

SECTION 7 ATTACHMENTS

7-1 GENERAL.

7-1.1 This section describes the installation of the following attachments which are available for the Cub Cadet Series 2000 Tractors.

1. 38 and 42 inch Mulching Attachments — Models 190-314 and 190-315.
2. 42" Snow Blade — Model 190-302.
3. 40" Snow Thrower — Model 190-303.
4. 28" Rotary Tiller — Model 190-304.

7-2 38 and 42 INCH MULCHING ATTACHMENTS (Models 190-314 and 190-315).

7-2.1 **General.** The 190-314 Mulching Kit is designed for usage on the 38" mower deck of Tractor Models 2130 and 2135. The 190-315 is designed for the 42" deck of the Tractor Models 2140 and 2145.

7-2.1.1 Before beginning installation of the mulching attachment, refer to Figure 7-1 to confirm that all parts are included.

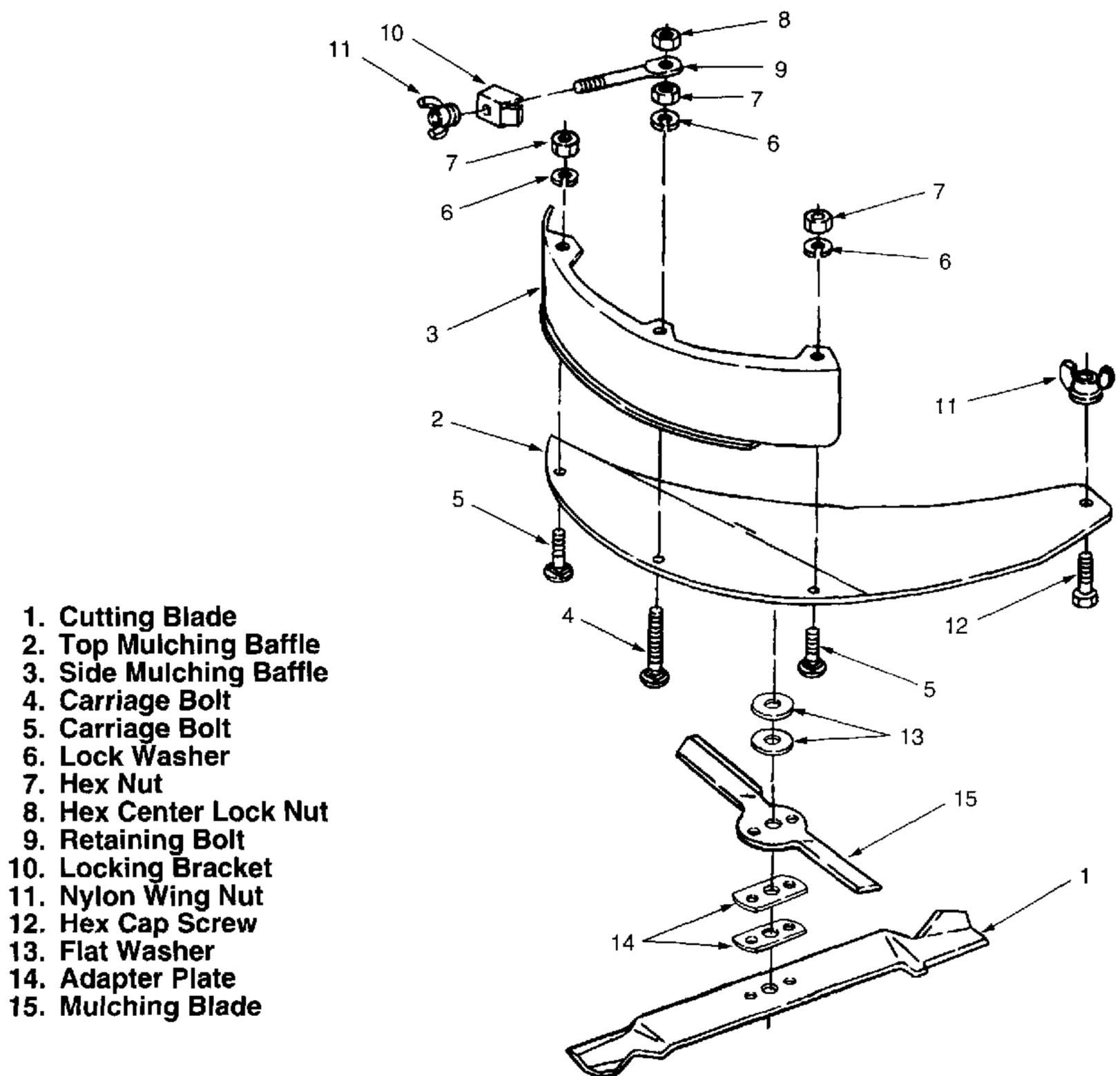


Figure 7-1. Mulching Kit Components.

7-2.2 Deck Removal From Tractor.



WARNING

Stop the tractor engine, disengage the PTO, place all controls in neutral and engage the brake lock before performing deck removal.



WARNING

When handling the mower deck, be careful not to cut yourself on the sharp blades.



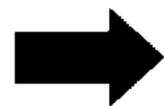
CAUTION

Place the tractor on a firm and level surface before beginning deck removal.



WARNING

Do not remove the deck immediately after running the unit. Both the grille and PTO clutch are hot. Let the unit cool before touching.



NOTE

Refer to the Deck Owner's Manual to remove the deck.

7-2.3 Remove Cutting Blades From Deck.



WARNING

When handling the blades, be careful not to cut yourself.

1. A block of wood may be placed between the housing and cutting edge of the blade to assist in removal of the hex nut securing the blade. Refer to Figure 7-2.
2. Remove the hex nuts, flat washers, cutting blades and spacers from the deck. See Figure 3. Put the blades and spacers aside. Save the hex nuts and flat washers to mount the mulching blade assembly.

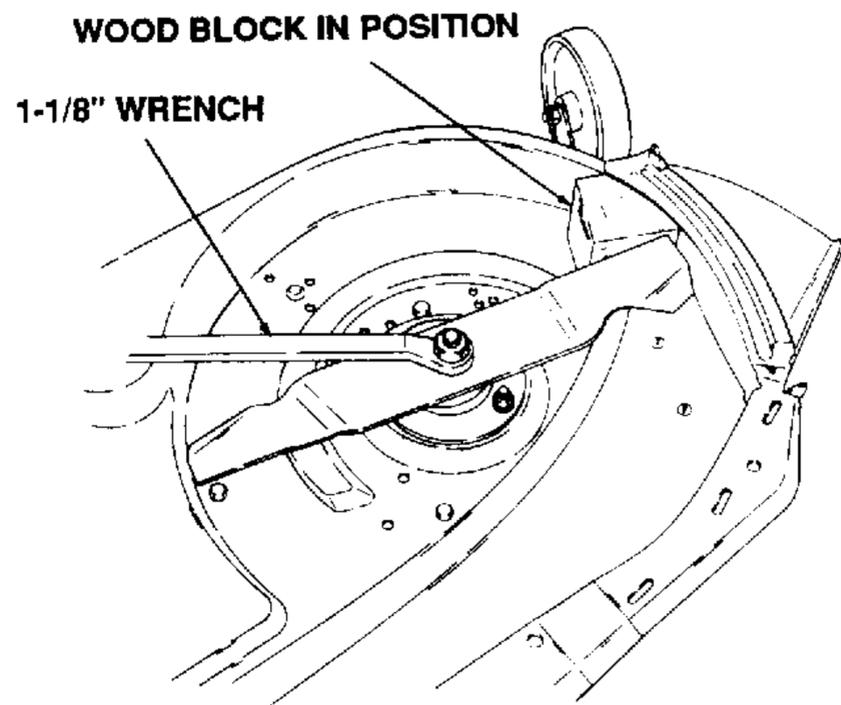


Figure 7-2. Loosen Hex Nut Securing Cutting Blade.

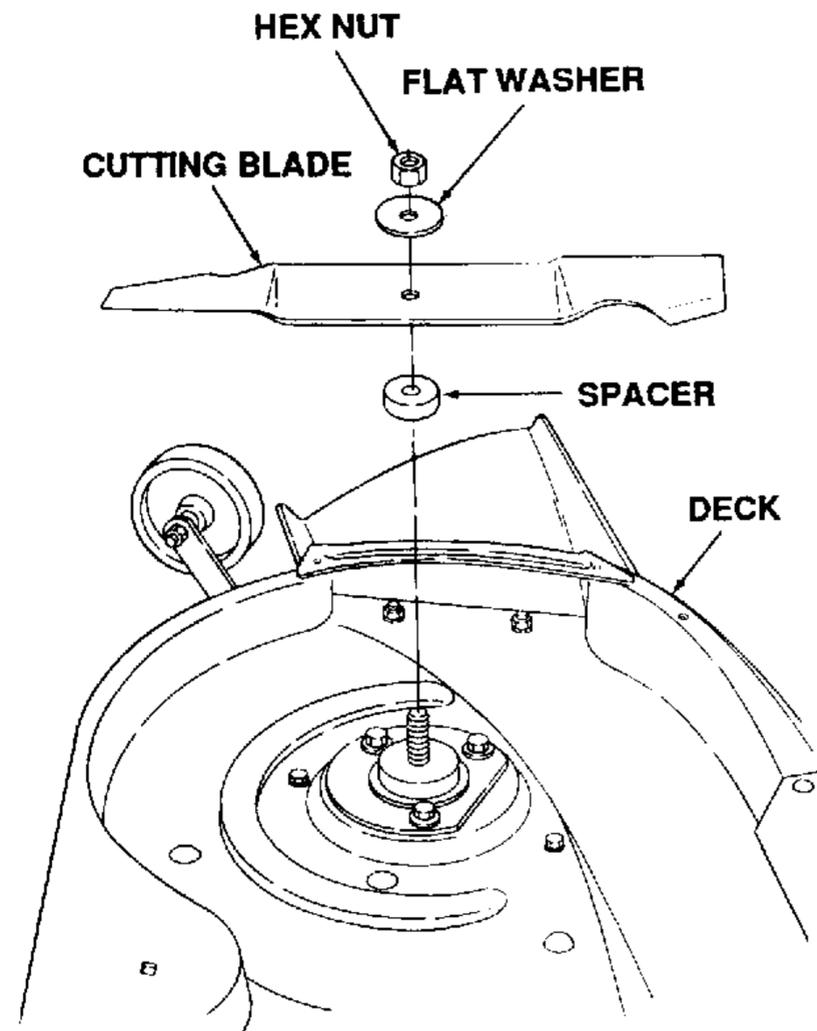
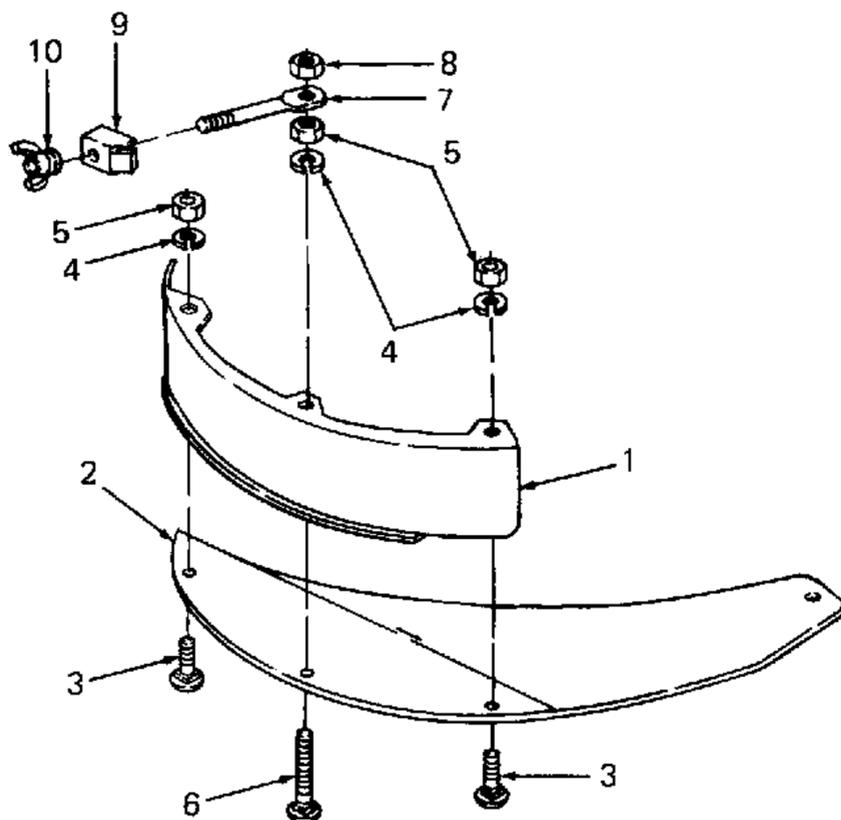


Figure 7-3. Removal Of Cutting Blade.

7-2.4 Assemble Mulching Baffle.

1. Assemble the top baffle (2, Fig. 7-4) to the side baffle (1) with the carriage bolts (3 and 6), lock washers (4) and hex nuts (5).
2. Assemble the retaining bolt (7, Fig. 7-4) to the carriage bolt (6) with the hex center lock nut (8). Tighten the center lock nut to eliminate side play, while still allowing the retaining bolt to pivot.



- | | |
|------------------|------------------------|
| 1. Side Baffle | 6. Carriage Bolt |
| 2. Top Baffle | 7. Retaining Bolt |
| 3. Carriage Bolt | 8. Hex Center Lock Nut |
| 4. Lock Washer | 9. Locking Bracket |
| 5. Hex Nut | 10. Nylon Wing Nut |

Figure 7-4. Mulching Baffle Assembly.

7-2.5 Mounting Mulching Baffle Assembly On Deck.

NOTE

The cutting blades should be removed from the deck when installing the baffle assembly.

NOTE

When performing the initial installation of the mulching baffle assembly, metal 1/4-20 hex nuts

may be used in place of the nylon wing nuts during the baffle seating procedure. This will prevent possible stripping of the wing nuts.

CAUTION

When installing the baffle assembly, the short flange at the bottom of the side baffle (1, Fig. 7-4) must be wedged in above the finger guard welded across the bottom of the deck discharge opening. Failure to do so could allow the baffle to fall and be struck by the spinning blades.

1. With the retaining bolt (7, Fig. 7-4) and locking bracket (9) projecting through the discharge opening, position the baffle assembly in the underside of the deck, and press the side baffle into the discharge opening as far as possible.
2. Hook the locking bracket (9) onto the edge of the deck (see Fig. 7-5) and tighten the wing nut (or hex nut, if used) until snug.

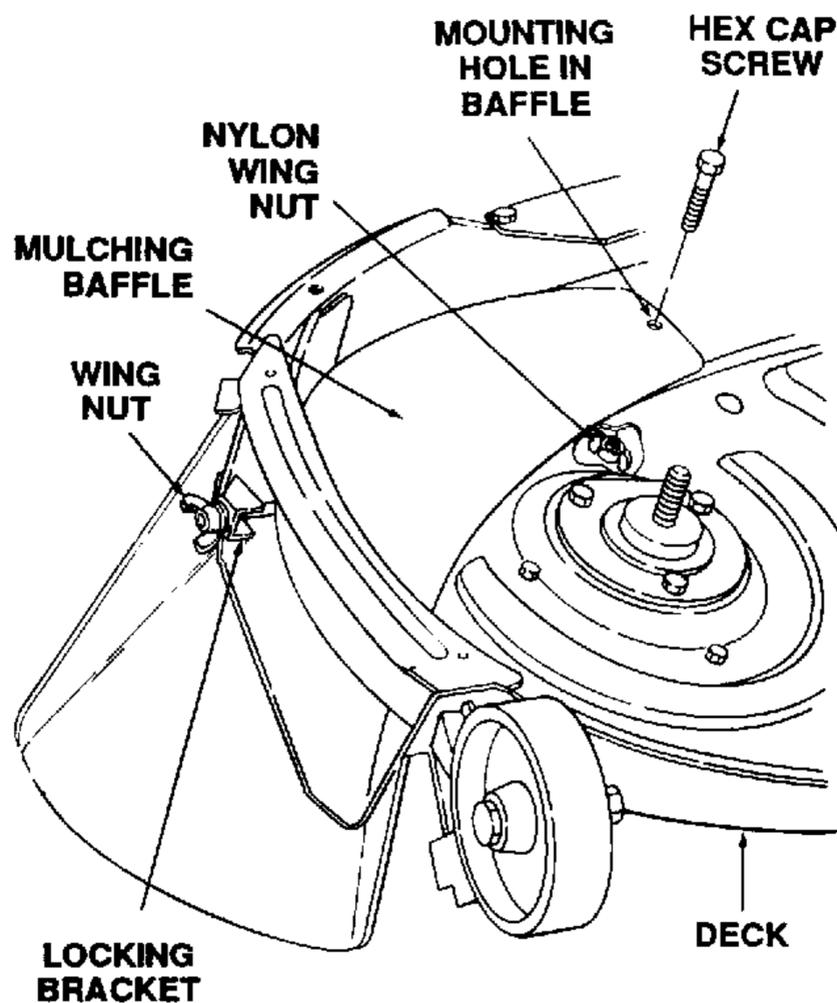


Figure 7-5. Positioning Mulching Baffle.

- Using a rubber mallet to tap the side baffle through the discharge opening (see Fig. 7-6), alternately tap the rear area of the baffle and re-tighten the wing nut (or hex nut, if used). Repeat until the baffle is completely seated, and the inner mounting hole of the baffle aligns with the hole in the deck.

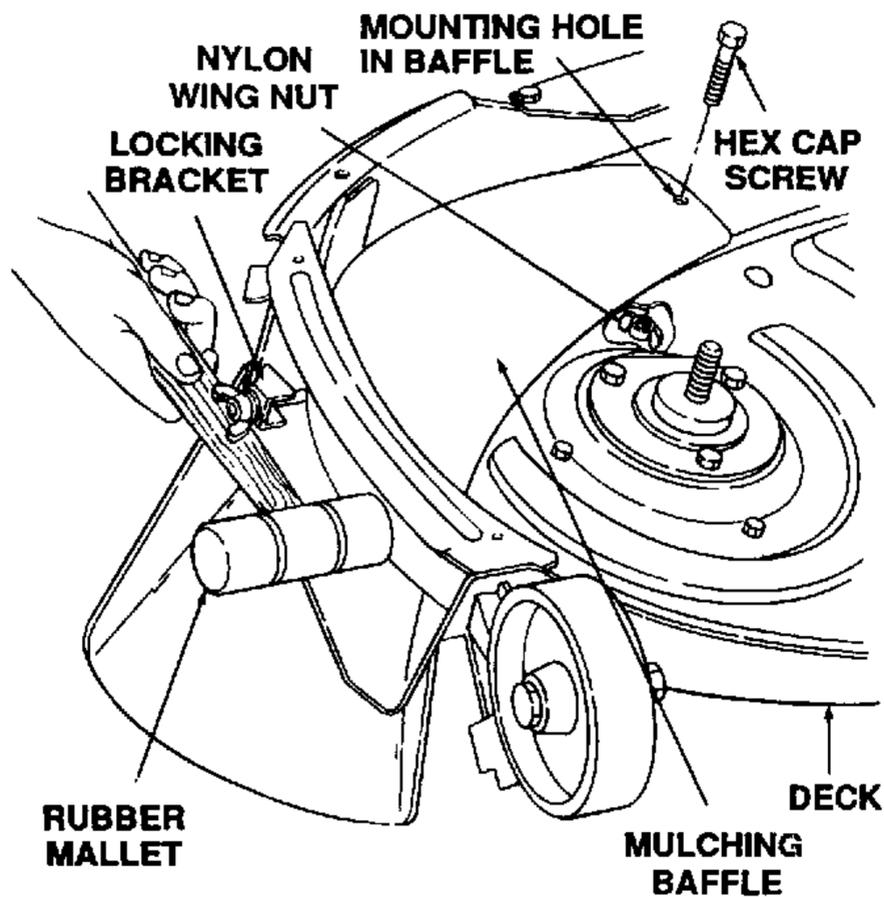


Figure 7-6. Seating the Baffle Assembly.

- Insert the hex cap screw (see Fig. 7-6) from the underside of the deck and secure with the second wing nut.

7-2.6 Installing Mulching Blades On Deck.



WARNING

Use care when handling the blades. The sharpened edges could cause cuts to the skin.



NOTE

With the blades removed, the spindle shafts can slip partially out of the spindle housings when the

deck is inverted to re-install the blades. If necessary, hold the shafts from the top of the deck when installing the blades and hardware.

- Assemble the blades and hardware on the spindle shafts as follows (see Fig. 7-7):

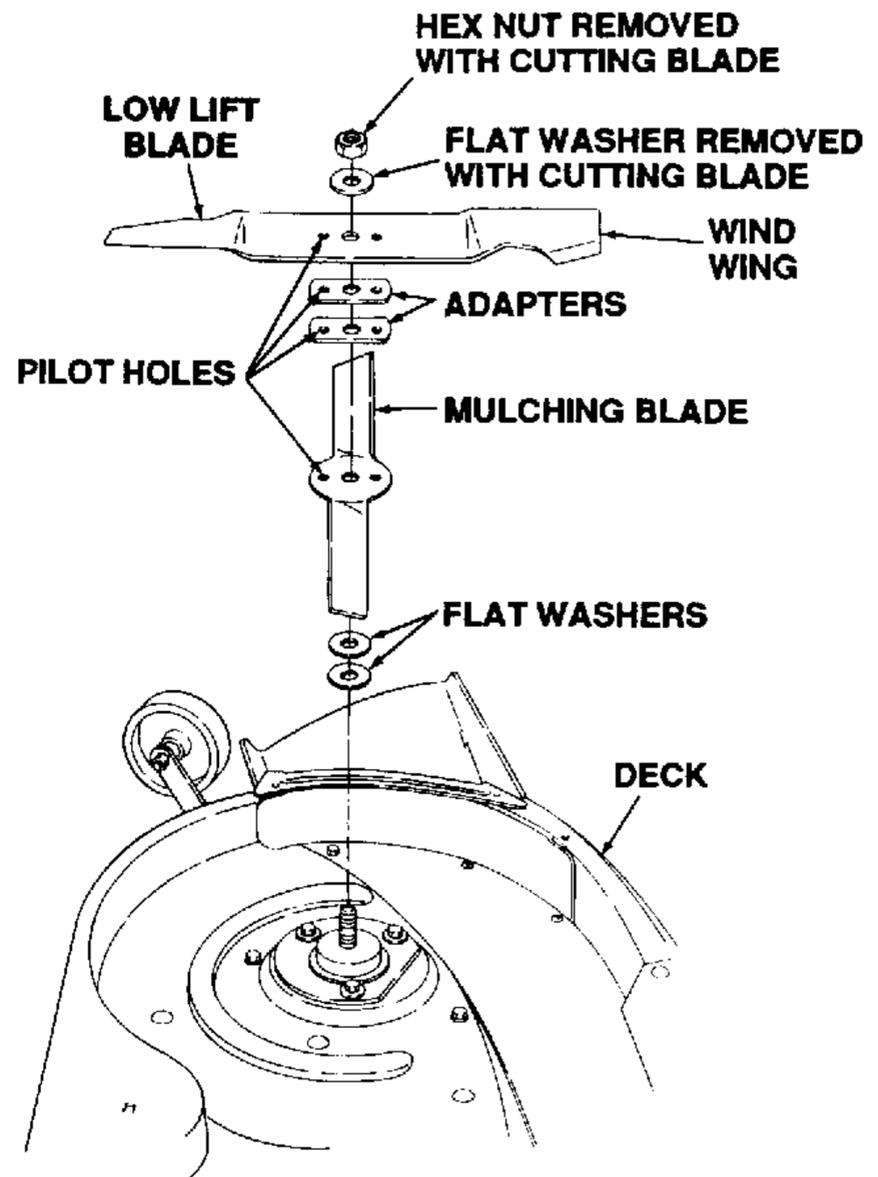


Figure 7-7. Installing Blades and Hardware.

- Slide the two flat washers (13, Fig. 7-1) onto each spindle shaft.
- Install the mulching blades (15, Fig. 7-1), making certain the sharpened edge is forward in relation to the blade rotation (sharpened edges pitch upward toward underside of deck).
- Install the two plate adapters (14, Fig. 7-1).
- Making sure the lift wings point toward the deck housing, install the cutting blades (1) and loosely secure with the flat washers and hex nuts removed earlier.



WARNING

NEVER USE THE PILOT HOLES OF THE MULCHING BLADES, ADAPTERS, AND CUTTING BLADES TO BOLT THEM TOGETHER. THEY ARE ONLY TO BE USED TO ALIGN THE BLADES AT 90° TO EACH OTHER, AND TO HOLD IN THAT POSITION AS THE HEX NUTS ARE TIGHTENED.

- Align the pilot holes of the blades and adapters (the blades should be at 90° to each other) and insert a phillips screwdriver, drift punch, or similar type instrument through the pilot holes (see Fig. 7-8).

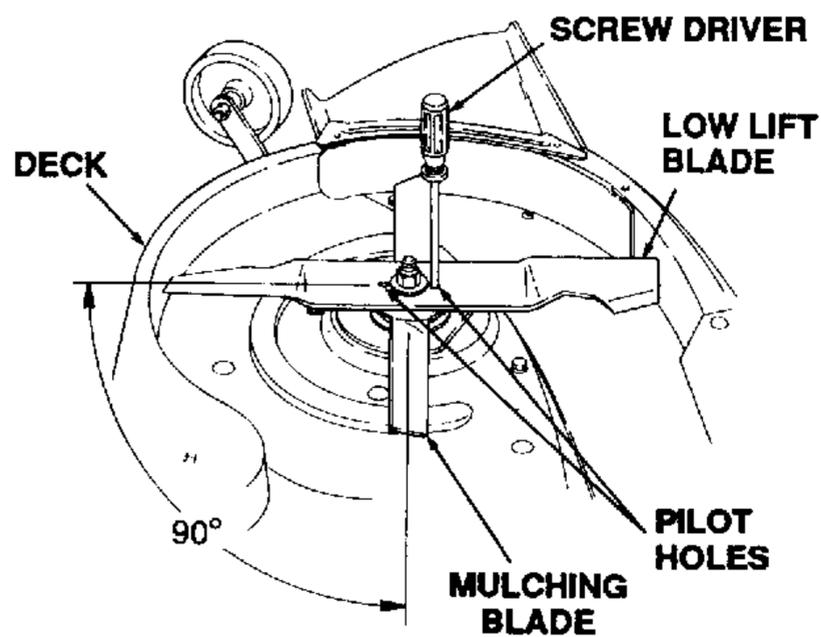
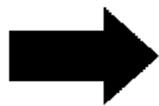


Figure 7-8. Using Pilot Holes To Align Blades.



NOTE

To prevent the spindle shaft from turning when tightening the hex nut, use a 1-1/4 inch wrench to hold the hex shaped hub of the V-pulley.

- Tighten the hex nuts to 90 to 110 ft-lbs.
- Install the mower deck on the tractor per the instructions in the Owner's Manual.
- If the blades strike a foreign object, remove the deck and inspect all blades for damage. If necessary, reposition the blades as described above.

7-3 42 INCH SPRING TRIP BLADE (Model 190-302).

- General.** The 42 inch Spring Trip Blade, Model 190-302, is designed for use on all of the Cub Cadet Series 2000 Tractors. The blade may be used for moving snow, terracing, or for light to medium grading.



WARNING

Whenever the blade assembly is installed on the front of the tractor, the Model 190-307 rear weight kit, with a minimum of two suitcase weights, must be installed on the rear of the tractor. The weight kit counterbalances the weight of the blade and provides stability to the tractor.

- 7-3.1.1** Before beginning installation of the spring trip blade, refer to Figure 7-9 to confirm that all parts are present, and to familiarize yourself with the components.

7-3.2 Tractor Preparation.



WARNING

Stop the tractor engine, disengage the PTO, place all controls in neutral and engage the brake lock before performing any preparation procedures.



WARNING

The exhaust system and surrounding areas are HOT. To avoid personal injury, allow the tractor to cool before beginning any blade installation procedures.



CAUTION

Place the tractor on a firm and level surface before beginning installation procedures.



NOTE

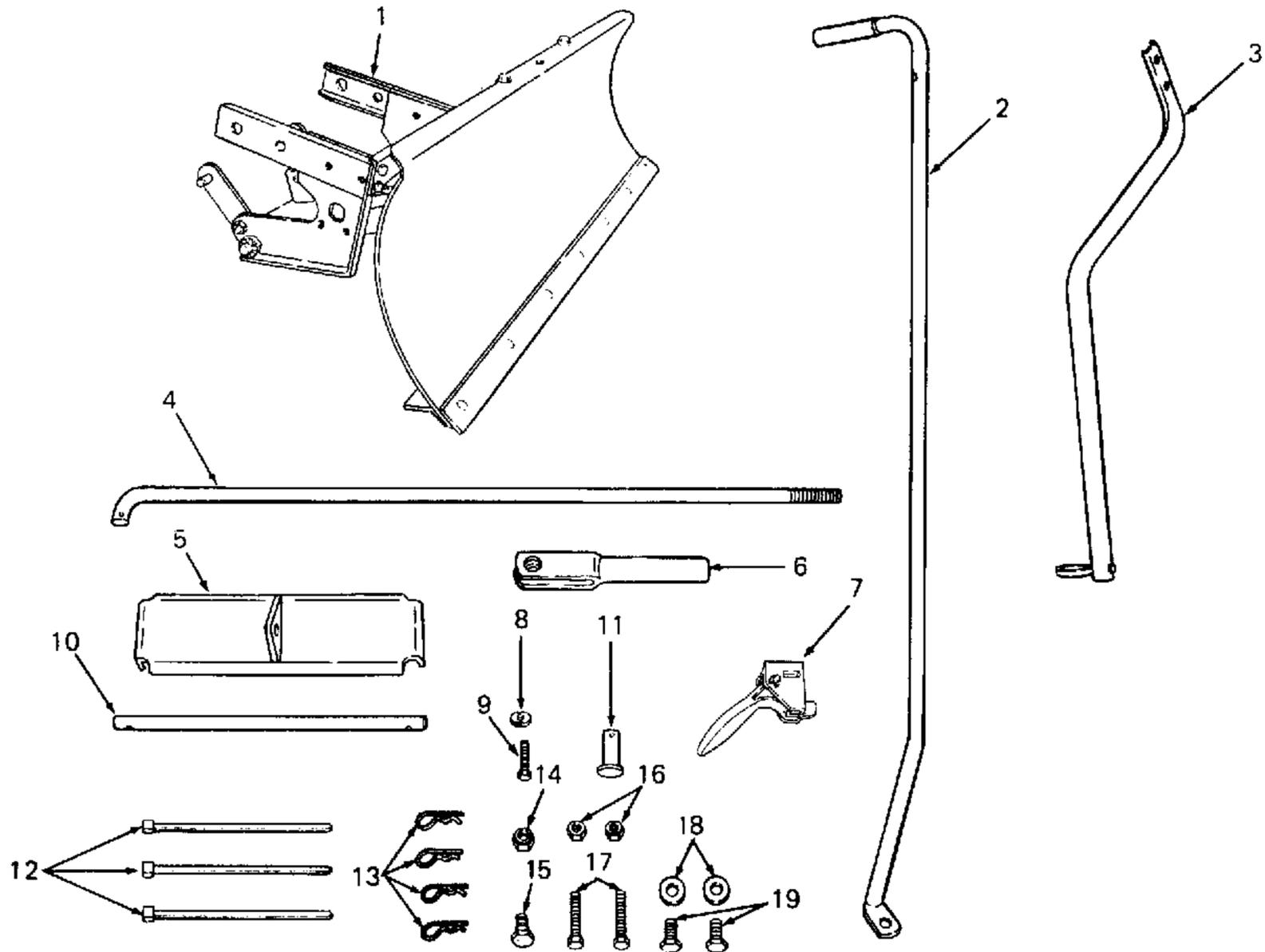
Remove the mower deck and front lift rod assembly, or any other attachment from the tractor.

1. Place the tractor lift handle in the No. 2 height position
2. Remove the front bumper from the frame (see Fig. 7-10) by removing the hex wash. tapp screw from each side. Store the screws and bumper for later reassembly.
3. Install an internal cotter pin (13, Fig. 7-9) in the hole at one end of the rod (10).



CAUTION

When installing the lift bracket (5, Fig. 7-9), the tractor lift links must be positioned **within** the slots at each side of the lift bracket, with the center lift rod tab of the bracket positioned as shown in Figure 7-11.



- | | |
|--|-----------------------------|
| 1. Dozer Blade Assembly
(with pivot cable attached) | 10. Rod |
| 2. Blade Pivot Handle | 11. Clevis Pin |
| 3. Handle Support Tube | 12. Tie Strap |
| 4. Lift Rod | 13. Internal Cotter Pin |
| 5. Lift Bracket | 14. Flanged Lock Nut |
| 6. Adjustment Clevis | 15. Shoulder Screw |
| 7. Trigger Assembly | 16. Hex Flange Top Lock Nut |
| 8. Flat Weld Nut | 17. Hex Screw |
| 9. Truss Screw | 18. Bell Washer |
| | 19. Hex Screw |

Figure 7-9. 42 Inch Spring Trip Blade Components (Model 190-302).

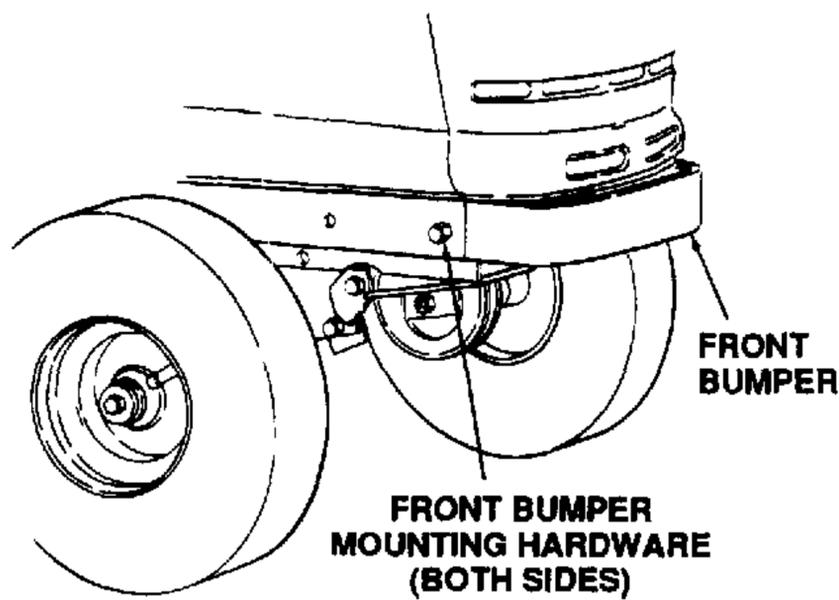


Figure 7-10. Removing Front Bumper.

4. Install the lift bracket (5) onto the tractor lift links, align the holes, and insert the rod (10) through the lift bracket and lift links. Install an internal cotter pin (13) in the other end of the rod (see Fig. 7-11).

