

Curb-Hopping: Adjustable front wheels and curb-hopping rear wheel allow the edger to be used with stability close to raised curbs.

Edging Depth: The edging depth in inches, that the blade can trench.

Chain Drive: Provides more direct power to the tines. Stamped chain case that is permanently lubricated.

Depth Bar: Allows full control during operation. Adjusts tilling depth.

Dual Direction Tines: Tines move in either forward or reverse direction for optimum tilling in either hard or soft soil.

Gear Drive: Provides extra weight for deep tilling and lower center of gravity for greater stability. Gear case constructed of rugged cast iron of galvanized steel.

Reverse Direction Tines: Provides greater stability when tilling and eliminates skipping. Tines rotate in the opposite direction from the drive wheels. Also known as counter rotating tines.

Differential Gear: A certain arrangement of gears connecting two axles in the same line and dividing force between them, allowing one axle to turn faster than the other. It is used in the rear axles of automobiles to permit a difference in axle speeds while turning curves.

Bushel: One bushel equals 8 gallons.

Gasoline: We recommend regular unleaded gas. Do not leave gas in tank over the winter unless fuel stabilizer is used; start each season with fresh gas (don't use fuel that is over 4 months old). DO NOT USE Gasohol that is more than 10% alcohol or methanol.

Oil: Use SAE 30 or 10W-30 weight detergent oil (not 10W-40). It is very important to change oil after the first two hours of use in a new mower and then after every 25 hours of operation. Always consult owners guide for fill capacity.

Fuel Stabilizer: For all 2 and 4 cycle engines this product allows for easy starts when put in full tank of gas and stored during long periods of time.

Cutting Height: It's not recommended to cut off more than the upper third of the grass at one cutting. In most grasses the cutting height should be lower in the cool spring, higher in the hot weather in heavily shaded areas.

Mowing Direction: During cutting, mow in a counter-clockwise manner to prevent clippings from being recycled into the cutting path. The cutting blade isn't forced to pick up wet clippings as it mows the uncut grass. If mower wheels compact the soil, leaving tracks, alternate the mowing pattern each time you mow.

Collecting Clippings: Heavy clippings left on the lawn can smother the grass, preventing needed air and moisture from reaching the roots. Clippings harbor lawn insects, disease, fungi, and are unsightly. Mulching mowers do not cause this problem since the grass clippings are cut finely and return nutrients to the soil.

Spark Plug: Should be changed every spring for easier starting and engine efficiency.

Air Filter: Replace the air filter every year, more often if needed.This helps the engine start easier, run better, last longer and uses less gas.

Mower Blade: Worn blades should be replaced, not only for the new cutting edge but also for the lift designed into it that restores air turbulence. A worn blade won't cut well or bag, causes engine vibration, and loss of power.

ENGINE TERMS

Automatic Choke: Method of automatically priming the carburetor for surer starts.

Automotive Type Air Filter (Paper Type): A larger filter area (90 sq. inches) than conventional oil bath sponge filters. Will last longer and does a better job keeping engine running cleaner, enhancing engine life. Requires little or no maintenance. For dusty/sandy areas, a washable/reusable precleaner is available to extend the life of the paper air filter.

Cast Iron Cylinder Liner: Provides better oil retention and superior wear. Dissipates heat more efficiently for longer engine life and lower maintenance cost.

Mechanical Governor: Internal flyball weights on the crankshaft automatically call for more fuel to increase the engine's output when more power is needed, for example, cutting thick, tall grass, helping to keep blade speed constant.

Mechanical Compression Release: A mechanical device which acts on the camshaft to greatly reduce internal air pressure during the starting cycle, significantly reducing the effort required to start the engine. It closes automatically during engine operation to retain full power.

Operator Zone: The area behind the handle where the user must be positioned when he operates the mower.

Overhead Valve Engine: Valves are located in the head of the engine rather than in the cylinder block itself. This enables the engine to develop more torque (power) than a conventional "L-head" engine with similar cubic inch displacement. It allows the engine to run cooler and more efficiently for longer life.

Polymer Gas Tank: Prevents rust and condensation in the fuel system.

Positive Lubrication: Oil is pumped to vital engine parts when the engine is started. Lubricates the engine with each turn of the crankshaft.

Horsepower: Horsepower is a technical term referring to the rate at which an engine can perform work. The larger the horsepower rating of an engine, the greater is its ability to handle the job.

Solid State Ignition: Solid state circuitry eliminates points and condensers in conventional ignition systems, which become less efficient and wear out. A self-contained module eliminates moving parts. In addition, it creates a hotter spark for more dependable starting. Eliminates costly electrical tune-ups. Simply change the spark plug.

