SERIES 3000
SERVICE MANUAL

770-10227

Series 3000 Technical Handbook
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3000 Series Pre-Delivery Check List

CUSTOMER NAME_____ MODEL NUMBER_____

CUSTOMER ADDRESS_____ SERIAL NUMBER_____

CITY_____ STATE_____ ZIP_____ TECHNICIAN _____

ENGINE INFORMATION
Engine Make _____
Model No. _____
Serial No. _____
Spec No. _____

TRANSMISSION INFORMATION
Transmission make _____
Model No. _____
Serial No. _____

CUSTOMER SIGNATURE_____ **DATE**_____

Operator's Manual Complete?
- ❑ Owners Manual
- ❑ Attachment Guide
- ❑ Merchandising Catalog

Battery and connections
- ❑ Remove battery and fill to proper level
- ❑ Allow battery to stand for 30 minutes
- ❑ Charge at 4 AMPS max. to 1.265 specific gravity

Tire Pressure
- ❑ Front
- ❑ Rear

*Refer to owners manual for proper PSI

Check all lights and indicators
- ❑ Headlights, Tail and Backup lights
- ❑ Low oil light
- ❑ Hour meter

Lubrication
- ❑ Transmission oil level
- ❑ Engine oil level

*Check tractor owners manual for type and grade

Air cleaner and connections
- ❑ Remove air cleaner cover to verify air cleaner is installed
- ❑ Insure retaining bolt seal is installed
- ❑ Insure proper installation of breather hose
- ❑ Proper operation of throttle and choke cables

Steering
- ❑ Check for 1/8 to 1/4 inch toe in.
- ❑ Insure equal travel right and left
- ❑ Check steering wheel tilt

Hydrostatic / Gear drive and brakes
- ❑ Check brakes
- ❑ Check for neutral when brake pedal is depressed
- ❑ Check for neutral when forward and reverse pedals are released
- ❑ Check cruise control

Grease pivot points
- ❑ Front axle pivot bar
- ❑ Each steering knuckle
- ❑ Each front wheel
- ❑ Steering housing
- ❑ All grease points on mower deck

*Refer to specific mower owners manual

Install attachments mower / snow blower etc.
- ❑ Check PTO
- ❑ Inspect linkage
- ❑ Deck level adjustment

Safety operations
- ❑ Check no cut in reverse
- ❑ Check engine shutdown with PTO engaged and seat empty
- ❑ Check engine shutdown with empty seat and parking brake not engaged

Check engine speeds / Controls
- ❑ Low idle - 1200 RPM
- ❑ High idle - 3600 RPM

Final inspection
- ❑ Overall appearance
- ❑ Clean and polish

Hydraulics
- ❑ Check lift valve
- ❑ Check lift cylinder

Cub Cadet 1999 Specifications

SERIES 3000 TRACTORS

Features and General Specifications:

- Hydrostatic Drive w/Cruise Control
- Shaft Drive Transmission
- Shaft Drive Deck and Front Attachments
- Power Steering
- Hydraulic Lift
- Welded Full Length Twin Channel, 9 gauge Steel Frame
- Deck Height Indicator
- Halogen Headlights
- Taillights w/Reverse Lights
- 27" Turning Radius
- Cast Iron Front Axle
- 4.5 Gallon Fuel Tank
- E-Vac PTO System
- Tilt Steering Wheel
- Differential Lock (3205, 3225)
- Speed:
  – 0-7 MPH Forward
  – 0-4 MPH Reverse
- Tires:
  – 16" x 7.5" Front
  – 24" x 10.5" Rear

Model	Factory No.	Series 3000
3165	14A-654-100	16.0 HP B&S Twin Vanguard OHV, Hydro, Power Steering, Power Lift
3185*	14A-665-100	18.0 HP B&S Twin Vanguard, Hydro, Power Steering, Power LIft
3186	14A-668-100	18.0 HP Kohler V-Twin OHV, Hydro, Power Steering, Power Lift
3205	14A-685-100	20.0 HP Liquid Cooled V-Twin Kawasaki OHV, Power Steering, Power Lift, Differential Lock
3225	14A-688-100	22.0 HP V-Twin Kohler OHV, Power Steering, Power Lift, Differential Lock
*Limited Quantities Available		

Model	Factory No.	Attachments and Accessories
345	190-345-100	Fan Assist Bagger for 48"/54" Deck
289	190-289-100	48" Deck, Shaft Driven
290	190-290-100	54" Deck, Shaft Driven
291	190-291-100	60" Deck, Shaft Driven (3205 & 3225 only)
343	190-343-100	Hydraulic Front Hitch System
352	190-352-100	54" Front Mounted Snow Blade (Requires 343; Optional 288 or 171)
353	190-353-100	45" Snow Thrower, Shaft Driven (Req. 343)
299	190-299-100	Ag Tires/Rims 23" x 8.5"
249	190-249-100	Ag Tires/Rims 23" x 10.5"
366	190-366-100	Rear Turf Tires/Rims 24" x 10.5"
365	190-365-100	Hydraulic 3 Pt. Hitch, Category “O”
924	190-924-100	‘A’ Frame Hitch Adapter, Converts Sleeve Hitch Attachments To Cat. “O” 3-Pt. Hitch
163	190-163-100	42"' Lawn Sweeper
653	190-653-100	10 Cu. Ft. Cart
368	190-368-100	10 Cu. Ft. Heavy Duty Dump Cart
425	190-425-100	17 Cu. Ft. Heavy Duty Dump Cart
161	190-161-000	48" Poly Bed Liner (Fits All 10’s) (Tailgate Section Must Be Cut Out By Dealer)

Cub Cadet 1999 Specifications (continued)

Model	Factory No.	Attachments and Accessories
162	190-162-000	60" Poly Bed Liner (Fits All 17's) (Tailgate Section Must Be Cut Out By Dealer
288	190-288-100	Hydraulic Front Angle Kit (Cannot Be Used w/353)
171	190-171-100	Manual Angle Kit (Cannot Be Used w/353)
412	190-412-100	Rear Wheel Weights (2 per Set) @ 75#
413	190-413-100	Front & Rear Wt. Bracket (Supports 390 Wt.)
190390	190-390-100	Suitcase Weights
506	590-605-100	Mulcher, 48" Deck+
507	590-507-100	Mulcher, 54" Deck++
920	190-920-000	12" Mold Board Plow (Requires 365)
921	190-921-000	Tandem Disc (Requires 365)
922	190-922-000	Spring Cultivator (Requires 365)
400	190-400-100	38" Tiller, 8.0 HP B&S Engine (Requires 365)
206	190-206-100	Series 3000 Tractor Display Stand

NOTES:

\+ To Mount on Series 3000 Deck You Must Order Qty. 1 - 603-0624 and 1- 603-0625 From Parts

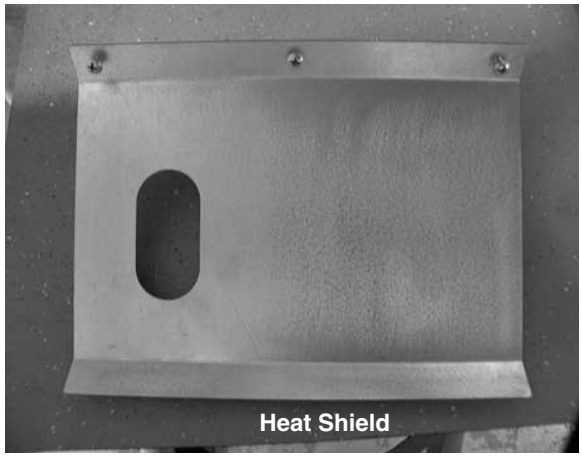
++ To Mount on Series 3000 Deck You Must Order Qty. 1- 603-0626 and 1- 603-0627 From Parts
It is recommended that the 3165 be equipped with a 48" deck for maximum performance.

NOTES

1999 3000 Series Engineering Updates

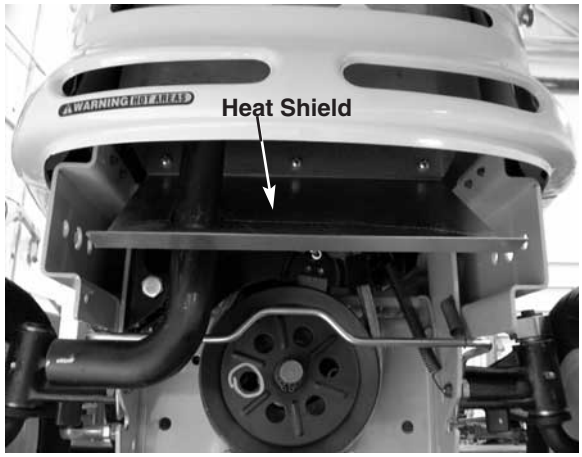
HEAT SHIELD

A heat shield has been installed on all 3000 series tractors for 1999. The heat shield prevents the exhaust gases from browning the grass. Use kit #759-3927. See Service Advisory CC-371.



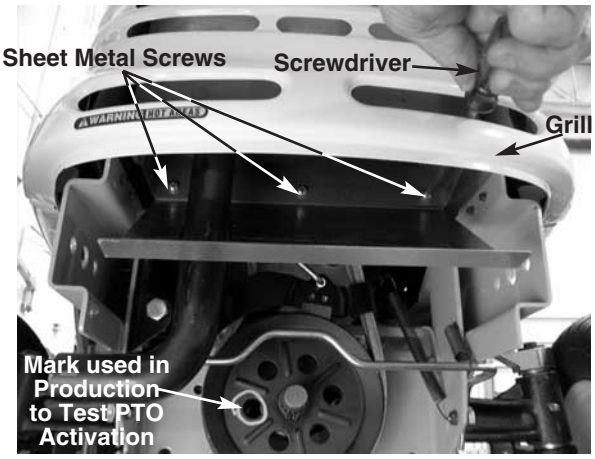
1. Remove both of the hex bolts and lock nuts securing the front bumper to the frame using a 3/4" socket and a 3/4" wrench.
2. Remove the bumper.
3. Slide the muffler shield over the exhaust pipe and rotate it into position.

   NOTE: Align all three holes in the top of the muffler shield with the existing shield. Also, the muffler shield will be slanting towards the bottom of the front grill assembly.



4. Secure the muffler shield with three sheet metal screws.

   NOTE: Use a long flat blade screwdriver through the air holes in the grill to tighten the sheet metal screws securely.



5. Install the bumper.

LIFT LINK

The lift link has been modified by strengthening the powder metal that connects the lift lever to the hydraulic valve for 1999.

CHECK VALVE

For 1999, a check valve will be installed to the hydraulic valve to prevent the decks and other attachments from leaking down during and after usage.

LIFT STOP BRACKET

A lift stop bracket will be installed on the left hand side of the deck to prevent the deck from hanging up during operations. Use kit #759-3927.

ROLLER HEIGHT ADJUSTER

The rear roller height adjustment mechanism will be changed for 1999. A newly designed detent pin will replace the old one, preventing the loss of cutting height during operations. Use kit #759-3928.

FRONT DECK HANGER ASSEMBLY

The front roller bracket has been redesigned to prevent the front lift rod from detaching during operation.

SEAT IMPROVEMENTS

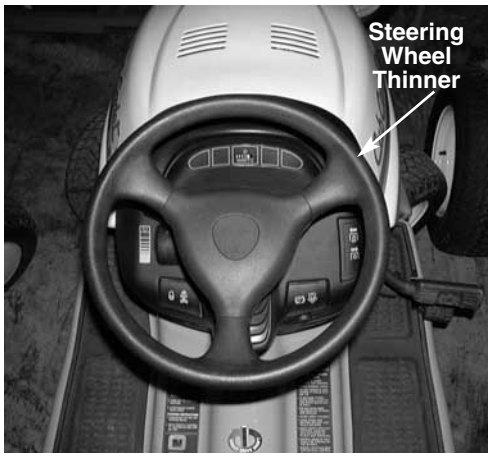
A safer seat spring, part number 732-0869, can be installed to level the seat for petite operators. In addition, the seat part number 757-3010A, is now made out of a softer material for better operator comfort. See Service Advisory CC-358A Sections 5 and 6.

FRONT MOWER DECK HEIGHT ADJUSTER

The front mower deck height adjuster pins have been changed from ball detent pins to quick pull pins.

STEERING WHEEL

The thickness of the steering wheel has been increased for operator comfort.

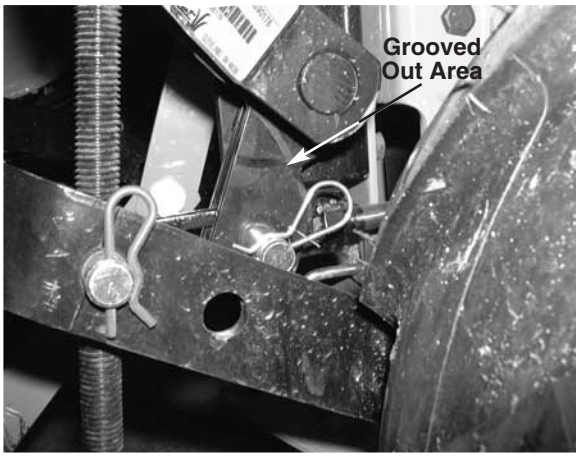


Old Style Steering Wheel

New Thicker Steering Wheel

ROCK SHAFT ASSEMBLY FOR 3 POINT HITCH 190-365-100

The cylinder arms have been redesigned with two V sections cut out to allow for clearance of the clevis nut on the cylinder shaft. See Service Advisory CC-364.



3000 Series Lift Assembly

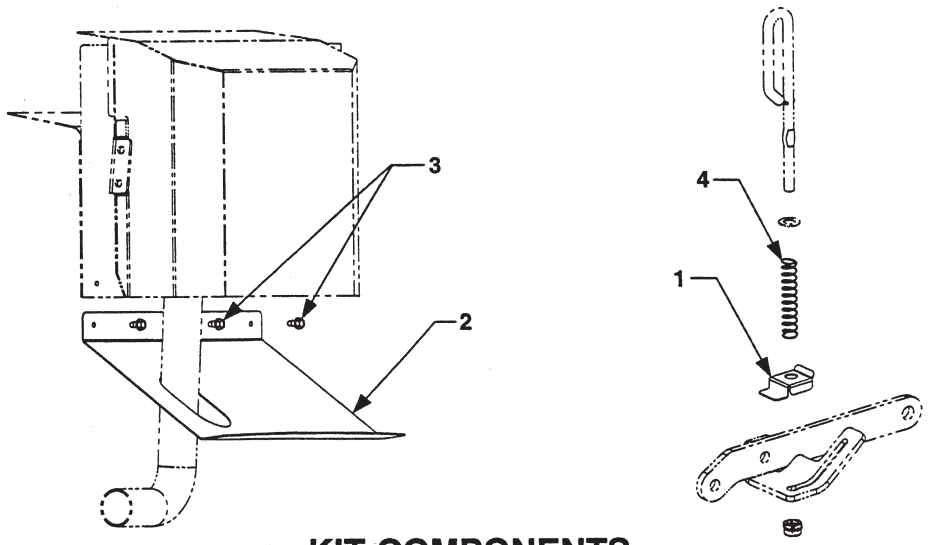
Installation Instructions

HEAT SHIELD AND LIFT BRACKET KIT

KIT NO. 759-3927

For Series 3000 Tractors

w/Mfg. Code 1H018G and Before.



KIT COMPONENTS

1.	703-3426 Lift Rod Stop Brkt.	Qty. 1	3.	710-3007 Hex Wash. Hd. Screw	Qty. 3
2.	703-3398 Lower Exhaust Shield	Qty. 1	4.	732-0870A Compression Spring	Qty. 1

WARNING

Place tractor on a firm and level surface, ensure the PTO switch is in "OFF" position, engage the brake pedal lock, and turn the ignition key to the "OFF" position before working on the tractor.

WARNING

If the tractor has been recently operated, the muffler, exhaust pipe, and surrounding areas will be HOT. Allow the tractor to cool before beginning installation.

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FORM NO. 772-4258 (7/98)

A. INSTALL THE LOWER HEAT SHIELD.

The lower heat shield can be installed without removing any parts from the tractor. However, if improved access is desired, the front grille may be removed. If you do not wish to remove the grille, skip step 1.

1. Remove the front grille as follows:

   a. Raise the hood and remove the LH and RH side panels from the tractor.

   b. Pinch the locking barbs and push forward on the two grille mount fasteners on each side of the tractor to release them from the grille mounting strips (See Figure 1). *NOTE: pliers may be used to pinch the barbs, if care is taken to avoid breaking them.*

   c. Partially lower the hood and slide the grille forward to remove from the tractor.

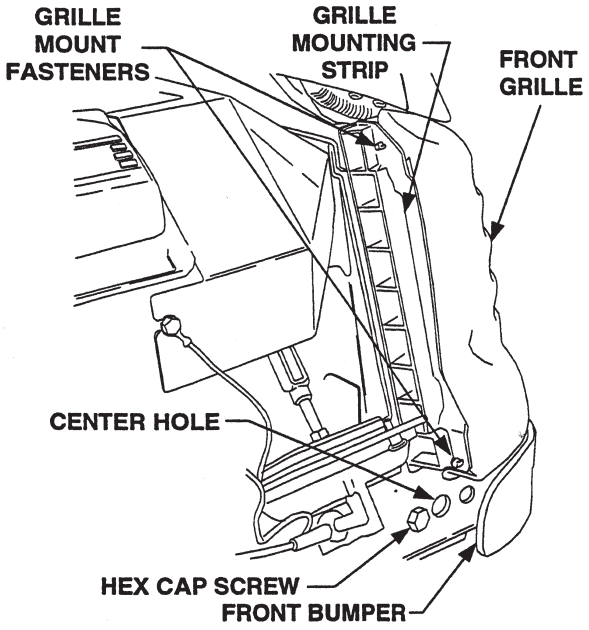


Figure 1

2. Remove the hex cap screw and lock nut securing the front bumper to each side of the frame. Slide the bumper from the frame channels to remove (See Figure 1).
3. With the forms (bends) facing upward and the screw holes inward, slide the heat shield onto the exhaust pipe of the muffler (See Figure 2).
4. While tipping the back of the shield upward, rotate it rearward to position the shield within the frame channels. See Figure 2.

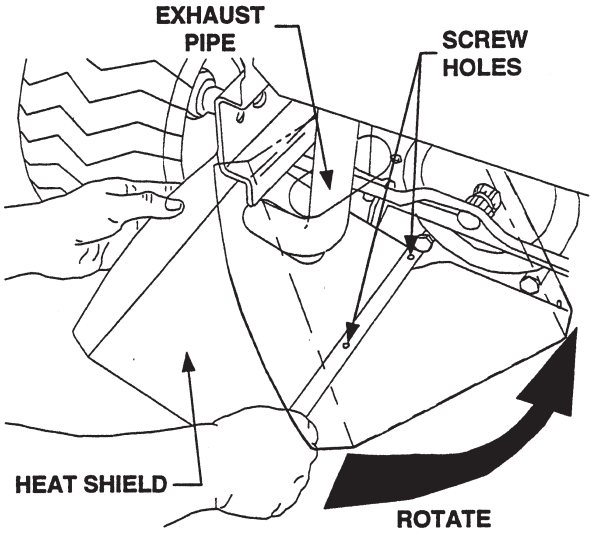


Figure 2

5. Insert the rear of the shield up into the muffler housing so that the three holes in the shield align with those of the rear plate of the muffler housing.
6. Secure the shield to the muffler housing using the three screws provided in the kit (See Figure 3). *NOTE: If the grille was not removed, the screws can be installed by accessing through the lower slots of the grille.*

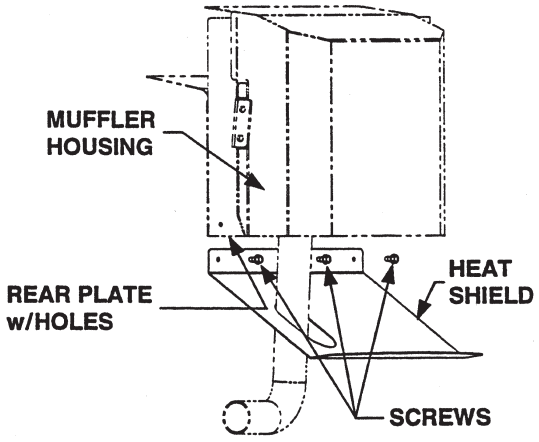


Figure 3

7. If the grille was removed, align the four grille mount fasteners with the corresponding holes in the grille mounting strips and press the grille rearward until locked in place.
8. Slide the bumper into the frame channels until the *front* holes of the bumper align with the *center* holes in the frame. Secure the bumper with the previously removed hex cap screws and lock nuts (See Figure 1).

B. INSTALL THE LIFT ROD STOP BRACKET.

Installation of the lift rod stop bracket on the LH lift rod of the tractor does not require complete removal of the mower deck.

1. Raise the front caster wheels and rear rollers to their highest setting (lowest deck setting). Refer to the deck Operator's Manual if necessary.
2. Using the tractor's hydraulic lift system, lower the deck to the ground. Stop the tracor engine.
3. Pull outward and cock the deck support pins in the rear deck brackets so that both spring-loaded pins are held in the disengaged position against the inner surface of the deck brackets (See Figure 4).

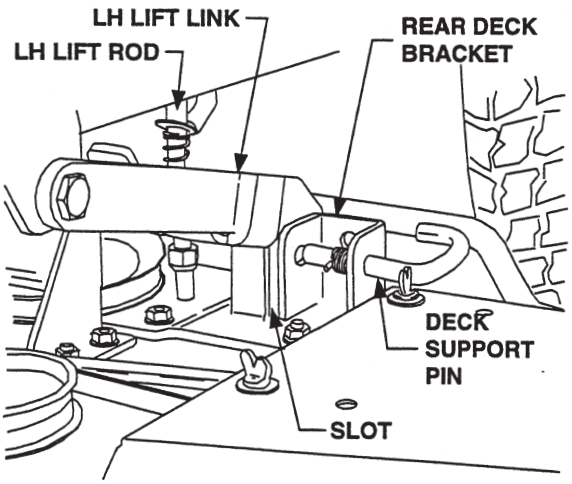
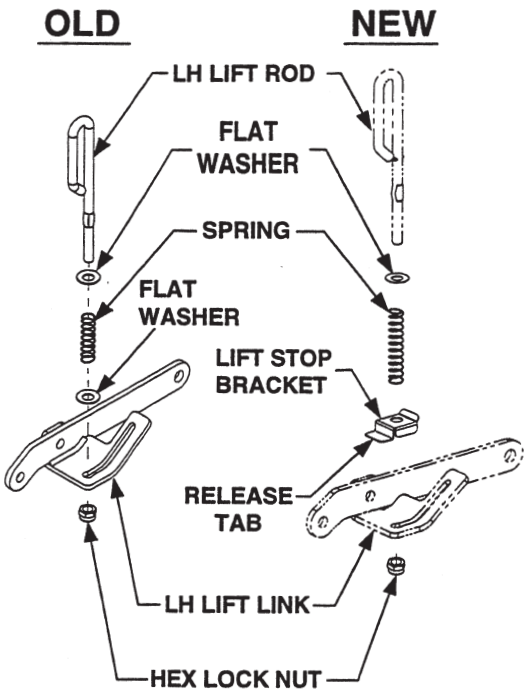


Figure 4

4. After marking its position on the threads of the LH lift rod, remove the hex lock nut from the bottom of the lift rod. Refer to Figure 5.
5. While holding the LH lift link down, slide the LH lift rod upward inside the tractor frame to disengage from the LH lift link. Refer to Figure 5.
6. Slide the lower flat washer and the spring from the bottom of the lift rod. Refer to Figure 5. Discard the washer and spring. Leave the upper flat washer on the rod.
7. Slide the new spring onto the lift rod.
8. With its open side facing downward and the release tab toward the rear, slide the lift stop bracket onto the lift rod. Refer to Figure 5.
9. Again slide the LH lift rod upward in the frame as necessary to allow the rod to be inserted down through the top of the LH lift link. Make certain to maintain proper orientation of the lift stop bracket. Secure with the hex lock nut, tightened to the earlier made mark on the threads.



VEIWED FROM RIGHT SIDE FOR CLARITY

Figure 5

10. Make certain the LH and RH lift links are in the slots of the rear deck brackets and release the deck support pins (Refer to Figure 4). Maneuver the deck slightly to align the pins with the holes of the lift links. The spring tension will push the pins through the lift links when aligned.
11. Reset the front caster wheels and rear roller to the desired height setting.

C. INSTALLATION AND REMOVAL OF DECK.

The left lift link must be raised to provide clearance for sliding the mower deck under, or out from under, the tractor. With the addition of the lift stop bracket, the procedure for locking the left lift link in its *deck installation position* will slightly change as follows:

1. Holding the left lift rod downward, *lift upward on the release tab of the lift stop bracket* while raising the rearward end of the lift link to align the notch of the rod with the slot of the link (Refer to the deck Operator's Manual).
2. Swing the lift rod forward until fully to the front of the lift link slot.

Installation Instructions

ROLLER HEIGHT ADJUSTMENT UPDATE KIT

KIT NO. 759-3928

For Series 3000 Tractor Mower Decks w/Mfg. Code 1H018G and Before.

KIT COMPONENTS

PART NO.	DESCRIPTION	QTY.
710-1800	Socket Hd. Screw w/Lock Patch, 1/4-20	1
715-0129	Spirol Pin, .125 x .812	1
715-0150	Roll Pin, 3/16 x 1.1	2
603-0693	Roller Adjustment Knob Assembly	1
731-3287	Cap	1

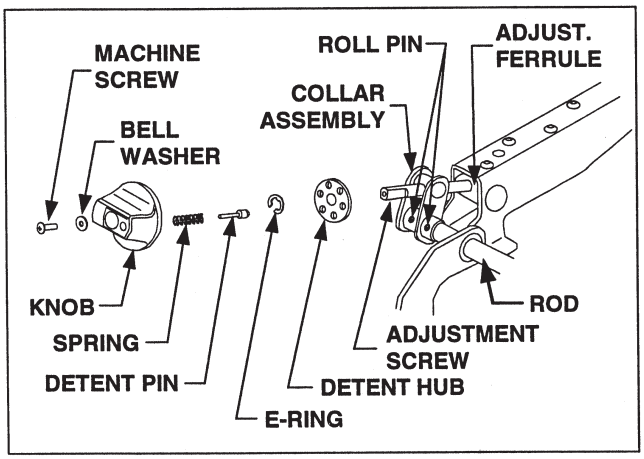


Figure 1

A. REMOVAL and PREPARATION. Refer to Figure 1.

1. Adjust the rollers to their highest setting (lowest deck setting) then lower the deck to the ground.
2. Pull the label from the knob, and remove the machine screw and bell washer to remove the knob. Discard the machine screw and washer.
3. Pull the detent pin and spring from the original knob. Discard the knob and detent pin.
4. Remove the E-ring from the adjustment screw and slide the detent hub off the screw. Discard the E-ring.
5. Using a drift punch, drive out the two roll pins that secure the collar assembly to the pivot arm rod.
6. Unscrew the adjustment screw completely from the adjustment ferrule; then slide the screw from the collar assembly ferrule.
7. Secure the adjustment screw in a vise. At the ring groove in the screw, drill a .127 (1/8 inch) hole through the diameter (See Figure 2).

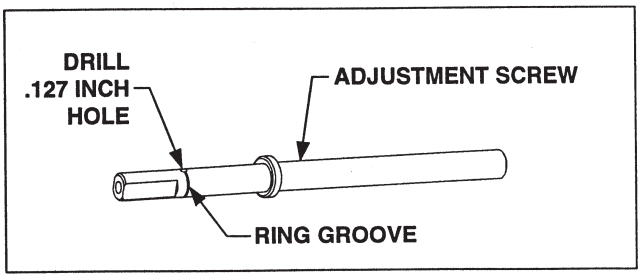


Figure 2

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FORM NO. 772-4257 (7/98)

8. Slide the adjustment screw into the collar assembly ferrule; then partially screw into the adjustment ferrule on the deck.
9. Align the holes and secure the collar assembly to the pivot arm rod using the two roll pins provided in the kit. Refer to Figure 1.
10. Secure the detent hub and open up the six perimeter holes to .281 inch using a 9/32" drill bit.
11. Slide the detent hub fully onto the adjustment screw, making certain the hub is forward of the newly drilled hole in the adjustment screw.
12. Capture the detent hub on the adjustment screw by driving the spirol pin provided with the kit into the hole in the screw (See Figure 3). Make certain the spirol pin is centered in the screw.

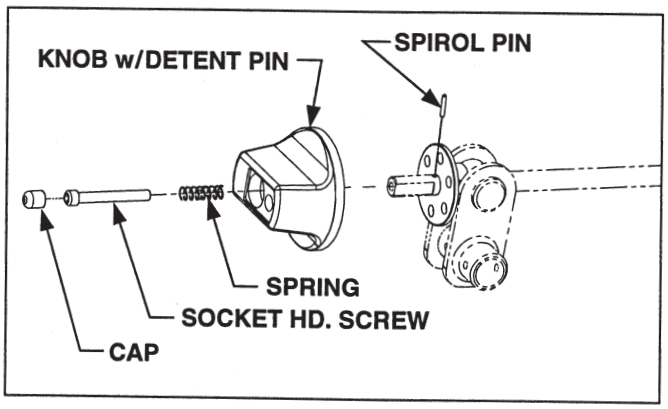


Figure 3

B. INSTALL KIT COMPONENTS. Refer to Figure 3.

1. Slide the new knob completely onto the adjustment screw, making sure the detent pin in the knob engages one of the holes of the detent hub.
2. Slide the spring (removed earlier) onto the socket hd. screw. Insert the screw trough the center hole of the knob and fully tighten into the adjustment screw.
3. Push the cap onto the the head of the screw.

C. OPERATION. Adjusting the roller height.

1. Pull the knob rearward (outward) to disengage the detent pin of the knob from the hole in the detent hub.
2. Holding the knob rearward, turn the knob as necessary to obtain the desired height (should correspond with the index setting of the front caster wheels).
3. Release the knob and turn as necessary to align the detent pin with the nearest hole in the detent hub. Make certain the pin is fully engaged in the hole.

NOTES

Fender Assembly Removal and Reinstallation

1. Slide the seat back and remove the front two pan torx head screws using a T30 torx.
2. Slide the seat forward and remove the rear two pan torx head screws using a T30 torx.
3. Pivot the seat assembly to the side and disconnect the seat safety switch. See figure 1.

   NOTE: Be careful not to scratch the fender with the seat support brackets. It is advisable to use a towel or cloth under the seat when pivoting the seat.
4. Remove the seat from the tractor. See figure 1.

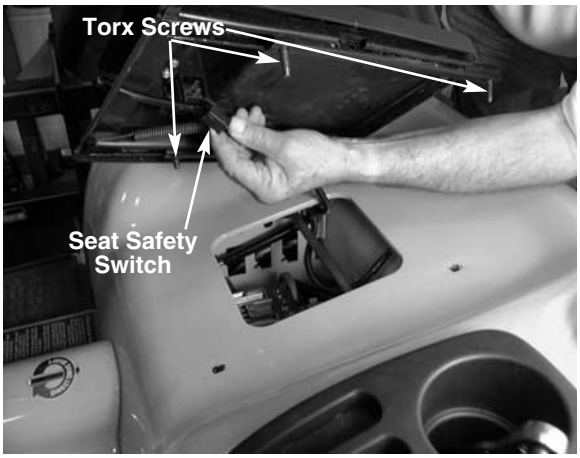


FIGURE 1.

5. Remove all the hex bolts securing the three foot pedals to the right side of the unit using a 9/16 socket. See figure 2.

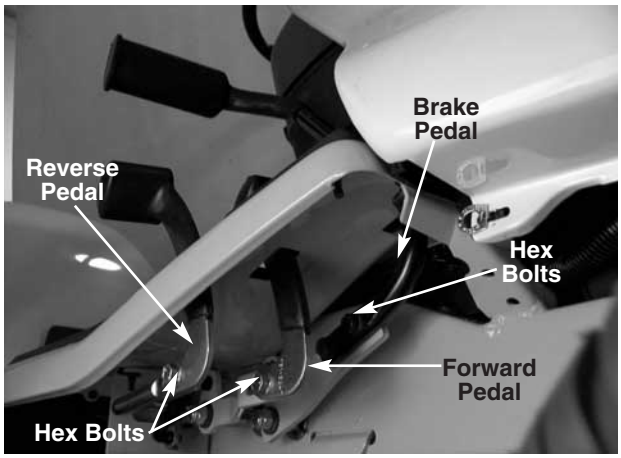


FIGURE 2.

6. Remove the hex bolt securing the differential lock out pedal on the left side of the unit using a 9/16 socket. Remove the "E" clip and the nylon flange bearing from the pivot shaft.

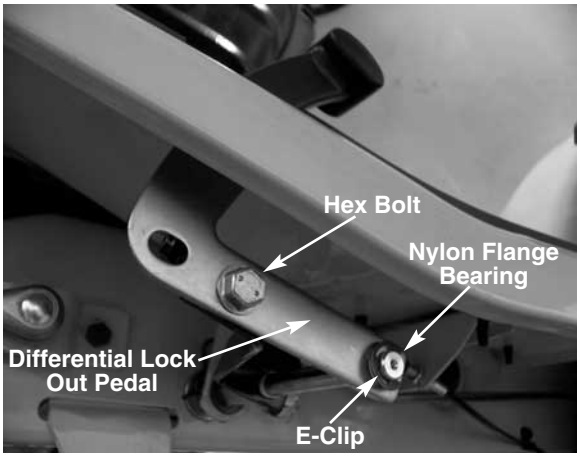


FIGURE 3.

7. Remove both rubber floor pads from the running boards. See figure 4.
8. Lift the hood and remove the battery cover.
9. Remove both side panels from the tractor by raising the latches horizontally and turning the latches 1/4 turn. See figure 4.
10. Loosen all four plastic wing nuts holding the dash panel screen in place. See figure 4.
11. Pull the dash screen towards the rear of the unit and out of the dash panel. See figure 4.

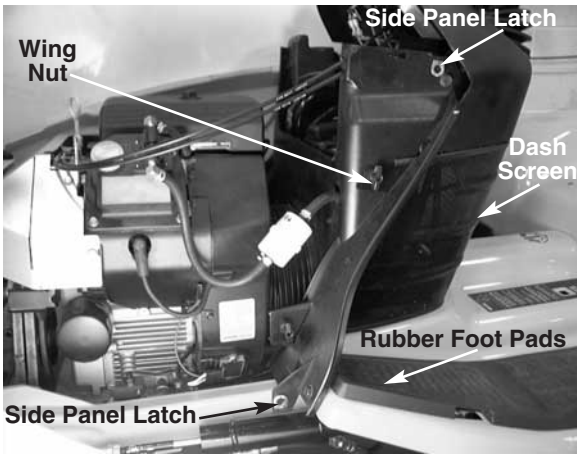


FIGURE 4.

12. Remove all four running board hex bolts from the tractor using a 1/2” socket. See figure 5.

    NOTE: There are two bolts fastening the running boards to the frame where the foot pads connect and there are two bolts fastening the running boards to the dash panel.

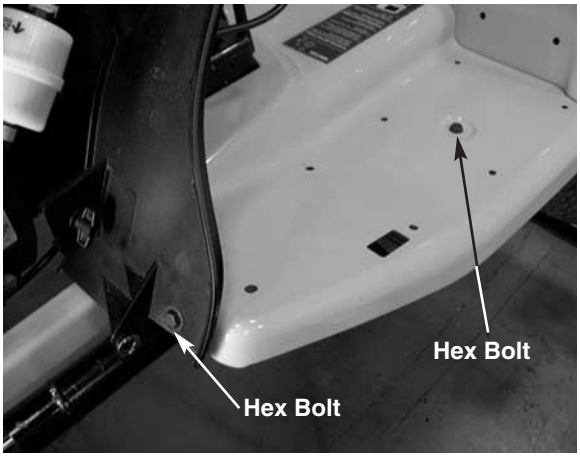


FIGURE 5.

13. Remove the fuel cap.
14. Remove the tail light sockets from the tail light assemblies by pushing in on the sockets gently and twisting a 1/4 turn. See figure 6.

    NOTE: When pulling the sockets out of the tail light assemblies, it is very important to make sure the light bulbs come straight out, or the light bulbs will fall into the tail light assemblies. Also, note the color of the wires for reinstallation. The white wires go to the reverse lights. See figure 6.

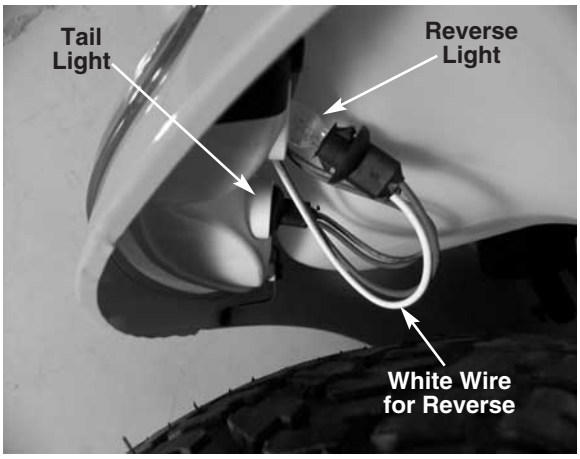


FIGURE 6.

15. Raise the rear fender high enough to access the hydraulic lift handle clamp. See figure 7.
16. Loosen the clamp connecting the hydraulic lift handle to the center lift valve using a 1/2” socket.

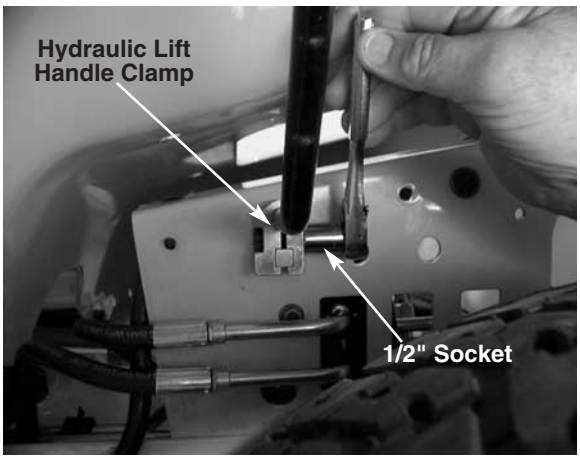


FIGURE 7.

17. Remove the lift handle from the tractor through the slot in the flap. See figure 8.

    NOTE: If the lever is not removed at this time, damage may occur to the lift knob.

18. Raise and remove the fender assembly.

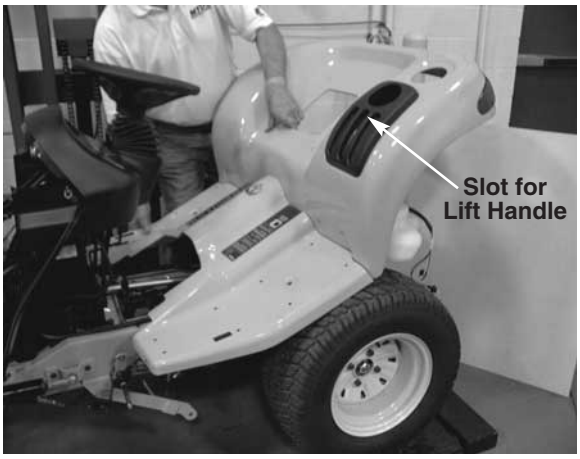
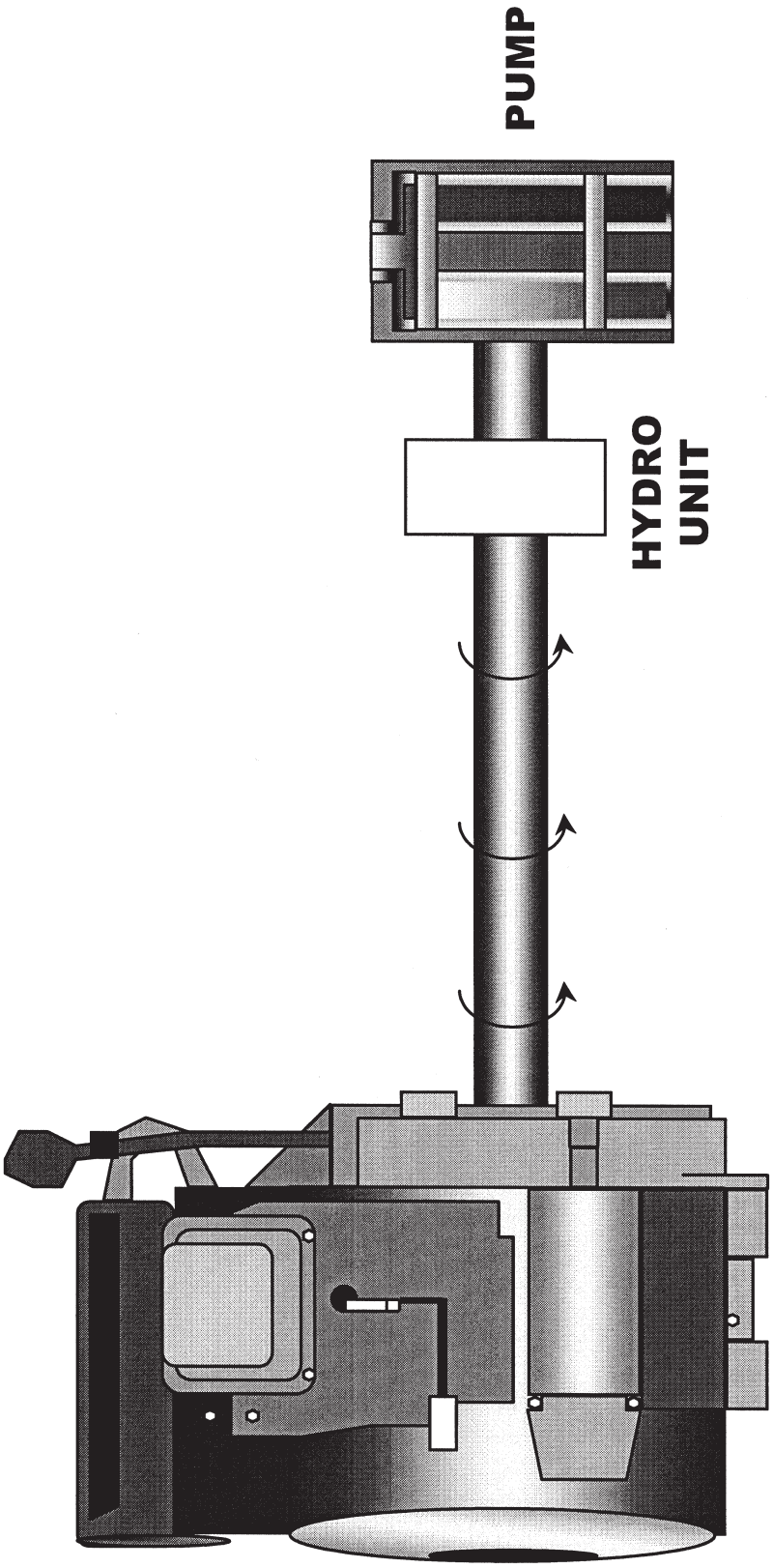
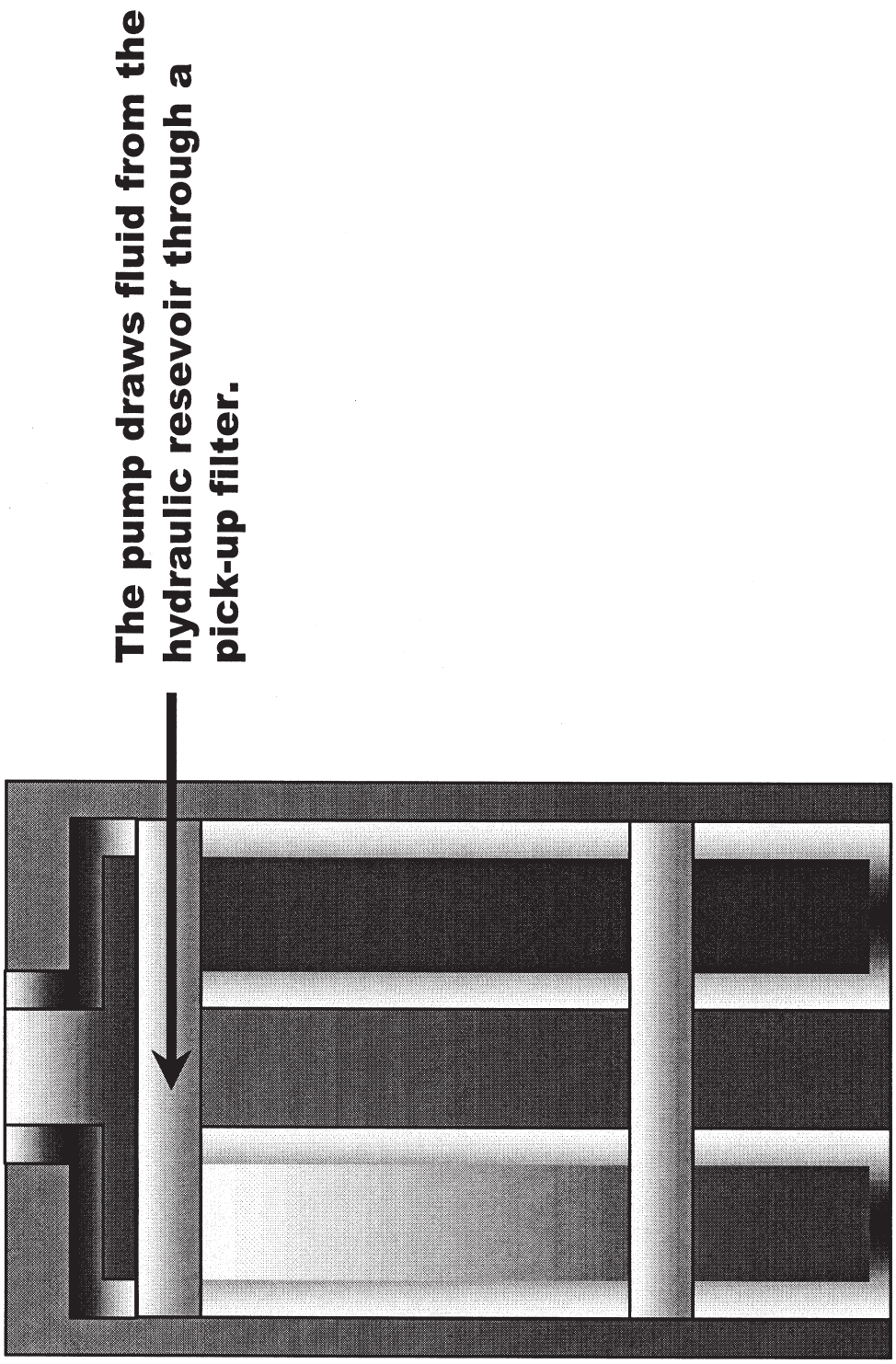


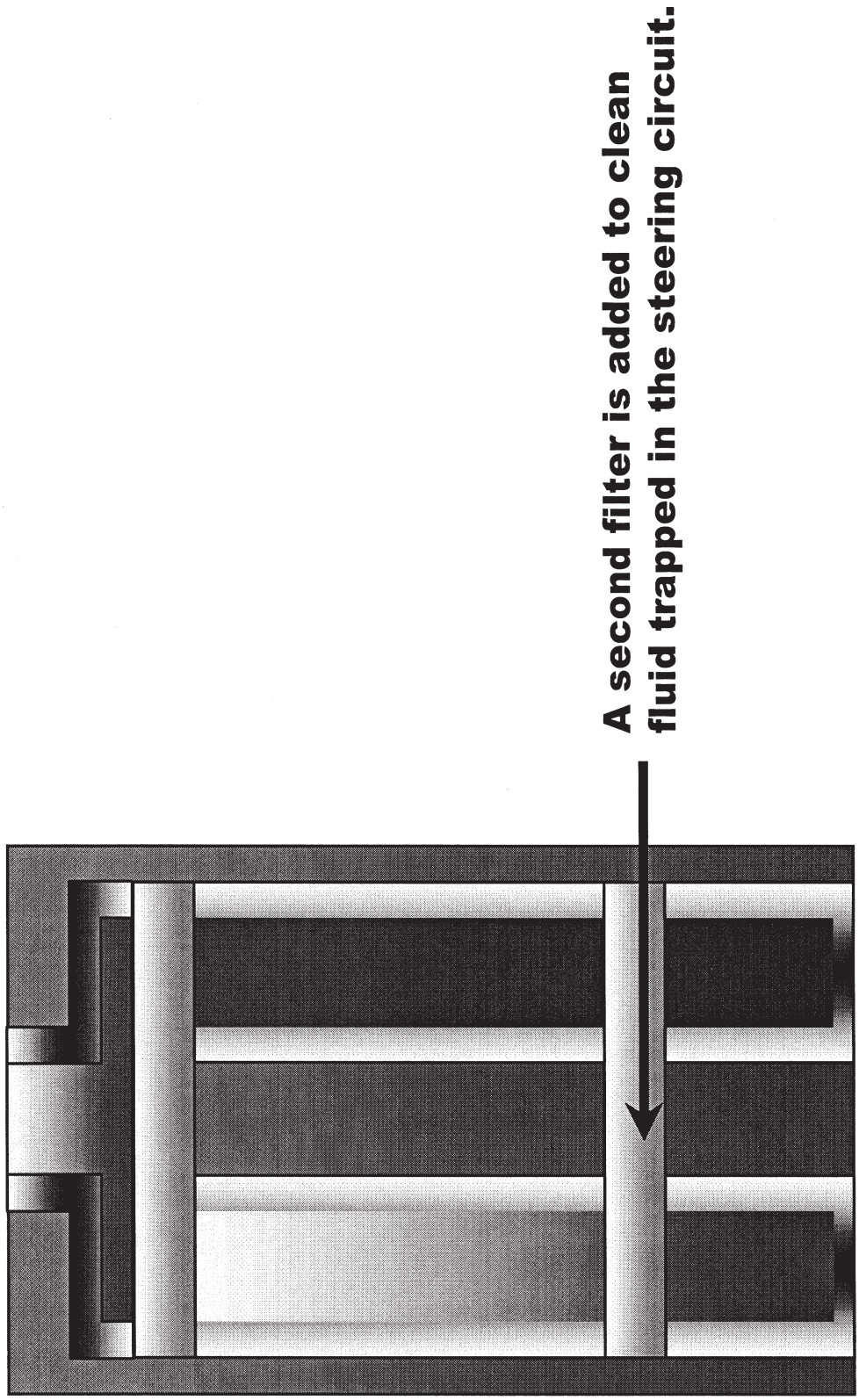
FIGURE 8.