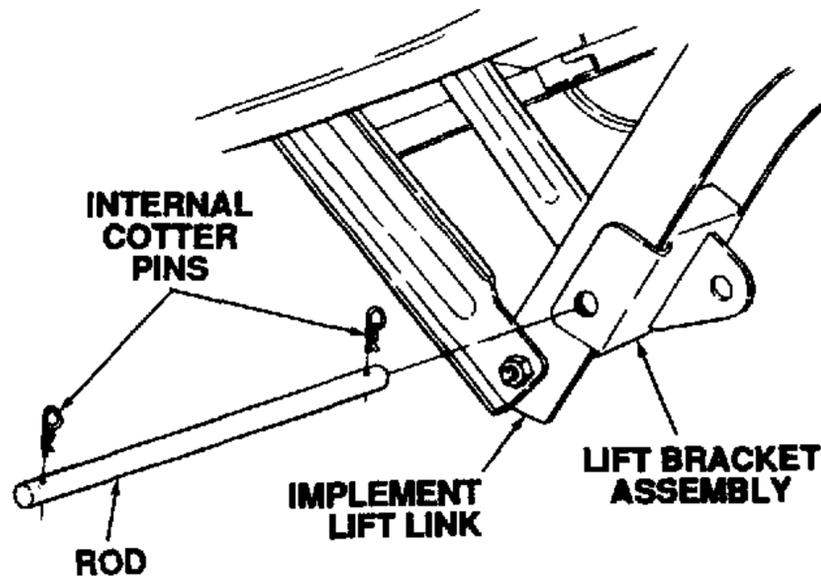


Figure 7-11. Installing the Lift Bracket.

7-3.3 Blade Assembly Preparation.



Although the blade assembly has been partially assembled at the factory, the pivot latch components and the contact surfaces between the pivot plate and A-frame should be checked for proper

lubrication. If necessary, apply a liberal amount of a good grade grease to the contact surfaces and apply spray lube to the latch components.

1. Assemble the handle support tube (3, Fig. 7-9) to the LH blade hitch assembly using the hex screws (17) and hex nuts (16) See Fig. 7-12.

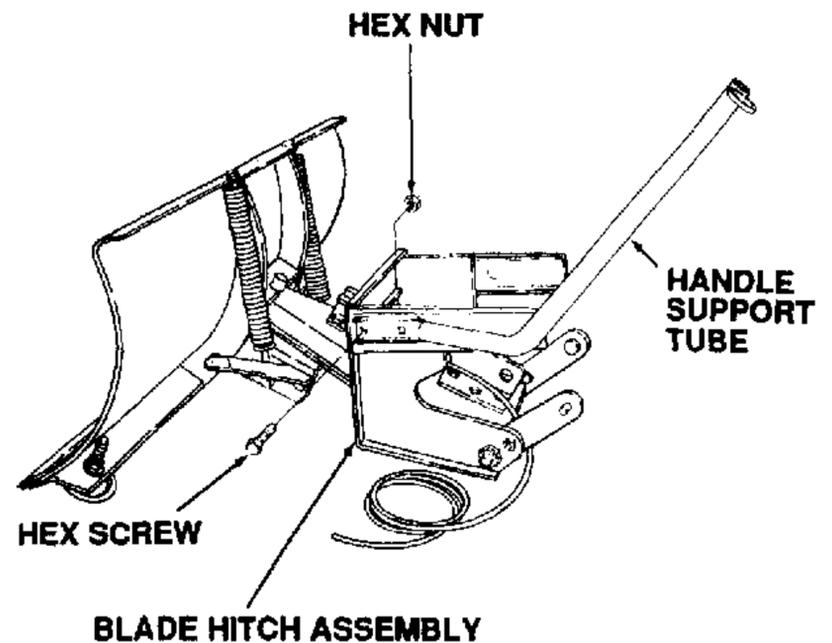


Figure 7-12. Attaching Handle Support Tube.

2. Slide the blade pivot handle (2, Fig. 7-9) through the eyelet of the handle support tube (3). Attach to the blade angle arm of the pivot plate with the shoulder screw (15) and flanged lock nut (14). See Fig. 7-13.

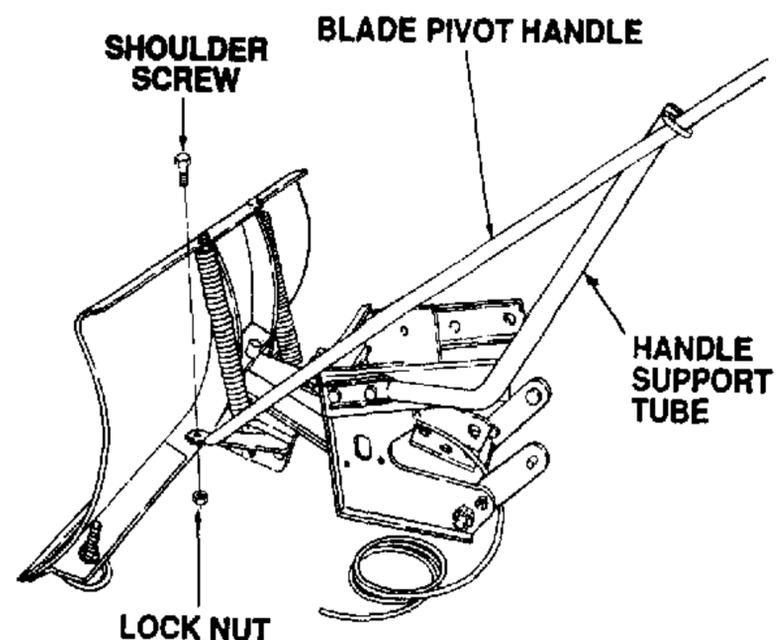


Figure 7-13. Installing Blade Pivot Handle.



CAUTION

When feeding the pivot release cable up through the eyelet of the handle support tube (3), route the cable as shown in Figure 7-14. Make certain the cable has a smooth even bend and is not kinked.

3. Feed the pivot release cable up through the eyelet to the top of the pivot handle (2).

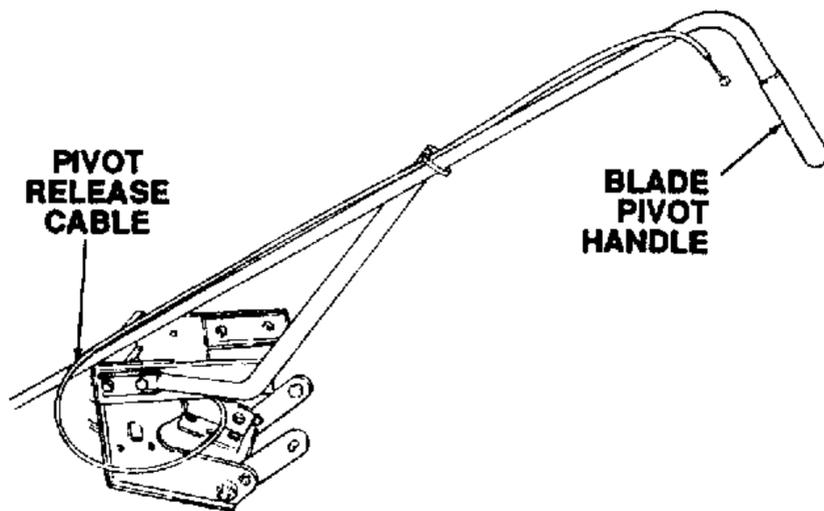


Figure 7-14. Routing Pivot Release Cable.

4. Install the trigger assembly (7, Fig. 7-9) onto the pivot release cable. Refer to Figure 7-15 and proceed as follows:

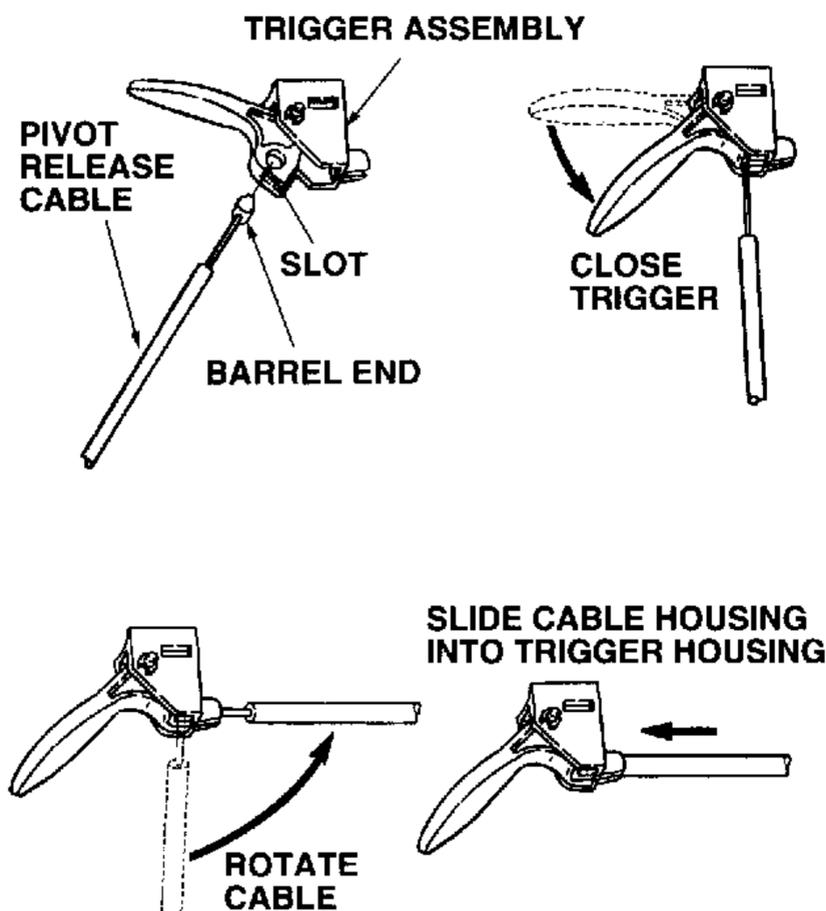


Figure 7-15. Attaching Trigger to Cable.

- a. Place the trigger assembly onto the end of the release cable by sliding the barrel end of the cable into the slot of the trigger.
 - b. Close the trigger as shown.
 - c. Rotate the cable into the slot of the trigger assembly housing.
 - d. Slide the cable housing into the receptacle of the trigger housing.
5. Slide the flat weld nut (8, Fig. 7-9) into the trigger housing. See Figure 7-16.

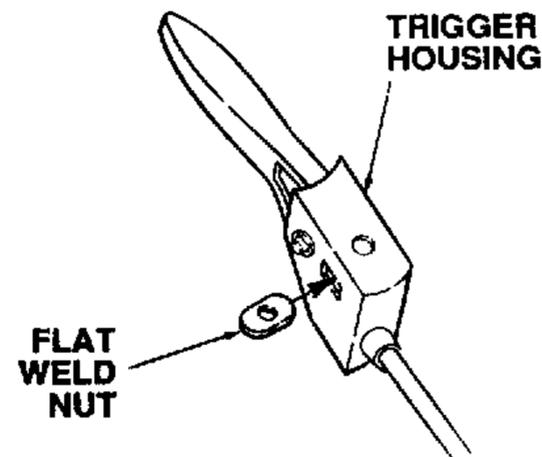


Figure 7-16. Inserting Flat Weld Nut.

6. While holding the flat weld nut (8) in position, place the trigger assembly (7) under the blade pivot handle (2) and fasten with the truss screw (9). See Figure 7-17.

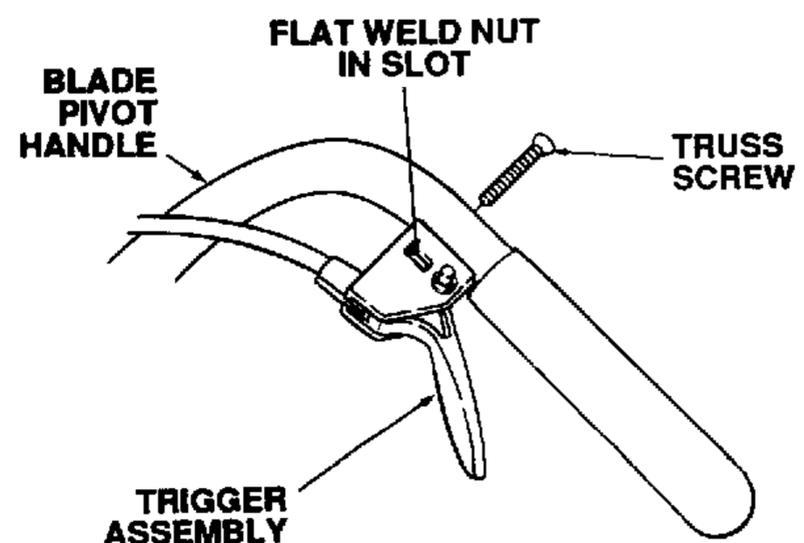


Figure 7-17. Installing Trigger Assembly.

7. Secure the blade release cable to the pivot handle with the three tie straps (12, Fig. 7-9) as shown in Figure 7-18. Cut excess from tie strap ends.

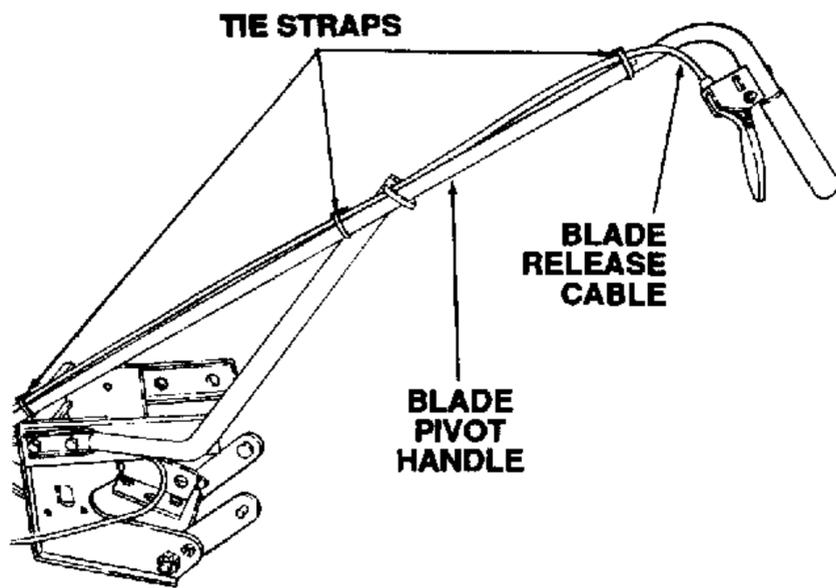


Figure 7-18. Installing Tie Straps.

8. Screw the adjustment clevis (6, Fig. 7-9) onto the threaded end of the lift rod (4).

NOTE

When attaching the lift rod assembly to the blade's A-frame assembly, the rod must be inserted from left to right as shown in Figure 7-19.

9. Install the lift rod (4) in the front lift bracket of the A-frame assembly and secure with an internal cotter pin (13). See Figure 7-19.

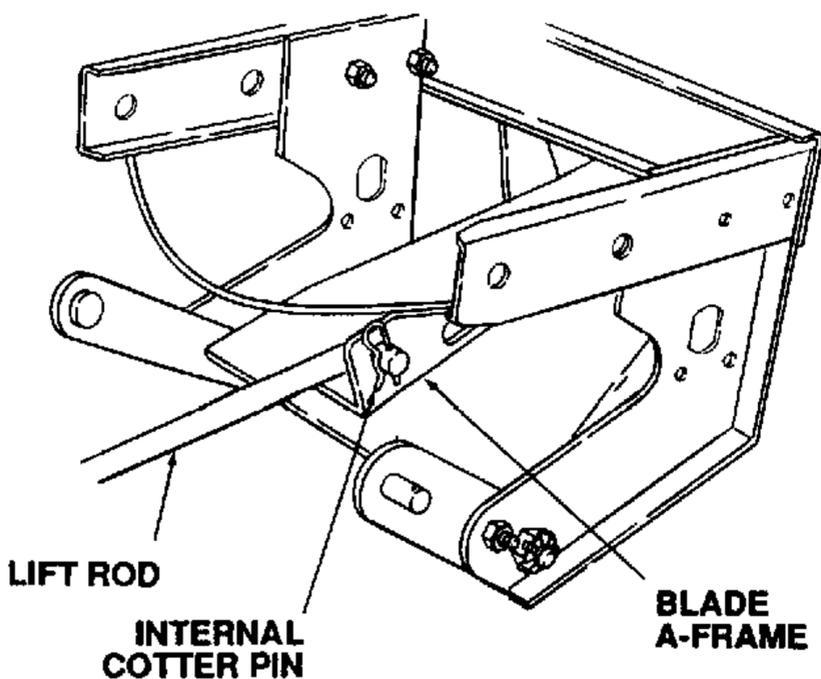


Figure 7-19. Attaching Lift Rod To A-frame.

10. Loosen BUT DO NOT REMOVE the four screws that fasten the front support plate to the LH and RH hitch plates. See Figure 7-20.

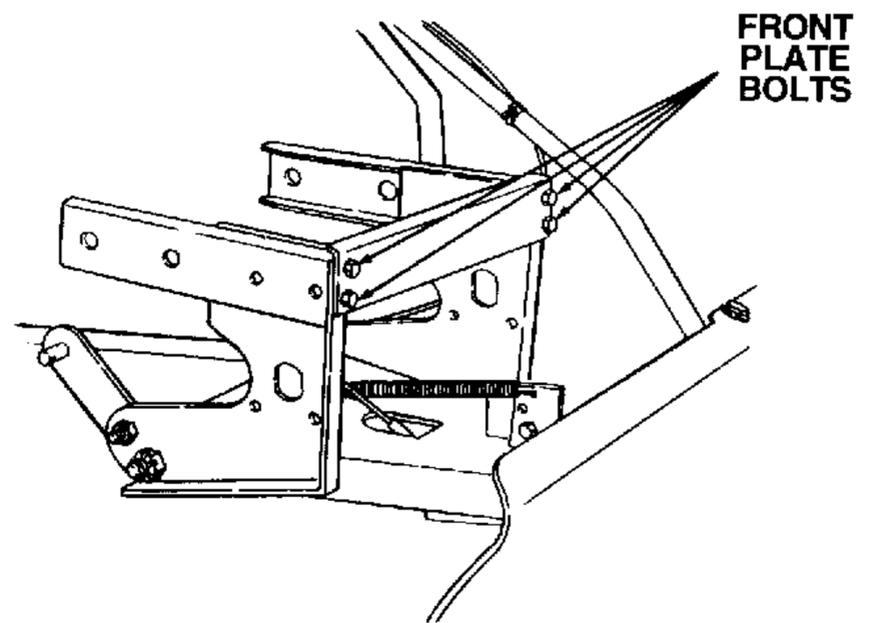


Figure 7-20. Loosen Front Support Plate.

7-3.4 Blade Installation.

1. Position the blade assembly directly in front of the tractor with the LH and RH hitch plate channel brackets aligned with the channels of the tractor frame.

NOTE

To ease insertion into the tractor frame channels, apply a light coating of grease to the channel brackets of the blade hitch assembly.

2. Pushing evenly on both sides as indicated in Figure 7-21, slide the blade hitch assembly into the tractor frame channels.

NOTE

The blade hitch assembly is fully inserted when the pins of the hitch assembly mounting arms are locked in the quick attach latch on each side of the tractor frame. See Figure 7-21.

3. Using one hex screw (19) and bell washer (18) per side, secure the blade hitch assembly to the tractor frame channels as shown in Figure 7-21.
4. Tighten the four screws in the front support plate which were loosened during the blade preparation procedures.

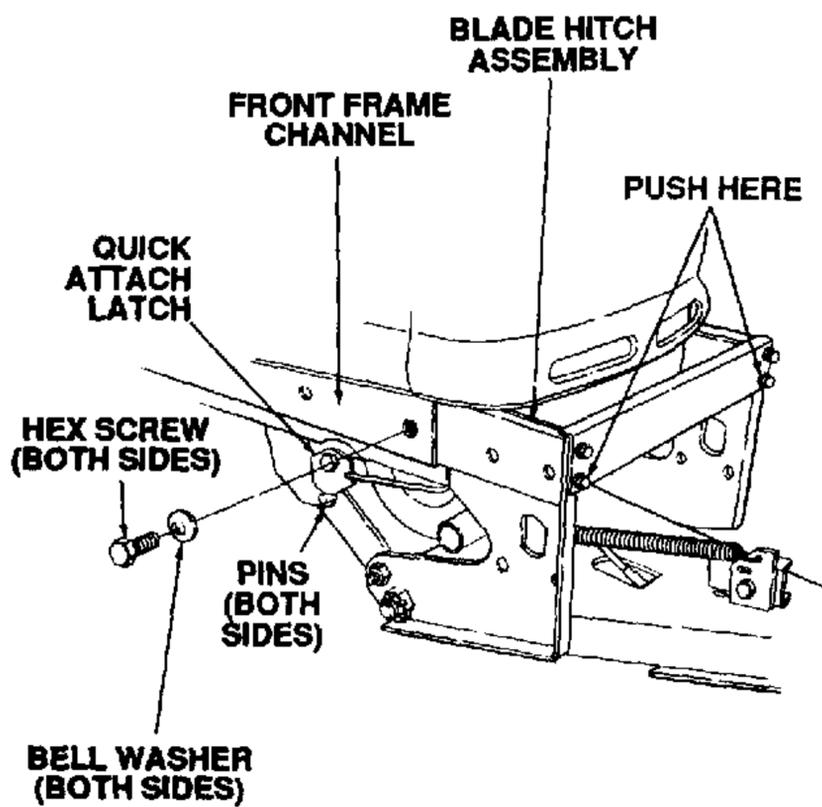


Figure 7-21. Installing Hitch Assembly.

NOTE

Make certain the tractor's implement lift handle is in the No. 2 height position.

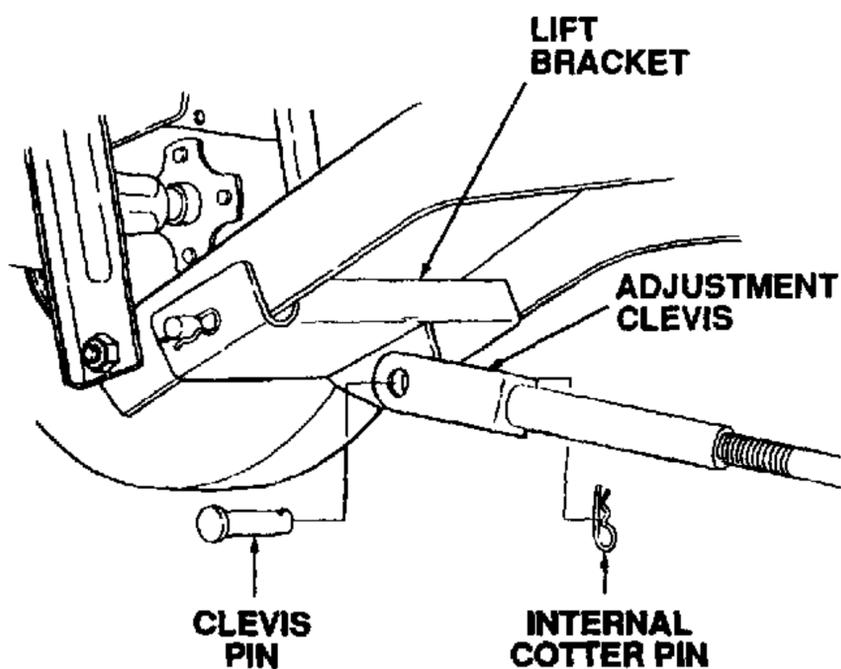


Figure 7-22. Attaching Adjustment Rod to Lift Bracket.

5. Turn the adjustment clevis on the lift rod to align with the hole in the lift bracket tab, then insert the clevis pin (11) and secure with an internal cotter pin (13). See Figure 7-22.

7-3.5 Blade Adjustments.

1. Adjust the skid shoes (refer to Fig. 7-23) to the appropriate position for the job being performed as follows:
 - Loosen the hex nuts on each shoe.
 - Turn the skid shoes to the desired position.
 - Tighten the hex nuts.
2. If the wear bar (see Fig. 7-23) becomes worn, reverse or replace the bar as follows:
 - Remove the seven carriage bolts, lock washers, and hex nuts fastening the wear bar to the blade.
 - Reverse or replace the wear bar and attach with the carriage bolts, lock washers and hex nuts.
3. Maintain the proper trip spring tension (see Fig. 7-23) as follows:
 - There should be a 1/4 inch gap between the top of the spring and the upper lip of the blade.
 - Tighten or loosen the hex cap screws on top of the blade to obtain the proper gap.

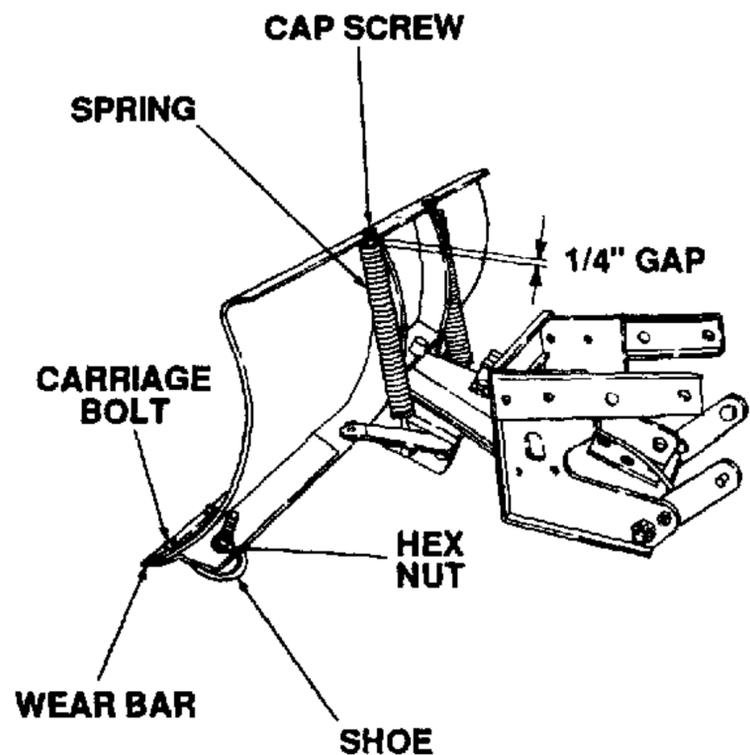


Figure 7-23. Adjusting the Blade.

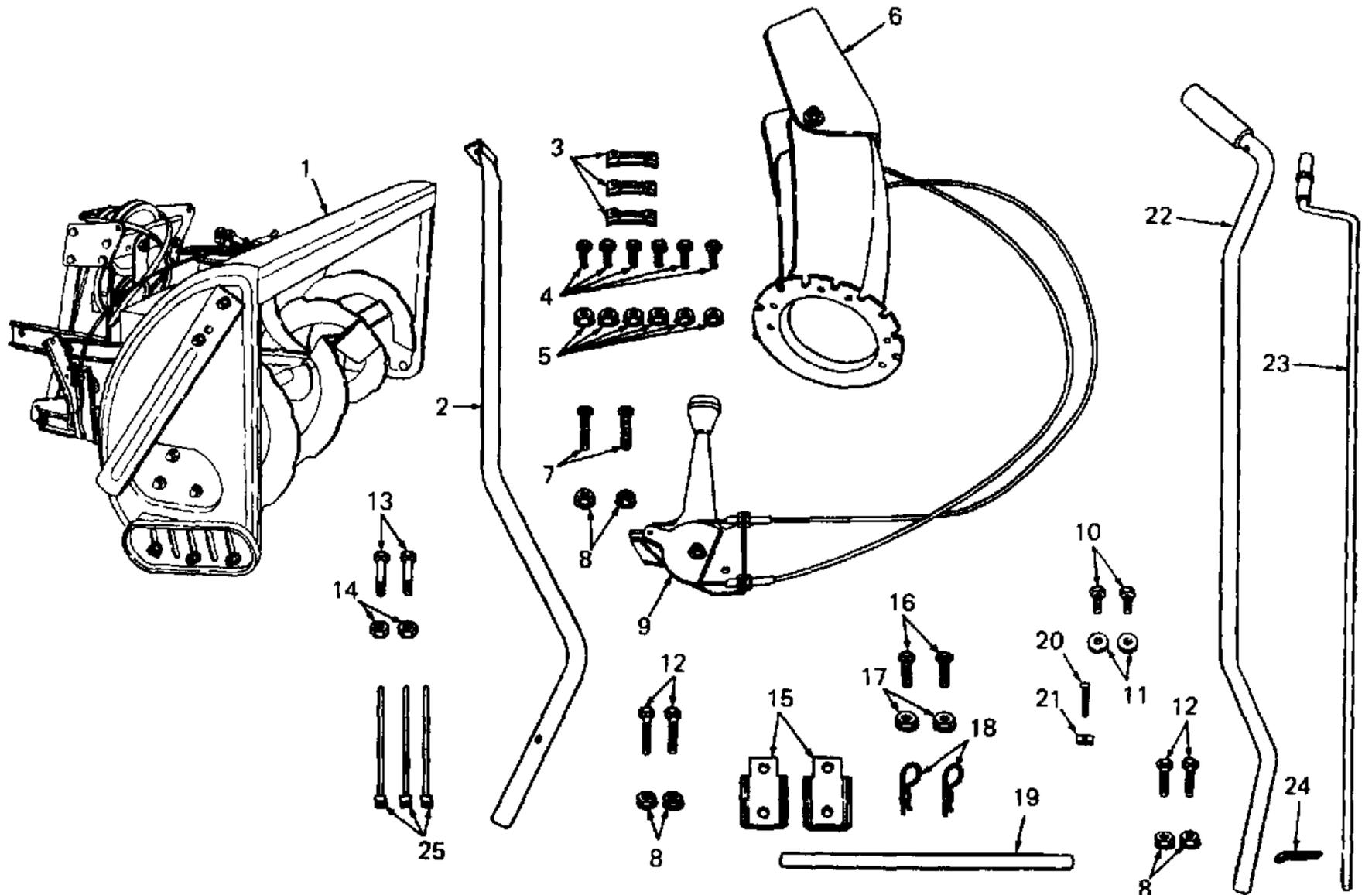
**7-4 40 INCH SNOW THROWER ATTACHMENT
(Model 190-303).**



7-4.1 General. The 40-inch Snow Thrower, Model 190-303, is designed for use on all of the Cub Cadet Series 2000 Tractors. It is intended to be used for snow removal purposes only.

7-4.1.1 Before beginning installation of the snow thrower, refer to Figure 7-24 to confirm that all parts are present, and to familiarize yourself with the components.

Whenever the snow thrower assembly is installed on the front of the tractor, the Model 190-307 rear weight kit, with a minimum of two suitcase weights, must be installed on the rear of the tractor. The weight kit counterbalances the weight of the snow thrower and provides stability to the tractor.



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| <ul style="list-style-type: none"> 1. Snow Thrower Assembly 2. Chute Crank Support Tube 3. Chute Flange Keeper 4. Hex Cap Screw, 1/4-20 X 3/4 Lg 5. Hex Flanged Lock Nut, 1/4-20 6. Discharge Chute 7. Carriage Bolt, 5/16-18 X 1.5 Lg 8. Hex Flange Top Lock Nut, 5/16-18 GR5 9. Chute Tilt Handle Assembly 10. Hex Cap Screw, 7/16-14 X 1.0 Lg 11. Bell Washer 12. Hex Cap Screw, 5/16-18 X 1.5 Lg 13. Shear Bolt (extra) | <ul style="list-style-type: none"> 14. Hex Center Lock Nut, 5/16-18 (Extra) 15. Frame Mounting Bracket 16. Hex Cap Screw, 3/8-16 X 3/4 GR5 17. Hex Flanged Lock Nut, 3/8-16 18. Internal Cotter Pin 19. Rod 20. Truss Screw, 10-24 X 1.36 Lg 21. Flat Weld Nut 22. Snow Thrower Lift Handle 23. Chute Crank Rod 24. Cotter Pin 25. Tie Strap |
|--|--|

Figure 7-24. 40-Inch Snow Thrower Components (Model 190-303).

7-4.2 Tractor Preparation.



WARNING

Stop the tractor engine, disengage the PTO, place all controls in neutral and engage the brake lock before performing any preparation procedures.



WARNING

The exhaust system and surrounding areas are HOT. To avoid personal injury, allow the tractor to cool before beginning any snow thrower installation procedures.



CAUTION

Place the tractor on a firm and level surface before beginning installation procedures.



NOTE

Remove the mower deck and front lift rod assembly, or any other attachment from the tractor.

1. Remove the front bumper from the frame (see Fig. 7-25) by removing the hex wash. tapp screw from each side. Store the screws and bumper for later reassembly.

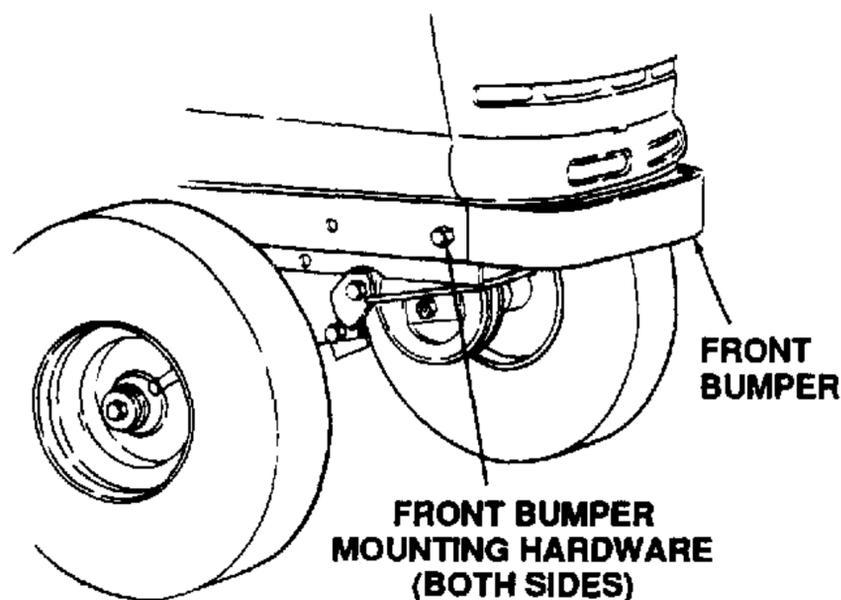


Figure 7-25. Removing Front Bumper.

2. Install the frame mounting bracket (15, Fig. 7-24) onto each side of the tractor frame. Position the brackets (see Fig. 7-26) with the flanges facing outward from the tractor frame. Secure with the hex cap screws (16) and hex flanged lock nuts (17). Insert the cap screws from inside the tractor frame.

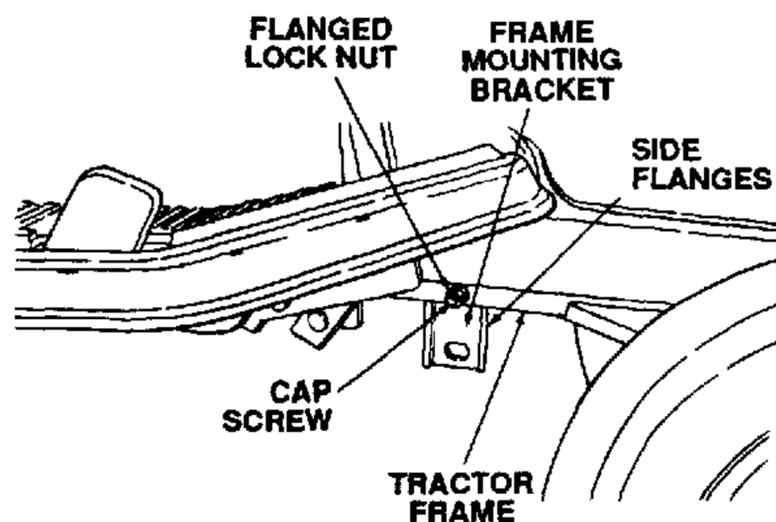


Figure 7-26. Installing Frame Mtg. Brackets

7-4.3 Snow Thrower Assembly Preparation.