Top Breather: Prevents oil overflow and maintains lubrication of vital parts when mowing alongside steep grades in either direction at any safe angle.
Muffler Deflector: Protects operator. Deflects the exhaust away from the operator.

Extended Oil Fill: Makes it easier to add oil to engine. Long tube extends to top of engine. Many extended oil fills feature automotive style dipstick.

Industrial Commercial Engine: Features rugged cast iron sleeves, heavy-duty dual element air cleaner, and heavy duty valves for extended engine life.

Pre-Cleaner For Air Filter: Is recommended in dusty, sandy conditions, and extends the life of the air filter, more economical.

Spark Plug Boot: Keeps spark plug clean and protects the engine from shorting out when contact is made with shrubs or trees. Rubber boot completely covers spark plug.

Counter-Balanced Engine: Counterweights are added to the crankshaft of the engine so that when the piston moves in one direction, the counterweight moves in the opposite direction, reducing vibration for smoother running.

Displacement: As with automobiles, the only way to accurately compare their various engines is to compare their various displacements. The displacement of an engine is measured in cubic centimeters of cubic engines. Displacement is the measure of the difference in cubic area of the cylinder when the piston has been fired all the way down and when it is all the way up. It is the area in which the explosion is made. Thus, the greater this area, the more power is generated.

TERMS FOR HYDROSTATIC TRANSMISSIONS

Axial Piston: Type of design for hydraulic motors and pumps in which the pistons are arranged parallel with the spindle (input or output shaft).

Bantam Duty: A descriptive term relating to the product capacity (meaning: light duty).

Bypass Valve: A valve whose primary function is to open a path for the fluid to bypass the motor or pump. Also referred to occasionally as the freewheel valve or dump valve.

Case Drain Line (Return Line): A line returning fluid from the component housing to the reservoir.

Cavitation: A concentrated gaseous condition within the fluid causing the rapid implosion of a gaseous bubble.
Center Section: A device that acts as the valve body and manifold of the transmission.

Charge Pump: A device that supplies replenishing fluid to the fluid power system (closed loop).

Charge Pressure: The pressure at which replenishing fluid is forced into a fluid power system.

Charge Relief Valve: A pressure control valve whose primary function is to limit pressure in the charge circuit.

Check Valve: A valve whose primary function is to restrict flow in one direction.

Closed Loop: A sealed and uninterrupted circulating path for fluid flow from the pump to the motor and back.

Decay Rate: The ratio of pressure decay over time.

End Cap: See “Center Section”

Entrained Air: A mechanical mixture of air bubbles having a tendency to separate from the liquid phase.

Gerotor: A positive displacement pump frequently used as a charge pump.

Hydraulic Motor: A device that converts hydraulic fluid power into mechanical force and motion by transfer of flow under pressure.

Hydraulic Pump: A device that converts mechanical forces and motion into hydraulic fluid power by producing flow.

Hydrostatic Transaxle: A multi-component assembly including a gear case and a hydrostatic transmission.

Hydrostatic Pump: See “Hydraulic Pump”

Hydrostatic Transmission: The combination of a hydraulic pump and motor in one housing to form a device for the control and transference of power.

Inlet Line: A supply line to the pump.

Integrated Hydrostatic Transaxle (IHT): The combination of a hydrostatic transmission and gear case in one housing to form a complete transaxle.

Manifold: A conductor that provides multiple connection ports.

Neutral: Typically described as a condition in which fluid flow and system pressure is below that which is required to turn the output shaft of the motor.

Pressure Decay: A falling pressure.

Priming: The filling of the charge circuit and closed loop of the fluid power system during start up, frequently achieved by pressurizing the fluid in the inlet line.

Purging: The act of replacing air with fluid in a fluid power system by forcing fluid into all of the components and allowing the air a path of escape.

Rated Flow: The maximum flow that the power supply system is capable of maintaining in at a specific operating pressure.

Scoring: Scratches in the direction of motion of mechanical parts caused by abrasive contaminants.

Swash Plate: A mechanical device used to control the displacement of the pump pistons in a fluid power system.

System Charge Check Valve: A valve controlling the replenishing flow of fluid from a charge circuit to the closed loop in a fluid power system.

System Pressure: The pressure that overcomes the total resistance in a system, including all losses.

Valve: A device that controls fluid flow direction, pressure, or flow rate.

Variable Displacement Pump: A pump in which the displacement per cycle can be varied.

Volumetric Displacement: The volume for one revolution.

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