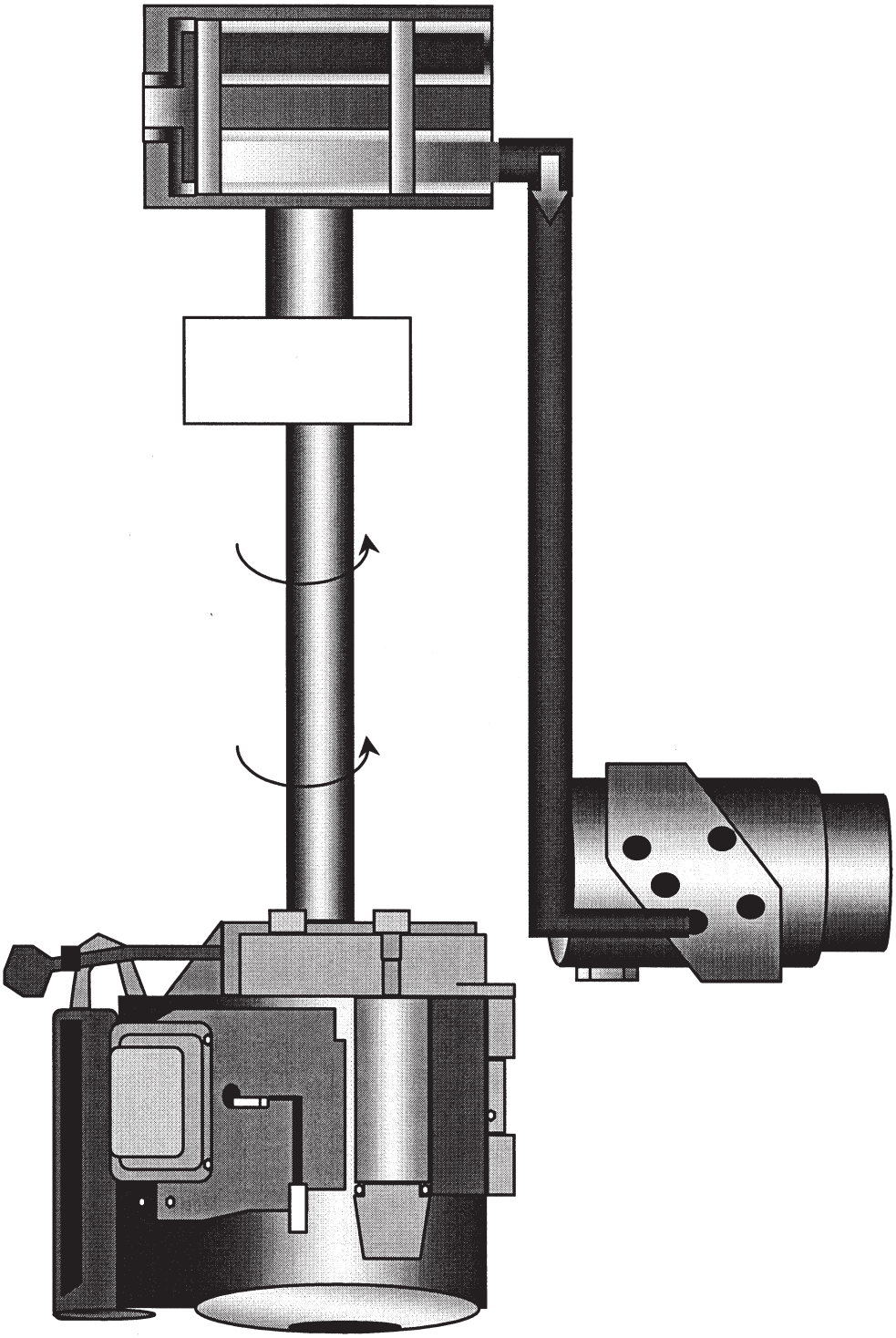
19. Reinstall the fuel cap.



The engine turns a drive shaft attached to the hydraulic pump on transaxle







A line is added from the pump to a steering control unit.

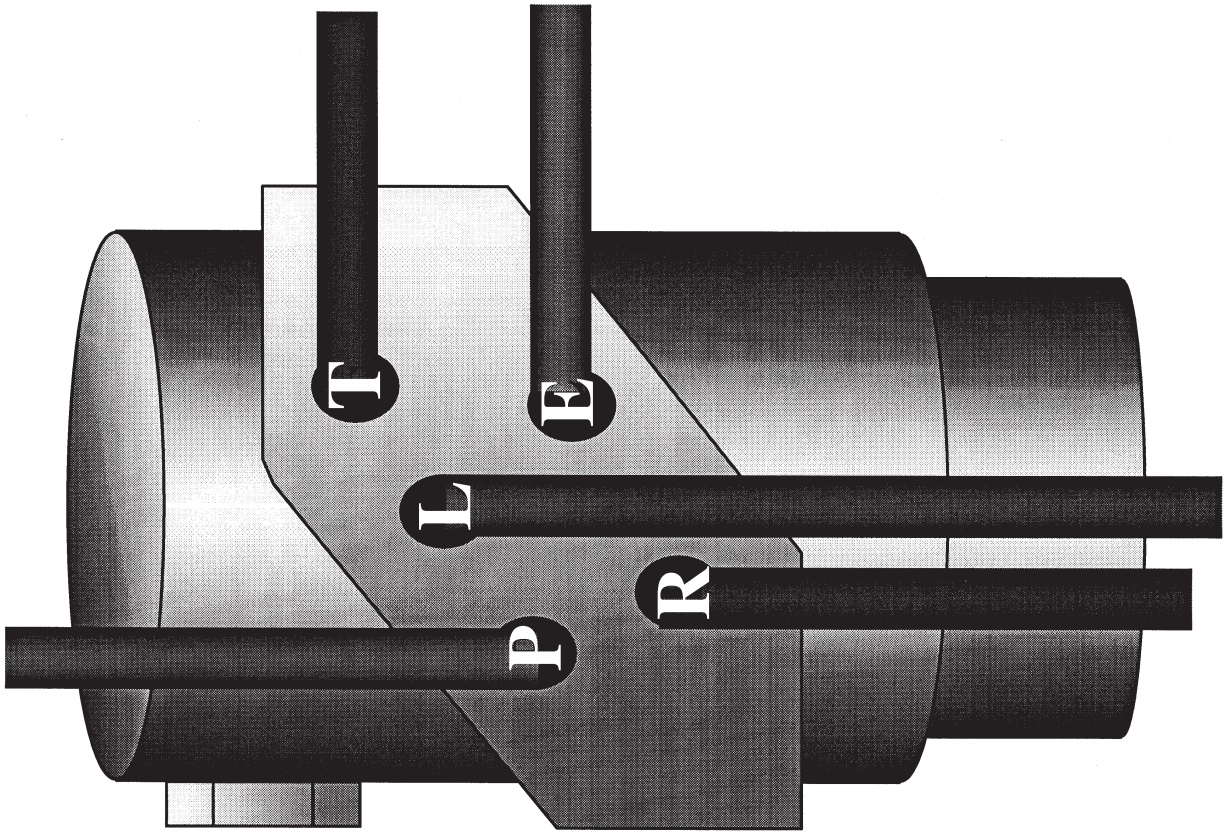
P - Power (received)

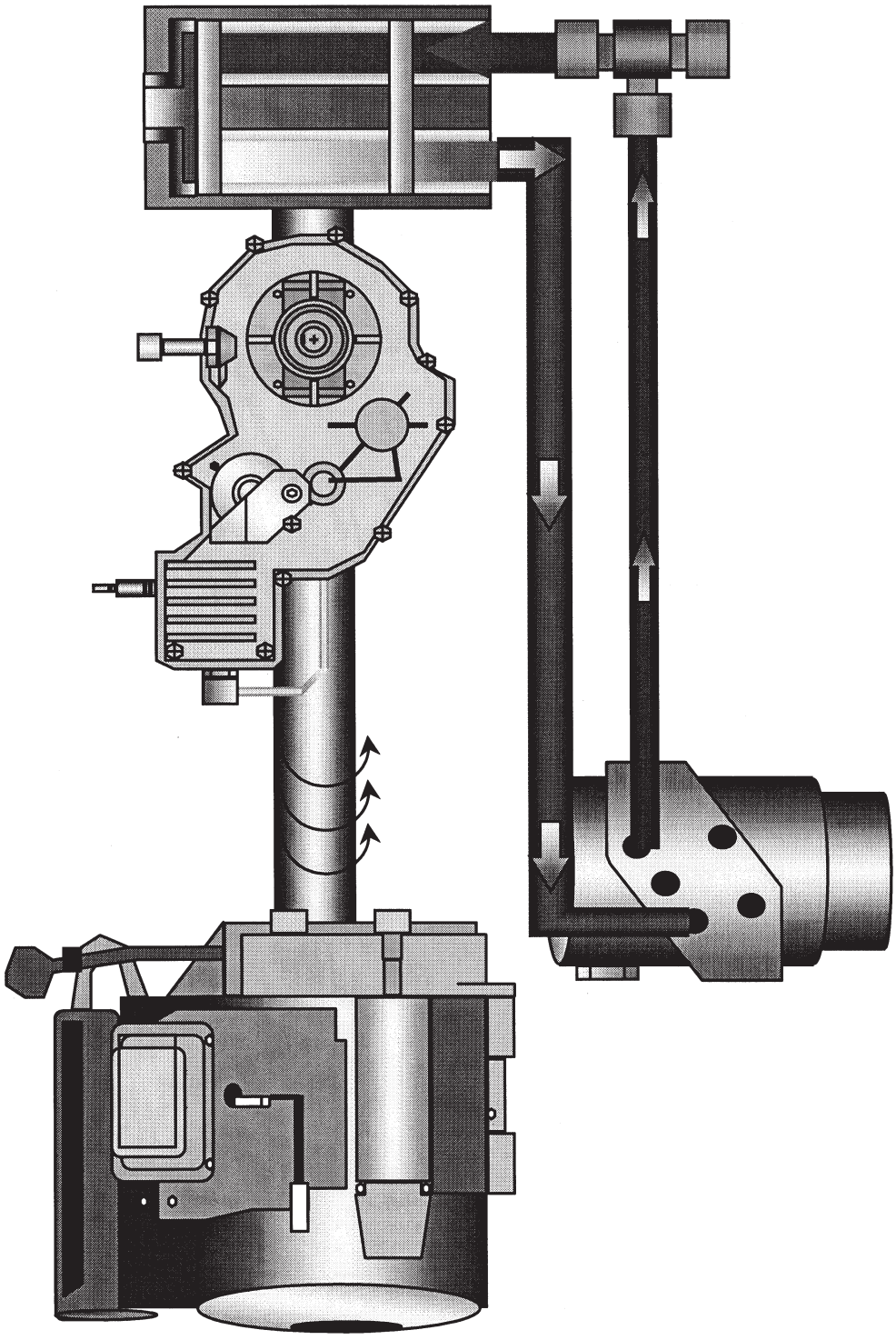
L - Left

R - Right

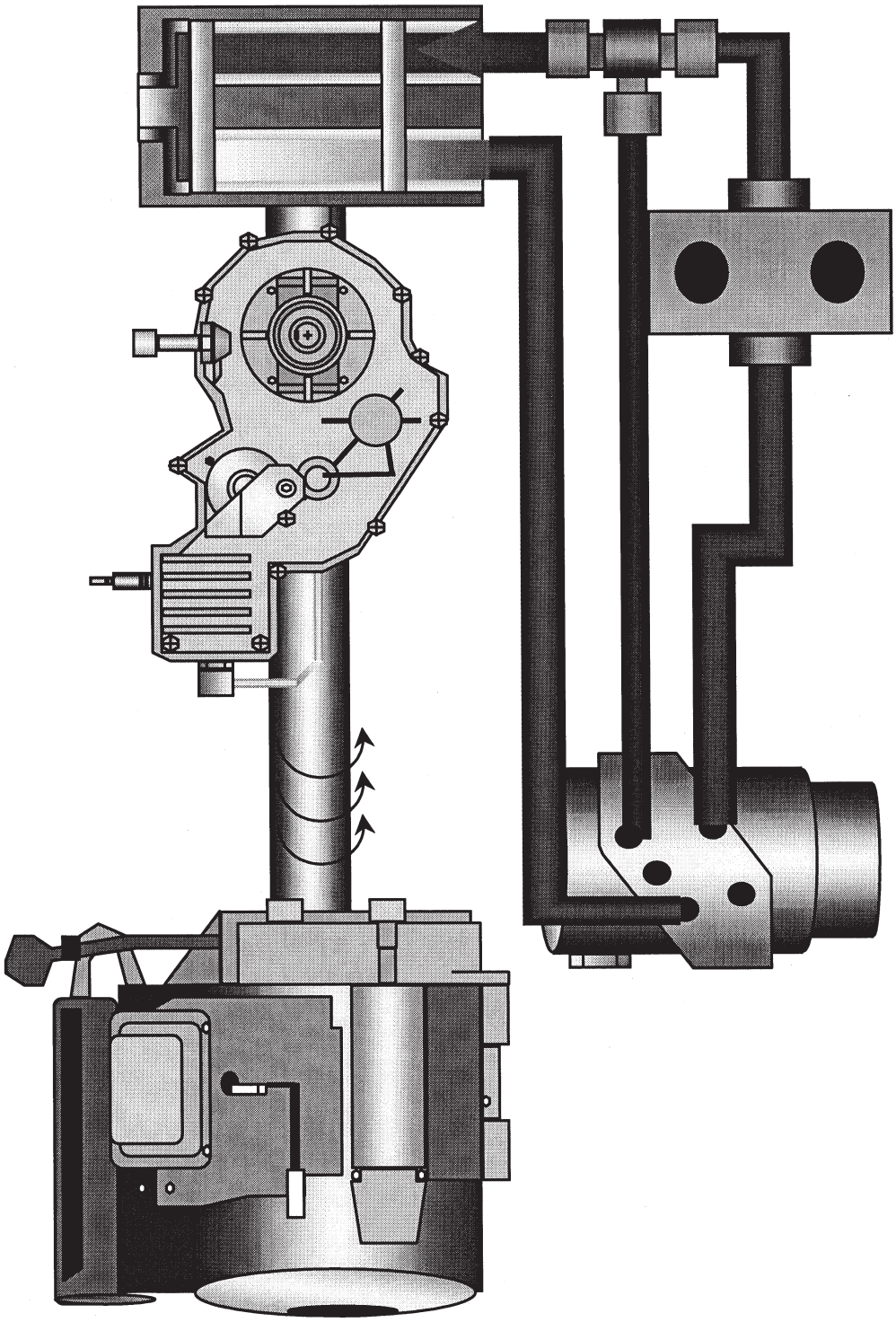
E - Extra (Power to Auxilary)

T - Tank (fluid returned)

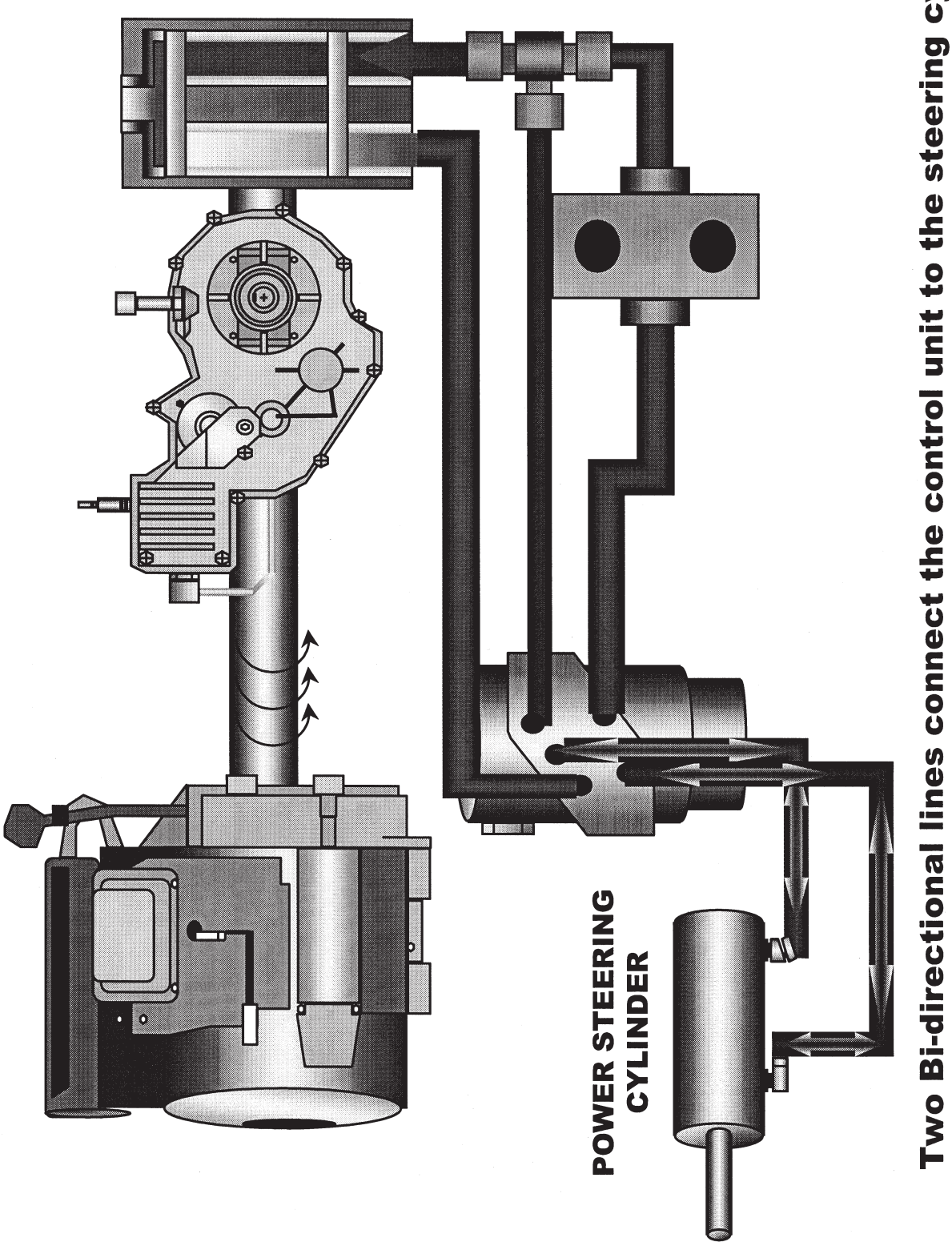


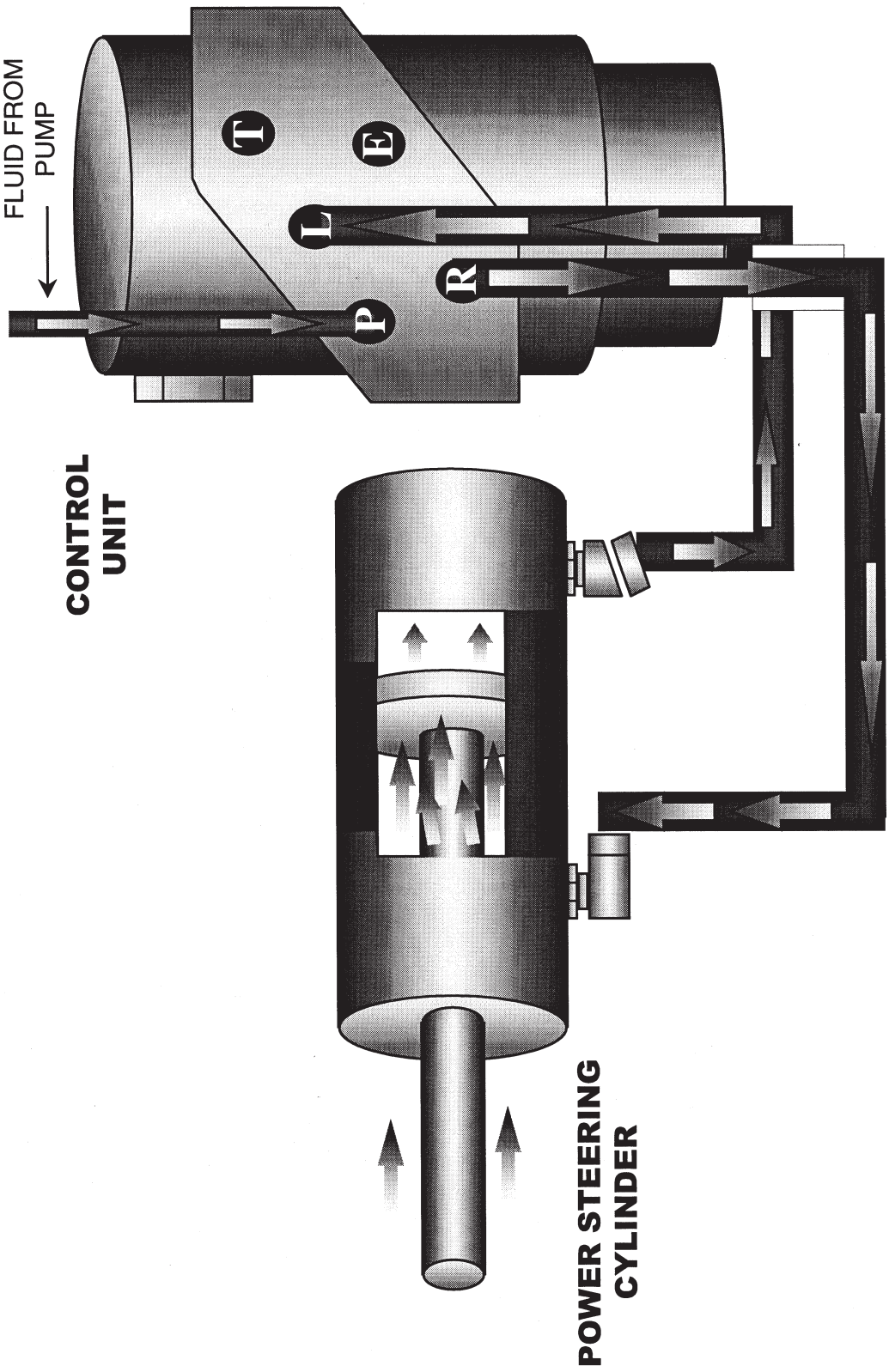


An auxiliary line is added from the control unit to a T-fitting which sends fluid back through to the pump.

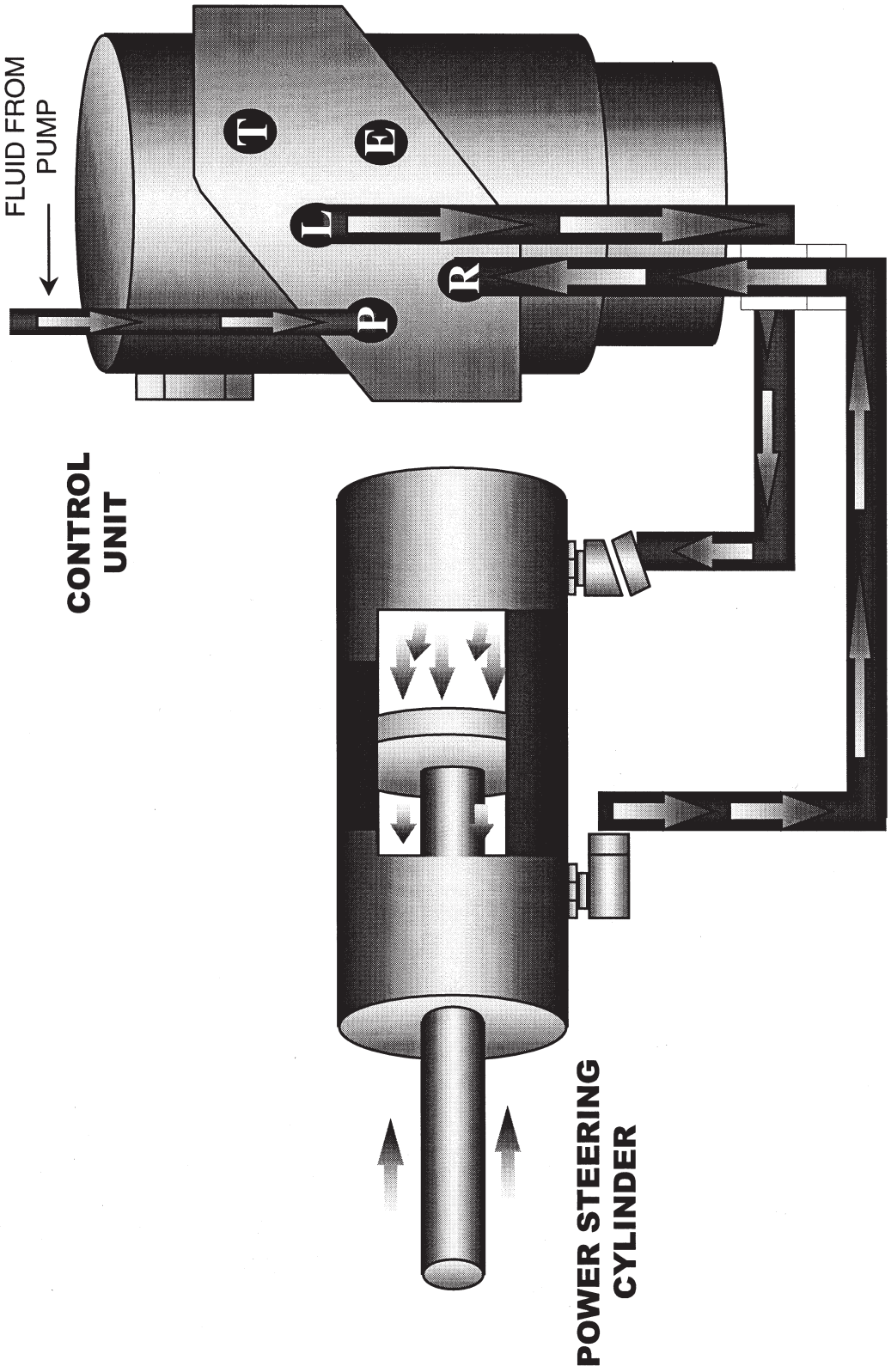


An auxiliary line is added from the control unit to a valve for the attachments and back through T-fitting.

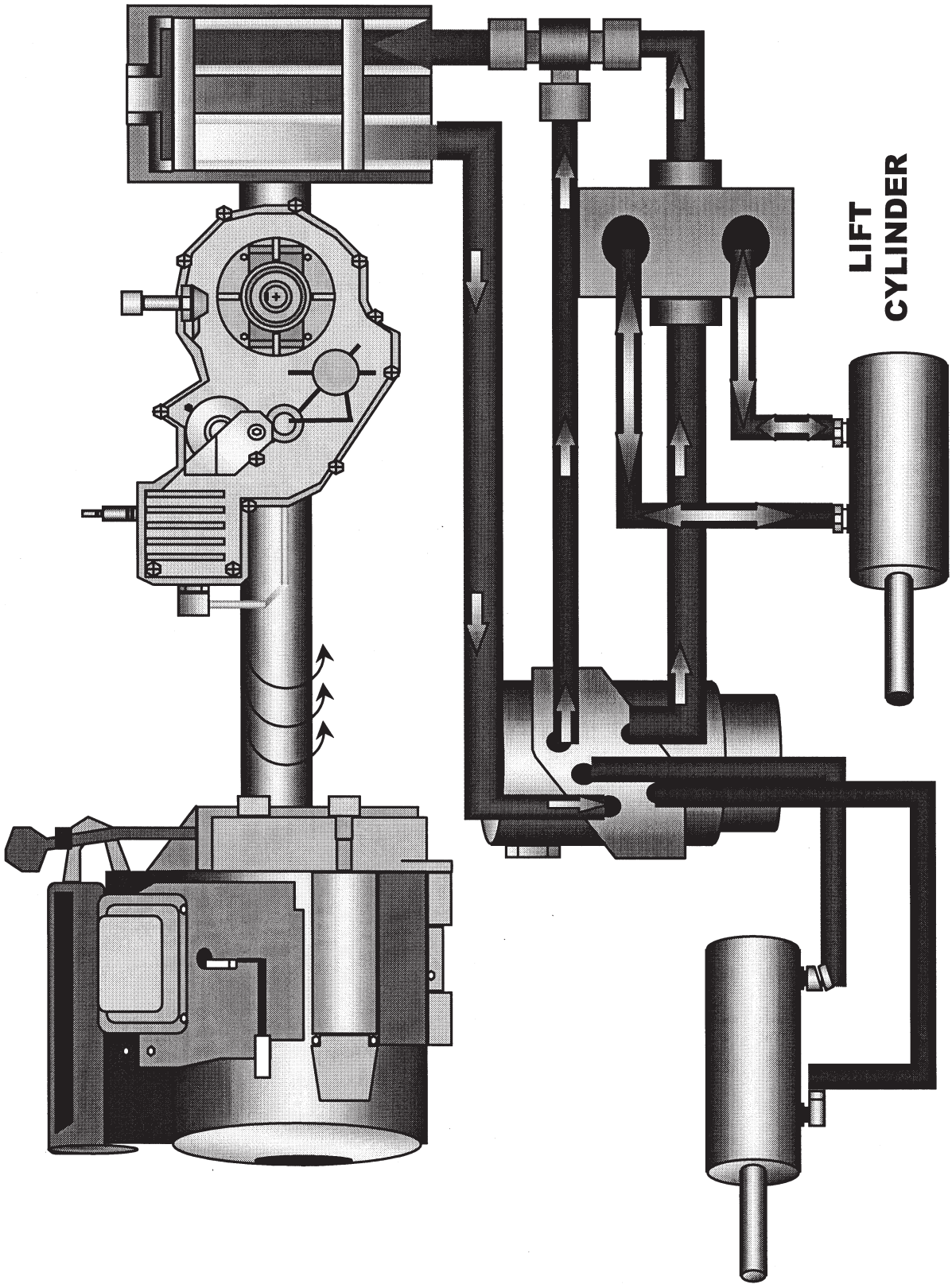




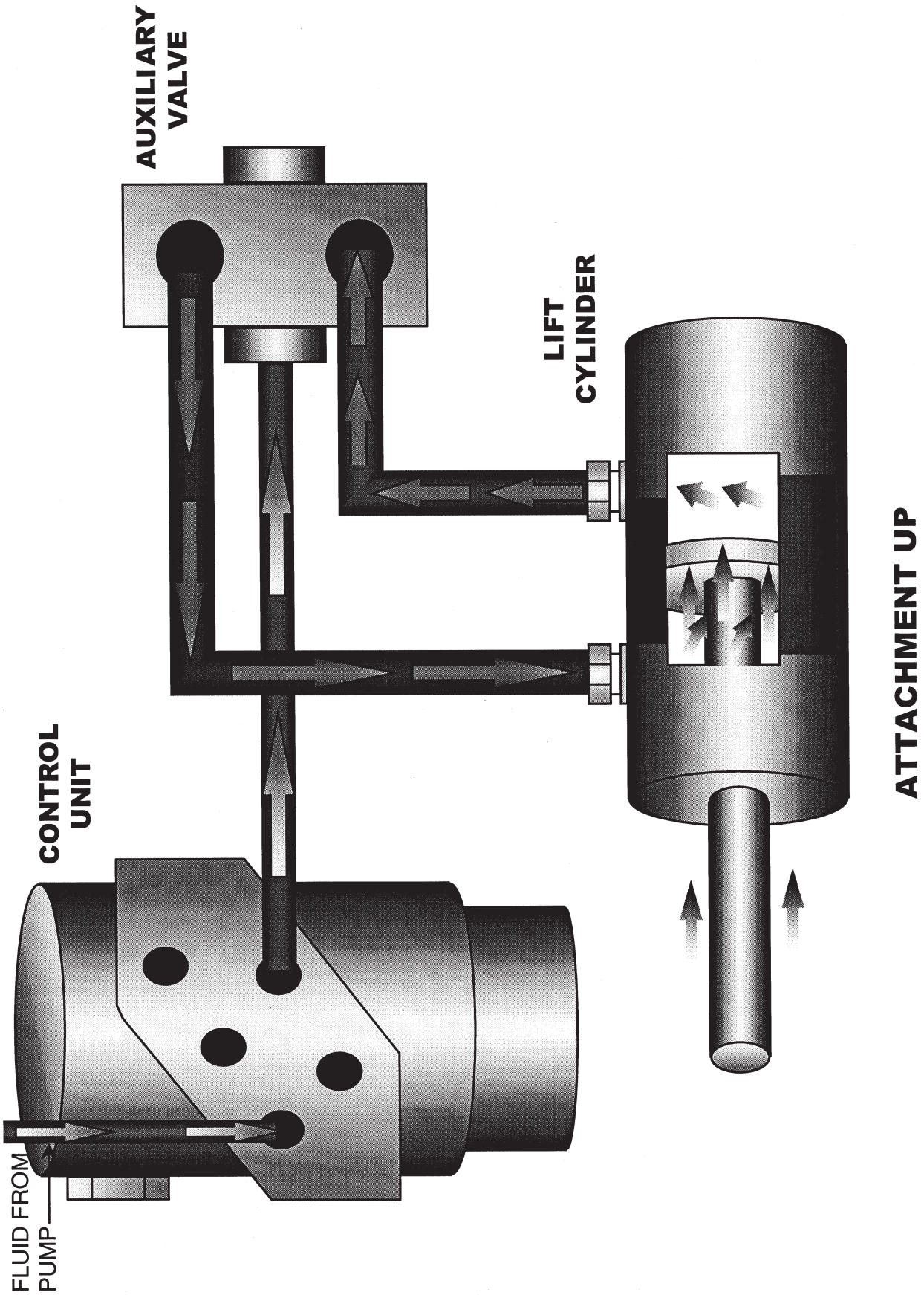
Fluid from the control unit is sent to the front of the cylinder and forces any fluid in the cylinder out the rear. This will result in a right turn.

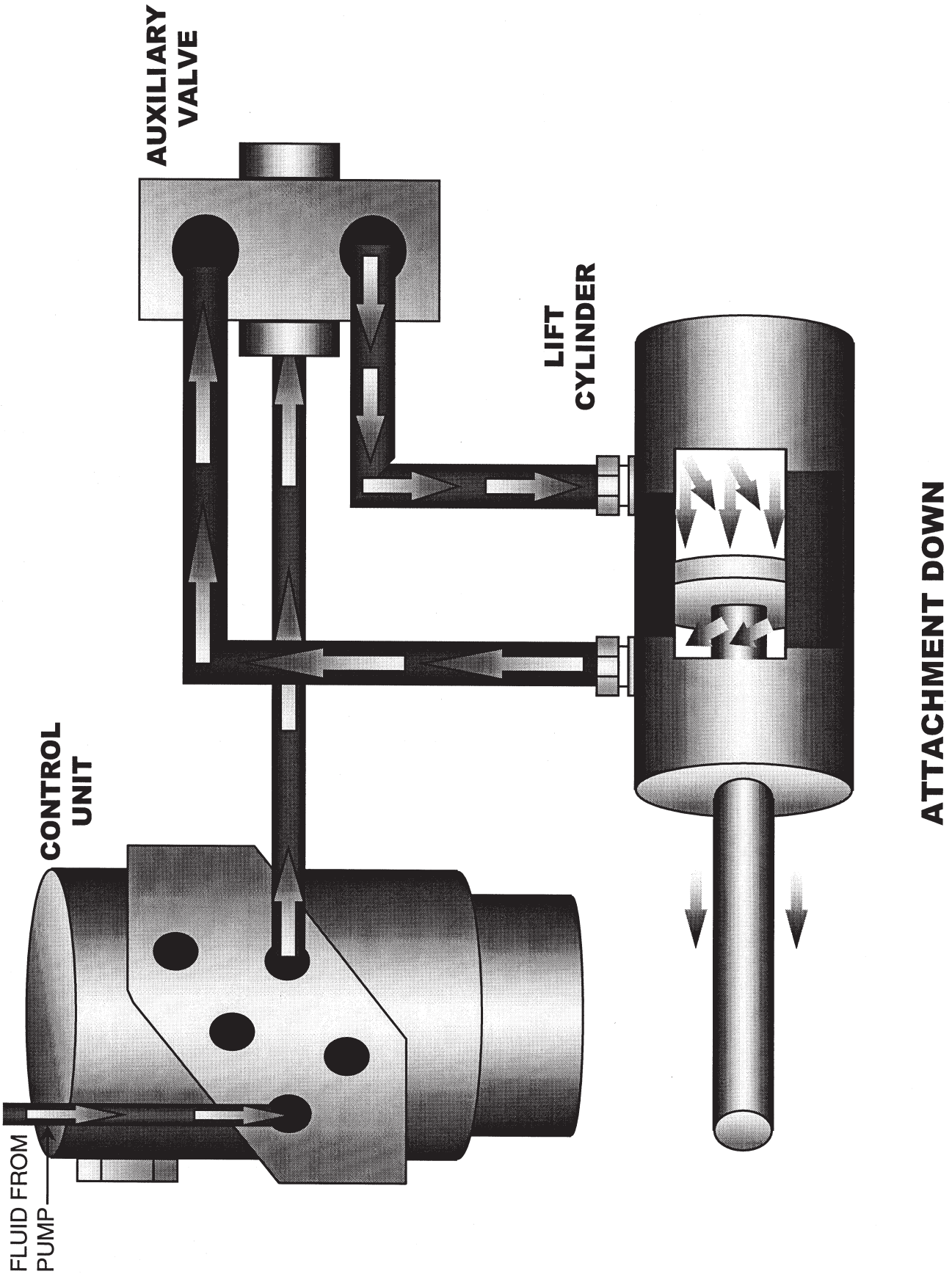


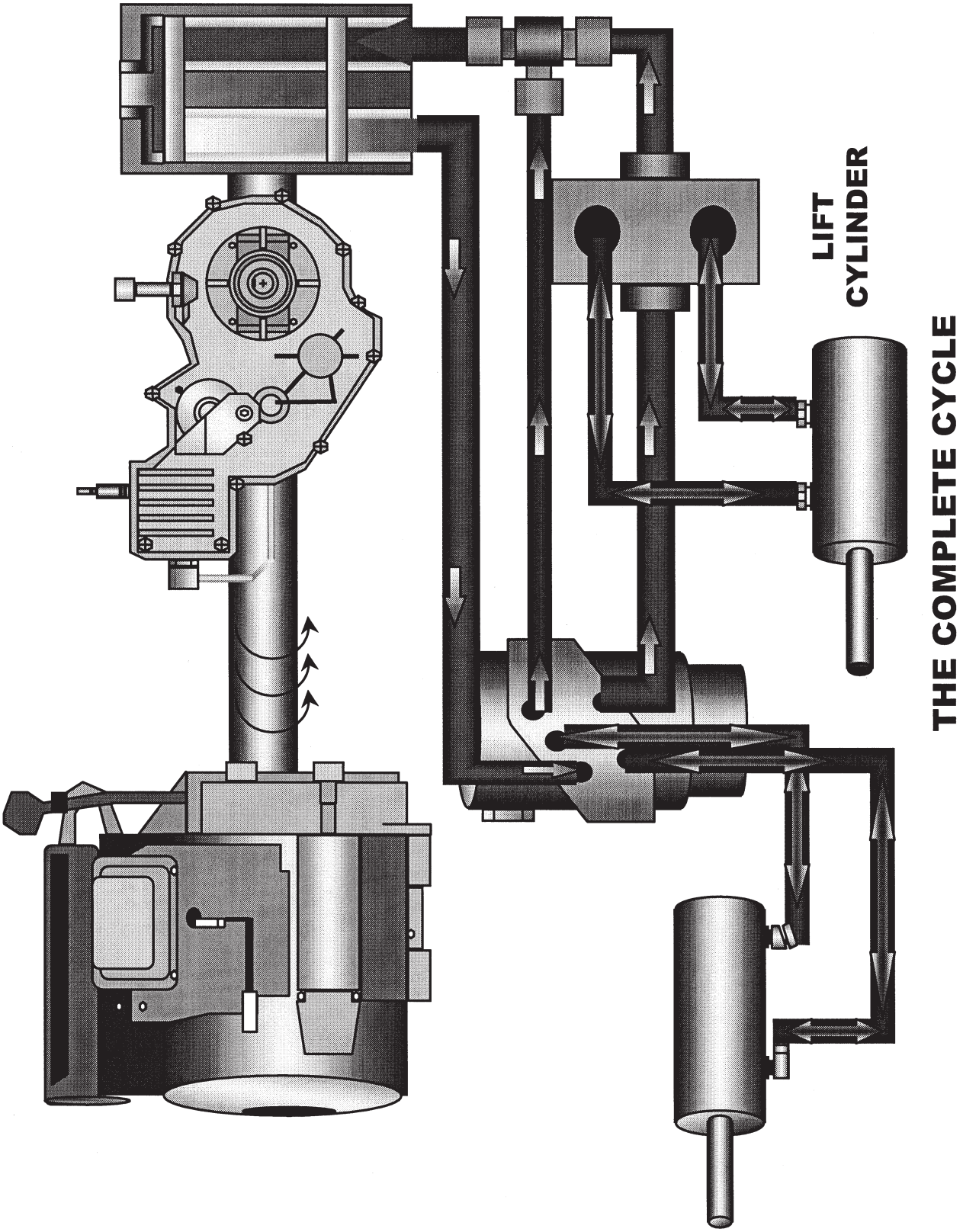
To make a left turn, fluid is sent to the rear of the cylinder and forces any other fluid out the front.