WARNING

Before beginning preparation of the snow thrower assembly, select a firm and level surface which is large enough to accommodate the snow thrower attachment and tractor. Engage the tractor brake lock.

1. Grease the top and bottom surfaces of the flange on the chute opening of the blower housing. Use a multi-purpose automotive grease or equivalent.
2. Place the discharge chute (6, Fig. 7-24) over the chute opening of the blower housing, with the opening in the discharge chute (6) facing forward.
3. With their flat surface facing down, place the chute flange keepers (3, Fig. 7-24) beneath the flange of the discharge chute (6) and the flange on the chute opening of the housing (see Fig. 7-27). Insert the hex cap screws (4) up through the flange keepers and discharge chute flange as shown in Figure 7-27, and secure with the hex flanged lock nuts (5). Tighten all lock nuts until snug, then back off (loosen) 1/4 turn.

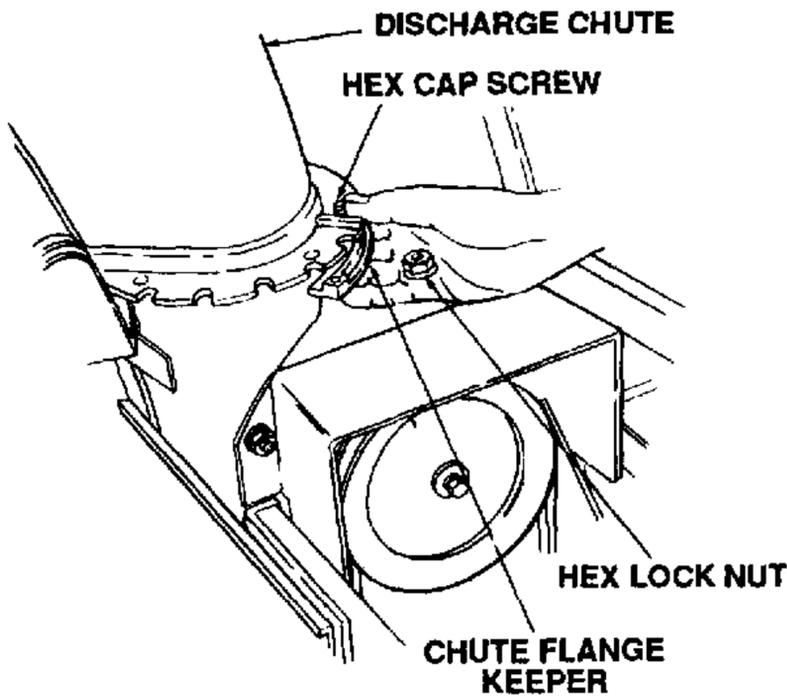


Figure 7-27. Installing Discharge Chute.

4. Install the chute crank support tube (2, Fig. 7-24) onto the frame of the snow thrower assembly (1) using the hex cap screws (12) and hex flange lock nuts (8). Refer to Figure 7-28.

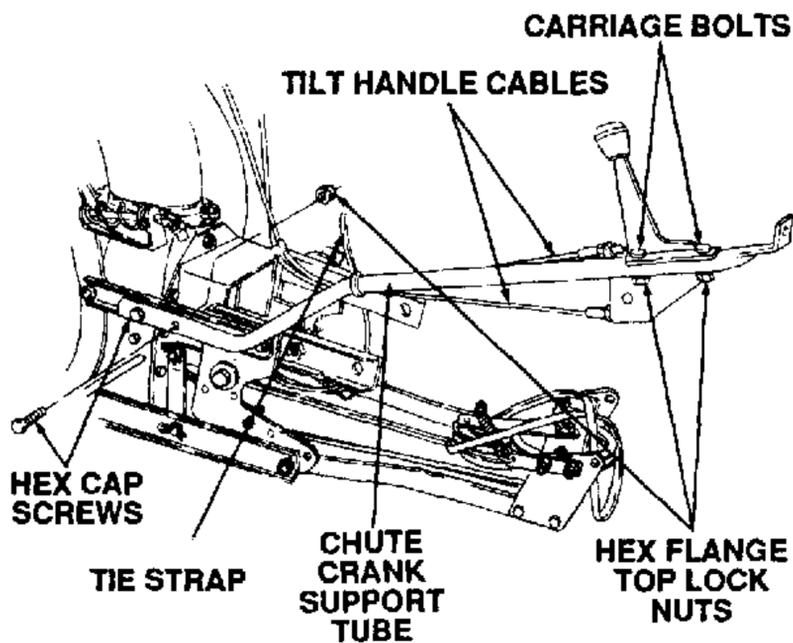


Figure 7-28. Installing Chute Crank Support Tube and Tilt Handle.

5. Install the chute tilt handle assembly (9) on the support tube (2) with the carriage bolts (7) and hex flange top lock nuts (8). See Figure 7-28.
6. Secure the cables of the chute tilt handle assembly (9) to the support tube (2) using one tie strap (25) as shown in Figure 7-28. Cut off excess on end of tie strap.

7. Insert the chute crank rod (23) through the hole in the rearward end of the support tube (2). Refer to Figure 7-29.

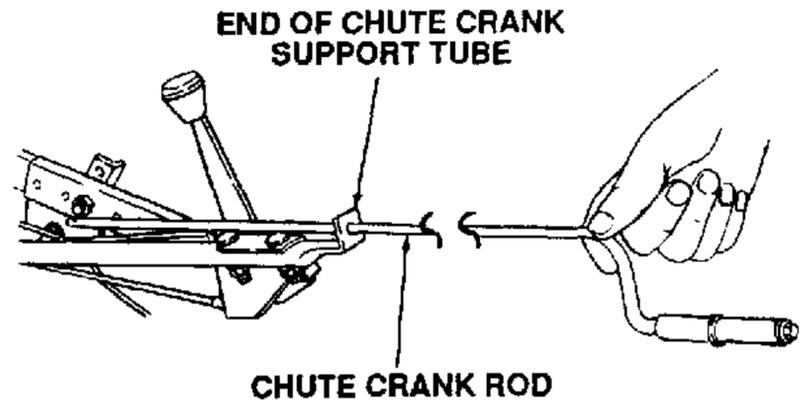


Figure 7-29. Install Chute Crank Rod.

8. Insert the forward end of the chute crank rod (23) into the universal joint, align the holes and secure with the cotter pin (24). See Figure 7-30.

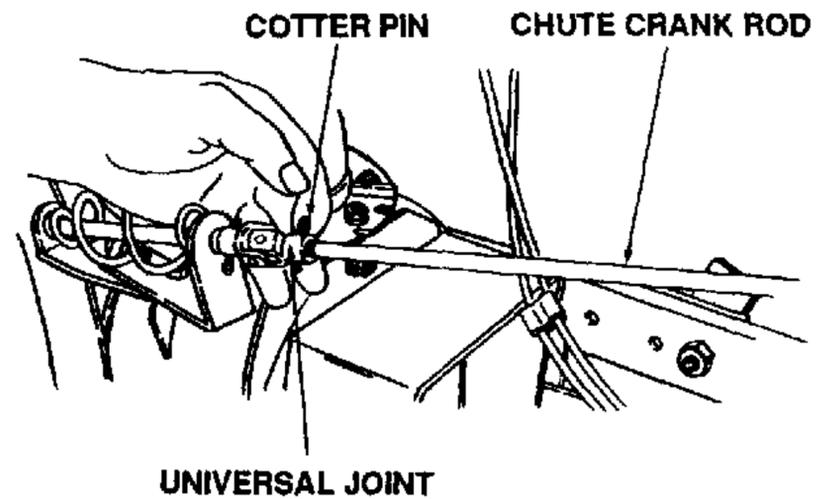


Figure 7-30. Attaching Chute Crank Rod.



Note the latch release cable and trigger assembly are preassembled and attached to the snow thrower assembly at the factory. Uncoil the cable and make certain it is out of the way before attaching the snow thrower lift handle.

9. Attach the snow thrower lift handle (22) to the lift latch bracket, located on the right side of the snow thrower undercarriage, using the two hex cap screws (12) and hex flange top lock nuts (8). See Figure 7-32.

- Slide the flat weld nut (21, Fig. 7-24) into the trigger housing. See Figure 7-31.

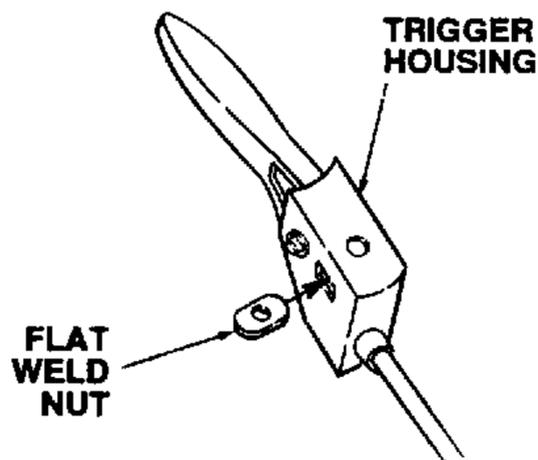


Figure 7-31. Inserting Flat Weld Nut.

- While holding the flat weld nut (21) in position, place the trigger assembly against the lift handle (22) and fasten with the truss screw (20). See Figure 7-33.

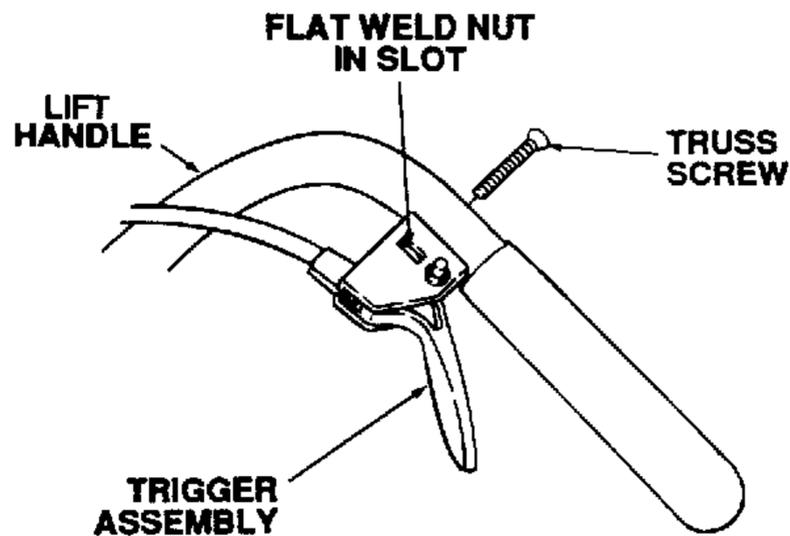


Figure 7-33. Installing Trigger Assembly.

- Secure the latch release cable to the lift handle using two tie straps (25) as shown in Figure 7-32.
- Cut the excess from the tie strap ends.

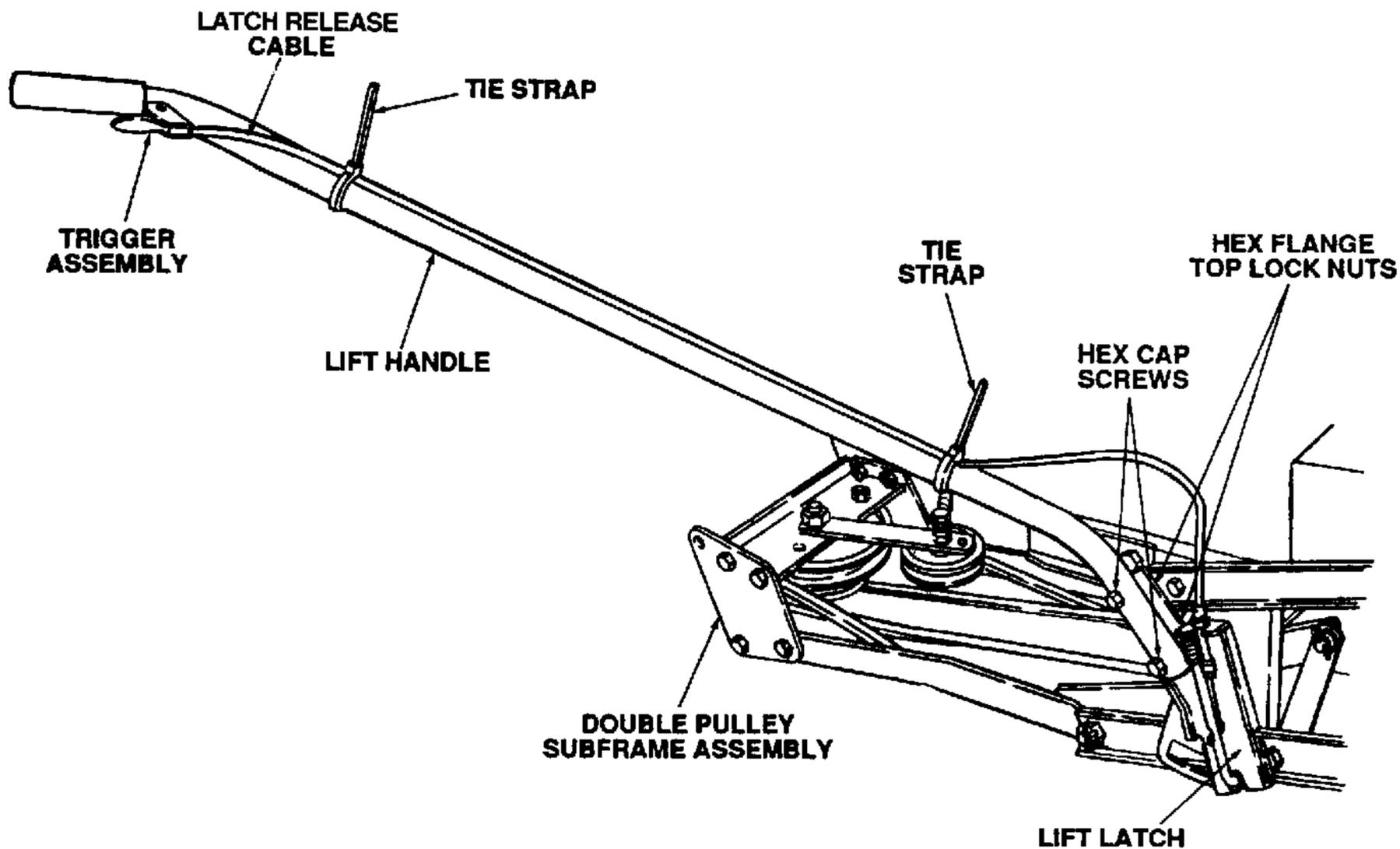


Figure 7-32. Installing Snow Thrower Lift Handle and Latch Release Cable.

7-4.4 Snow Thrower Installation.



WARNING

Before installing the snow thrower assembly onto the tractor, ensure the PTO switch and ignition switch are in the OFF position, the parking brake is locked, and that the exhaust system and surrounding areas have adequately cooled



NOTE

To ease insertion into the tractor frame channels, apply a light coating of grease to the channel brackets of the snow thrower hitch assembly.



NOTE

For easier installation, you can lock the pivot points of the snow thrower hitch assembly by rotating the lift handle (22) downward into its locked position.

1. Position the snow thrower assembly (1) directly in front of the tractor with the double pulley subframe assembly extending rearward between the front wheels of the tractor. See Figure 7-34.

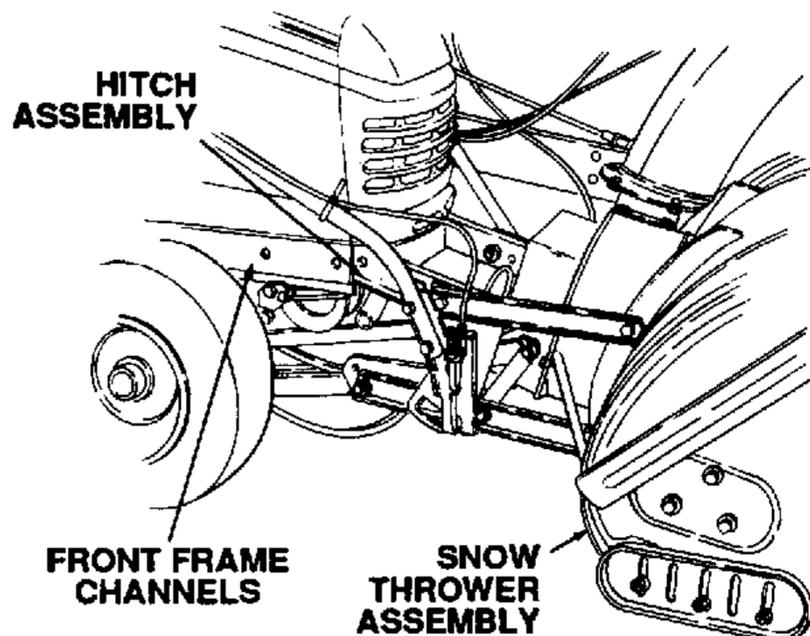


Figure 7-34. Position Snow Thrower.

2. Slide the snow thrower assembly rearward until the channel brackets of the hitch assembly engage the frame channel of the tractor. See Figure 7-34.



NOTE

To horizontally align the hitch assembly channel brackets with the tractor frame channels, tip the snow thrower auger housing slightly forward while moving the snow thrower rearward.

3. Lift the snow thrower assembly upward and move it rearward to slide the hitch channel brackets fully into the frame channels of the tractor. Secure the assembly to both sides of the tractor frame using the hex cap screws (10) and bell washers (11). See Figure 7-35.

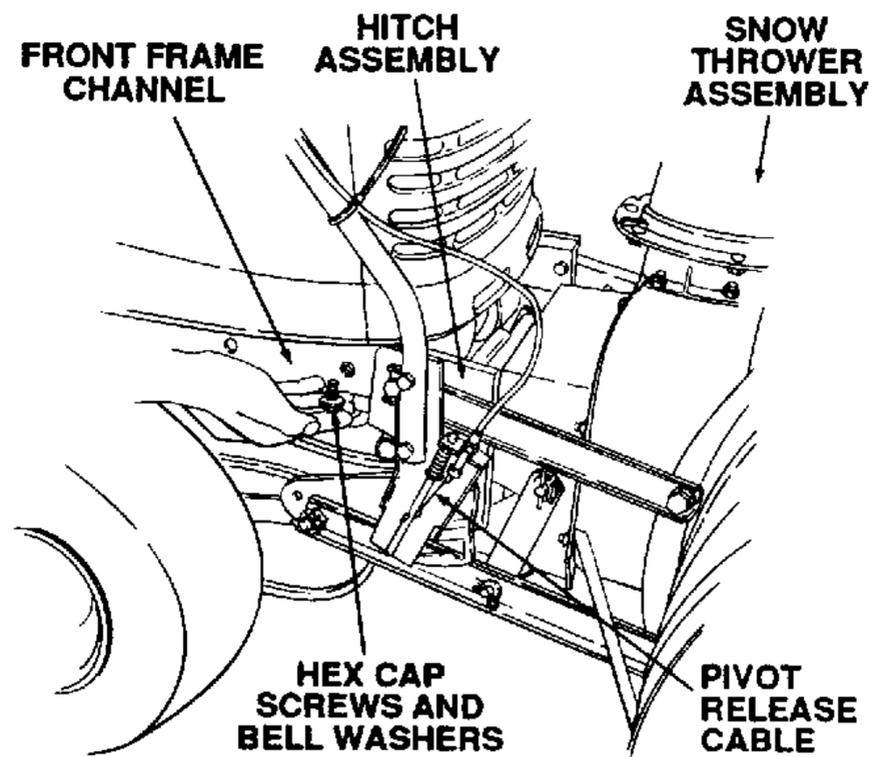


Figure 7-35. Attaching Snow Thrower to Tractor Frame.

4. Install an internal cotter pin (18) into one end of the rod (19) and lift the double pulley subframe assembly up between the frame mounting brackets (15). See Figure 7-36.

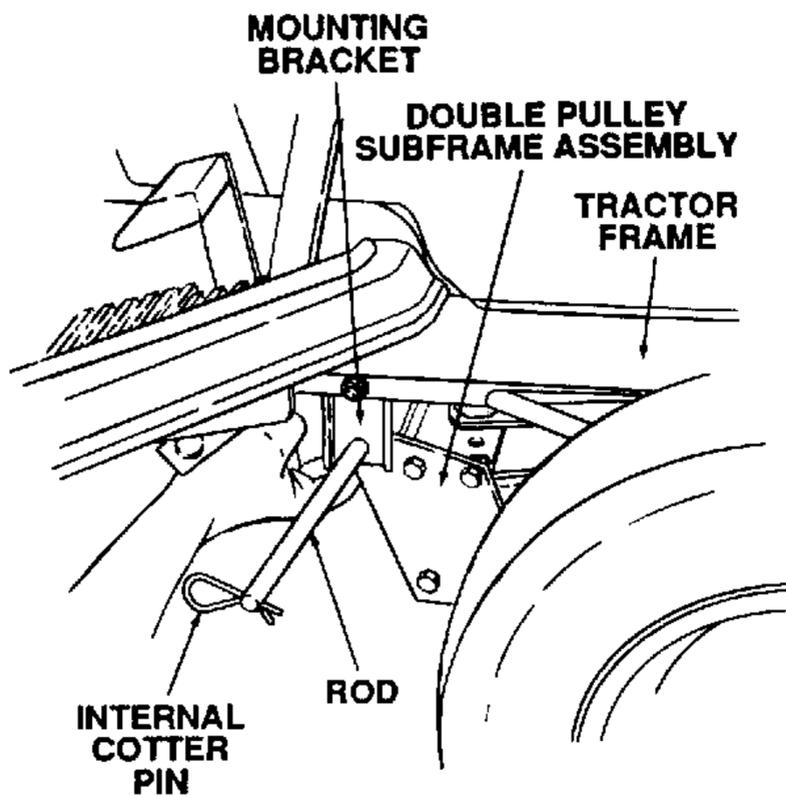


Figure 7-36. Attaching Double Pulley Subframe Assembly.

5. Slide the rod (19) through the nearest mounting bracket (15), both sides of the double pulley subframe, and the other mounting bracket (15). Install the second internal cotter pin (18) into the other end of the rod. See Figure 7-36.
6. Open the hood of the tractor and remove at least one of the side panels.
7. Route the PTO belt under the idler pulleys of the tractor and up over the PTO clutch on the front of the engine. See Figure 7-37.

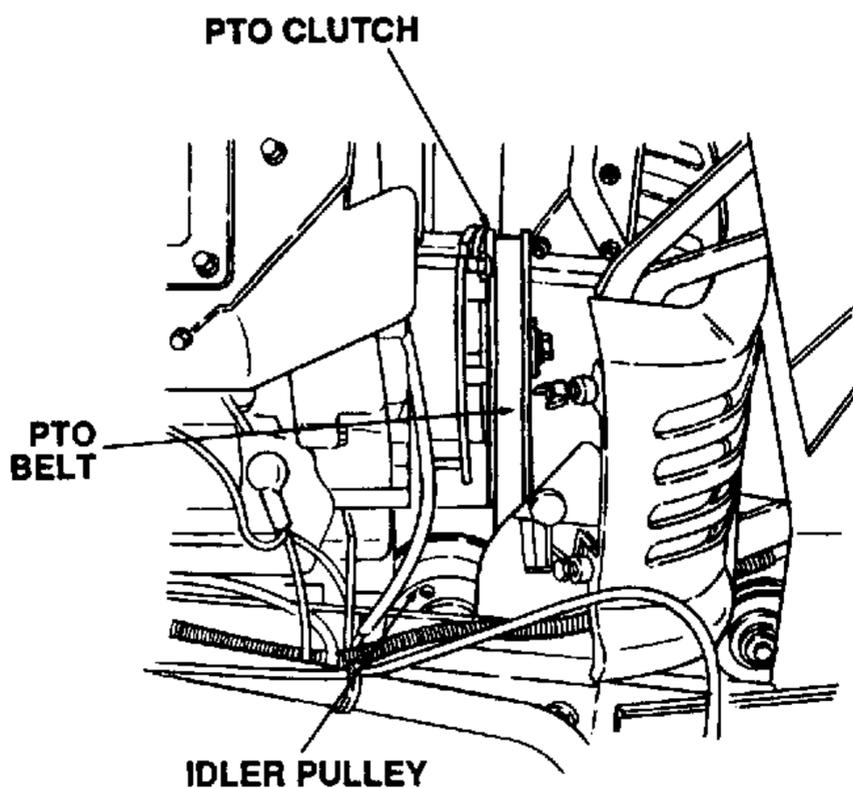


Figure 7-37. Installing PTO Belt.

8. From behind the front/right tire, pull the flat idler pulley toward you and position the PTO belt inside the flat idler pulley. Refer to Figure 7-38.

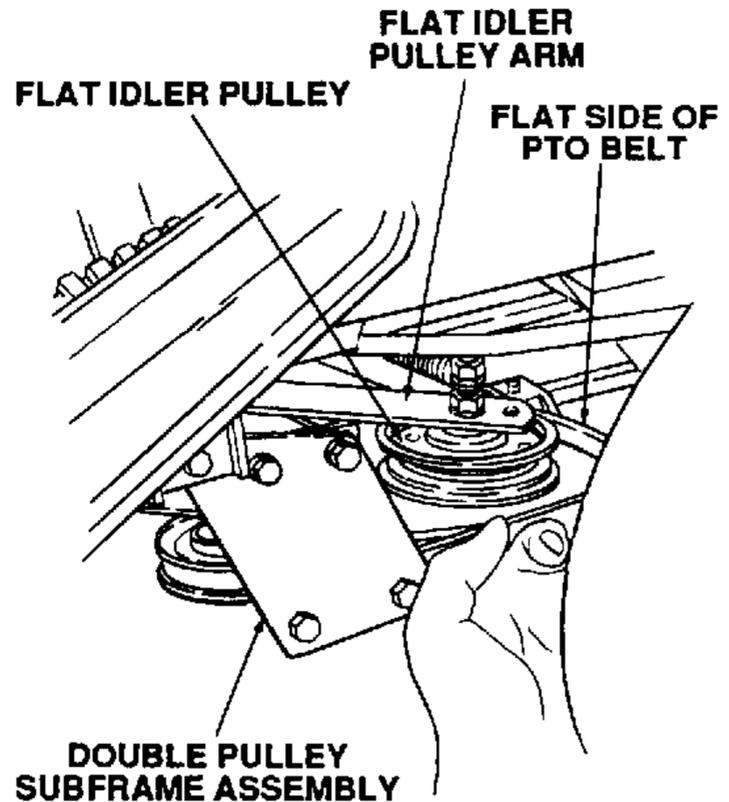


Figure 7-38. Position Flat Idler Pulley.

7-4.5 Snow Thrower Maintenance.

1. The lift latch is operated by the trigger assembly on the lift handle, through the latch release cable. If the latch cable is not functioning properly, refer to Figure 7-39 and adjust as follows:

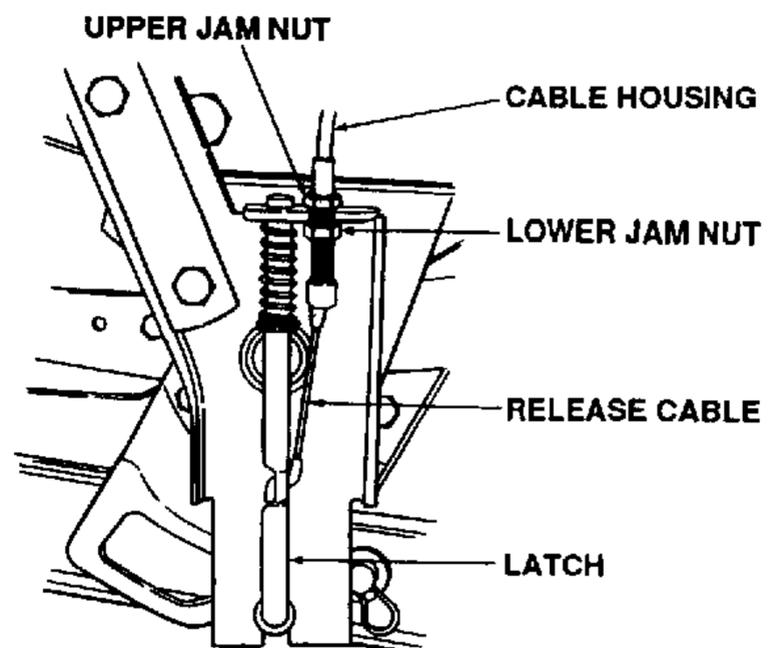


Figure 7-39. Adjusting Latch Release Cable.

- a. If the lift latch does not latch securely, loosen the upper jam nut and tighten the lower jam nut until the latch seats fully into the slot of the latch bracket.
 - b. If the lift latch still does not latch securely in the slot of the latch bracket, refer to Cub Cadet Service Bulletin CG-293 for instructions on modifying the latch bracket slot to obtain a more positive engagement.
 - c. If the latch does not release, check for slack in the release cable. Loosen the lower jam nut and tighten the upper jam nut until all slack is removed from the cable wire.
2. The shave plate and skid shoes on the bottom of the snow thrower (See Fig. 7-40) are subject to wear. If worn service as follows:
 - a. Remove the hex nuts securing the skid shoes to the sides of the auger housing and reverse (right to left, etc.) the shoes.
 - b. Replace the shave plate as follows:
 - Loosen the skid shoe fasteners and remove the rear hex nut, bell washer, flat washer, and carriage bolt from both skid shoes.
 - Remove the hex nuts, bell washers and carriage bolts securing the shave plate to the housing and replace the shave plate.

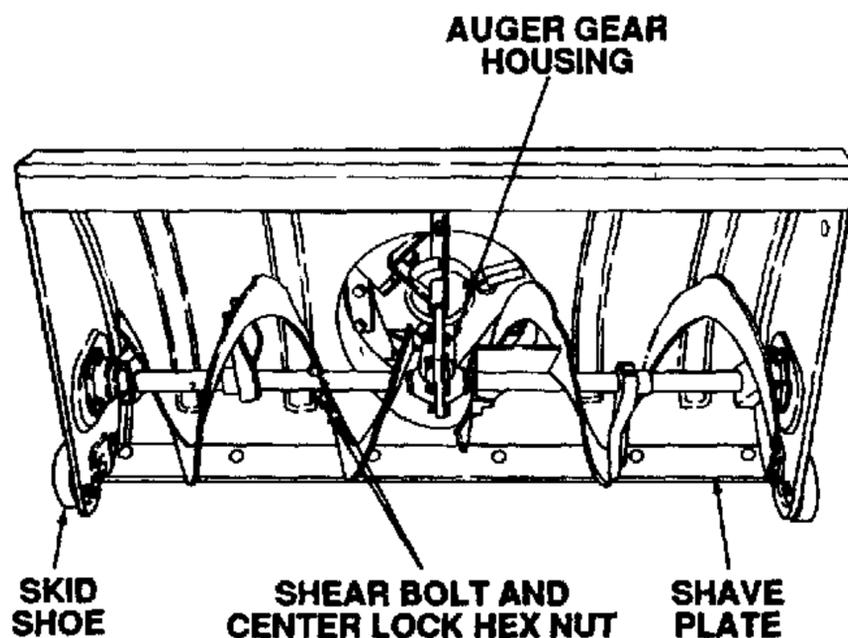


Figure 7-40. Shave Plate and Skid Shoes.

3. To protect the gear box from damage if the augers become jammed, the augers are secured to the auger shaft with shear bolts (13, Fig. 7-24) and hex center lock nuts (14). If the augers will not turn, check the shear bolts (see Fig. 7-40) and replace if necessary.

4. Replace the PTO drive belt as follows:
 - a. Remove the snow thrower assembly from the tractor.
 - b. Remove the belt guide from the double pulley subframe by removing the hex nuts and lock washers. See Figure 7-41.

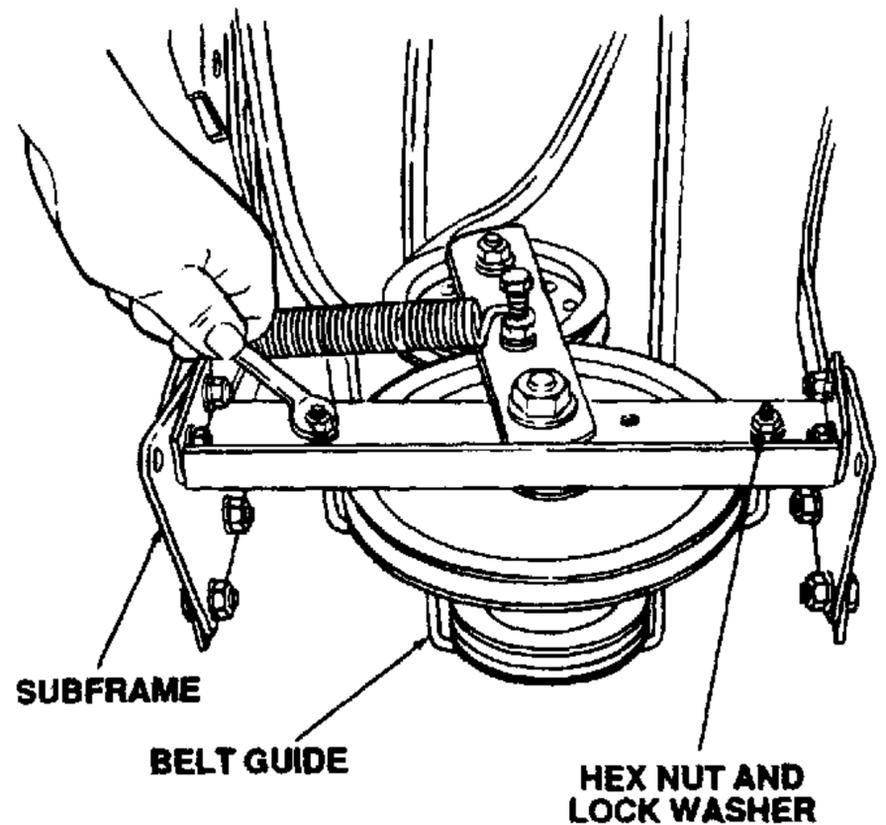


Figure 7-41. Removing Belt Guide.

- c. Pivot the subframe up. See Figure 7-42.
- d. Lift the auger drive belt off the smaller pulley. Refer to Figure 7-42.

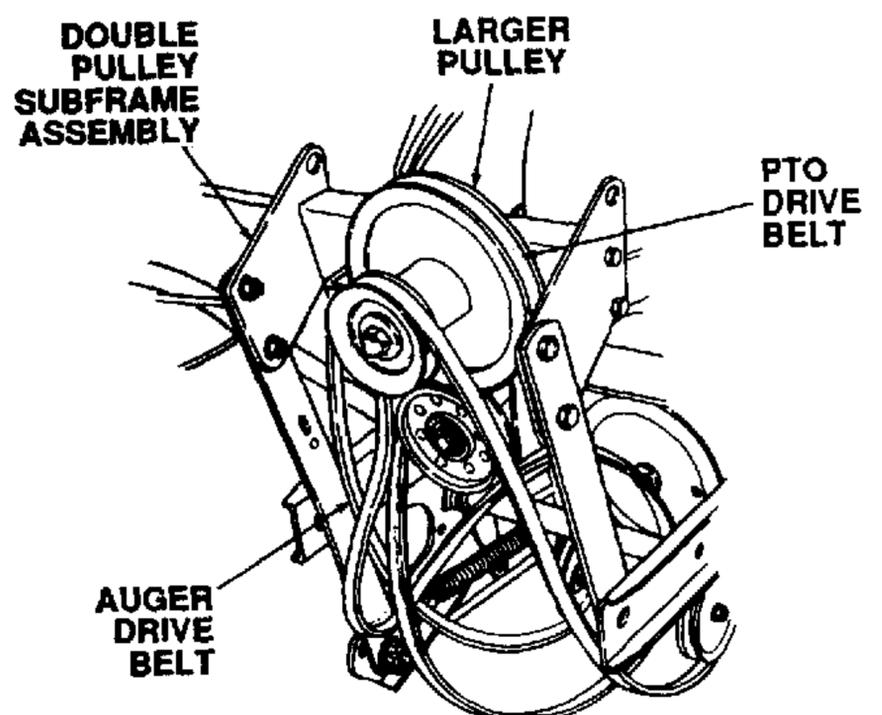


Figure 7-42. Remove PTO Drive Belt.

- e. Lift the PTO drive belt off the larger pulley.
 - f. Place the new PTO drive belt on the larger pulley.
 - g. Place the auger drive belt on the small pulley.
 - h. Install the belt guide using the hex nuts and lock washers. Refer to Figure 7-41.
 - i. Reinstall the snow thrower assembly on the tractor.
5. Replace the auger drive belt as follows:
- a. Remove the auger drive belt from the double pulley subframe assembly by following the steps 4a through 4d above.
 - b. Stand the snow thrower up on its auger housing. See Figure 7-43.

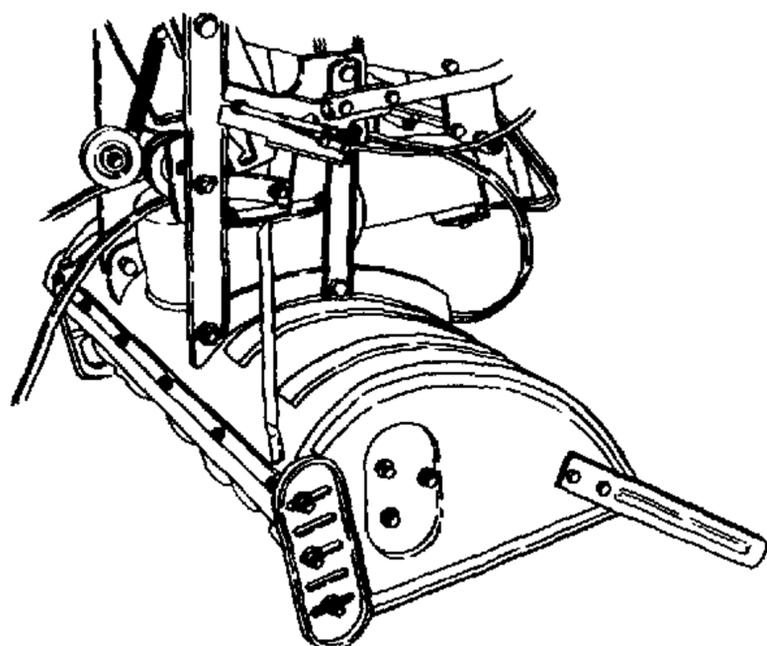


Figure 7-43. Stand Snow Thrower On Auger Housing.

- c. Remove the shoulder bolts which are used as idler pulley belt guides. See Figure 7-43.
- d. Remove the auger drive belt from both snow thrower idler pulleys and the auger drive pulley. Refer to Figure 7-43.
- e. Install the new auger drive belt on the auger drive pulley and both idler pulleys.
- f. Install the shoulder bolt belt guides.
- g. Place the auger drive belt on the smaller pulley of the double pulley assembly, then install the belt guide using the hex nuts and lock washers. Refer to Figure 7-41.

- h. Reinstall the snow thrower assembly on the tractor.

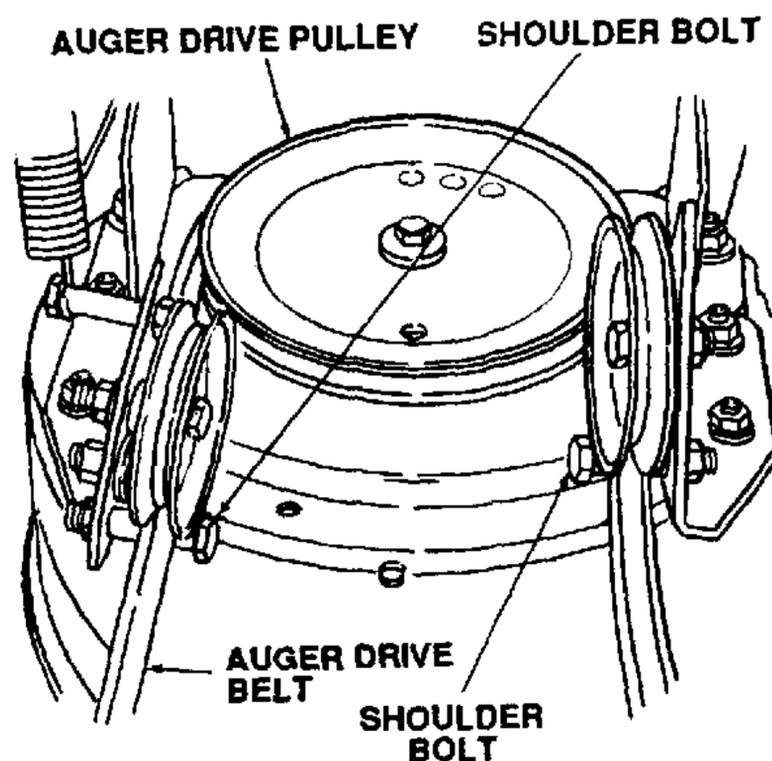


Figure 7-44. Removing Auger Belt From Snow Thrower.

7-5 28 INCH REAR MOUNTED TILLER (Model 190-304).

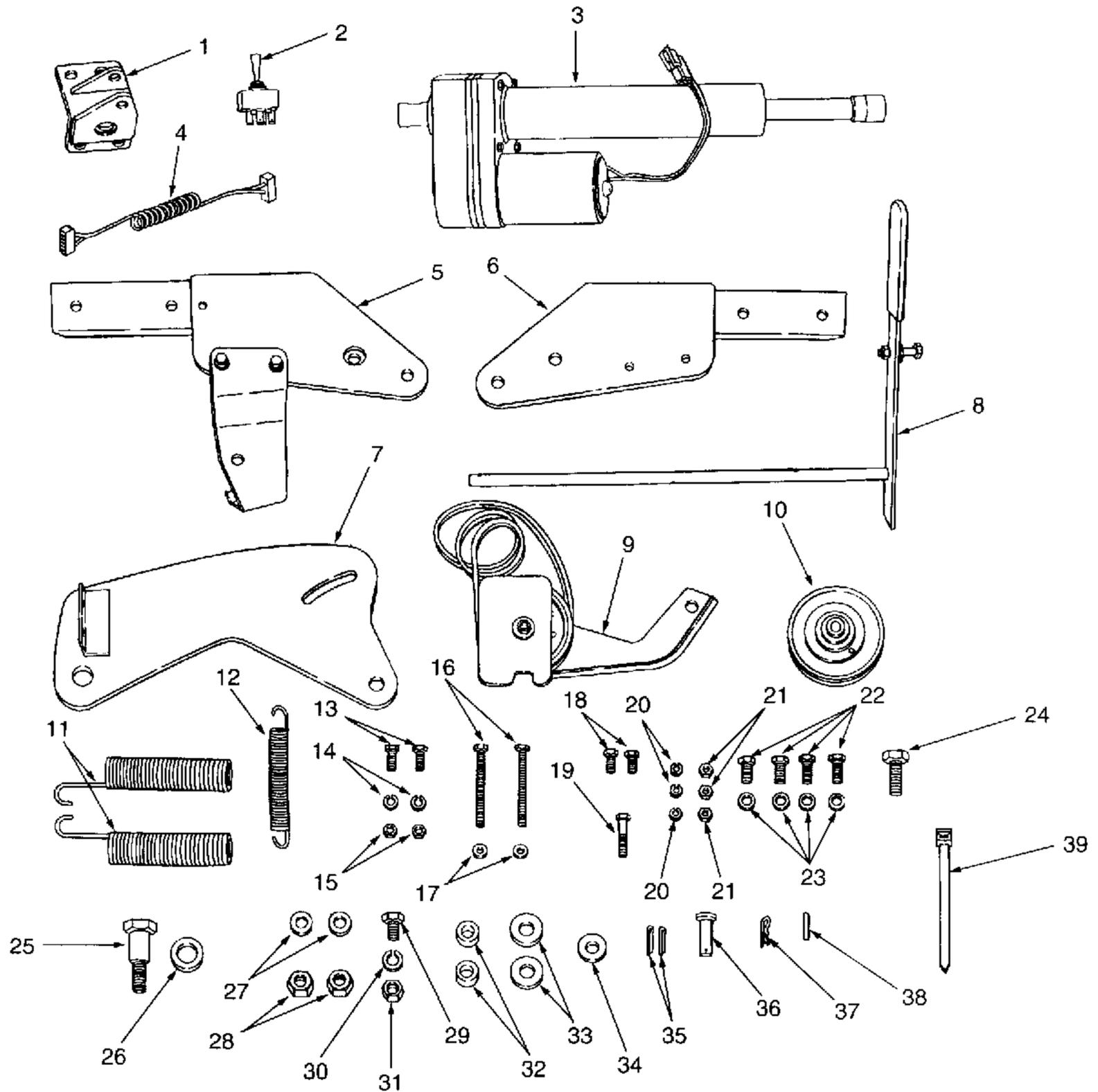
7-5.1 **General.** The 26-inch Rear Mounted Tiller, Model 190-304, is designed for use on Cub Cadet Series 2000 Tractor Models 2160, 2165 and 2185.

7-5.1.1 Before beginning assembly and installation of the rear mounted tiller, refer to Figure 7-45 to confirm that all parts are present, and to familiarize yourself with the component parts.



WARNING

Whenever the rear mounted tiller assembly is installed on the back of the tractor, the Model 190-307 front/rear weight kit, with a **minimum** of two suitcase weights, must be installed on the front of the tractor. The weight kit counterbalances the weight of the tiller assembly and provides stability to the tractor.



- | | |
|------------------------------------|---|
| 1. Lift Cylinder Mtg. Bracket | 21. Hex Nut, 3/8-16 |
| 2. Electric Lift Switch | 22. Hex Cap Screw, 7/16-14 X 1 |
| 3. Lift Cylinder | 23. Bell Washer, .45 X 1.0 X .62 |
| 4. Wire Harness | 24. Hex Cap Screw, 1/2-13 X 1-1/2 |
| 5. Left Channel Bracket Assy. | 25. Shoulder Bolt, 3/4 X 1.10 |
| 6. Right Channel Bracket Assy. | 26. Flat Washer, .76 ID X 1.44 OD X .06 |
| 7. Lift Arm | 27. Flat Washer, .510 ID X 1.0 OD X .12 |
| 8. Idler Shaft | 28. Hex Lock Nut, 1/2-13 |
| 9. Idler Bracket | 29. Shoulder Bolt, .62 X .30 |
| 10. Idler Pulley | 30. Lock Washer, 1/2 |
| 11. Helper Spring | 31. Hex Jam Nut, 1/2-20 |
| 12. Extension Spring | 32. Spacer, .50 ID X .88 OD X .27 |
| 13. Hex Cap Screw, 5/16-18 X 3/4 | 33. Flat Washer, 1/2 X 1-1/2 X .08 |
| 14. Lock Washer, 5/16 | 34. Flat Washer, .510 ID X 1.0 OD X .60 |
| 15. Hex Nut, 5/16-18 | 35. Cotter Pin, 1/8 X 1.0 |
| 16. Hex Cap Screw, 5/16-18 X 3-1/2 | 36. Clevis Pin, .50 X 2.0 |
| 17. Flat Washer, 5/16 | 37. Hairpin Cotter |
| 18. Hex Cap Screw, 3/8-16 X 3/4 | 38. Spring Roll Pin, 3/16 X 1-1/2 |
| 19. Hex Cap Screw, 3/8-16 X 1-1/2 | 39. Tie Strap |
| 20. Lock Washer, 3/8 | 40. Tiller Assembly (Not Shown) |

Figure 7-45. 28-Inch Rear Mounted Tiller Components (Model 190-304).

7-5.2 Tractor Preparation.



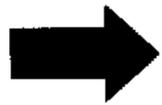
WARNING

Before performing any tractor preparations, place the PTO switch in the "OFF" position, engage the brake pedal lock, turn the ignition key to the "OFF" position and remove the key from the switch.



WARNING

The tractor must be placed on a hard, level surface during preparation.



NOTE

Two 5/16 inch mounting holes must be drilled in the tractor drawbar in order to securely fasten the lift cylinder mounting bracket to the tractor.

1. Install the lift cylinder mounting bracket (1, Fig. 7-45) on the tractor as follows:
 - a. Assemble the lift cylinder mounting bracket (1) on the right rear of the tractor frame as shown in Figure 7-46. Snugly secure the bracket with the two hex cap screws (18), lock washers (20) and hex nuts (21).

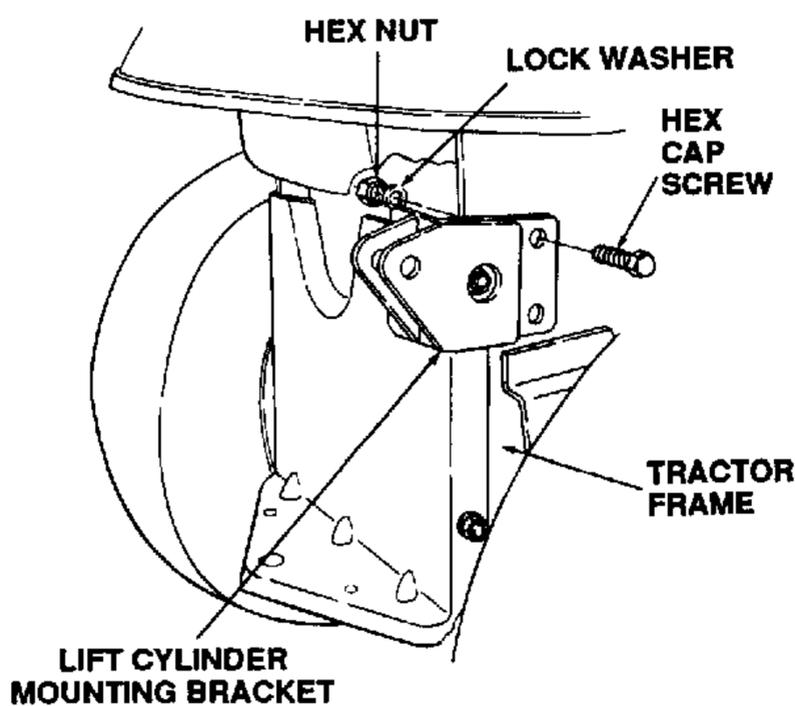


Figure 7-46. Installing Lift Cylinder Mounting Bracket.

- b. Using the two holes in the rear of the cylinder mtg. bracket (1) as a template, mark the hole locations on the tractor drawbar. See Figure 7-47.

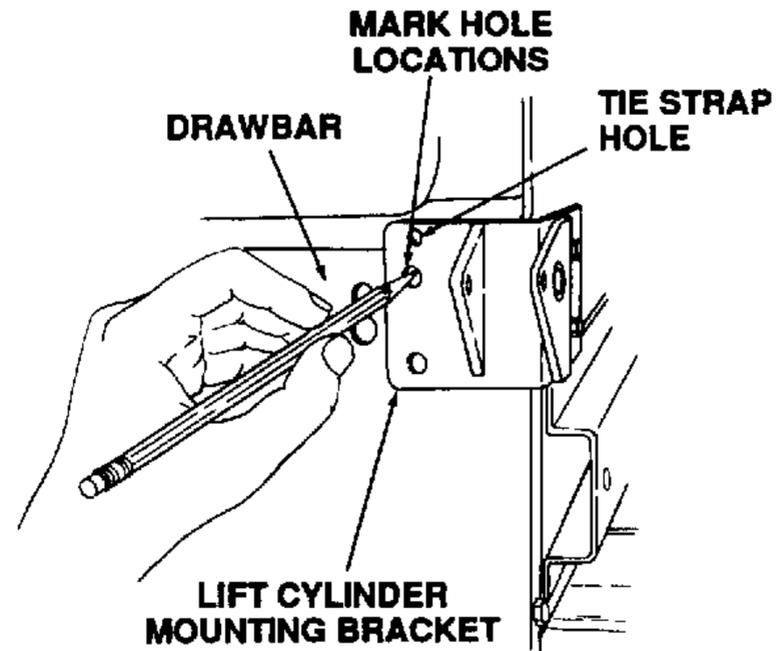


Figure 7-47. Marking Location For Holes.

- c. Once the hole locations are marked, remove the mounting bracket from the tractor frame. Drill two 5/16 inch diameter holes at the locations marked on the drawbar.



NOTE

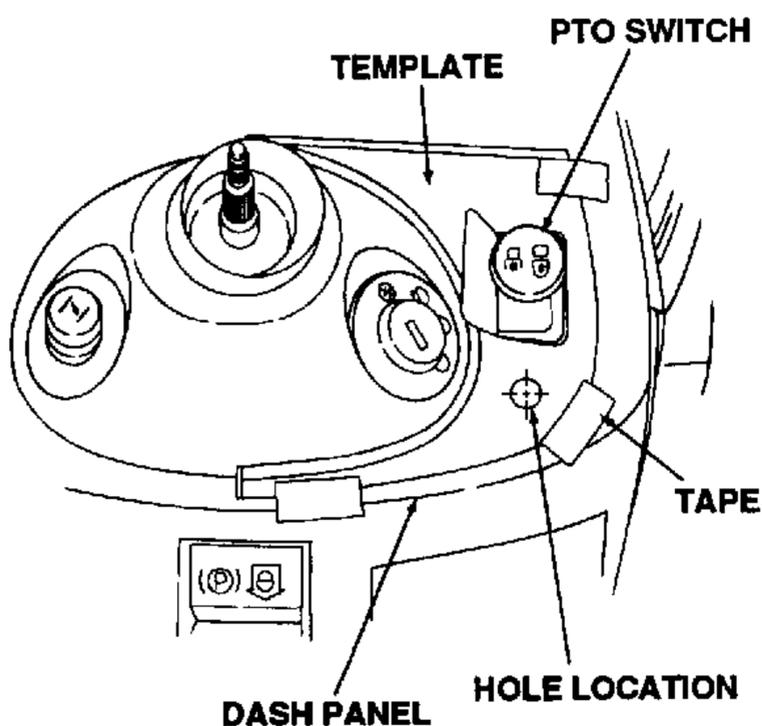
Proper centering of the holes is important. Use a center punch to make an indentation at the center of each marked hole prior to drilling the holes.

- d. Install the lift cylinder mtg. bracket (1) onto the right rear of the tractor frame as shown in Figure 7-46. Secure the bracket to the right side of the frame with the two hex cap screws (18), lock washers (20) and hex nuts (21). Secure the bracket to the drawbar with the two hex cap screws (13), lock washers (14) and hex nuts (15).

NOTE

A 1/2 inch mounting hole must be drilled in the tractor dash panel to accommodate the electric lift switch. Use the template provided in the Tiller Owner's Manual to properly position the hole.

2. Install the electric lift switch (2, Fig. 7-45) in the tractor dash panel as follows:
 - a. Position the template provided in the Owner's Manual on the tractor dash panel as shown in Figure 7-48, then mark the hole location below the PTO switch as shown.



NOTE: STEERING WHEEL IS REMOVED ONLY FOR CLARITY.

Figure 7-48. Marking Hole Location For Electric Lift Switch.

- b. Open the tractor hood and inspect the area immediately below the marked hole location. This area must be free of wiring that may be damaged when drilling the hole. Temporarily secure wires away from this area, if necessary.

NOTE

To properly center the hole, use a small diameter drill bit to make a pilot hole at the center of the marked hole location prior to drilling the 1/2 inch hole.

- c. Drill a 1/2 inch hole in the dash panel at the marked location.
 - d. Remove the hex nut from the switch and insert the switch up through the hole from the underside of the dash panel.
 - e. Position the switch so that the flat surface on the threads of the switch is toward the right side of the tractor as shown in Figure 7-49. Secure the switch to the dash panel with the hex nut.

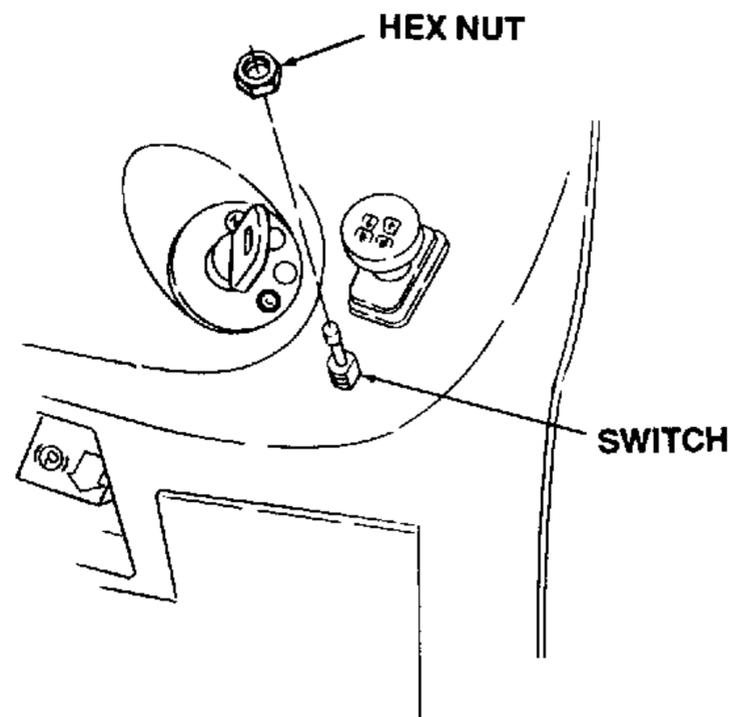


Figure 7-49. Installing Lift Switch.

- f. Plug the matching terminal connector of the wire harness (4, Fig. 7-45) onto the spade terminals of the lift switch.
 - g. Route the wire harness (4, red and yellow wires) downward through the tractor pedestal and rearward along the right frame channel, between the frame and running board. Note the harness should be routed adjacent to the existing tractor wire harness.
 - h. Secure the rearward end of the wire harness (4) to the cylinder mounting bracket (1) with the tie strap (39).
 - i. Connect the short blue wire (with in-line fuse) of the harness (4) to the positive terminal of the battery.
 - j. Connect the short black wire of the harness to the negative terminal of the battery.

7-5.3 Tiller Assembly Preparation.



WARNING

Place the rear mounted tiller assembly on a firm and level surface during preparation.



NOTE

The installation components must be assembled on the tiller assembly prior to installation of the tiller onto the rear of the tractor.

1. Assemble the left channel bracket assembly (5, Fig. 7-45) to the left side of the tiller pivot bracket as shown in Figure 7-50. Secure the brackets together with the shoulder bolt (29), lock washer (30) and hex jam nut (31).

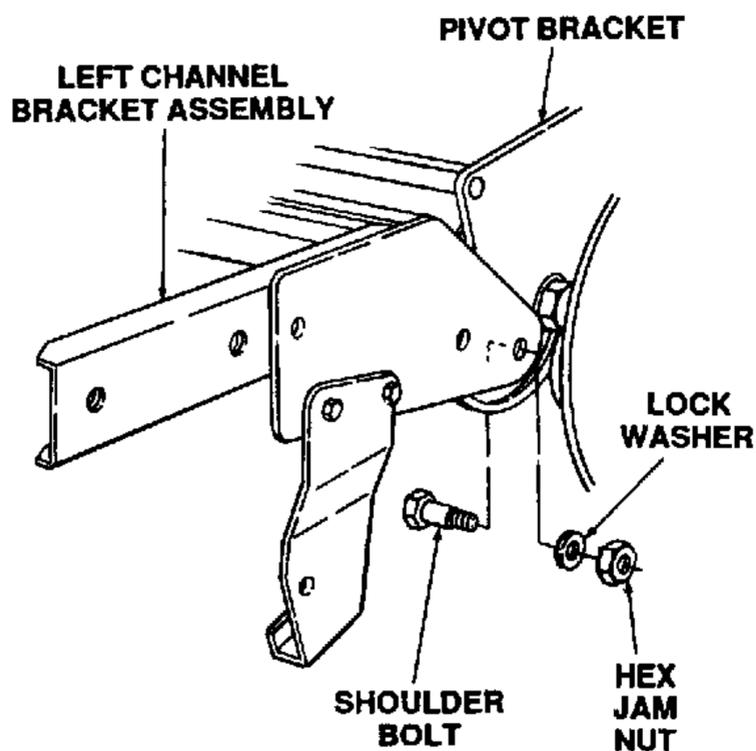


Figure 7-50. Install Left Channel Bracket Assembly.

2. In this order: slide a spacer (32, Fig. 7-45), the lift arm (7), a flat washer (33), the second spacer (32) and flat washer (33) onto the rod of the tiller pivot bracket. Refer to Figure 7-51. Install a cotter pin (35) in the hole at the end of the rod.

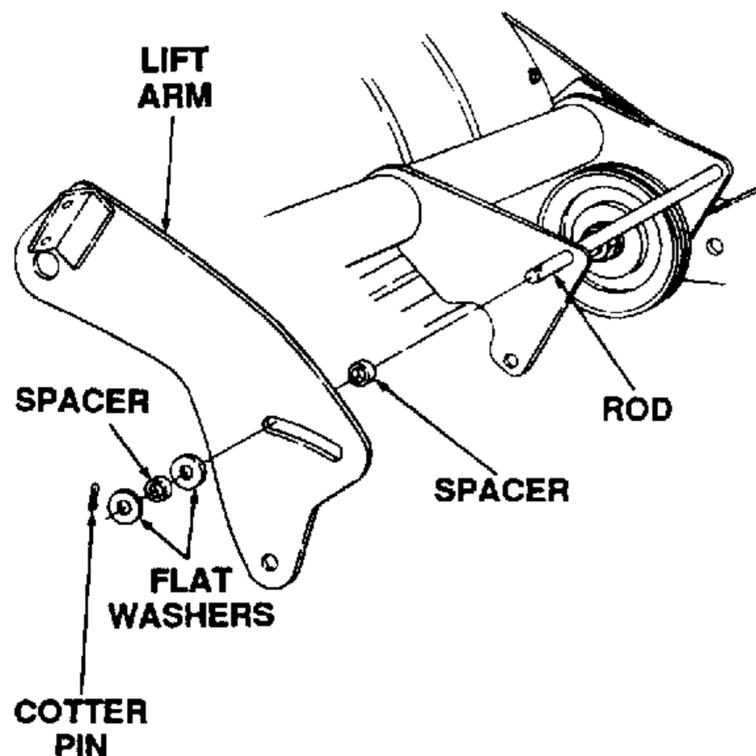


Figure 7-51. Install Lift Arm and Spacers.

3. Position the right channel bracket (6, Fig. 7-45) between the lift arm and right side of the tiller pivot bracket as shown in Figure 7-52. Align the holes and insert the hex cap screw (24) through the brackets and lift arm. Secure with the flat washer (27) and hex lock nut (28).

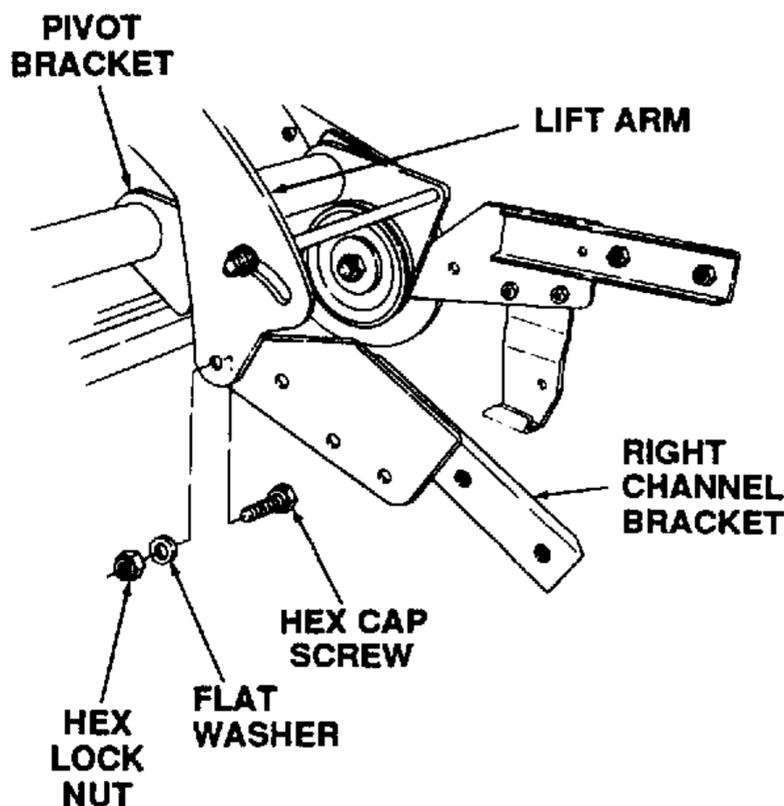


Figure 7-52. Install Right Channel Bracket.

- Referring to Figure 7-53, attach and hold the hook of each helper spring (11, Fig. 7-45) onto the tiller pivot bracket rod, one hook between each end of the spacer (see Fig. 7-51) and its adjacent flat washer. Insert the two hex cap screws (16) through the holes in the L-bracket of the lift arm, and thread into the helper springs. Tighten each bolt one or two turns only, ensuring that there is no tension on the springs.

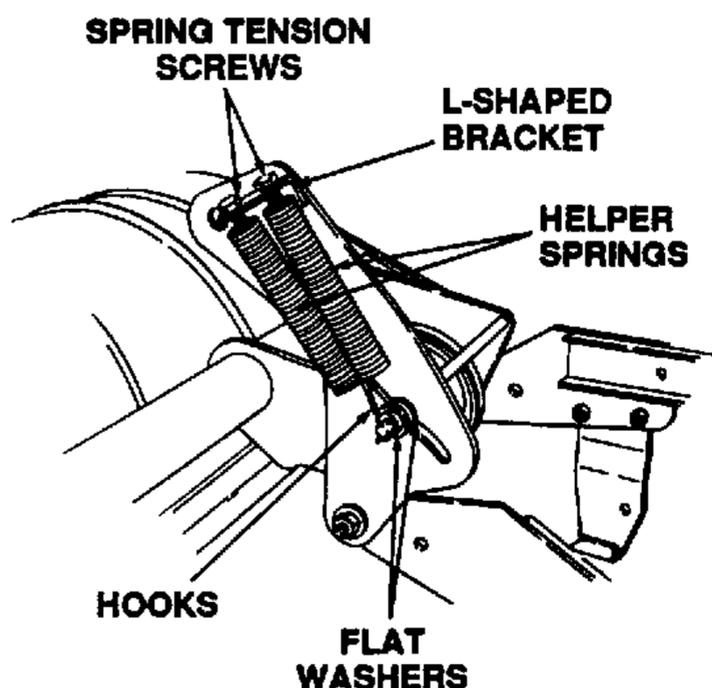


Figure 7-53. Attaching Helper Springs.

- Refer to Figure 7-54 and insert the idler shaft (8, Fig. 7-45) through the rearward hole of the left channel bracket assembly. Push the shaft approximately half the distance toward the right channel bracket. With the idler pulley facing toward the left, slide the idler bracket assembly (9) onto the idler shaft as shown in Figure 7-54.

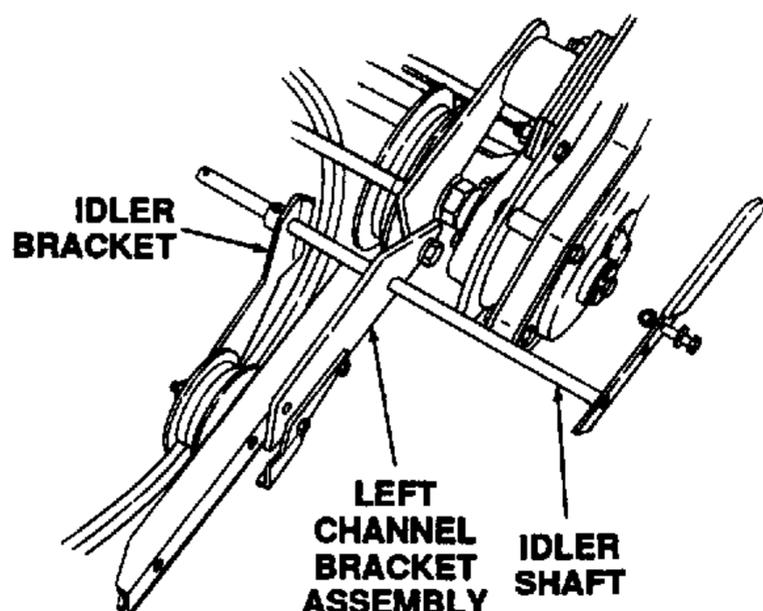


Figure 7-54. Installing Idler Shaft and Bracket.

- Push the idler shaft through the rearward hole of the right channel bracket. Slide the flat washer (34) onto the end of the idler shaft and secure with a cotter pin (35). Refer to Figure 7-55.

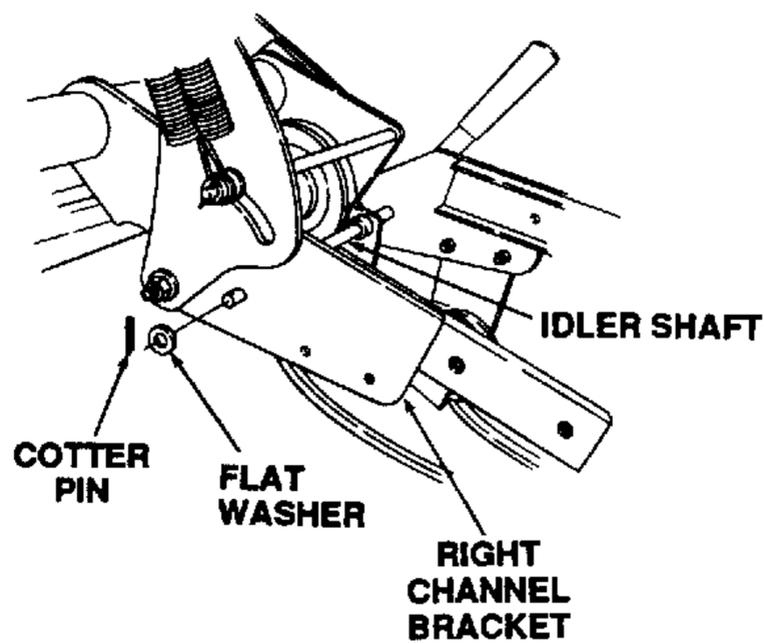


Figure 7-55. Securing Idler Shaft.