Two Bi-directional lines are added to each (up to three) auxiliary lift cylinder.







THE COMPLETE CYCLE

Removal and Replacement of the Power Steering Cylinder

CAUTION: Slowly remove the hydraulic lines from the cylinder. Test for pressure in the lines before removal.

1. Place an oil pan directly under the steering cylinder. This will catch the hydraulic fluid that will be drained from the lines and the cylinder.
2. Remove both hydraulic line connectors from the fittings on the cylinder using an 11/16 and a 5/8 open end wrench. See figure 1.
3. Lower the hydraulic lines down into the oil pan and allow to drain.

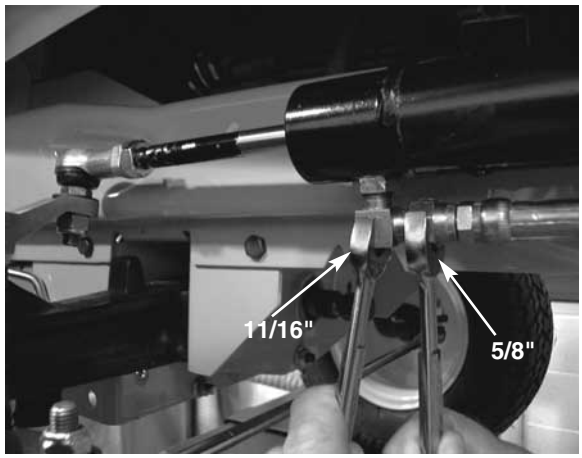


FIGURE 1.

4. Remove the front ball joint NUT from the steering arm using a 17mm and 3/4" open end wrench. See figure 2.

   NOTE: Remove the ball joint NUT only!!!

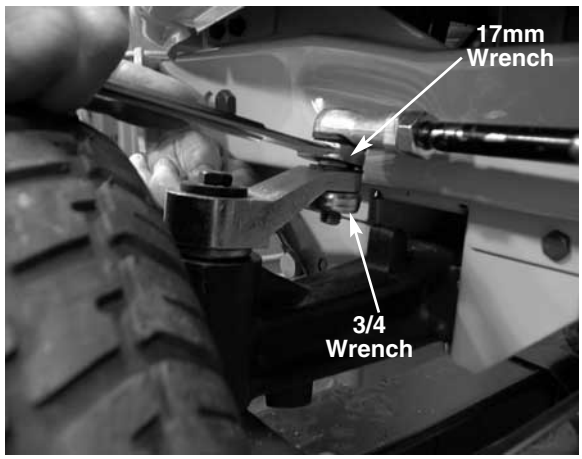


FIGURE 2.

5. Remove both of the hex head screws and the hex flange nuts from the cylinder mounting bracket using a 9/16 socket and a 9/16 wrench. See figure 3.

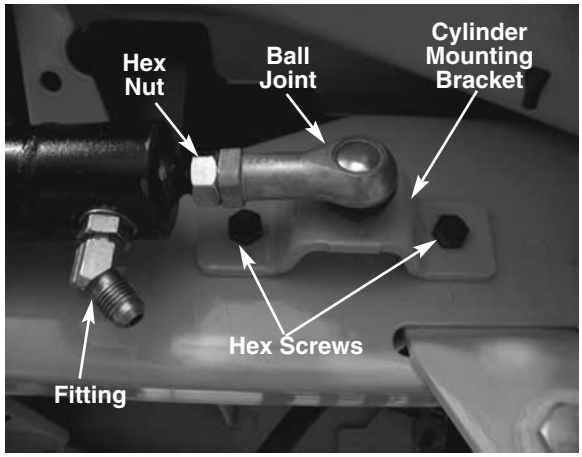


FIGURE 3.

6. Tilt the cylinder down into a pan and allow the oil to drain.
7. Remove the front ball joint from the steering arm.
8. Remove the flat washer from the top of the steering arm.
9. Place the cylinder on a bench and remove the hex nut securing the cylinder to the mounting bracket using a 17mm wrench and a 3/4" open end wrench.
10. Slowly push the cylinder rod into the cylinder until it is fully closed.

    NOTE: At this point, the cylinder and both ball joints are still in the original positions.
11. Record the exact positions of all the ball joints, hex nuts and fittings on the cylinder. See figure 4.
12. Measure the distance from the inner edge of the ball joint hex nut to the cylinder end. Repeat this step for the opposite end. Write both distances down. See figure 4.

    NOTE: The proper measurements are needed to keep the steering adjusted properly during reassembly. These measurements should be approximately 2.75" on the rod end, and 7/16" on the mounting bracket end. See figure 4.
13. Remove the ball joints and hex nuts from the cylinder.

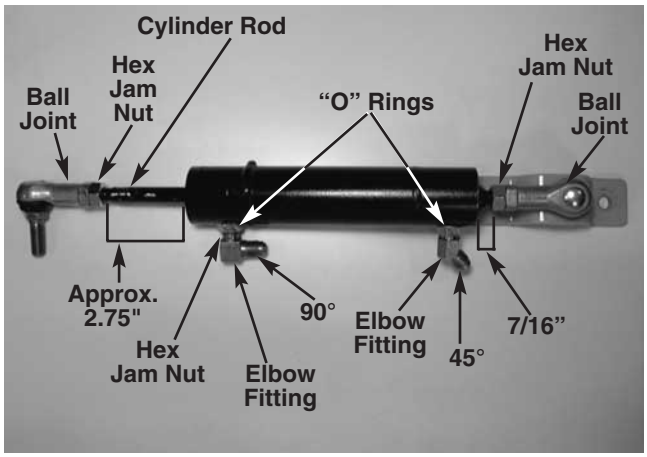


FIGURE 4.

CAUTION ON THE NEXT STEP: There are "O" rings between the cylinder block and the fittings. Extreme care should be used to hold the fittings in place while loosening the hex jam nuts, or damage will occur to the "O" rings. Replacement of the "O rings" is recommended.

14. Hold the hydraulic cylinder elbow fittings in place with a 5/8 wrench, and loosen the hex jam nuts with an 11/16 wrench. Slowly back the fittings out of the cylinder.
15. Replace the "O" rings at this point.

    NOTE: The front fitting is a 90 degree and the rear fitting is a 45 degree.

Reinstallation of the Hydraulic Fittings to the Cylinder

1. Set the new hydraulic steering cylinder on a bench.
2. Loosen the hydraulic fitting jam nut until it bottoms out on the threads.
3. Press the flat washer snug up against the hex jam nut.
4. Inspect the "O" ring for damage. If damaged, replace.
5. Press the "O" ring snug up against the flat washer.
6. Gently screw the fitting into place until the fitting becomes snug.

   NOTE: Do not tighten!!! At this time the "O" ring will be seated properly in the cylinder port. If it is over tightened, damage will occur.
7. Slowly unscrew the hydraulic fitting to the correct recorded position.

   NOTE: Do not unscrew the fitting more than one full turn, because the cylinder may leak at the "O" ring.
8. Hold the fitting in place with a 5/8 wrench, and tighten the hex nut with an 11/16 wrench.

INSTALL THE SECOND FITTING BY REPEATING STEPS ONE THROUGH EIGHT IN THIS SECTION.

Cub Cadet 3000 Series Char-Lynn 2 Series Steering Control

The following information may be used in the inspection and repair of Eaton's Char-Lynn 2 series steering control units.

When ordering replacement parts, give the product number and date code. The product and date code is noted on the serial number tag, which is located on the side of the valve housing.

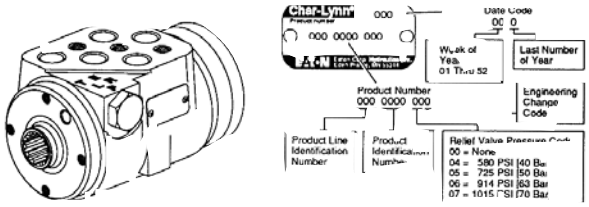


Figure 1.

Tools required for disassembly and reassembly: 10 mm socket, 7/8 in. socket, ratchet wrench, torque wrench (160 lb. in. capacity)

Tool List

- 10 mm Socket
- 7/8 in Socket
- Torque Wrench (160 lb-in Capacity)
- Small Blade Screwdriver

The following disassembly procedures may be used to disassemble the 2 series steering control. The configuration of your steering control may vary from the pictures shown in this program. The configuration of each control is determined by model. Different models may incorporate different component parts and/or assemblies. These differences may be the width of the gerotor assembly, spool/sleeve assembly, housing configuration and etc.

It is recommended that the steering control be thoroughly cleaned before any repairs are attempted. When cleaning, be sure all open ports are sealed.

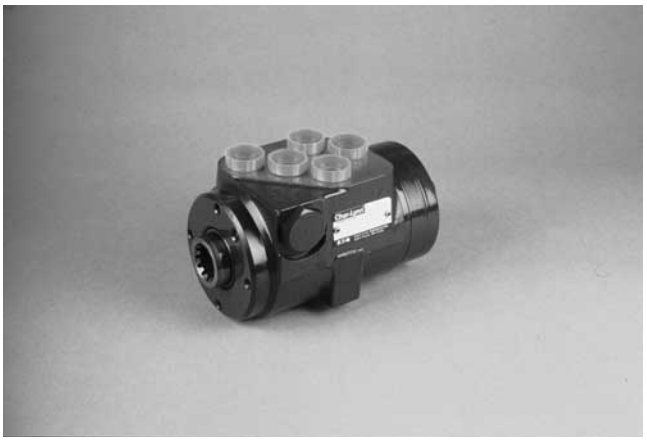


Figure 2.

To disassemble the steering control, first support the control in a vertical position with the metering (gerotor) section end up. Using a 10 mm socket wrench, remove the metering section end cap retaining cap screws.

NOTE: When using a bench vise to support the control, caution must be used not to use excessive clamping pressure on the control housing that could cause housing distortion.

Figure 3.

Remove the end cap from the gerotor assembly.

Figure 4.

Remove the o-ring seal from the gerotor assemblies outer ring.

Figure 5.

Remove the gerotor assemblies outer ring.

NOTE: The gerotor assembly may/may not remain intact during removal.

Figure 6.

Remove both the seal ring and o-ring seal from the gerotors inner star.

Figure 7.

Remove the gerotors inner star from the drive.

Figure 8.

Remove the spacer.

Figure 9.

Remove the drive from the spool/sleeve assembly.

Figure 10.

Remove the o-ring seal from the wear plate.

Figure 11.

Remove the wear plate from the housing assembly.

Figure 12.

Remove the o-ring from the control housing.

Figure 13.

The spool/sleeve assembly may be removed from the control valve housing in either the vertical or horizontal position.

VERTICAL POSITION

Carefully reposition the control valve assembly in the vertical position with the meter end of the control valve housing pointing upward. Remove the spool/sleeve assembly from the control valve housing.

IMPORTANT: Do not bind the spool/sleeve assembly in the control housing.

Rotate the spool/sleeve assembly slightly and slowly when removing from the control housing.

HORIZONTAL POSITION

Rotate the spool/sleeve assembly until the cross pin is horizontal with the porting face flange. Position the control valve assembly with the porting face on a clean flat surface.

Remove the spool/sleeve assembly from the metering section end of the control housing keeping the cross pin in the horizontal position.

IMPORTANT: Do not bind the spool/sleeve assembly in the control housing.

Rotate the spool/sleeve assembly slightly back and forth when removing from the control housing.

Figure 14.

Using a small screwdriver or similar type tool, remove the cross pin from the spool/sleeve assembly.

Figure 15.

Push or pull the spool forward to remove it from the sleeve.

NOTE: Caution must be used not to dislodge the spring retaining ring during removal of the spool from the sleeve.

Figure 16.

Carefully remove the spring retaining ring from the centering springs.

Figure 17.

Carefully remove the centering springs from the spool.

NOTE: It is not necessary nor recommended to remove the external ring from the spool.

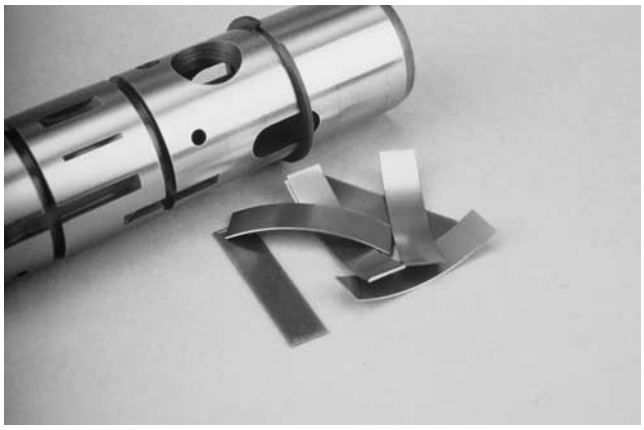


Figure 18.

Turn the valve housing over and remove the two bearing races and thrust bearing.

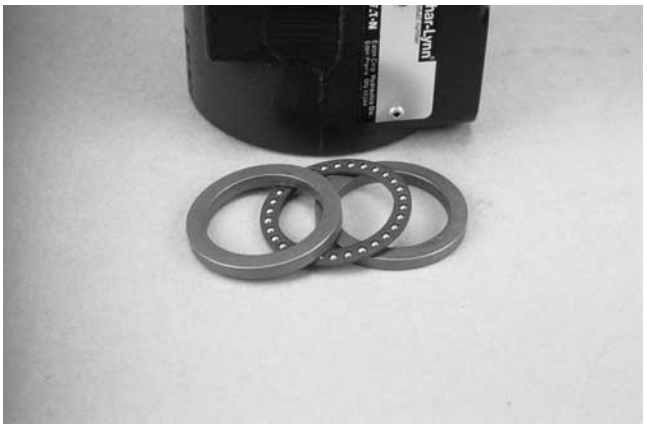


Figure 19.

Using the small screwdriver or similar tool, remove the dust seal. Caution must be used not to scratch or damage the dust seals counter bore when removing the dust seal.

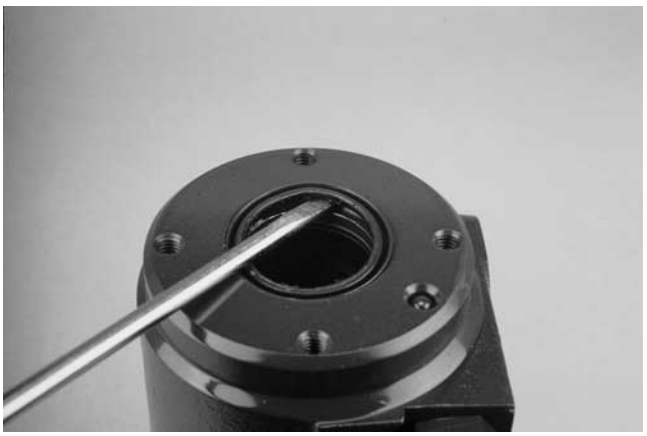


Figure 20.

Again using a small screwdriver or similar tool, remove the quad ring seal from the valve housing.

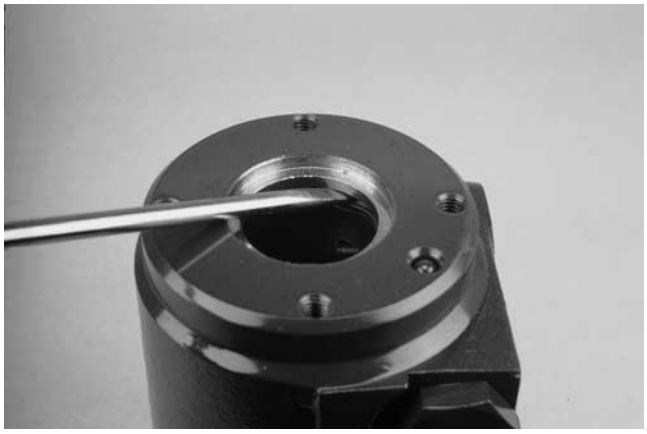


Figure 21.

Using a 7/8 in. socket or end wrench, remove the relief valve check or check ball plug.

Figure 22.

Shown here are both the relief valve check and check ball assemblies.

The relief valve check assembly is optional.

Figure 23.

REASSEMBLY

Prior to the reassembly of the steering control, replace all worn and damaged parts and/or assemblies along with all seals and sealing rings. Clean all parts in clean solvent and blow dry with compressed air.

Lubricate all finished parts surfaces freely with clean hydraulic fluid during assembly to provide instant lubrication between rotating surfaces at start-up.

Lubricate all seals and sealing rings with petroleum jelly to help retain the sealing rings during reassembly and provide lubrication to the dust and spool seals.

Install the two bearing races and thrust bearing into the valve housing.

Figure 24.

Install the sleeve into the valve housing.

Figure 25.

Using caution to retain the races, bearing and sleeve in the valve housing, carefully turn the assembly over and set it on a clean flat surface. Together, the housing, races, bearing and sleeve create a groove into which the quad seal can be installed. Lubricate and install the quad seal in its seat through the input end of the valve housing.

CAUTION: When installing, be sure the quad seal is not twisted.

Figure 26.

After the seal is installed, turn the valve housing over and remove the sleeve, races and bearing.

Figure 27.

Turn the valve housing over and press the dust seal into its bore, located in the face of the valve housing.

NOTE: The lip of the dust seal must point away from the valve housing.

Figure 28.

Shown here is the correct orientation of the spool/sleeve centering springs. Two sets of (3) each curved springs in the center and (1) each flat piece on the outside.

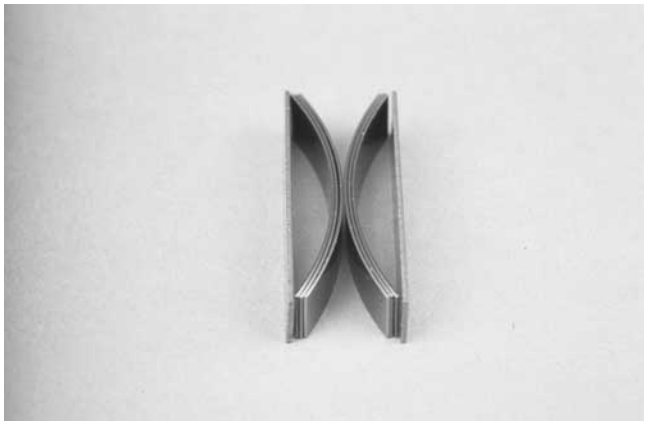


Figure 29.

To install the centering springs on the spool, first install the two flat pieces.

Figure 30.

Next install one set of the 3 curved centering springs between the two flat pieces.

Figure 31.

Then install the final set of 3 curved centering springs between the flat piece and the previously installed curved centering springs.

NOTE: The bowed side of the two sets of 3 centering springs must point toward each other.

Figure 32.

Center the centering springs and install the spring retaining ring over the springs.

Figure 33.

Lubricate the spool assembly and install into the sleeve, aligning the centering springs with the notches machined in the sleeve.

Figure 34.

Push the spool assembly into the sleeve until the centering springs are firmly positioned into the notches located in the sleeve.

Figure 35.

Insert the cross pin into the spool/sleeve assembly.

Figure 36.

Supporting the valve housing in the upright position, lubricate and install the bearing races and thrust bearing.

NOTE: The thrust bearing must be installed between the two bearing races.

Figure 37.

Lubricate and install the spool/sleeve assembly into the valve housing.

Figure 38.

Lubricate and install the o-ring seal into the groove located in the control valve housing.

Figure 39.

Install the wear plate by aligning the holes in the wear plate with the cap screw and porting holes in the control housing.

NOTE: The grooved side of the wear plate must point upward.

Figure 40

Lubricate and install the o-ring seal into the groove located in the wear plate.

Figure 41.

Install the drive, making sure you fully engage the slot on end of drive with the cross pin in the spool/sleeve assembly.

Figure 42.

Lubricate and install both the gerotor star and outer ring. Install by aligning the splines of the star with the drive. After installation, rotate the gerotors outer ring to align with the housing cap screw holes.

NOTE: The grooved side of both gerotor star and outer ring must face upward.

Figure 43.

Install drive spacer in gerotor star.

Figure 44.

Lubricate and install both the o-ring seal and seal ring into the gerotor star. Install the o-ring in the groove located in the star first and then the seal ring.

Figure 45.

Lubricate and install the o-ring seal into the groove located in the gerotors outer ring.

Figure 46.

Prior to the installation of the end cap, freely lubricate the gerotor star seal ring.

Figure 47.

Install the end cap onto the gerotor assembly by aligning the cap screw holes.

Figure 48.

Install the end cap retaining cap screw and tighten in a crisscross sequence. Torque to 140-160 in. lbs.

Figure 49.

Install the check ball or optional relief valve check as shown here.

Figure 50.

Torque plug to 15 in. lbs.

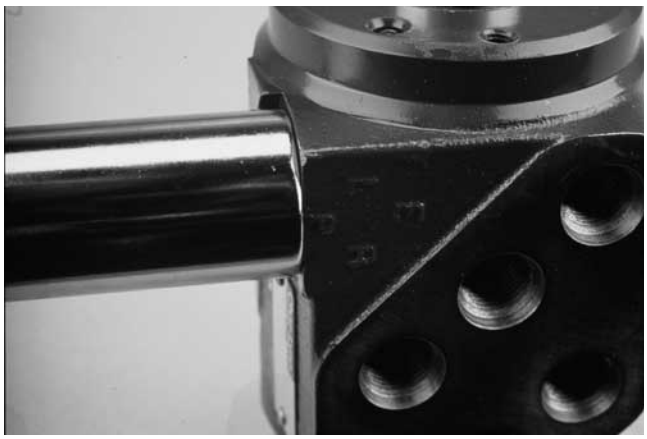


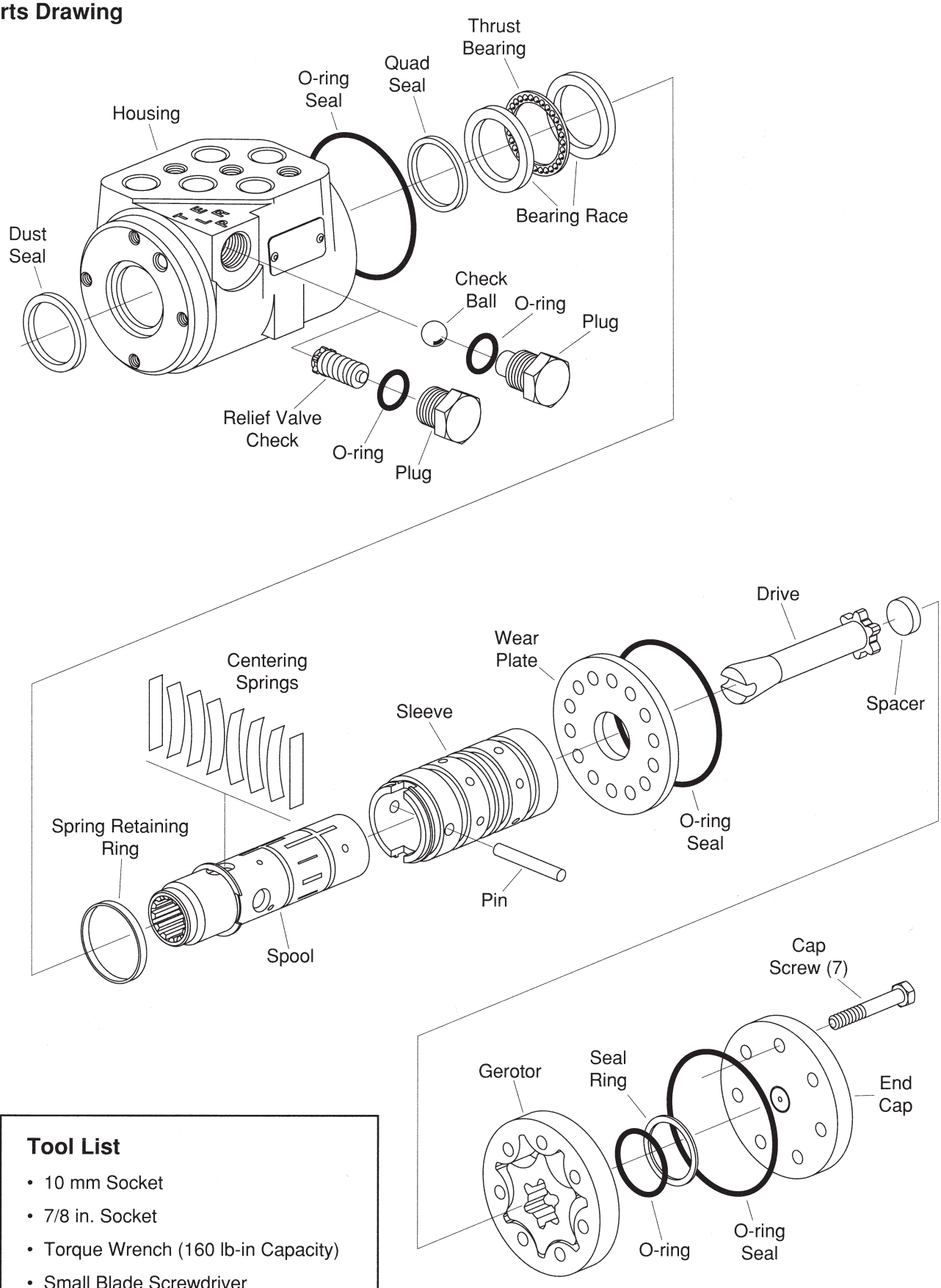
Figure 51.

The steering control is now ready for test and installation.

Figure 52.

Cub Cadet 3000

Parts Drawing



Tool List

- 10 mm Socket
- 7/8 in. Socket
- Torque Wrench (160 lb-in Capacity)
- Small Blade Screwdriver

Disassembly

Cleanliness is extremely important when repairing hydraulic Steering Control Units (SCU). Work in a clean area. Before disconnecting the hydraulic lines, clean the port area of the SCU. Before disassembly, drain the oil, then plug the ports and thoroughly clean the exterior of the SCU. During repairs, always protect machined surfaces.

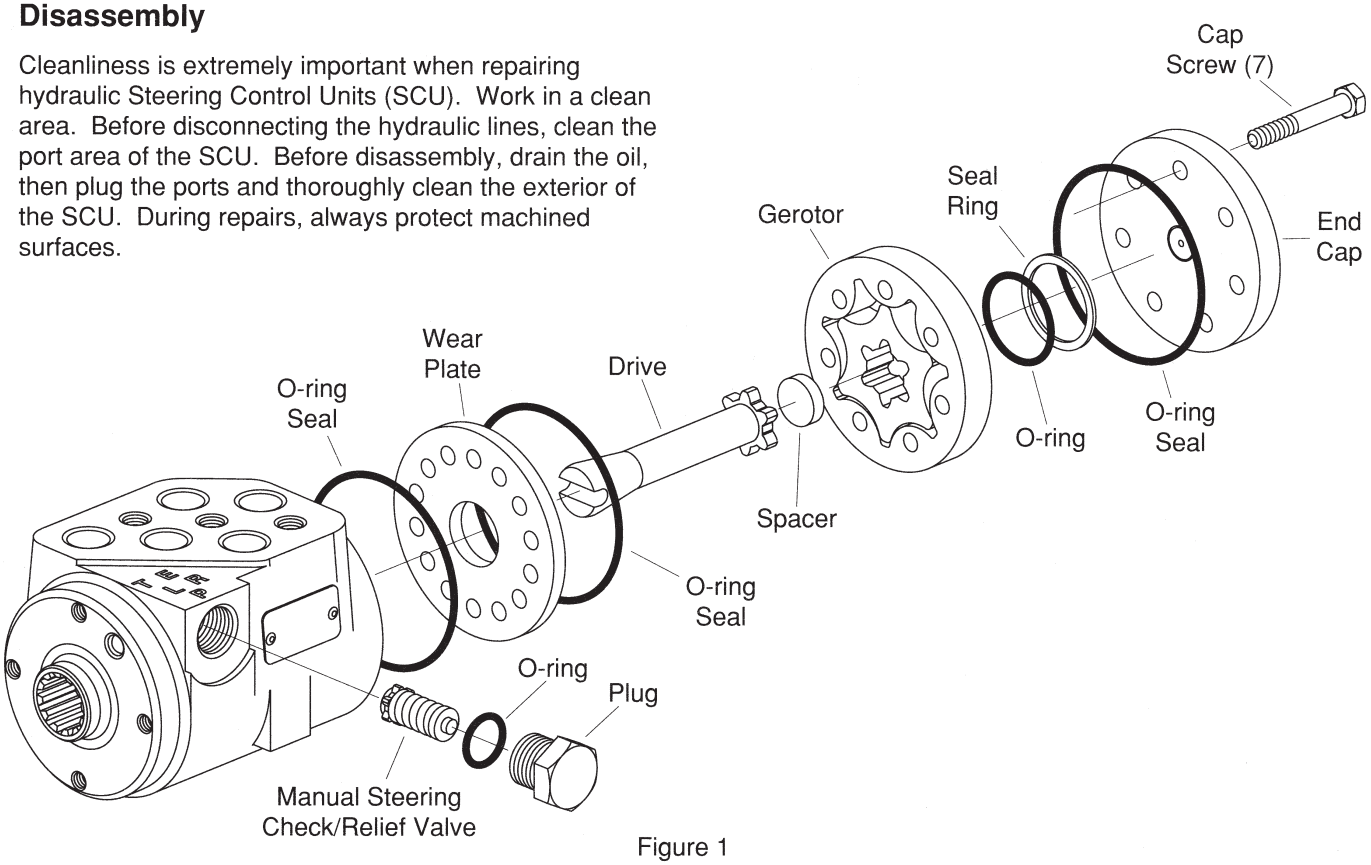


Figure 1

1 Remove the 7 cap screws and disassemble the SCU as shown in figure 1.

2 Remove the plug and manual steering check as shown in figure 1.

Note: The manual steering check may be a check ball or a check/relief valve.

3 Slide the spool and sleeve from the housing, see figure 2.

4 Remove the thrust bearing and bearing races.

5 Remove the quad seal.

6 Using a small blade screwdriver, carefully pry the dust seal from the housing.

Important: Do not damage the dust seal seat.

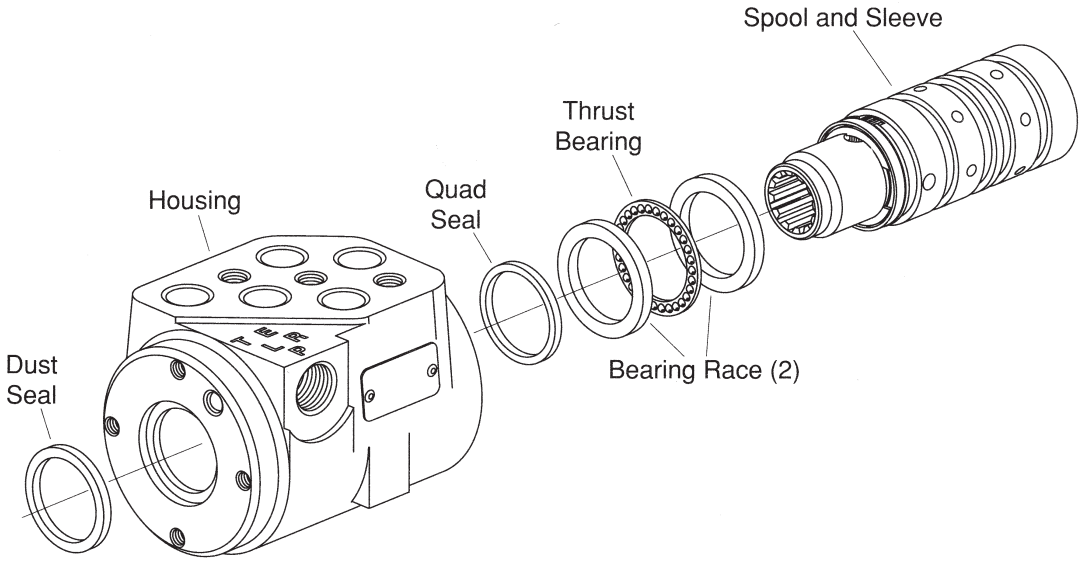


Figure 2

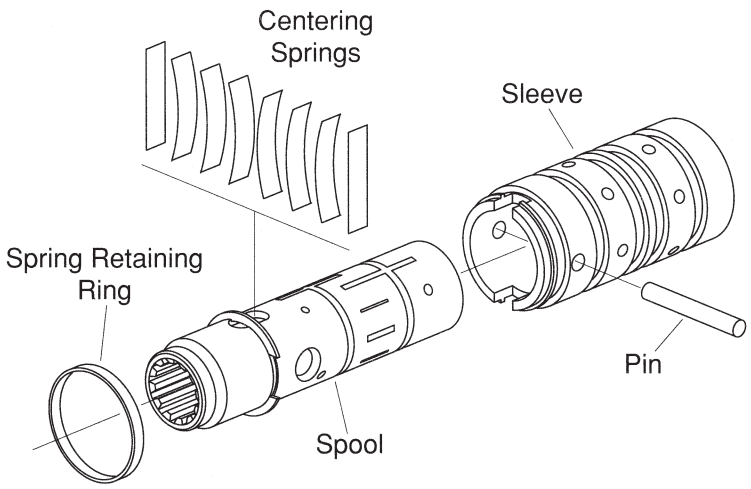


Figure 3

7 Remove the pin that holds the spool and sleeve together, see figure 3.

8 Carefully slide the spool out of the sleeve. The springs and retaining ring will stay with the spool as it's removed.

9 Remove the retaining ring and springs.

Caution: The centering springs are under tension; remove the retaining ring carefully.

Reassembly

Check all mating surfaces. Replace any parts with scratches or burrs that could cause leakage. Wash all metal parts in clean solvent. Blow them dry with pressurized air. Do not wipe parts dry with paper towels or cloth. Lint in a hydraulic system will cause damage.

Note: Always use new seals when reassembling hydraulic steering control units. Refer to parts list 6-323 for seal kit part numbers, replacement parts, and ordering information.

Important: During reassembly lubricate the new seals with a petroleum jelly like Vaseline. Also lubricate machined surfaces and bearings with clean hydraulic fluid.

10 Install the quad seal:

- Put one of the bearing races and sleeve into the housing.
- Together, the housing and bearing race create a groove into which the quad seal will be installed.
- Hold the bearing race tightly against the input end of the housing by pushing on the gerotor end of the sleeve.
- Fit the quad seal into its seat through the input end of the housing. Be sure the seal is not twisted.
- Remove the sleeve and bearing race.

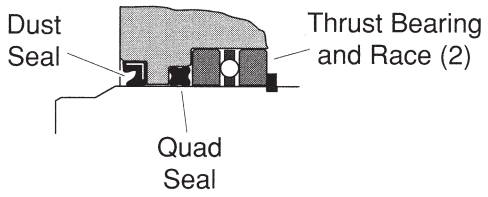


Figure 4

11 Lubricate and install the dust seal, see figure 4 for correct seal orientation.

12 Install the centering springs in the spool. It is best to install the two flat pieces first. Next, install the curved pieces, three at a time.

13 Fit the retaining ring over the centering springs.

14 Apply a light coating of clean hydraulic fluid to the spool and slide it into the sleeve. Be sure the centering springs fit into the notches in the sleeve.

15 Install the pin, see figure 3.

16 Apply a light coating of petroleum jelly to the inner edge of the dust and quad seals.

17 Put the thrust bearing and races into the housing. The thrust bearing goes between the two races, see figure 2.

18 Apply a light coating of clean hydraulic fluid to the spool and sleeve assembly and slide it into the housing.

Important: Do not damage the dust or quad seals.

19 Clamp the housing in a vise as shown in figure 5. Use just enough clamping force to hold the housing securely.

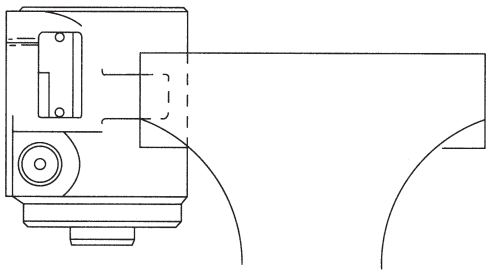


Figure 5

20 Lubricate and install a new o-ring seal in the groove in the housing.

21 Install the wear plate and align the holes in the wear plate with threaded holes in the housing.

Note: The holes in the wear plate are symmetrical.

22 Install the drive, be sure the slot in the drive engages the pin.

23 Lubricate and install a new o-ring seal in the groove in the wear plate.

24 Install the gerotor and align the screw holes.

25 Lubricate and install a new o-ring seal in the groove in the gerotor ring.

26 Lubricate and install a new o-ring and seal ring in the groove in the gerotor star.

27 Install the spacer.

28 Install the end cap and 7 cap screws. Tighten the cap screws, in a criss-cross pattern, to 140 -160 lb-in. [16 -18 Nm].

29 Remove the SCU from the vise.

30 Install the relief valve/check or check ball and plug. Use a new o-ring and tighten the plug to 150 lb-in. [17 Nm].

NOTES

Removal and Replacement for the Center Lift Cylinder

CAUTION: Slowly remove the hydraulic lines from the cylinder. Test for pressure in the lines before removal.

1. Place an oil pan directly under the center lift cylinder. This will catch the hydraulic fluid that will be drained from the lines and the cylinder.
2. Remove the hairpin from the clevis pin at the rear of the lift cylinder. See figure 1.
3. Slide the clevis pin all the way to the left rear tire.

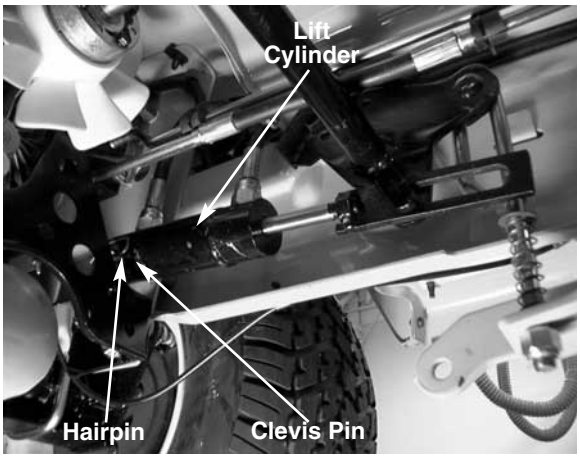


FIGURE 1.

4. Pull the cylinder towards the center of the machine and release the cylinder from the clevis pin. See figure 2.
5. Pull the cylinder forward applying pressure to the lift shaft assembly. The lift shaft assembly will pivot forward with the cylinder, and allow the rear of the cylinder to pass by the front transmission support bracket.

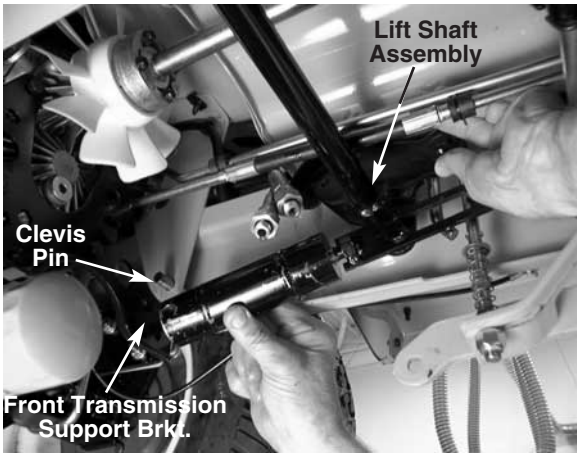


FIGURE 2.

6. Remove both hydraulic connectors from the lift cylinder using a 7/8" open end wrench.

   NOTE: The front connector on the lift cylinder hydraulic line runs to the top port of the lift valve. The back connector on the lift cylinder hydraulic line runs to the bottom port of the lift valve. Be sure to reinstall the hydraulic lines in the correct ports during reassembly.
7. Inspect the "O" rings on the connectors for any damage. If damaged, replace.
8. Pivot the cylinder down 90 degrees and release the slotted bracket from the lift shaft assembly cam. See figure 3.

   NOTE: Allow the hydraulic fluid to drain completely from the cylinder into the oil pan.

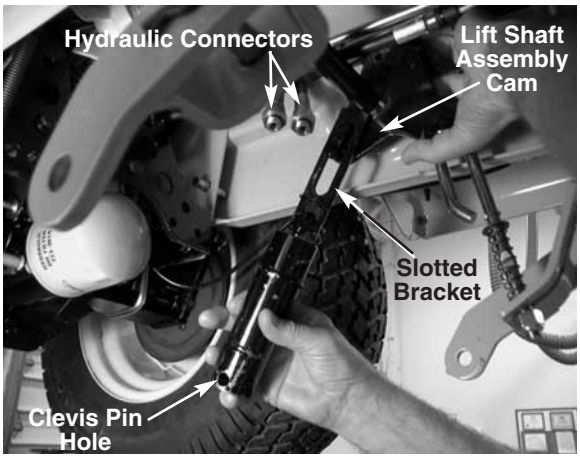


FIGURE 3.

REINSTALL THE CENTER LIFT CYLINDER IN THE REVERSE ORDER ABOVE.

NOTE: When reinstalling the cylinder to the cam on the lift shaft assembly, make sure the slotted cylinder bracket is offset towards the left frame of the tractor.

NOTES

Removal and Replacement of the Pump Adapter

Prior to removing the pump adapter, it is necessary to remove the fender assembly.

1. Remove the side panels and disconnect the spark plug wires.
2. Remove all four of the hex head tapp screws that connect the drive shaft to the pump adapter using a 3/8 socket. See figure 1.

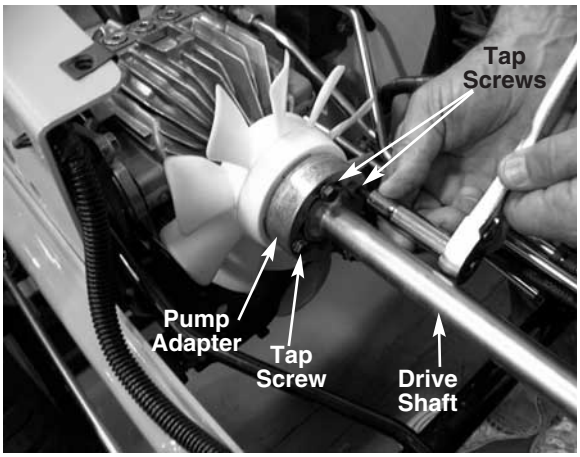


FIGURE 1.

3. Remove both hex cap screws and lock nuts from the tilt wheel coupling using a 7/16 wrench and a 7/16 socket. See figure 2.