- Align the hole of the idler bracket (9) hub with the hole in the idler shaft (8). Using a block of wood to support the idler shaft, drive the spring roll pin (38) through the holes as shown in Figure 7-56.

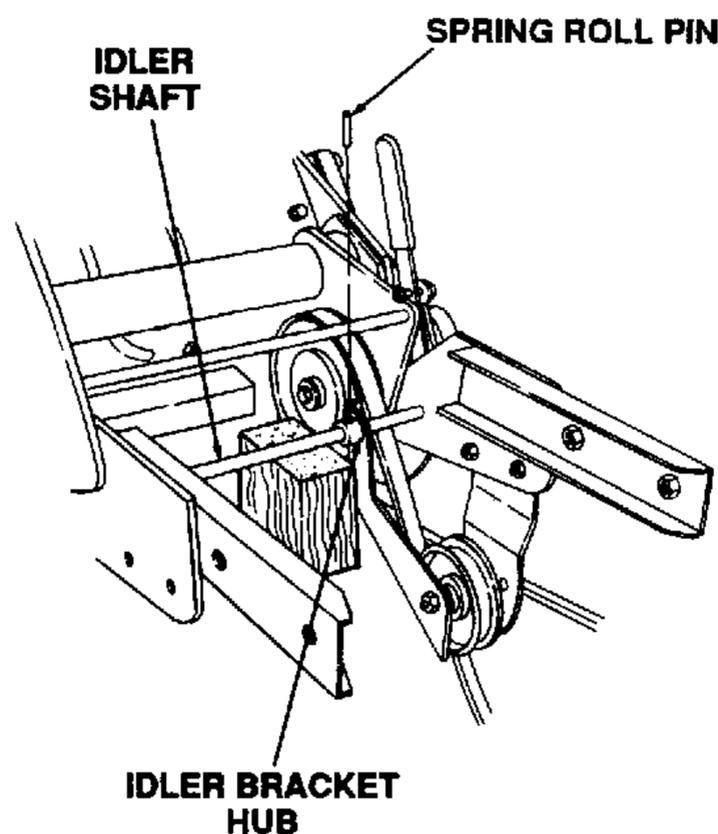


Figure 7-56. Installing Roll Pin.

NOTE

The PTO belt should be captured in the idler bracket (9) assembly with the back of the belt (flat side) against the flat idler pulley.

8. Route the PTO belt around the tiller drive pulley as shown in Figure 7-57. Make certain the V-side of the belt fully engages the pulley groove.

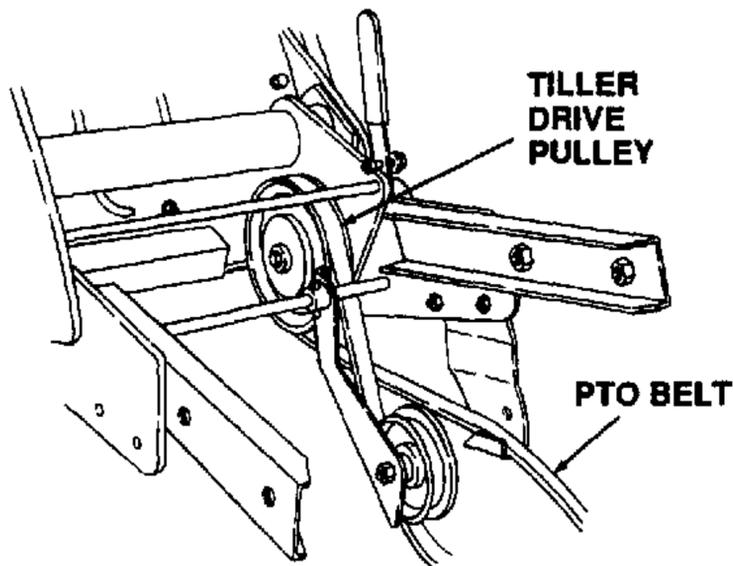


Figure 7-57. Routing the PTO Belt.

9. Place the V-side of the PTO belt in the groove of the idler V-pulley (10), then with the extended hub of the pulley toward the bracket, position the idler pulley (with the belt) on the left channel bracket assembly as shown in Figure 7-58.

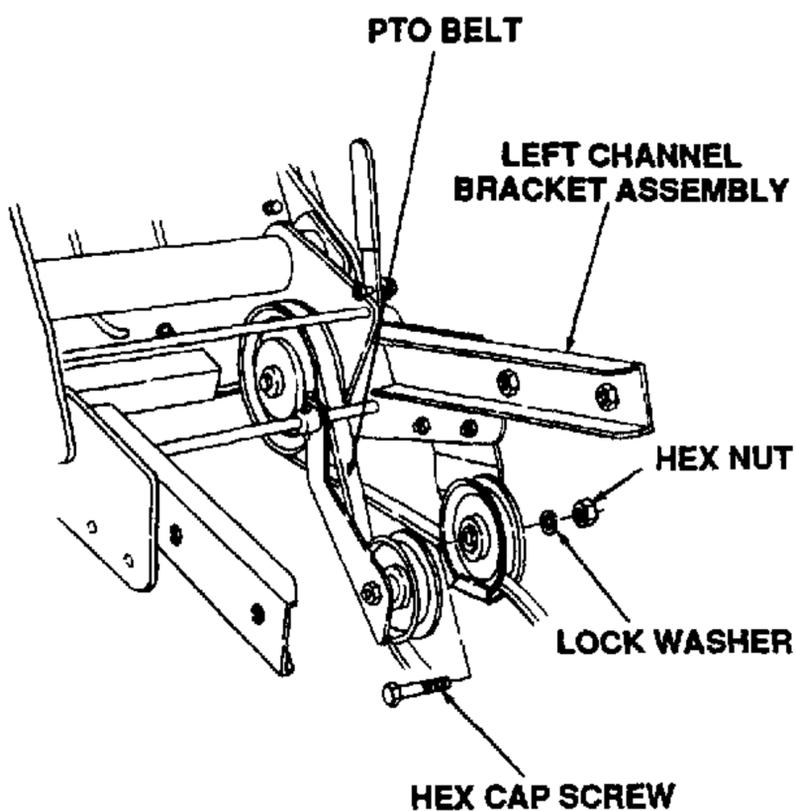


Figure 7-58. Installing V-Idler Pulley.

10. Ensure that the PTO belt is properly routed over the pulleys as shown in Figure 7-59; then secure the idler pulley (with belt) to the left channel bracket with the hex cap screw (19), lock washer (20) and hex nut (21). See Figure 7-58.

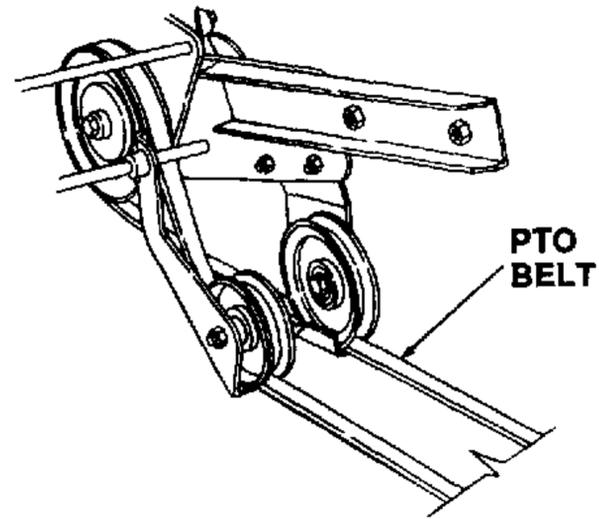


Figure 7-59. Proper PTO Belt Routing.

7-5.4 Tiller Installation.

WARNING

Before preparing for tiller installation onto the tractor, ensure the PTO switch is in the "OFF" position, the brake pedal lock is engaged, and the ignition switch is in the "OFF" position and the key is removed.

WARNING

Select a firm and level surface which is large enough to accommodate the tiller attachment and tractor.

WARNING

If the tractor has been recently run, the exhaust system and surrounding areas will be HOT. To avoid personal injury, allow the tractor to cool before installing the PTO belt.

NOTE

Apply a light coating of grease to the tiller channel brackets to ease insertion into the tractor frame channels.

1. Position the tiller assembly directly behind the tractor with the left and right channel brackets toward the rear of the tractor. Slide the PTO belt under the tractor.
2. Align both channel brackets with the rear frame channels of the tractor and carefully slide the tiller forward until the channel brackets are fully inserted into the frame channels. See Figure 7-60.
3. Align the mounting holes of the channel brackets and frame, then secure with the four hex cap screws (22) and bell washers (23). Refer to Figure 7-60.

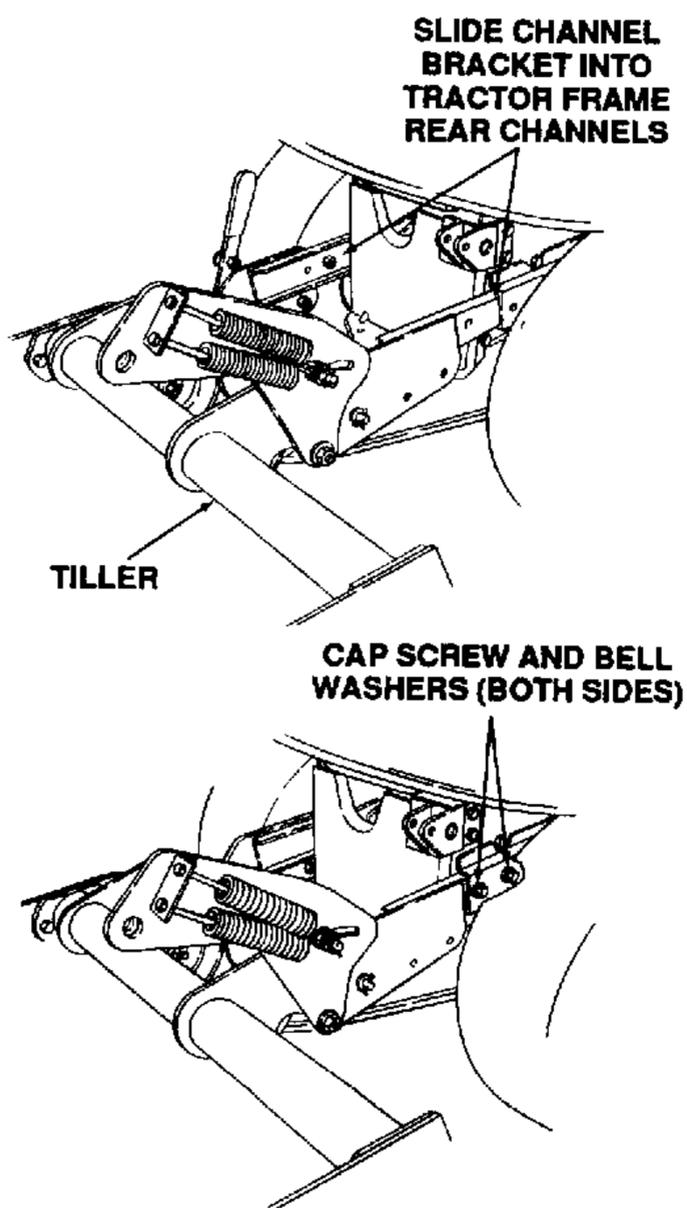


Figure 7-60. Attaching Tiller To Tractor.

4. Install the electric lift cylinder (3, Fig. 7-45) between the lift cylinder mounting bracket (1) on the right rear of the tractor and the tiller lift arm (7) as follows:
 - a. Position the motor end of the lift cylinder (3) between the mounting ears of the cylinder mounting bracket as shown in Figure 7-61.

- b. Align the holes, insert the clevis pin (36), and secure with the hairpin cotter (37) as shown in Figure 7-61.

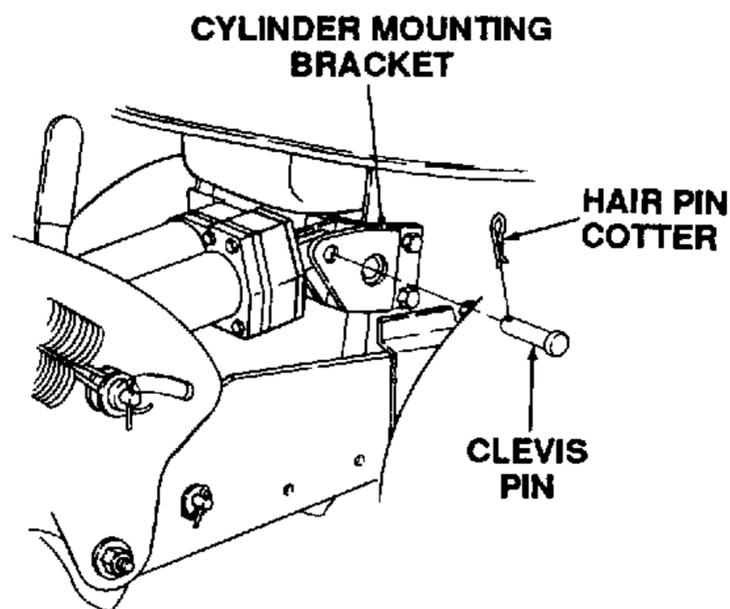


Figure 7-61. Attaching Lift Cylinder To Tractor.

- c. Position the piston end of the lift cylinder to align with the mounting hole of the tiller lift arm. See Figure 7-62. If necessary, rotate the cylinder piston counterclockwise to manually extend the piston.
 - d. Slide the flat washer (26) onto the shoulder bolt (25) and insert the shoulder bolt through the lift arm and cylinder piston. Secure with the flat washer (27) and hex lock nut (28) as shown in Figure 7-62.

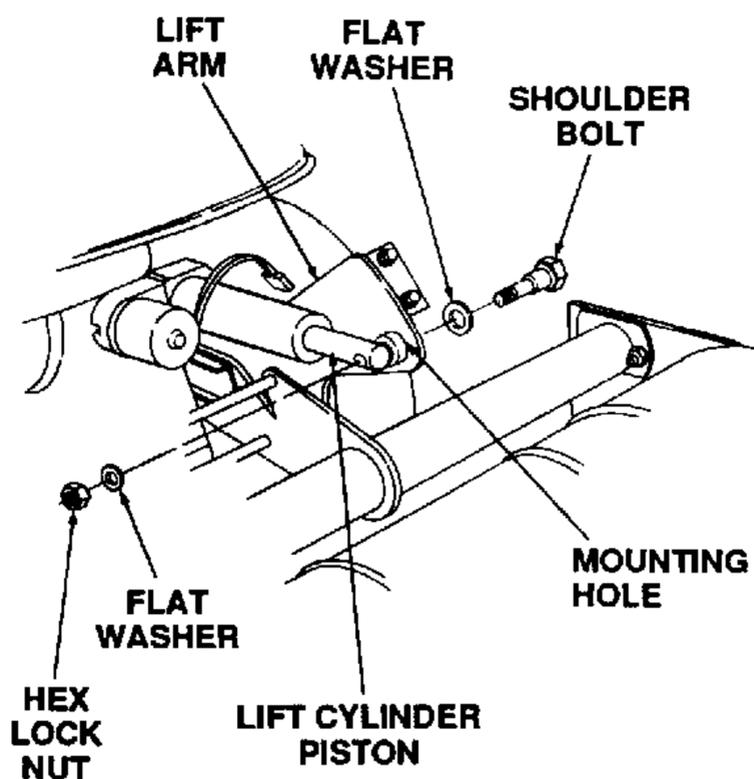


Figure 7-62. Attaching Lift Cylinder To Tiller.

5. Plug the rear connector of the tiller wire harness (4) firmly into the lift cylinder (3) electric motor connector.
6. Hook one end of the extension spring (12) onto the extended bolt of the left channel bracket. Push the idler shaft handle forward and extend the spring to hook the other end of the spring onto the extended bolt of the idler shaft handle. See Figure 7-63.

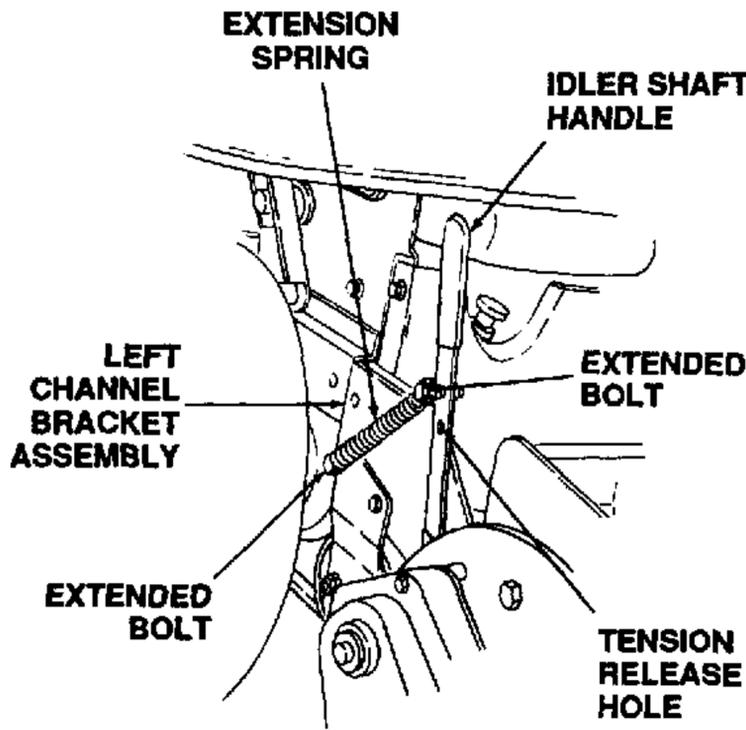


Figure 7-63. Installing Extension Spring.

7. Install the PTO belt onto the PTO clutch at the front of the engine as follows:



WARNING

The exhaust system and surrounding area may be **HOT**. To avoid personal injury, allow the engine and exhaust system to cool before proceeding with the following PTO belt installation instructions.

- a. Pull the PTO belt toward the front of the tractor.
- b. Pull the idler shaft handle rearward until its tension release hole (located below the extension spring, see Fig. 7-63), is positioned behind the rear edge of the left channel bracket.

- c. Insert a pin (or 5/16 inch bolt) through the tension release hole and slowly release the idler shaft handle so that the pin (or bolt) jams against the rear edge of the channel bracket. The pin (or bolt) should hold the handle in place with the tension released from the PTO belt.



CAUTION

Proper belt installation is important to the operation of the tiller. When the belt is correctly installed it will have a 180° twist on the right side between the tiller idler bracket and the right front idler pulley of the tractor. Refer to Figure 7-66.

- d. Install the forward end of the PTO belt on the PTO clutch by passing the belt upward inside the tractor frame. Make sure the V-side of the belt fully engages the groove of the pulley. See Figure 7-64.

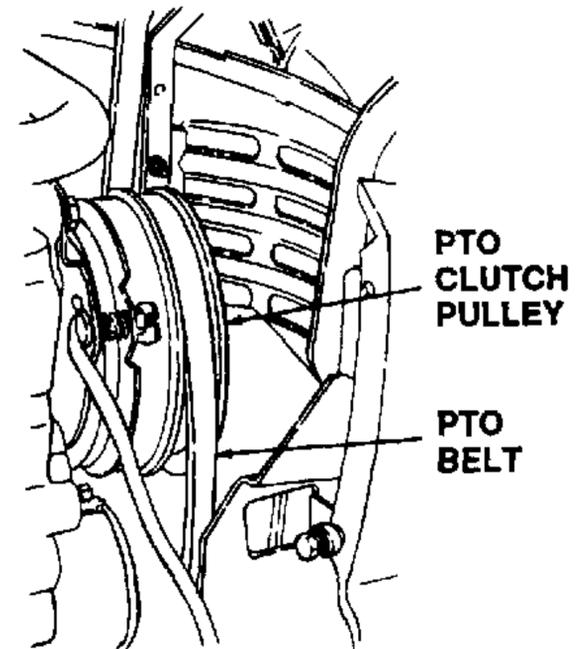


Figure 7-64. Install PTO Belt On PTO Clutch.

- e. Twist the PTO belt 1/4 turn to place the V-sides of the belt in the grooves of the two front idler pulleys of the tractor. See Figure 7-65.
- f. Referring to Figure 7-53, tighten the two spring tension hex cap screws (16) until the upper end of the helper springs (11) are against the L-bracket of the lift arm (7).

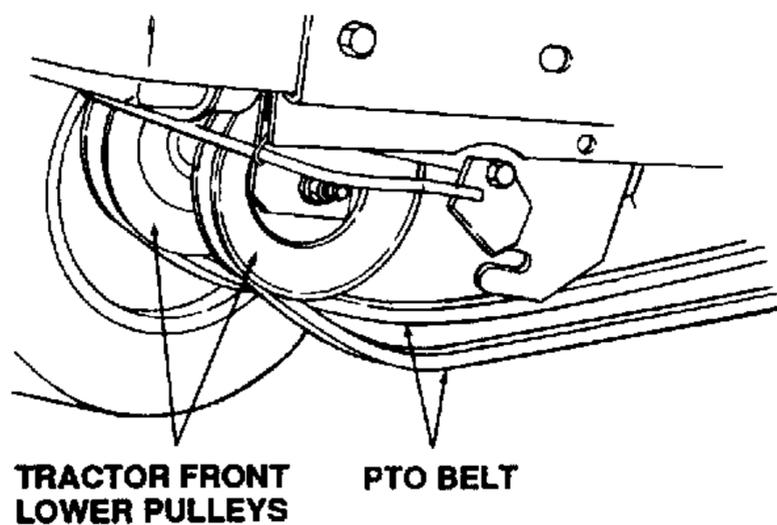


Figure 7-65. Place PTO Belt In Front Idler Pulleys

- g. Pull the idler shaft handle rearward and remove the pin (or bolt), then slowly release the handle. The extension spring (12) should apply tension to the handle and PTO belt.
- h. Referring to Figure 7-66, make certain the PTO belt is correctly installed in each pulley and that there is a 180° twist in the belt between the idler bracket pulley and the right front idler pulley of the tractor.

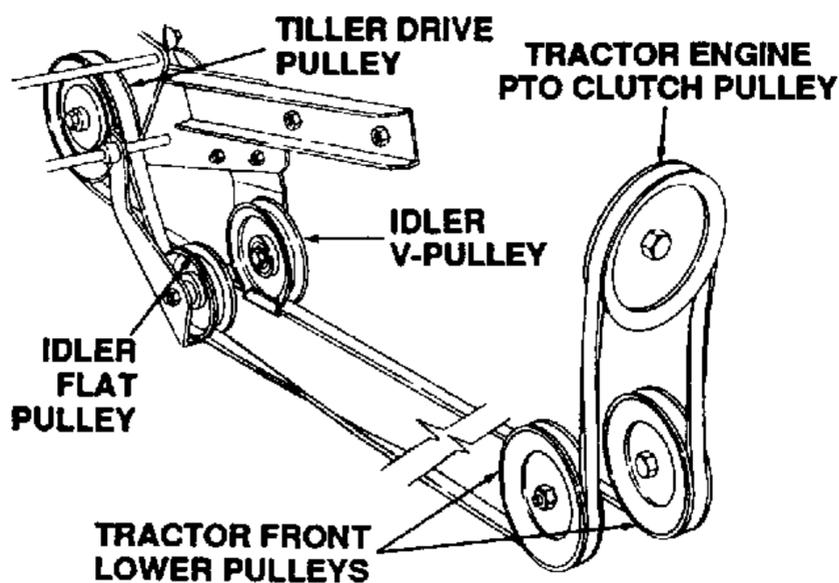


Figure 7-66. Correct PTO Belt Routing.

7-5.5 Tiller Maintenance.

1. To prevent damage or premature wear to the PTO belt, regularly check for the following:
 - Check the tiller idler pulleys and drive pulley for accumulation of dirt. Keep pulleys clean.

- Check the pulleys for stones or other foreign matter which may have been tilled up from beneath the soil.
- Check the pulleys for damage caused by striking foreign objects.

2. Replace the PTO belt as follows:



WARNING

Place the PTO switch in the "OFF" position, engage the brake pedal lock, turn the ignition key to the "OFF" position and remove the key from the switch.



WARNING

If the tractor has been recently run, the exhaust system and surrounding areas will be **HOT**. To avoid personal injury, allow the tractor to cool before removing the PTO belt.

- a. Pull the idler shaft handle rearward until its tension release hole (located below the extension spring, see Fig. 7-63), is positioned behind the rear edge of the left channel bracket.
- b. Insert a pin (or 5/16 inch bolt) through the tension release hole and slowly release the idler shaft handle so that the pin (or bolt) jams against the rear edge of the channel bracket. The pin (or bolt) should hold the handle in place with the tension released from the PTO belt.
- c. Remove the belt from the PTO clutch on the front of the engine and pull the belt downward through the inside of the tractor frame.
- d. Pull the idler shaft handle rearward, remove the pin (or bolt) from the handle and slowly release the handle.
- e. Remove the V-idler pulley and belt from the left channel bracket.
- f. Remove the fasteners securing the belt guard plate and flat idler pulley to the idler bracket (9) and remove the belt.
- g. Place the back side (flat side) of the new belt against the flat idler pulley and reinstall the belt, flat idler pulley and belt guard plate onto the idler bracket (9).

- h. Route the belt around the tiller drive pulley as shown in Figure 7-57. Make certain the V-side of the belt fully engages the pulley groove.
 - i. Place the V-side of the PTO belt in the groove of the idler V-pulley (10), then with the extended hub of the pulley toward the bracket, position the idler pulley (with the belt) on the left channel bracket assembly as shown in Figure 7-58.
 - j. Ensure that the PTO belt is properly routed over the pulleys as shown in Figure 7-59; then secure the idler pulley (with belt) to the left channel bracket with the hex cap screw (19), lock washer (20) and hex nut (21). See Figure 7-58.
 - k. Following the instructions in step 7 of paragraph 7-5.4, reinstall the belt onto the PTO clutch.
3. The chain case is lubricated and sealed at the factory and should not require checking or changing. If the chain case is disassembled, replace the grease with 20 ounces of plastilube type "O" grease (part number 737-0133, 14 ounce container).
 4. At least once a season, remove the bearing cup on the right hand side of the tiller housing. See Figure 7-67. Clean and refill the cup with 2 ounces of plastilube type "O" grease (part number 737-0133).

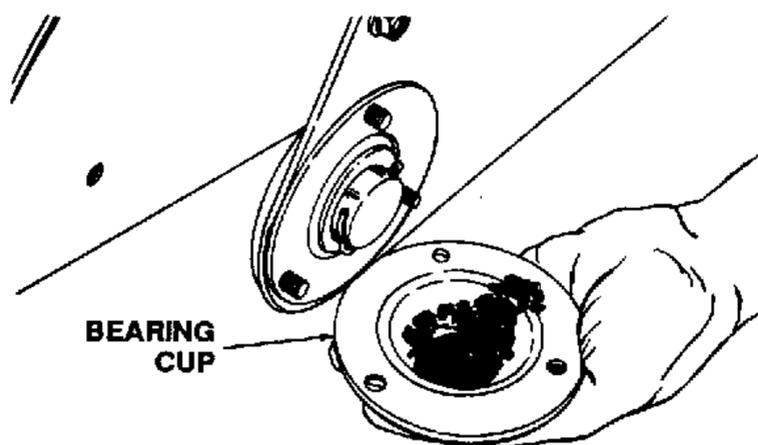


Figure 7-67. Lubricating Right Bearing Cup.

5. The tines are subject to wear and periodically require replacement. When replacing the tines, it is recommended that the individual tines be replaced one at a time in order to retain the correct orientation pattern. When replacing tines, note the following.
 - Left hand tines (part number 742-0243) are stamped with an "L" and right hand tines (part number 742-0244) are stamped with an "R".
 - Left hand tines mount on the left sides of the two outer tine carriers and on the right sides of the three inner tine carriers. The blade edges extend to the right and face rearward as the tine shaft rotates rearward from the top.
 - Right hand tines mount on the right sides of the two outer tine carriers and on the left sides of the three inner tine carriers. The blade edges extend to the left and face rearward as the tine shaft rotates rearward from the top.
 - The sharpened edges of all tine blades must face in the direction of rotation, which is rearward from the top. Refer to Figure 7-68.

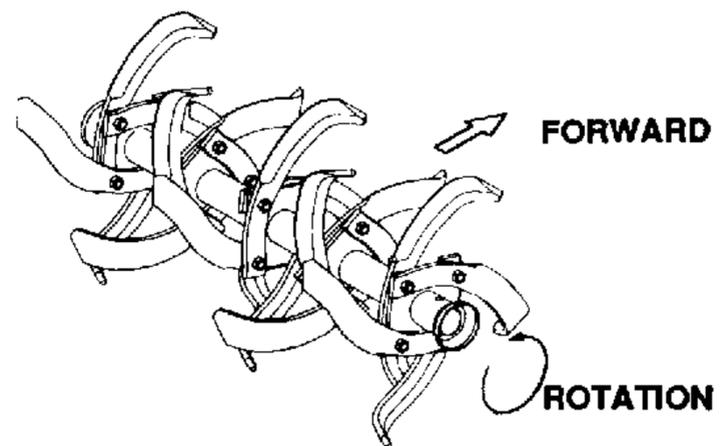


Figure 7-68. Tiller Tines.

APPENDIX A RELATED SERVICE MANUALS

A-1. GENERAL

A-1.1 Appendix A lists service manuals for engines used in the Series 2000 tractors covered in this manual. Refer to Table A-1.

Table A-1. Related Service Manuals

Item	Service Manual No.
Kohler Command 11, 12.5, 14 HP Horizontal Engines	KH-TP-2402
Onan E125H, E140H Elite Series Engines	965-0758
Briggs & Stratton Vanguard V-Twin OHV Engines	BS-272144-9
Kohler Command 18, 20, 22, 25 HP Horizontal Engines	KH-TP-2428

APPENDIX B BULK SERVICE ITEMS

B-1. GENERAL.

B-1.1 This appendix lists bulk service items available for the maintenance of the equipment covered in this manual. Refer to Table B-1.

Table B-1. Bulk Service Items

Bulk Item	Part Number
ENGINE OIL	
-Low Ash SAE 30W (gasoline)	737-3029 (1 qt.)
-Low Ash SAE 30W (gasoline)	737-3061 (1 gal.)
-Low Ash SAE 10W30 (gasoline)	737-3030A (1 qt.)
-Low Ash SAE 5W30 (gasoline)	737-3049 (1 qt.)
TRANSMISSION OIL	
-Cub Cadet Drive System Oil	737-3055 (1 qt.)
-Cub Cadet Drive System Oil	737-3054 (1 gal.)
MULTI-PURPOSE GREASE	
-251H EP Lithium	737-3034 (14.5 oz. cartridge)
	737-3020 (4 oz. can)
	737-3019 (4 oz. can w/extension)
	737-3018 (8 oz. can w/extension)
PENETRATING OIL	
	737-3037 (11.75 oz. can)
ULTRA GREY SEALANT	
	737-3746 (2 oz. tube)
PAINTS	
-Cadet Yellow (powder coat)	759-3588 (12 oz. aerosol)
	759-3589 (quart)
	759-3692 (.6 oz. bottle w/brush)
-Cadet Beige (powder coat)	759-3735 (12 oz. aerosol)
	759-3736 (quart)
	759-3674 (.6 oz. bottle w/brush)
-Gloss Black	759-3262 (12 oz. aerosol)
-Hi -Temp Black	759-3261 (12 oz. aerosol)

APPENDIX C

INSPECTING AND TESTING ELECTRICAL COMPONENTS

C-1. GENERAL.

C-1.1 This appendix contains general testing and inspection information pertaining to selected electrical components. Refer to ELECTRICAL SCHEMATICS in APPENDIX D and to TROUBLE SHOOTING AND TESTING in SECTION 4 when attempting to diagnose electrical system problems.

C-2. REPLACEMENT OF STARTER SOLENOID - Models 2160 and 2165. Models 2130, 2135, 2140, 2145 and 2185 are equipped with a solenoid shift type starter. Refer to the appropriate Engine Service Manual for information regarding the solenoid on these models.

C-2.1 **General.** In many instances the solenoid is replaced unnecessarily when a starting problem is experienced. Simple testing can determine whether replacement is necessary.

C-2.2 **Solenoid Problems.** The following are solenoid problems that require replacement of the solenoid.

1. Solenoid is stuck; the starter remains engaged regardless of the ignition switch key position.
2. The coil wiring (inside solenoid) is bad; the solenoid will not function.
3. Bad leaf contactor (inside solenoid); solenoid clicks but starter motor does not turn.

C-2.3 **Other Problems Which Can Appear To Be A Defective Solenoid.**

1. Faulty ground
2. Defective safety switch
3. Discharged battery
4. Defective starter motor
5. Blown fuse
6. Defective ignition switch
7. Defective wire harness

C-2.4 **Testing The Starter Solenoid.** Refer to Section 4, Table 4-2, for electrical system testing procedures which will help to determine if the solenoid should be tested.

1. Remove the solenoid from the tractor.

2. Using an ohmmeter, test for continuity across the two large terminals. There should be **no** continuity.
3. Test for continuity between small coil terminal and the mounting plate. There should be continuity.
4. Using jumper leads, ground the mounting plate to the negative terminal of the battery and connect the small coil terminal to the battery's positive terminal. Re-test for continuity across the large terminals of the solenoid. Continuity should now be present.
5. The solenoid is functioning properly if these results are obtained.

C-3. REPLACEMENT OF THE PTO SWITCH AND REVERSE RELAY - All Models.

C-3.1 **General.** Unnecessary replacement of the PTO switch and/or the reverse relay should not be the first action taken to correct an electric PTO problem. Simple continuity tests can be conducted to determine their condition and whether replacement is necessary.

C-3.2 **Testing the PTO switch.** Refer to Figure C-1. Using an ohmmeter, check the terminals for proper continuity.

1. With the switch knob fully **depressed**, continuity should be present only between terminals 1 & 2 and terminals 5 & 7. **No** continuity should be present between terminals 3 & 4 and 6 & 7.

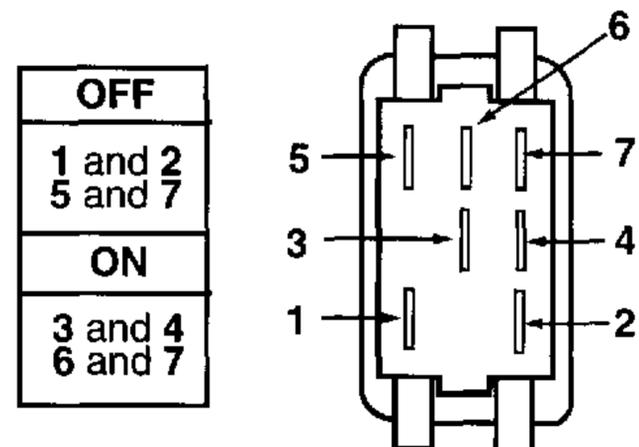


Figure C-1. PTO Switch Terminals.

2. Pull the switch knob to the fully **extended** position. Continuity should now be present between terminals 3 & 4 and terminals 6 & 7. There should be no continuity between terminals 1 & 2 and 5 & 7.
3. If these results are obtained, the switch is operating correctly and the problem is elsewhere in the system.

C-3.3 Testing the Reverse Relay. Refer to Figure C-2. The relay consists of two separate circuits: the activation coil circuit and the contact point circuit. Remove the relay and test as follows:

1. Test for continuity across the coil circuit (terminals 1 and 2). If there is no continuity, replace the relay. Proceed to step 2 if continuity is present.
2. Using jumper leads, apply battery voltage to one terminal of the relay coil and ground the other terminal (you may hear the contact points close).
3. Test for continuity across the contact point terminals (terminals 3 and 5). No continuity indicates the contact points are not closing and the relay should be replaced. If continuity is present, proceed to step 4.

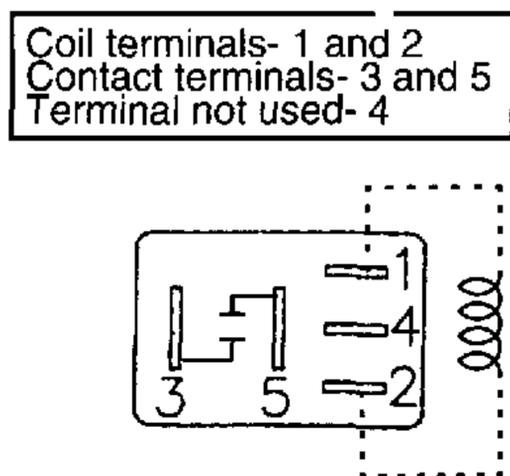


Figure C-2. Reverse Relay Terminals.

4. Remove either jumper lead from its coil terminal (1 or 2). Continuity should be broken across the contact points. If the circuit remains closed, the contact points are sticking and the relay should be replaced. If the circuit is broken, the relay is operating correctly and the problem is elsewhere in the PTO circuit.

C-4. REPLACEMENT OF THE BRAKE PEDAL INTERLOCK SWITCH - All Models.

C-4.1 General. The interlock switch consists of two separate switch circuits, one normally open and the other normally closed. Testing the continuity of the circuits can determine if the switch is functioning properly.

C-4.2 Testing the Interlock Switch. Refer to figures C-3 and C-4. Using an ohmmeter, check the switch terminals for proper continuity.

1. Touch the tester probes to the switch terminals in Position A as shown in Figure C-3.
 - a. With the switch button extended (out) there should be no continuity between the terminals.
 - b. Depress the button. The tester should now indicate continuity between the terminals.

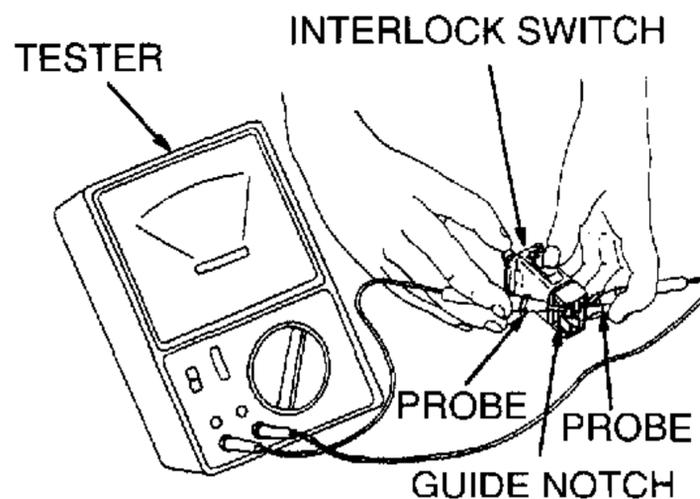


Figure C-3. Interlock Switch Terminals - Position A.

2. Touch the tester probes to the switch terminals in Position B as shown in Figure C-4.
 - a. With the switch button extended (out), the tester should indicate continuity between the terminals.
 - b. Depress the button. The tester should now indicate no continuity between the terminals.

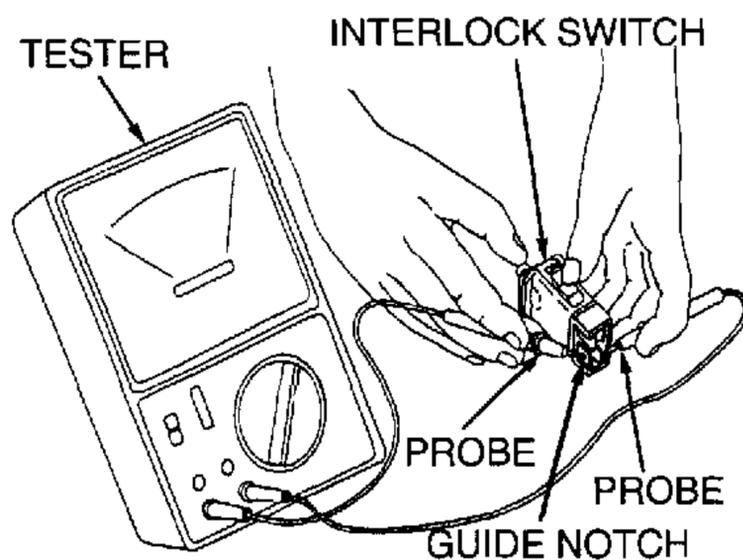


Figure C-4. Interlock Switch Terminals - Position B.

C-5. BATTERY INSPECTION AND TESTS.

C-5.1 A visual inspection cannot be expected to effectively substitute for an instrument check when diagnosing a battery problem or evaluating its condition. An inspection may, however, uncover tell-tale clues which can direct the service technician toward the selection of instrumentation which will most efficiently test a battery under a given set of conditions.

C-5.2 Where there is an indication that there is a need for further service, it is advisable that the technician check the installation date. (Length of service could be a factor — it would certainly be an aid in determining whether trouble is premature or the result of normal degeneration.)

C-5.3 Common Causes of Battery Failure.

1. Overcharging. Charging a battery greatly in excess of what is required is harmful in the following ways:
 - a. Severely corrodes the positive plate grids, causing mechanical weakening and loss of electrical conduction.
 - b. Evaporates the water of the electrolyte into hydrogen and oxygen gas, creating gas bubbles which tend to wash active material from the plates and carry moisture from the cells as a fine mist.

- c. Evaporation of water leaves the acid more concentrated. This concentrated acid is harmful to cell components.
 - d. Causes high internal heat, which accelerates the above mentioned corrosion of the positive plates and damages the separators and negative plates.
 - e. Causes liquid expansion, forcing electrolyte from the cells and causing corrosion and damage to external parts.
2. Undercharging. Operating with an insufficient charge can cause sulfating of the plates, which may result in buckling of the plates. Especially if subjected to a prolonged overcharging.
 3. Lack of water. The plates cannot take full part in the battery action unless they are completely covered by the electrolyte.

C-5.4 **Visual Inspection.** The following are items which may be checked visually for symptoms of trouble in-the-making:



WARNING

Battery cables must be disconnected in proper order to avoid arcing. When disconnecting the cables from the battery, ALWAYS remove the negative cable first, and then remove the positive cable.



WARNING

Battery electrolyte is diluted sulfuric acid. Use extreme care to avoid spilling and to avoid contact with the skin and eyes. Acid can destroy clothing and burn your skin.

1. Battery date coding.
2. The condition of the battery case and its individual cell covers.
3. The top surface of the cover for acid accumulation.
4. The color and odor of the electrolyte in the battery.

5. A gassing condition when the charging circuit is operating.
6. The condition and size of the cables.
7. Corrosive deposits.
8. All surfaces of the battery for any indications of abuse.
9. Missing vent plugs.
10. The level of the battery's electrolyte.

C-5.5 Condition of the Case and Cover. Check for cracks or buckling which could result from one of the following:

1. Hold-down attachment too loose, causing vibration damage.
2. Excessive temperatures in the engine compartment, or internally, due to a high charging rate.
3. Freezing of the electrolyte, due to undercharging of the battery (a battery with a 3/4 state of charge is in no danger of freezing).
4. Prolonged overcharging which could cause severe buckling and warping of the battery plates, especially after operating in an undercharged condition over a long period of time.

C-5.6 Evidence of Acid on the Cover. If acid deposits are noted on the cover, it is quite possible that leakage, spillover, or gassing due to a high charging rate is a contributing cause. (A voltmeter check will determine whether leakage is taking place.) If these conditions are not serviced, they can result in an increase in the rate of self-discharge.

C-5.7 Color and Odor of the Electrolyte. Separately or in combination, discoloration of the normally clear electrolyte and/or the presence of an odor similar to that of rotten eggs suggests one or more of the following:

1. The existence of an excessively high charging rate.
2. The adverse affects of deep cycling.
3. The presence of impurities in the electrolyte solution.
4. An aged battery which is approaching the end of its useful life.

C-5.8 Electrolyte Level. Battery capacity is reduced in direct proportion to the amount of active material that is exposed to the air.



WARNING

NEVER use **ACID** to refill the battery.

1. If inspection reveals a low supply, pure water should be added to bring the electrolyte to the proper level. Most batteries will have an electrolyte level indicator near the base of the filler opening. For batteries which do not have a level indicator, add water to restore the level to 1/4 to 1/2 inch above the top of the plates. Never add acid to restore the electrolyte level. This would disrupt the predetermined sulfuric acid to water ratio and cause destruction of the plate separators.
2. The need to add excessive amounts of water suggests the need to check and possibly replace the voltage regulator.

C-5.9 Signs of Abuse. Surface indications of abuse to the battery are a clue to the cause of some troubles. Check the battery posts for damage which may be the result of the following:

1. Hammering.
2. Striking tools or wires across the terminals.
3. Stretching short cables on applications where longer lengths are required.
4. Improper removal of the cables.
5. Improper connection of booster or charging equipment.

C-5.10 Testing the Battery With a Hydrometer.

1. Raise the hood.
2. Remove the battery cell caps.
3. Make sure the electrolyte level in each cell is high enough to withdraw the proper amount of liquid into the hydrometer barrel
 - a. Do not take readings immediately after adding water.

- b. In the event the electrolyte level is too low to test with the hydrometer, add water and charge before testing.
 - c. A correct specific gravity reading can be measured only when the electrolyte temperature is 80°F. If the electrolyte varies from this temperature, compensation must be made in the reading by adding four gravity points (.004) for each 10° above or subtracting .004 for each 10° below 80°F.
4. With the bulb squeezed tightly by thumb pressure, insert the hydrometer pick-up tube into the cell.
 5. Slowly release the thumb pressure until the bulb is fully expanded and the float is suspended freely in the barrel.
 - a. Always hold the barrel vertically to prevent the float from binding or sticking to the sides
 - b. The float assembly should not touch the top or bottom stoppers of the barrel.
- c. Periodically wash the barrel and float assembly with soap and water and inspect the float for leaks.
6. Holding the hydrometer with the liquid at eye level, read the float scale and record the specific gravity reading.
 7. Repeat this procedure (steps 4 through 6) for each cell in the battery.
 8. When all cells are tested, if the specific gravity between the highest and lowest cell varies 50 points (.050) or more the battery is no longer serviceable.
 9. If there is less than a 50 point variation, but the reading of one or more cells is below 1.250, recharge the battery.
 10. If unable to bring the specific gravity of any one cell up to 1.250 after charging, the battery is no longer serviceable.

APPENDIX D ELECTRICAL SCHEMATICS AND CIRCUIT DESCRIPTIONS

D-1. GENERAL.

D-1.1 This appendix contains electrical schematics for all tractors covered in this manual, along with a general description of each working circuit within the schematic.

D-1.2 All switches shown in the electrical schematics are depicted (normally open/normally closed) in their non-engaged position.

D-1.3 The information provided is schematically correct; however, some wire connections may not be located as shown. In many cases the connection is made at the terminal connector (resulting in multiple wires at the connectors).

D-1.4 The following applies to all tractors covered in this manual and will be considered as understood when describing the circuit functions: Battery voltage should always be present at one large terminal of the solenoid via the positive battery cable; and at terminal B of the key switch, through a circuit consisting of a red wire connecting the large solenoid terminal (or positive battery terminal) to the fuse and a black wire connecting the fuse to the B terminal of the key switch. Because the circuit is incomplete, there should be no current flow (amperage) with the key switch in the off position.

D-2. CIRCUIT DESCRIPTION AND SCHEMATICS (All Models).

D-2.1 **General.** The Engine Crank and Engine Run circuits of Models 2160, 2165 and 2185 differ slightly from those of Models 2130, 2135, 2140 and 2145. Therefore, separate schematics and descriptions are included for the Models 2160, 2165 and 2185.

D-2.2 **Function: Engine Cranking - Models 2130, 2135, 2140 and 2145 (Refer to Figure D-1).** Observe the following to start the engine.



WARNING

Operator must be in the seat when starting the engine.

1. The brake pedal must be depressed.
2. The PTO switch must be in the off position.
3. The key switch must be turned to the start position.
 - a. Current flows through the key switch from terminal B to terminal S. From terminal S, current flows through an orange wire to terminal 2 of the PTO switch. With the PTO switch in the off position, current passes through the closed contacts to terminal 1 and on to the interlock switch through the orange wire.
 - b. With the brake pedal depressed, the normally open contacts of the interlock switch are closed. Current passes across the now closed contacts and through the orange wire to the starter solenoid. The solenoid is engaged and the contacts are closed, allowing current to flow from the battery to the starter which cranks the engine over.

D-2.3 **Function: Engine Cranking - Models 2160 and 2165 (Refer to Figure D-2).** Observe the following to start the engine.



WARNING

Operator must be in the seat when starting the engine.

1. The brake pedal must be depressed.
2. The PTO switch must be in the off position.
3. The key switch must be turned to the start position.
 - a. Current flows through the key switch from terminal B to terminal S. From terminal S, current flows through an orange wire to terminal 2 of the PTO switch. With the PTO switch in the off position, current passes through the closed contacts to terminal 1 and on to the interlock switch through the orange wire.

- b. With the brake pedal depressed, the normally open contacts of the interlock switch are closed. Current passes across the now closed contacts and through the orange wire to the starter solenoid. The solenoid is activated, allowing current to flow from the battery to the starter which cranks the engine over.
- c. With the starter solenoid activated, battery current at the starter is also picked up by a red wire connected to the starter cable terminal. Current flows through a diode assembly and a red wire to the carburetor fuel solenoid, activating the fuel solenoid. This allows fuel flow in the carburetor when the key switch is in the start position.

D-2.4 Function: Engine Cranking - Model 2185 (Refer to Figure D-3). Observe the following to start the engine.



WARNING

Operator must be in the seat when starting the engine.

1. The brake pedal must be depressed.
2. The PTO switch must be in the off position.
3. The key switch must be turned to the start position.
 - a. Current flows through the key switch from terminal B to terminal S. From terminal S, current flows through an orange wire to terminal 2 of the PTO switch. With the PTO switch in the off position, current passes through the closed contacts to terminal 1 and on to the interlock switch through the orange wire.
 - b. With the brake pedal depressed, the normally open contacts of the interlock switch are closed. Current passes across the now closed contacts and through the orange wire to the starter solenoid. The solenoid is engaged and the contacts are closed, allowing current to flow from the battery to the starter which cranks the engine over.

D-2.5 Function: Engine Run and Charging - Models 2130, 2135, 2140 and 2145 (Refer to Figure D-4). Observe the following.

1. The operator must be in the seat or the brake pedal must be depressed.
2. The operator must be in the seat if the PTO switch is in the on position.
3. The key switch must be in the run position.
 - a. Battery current passes from terminal B to terminal R of the key switch. From terminal R, current passes through a red wire to the regulator/rectifier of the engine, activating the regulator. With the engine running, alternating current (AC) is produced by the engine alternator and converted to direct current (DC) by the rectifier. This DC current flows in the reverse direction through this same circuit (red wire) to the positive terminal of the battery and maintains the battery charge.
 - b. With the PTO switch in the off position and the tractor in neutral or forward drive, current flows from the R terminal to the reverse switch through a red wire. Current passes across the closed reverse switch and on to the coil of the reverse relay through a white wire, through the relay coil, and on to terminal 7 of the PTO switch through a brown wire. With the PTO off, the contacts of terminals 7 and 5 are closed and the circuit is completed to ground. This energizes the relay, closing the relay points and providing this circuit with a second source to ground.
 - c. Battery current also flows from the R terminal through a red wire to the hourmeter, activating the hourmeter.
 - d. Battery *voltage* from terminal R is supplied through red wires to the PTO clutch, dash lights, and voltage sensor. No current flow (amperage) is present until conditions are met that will complete each circuit to ground.

D-2.6 Function: Engine Run and Charging - Models 2160 and 2165 (Refer to Figure D-5).

Observe the following.

1. The operator must be in the seat or the brake pedal must be depressed.
2. The operator must be in the seat if the PTO switch is in the on position.
3. The key switch must be in the run position.
 - a. Battery current passes from terminal B to terminal R of the key switch. From terminal R, current passes through a red wire to the regulator/rectifier of the engine, activating the regulator. With the engine running, alternating current (AC) is produced by the engine alternator and converted to direct current (DC) by the rectifier. This DC current flows in the reverse direction through this same circuit (red wire) to the positive terminal of the battery and maintains the battery charge. Battery current and/or charge current is also supplied to the carburetor fuel solenoid through a red wire, keeping the solenoid activated.
 - b. With the PTO switch in the off position and the tractor in neutral or forward drive, current flows from the R terminal to the reverse switch through a red wire. Current passes across the closed reverse switch and on to the coil of the reverse relay through a white wire, through the relay coil, and on to terminal 7 of the PTO switch through a brown wire. With the PTO off, the contacts of terminals 7 and 5 are closed and the circuit is completed to ground. This energizes the relay, closing the relay points and providing this circuit with another source to ground.
 - c. Battery current also flows from the R terminal through a red wire to the hourmeter, activating the hourmeter.
 - d. Battery *voltage* from terminal R is supplied through red wires to the PTO clutch, dash lights, and voltage sensor. No current flow (amperage) is present until conditions are met that will complete each circuit to ground.

D-2.7 Function: Engine Run and Charging - Model 2185 (Refer to Figure D-6). Observe the following.

1. The operator must be in the seat or the brake pedal must be depressed.
2. The operator must be in the seat if the PTO switch is in the on position.
3. The key switch must be in the run position.
 - a. Battery current passes from terminal B to terminal R of the key switch. From terminal R, current passes through a red wire to the regulator/rectifier of the engine, activating the regulator. With the engine running, alternating current (AC) is produced by the engine alternator and converted to direct current (DC) by the rectifier. This DC current flows in the reverse direction through this same circuit (red wire) to the positive terminal of the battery and maintains the battery charge. Battery current and/or charge current is also supplied to the carburetor fuel solenoid through a wire (normally red) and diode in the engine wire harness, keeping the solenoid activated.
 - b. With the PTO switch in the off position and the tractor in neutral or forward drive, current flows from the R terminal to the reverse switch through a red wire. Current passes across the closed reverse switch and on to the coil of the reverse relay through a white wire, through the relay coil, and on to terminal 7 of the PTO switch through a brown wire. With the PTO off, the contacts of terminals 7 and 5 are closed and the circuit is completed to ground. This energizes the relay, closing the relay points and providing this circuit with a second source to ground.
 - c. Battery current also flows from the R terminal through a red wire to the hourmeter, activating the hourmeter.
 - d. Battery *voltage* from terminal R is supplied through red wires to the PTO clutch, dash lights, and voltage sensor. No current flow (amperage) is present until conditions are met that will complete each circuit to ground.

D-2.8 Function: Normal and Safety Engine Shutdown - All Models (Refer to Figure D-7).

1. *Normal Engine Shutdown.* A yellow wire runs from the engine wire harness to the M terminal of the key switch. The corresponding wire of the engine harness connects to the grounding terminal of the ignition module(s). When the key switch is turned to the off position, contact is closed between terminals M and G. The ignition module is grounded and engine shutdown occurs.
2. *Safety Engine Shutdown.* A second yellow wire runs to the normally closed seat switch. If the operator is **not** in the seat, the circuit continues through a yellow wire to the normally closed interlock switch and also to terminal 3 of the PTO switch. If the brake pedal is not depressed, the circuit is completed to ground and the engine is shut down. The operator cannot leave the seat without locking down the brake pedal. If the PTO switch is in the on position, contact between terminals 3 and 4 is closed, completing the circuit to ground and shutting down the engine. The operator cannot leave the seat when the PTO switch is on.

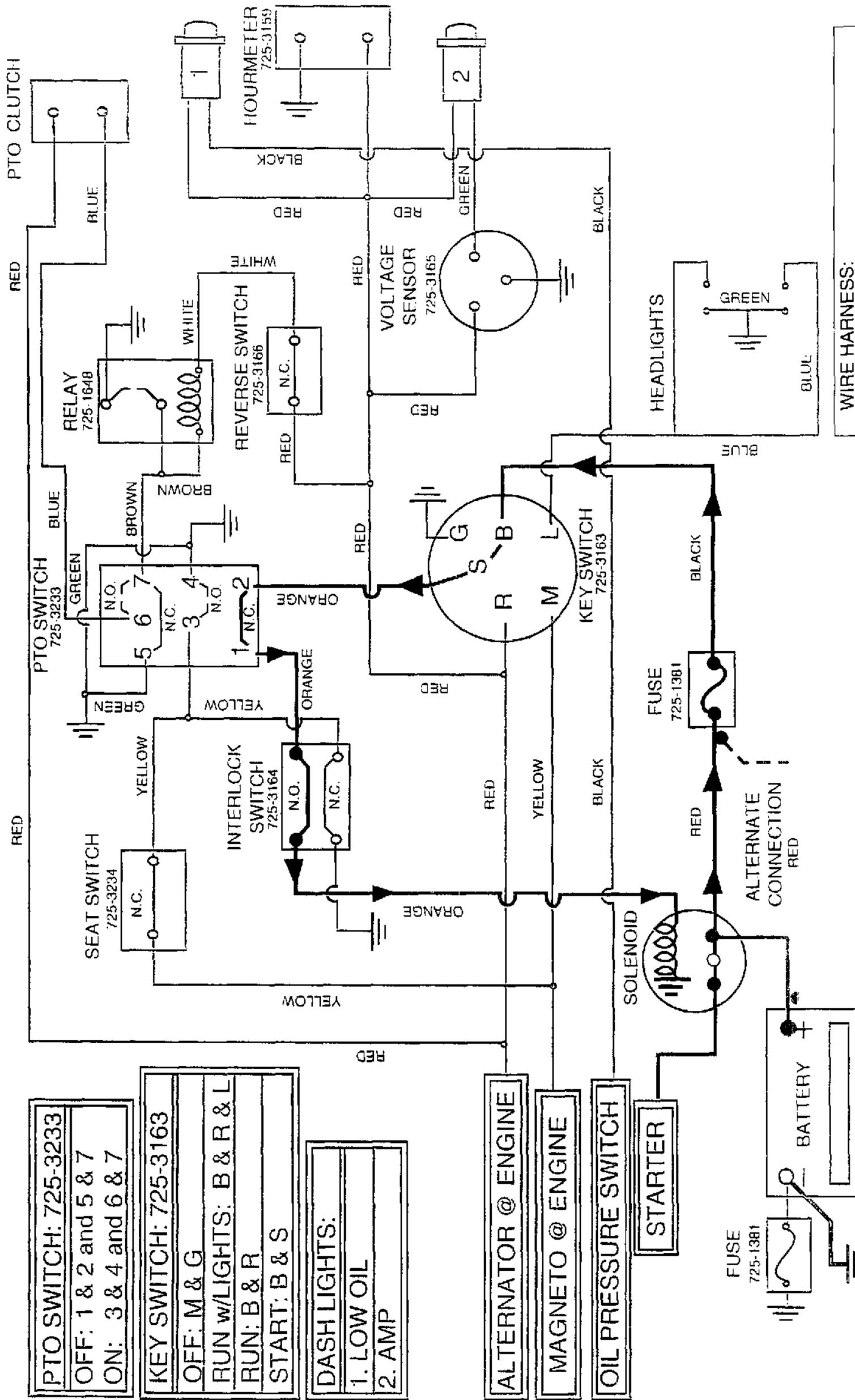
D-2.9 Function: PTO Start and Run - All Models (Refer to Figure D-8).



WARNING

The operator must be in the seat when operating the PTO.

1. Battery voltage from terminal R of the key switch is available at the PTO clutch through a red wire, and also at terminal 6 of the PTO switch through the clutch field coil and a blue wire. Because the circuit is incomplete, no current flows and the PTO clutch is not engaged.
2. As noted previously in the **Engine Run** descriptions, when the PTO switch is in the off position and the tractor in neutral or forward drive, current flows from the R terminal of the key switch to the reverse switch through a red wire. Current passes across the closed reverse switch and through a white wire to the coil of the reverse relay, through the relay coil, and on to terminal 7 of the PTO switch through a brown wire. With the PTO off, the contacts of terminals 7 and 5 are closed and the circuit is completed to ground. This closes the relay points and provides this circuit with a second source to ground.
3. When the PTO switch is moved to the on position, continuity between terminals 5 and 7 is broken and terminals 6 and 7 are closed. The opening of terminals 5 and 7 eliminates one source to ground and the relay coil must now ground through the relay points to remain energized. The closing of terminals 6 and 7 provides the blue wire from the PTO clutch a source to ground through a brown wire and the relay points, thus completing the PTO circuit and engaging the PTO clutch.
4. When the reverse drive pedal is depressed, the reverse switch is actuated and the switch contacts are opened. This breaks the circuit energizing the relay coil, causing the relay points to open. The opening of the relay eliminates the source of ground for the PTO clutch circuit and the clutch disengages.
5. When the reverse drive pedal is released, the reverse switch closes and battery *voltage* is again available to the relay coil. However, because the PTO switch is in the on position and the relay points are open, the circuit cannot be completed. The PTO switch must be moved to the off position, closing terminals 5 and 7, to complete the circuit and re-activate the relay.



PTO SWITCH: 725-3233
 OFF: 1 & 2 and 5 & 7
 ON: 3 & 4 and 6 & 7

KEY SWITCH: 725-3163
 OFF: M & G
 RUN w/LIGHTS: B & R & L
 RUN: B & R
 START: B & S

DASH LIGHTS:
 1. LOW OIL
 2. AMP

ALTERNATOR @ ENGINE
 MAGNETO @ ENGINE
 OIL PRESSURE SWITCH
 STARTER

WIRE HARNESS:
 MODELS 2130 and 2135: 629-3002A
 MODELS 2140 and 2145: 629-3011A

PRIMARY CIRCUIT (CURRENT FLOW)

ELECTRICAL SYSTEM - ENGINE
 CRANK. Models 2130, 2135, 2140
 and 2145.

Figure D-1. Engine Crank, Models 2130, 2135, 2140 and 2145

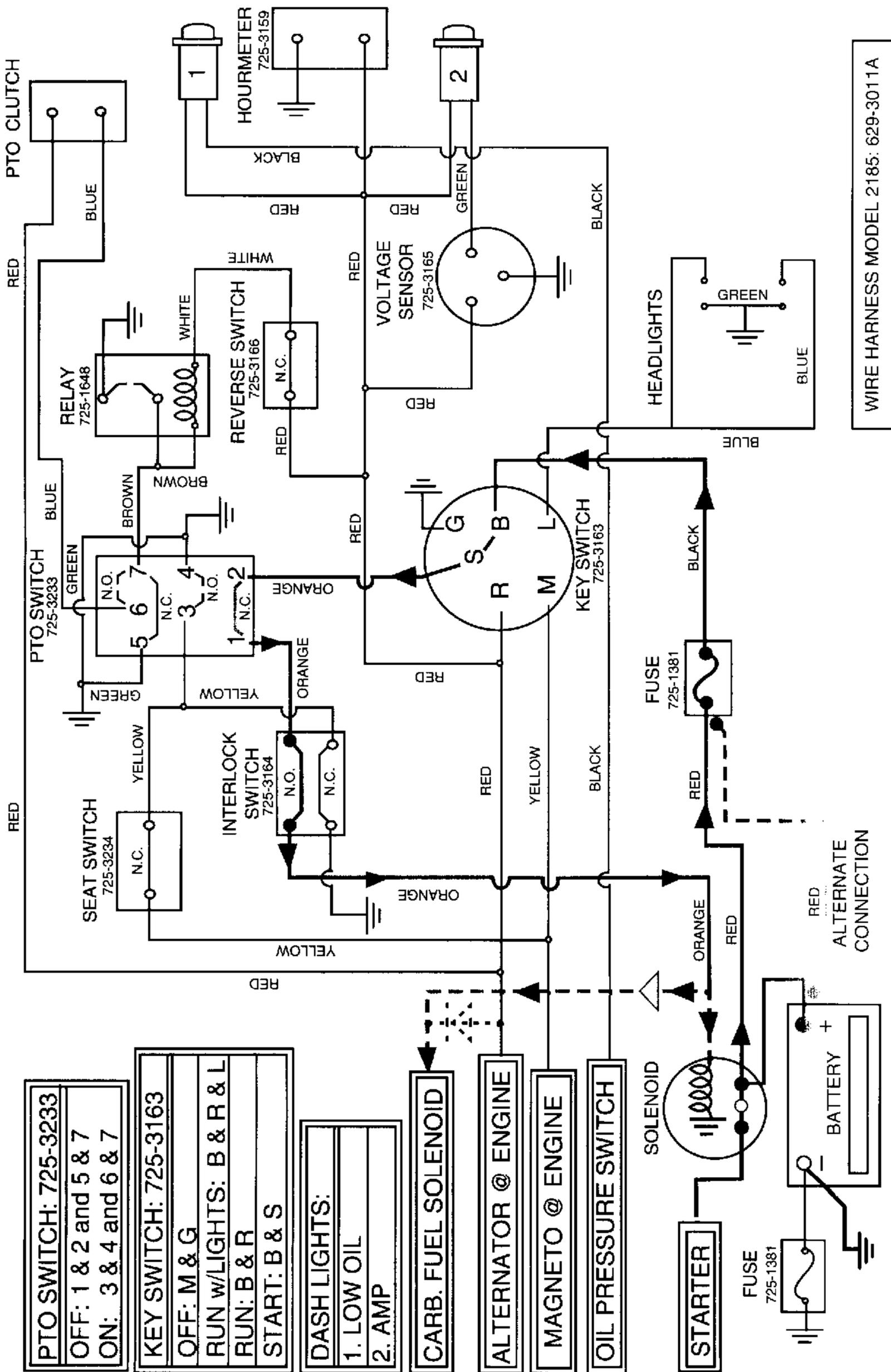
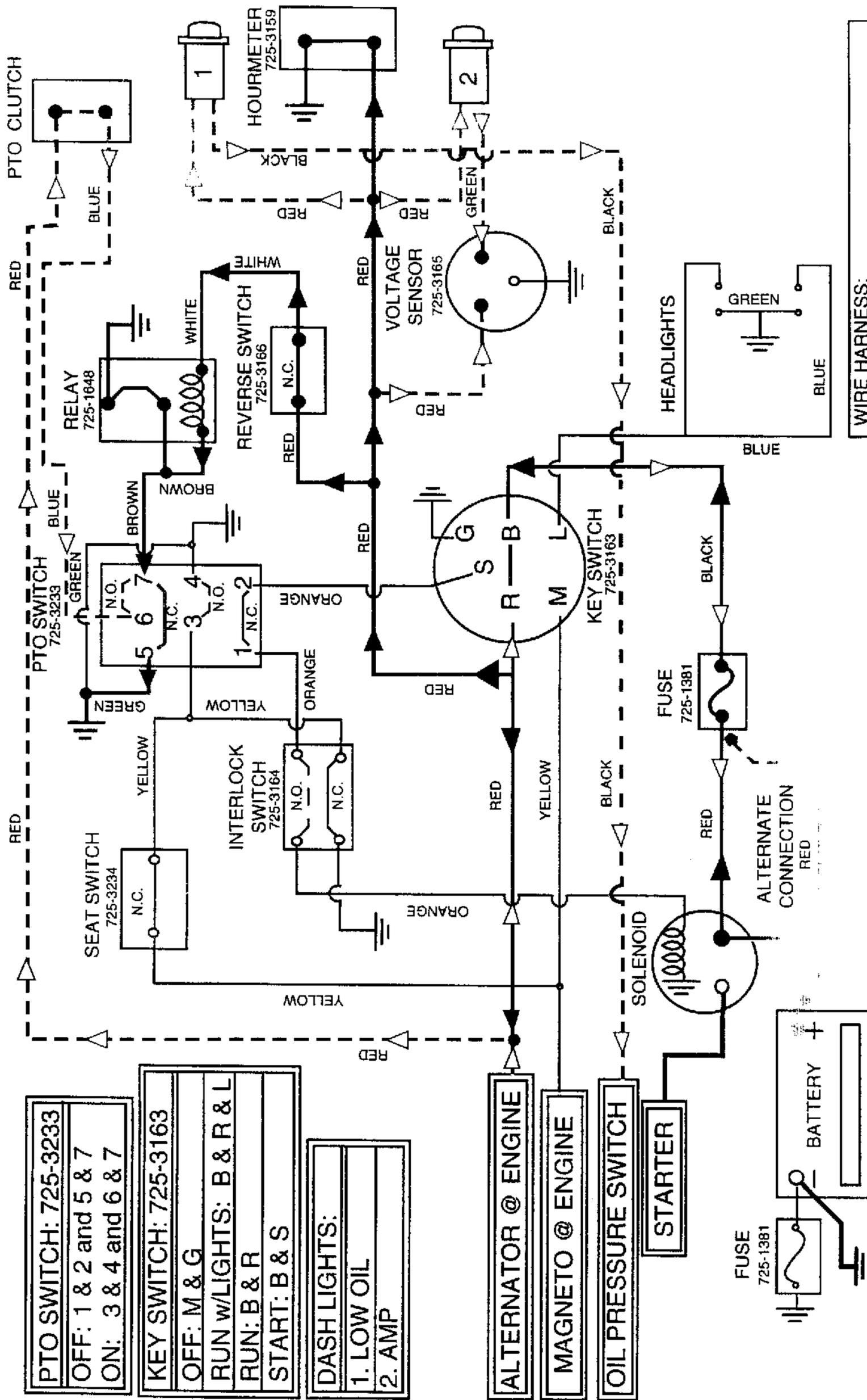


Figure D-3. Engine Crank, Model 2185.