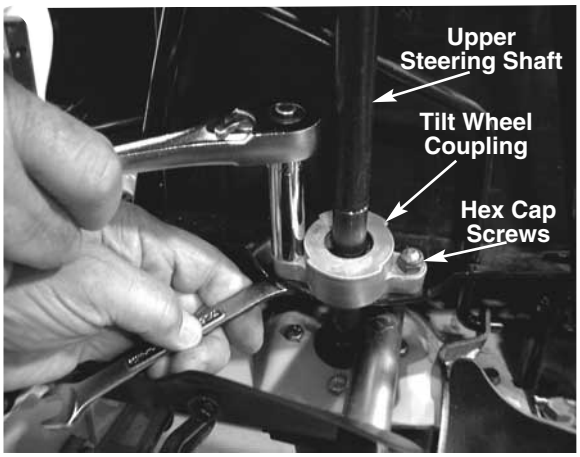


FIGURE 2.

4. Raise the upper steering shaft. See figure 3.
5. Remove the lower steering shaft from the hydraulic steering pump. See figure 3.

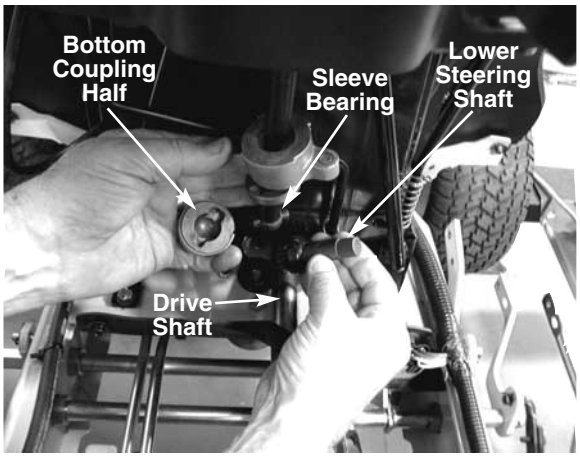


FIGURE 3.

6. Slide the drive shaft towards the left frame rail.

   NOTE: Be careful not to dislodge the blue barrels on each end of the drive shaft.
7. Remove the fan from the pump adapter and set it aside.

   NOTE: There may be a spacer on the coupler. If so, set it aside.
8. Loosen the nut securing the pump adapter using a 9/16 socket. See figure 4.

   NOTE: Channel locks may be needed to hold the pump adapter in place while breaking the pump adapter nut free.

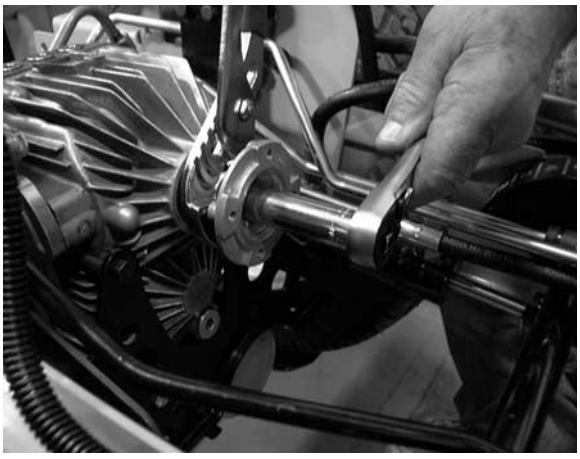


FIGURE 4.

9. Finger loosen the pump adapter nut until it is flush with the end of the hydro input shaft.
10. Place a 13/16 socket against the nut with the opened end of the socket facing away from the nut. See figure 6.
11. Place the new pump adapter, cupped side in, over the opened end of the 13/16 socket. See figure 5.
12. Finger tighten two of the drive shaft hex screws across from one another.
13. Using a 3/8 socket, tighten the hex screws equally a quarter of a turn at a time until the old hub breaks free. See figure 5.

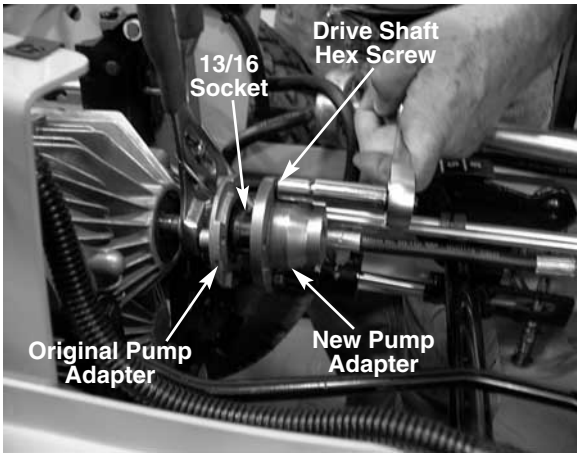


FIGURE 5.

14. Remove the hex screws and new hub. See figure 5.
15. Remove the hex nut, bell-washer, old pump adapter, and key from the input shaft.

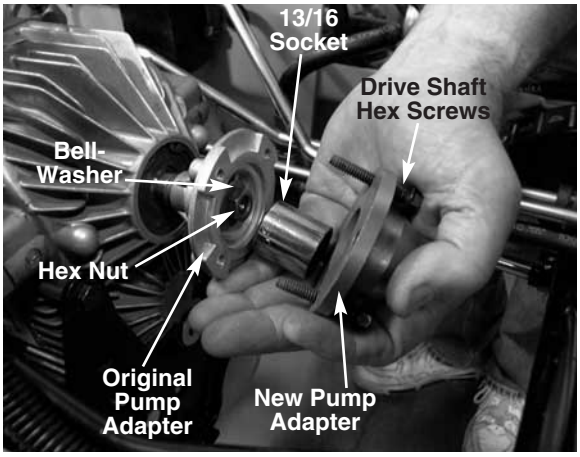


FIGURE 6.

INSTALLATION OF THE NEW PUMP ADAPTER

1. Clean the hydrostatic input shaft of any debris. See figure 7.
2. Apply a light coat of loctite 803 to the taper of the input shaft. See figure 7.
3. Place the new fan over the cone of the new pump adapter.
4. Push the new pump adapter and fan onto the hydro input shaft.

   NOTE: The fan will be on the inside of the pump adapter.

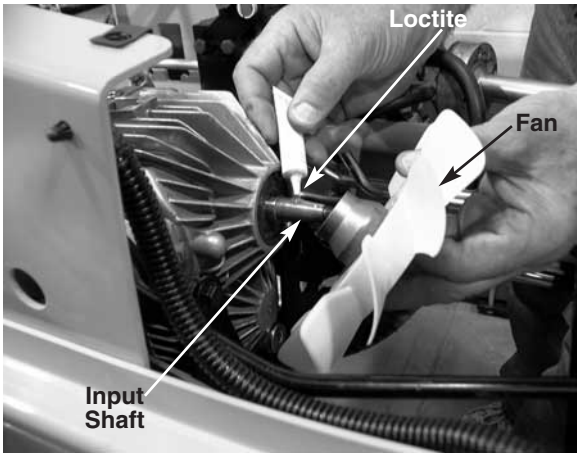


FIGURE 7.

5. Install the new bell washer and locknut.

   NOTE: Hold the new pump adapter in place with a drift punch and torque the lock nut to 20 ft. lbs. See figure 8.

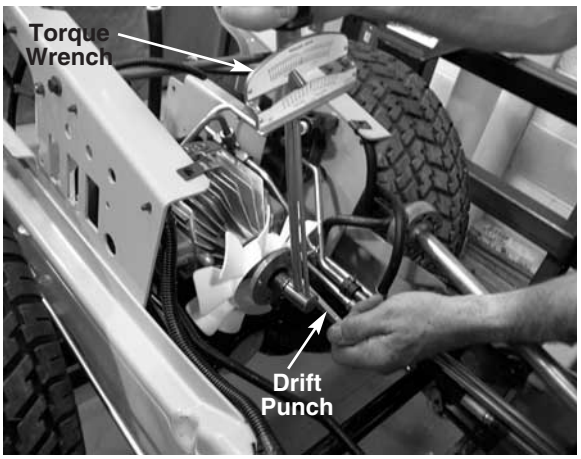


FIGURE 8.

6. Line up the drive shaft with the new pump adapter.

   NOTE: If there is more than an 1/8” gap between the drive shaft and pump adapter place the spacer in between the the drive shaft and the pump adapter. Do not force the spacer in if it does not fit.

7. Install the new bolts through the drive shaft, pump adapter, and the fan.

8. Finger tighten the shoulder nuts with the shoulder facing the fan.

   NOTE: The shoulder on the nuts fit into the fan holes. See figure 9.

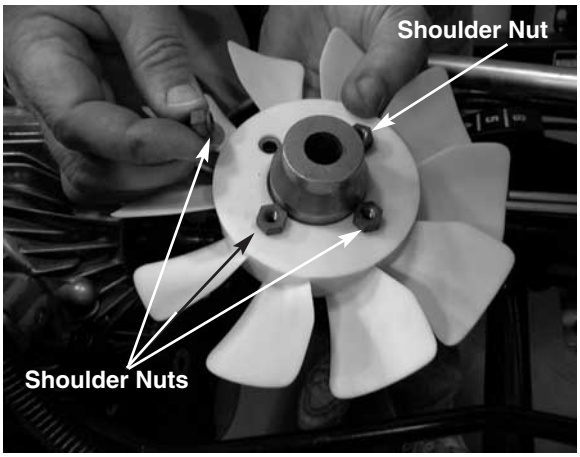


FIGURE 9.

9. Tighten the hex bolts and shoulder nuts securing the pump adapter assembly, using a 7/16 wrench and a 7/16 socket. See figure 10.

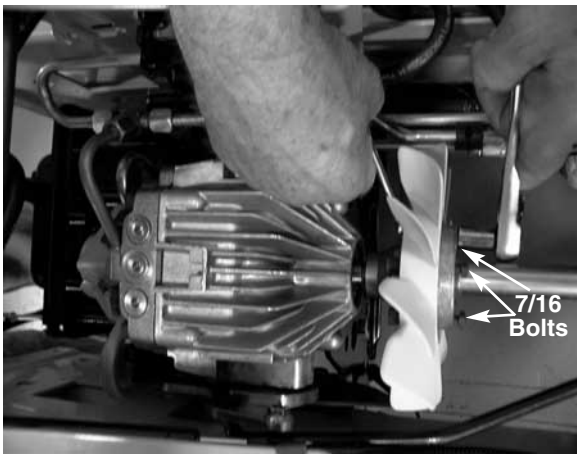


FIGURE 10.

REINSTALL THE FENDER ASSEMBLY.

NOTES

BDU-21L-500 Auxiliary Pressure Test

Prior to performing this test, it is necessary to remove the deck and fender assemblies.

1. Remove the hex cap screw securing the double valve clamp to the charge pump using an 11mm swivel socket. See figure 1.
2. Remove the hydraulic pressure tube end from the charge pump.

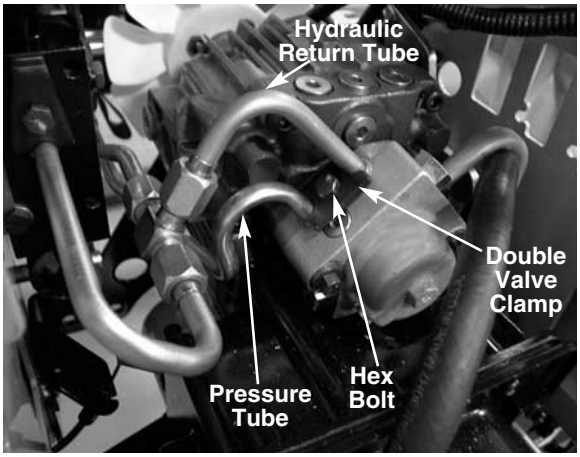


FIGURE 1.

3. Remove both of the hex cap screws from the power steering pump port plate using a 13mm wrench. See figure 2.
4. Remove the hydraulic pressure tube end from the hydraulic steering pump. Charge pump to steering pump. See figure 2.

   NOTE: Be careful not to damage the "O" rings. If damaged, replace.
5. Remove the hydraulic pressure tube from the unit.

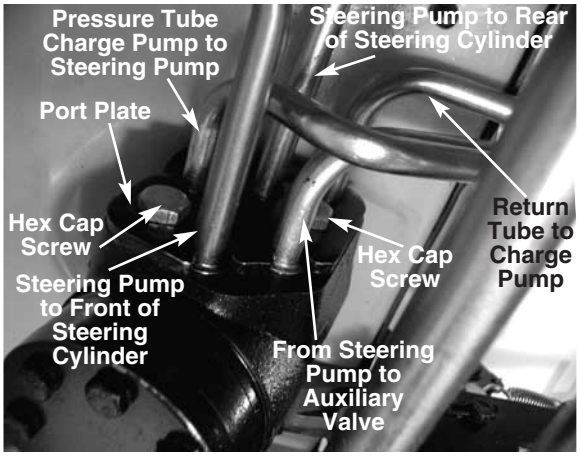


FIGURE 2.

6. Install the pressure test kit into the unit with the pressure gauge standing straight up. See figure 3 and 4.
7. Reinstall the double valve clamp to the charge pump. See figure 1.
8. Reinstall the power steering pump port plate. See figure 2.
9. Fasten all hardware securely.

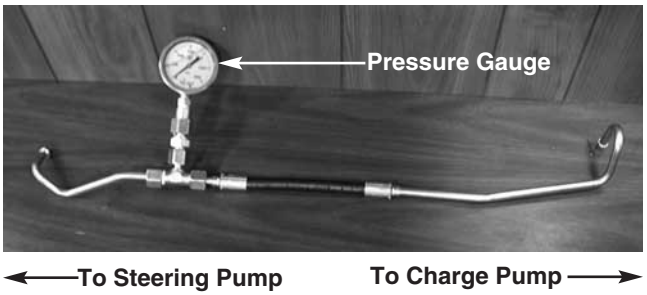


FIGURE 3.

10. Start the unit and allow the hydraulic fluid to circulate at idle.
11. Slowly increase the throttle to full.
12. Slowly decrease the throttle to idle. Record the hydro reading at the pressure gauge. See figure 4.

NOTE: The pressure will be very low if shown at all on the gauge.

FIGURE 4.

13. Increase the throttle to full. Record the hydro reading at the pressure gauge. The reading should be between 200 PSI and 650 PSI. See figure 5.

NOTE: This system should not read higher than 650 PSI. The relief valve is set to 650 PSI in the auxiliary manifold.

FIGURE 5.

14. Remain at full throttle and max out the lift valve. There should be a **PEAK** pressure of 1100-1200 PSI. See figure 6.

    NOTE: Only hold the lift valve for a short amount of time. Record the reading and release the lift valve lever as quick as possible.

IMPORTANT: System pressure will increase with the actuation of the power steering and/or deck lift.

FIGURE 6.

If the pressure readings are not meeting the specifications, the charge pump is faulty.

If the pressure readings are meeting specifications, the charge pump is not faulty and the mechanical system must be checked.

Hydrostatic Transmission Pressure Test Setup

Bill of Materials

- 2 - 3000 P.S.I. Hydraulic Gauges
- 1 - 200 P.S.I Hydraulic Gauge
- 2 - 9/16-18 Straight Thread O-ring & JIC fitting (JIC dependent on hose fittings)
- 3 - 3000 P.S.I. hoses of adequate lengths (Connect as shown in FIG 1)
- 1 - T fitting
- 1 - needle valve

Connection Procedure

1. Remove tractor seat.
2. Remove both check plugs using a 1/4" hex drive.
3. Replace check plugs with the 2 9/16-18 straight thread O-ring fittings.
4. Connect the T fitting and needle valve to the left side. (Reverse Hi)
   - Connect the 200 P.S.I. gauge to the needle valve making sure flow can be shut off to this gauge.
   - Connect the 3000 P.S.I. gauge to the T fitting.
5. Connect another 3000 P.S.I. fitting to the right side. (Forward high pressure port)

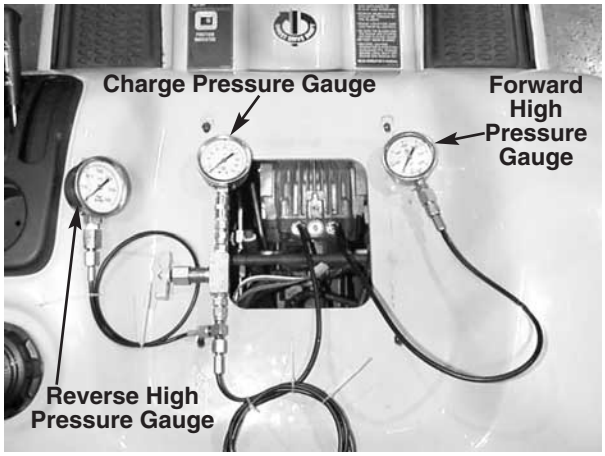


FIGURE 1.

Forward ONLY Test Procedure

1. Lift tractor elevating rear tires off the ground. (Tires will rotate)
2. Remove pin from parking brake. (allowing brake to be apply while not in neutral)
3. Open needle valve allowing flow to the 200 P.S.I. gauge (applying reverse can now damage this gauge).
4. With tractor running, apply parking brake.
5. Continue holding the brake. depress the forward foot pedal until max. pressure is seen on right side gauge.
6. Record pressures from the 200 P.S.I. gauge and the right side 3000 P.S.I. gauge.

Reverse ONLY Test Procedure

** To test for reverse side high pressure switch the changes to opposite ports and repeat the similar to the forward test. **

Conclusion

The 200 P.S.I. gauge sees the charge pressure in the system, and during this type of the test the pressure should be 20-40 P.S.I. The right side 3000 P.S.I. gauge sees the forward high pressure and for this test should read 1000 to 1400 P.S.I. If the gauges see values close to this range the hydrostat is functioning properly.

NOTES

Removal and Replacement of the Hydraulic Steering Pump

Prior to removing the steering pump, it is necessary to remove the fender assembly.

CAUTION: Slowly remove the hydraulic lines from the hydraulic steering pump. Test for pressure in the lines before removal.

1. Place an oil pan directly under the hydraulic steering pump. This will catch the hydraulic fluid that will be drained from the lines and the pump.
2. Remove all four of the hex head tapp screws from the drive shaft to the pump adapter using a 3/8 socket.

   NOTE: Removal of the drive shaft from the pump adapter is necessary to allow access to the four hydraulic steering pump mounting bolts.

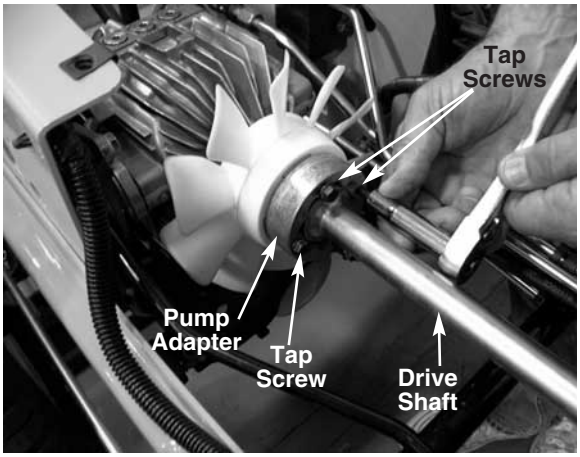


FIGURE 1.

3. Remove both hex cap screws and lock nuts from the tilt wheel coupling using a 7/16 wrench and a 7/16 socket. See figure 2.

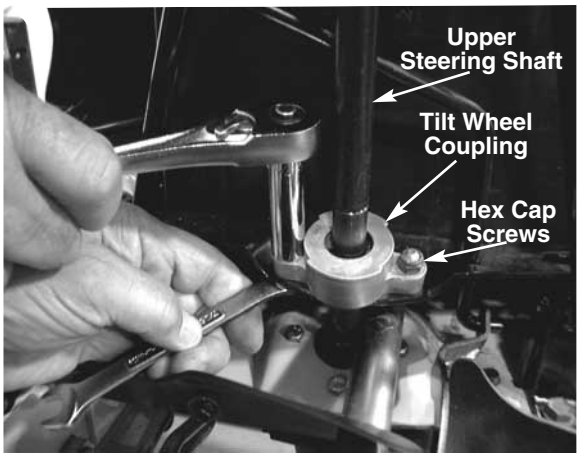


FIGURE 2.

4. Raise the upper steering shaft. See figure 3.
5. Remove the lower steering shaft from the hydraulic steering pump. See figure 3.

   NOTE: The lower steering shaft is splined on each end and requires lubrication prior to reassembly.
6. Slide the drive shaft towards the left frame rail.

   NOTE: Be careful not to dislodge the blue barrels on each end of the drive shaft.

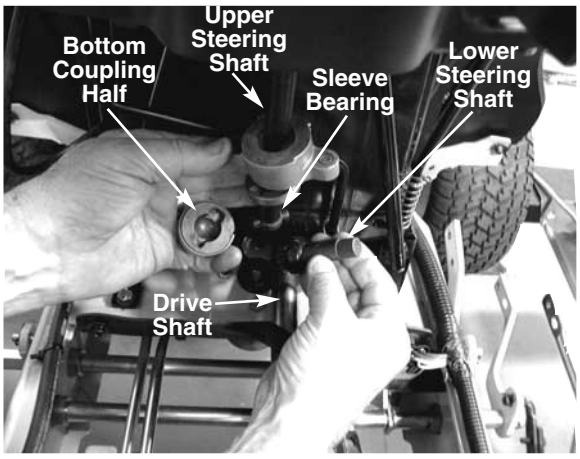


FIGURE 3.

7. Write down the exact locations of all the hydraulic tubes. See figure 4.
8. Remove both hex cap screws from the steering pump port plate using a 13mm wrench.
9. Remove the port plate from the hydraulic lines.

   NOTE: Pivot the top edge of the port plate backward (towards the left frame rail), bringing the plate to horizontal. Push the port plate up and rotate the port plate counter-clockwise 90 degrees using the main pressure line as the pivot point. Slide the port plate towards the left frame rail until the port plate clears the hydraulic lines.

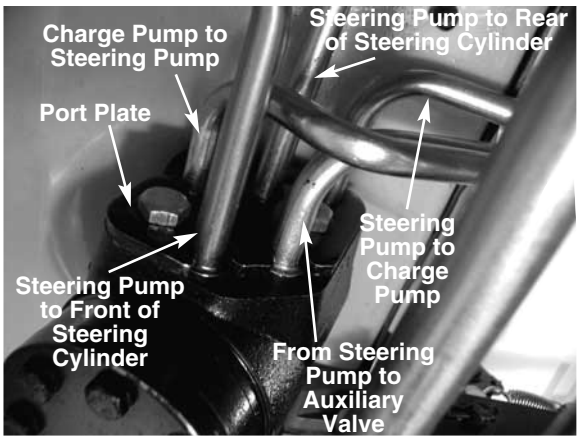


FIGURE 4.

10. Remove the hydraulic tubes from the hydraulic steering pump.

    NOTE: If the hydraulic tubes do not want to come out, use a small mallet and tap them out of the ports. Be careful not to damage the tubes.

11. Inspect the "O" rings on the connectors for damage. If damaged, replace.

    NOTE: Place a small amount of grease on the "O" rings and cover the connector surface completely for reinstallation.

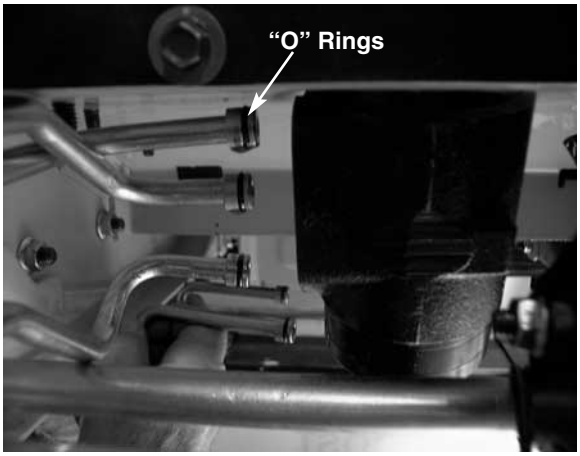


FIGURE 5.

12. Support the hydraulic steering pump from below. See figure 6.
13. Remove the four hex cap screws securing the hydraulic steering pump to the frame using a 10mm wrench. See figure 6.

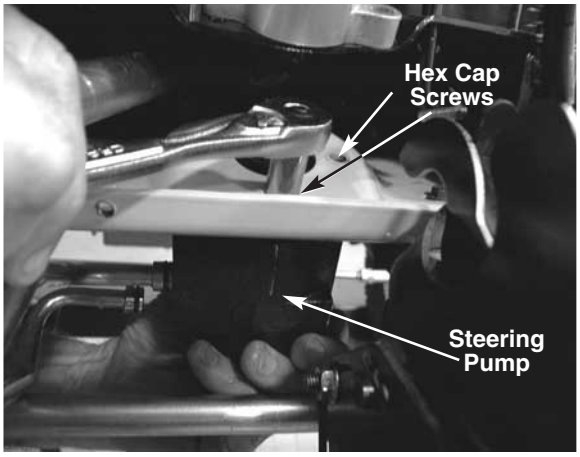


FIGURE 6.

14. Remove the hydraulic steering pump from the tractor.

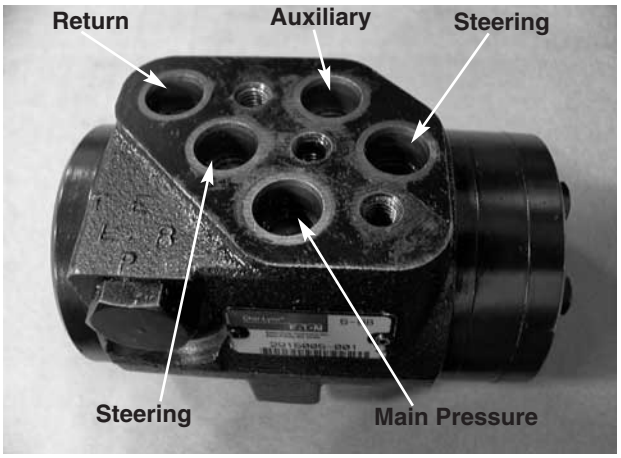


FIGURE 7.

Refer to the 1998 Cub Cadet Technical Update Seminar manual for inspection and repair of the Char-Lynn 2 series Steering Control in Section 17.

REASSEMBLE THE HYDRAULIC STEERING PUMP IN THE REVERSE ORDER.

Removal and Replacement of the Hydraulic Valve

Prior to removing the hydraulic valve, it is necessary to remove the fender assembly.

CAUTION: Slowly remove the hydraulic lines from the hydraulic valve. Test for pressure in the lines before removal.

1. Place an oil pan directly under the hydraulic valve. This will catch the hydraulic fluid that drains from the lines and the valve.
2. Remove the double valve clamp from the valve body using a 7/16 socket. See figure 1.
3. Remove both hydraulic hose connectors coming from the hydraulic lift cylinder to the valve body. See figure 1.

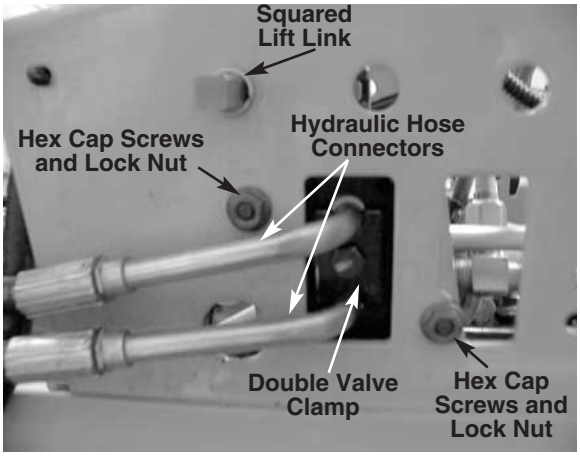


FIGURE 1.

4. Remove the side valve clamp that holds the return tube to the valve body. See figure 2.
5. Remove the hydraulic return tube from the “T” fitting with an 18mm wrench. See figure 2.
6. Remove the hydraulic return tube from the hydraulic valve body. See figure 2.

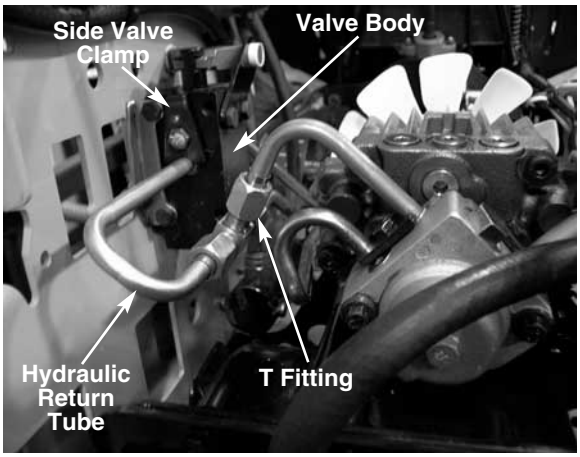


FIGURE 2.

7. Remove the side valve clamp that holds the inlet tube to the valve body using a 7/16 socket. See figure 3.

   NOTE: All the hydraulic lines and tubes going into the hydraulic valve ports have two “O” rings on each connector. See figure 4.

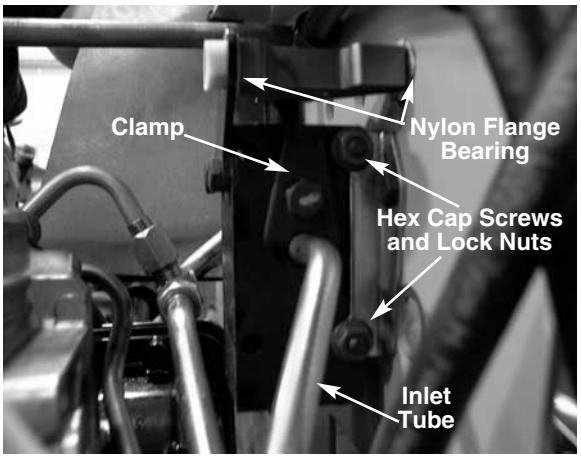


FIGURE 3.

8. Remove both hex cap screws and hex flange lock nuts securing the hydraulic valve to the frame using a 7/16 socket. See figure 1.

   NOTE: The hydraulic valve body must be secured to the frame with both screws before the hydraulic tubes can be assembled to the hydraulic valve during reassembly.
9. Pull the hydraulic valve body away from the hydraulic inlet tube slowly.

   NOTE: If the hydraulic tube does not want to come out, use a small mallet and tap it out of the port. Be careful not to damage the valve body or the hydraulic tube/s.
10. Remove the valve body from the tractor. See figure 5.

    NOTE: Record the correct positions of the nylon flange bearings on the squared lift link. See figure 3.

11. Inspect the “O” rings for damage. If damaged, replace. See figure 4.
12. Remove all the remaining hardware from the valve body using a 7/16 socket.

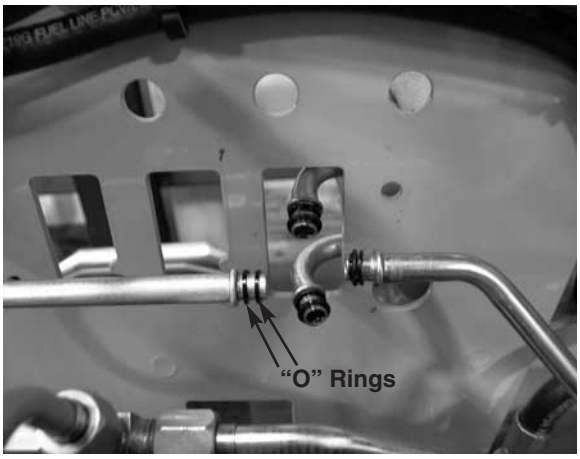


FIGURE 4.

13. Remove the valve mounting brackets. See figure 5.

    NOTE: Write down the correct positions of the mounting brackets. The brackets can be installed backwards if not properly marked.

14. Remove the squared lift link.

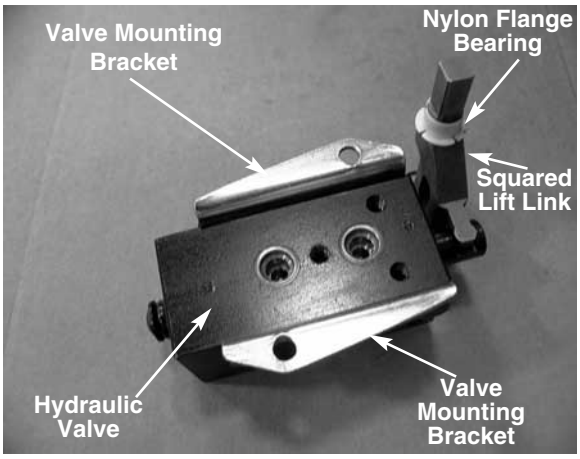


FIGURE 5.

REASSEMBLE THE HYDRAULIC VALVE IN THE REVERSE ORDER ABOVE.

Engine Removal and Replacement

IMPORTANT: Use proper safety procedures when working on the tractor.

1. Open the hood and remove the battery box cover.
2. Remove the negative and positive battery terminal connectors from the battery using a 5/16 socket.
3. Remove both of the side panels from the tractor by raising the latches horizontally and turning the latches 1/4 turn. See figure 1.
4. Loosen all four plastic wing nuts holding the dash panel screen in place.
5. Remove the dash panel screen by pulling it towards the seat.

FIGURE 1.

6. Cut the cable ties securing the headlight wiring harness to the hood assembly. See figure 2.
7. Remove the headlight bayonet mounts from both of the headlights by twisting the sockets 1/4 turn and pulling straight out. See figure 2.

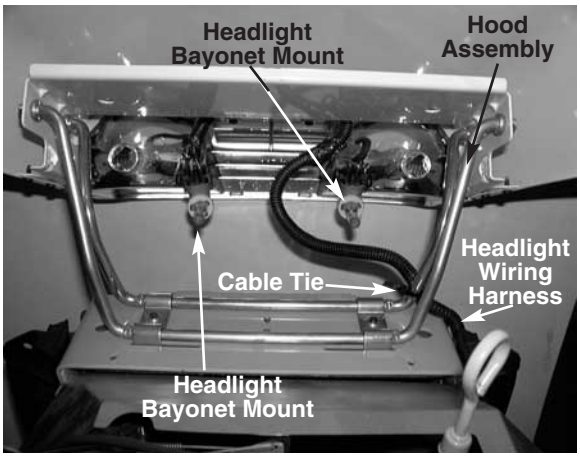


FIGURE 2.

8. Partially close the hood to allow access to the grill fasteners. See figure 3.
9. Squeeze all four grill fasteners and release the grill. See figure 3.
10. Remove the grill and set it aside.
11. Remove all four hood mounting bolts from the muffler assembly brackets using a 1/2" socket. See figure 3.

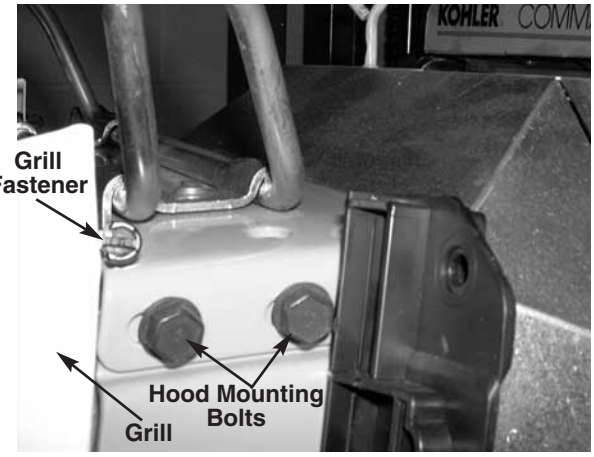


FIGURE 3.

12. Remove all four muffler assembly bracket bolts from the tractor frame using a 1/2" socket. See figure 4.
13. Remove the muffler assembly from the engine.

    NOTE: Move the muffler assembly side to side. This will allow the muffler to separate from the exhaust manifolds. See figure 4.

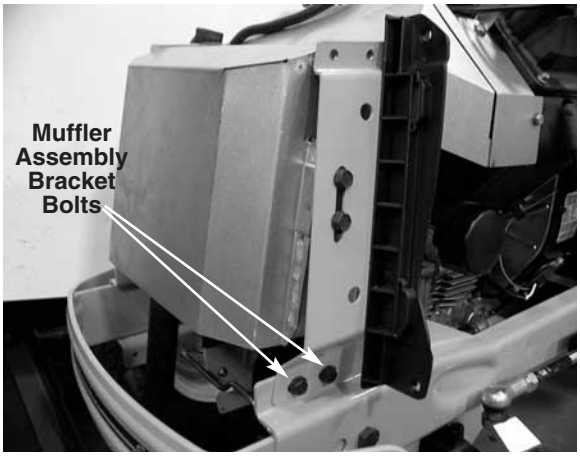


FIGURE 4.

14. Remove both the choke and the throttle cables. See figure 5.

    NOTE: use a marker and mark the holes and cable alignment before removal.

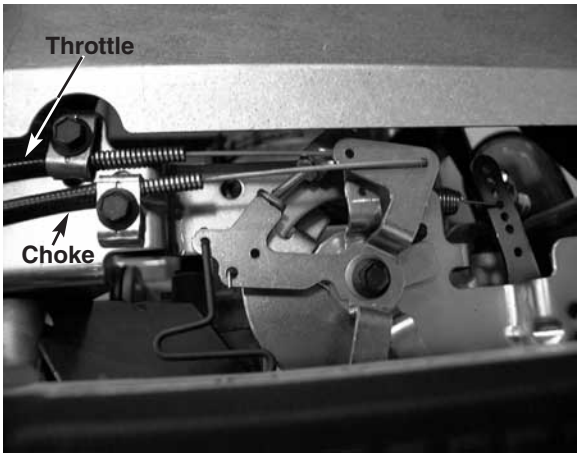


FIGURE 5.

15. Disconnect the vacuum tube from the E-Vac check valve. See figure 6.

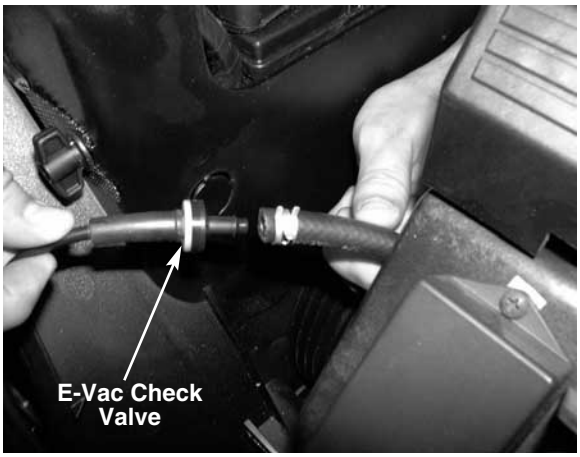


FIGURE 6.

16. Disconnect the wiring harness, ground cables, and any sensor connectors from the engine. See figure 7.

    NOTE: Visually inspect the engine from all angles to make sure all wires and cables are disconnected from the engine to the frame.

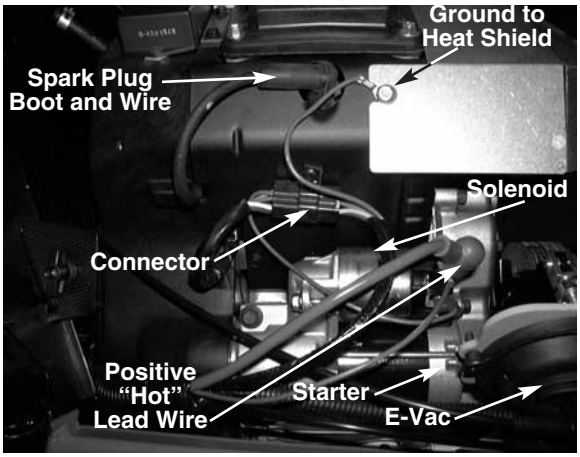


FIGURE 7.

17. Remove the fuel line from the engine.

    NOTE: Make sure the fuel line is fully drained and secured in a safe place during engine removal.

18. Remove both of the hex bolts securing the belt guard to the engine using a 13mm socket and extension. See figure 8.

19. Remove the E-vac clip. See figure 8.

    NOTE: Push up on the locking clip and slide the pin away from the engagement arm.

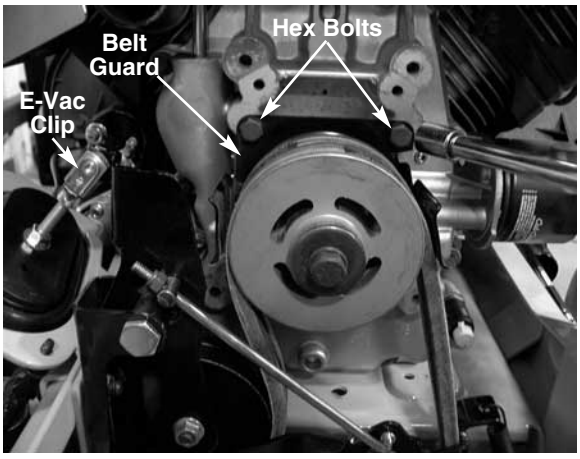


FIGURE 8.

20. Remove the battery from the unit.

    NOTE: The battery was removed to give direct access to the drive shaft bolts through the dash panel area.

21. Remove all four of the hex bolts securing the drive shaft to the engine flywheel using a 7/16 socket and extension. See figure 9.

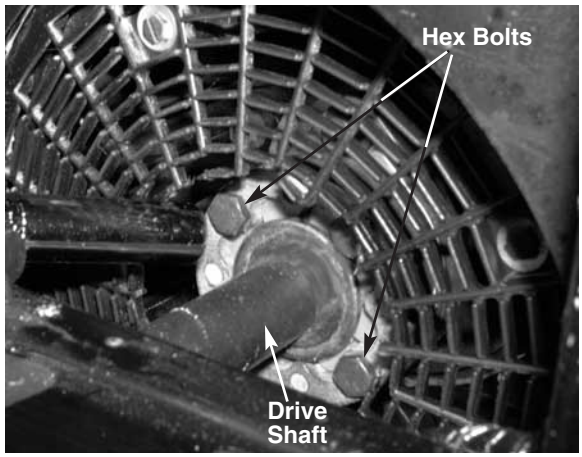


FIGURE 9.

22. Remove the PTO idler arm extension spring. See figure 10.
23. Remove both of the hex bolts and flanged lock nuts securing the PTO idler assembly to the frame using a 9/16 socket and a 9/16 wrench. See figure 10.

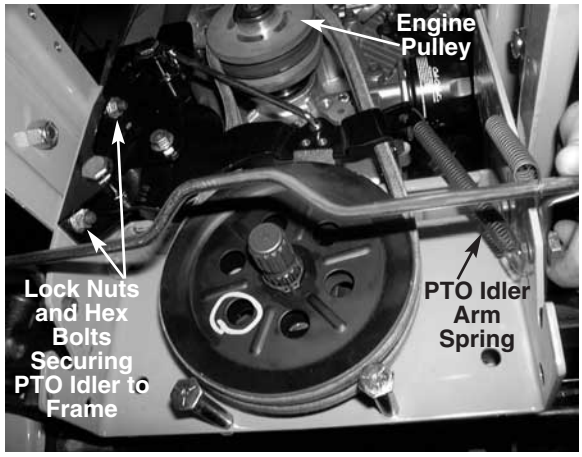


FIGURE 10.

24. Remove the PTO idler assembly from the unit.
25. Remove both of the PTO belts from the engine pulley.
26. Secure the engine from above using the engine brackets. See figure 12.
27. Remove all six of the hex bolts and lock nuts from the engine mounting plate using a 1/2” socket and a 1/2" wrench. See figure 11.

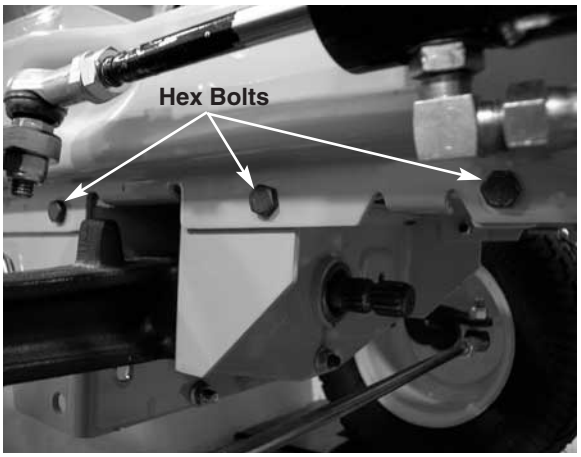


FIGURE 11.

28. Slowly raise the engine and mounting plate from the unit while a helper guides the drive shaft out of the flywheel screen. See figure 12.

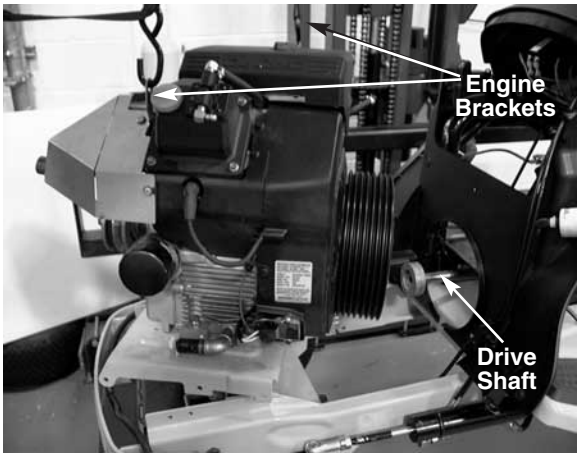


FIGURE 12.

NOTE: Use extreme caution while pulling the drive shaft away from the unit. The drive shaft couplers will come apart if you are not careful.

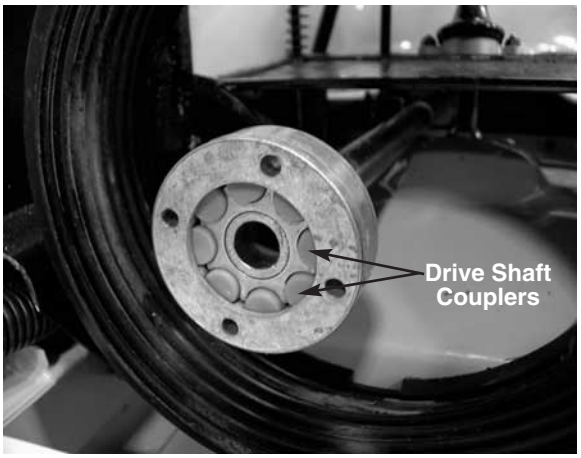


FIGURE 13.

REINSTALL THE ENGINE IN THE REVERSE ORDER ABOVE.

NOTES

Transmission Removal and Installation

Prior to removing the transmission, it is necessary to remove the fender assembly.

1. Loosen the fuel line clamp at the gas tank and slide it down the fuel line.
2. Remove the fuel line from the gas tank.
3. Remove the fuel sensor connector.
4. Remove all four of the hex bolts and lock nuts from the rear hitch plate panel using a 9/16 socket and a 9/16 wrench. Remove the hitch plate.
5. Remove the gas tank from the tractor.
6. Remove the oil tube and dipstick from the hitch plate and slide it back into the transmission.

   NOTE: The dipstick and tube will keep debris out of the transmission.
7. Raise the rear of the unit off the ground.
8. Remove all eight of the rear wheel hub nuts using a 3/4" socket.
9. Remove the rear wheel assemblies from the unit.
10. Remove the hex bolt securing the double valve clamp on the charge pump using an 11mm swivel socket. See figure 1.
11. Remove the hydraulic return tube from the “T” fitting using an 18mm wrench. See figure 1.
12. Remove the hydraulic steering pressure tube from the charge pump. See figure 1.

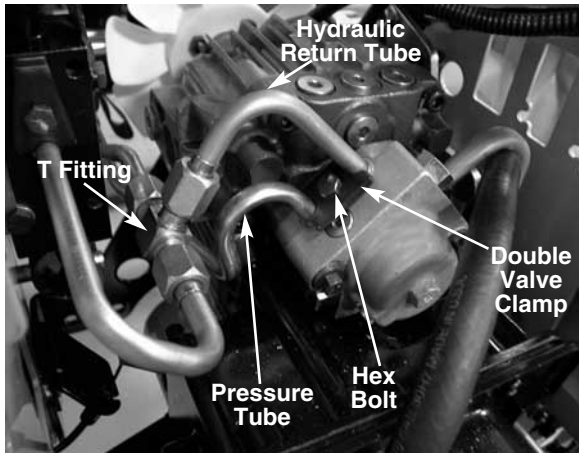


FIGURE 1.

13. Remove all four of the drive shaft hub screws from the pump adapter using a 3/8 socket. See figure 2.

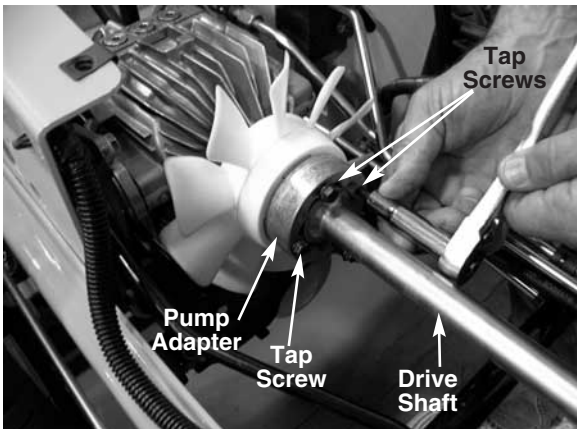


FIGURE 2.

14. Remove both hairpins securing the brake rod ferrules to the brake lever assemblies. See figure 3.

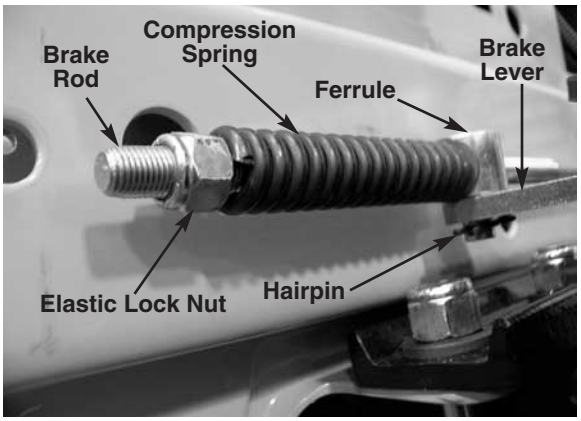


FIGURE 3.

15. Remove the shoulder bolt and lock nut securing the cylinder damper to the frame using a 5/8 wrench and a 7/16 socket. See figure 4.
16. Remove the hairpin from the rear control rod at the hydro neutral return plate. See figure 4.

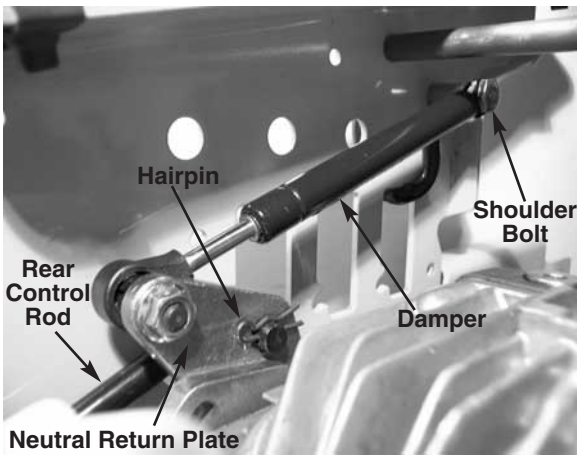


FIGURE 4.

17. Brace the transmission.
18. Remove all four of the front transmission support bracket to frame hex cap screws and hex flange lock nuts using a 9/16 wrench and a 9/16 socket. See figure 5.

    NOTE: The differential lock cable retainer bracket is removed along with the transmission support bracket.

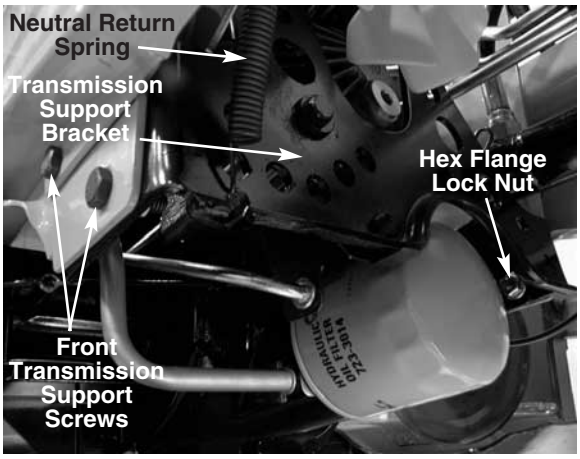


FIGURE 5.

19. Remove the “Z” fitting from the differential lock actuator arm. See figure 6.

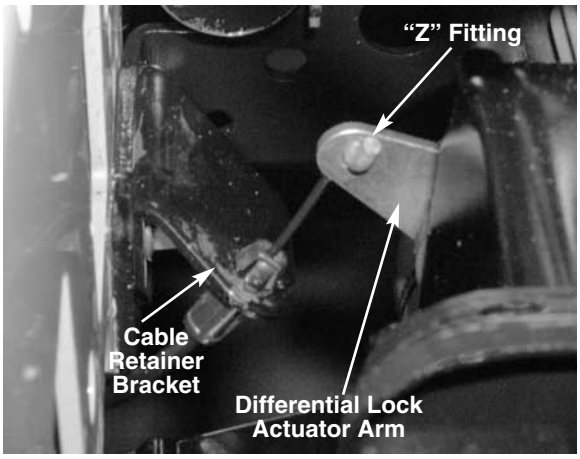


FIGURE 6.

20. Remove both transmission to frame “U” bolts using a 3/4" socket. See figure 7.

    NOTE: The “U” bolts have a lower point on one side. The point goes towards the rear of the unit during reassembly. See figure 7.

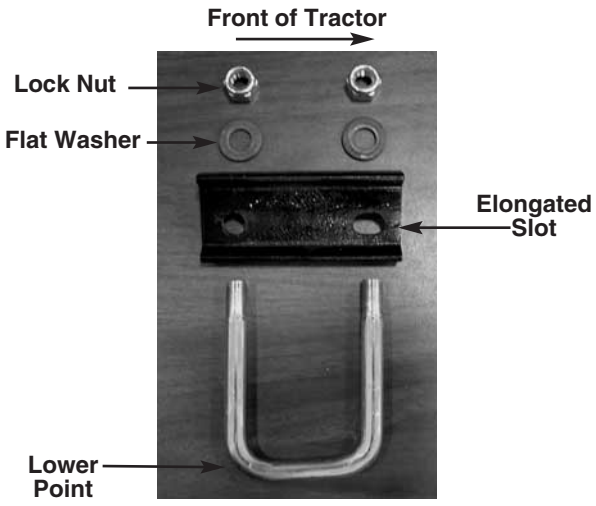


FIGURE 7.

21. Lower the transmission from the unit.

    NOTE: Be certain that the rear control rod is removed from the hydro neutral return plate as the transmission is removed. Also, make certain the brake levers clear the frame.

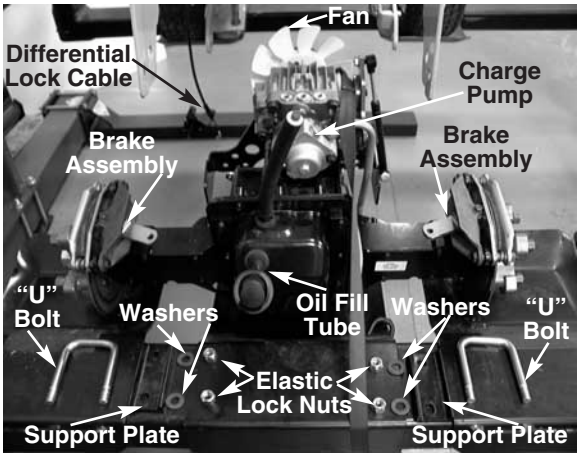


FIGURE 8.

REASSEMBLE THE TRANSMISSION TO THE UNIT IN THE REVERSE ORDER ABOVE.

Transmission Inspection and Disassembly

1. Inspect the pump adapter to be certain that it is turning the hydraulic input shaft. See figure 1.
2. Inspect the center hex jam nut and flat washer on the pump adapter to be certain that it is not loose. See figure 1.

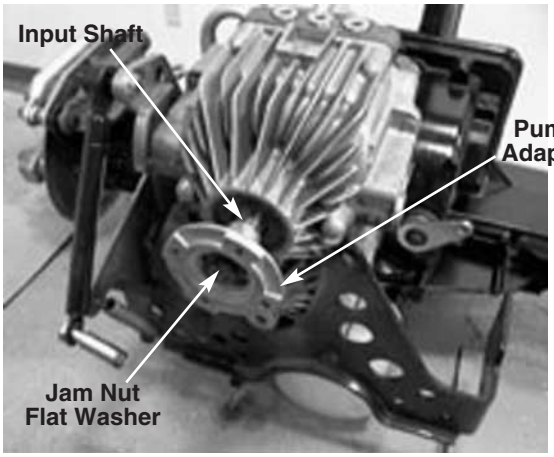


FIGURE 1.

3. Inspect the connection between the hydro arm and the trunnion arm behind the neutral return link. See figure 2.

   NOTE: Make sure the flat washer and hex screw are tight on the hydro arm. Also, check the set screw on the hydro arm to be certain it is tight.

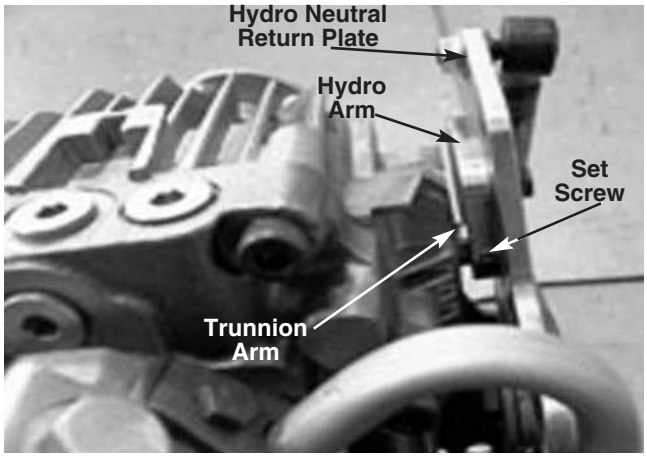


FIGURE 2.

4. Inspect the clearance between the hydro bypass spring plate and the bypass valve on the hydro pump. See figure 3.

   NOTE: There should be free play in between the plate and the bypass valve.

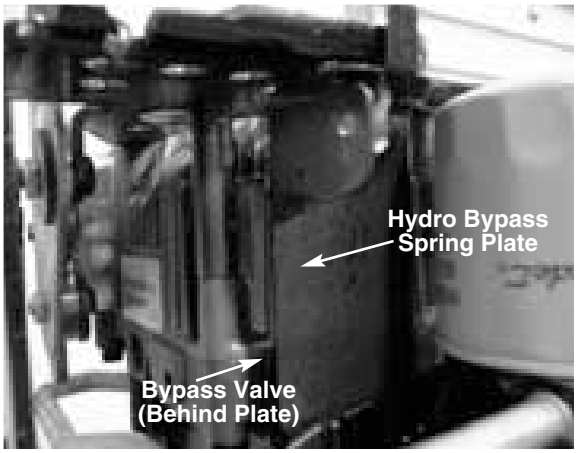


FIGURE 3.

5. Remove the hydro oil filter from the transmission and check for contamination in the filter, filter nipple, and the inlet cavity. See figure 4.

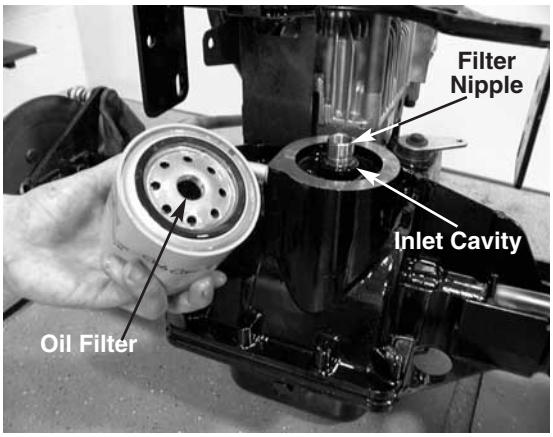


FIGURE 4.

6. Remove both clamps from the hydro pickup tube using a 7/16 wrench on the upper hex screw and a 3/8 wrench on the lower hex screw.
7. Remove the hydro pickup tube and inspect the tube for any contamination that would restrict the hydro oil flow. See figure 5.
8. Inspect the “O” ring at each end of the hydro pick-up tube. If damaged, replace. See figure 5.
9. Inspect the output and input ports where the hydro pickup tube clamps on. See figure 5.
10. Remove the extension spring from the torque bracket. See figure 5.

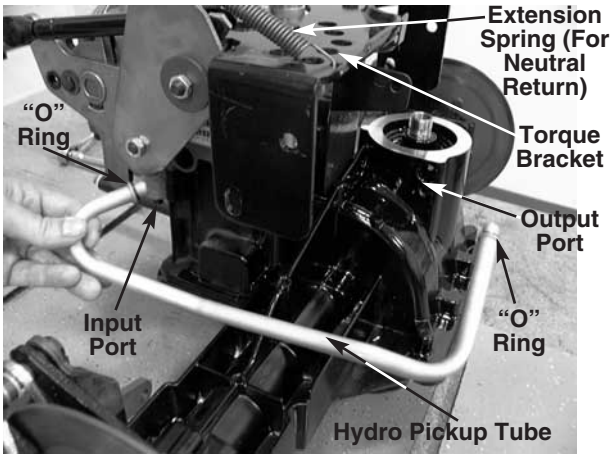


FIGURE 5.

11. Remove all four- 5.5” hex cap screws from the torque bracket using a 1/2” socket. See figure 6.
12. Remove the torque bracket and all four hex cap screws from the hydro transmission assembly by pulling straight up on the torque bracket.

    NOTE: The neutral return link comes off with the torque bracket.

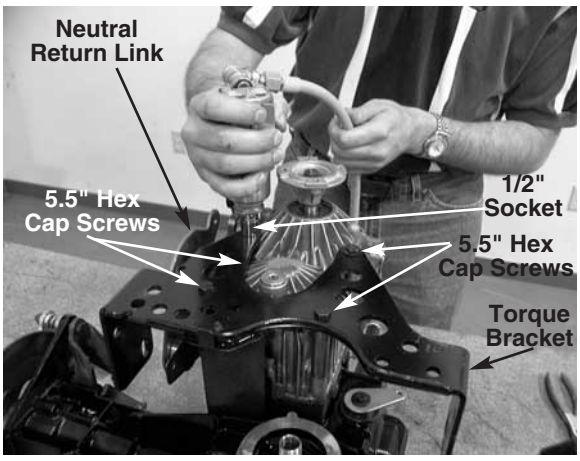


FIGURE 6.

13. Remove the hydrostatic transmission from the differential transmission and inspect the case drain holes on the hydro and the differential. See figure 7.

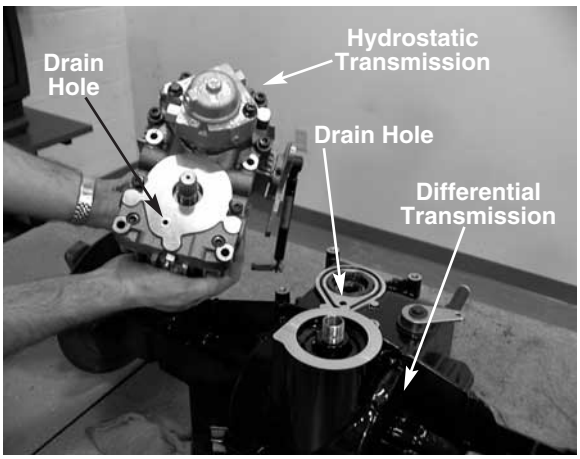


FIGURE 7.

14. Remove the “O” ring from between the hydro and differential. See figure 8.
15. Remove the spring washer from between the hydro and the differential. See figure 8.
16. Pull on the differential lock actuator using a fish scale and see if it locks in with less than 35 pounds of pull. See figure 8.
17. Grasp both hub assemblies. Rotate the hubs in opposite directions, in the forward direction together, and in the reverse direction together, looking for any binding.

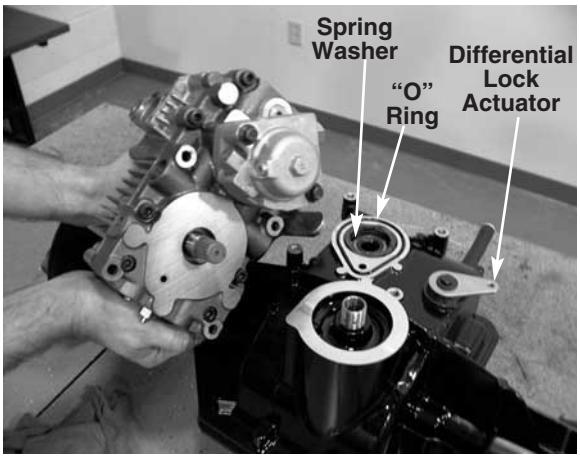


FIGURE 8.

18. Remove the center hub lock nuts on the hub assemblies using a 1 and 5/16” socket. See figure 9.

    NOTE: The torque on the center hub nut is 180-250 ft-lbs.

19. Remove the brake mounting bracket from the differential assembly by rotating the brake disk until the access holes are directly above the hex washer screws. Using a 1/2” socket and extension, remove all three hex washer screws from each side of the differential assembly. See figure 9.

20. Remove the hex cap screw and belleville washer from the differential lock actuator arm using a 7/16 socket. See figure 9.

21. Remove the differential actuator arm and all three flat washers from the differential.

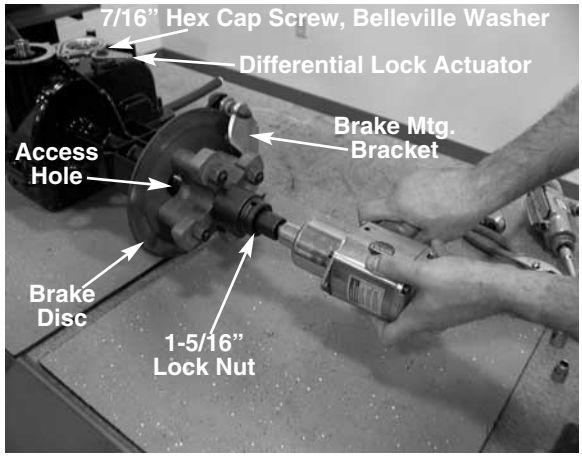


FIGURE 9.

22. Turn the differential over.

23. Remove all the hex washer tapp screws from the rear cover assembly using a 3/8 socket. See figure 10.

    NOTE: There is a difference in the hardware lengths. The six bolts that pass through the transmission cover blocks are 1.25" long. The remaining hardware is 1” long.

24. Remove and discard the cover assembly gasket.

25. Inspect all the gears in the differential for uneven wear or damaged teeth. See figure 10.

26. Remove the hex washer tapp screws from the transmission plate using a 3/8 socket.

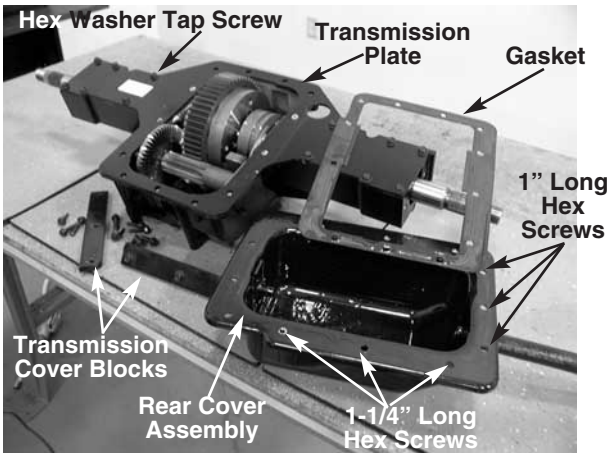


FIGURE 10.

27. Remove the transmission plate.

28. Remove and discard the second transmission plate gasket. See figure 11.

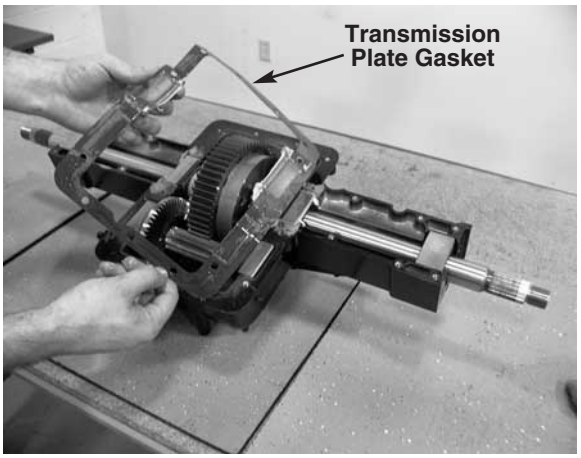


FIGURE 11.

29. Remove the complete differential assembly.

    NOTE: The differential lock actuator shaft will come out with the differential assembly.

30. Inspect the outer and inner bearing block assemblies for any damage. See figure 12.

31. Inspect the actuator shaft and make certain it is not bent.

    NOTE: Not all models are equipped with the differential lock out feature. See figure 12.

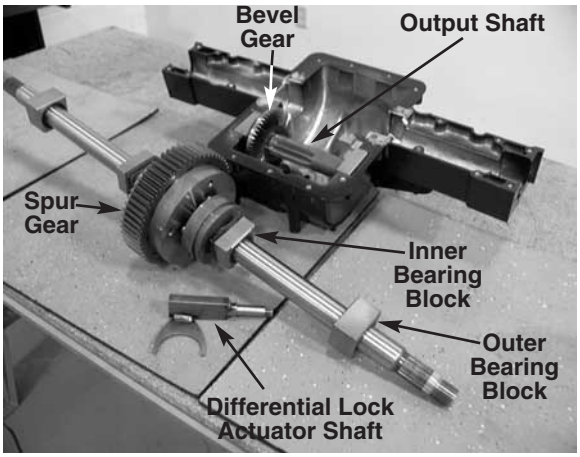


FIGURE 12.

32. Write down the shim orientations for both sides of the output shaft. See figure 13.

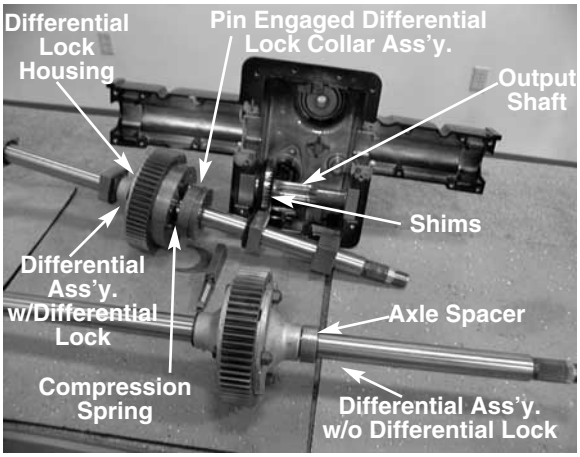


FIGURE 13.

33. Remove the output shaft assembly from the case and inspect for any wear.

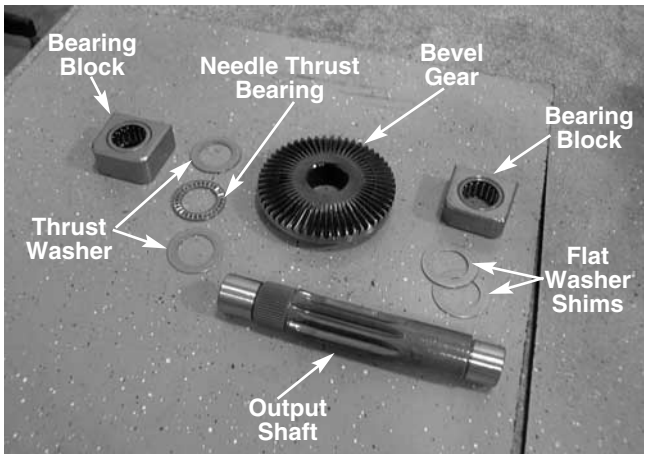


FIGURE 14.

34. Remove the input pinion gear assembly from the case. See figure 15.

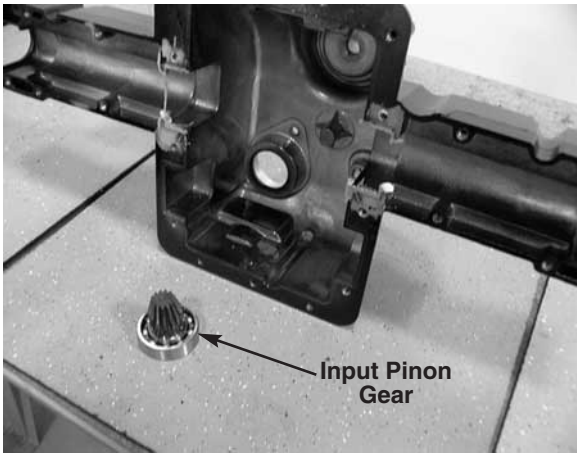


FIGURE 15.

35. Remove the four hex cap screws from the differential housing using a 9/16 socket. See figure 16.
36. Separate the differential assembly.
37. Remove the large spur gear and the differential gears together and lay them on the bench.
38. Grasp the large spur gear and pull it away from the differential gear assembly.

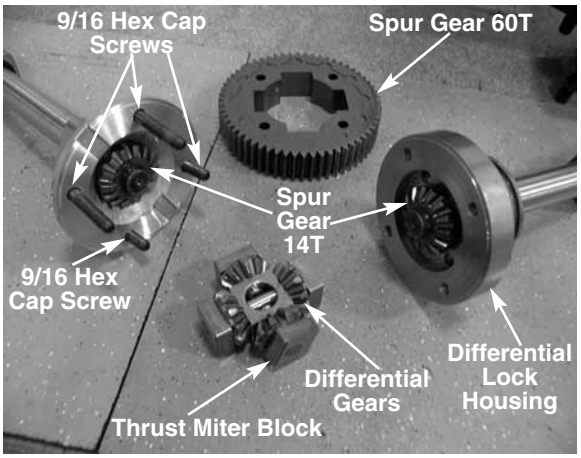


FIGURE 16.

INSPECT ALL COMPONENTS AND PARTS BEFORE REASSEMBLY.

Transmission Reassembly

1. Assemble the differential gear assembly flat on a work bench and in the correct sequence. See figure 1.

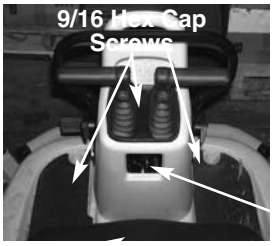


FIGURE 1.

2. Pick up all the components together and place them on the steel differential lock housing.
3. Rotate all four of the thrust miter blocks until they are flush with the top surface of the steel differential lock housing.
4. Place the large spur gear over the differential gear assembly.
5. Rotate the large spur gear until the screw holes line up directly above the screw holes in the steel differential lock housing.

   NOTE: At this point, the differential assembly should be complete and ready to be bolted together.
6. Apply thread locker to all four of the hex head cap screws that secure the differential assembly together.
7. Tighten all four hex head cap screws that secure the two differential halves to one another.

   NOTE: Torque the hex head cap screws to 220-280 in-lbs.
8. Turn the gear case input side up.
9. Remove the oil seal from the differential lock actuator hole.
10. Turn the gear case input side down.
11. Tap the input pinion gear assembly back into the housing.
12. Turn the gear case input side up.
13. Clean and grease the new “O” ring and the “O” ring passage on the differential housing.
14. Clean and place the spring washer into the inlet cavity.
15. Place the hydrostatic transmission assembly on the differential case.
16. Place the hydrostatic torque bracket on the hydrostatic transmission.
17. Place both of the hydro spacers between the torque bracket and the hydro.
18. Install the 5.5” hex cap screws that secure the torque bracket to the differential case.

    NOTE: Torque the screws to 180-200 in-lbs.
19. Put the extension spring back on to the torque bracket.
20. Remove and replace the “O” ring on each end of the pickup tube.
21. Secure the hydro pickup tube to the transmission using both tube clamps.

    NOTE: The upper hex cap screw is secured with a 7/16 wrench. The lower hex cap screw is secured with a 3/8 wrench. Torque both screws from 90-110 in-lbs.
22. Turn the gear case input side down.
23. Assemble the output shaft assembly in the correct sequence.

    NOTE: The sequence is as follows: Bearing block assembly, two thrust washers, output shaft, 54T bevel gear, thrust washer, needle thrust bearing, thrust washer, shim/s (no set amount of shims), and needle bearing block assembly.

    IMPORTANT: The total depth of the needle bearing block, shim/s, inner thrust washer, thrust needle bearing, and outer thrust washer, must measure between 1.153-1.158. This arrangement must be measured out of the differential. If the tolerance is not met, add or remove shim/s until the correct tolerance is achieved. See figure 2.

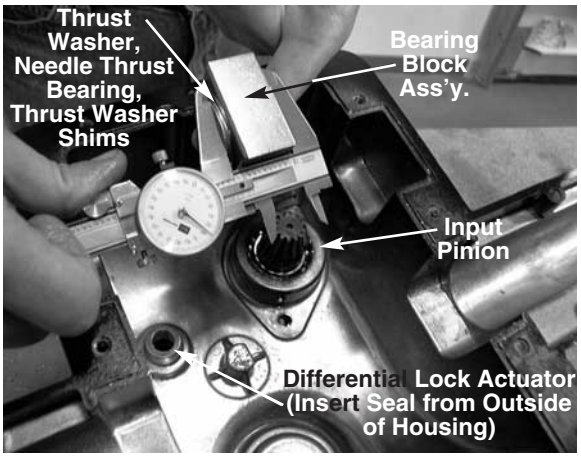


FIGURE 2.

24. Install the output shaft assembly. See figure 3.
25. Install the complete internal differential assembly and the differential lock actuator shaft at the same time. See figure 3.

    NOTE: Make sure the bearing block assemblies are seated properly. See figure 3.
26. Apply sealant to both inner bearing block assemblies that complete the center of the differential housing.

    NOTE: Loctite 5999 or equivalent is recommended for sealant. See figure 3.
27. Place the new differential housing gasket directly above the inner hardware holes. See figure 3.

    NOTE: There is a notch in the gasket for proper installation.

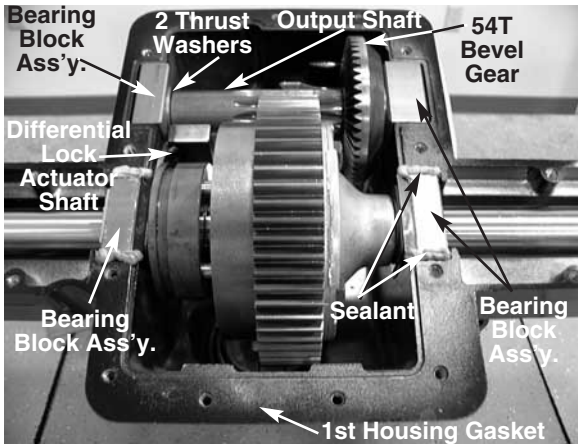


FIGURE 3.

28. Place the steel transmission plate over the differential housing gasket aligning all the hardware holes.
29. Place a new rear cover gasket on top of the transmission plate directly above all the inner hardware holes.
30. Place the rear cover assembly directly over all the inner hardware holes.
31. Place both transmission cover blocks directly on top of the side holes of the rear cover assembly.

    NOTE: The transmission cover blocks are rounded on the ends and must face outward. Also, the inner edge is beveled and faces the center of the oil pan. Beveled edge down.
32. Install all six of the 1.25" long hex washer screws through the transmission cover blocks and into the differential housing. Do not tighten at this time.
33. Install all seven of the 1" long hex washer screws in the remaining hardware holes around the rear cover assembly. Do not tighten.
34. Install the remaining twelve- 3/4" hex washer screws that secure the transmission plate to the differential housing. Do not tighten.
35. Torque down the six- 1.25" hex washer screws between 90-110 in-lbs.

    NOTE: Tighten these in a star pattern, starting with the upper left hand corner screw.
36. Torque down all of the remaining screws between 90-110 in-lbs.
37. Slide both brake hub assemblies over the axle shaft splines. See figure 4.
38. Line up the brake mounting brackets hardware holes with the differential housing notches. See figure 4.
39. Rotate the brake disk until the access holes are directly over the hardware holes. See figure 4.
40. Install all three hex washer screws through the access holes of the brake disk using a 1/2" socket and extension. See figure 4.

    NOTE: Torque the hex washer screws between 180-200 in-lbs.

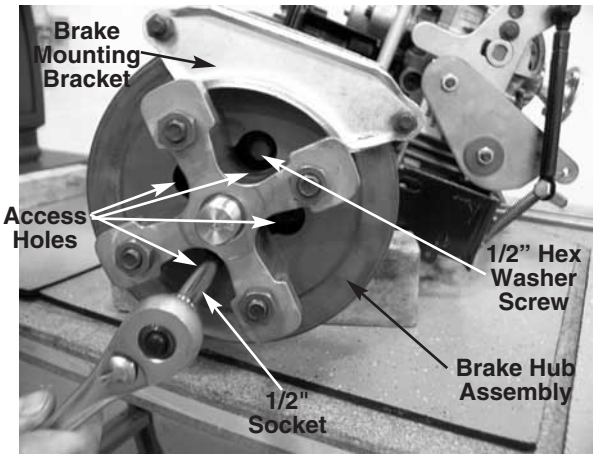


FIGURE 4.

41. Install both of the center hub lock nuts to the hub assemblies using a 1 and 5/16" socket.

    NOTE: The torque for the center hub nut is 185-250 ft-lbs.
42. Install the differential lock oil seal by tapping the perimeter of the seal until it is below the top of the housing.
43. Install all three flat washers and the lock actuator arm on to the differential actuator shaft.
44. Secure the differential actuator arm to the shaft with a belleville washer and a hex head cap screw.

    NOTE: Torque the screws between 90-110 in-lbs.
45. Install a new oil filter.
46. Install the oil dipstick.

3000 SERIES

CAST IRON TRANSMISSION

ADDENDUM

Cast Iron Transmission Disassembly

Transmission Inspection and Disassembly

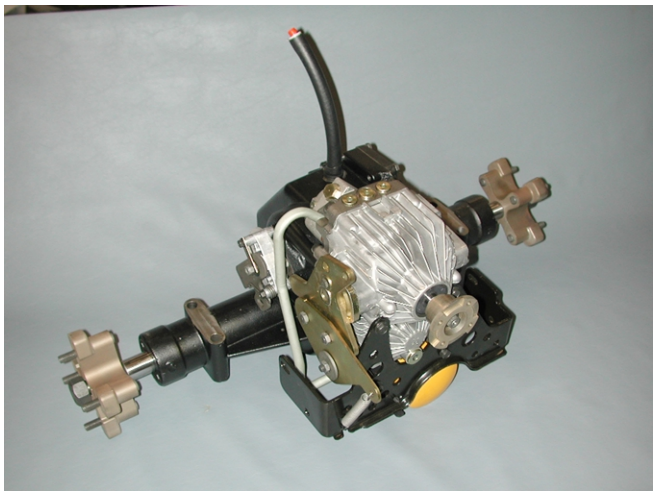


Figure 1

Inspection

1. Inspect the pump adapter to make certain it is rotating the hydraulic input shaft.
2. Inspect the center hex jam nut and flat washer that secures the pump adapter to the hydraulic input shaft.
3. Inspect the connection between the hydro arm and the trunion arm behind the neutral return link.

   NOTE: Make certain the hex screw securing the flat washer, hydro arm and neutral return plate is tight.
4. Inspect the set screw securing the hydro arm to the trunion shaft.
5. Inspect the clearance between the hydro bypass spring plate and the bypass valve on the hydro pump.

   NOTE: The hydro bypass spring plate must not touch the bypass valve.

Transmission Disassembly

1. Place a suitable oil drain pan below the hydrostatic transmission.
2. Remove and set aside the oil drain plug using a 16mm socket. See Figure 2.

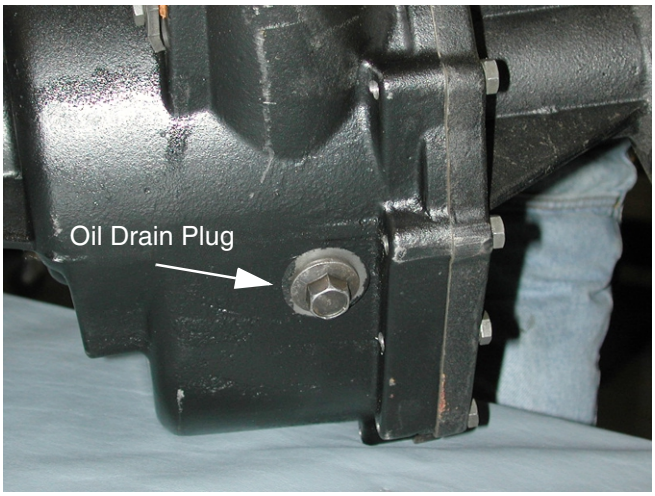


Figure 2

NOTE: The oil drain plug must be removed and set aside before disassembly, to allow the differential assembly to be removed.

3. Remove the hydraulic oil filter and drain any remaining fluid. See Figure 1.

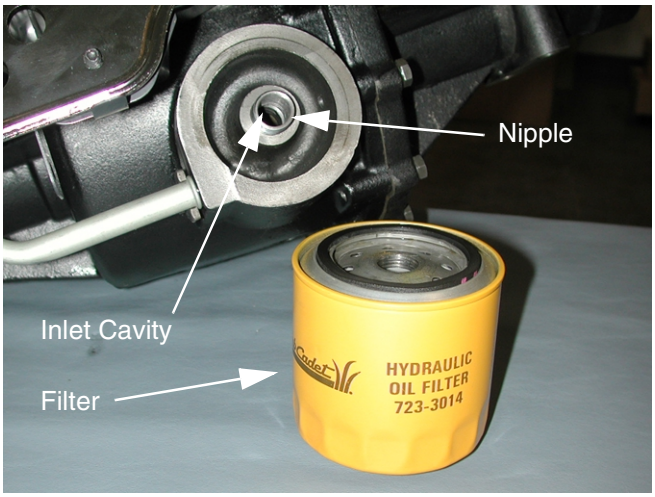


Figure 1

NOTE: The filter part number is 723-3014.

4. Inspect the hydraulic oil filter, filter nipple, and inlet cavity for contamination.

Cast Iron Transmission Disassembly15

5. Remove the center hex lock nuts securing the axle hubs to the axles using a 1-5/16” socket. See Figure 2.

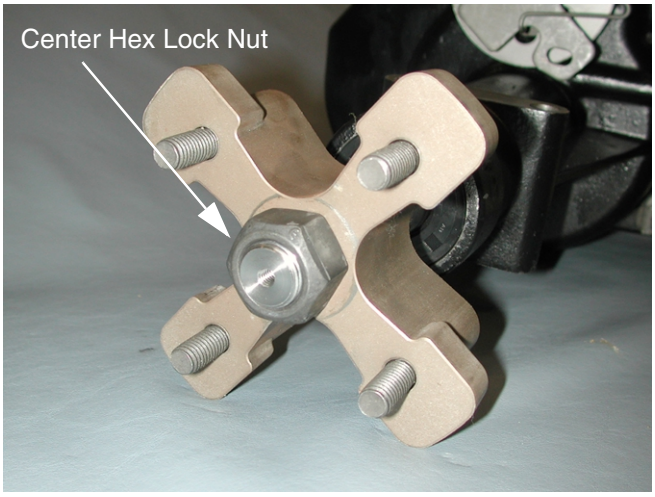


Figure 2

6. Chock and level the hydrostatic transmission from below. See Figure 3.

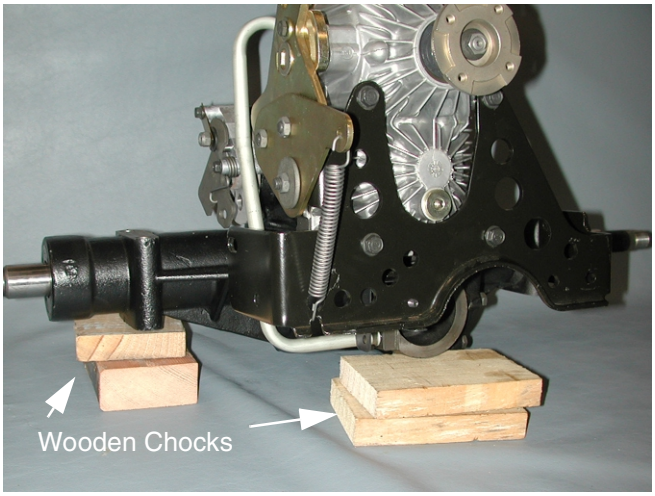


Figure 3

7. Remove the hex screw and clamp securing the hydraulic pickup tube to the charge pump using a 7/16” socket. See Figure 4.

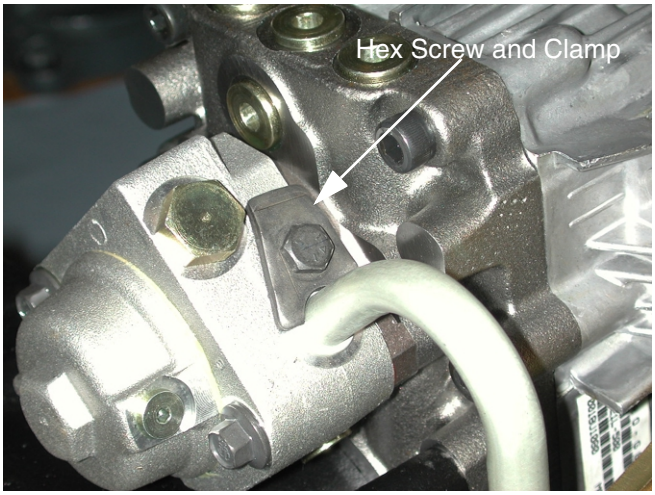


Figure 4

8. Remove the hex screw and clamp securing the hydraulic pickup tube to the transmission housing using a 7/16” socket. See Figure 5.