PTO SWITCH: 725-3233
 OFF: 1 & 2 and 5 & 7
 ON: 3 & 4 and 6 & 7

KEY SWITCH: 725-3163
 OFF: M & G
 RUN w/LIGHTS: B & R & L
 RUN: B & R
 START: B & S

DASH LIGHTS:
 1. LOW OIL
 2. AMP

ALTERNATOR @ ENGINE
 MAGNETO @ ENGINE
 OIL PRESSURE SWITCH
 STARTER

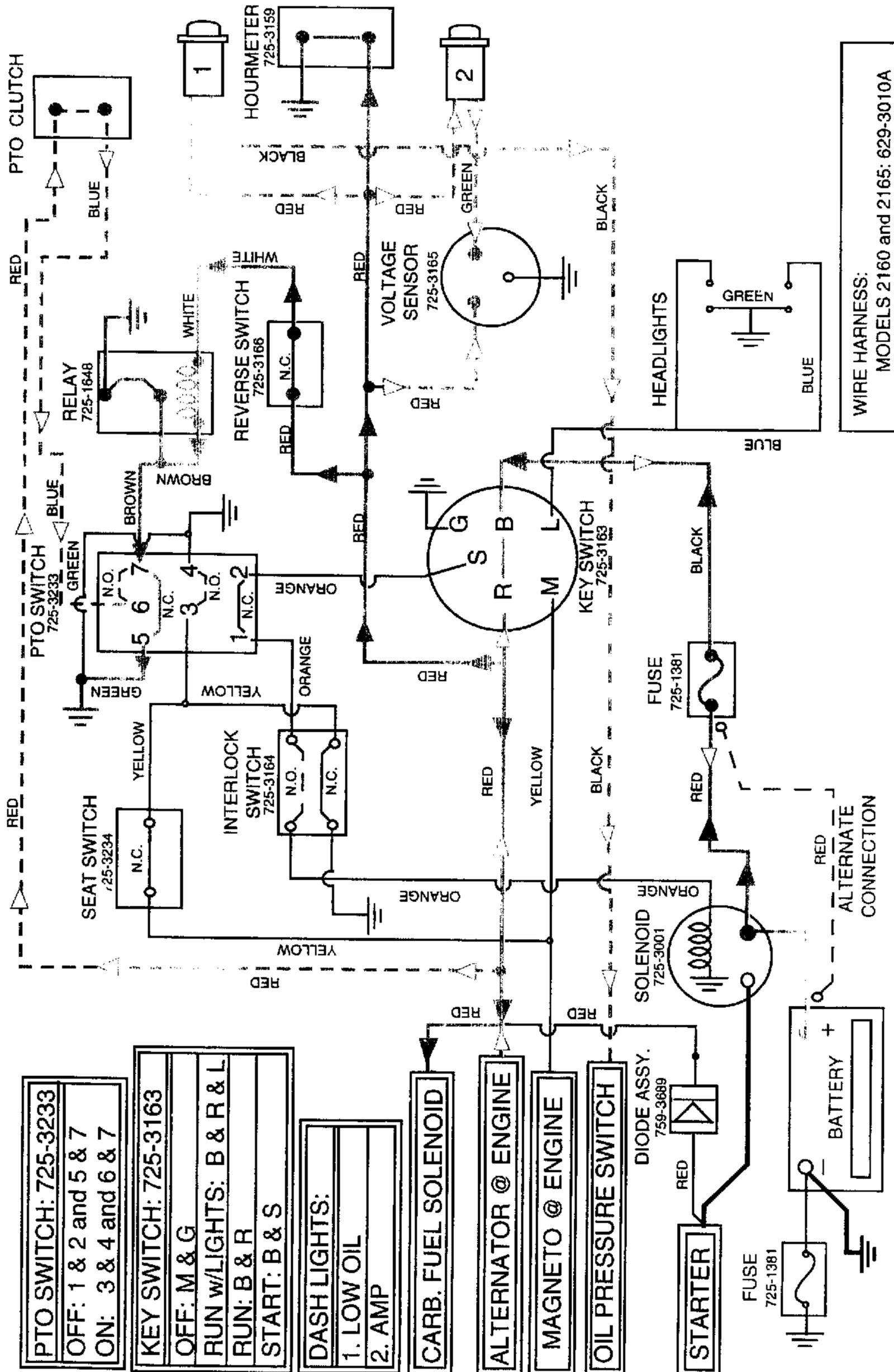
FUSE 725-1381
 BATTERY

WIRE HARNESS:
 MODELS 2130 and 2135: 629-3002A
 MODELS 2140 and 2145: 629-3011A

**ELECTRICAL SYSTEM - ENGINE
 RUN & CHARGE. Models 2130,
 2135, 2140 and 2145.**

PRIMARY CIRCUIT (CURRENT FLOW)
 CHARGE CURRENT
 SECONDARY CIRCUIT (VOLTAGE PRESENT)

Figure D-4. Engine Run and Charging Circuit, Models 2130, 2135, 2140 and 2145.
 D-8



PTO SWITCH: 725-3233
 OFF: 1 & 2 and 5 & 7
 ON: 3 & 4 and 6 & 7

KEY SWITCH: 725-3163
 OFF: M & G
 RUN w/LIGHTS: B & R & L
 RUN: B & R
 START: B & S

DASH LIGHTS:
 1. LOW OIL
 2. AMP

CARB. FUEL SOLENOID
 ALTERNATOR @ ENGINE
 MAGNETO @ ENGINE
 OIL PRESSURE SWITCH

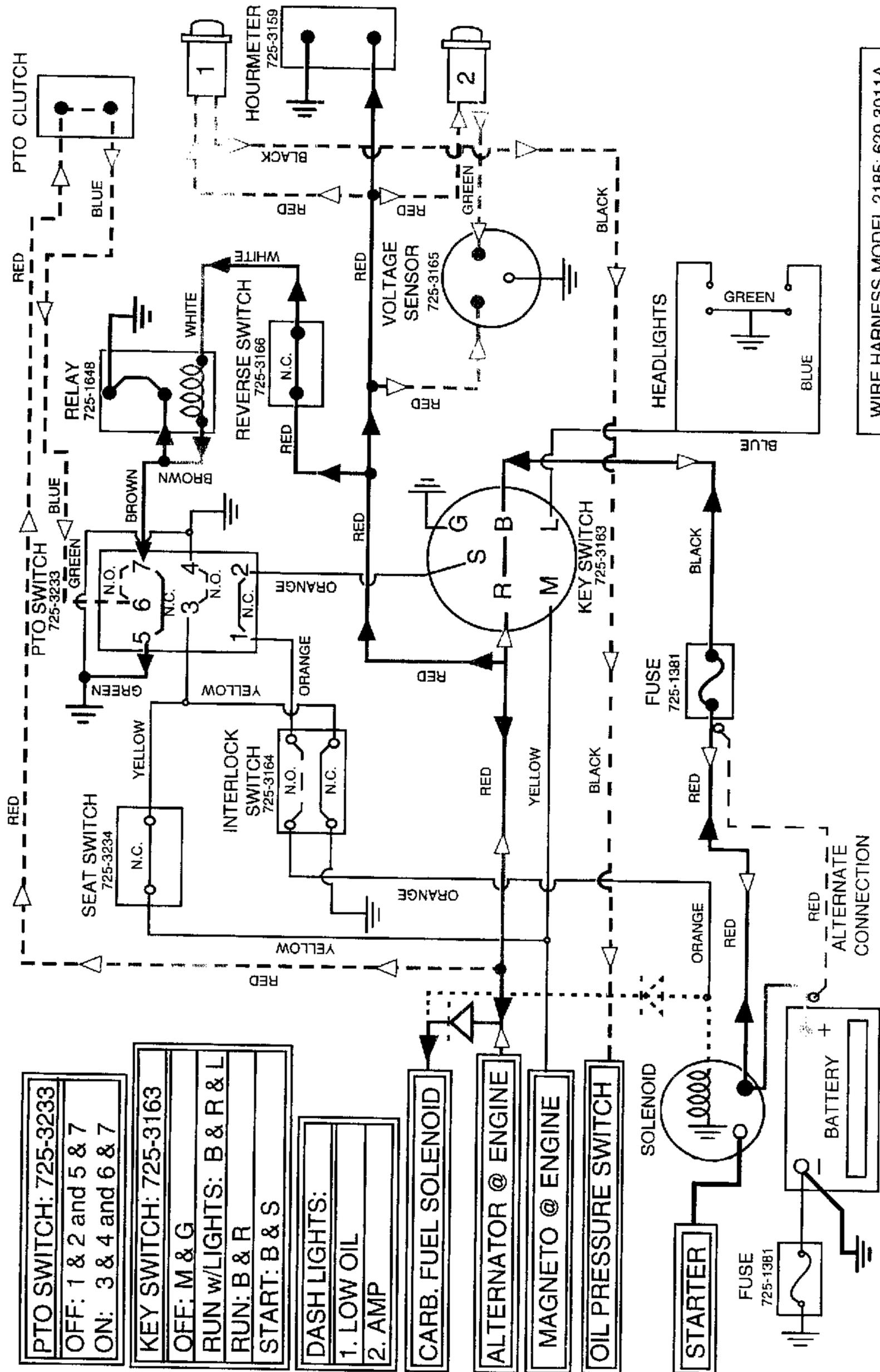
STARTER
 DIODE ASSY. 759-3689
 FUSE 725-1381
 BATTERY +
 ALTERNATE CONNECTION

WIRE HARNESS:
 MODELS 2160 and 2165: 629-3010A

ELECTRICAL SYSTEM - ENGINE
 RUN & CHARGE. Models 2160
 and 2165.

PRIMARY CIRCUIT (CURRENT FLOW)
 CHARGE CURRENT
 SECONDARY CIRCUIT (VOLTAGE PRESENT)

Figure D-5. Engine Run and Charging Circuit, Models 2160 and 2165.
 D-9



PTO SWITCH: 725-3233
 OFF: 1 & 2 and 5 & 7
 ON: 3 & 4 and 6 & 7

KEY SWITCH: 725-3163
 OFF: M & G
 RUN w/LIGHTS: B & R & L
 RUN: B & R
 START: B & S

DASH LIGHTS:
 1. LOW OIL
 2. AMP

CARB. FUEL SOLENOID

ALTERNATOR @ ENGINE

MAGNETO @ ENGINE

OIL PRESSURE SWITCH

SOLENOID

STARTER

FUSE 725-1381

BATTERY

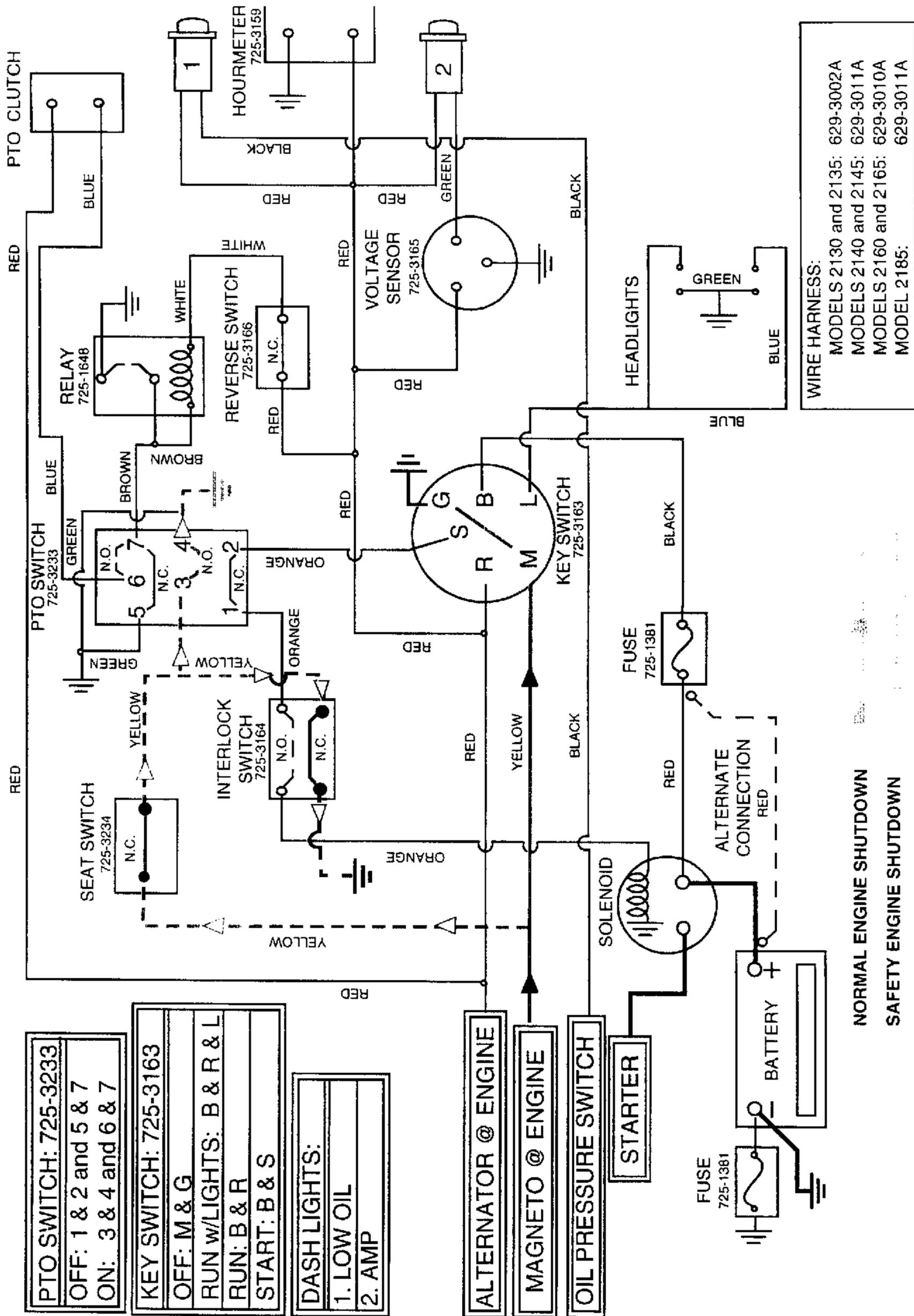
PRIMARY CIRCUIT (CURRENT FLOW)
 CHARGE CURRENT

SECONDARY CIRCUIT (VOLTAGE PRESENT)
 ENGINE WIRE HARNESS

WIRE HARNESS MODEL 2185: 629-3011A

ELECTRICAL SYSTEM - ENGINE
 RUN & CHARGE. Model 2185

Figure D-6. Engine Run and Charging Circuit, Model 2185.
 D-10



PTO SWITCH: 725-3233
 OFF: 1 & 2 and 5 & 7
 ON: 3 & 4 and 6 & 7

KEY SWITCH: 725-3163
 OFF: M & G
 RUN w/LIGHTS: B & R & L
 RUN: B & R
 START: B & S

DASH LIGHTS:
 1. LOW OIL
 2. AMP

ALTERNATOR @ ENGINE
 MAGNETO @ ENGINE
 OIL PRESSURE SWITCH

STARTER

FUSE
725-1381

BATTERY

NORMAL ENGINE SHUTDOWN
 SAFETY ENGINE SHUTDOWN

WIRE HARNESS:
 MODELS 2130 and 2135: 629-3002A
 MODELS 2140 and 2145: 629-3011A
 MODELS 2160 and 2165: 629-3010A
 MODEL 2185: 629-3011A

**ELECTRICAL SYSTEM - NORMAL
 & SAFETY ENGINE SHUTDOWN.**
All Models.

Figure D-7. Normal/Safety Engine Shutdown, ALL MODELS.
 D-11

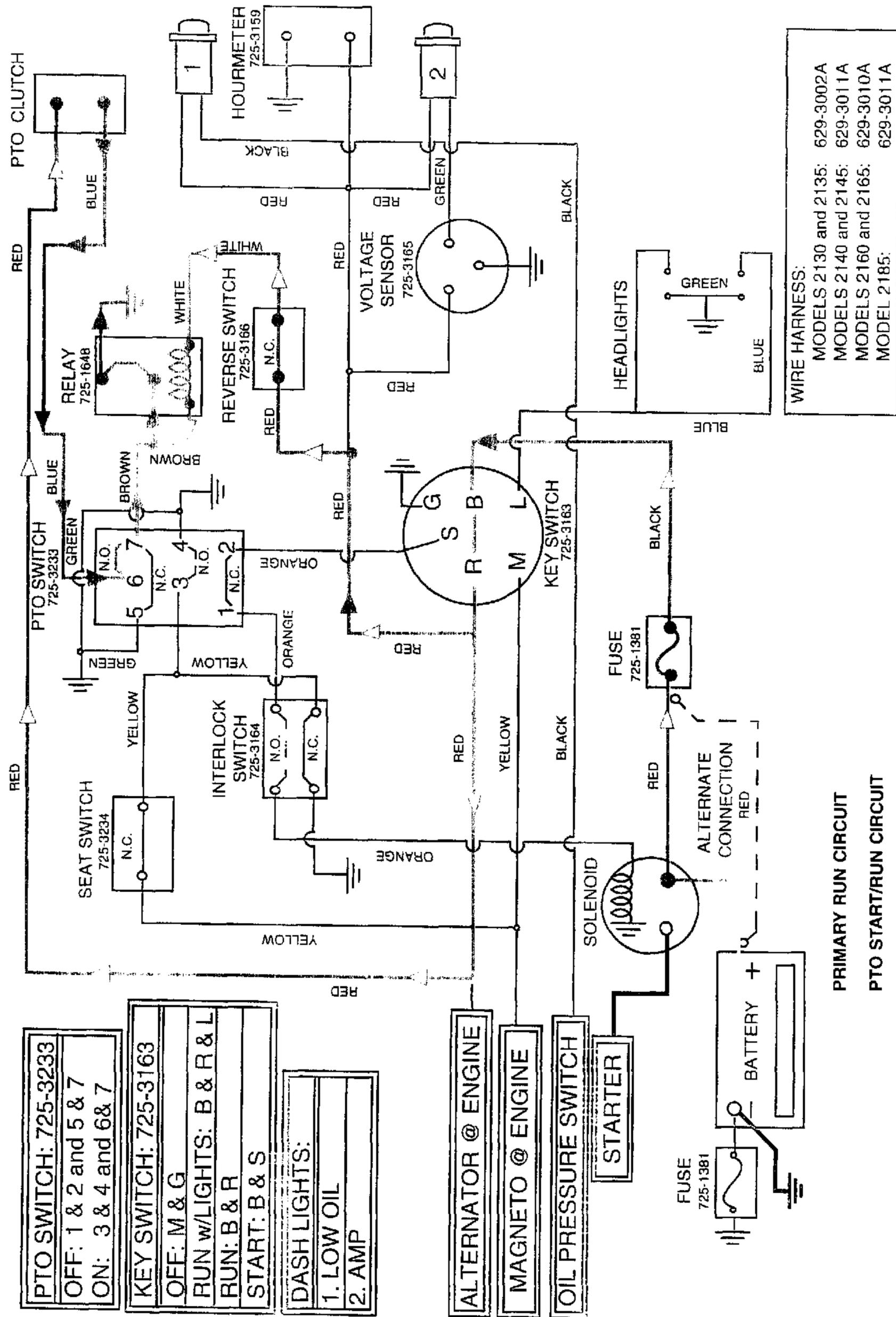


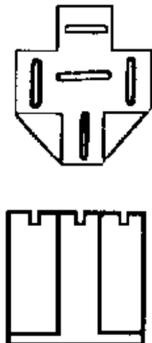
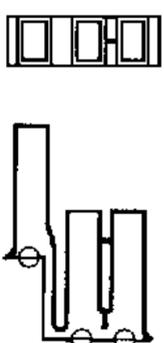
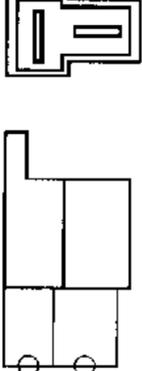
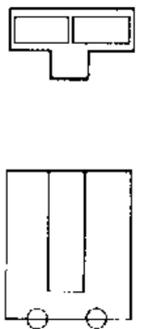
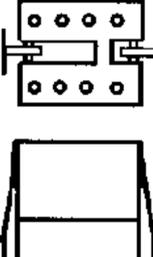
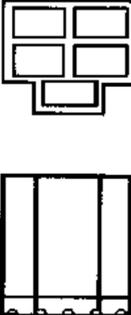
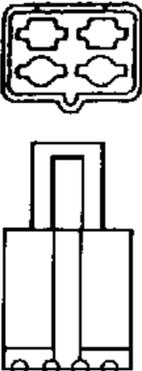
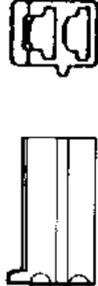
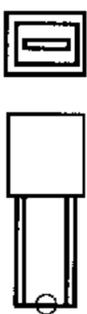
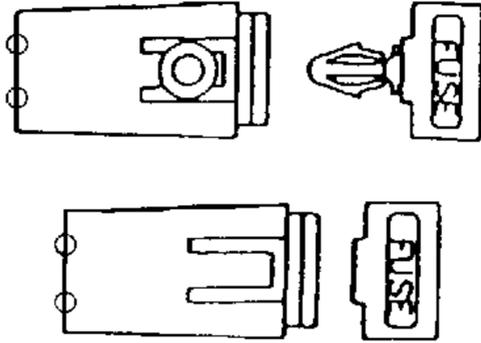
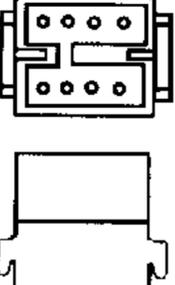
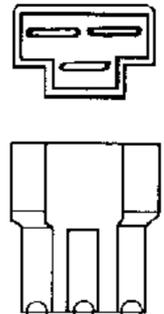
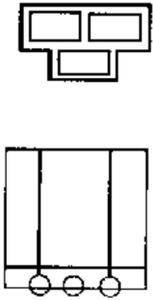
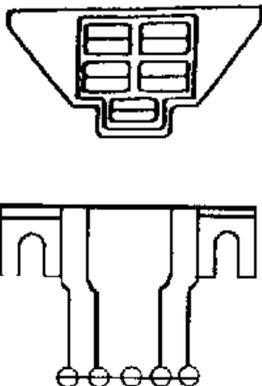
Figure D-8. PTO Start/Run, ALL MODELS.
 D-12

APPENDIX E ELECTRICAL CONNECTION INSULATORS

E-1. GENERAL.

E-1.1 This appendix shows the general configuration and part numbers of electrical connection insulators available through Cub Cadet Service Parts.

Table E-1. Electrical Connection Insulators

<p><u>729-0166</u></p> 	<p><u>729-0132</u></p> 	<p><u>729-0141</u></p> 	<p><u>729-0205</u></p> 	<p><u>725-0768</u></p> 	<p><u>729-0145</u></p> 	<p><u>729-0140</u></p> 
<p><u>729-0139</u></p> 	<p><u>729-0171</u></p> 	<p><u>729-0170</u></p> 		<p><u>729-0125</u></p> 	<p><u>729-0213</u></p> 	<p><u>729-0147</u></p> 
<p><u>729-0142</u></p> 	<p><u>729-0152</u></p> 	<p><u>725-3168</u></p> 			<p><u>729-0207</u></p> 	
<p><u>729-0169</u></p> 	<p><u>729-0177</u></p> 	<p><u>729-0131</u></p> 	<p><u>729-0206</u></p> 			
						

APPENDIX F MOWER DECK BELT INFORMATION

F-1 GENERAL.

F-1.1 This Appendix contains information related to the possible causes of belt problems which are occasionally encountered with belt-driven mower decks.

1. V-belt failures are not normally caused by a bad belt. Such failures are usually the result of the failure of another part.
2. Belts which are frayed or worn on the inside surfaces indicate defective or damaged pulley(s).
 - a. A V-belt should not bottom out in the pulley sheave. If the belt bottoms out, the pulley is too wide or the sheave has spread apart. Refer to Figure I-1.

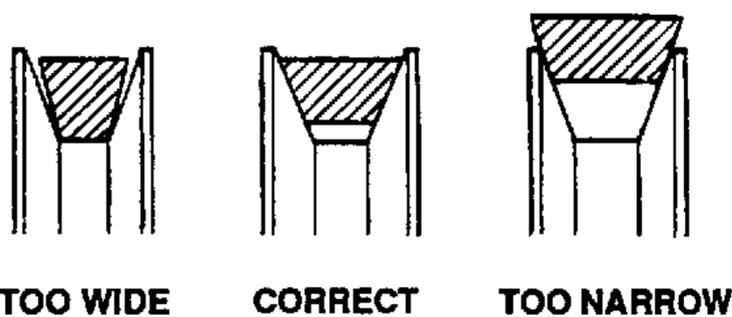


Figure F-1. Belt Position in Pulley Sheaves.

- b. If the sheave is too narrow, the belt will not have full contact with the V-surface of the pulley sheaves. As a general rule, a belt should not ride out of the pulley more than 1/16 inch. A belt riding too far out of the pulley will also appear to be too short.
 - c. Check to determine if the double pulley has been mounted upside down, causing a mismatch between the pulley and belt sizes.
 - d. Inspect the pulley sheaves for dents or nicks caused by thrown objects, prying the belt on or off with a screw driver (or similar device), or striking the pulley to remove it from its blade spindle or shaft.
3. Heavy wear on only one side of the PTO belt indicates misaligned pulleys.
 - a. Figure I-2 shows the optimal alignment of the drive belt running over idler pulleys to the input pulley of the mower. Some misalignment of the mower pulley is normal, due to deck

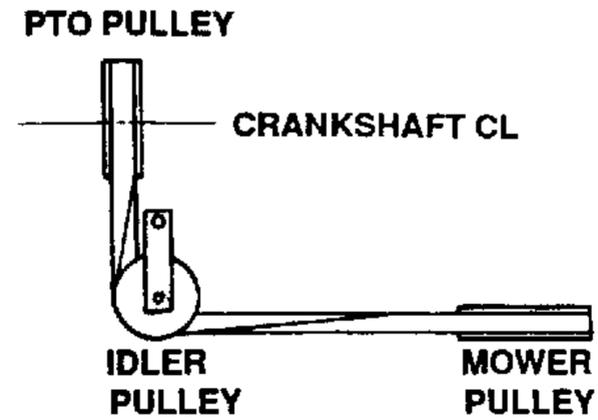


Figure F-2. Properly Aligned Drive Belt.

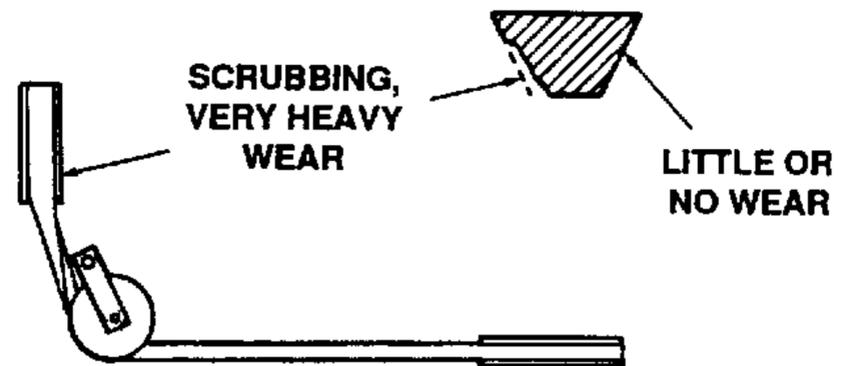


Figure F-3. Excessively Misaligned Drive Belt.

- b. If the sheave is too narrow, the belt will not have full contact with the V-surface of the pulley sheaves. As a general rule, a belt should not ride out of the pulley more than 1/16 inch. A belt riding too far out of the pulley will also appear to be too short.
 - c. Check to determine if the double pulley has been mounted upside down, causing a mismatch between the pulley and belt sizes.
 - d. Inspect the pulley sheaves for dents or nicks caused by thrown objects, prying the belt on or off with a screw driver (or similar device), or striking the pulley to remove it from its blade spindle or shaft.
3. Heavy wear on only one side of the PTO belt indicates misaligned pulleys.
 - a. Figure I-2 shows the optimal alignment of the drive belt running over idler pulleys to the input pulley of the mower. Some misalignment of the mower pulley is normal, due to deck height adjustment. The degree of misalignment will depend on the height selected.
 - b. Figure I-3 shows excessive misalignment (particularly over a short length run of the drive belt) causing one side of the belt to scrub heavily against the PTO pulley.
4. A misaligned pulley may also cause the belt to roll over on the pulley. A belt which has rolled over will have cracks throughout the length of the belt (see Figure I-4). Once a belt has rolled over in the pulleys, it must be replaced.
5. As long as a belt is not slipping, it can be assumed the it has proper tension. An over tightened belt will stress components and reduce the service life of the belt.



Figure F-4. Cracked Drive Belt.

APPENDIX G BASICS OF MOWER DECK OPERATION

G-1 GENERAL.

G-1.1 Appendix G contains information on the basic principles of mower deck operation. Knowledge of these principles can be helpful when attempting to determine the cause of poor mowing deck performance.

G-2 BASIC CUTTING BLADE OPERATION.

Figure G-1 below depicts the normal cutting blade of a rotary mower deck as it moves through the grass.

The leading edge (relative to the direction of rotation) at each end of the blade will have a sharpened cutting edge.

The trailing edges of the blade will have *lift wings*, curving upward from the top surface of the blade. The height and pitch (angle) of these lift wings control the amount of vacuum created by the blade. This *vacuum action* serves the following functions:

- Stands the grass up for a quality cut.
- Provides the air movement needed to discharge the grass clippings.

The designed form of the deck housing directs this air movement, creating the *air flow* which carries the grass clippings out the discharge tunnel of the housing.

Any condition that will spoil this *air flow*, such as a damaged deck housing, grass build-up from previous

mowings, or mowing an excessive volume of grass, will adversely affect the mower deck performance.

As the cutting blade moves forward, it takes *bites* of grass. First one tip then the other, A,B,A,B,A,B, etc.

The size of these *bites* is determined by two things, the *ground speed* of the tractor and the *tip speed* of the cutting blade. Generally it is desirable to keep the bite size very small for a quality cut. The smaller bites allow efficient discharge of the grass clippings, which will lessen problems with clogging. The smaller bites also require less engine horsepower.

The *tip speed* of the cutting blade is limited by regulations to 19,000 feet per minute. The mower deck *must be designed to operate within this regulated tip speed* when the tractor engine is running at top (no load) speed. Consequently, mowing at a slower engine speed will **not** produce the preferred blade tip speed.

The bite size of the of the cutting blade is under the control of the operator through ground speed and engine speed. Because of the *regulated tip speed*, it is

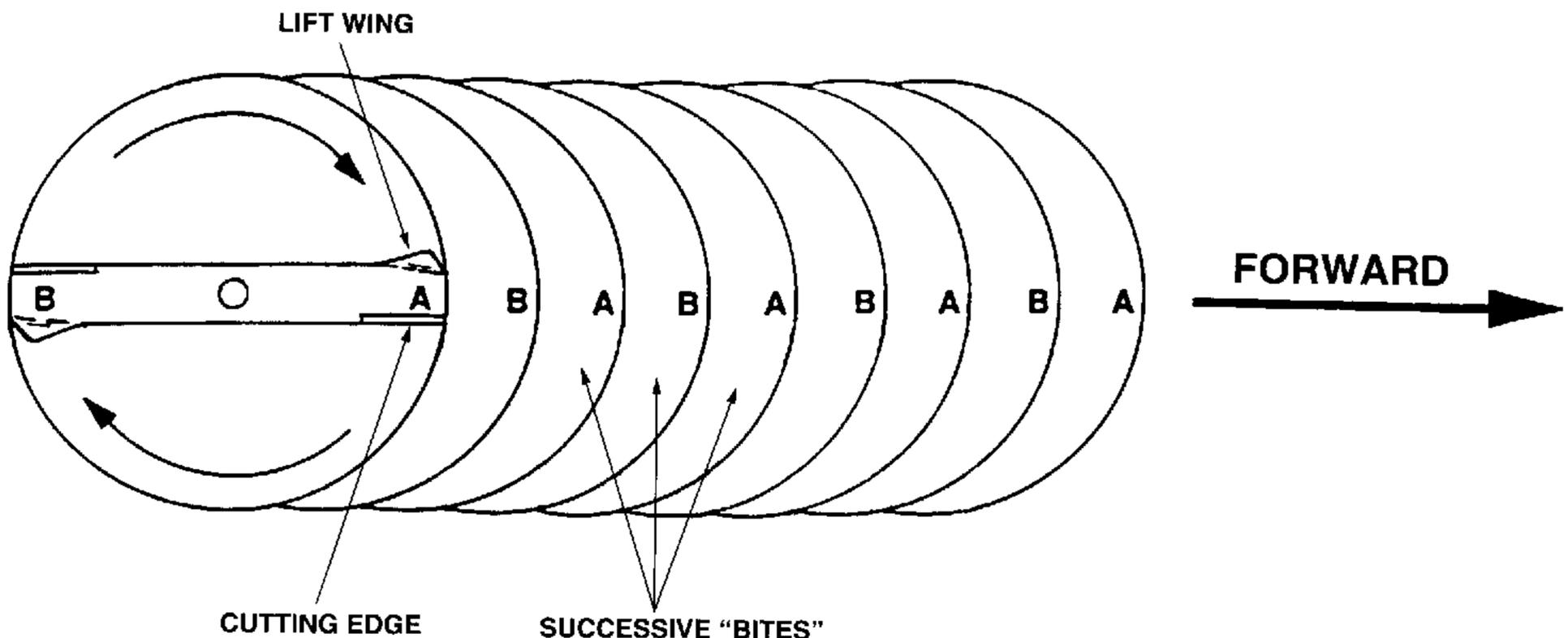


Figure G-1. Basic Cutting Blade Operation.



NOTE:

The forward tilt of the cutting blade shown in this figure is exaggerated for informational purposes. In practice, the front of the blade should be approximately 1/8 to 1/4 inch lower than the rear.

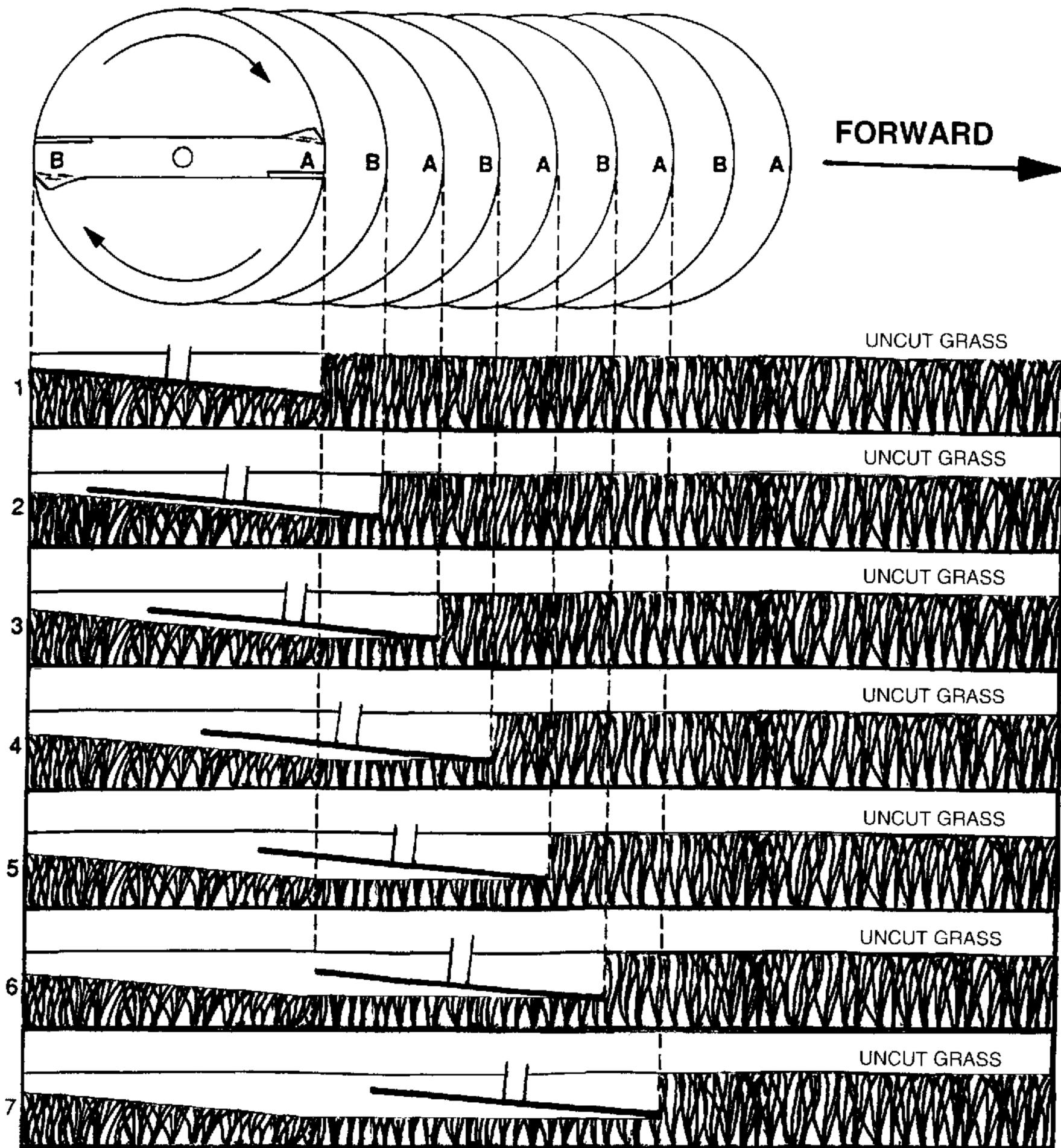


Figure G-2. Cutting Grass With Mower Deck Correctly Leveled.

normally recommended that the tractor engine be operated at full throttle when cutting grass. The operator must decide what *bite size* is right for the particular lawn being mowed, and adjust the ground speed to control the bite size. The right bite for the same lawn may differ from one cutting to the next, or one area to another. The ground speed may have to be adjusted to compensate for changes in *grass length*, *desired cutting height*, *moisture content*, and possible *horsepower* or *terrain* changes. In all cases, the right bite size is determined by the conditions.