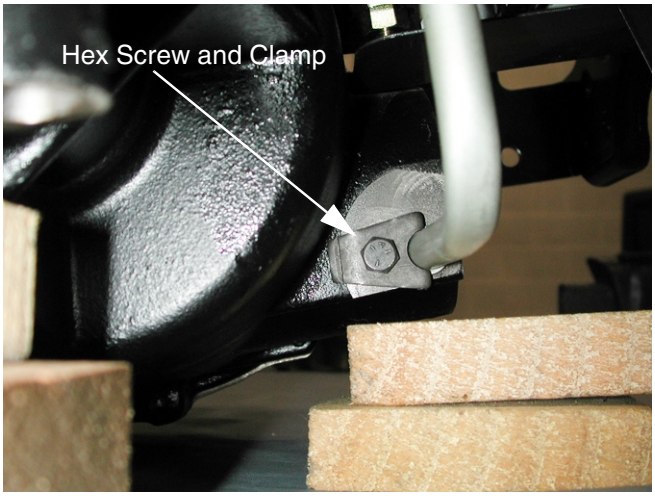


Figure 5

Cast Iron Transmission Disassembly1

9. Remove the hydraulic pickup tube and inspect for contamination. See Figure 6.

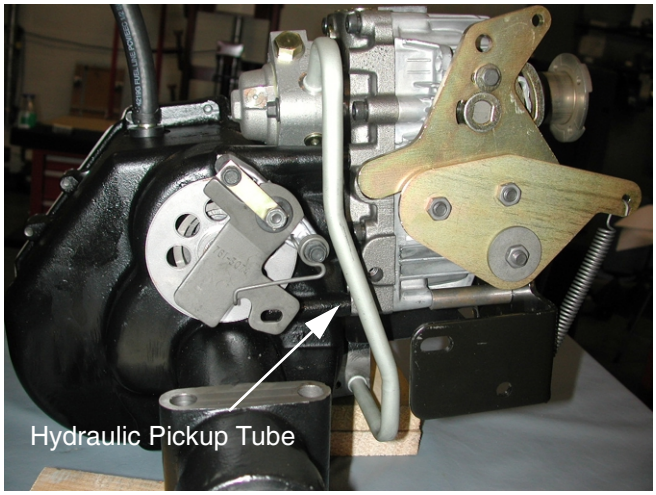


Figure 6

10. Remove and replace the “O” ring on each end of the pickup tube. See Figure 7.

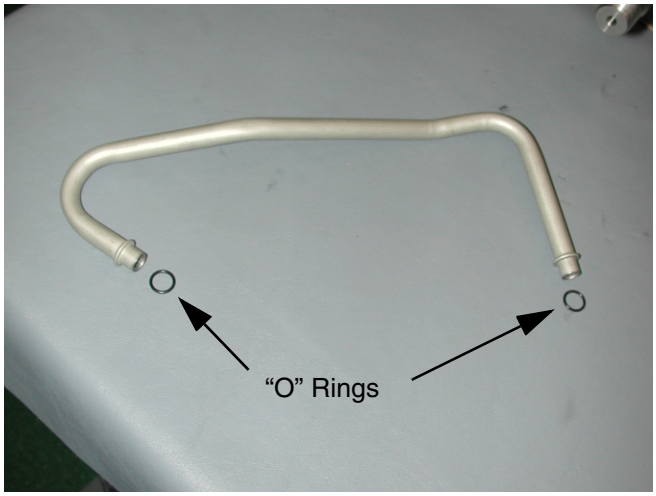


Figure 7

11. Inspect and cap the input and output ports where the hydraulic pickup tube was removed. See Figure 8.

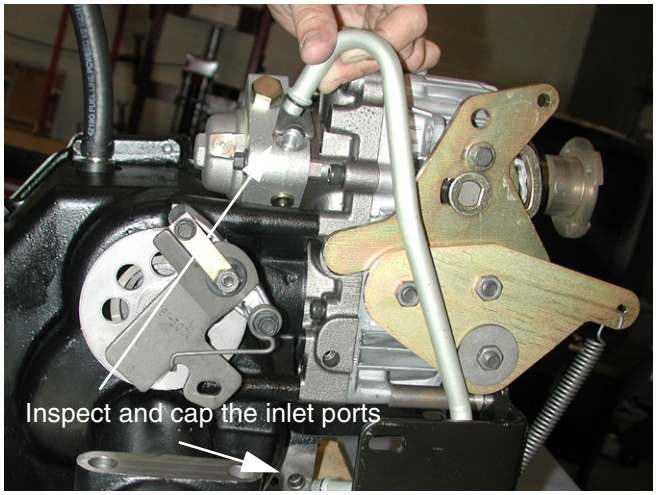


Figure 8

12. Remove the extension spring from the torque bracket using a short piece of recoil rope. See Figure 9.

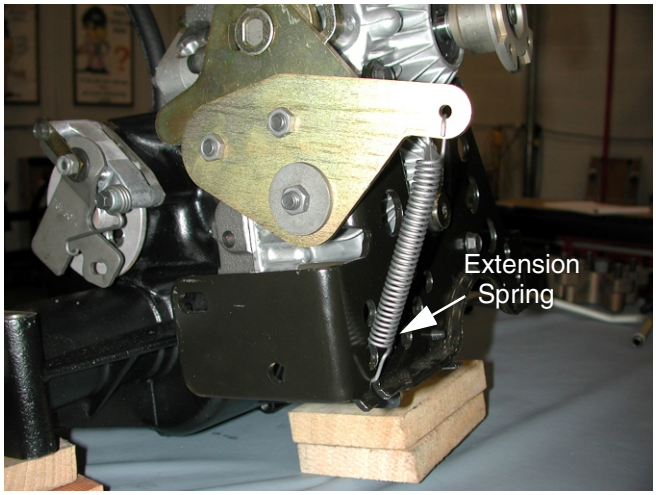


Figure 9

Cast Iron Transmission Disassembly11

13. Remove all four 5.5” hex bolts securing the torque bracket, hydrostatic pump and long spacers to the transmission housing using a 1/2" socket. See Figure 10.

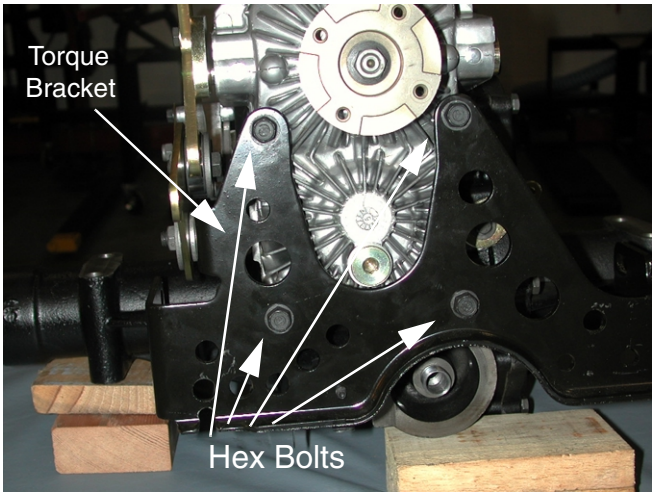


Figure 10

NOTE: Both long spacers go on the bottom bolts.

14. Remove the torque bracket assembly.

15. Remove the hydrostatic pump from the transmission housing. See Figure 11.

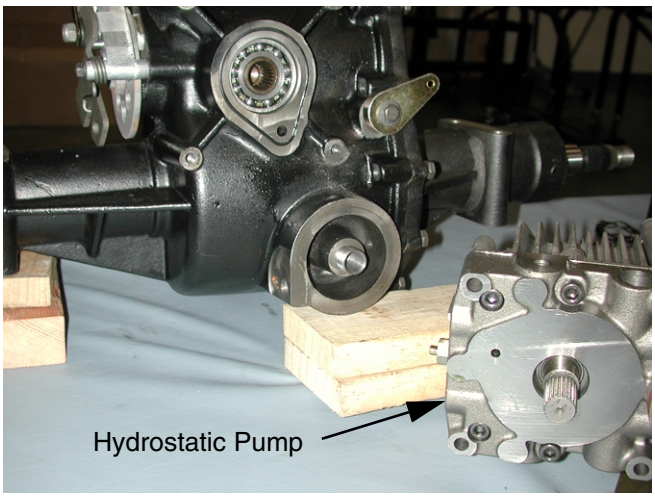


Figure 11

16. Remove and replace the large “O” ring from the transmission housing. See Figure 12.

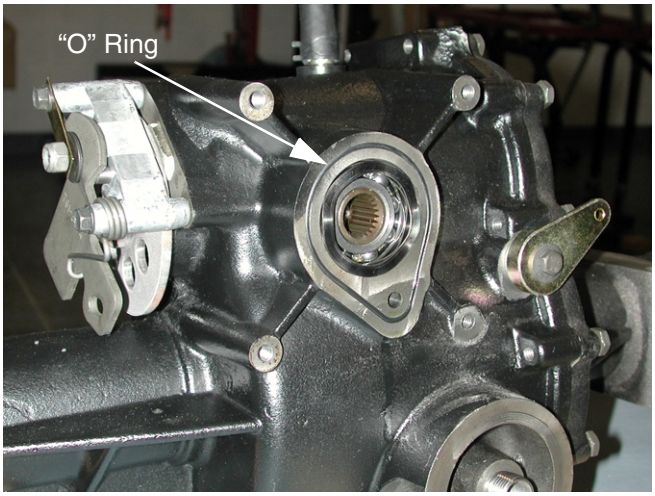


Figure 12

17. Remove the spring washer from the input bearing. See Figure 13.

Figure 13

18. Grasp both axles assemblies and rotate them as follows:

- Opposite directions
- Forward direction - together
- Reverse direction - together

NOTE: There should be no binding.

19. Remove both self tapping screws securing the brake assembly to the transmission housing using a 3/8” socket. See Figure 14.

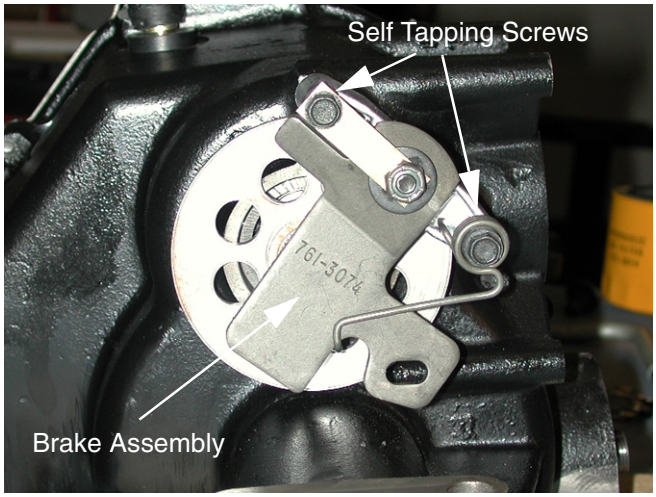


Figure 14

20. Remove the brake assembly.
21. Remove the brake disc.
22. Remove the oil seal from the 9T output shaft.
23. Disassemble and inspect the brake assembly for damage or wear. See Figure 15.

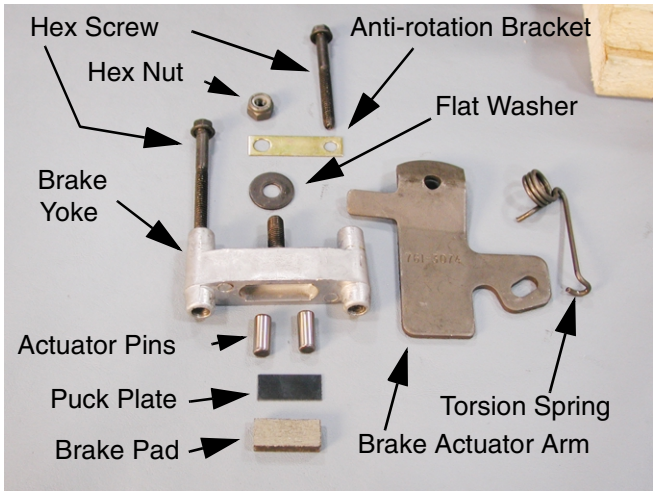


Figure 15

NOTE: Lubricate the actuator pins before reassembling. See Figure 16.

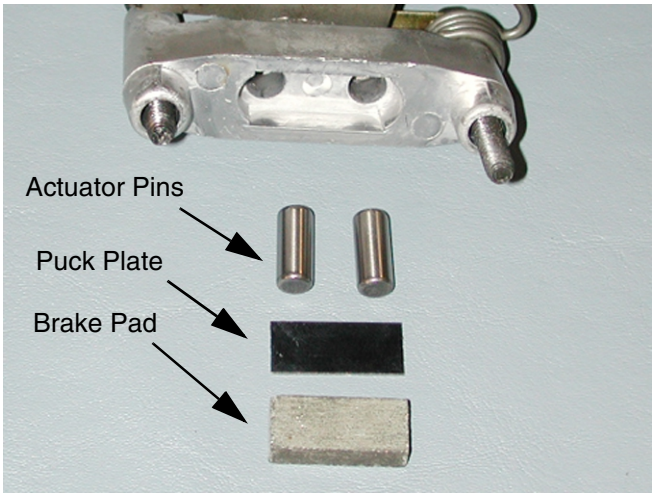


Figure 16

24. Loosen and slide the hose clamp up the vent tube using a large pair of pliers. See Figure 17.

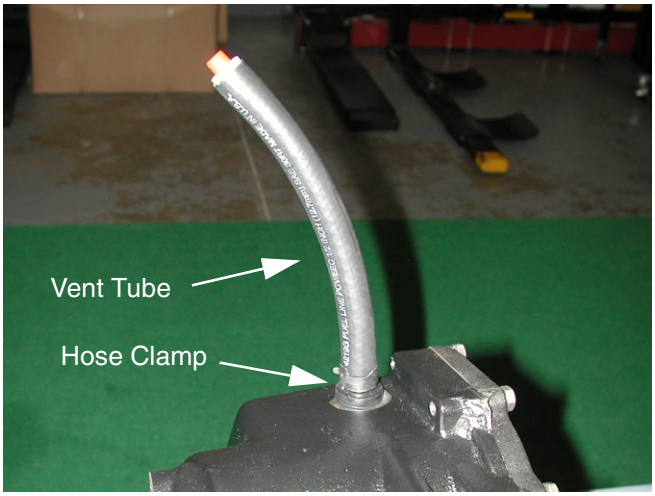


Figure 17

25. Remove the vent tube from the pipe fitting.

Cast Iron Transmission Disassembly

26. Remove all 14 hex bolts securing the left housing to the right housing using a 1/2" socket. See Figure 18.

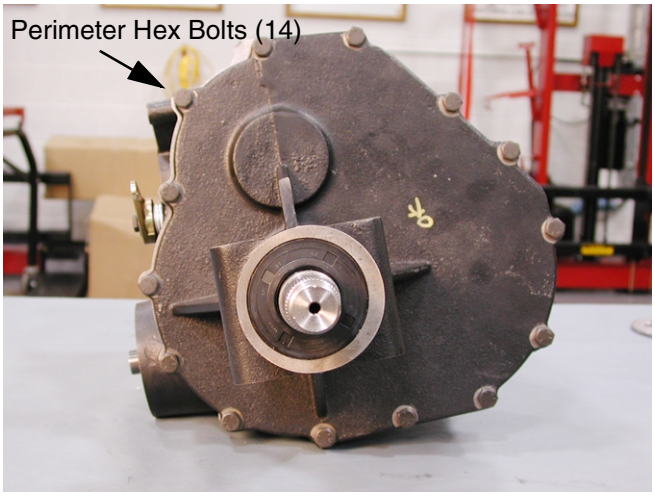


Figure 18

NOTE: Loctite all the screws during assembly.

27. Slowly remove the left housing from the axle assembly. See Figure 19.

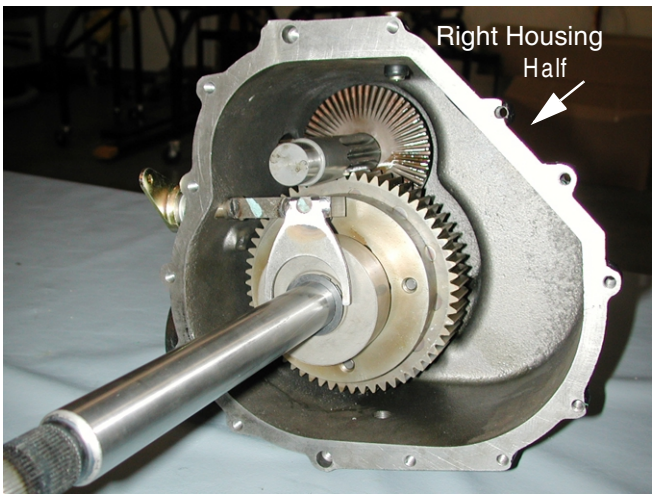


Figure 19

NOTE: Loctite sealer is used between the two case halves during production, and a scraper may be needed to separate the housings from one another.

28. Pull on the differential lock actuator using a fish scale, and make certain the differential engages with less than 35 pounds of pull. See Figure 20.

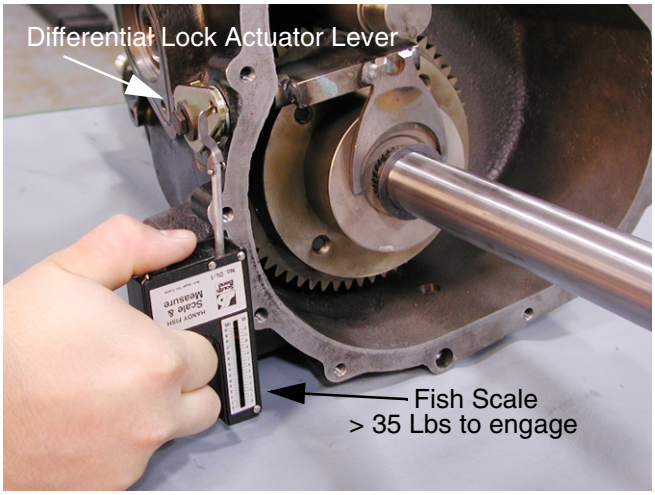


Figure 20

29. Remove the hex cap screw securing the actuator arm to the differential lock assembly using a 7/16” socket. See Figure 21.

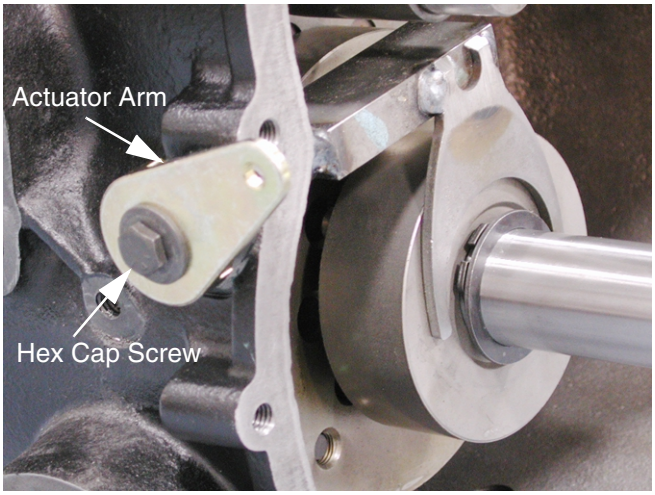


Figure 21

30. Remove the differential lock assembly and inspect for wear or damage. See Figure 22.

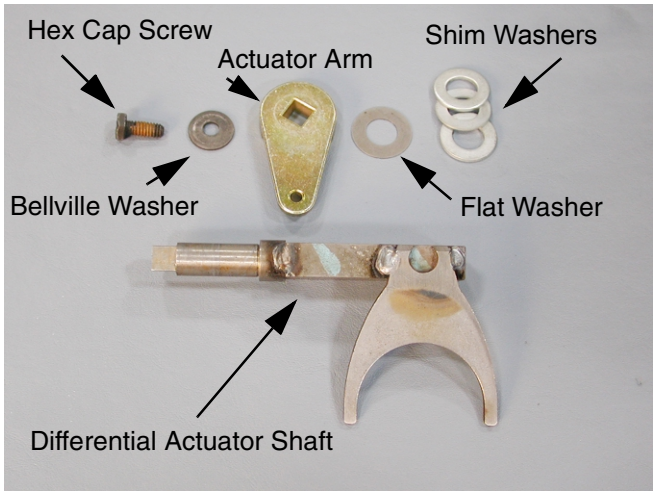


Figure 22

31. Remove the input pinion and bearing from the housing using a soft mallet. See Figure 23.

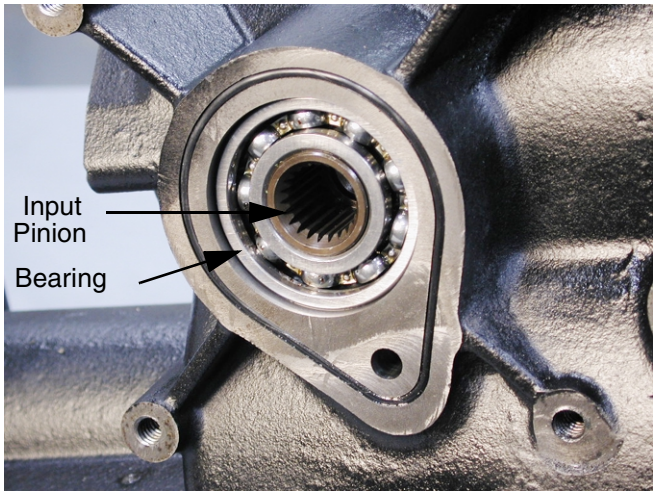


Figure 23

32. Slowly remove the output shaft, 54T bevel gear and differential assembly together. See Figure 24.

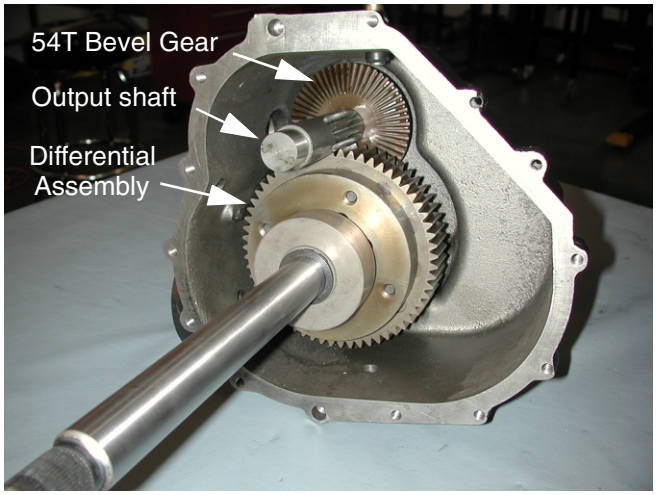


Figure 24

NOTE: Make certain the 54T bevel gear does not drop to the bottom of the transmission housing.

33. Remove the flat washer from the left axle.

34. Place the differential assembly in a vice (horizontally) and break all hex bolts free using a 9/16" socket. See Figure 25.

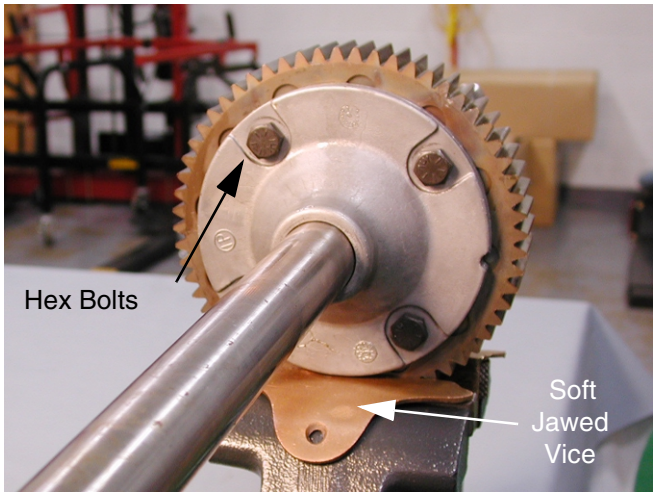


Figure 25

NOTE: Only use a vice with soft-jaws.

Cast Iron Transmission Disassembly

35. Place the differential assembly in a the vice (vertically) with the hex bolts facing up. See Figure 26.

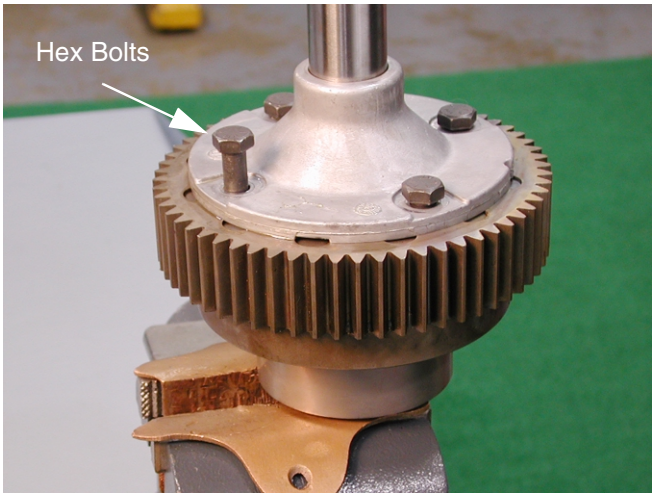


Figure 26

NOTE: Only use a vice with soft-jaws.

36. Remove all four hex bolts securing the differential assembly together using a 9/16” socket. See Figure 27.

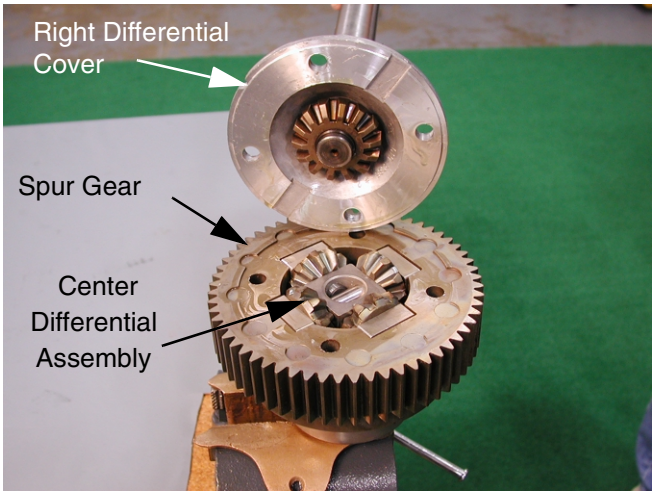


Figure 27

NOTE: Torque the hex bolts to 220-280 in.-lbs. during assembly.

37. Remove the right differential housing cover and flat washer from the right axle.

38. Remove both of the spiral retaining rings that secure the right axle side gear to the axle using a small flat-blade screw driver. See Figure 28.

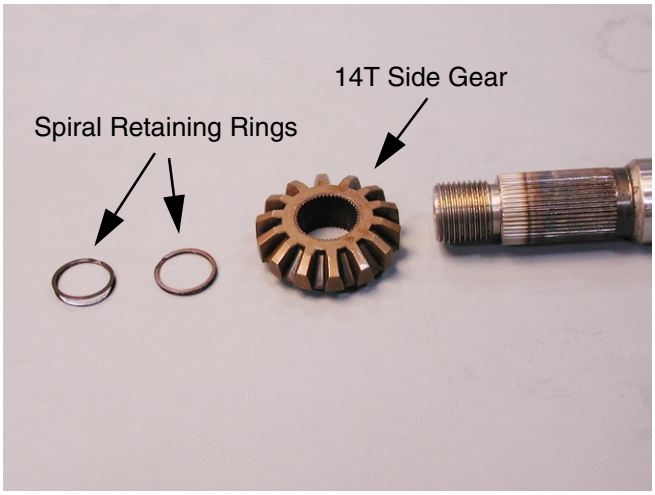


Figure 28

39. Remove the 14T side gear.

40. Remove the 60T spur gear from the center differential assembly. See Figure 29.

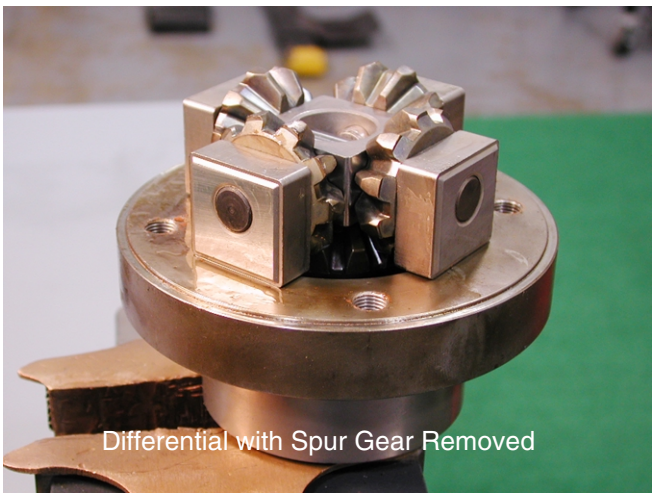


Figure 29

41. Disassemble the center differential assembly and inspect for wear or damage. See Figure 30.

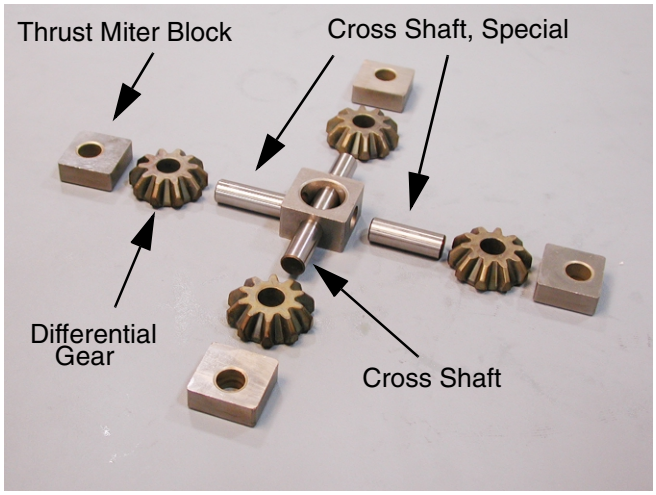


Figure 30

NOTE: Make certain the thrust miter blocks are orientated correctly during assembly. See Figure 29.

42. Remove both spiral retaining rings from the left axle using a flat-blade screw driver. See Figure 31.

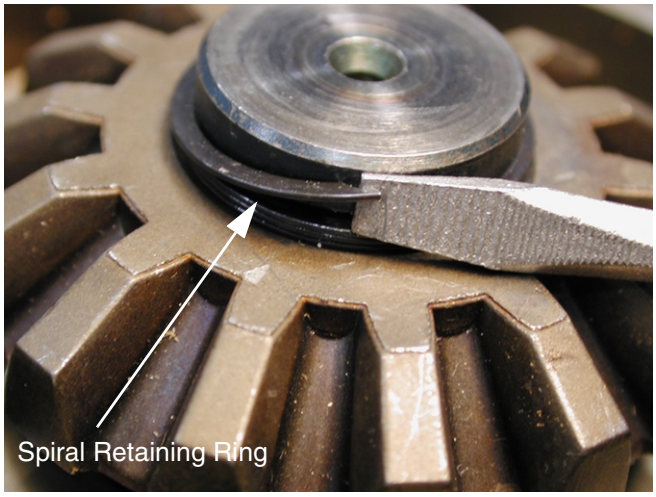


Figure 31

43. Remove the 14T side gear, differential lock housing, thrust washer, comp spring and differential engagement collar from the left axle, and inspect for wear or damage. See Figure 32.

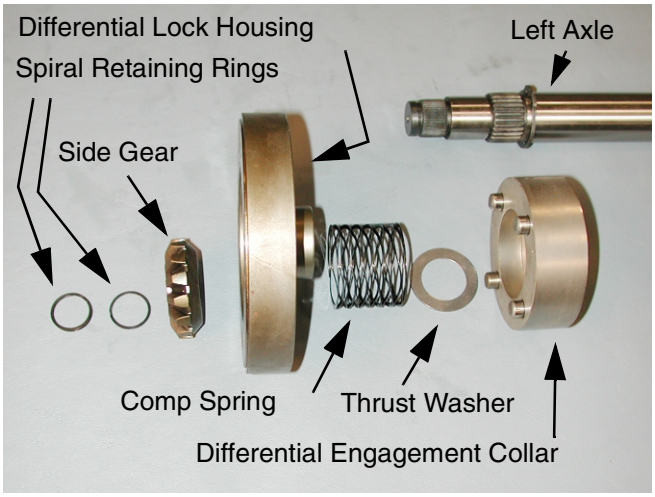


Figure 32

44. Inspect the bearings in the housing for wear or damage. See Figure 33.

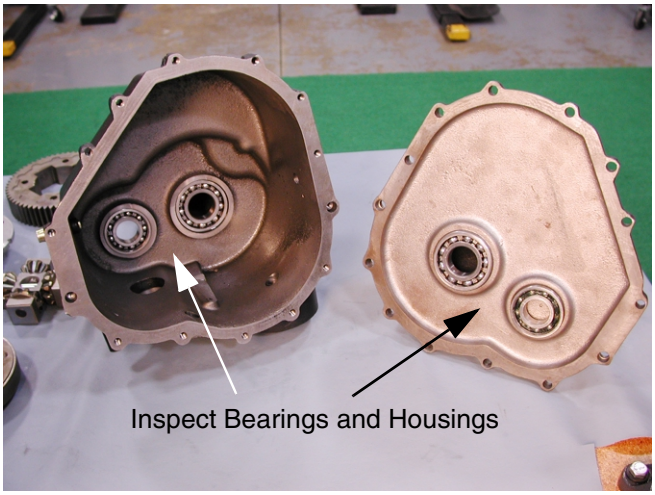


Figure 33

45. Clean the mating surfaces of the two transmission housings.

NOTE: Use Loctite 598 between the transmission housing mating faces during assembly.

46. Remove and replace the outer bearing seals.

Cast Iron Transmission Disassembly

47. Inspect the outer bearings for damage or wear. See Figure 34.

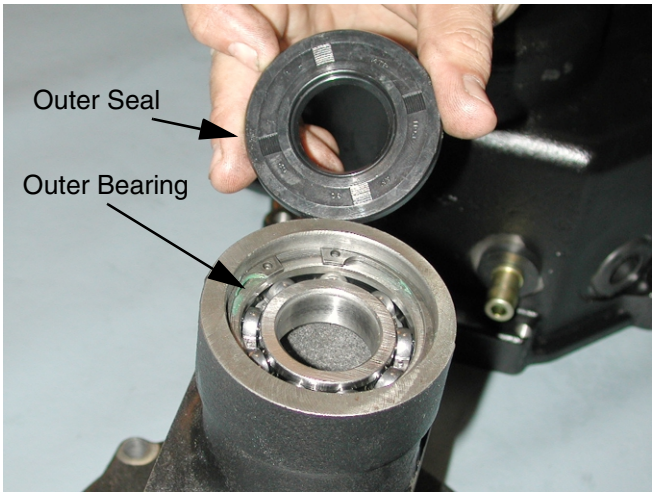


Figure 34

3000 Series Neutral Control Adjustment

The following information will correct forward or rearward movement (creeping).

1. Drive the tractor for a few minutes to warm up the hydrostatic transmission.
2. Raise the rear of the tractor off the ground.
3. Remove all four of the wheel hub nuts securing the right rear wheel assembly to the wheel hub, using a 3/4" socket and extension.
4. Remove the right wheel assembly.
5. Remove the hairpin securing the brake rod ferrule to the brake lever assembly. See figure 1.

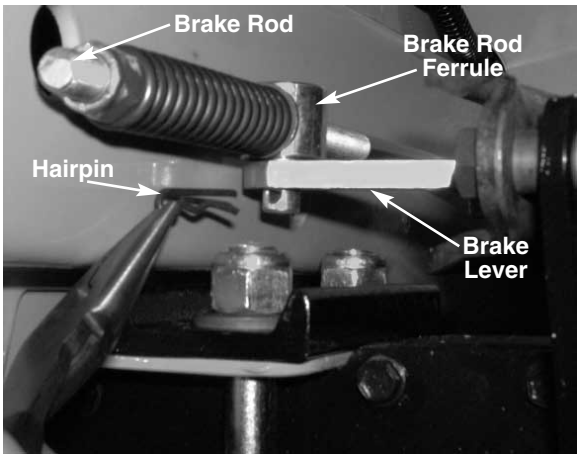


FIGURE 1.

6. Lock the parking brake.
7. Carefully start the tractor and move the throttle control lever to the full throttle position.
8. Loosen the hex cap screw securing the hydro neutral return plate to the hydro arm using a 7/16 socket and extension. See figure 2.

   NOTE: DO NOT REMOVE THE HEX CAP SCREW!

   NOTE: There is an access hole that will allow the socket to reach the hex cap screw through the right rear side frame. See figure 2.

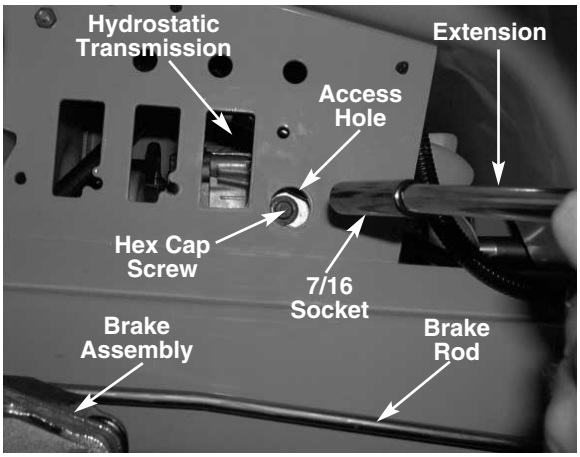


FIGURE 2.

9. While observing the axle rotation, slide the hex cap screw slowly forward or rearward in the neutral return plate until the axle rotation stops.

   NOTE: Use the 7/16 socket and extension to slide the hex cap screw. See figure 3.

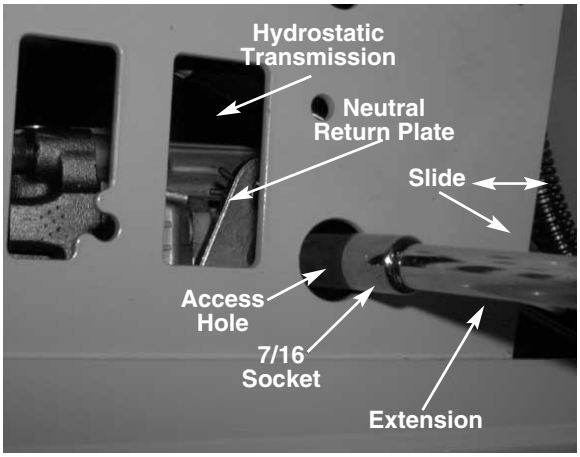


FIGURE 3.

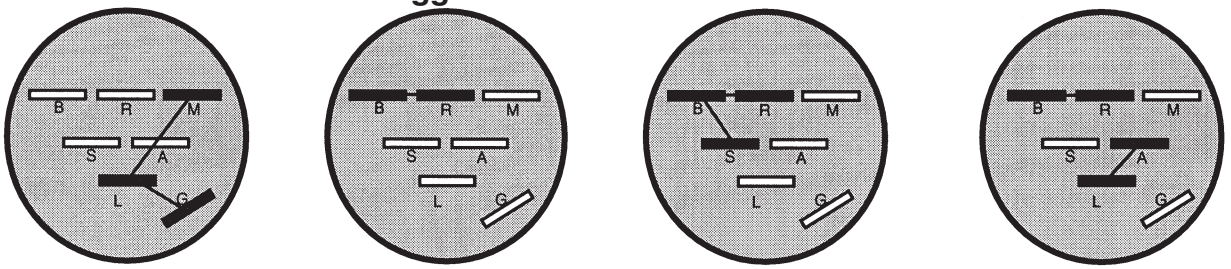
10. Tighten the hex cap screw and check to be certain that the axle is not rotating.

REASSEMBLE THE UNIT IN THE REVERSE ORDER ABOVE.

NOTES

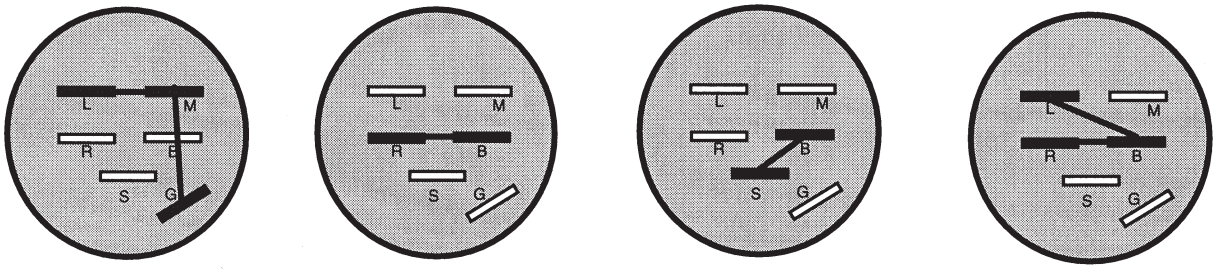
Switch Configuration & Symbol Chart

Briggs & Stratton and Kawasaki



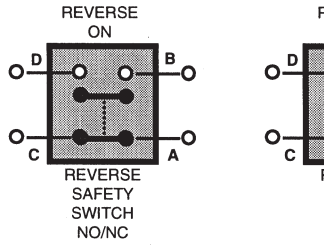
OFF ON START ON,LIGHTS

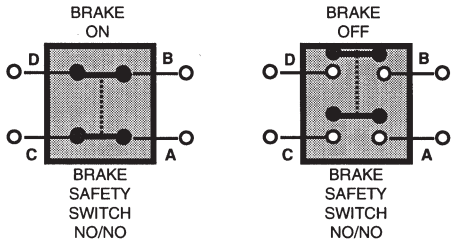
Kohler

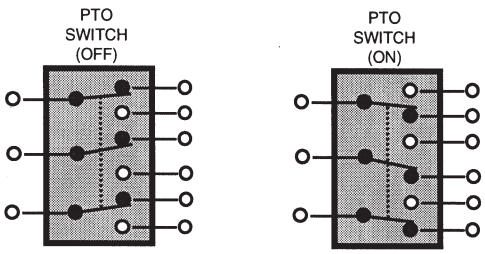


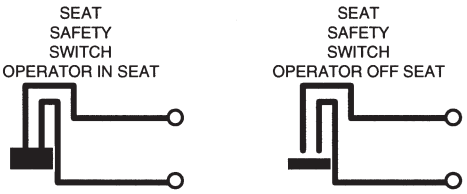
G - Ground, B - BATT, R - Run
M - MAG, S - Start, A - Accessory, L - Light

IGNITION SWITCH









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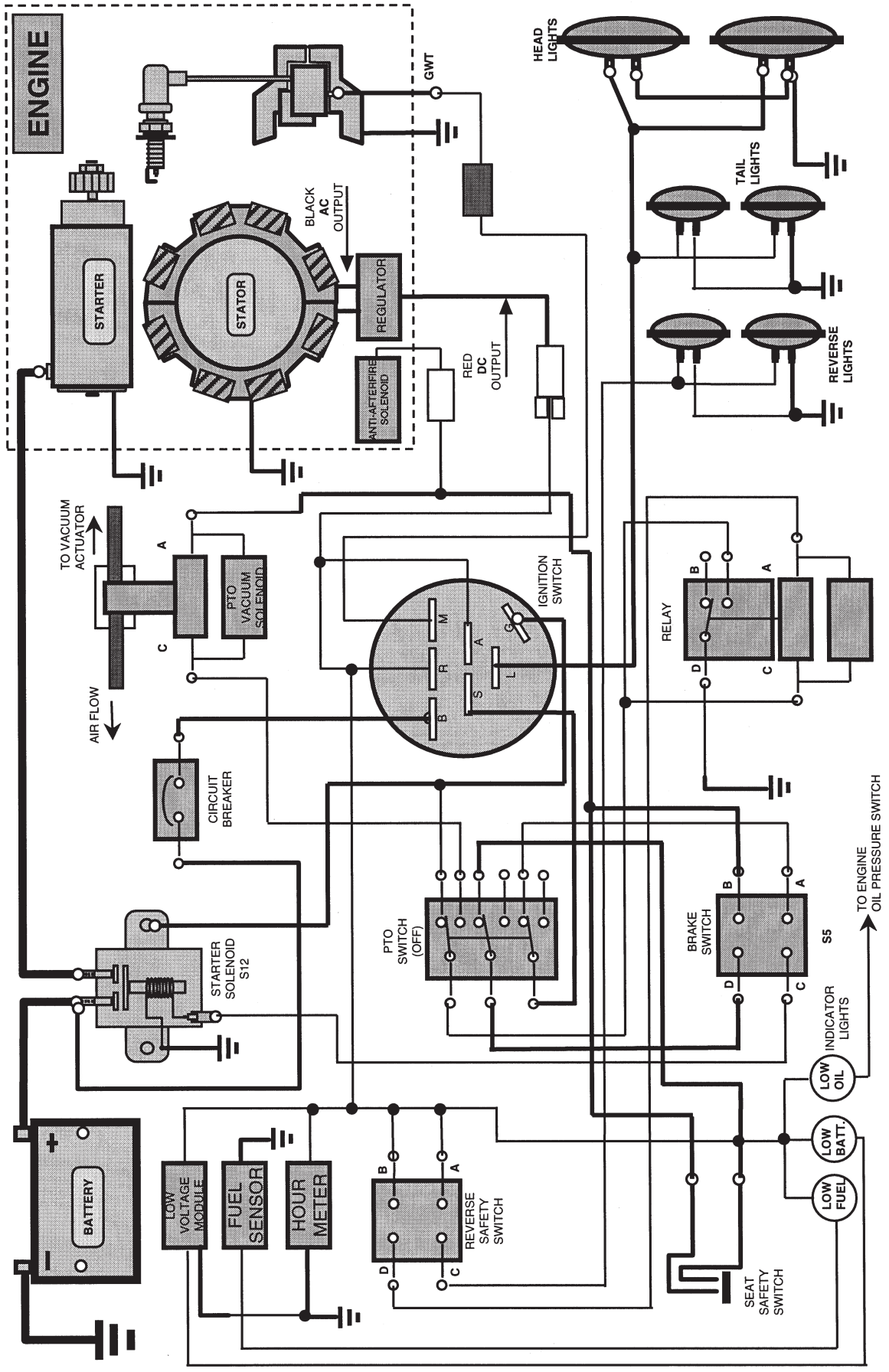
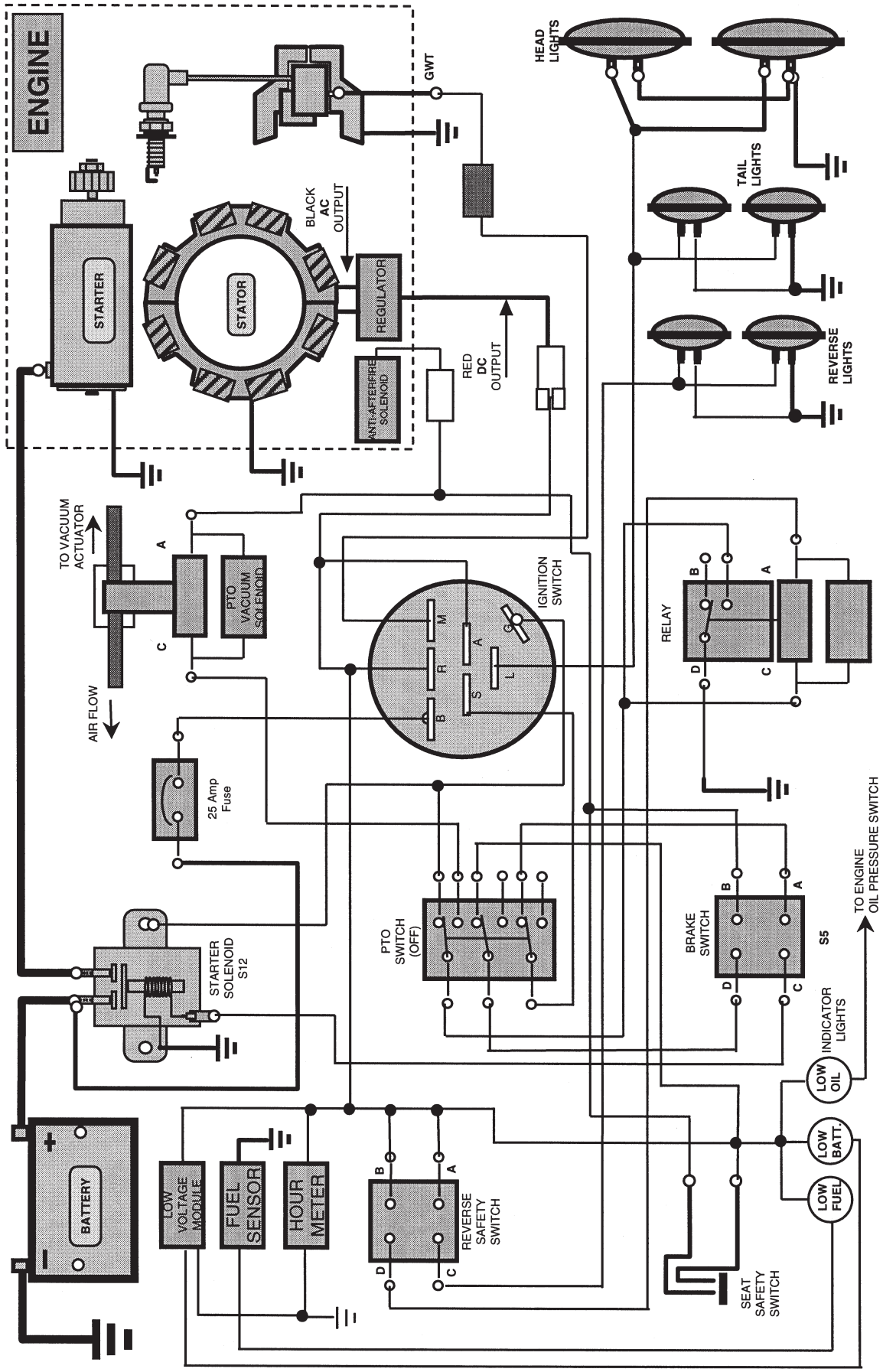
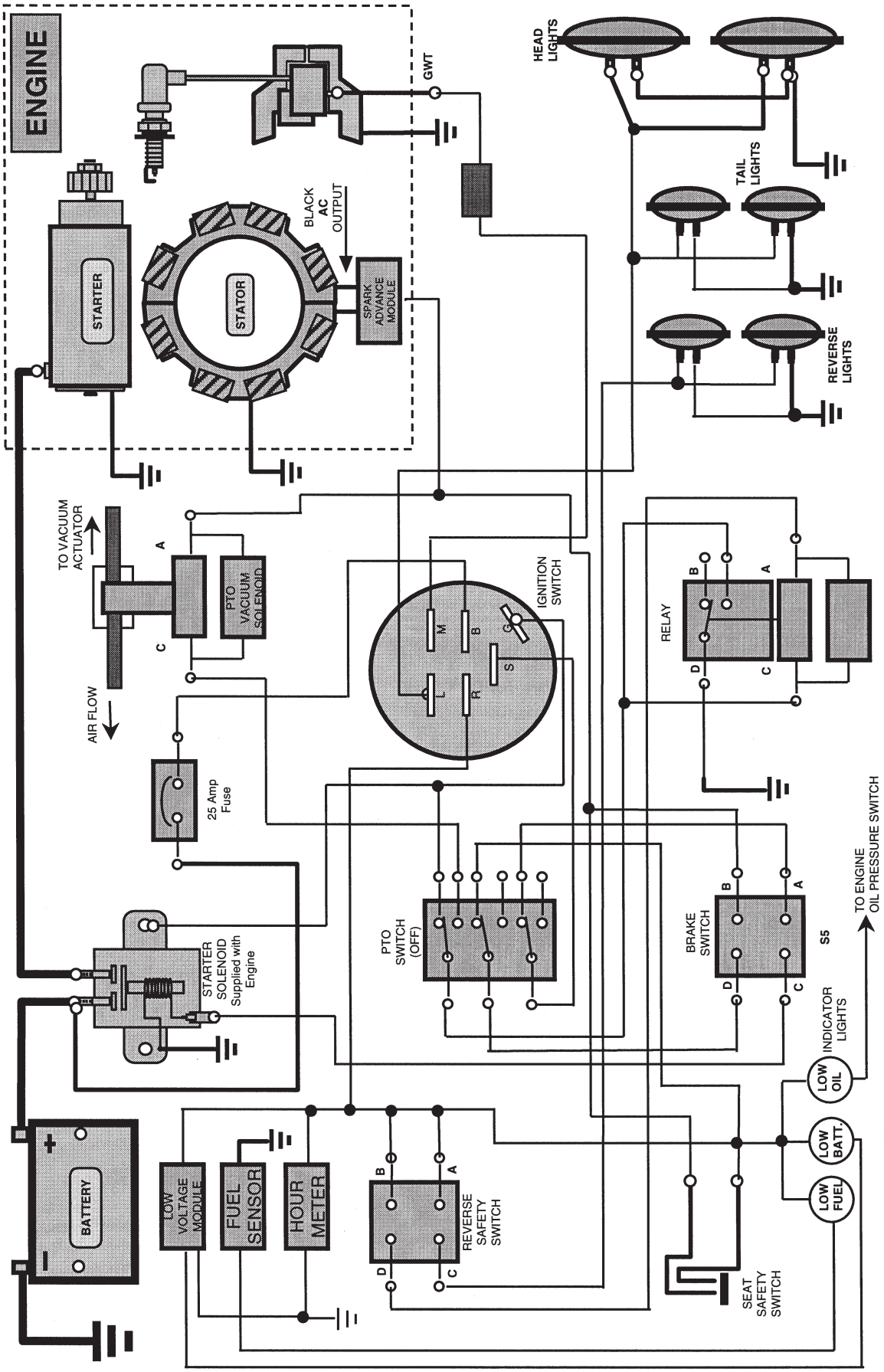


629-3057 Wiring Harness **3000 Series — B&S Engine**

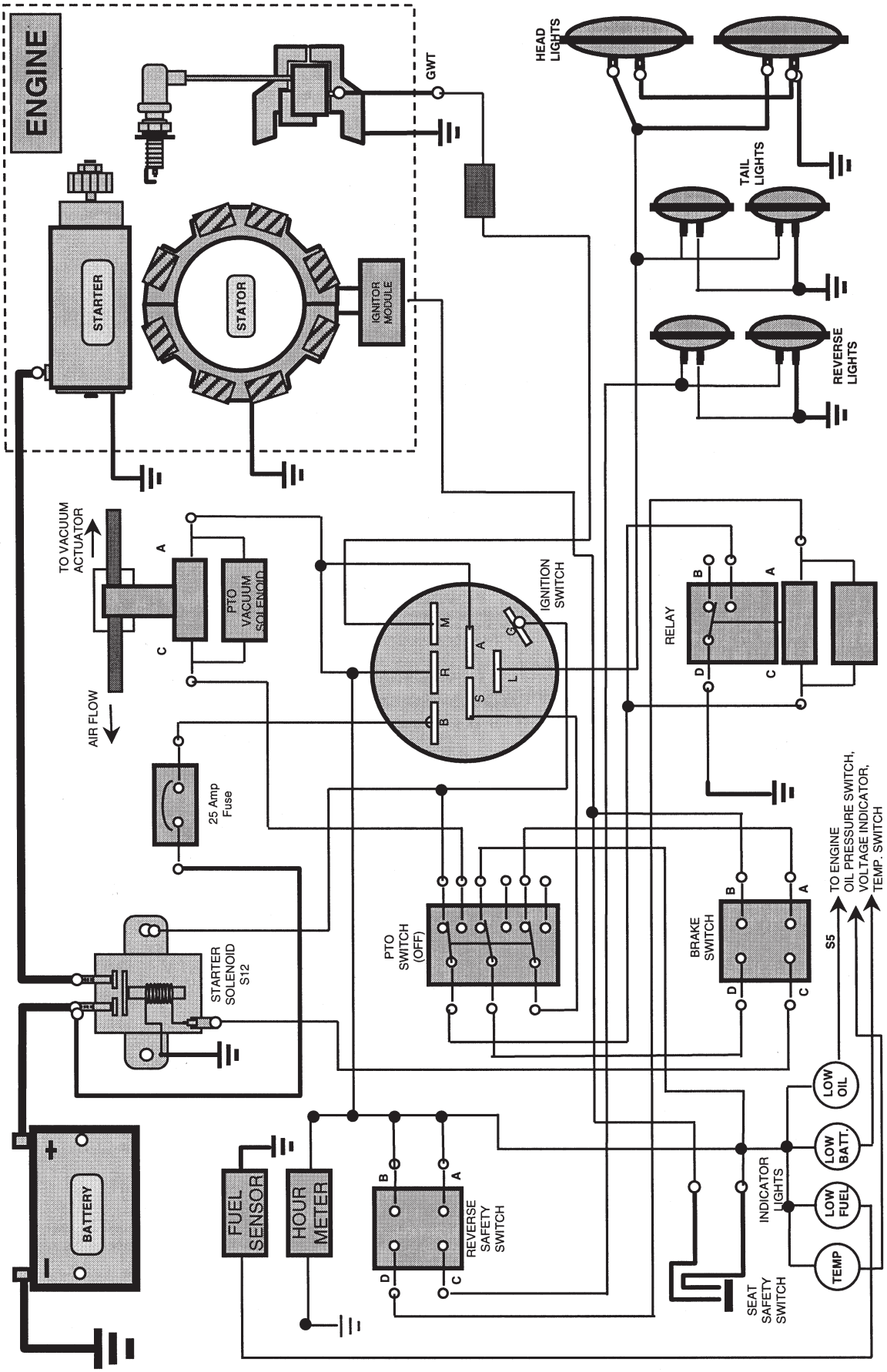


629-3057 Wiring Harness **3000 Series — B&S Engine**

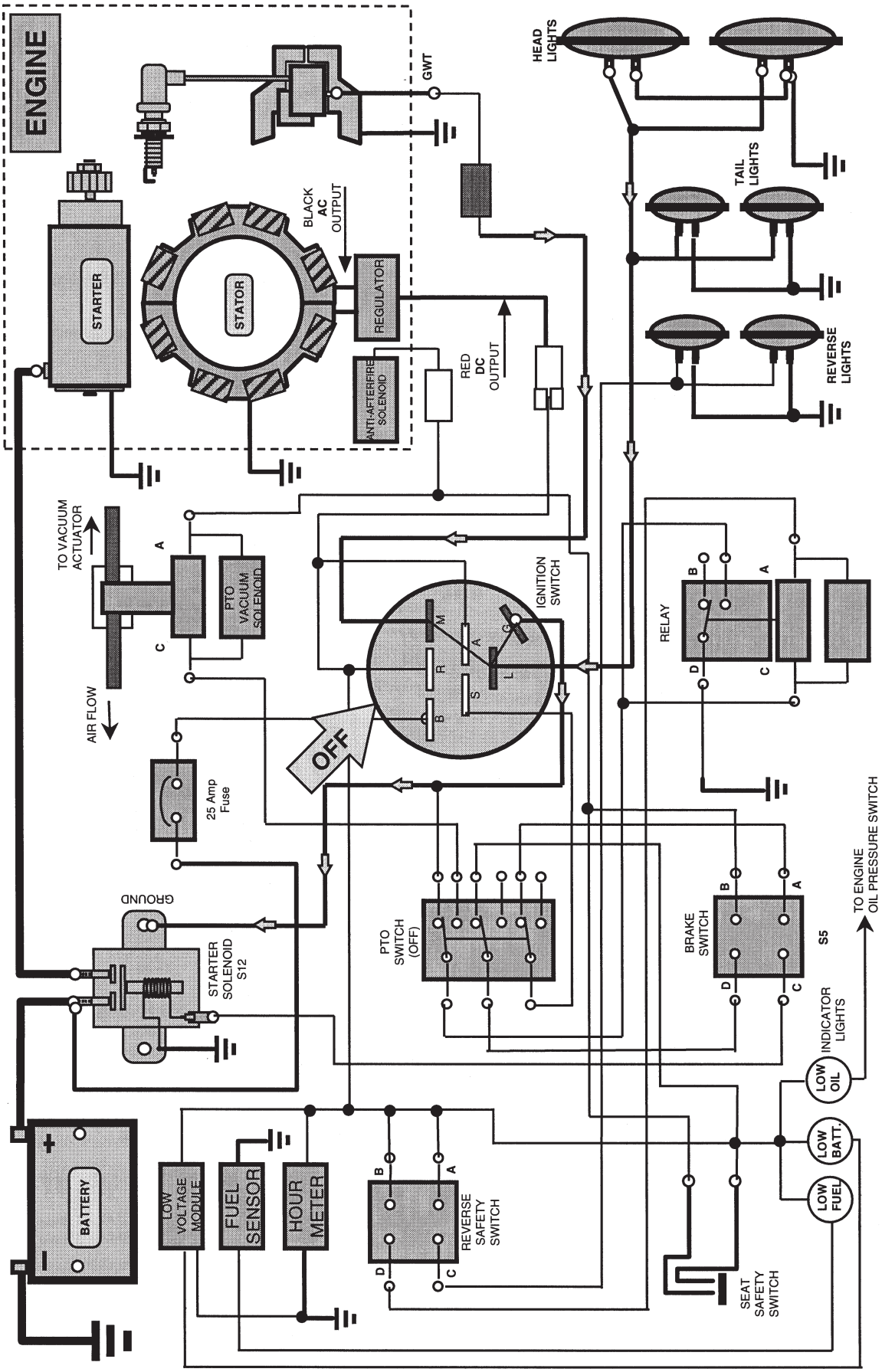
Electrical



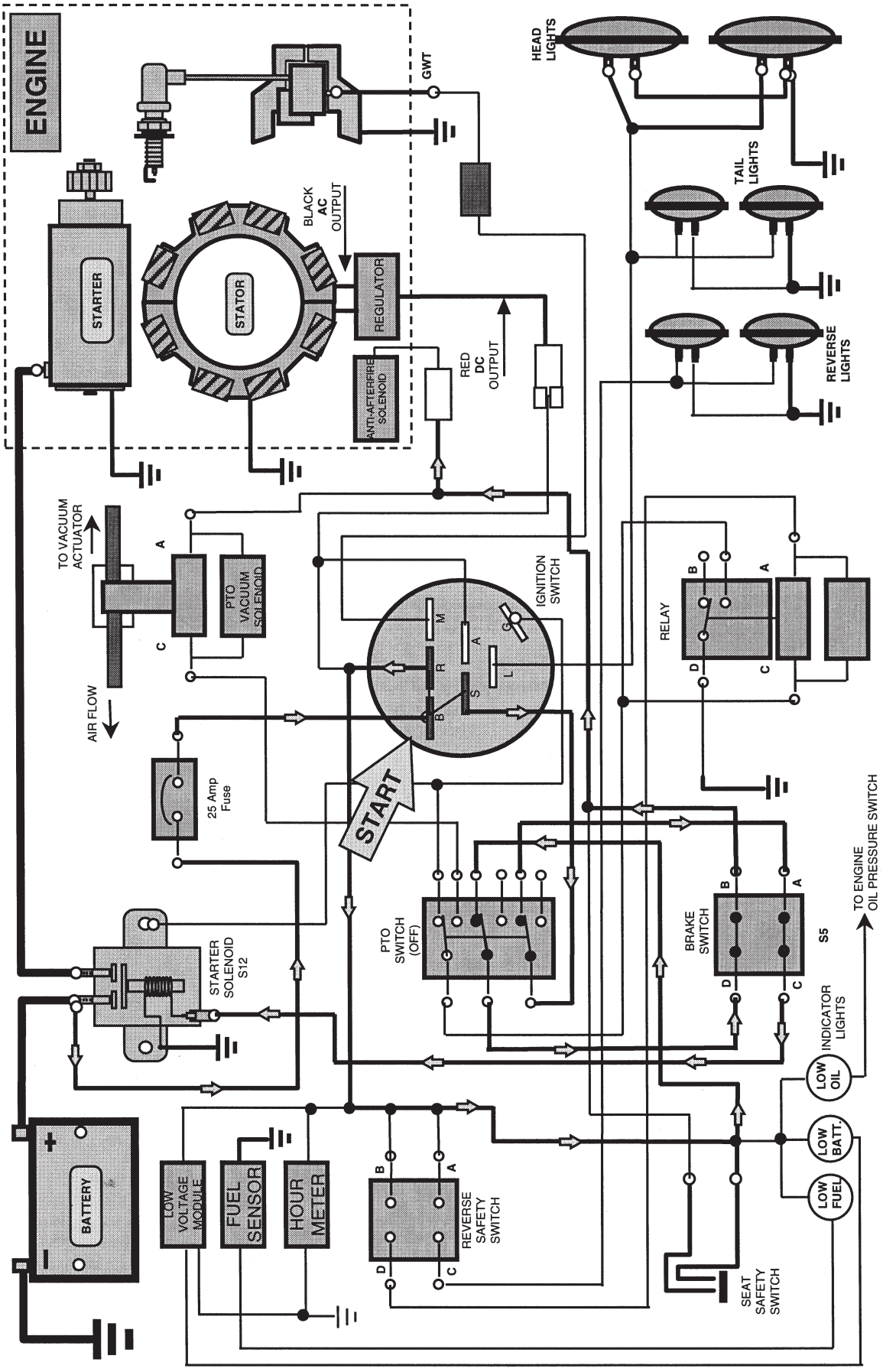
629-3056 Wiring Harness **3000 Series — Kohler Engine**



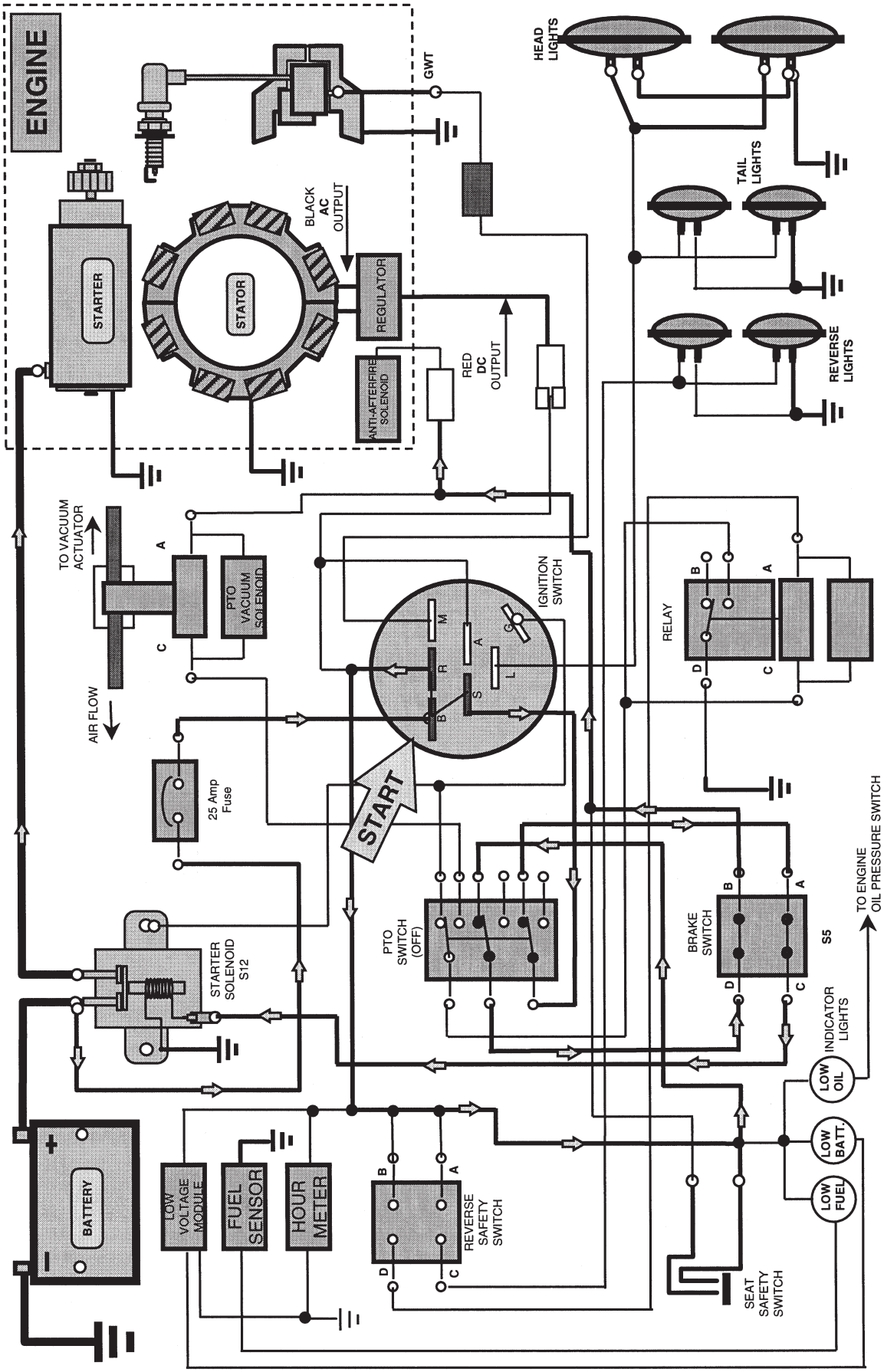
629-3045 Wiring Harness **3000 Series — Kawasaki Engine**



629-3057 Wiring Harness **3000 Series — B&S Engine**



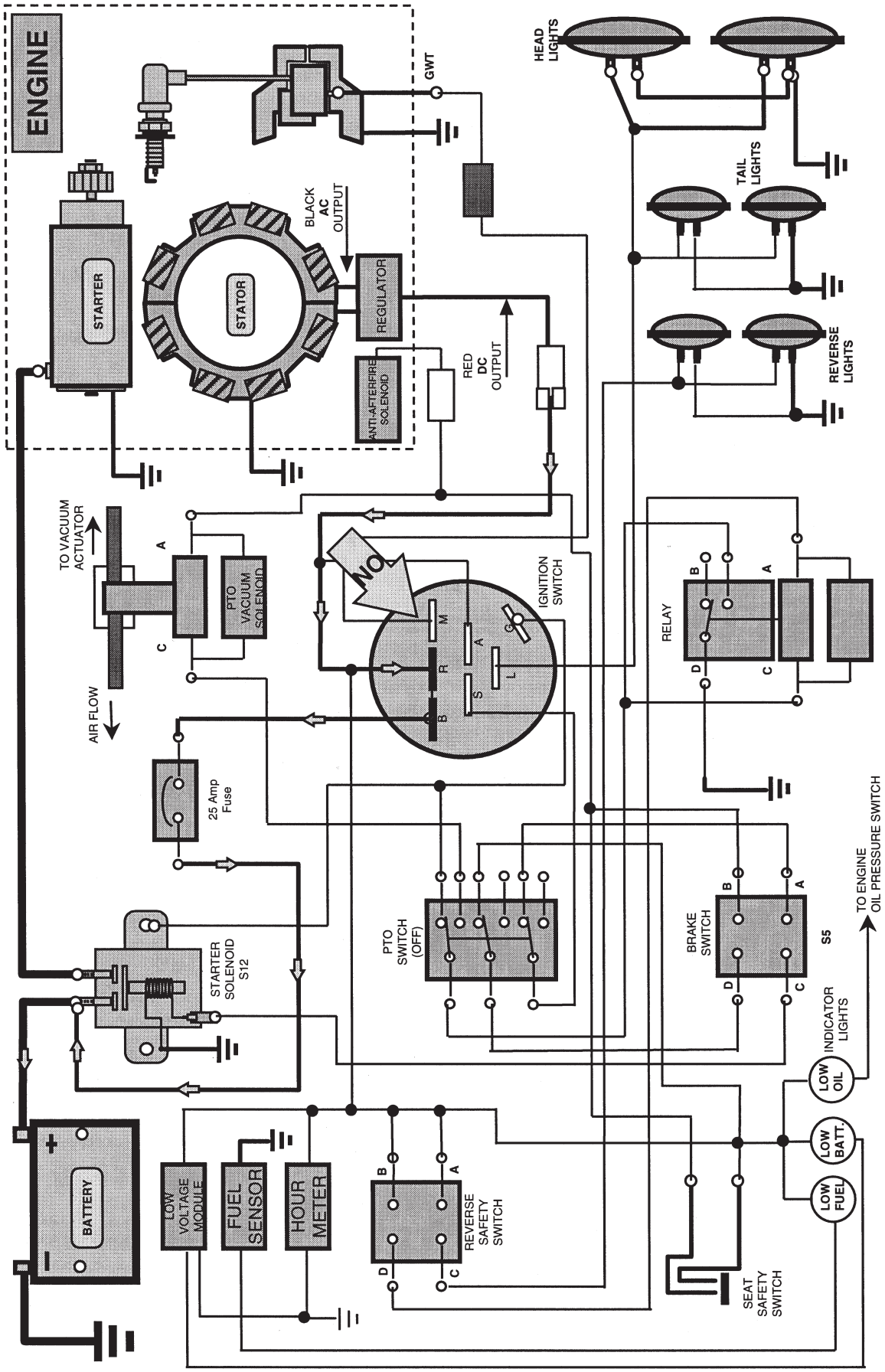
629-3057 Wiring Harness **3000 Series — B&S Engine**



STARTING 2

3000 Series — B&S Engine

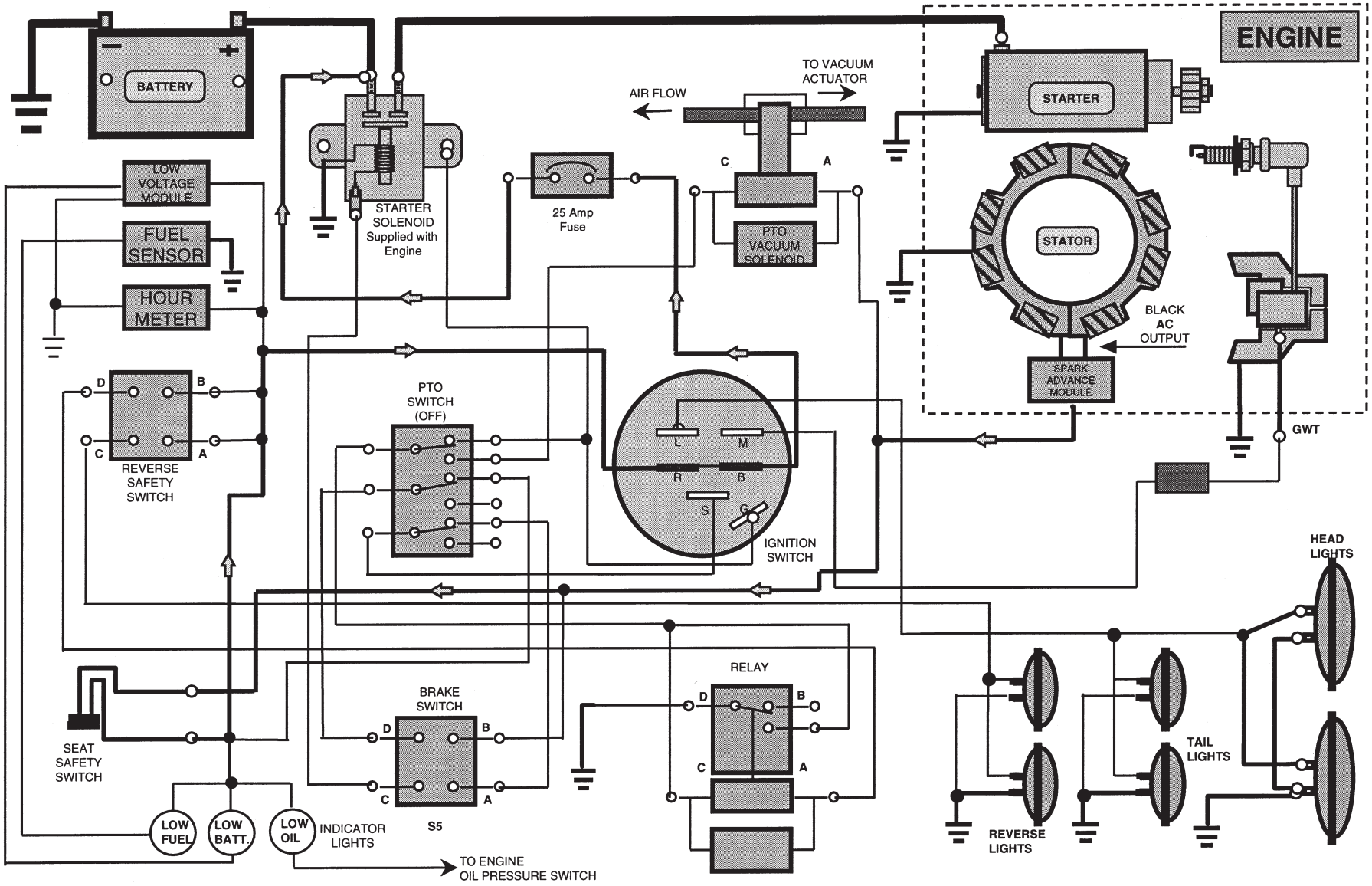
629-3057 Wiring Harness



RUN / CHARGE

3000 Series — B&S Engine

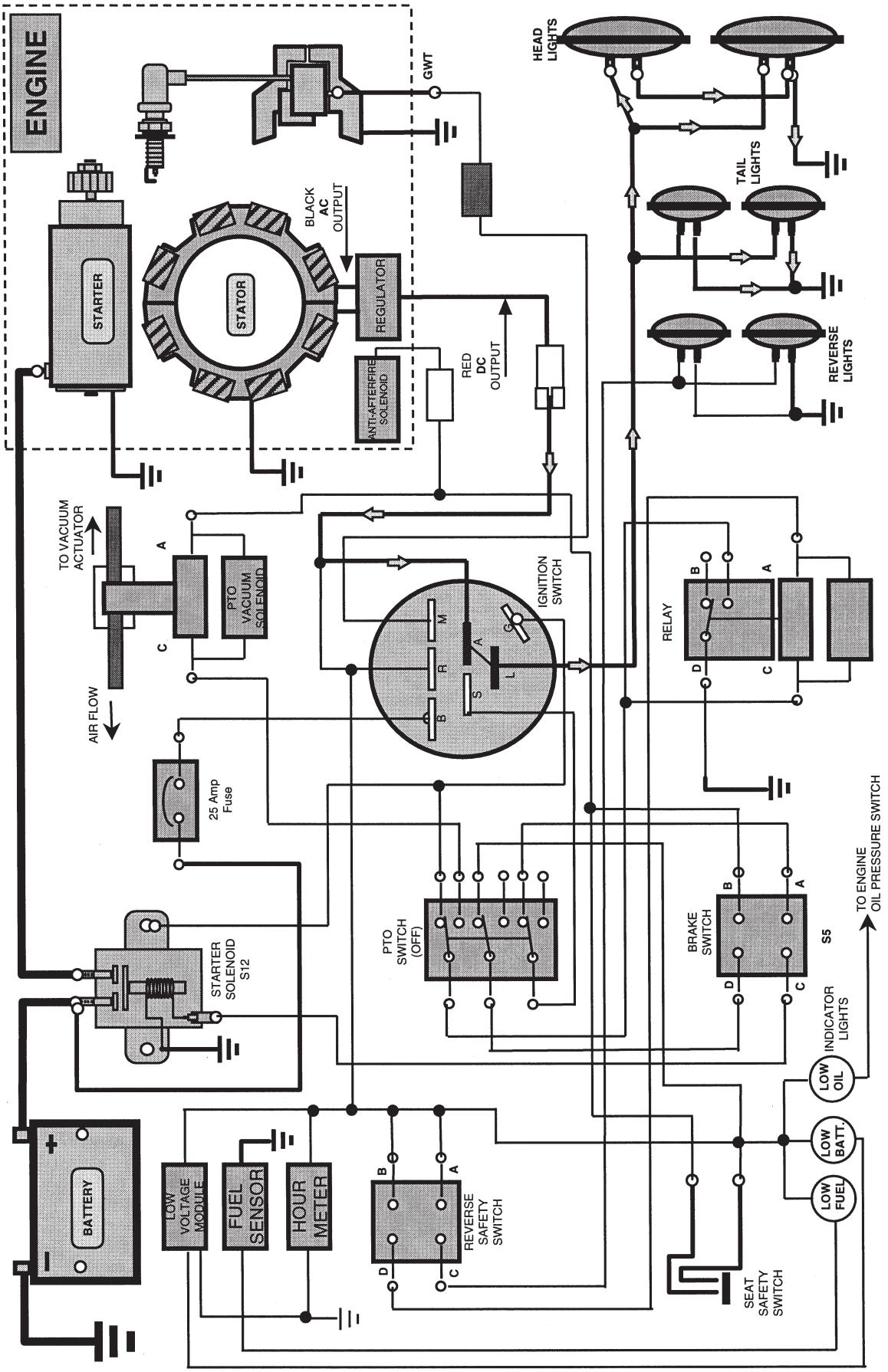
629-3057 Wiring Harness



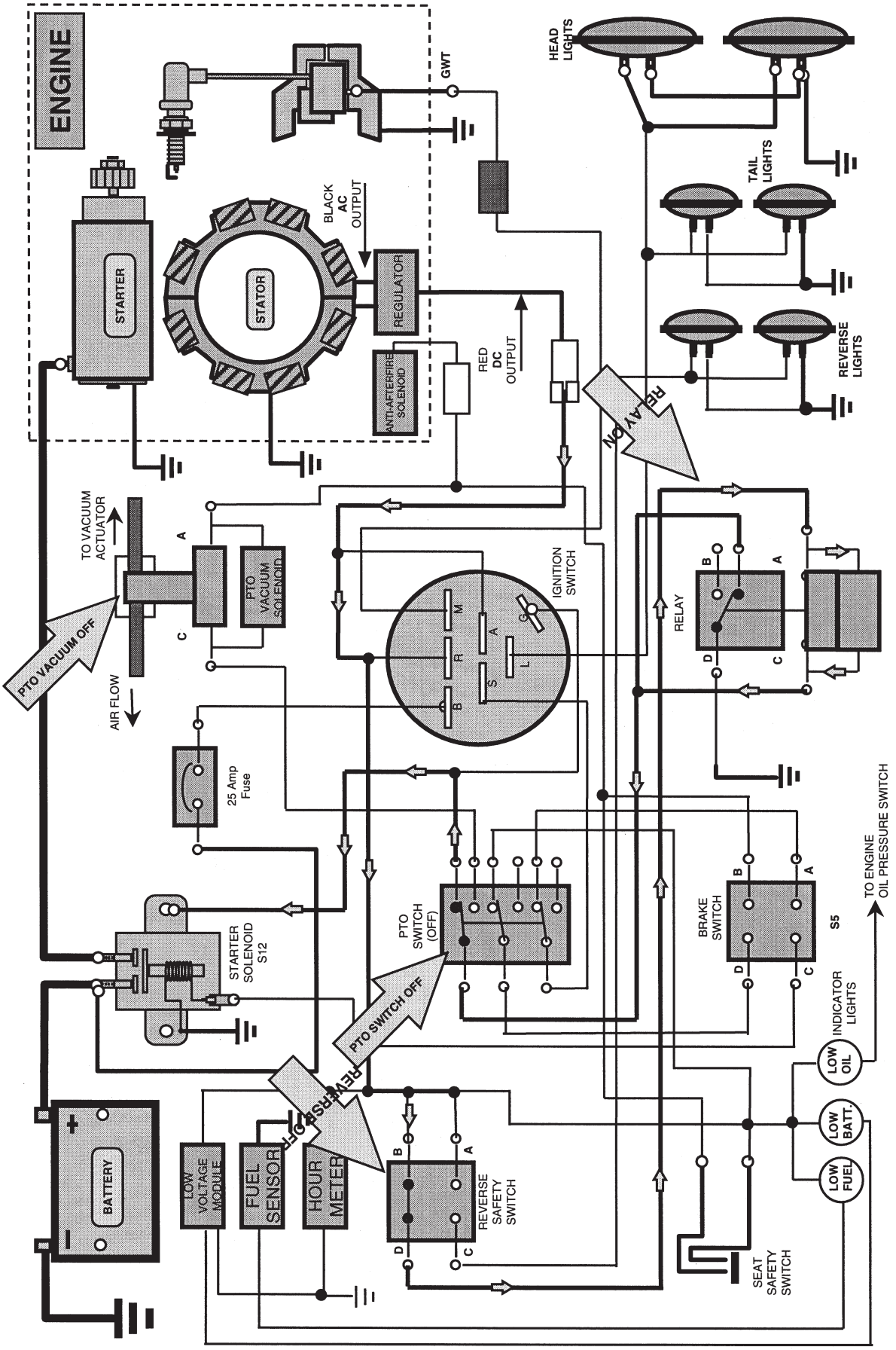
629-3056 Wiring Harness

3000 Series — Kohler Engine

RUN / CHARGE



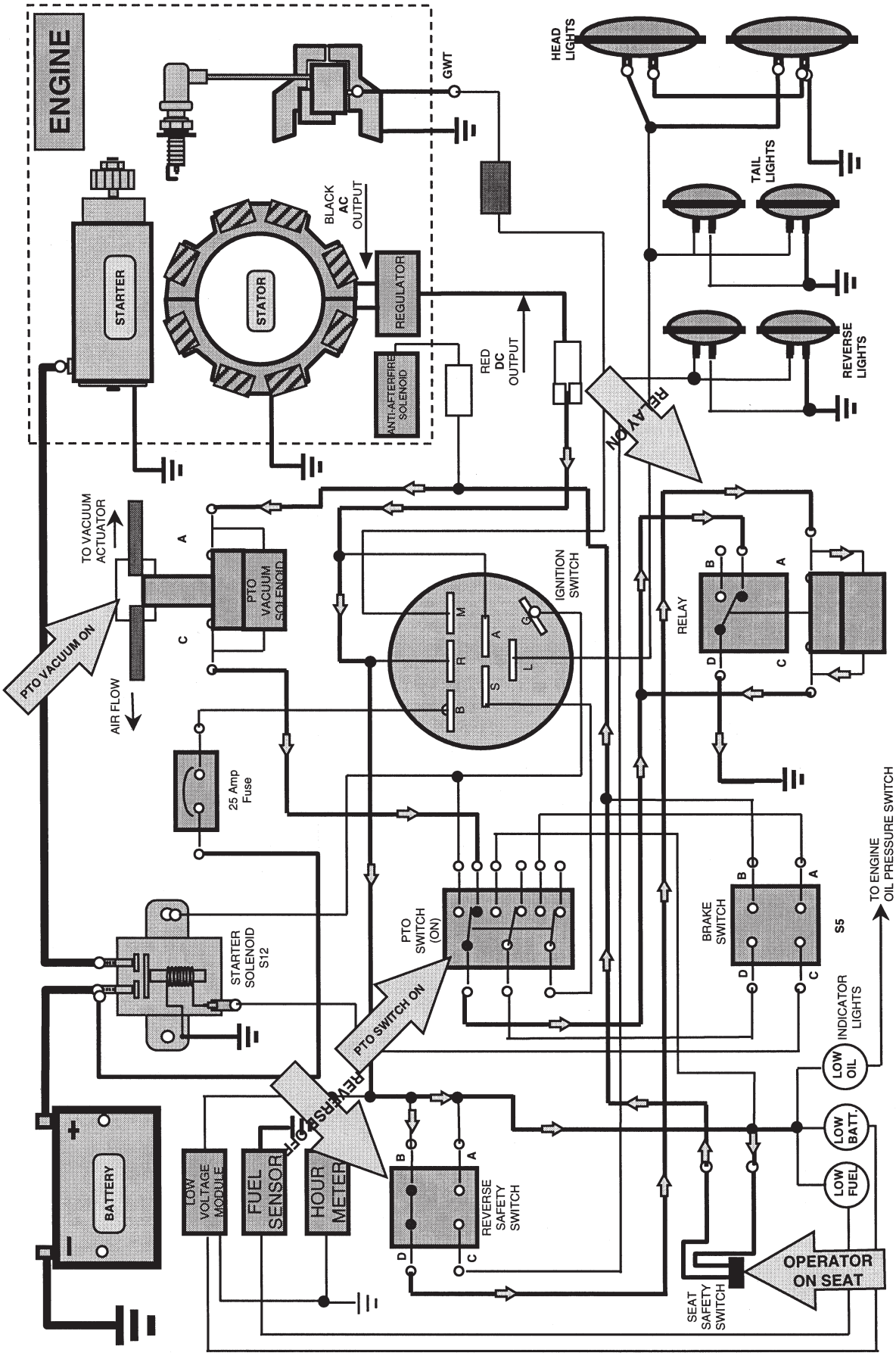
629-3057 Wiring Harness **3000 Series — B&S Engine**