G-3 MOWING WITH A CORRECTLY LEVELED MOWER DECK.



The forward tilt of the cutting blade shown in Figure G-2 is exaggerated for informational purposes.

Figure G-2 depicts the cutting blade of a properly leveled mowing deck as it moves through the grass.

Line 1 shows the plane of the cutting blade with the tractor stationary on the lawn. At this point, the mower deck is *engaged* and the blade starts spinning.

Note (line 1) when the mower deck is initially engaged, the cutting blade is in *full contact* with the grass. The entire length of the blade is attempting to cut grass, even the unsharpened areas of the blade. This results in ragged cut at the spot of engagement.

The succeeding lines (2 through 7) show the plane of the blade as it moves forward through the grass. Note that **only** the leading edge of the blade is in contact with the grass, due to the *forward tilt* of the mower deck. Each blade of grass is cut to the proper height with just one cut. **This is the condition desired when performing deck leveling procedures.**

G-4 MOWING WITH AN INCORRECTLY LEVELED MOWER DECK.



The rearward tilt of the cutting blade shown in Figure G-3 is exaggerated for informational purposes.

Figure G-3 depicts the cutting blade of an improperly leveled mowing deck as it moves through the grass.

Line 1 shows the plane of the cutting blade with the tractor stationary on the lawn. At this point, the mower deck is *engaged* and the blade starts spinning.

Note (line 1) when the mower deck is initially engaged, the cutting blade is in *full contact* with the grass. The entire length of the blade is attempting to cut grass, even the unsharpened areas of the blade.

The succeeding lines (2 through 7) show the plane of the blade as it moves forward through the grass. Note that the condition does not improve. The entire length of the blade remains in *full contact* with the grass as a result of the rearward tilt of the mower deck.

As the blade moves forward, the leading edge of the blade makes a major cut of the grass; while the *remainder of the blade length* attempts to make many more *minor cuts*, with the trailing edge making the final cut.

These many *minor cuts* of each blade of grass can result in damaged or frayed grass tips, and, especially in lush grass, can cause a *milking* of the tips. This *milking*, combined with the bits of grass from the many minor cuts, can form a paste-like substance which can stick the underside of the deck housing. As this condition continues, the deck *air flow* is disrupted and eventually the deck becomes plugged.

This multiple cutting of the grass requires more engine horsepower. Also, because of the increased load, may cause premature PTO clutch and/or belt wear.

G-5 CORRECT MOWER DECK LEVELING.

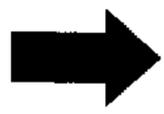


Refer to the appropriate tractor or deck Owner's Manual for the specific deck leveling procedure.

Before attempting to level the mower deck, ensure all deck hangers are properly connected and all tires are inflated properly.

Place the tractor on a hard, flat and level surface.

All measurements requested in the leveling procedure should be measured from the sharpened edge



NOTE:

The rearward tilt of the cutting blade shown in this figure is exaggerated for informational purposes. However, even a minor rearward tilt will result in the condition shown.

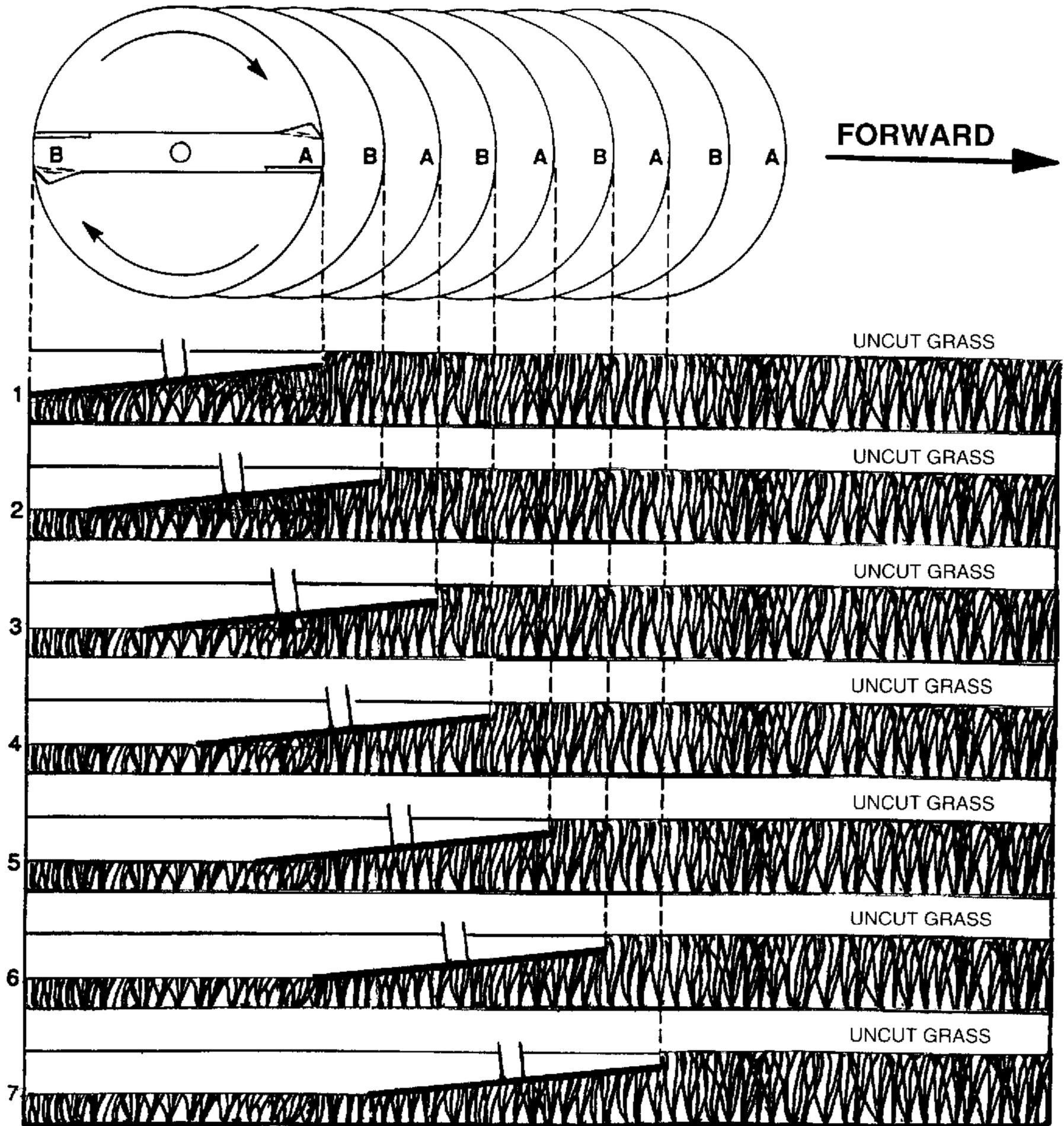


Figure G-3. Cutting Grass With an Incorrectly Levelled Mower Deck.

of the blade tip to the flat level surface. DO NOT take measurements from the deck housing.

Level the mower deck in the following sequence:

- Position the two outer blades so they are pointing left to right (perpendicular to tractor frame).
- Measure the height of the outside blade tips from the flat level surface. The measurements should be within 1/16 inch of each other.
- If necessary, refer to the Owner's Manual to adjust the side to side leveling.
- Rotate the blades 180 degrees and measure again at the same points. The measurements should be the same. A difference in measurements could indicate a bent — blade, blade spindle, or spindle mounting surface.
- Position the outer blades fore and aft (parallel to tractor frame).
- Measure the height of the *forward* blade tips; then measure the *rearward* blade tips. The *forward* measurement should be 1/8 to 1/4 inch **LESS** than the rear measurement.
- If necessary, refer to the Owner's Manual and perform the adjustments needed to achieve the above specified *forward tilt*.

G-6 MOWING WITH A MULTI-BLADE MOWER DECK.



The conditions depicted in Figures G-4.2 and G-4.3 are exaggerated for instructional purposes.

There are two basic types of multi-blade mowing decks.

The less popular type is designed with “timed” cutting blades. This design allows the blades to be placed in line with each other, with the blade tips actually overlapping. The problems with this design are:

- The need for costly *toothed* timing belts and pulleys.
- The frequency of belts “jumping time.” This can allow the blades to contact each other, which could result in extensive damage.

The more practical type is the design shown in Figure G-4. With this design, the blades are positioned off-set behind one another and cannot come in contact with each other.

Figure G-4.1 depicts this design on a two-bladed mower deck moving in the straight forward direction. Note the *staggered* arrangement of the blades create the *blade overlap* that is necessary to avoid leaving strips of uncut grass.

Characteristics of this style mowing deck can, however, affect the mowing procedure and resulting quality of cut. Particularly when turning the tractor while mowing.

Figure G-4.2 depicts the same two-bladed mower deck in a tight left turn. Note that as the tractor turns, the right blade trails behind the left blade; momentarily increasing the the *blade overlap* while decreasing the cutting width.

Figure G-4.3 shows the two-bladed mower in a tight right turn. As the tractor turns, the space between the blades momentarily aligns with the direction of travel. This allows a thin strip of uncut grass to pass between the blades, resulting in a poor quality cut.

On a three-bladed deck, both of the conditions described above (Fig. G-4.2 and G-4.3) apply when turning the tractor in either direction.

- When turning to the left, the space between the left and center blades aligns with the direction of travel, leaving uncut grass. The right blade trails the center blade; increasing the overlap while decreasing the cutting width.
- When turning to the right, although the conditions and results are reversed, the same poor quality cut is obtained.

When mowing the lawn with a multi-blade mower deck, the following procedures are recommended for the best cut quality and appearance:

- When making turns, reduce the tractor ground speed.
- Cut in a “*clover-leaf pattern*,” with the turns being made over the previously cut grass.
- Remove areas where the initial cut was made while turning the tractor.
- Discharge grass clippings toward the previously mowed areas.

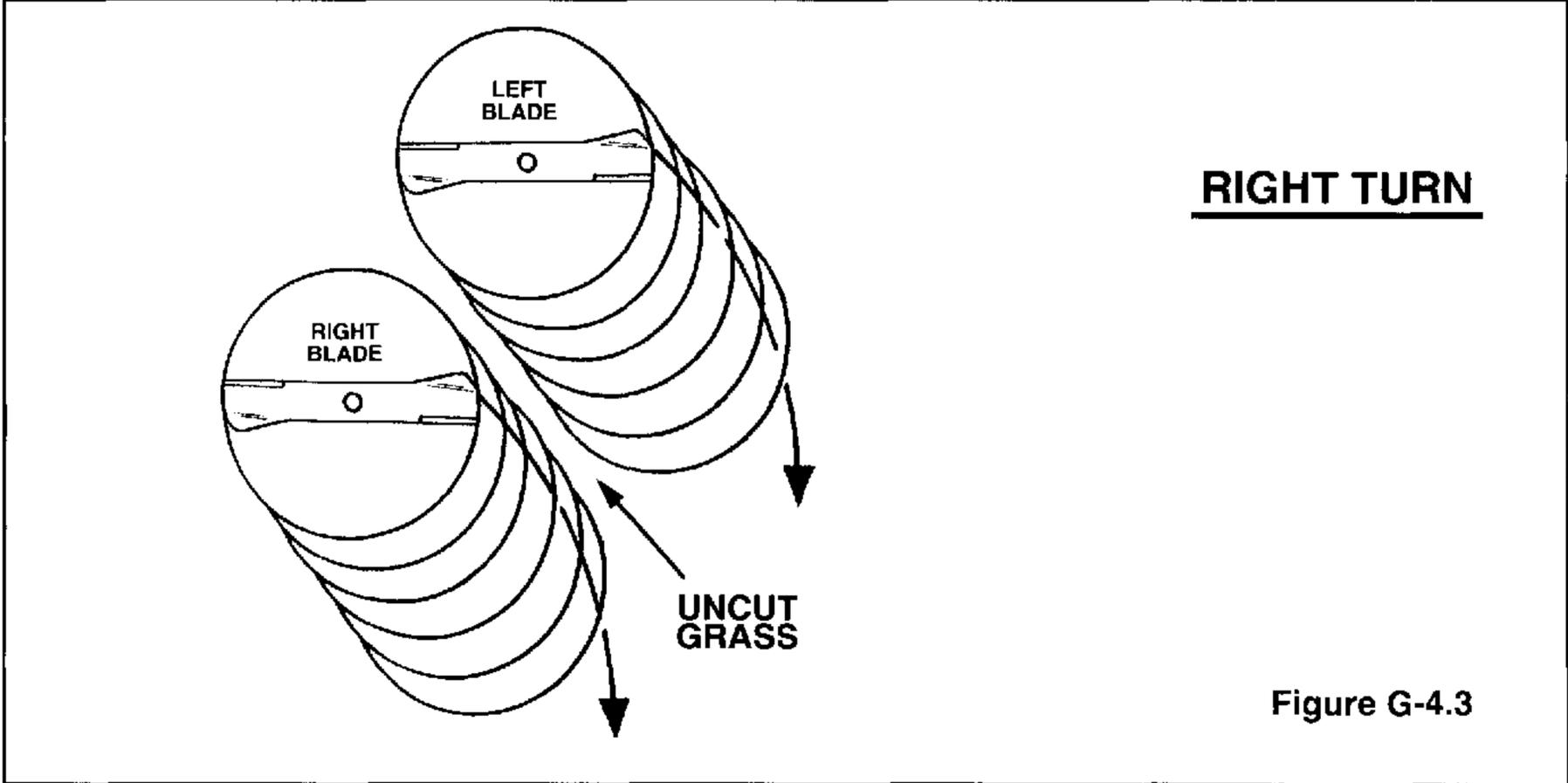
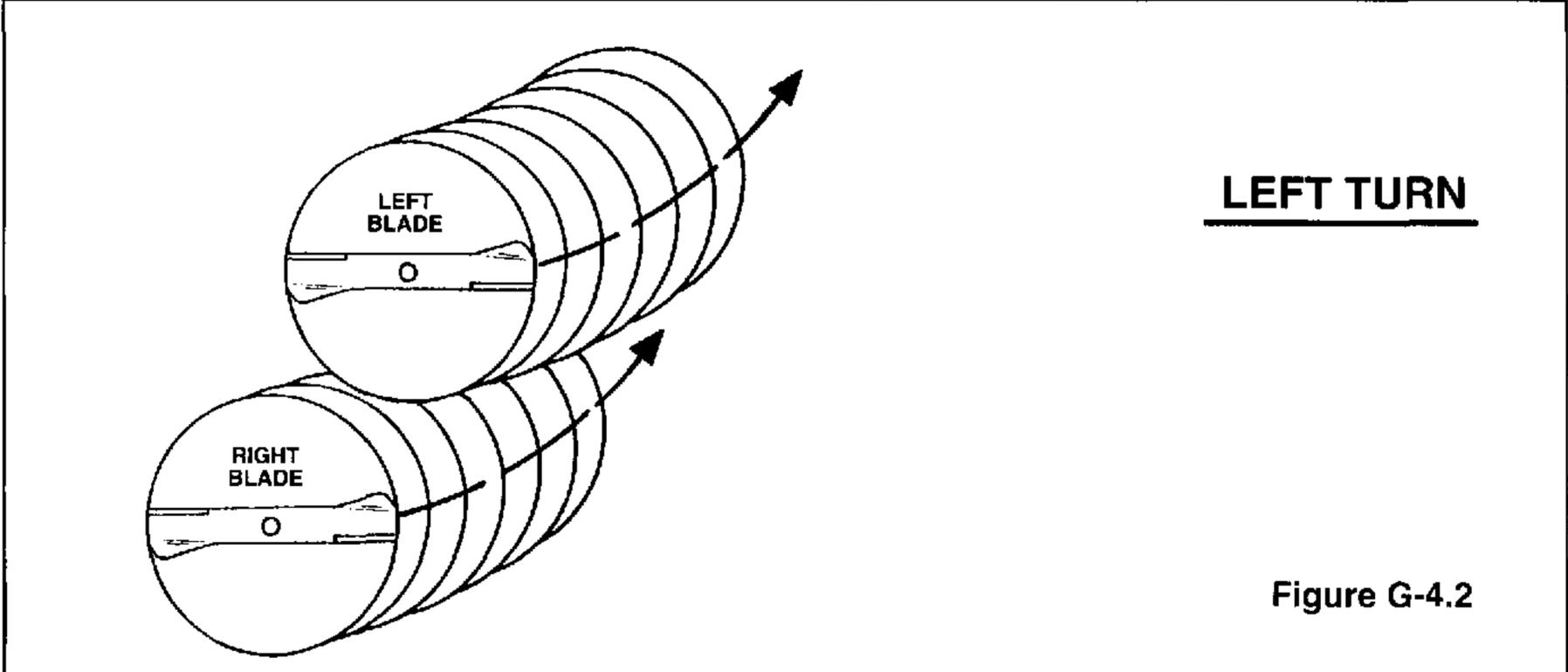
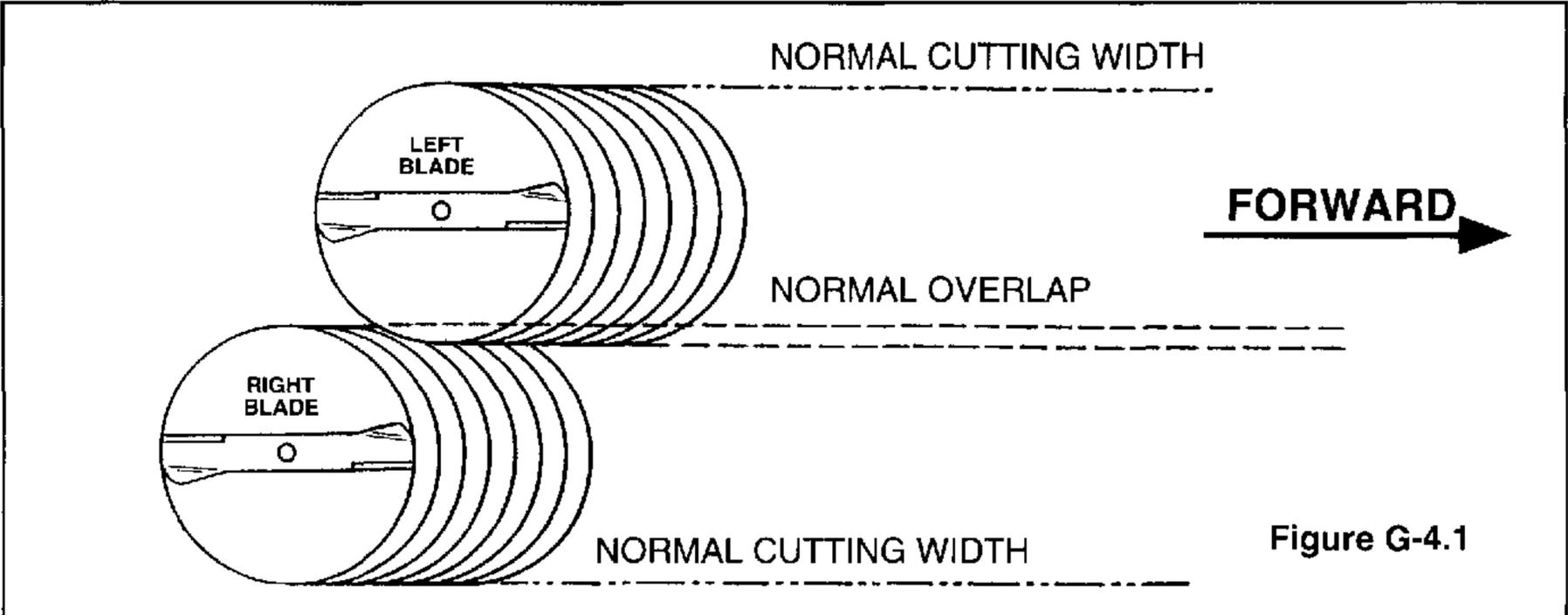


Figure G-4. Mowing with Multi-Blade Mowing Decks.

Table G-1. Basic Mower Deck Troubleshooting.

MOWER DECK TROUBLESHOOTING		POSSIBLE CAUSES	<u>SYMPTOMS</u>													
			UNCUT GRASS (PATCHES)	UNCUT GRASS (RANDOM)	UNCUT GRASS (BETWEEN BLADES)	UNEVEN CUT	SCALPING	VIBRATION	BELTS SLIPPING	ENGINE LUGS DOWN	POOR BAGGING	PLUGGING DECK/CHUTE	GRASS BLOWING OUT FROM UNDER DECK	BLADE SPINDLE BEARING FAILURE	DECK DRIVE PULLEY BEARING FAILURE	
OPERATOR CONTROLLED	GROUND SPEED TOO HIGH		•	•	•	•				•	•	•	•			
	ENGINE RPM TOO SLOW		•	•	•	•			•		•	•	•			
	CUTTING TOO LOW						•			•	•	•	•			
	CUTTING TOO HIGH		•	•	•											
	TURNING SPEED TOO FAST		•	•	•	•	•									
ENVIRONMENT RELATED	ROUGH OR UNEVEN TERRAIN		•	•	•	•	•				•					
	GRASS VERY DRY		•	•	•							•				
	GRASS VERY WET		•	•	•	•			•	•	•	•				
	GRASS TOO HIGH		•	•	•	•			•	•	•	•				
	SANDY TERRAIN													•	•	
MAINTENANCE PROBLEMS	DECK INCORRECTLY ADJUSTED		•	•	•	•	•	•	•	•	•	•	•	•		
	DEBRIS UNDER DECK		•	•	•				•	•	•	•	•	•	•	
	'V' BELTS DAMAGED/STRETCHED		•	•	•				•	•		•	•			
	OIL OR GREASE ON BELTS		•	•	•					•		•	•			
	PTO CLUTCH SLIPPING		•	•	•				•			•	•			
	DULL OR WORN BLADES (CUTTING EDGE OR LIFT WINGS)		•	•	•	•					•	•	•	•		
	BLADES BENT/OUT OF BALANCE		•	•	•	•	•	•	•			•	•	•		
	BLADES INSTALLED UPSIDE DOWN		•	•	•	•	•	•	•	•	•	•	•			
	INCORRECT BLADES		•		•			•		•	•	•	•	•		
	TIRES OVER/UNDER INFLATED		•	•		•	•									
MECHANICAL PROBLEMS	DAMAGED OR SEIZED SPINDLES OR BEARINGS		•	•	•				•	•	•	•	•		•	•
	PTO CLUTCH WORN OR IMPROPERLY ADJUSTED		•	•	•				•			•	•			
	DECK WORN OR DAMAGED											•	•	•		

APPENDIX H TORQUE DATA

H-1. GENERAL.

H-1.1 This appendix provides the general torque information listed below. Except where a specific torque value is contained in the text, these torque values should be used to tighten fasteners removed when performing the repair procedures covered in this manual.

Table H-1 — Standard Torque Data for Inch Nuts and Bolts - Given In Foot Pounds.

Table H-2 — Standard Torque Data for Inch Nuts and Bolts - Given In Newton Meters.

Table H-3 — Conversion Table - Inches to Millimeters.

Table H-4 — Conversion Table - Millimeters to Inches.

Table H-1. Standard Torque Data for Inch Nuts and Bolts - Foot Pounds

Recommended torque for all standard unplated nuts and bolts, provided:

- A. Surface finish is oxide coated, oil quenched or bright.
- B. All threaded surfaces are clean and lubricated with SAE-30 engine oil or equivalent (see NOTE).
- C. Joints are rigid, that is, no gaskets or compressible materials are used.
- D. When reusing nuts or bolts, use minimum torque values.

NOTE: Multiply the standard torque by:

- .65 when finished jam nuts are used.
- .70 when Molykote, white lead or similar mixtures are used as lubricants.
- .75 when phosphate coated and oiled bolts or nuts are used.
- .85 when cadmium or zinc dichromate bolts or nuts are used.
- .90 when hardened surfaces are used under the nut or bolt head.
(this applies to standard unplated hardware only)

1 Foot Pound = 1.355 Newton Meters

Bolt or Stud Diameter	Type 2 Studs Only		Type 2 Bolts 6" Length or Less		Type 2 Bolts Longer Than 6"		Type 5 All Lengths		Type 8 - All Lengths			
									† Only When Used In Cast (gray) Iron		All Other Applications	
Inches	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1/4	5	6	6	7	4	4	9	10	11	13	13	14
5/16	12	13	11	13	7	8	18	20	22	25	25	28
3/8	21	24	21	24	13	14	33	37	41	46	45	50
7/16	35	38	35	38	20	23	53	60	65	74	75	85
1/2	52	58	52	59	31	35	80	90	100	112	115	130
9/16	70	80	75	85	45	51	115	130	145	160	165	185
5/8	98	110	104	117	62	70	160	180	200	225	225	255
3/4	174	195	185	205	180	200	285	320	355	400	400	450
7/8	280	315	265	300	265	300	460	575	570	640	645	725
1	420	470	380	425	380	425	685	720	855	960	970	1090
1-1/8	595	670	535	600	535	600	850	950	1210	1360	1375	1545
1-1/4	840	945	700	785	700	785	1200	1350	1705	1920	1940	2180
1-3/8	1100	1240	925	1045	925	1045	1570	1760	2235	2515	2540	2860

† When bolt penetration is 1-1/2 times the diameter of the bolt.

Bolt Type Identification Chart

SAE Grade	Description	Bolt Head Marking *
2	WILL BE BLANK IN THE CENTER OF THE HEAD Low or Medium Carbon Steel Not Heat Treated	
5	WILL HAVE 3 RADIAL LINES Quenched and Tempered Medium Carbon Steel	
8	WILL HAVE 6 RADIAL LINES Quenched and Tempered Special Carbon or Alloy Steel	

* The center marking identifies the bolt manufacturer.

Table H-2. Standard Torque Data for Inch Nuts and Bolts - Newton Meters

Recommended torque for all standard unplated nuts and bolts, provided:

- A. Surface finish is oxide coated, oil quenched or bright.
- B. All threaded surfaces are clean and lubricated with SAE-30 engine oil or equivalent (see NOTE).
- C. Joints are rigid, that is, no gaskets or compressible materials are used.
- D. When reusing nuts or bolts, use minimum torque values.

NOTE: Multiply the standard torque by:

- .65 when finished jam nuts are used.
- .70 when Molykote, white lead or similar mixtures are used as lubricants.
- .75 when phosphate coated and oiled bolts or nuts are used.
- .85 when cadmium or zinc dichromate bolts or nuts are used.
- .90 when hardened surfaces are used under the nut or bolt head.
(this applies to standard unplated hardware only)

1 Newton Meter = 0.738 Foot Pound

Bolt or Stud Diameter	Type 2 Studs Only		Type 2 Bolts 6" Length or Less		Type 2 Bolts Longer Than 6"		Type 5 All Lengths		Type 8 - All Lengths			
									† Only When Used In Cast (gray) Iron		All Other Applications	
Inches	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1/4	7	8	8	9	5	5	12	14	15	18	18	19
5/16	16	18	15	18	9	11	24	27	30	34	34	38
3/8	28	33	28	33	18	19	45	50	56	62	61	68
7/16	47	52	47	52	27	31	72	81	88	100	102	115
1/2	71	79	71	80	42	47	109	122	136	152	156	176
9/16	95	109	102	115	61	69	156	176	197	217	224	251
5/8	133	149	141	159	84	95	217	244	271	305	305	346
3/4	236	265	251	278	244	271	387	434	482	543	543	611
7/8	380	427	360	407	360	407	624	780	773	868	875	984
1	570	638	516	577	516	577	929	977	1160	1303	1316	1479
1-1/8	807	909	726	814	726	814	1153	1289	1642	1845	1866	2096
1-1/4	1140	1282	950	1065	950	1065	1628	1832	2313	2605	2632	2958
1-3/8	1492	1682	1255	1418	1255	1418	2130	2388	3033	3412	3446	3881

† When bolt penetration is 1-1/2 times the diameter of the bolt.

Bolt Type Identification Chart

SAE Grade	Description	Bolt Head Marking *
2	WILL BE BLANK IN THE CENTER OF THE HEAD Low or Medium Carbon Steel Not Heat Treated	
5	WILL HAVE 3 RADIAL LINES Quenched and Tempered Medium Carbon Steel	
8	WILL HAVE 6 RADIAL LINES Quenched and Tempered Special Carbon or Alloy Steel	

* The center marking identifies the bolt manufacturer.

Table H-3. Conversion Table - Inches to Millimeters

Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
1	25.4	26	660.4	51	1295.4	76	1930.4
2	50.8	27	685.8	52	1320.8	77	1955.8
3	76.2	28	711.2	53	1346.2	78	1981.2
4	101.6	29	736.6	54	1371.6	79	2006.6
5	127.0	30	762.0	55	1397.0	80	2032.0
6	152.4	31	787.4	56	1422.4	81	2057.4
7	177.8	32	812.8	57	1447.8	82	2082.8
8	203.2	33	838.2	58	1473.2	83	2108.2
9	228.6	34	863.6	59	1498.6	84	2133.6
10	254.0	35	889.0	60	1524.0	85	2159.0
11	279.4	36	914.4	61	1549.4	86	2184.4
12	304.8	37	939.8	62	1574.8	87	2209.8
13	330.2	38	965.2	63	1600.2	88	2235.2
14	355.6	39	990.6	64	1625.6	89	2260.6
15	381.0	40	1016.0	65	1651.0	90	2286.0
16	406.4	41	1041.4	66	1676.4	91	2311.4
17	431.8	42	1066.8	67	1701.8	92	2336.8
18	457.2	43	1092.2	68	1727.2	93	2362.2
19	482.6	44	1117.6	69	1752.6	94	2387.6
20	508.0	45	1143.0	70	1778.0	95	2413.0
21	533.4	46	1168.4	71	1803.4	96	2438.4
22	558.8	47	1193.8	72	1828.8	97	2463.8
23	584.2	48	1219.2	73	1854.2	98	2489.2
24	609.6	49	1244.6	74	1879.6	99	2514.6
25	635.0	50	1270.0	75	1905.0	100	2540.0

1 Inch = 25.4 Millimeters

To convert inches to millimeters, the inch value to be converted should be written down, carried to as many decimal places as the desired accuracy requires. It should then be split into groups of not more than two figures each. The equivalent of each group should then be taken from the table, proper regard being given to the position of the decimal point in each case, and the equivalent values of the groups added together. This sum will be the millimeter equivalent of the inch value given.

For example, to convert 2.4635 inches to millimeters:

$$\begin{array}{r}
 2.0000 \text{ inches} = 50.80000 \text{ millimeters} \\
 .4600 \text{ inches} = 11.684000 \\
 \underline{.0035 \text{ inches} = .08890} \\
 2.4635 \text{ inches} = 62.57290 \text{ millimeters} \\
 \text{Correct to 3 decimal places.} \\
 2.4635 \text{ inches} = 62.573 \text{ millimeters}
 \end{array}$$

Table H-4. Conversion Table - Millimeters to Inches

Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches
1	.0393701	26	1.0236220	51	2.0078740	76	2.9921260
2	.0787402	27	1.0629921	52	2.0472441	77	3.0314961
3	.1181102	28	1.1023622	53	2.0866142	78	3.0708661
4	.1574803	29	1.1417323	54	2.1259842	79	3.1102362
5	.1968504	30	1.1811024	55	2.1653543	80	3.1496063
6	.2362205	31	1.2204724	56	2.2047244	81	3.1889764
7	.2755906	32	1.2598425	57	2.2440945	82	3.2283465
8	.3149606	33	1.2992126	58	2.2834646	83	3.2677165
9	.3543307	34	1.3385827	59	2.3228346	84	3.3070866
10	.3937008	35	1.3779528	60	2.3622047	85	3.3464567
11	.4330709	36	1.4173228	61	2.4015748	86	3.3858268
12	.4724409	37	1.4566929	62	2.4409449	87	3.4251968
13	.5118110	38	1.4960630	63	2.4803150	88	3.4645669
14	.5511811	39	1.5354331	64	2.5196850	89	3.5039370
15	.5905512	40	1.5748031	65	2.5590551	90	3.5433071
16	.6299213	41	1.6141732	66	2.5984252	91	3.5826772
17	.6692913	42	1.6535433	67	2.6377953	92	3.6220472
18	.7086614	43	1.6929134	68	2.6771654	93	3.6614173
19	.7480315	44	1.7322835	69	2.7165354	94	3.7007874
20	.7874016	45	1.7716535	70	2.7559055	95	3.7401575
21	.8267717	46	1.8110236	71	2.7952756	96	3.7795276
22	.8661417	47	1.8503937	72	2.8346457	97	3.8188976
23	.9055118	48	1.8897638	73	2.8740157	98	3.8582677
24	.9448819	49	1.9291339	74	2.9133858	99	3.8976378
25	.9842520	50	1.9685039	75	2.9527559	100	3.9370080

1 Millimeter = .03937008 Inch

To convert millimeters to inches, the millimeter value to be converted should be written down, carried to as many decimal places as the desired accuracy requires. It should then be split into groups of not more than two figures each. The equivalent of each group should then be taken from the table, proper regard being given to the position of the decimal point in each case, and the equivalent values of the groups added together. This sum will be the inch equivalent of the millimeter value given.

For example, to convert 75.384 millimeters to inches:

75.000	millimeters	=	2.9527559	inches
.380	millimeters	=	.0149606	
<u>.004</u>	millimeters	=	<u>.0001574</u>	
75.384	millimeters	=	2.9678739	inches
			Correct to 5 decimal places.	
75.384	millimeters	=	2.96787	inches

TRACTOR SERVICE MANUAL FOR SERIES 2000

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