PTO ON 1

629-3057 Wiring Harness

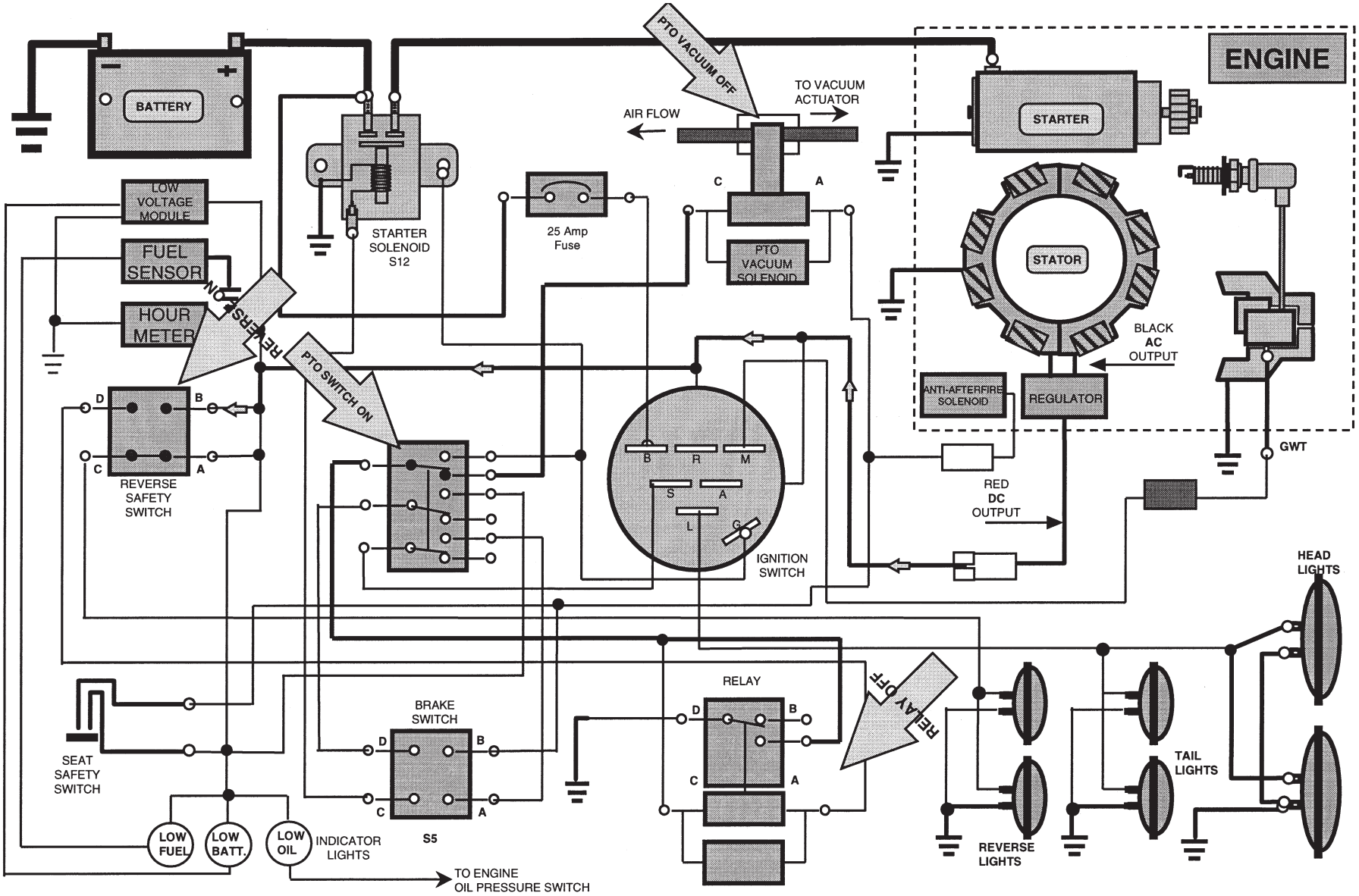
3000 Series — B&S Engine



PTO ON 2

3000 Series — B&S Engine

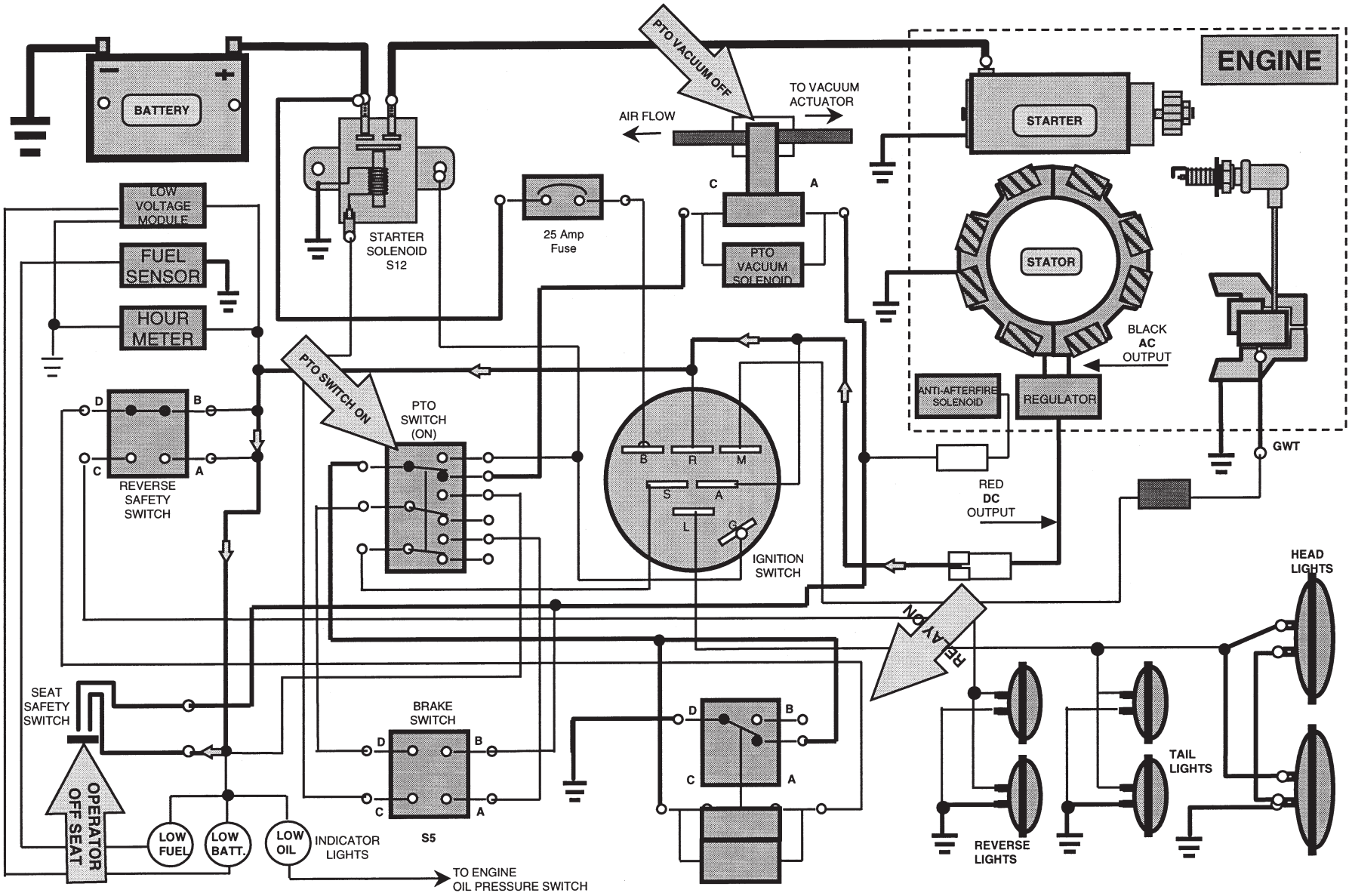
629-3057 Wiring Harness



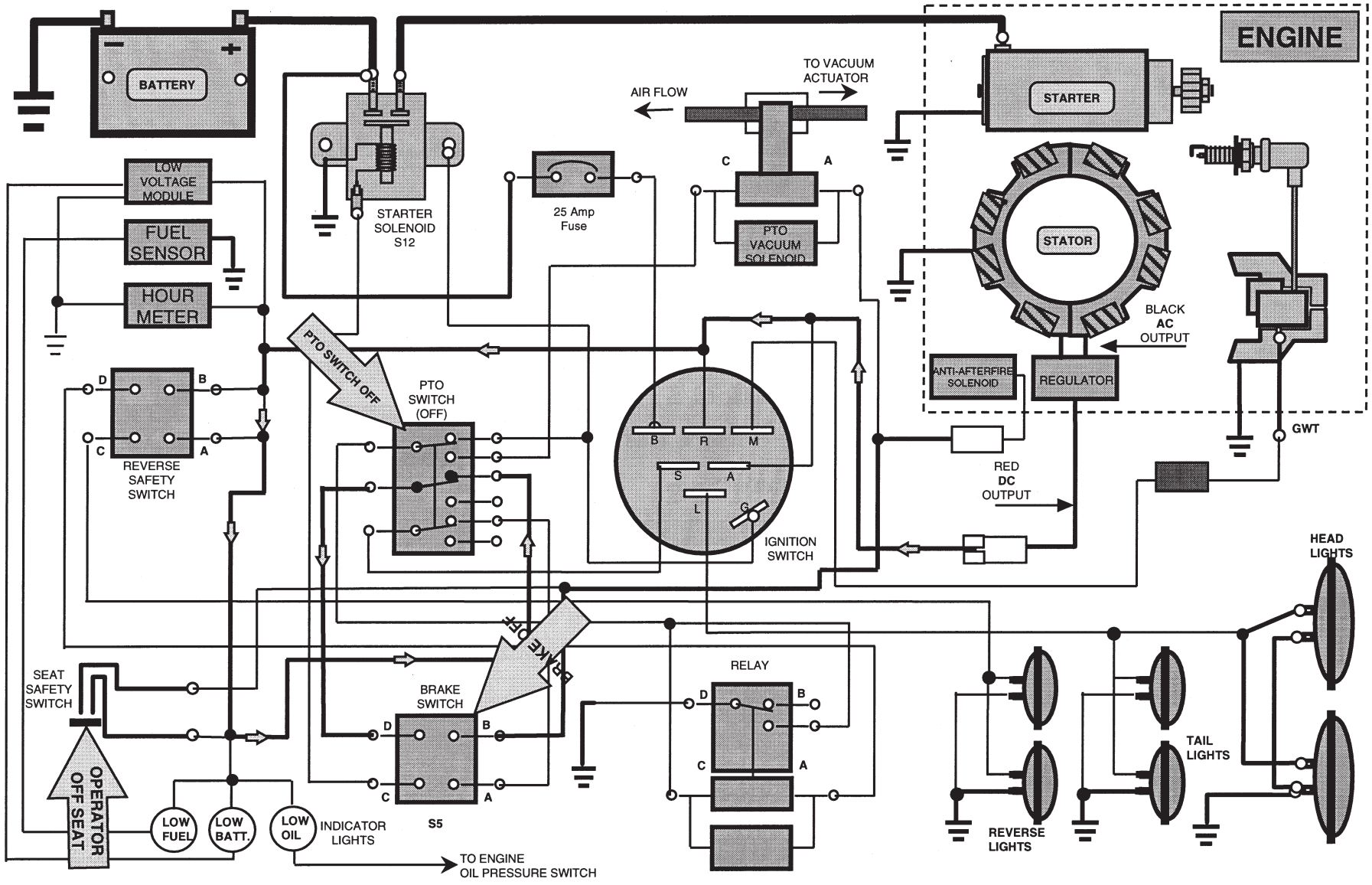
629-3057 Wiring Harness

3000 Series — B&S Engine

SAFETY / REVERSE



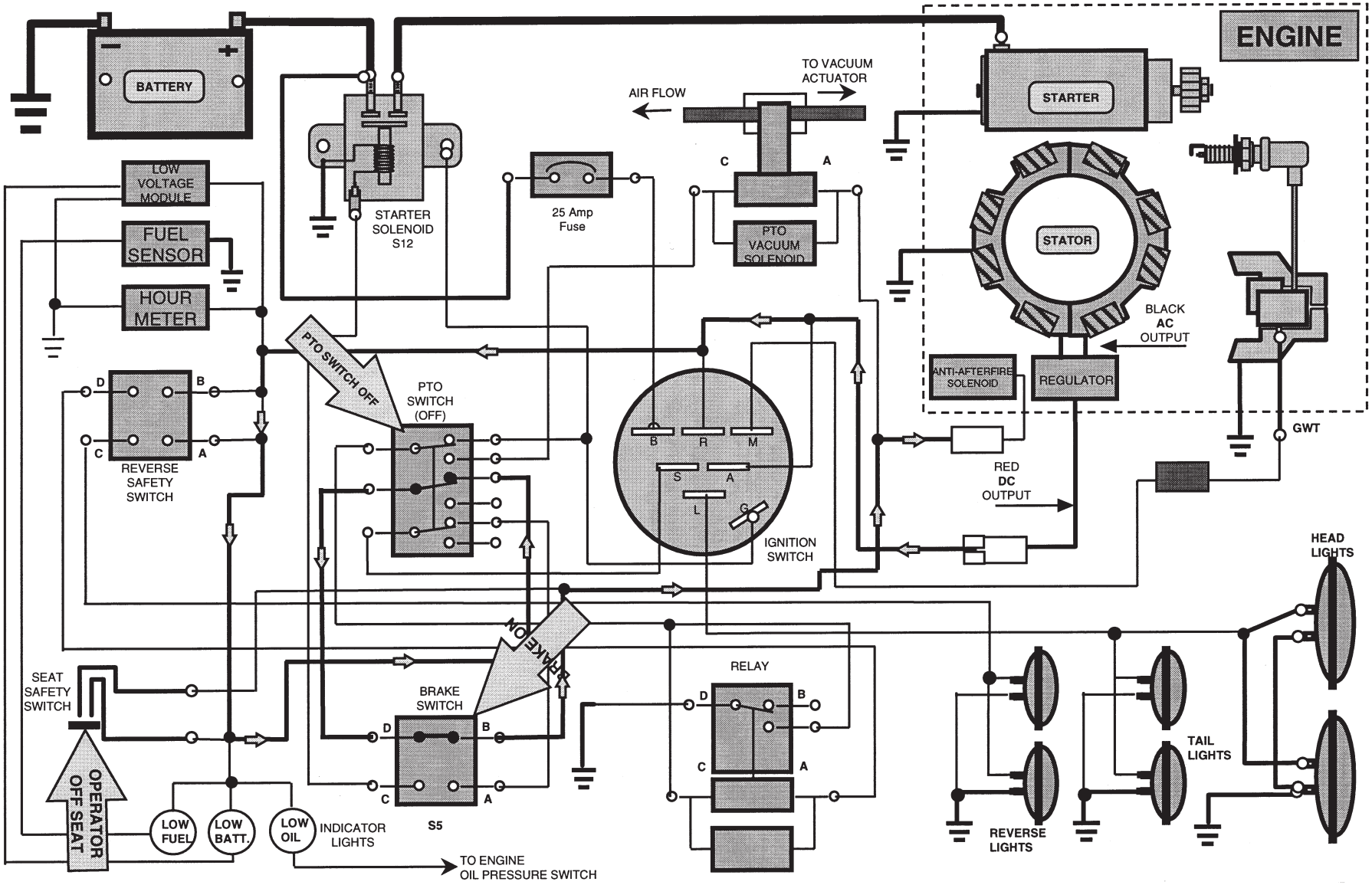
629-3057 Wiring Harness **3000 Series — B&S Engine** ***SAFETY / PTO-SEAT***



629-3057 Wiring Harness

3000 Series — B&S Engine

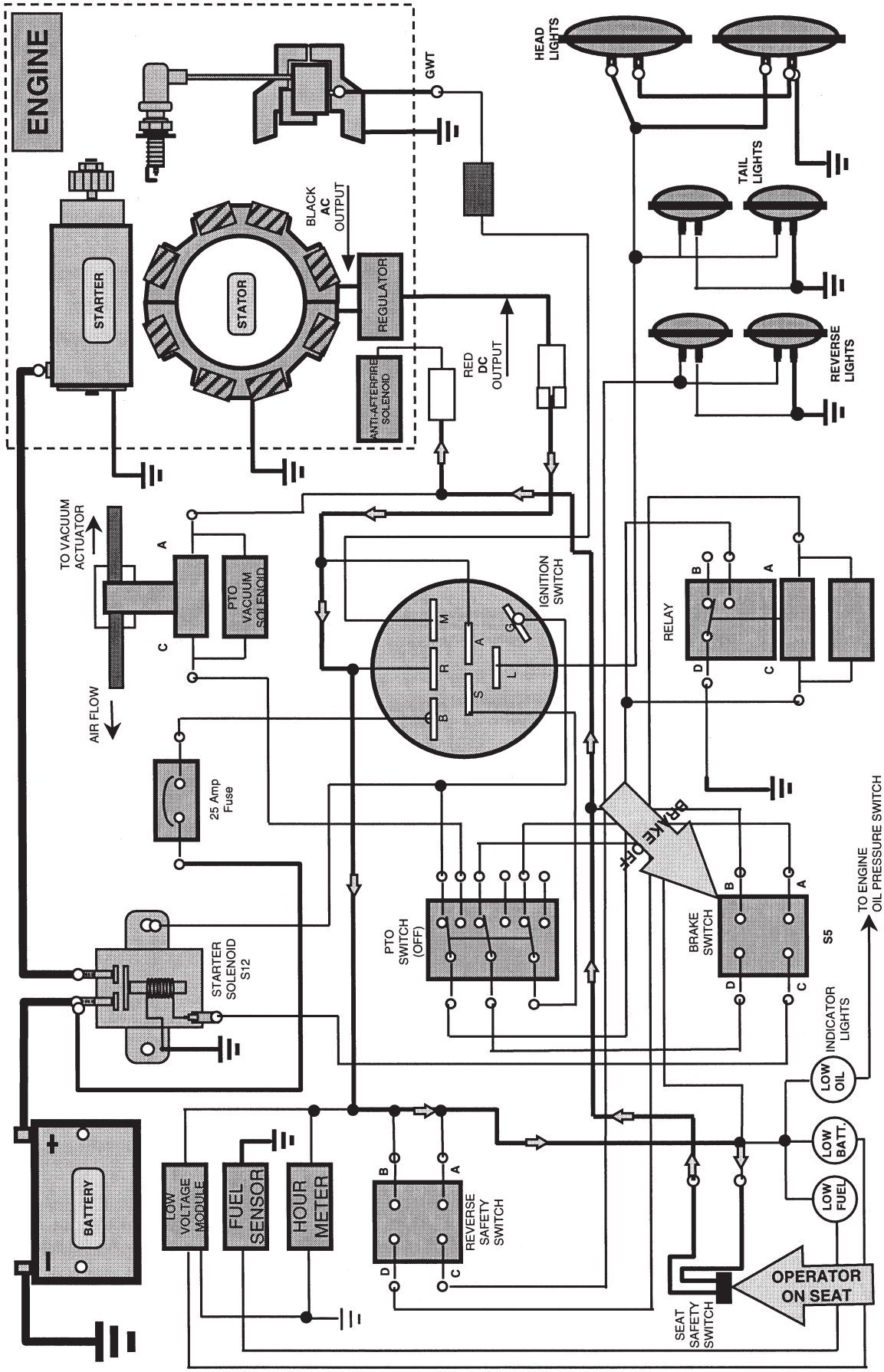
SAFETY / PTO-BRAKE



629-3057 Wiring Harness

3000 Series — B&S Engine

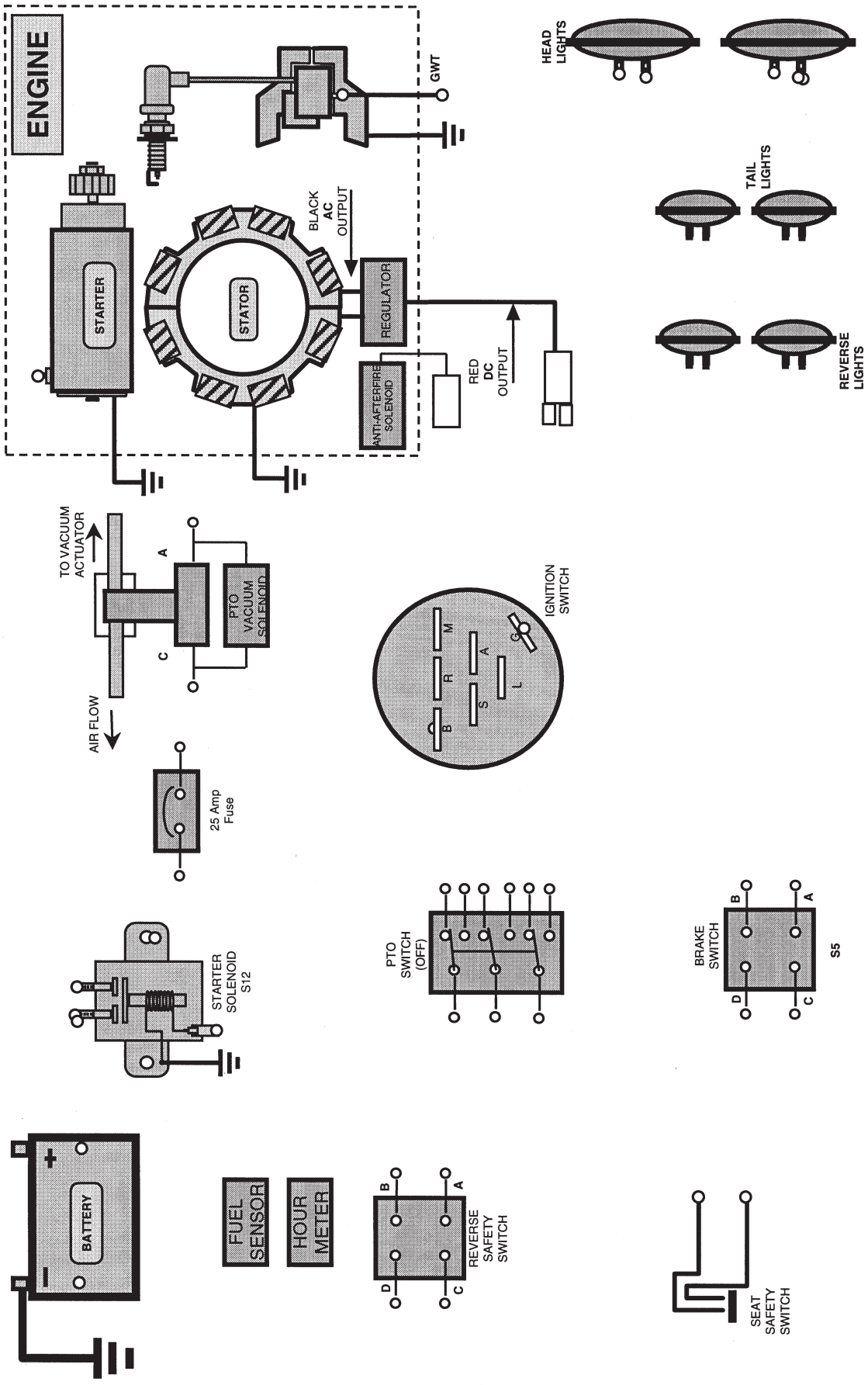
SAFETY / OK



SAFETY / OK

3000 Series — B&S Engine

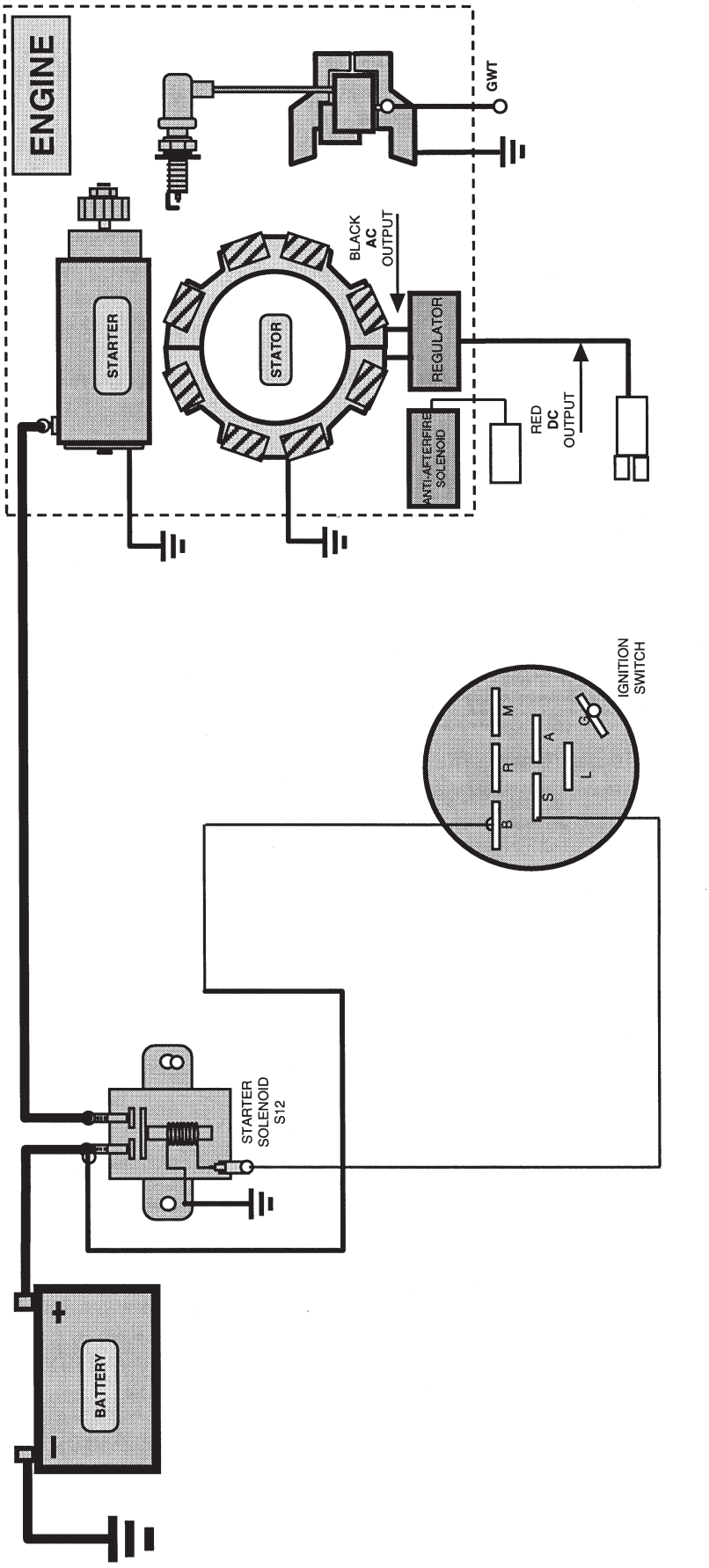
629-3057 Wiring Harness



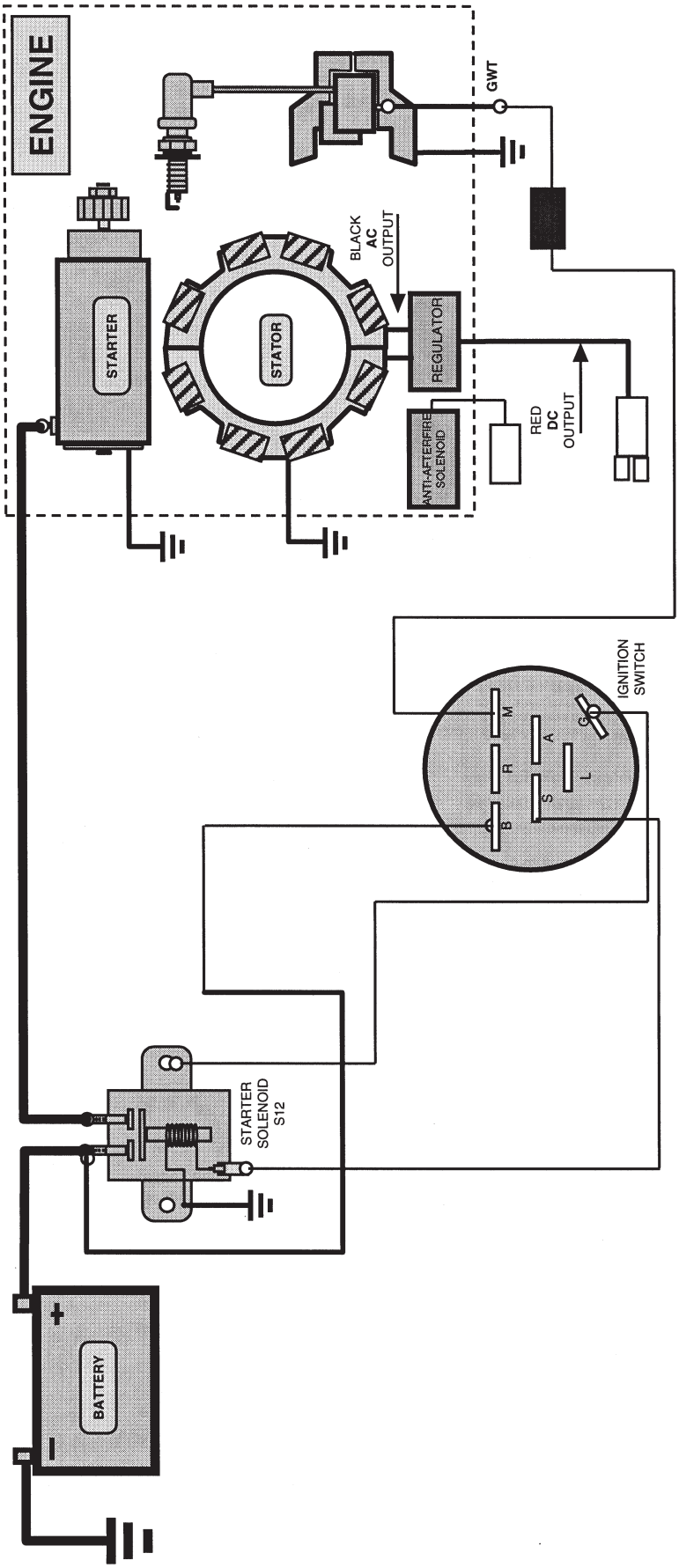
629-3057 Wiring Harness

3000 Series — B&S Engine

Electrical

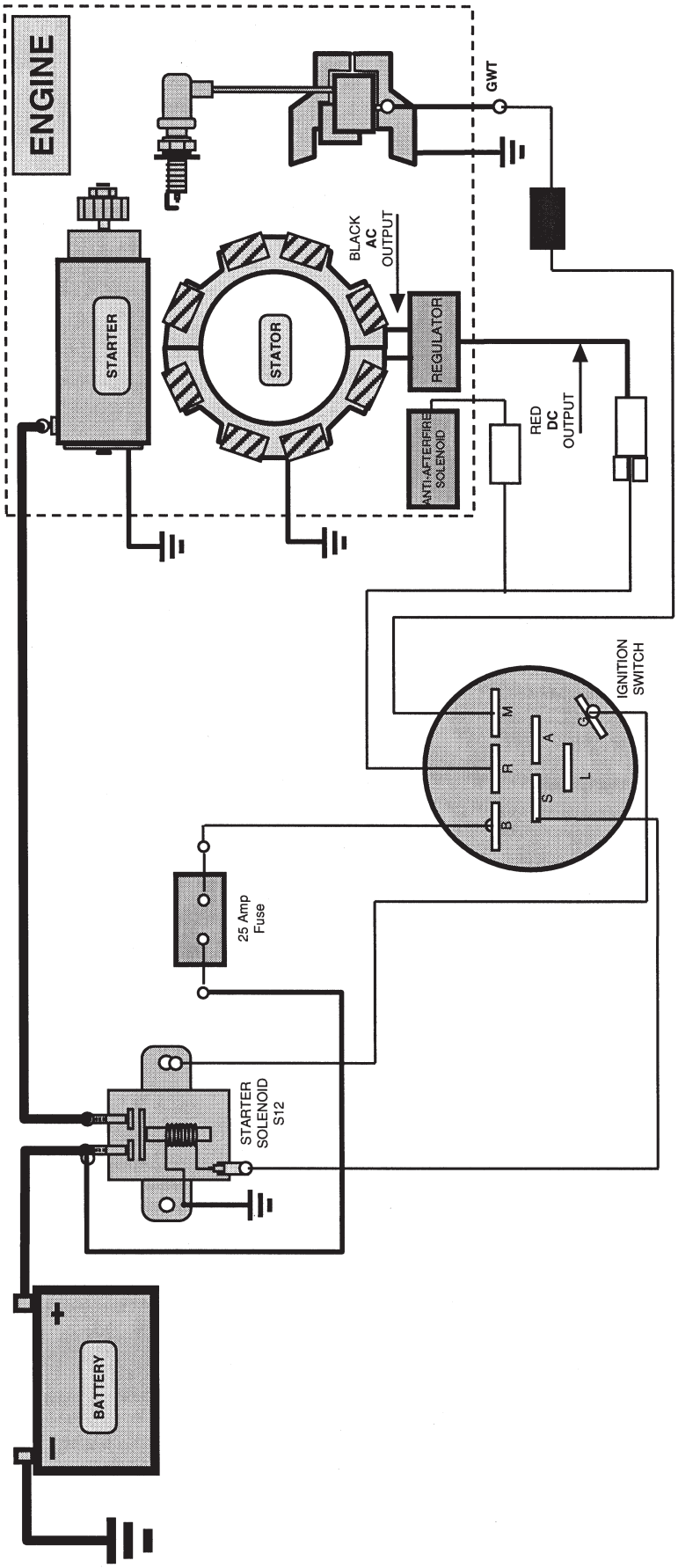


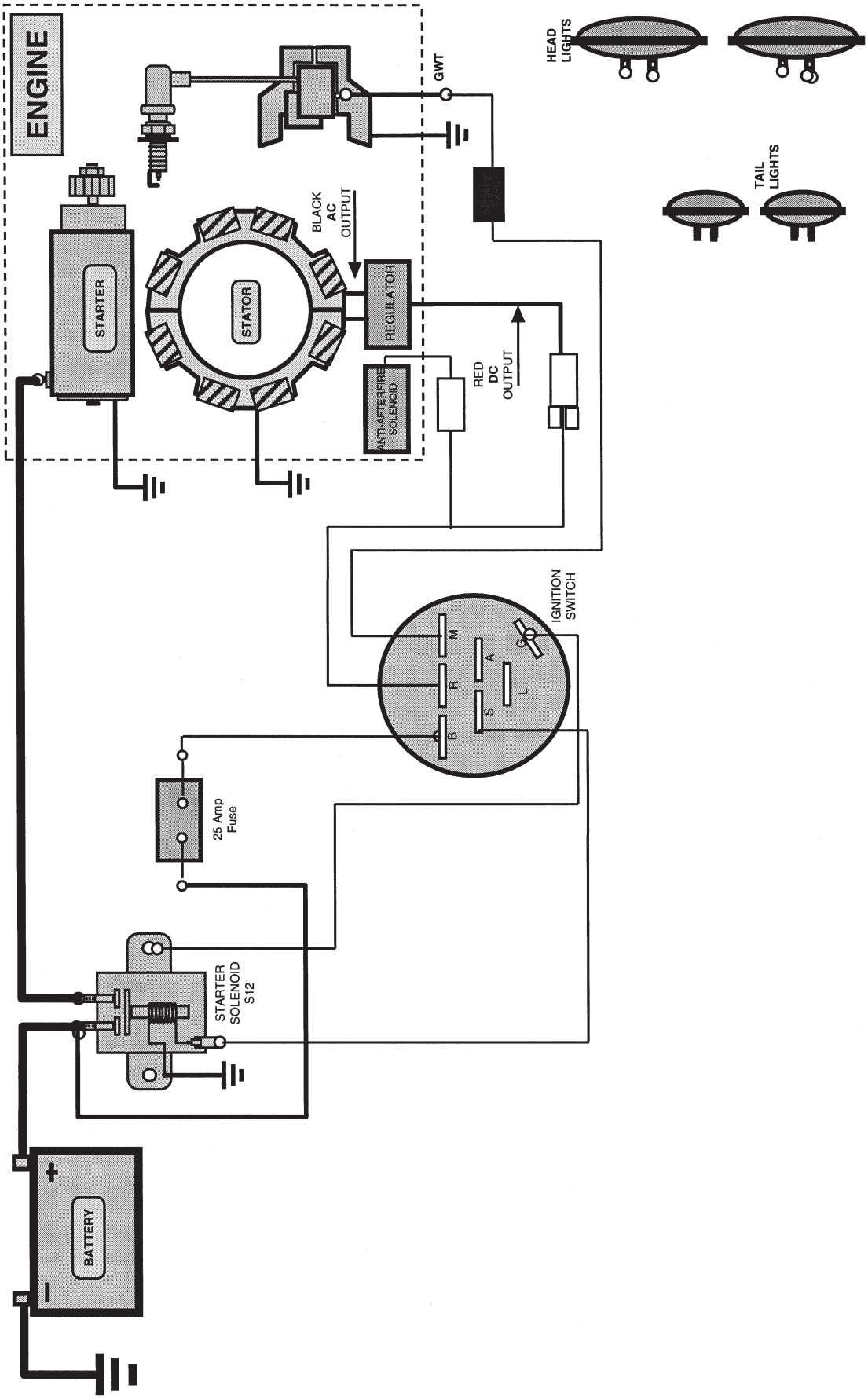
629-3057 Wiring Harness **3000 Series — B&S Engine**



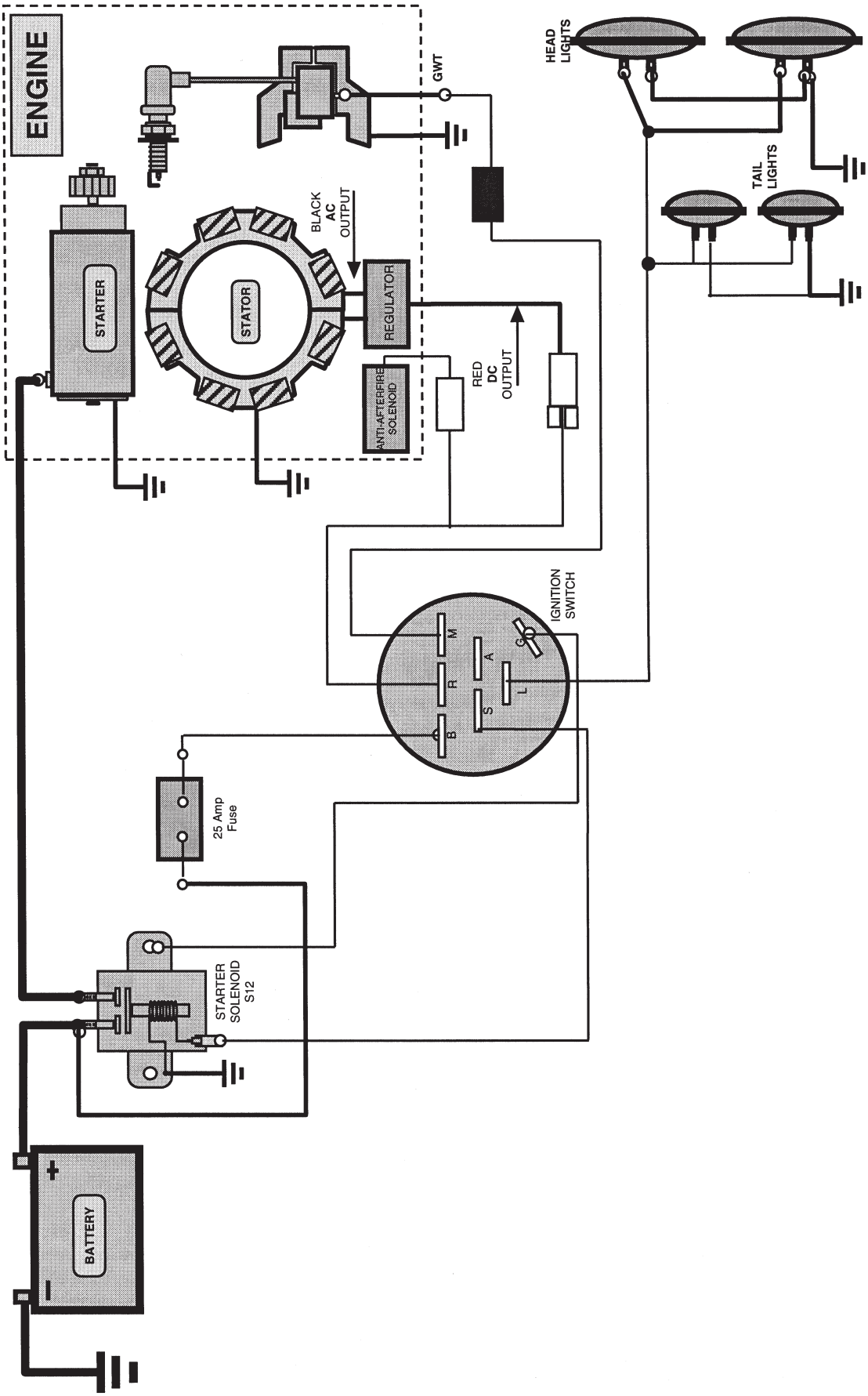
629-3057 Wiring Harness

3000 Series — B&S Engine



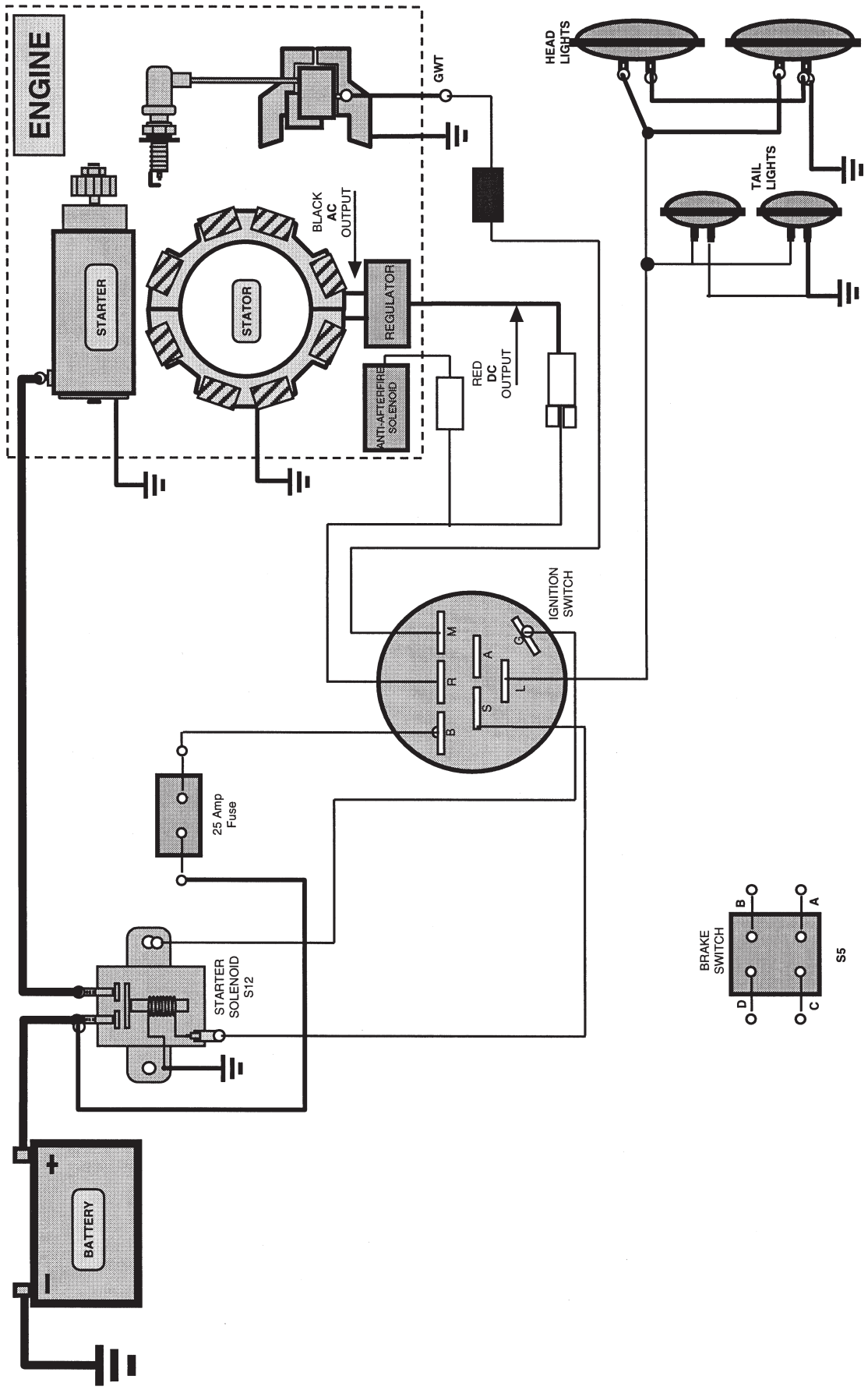


629-3057 Wiring Harness **3000 Series — B&S Engine**



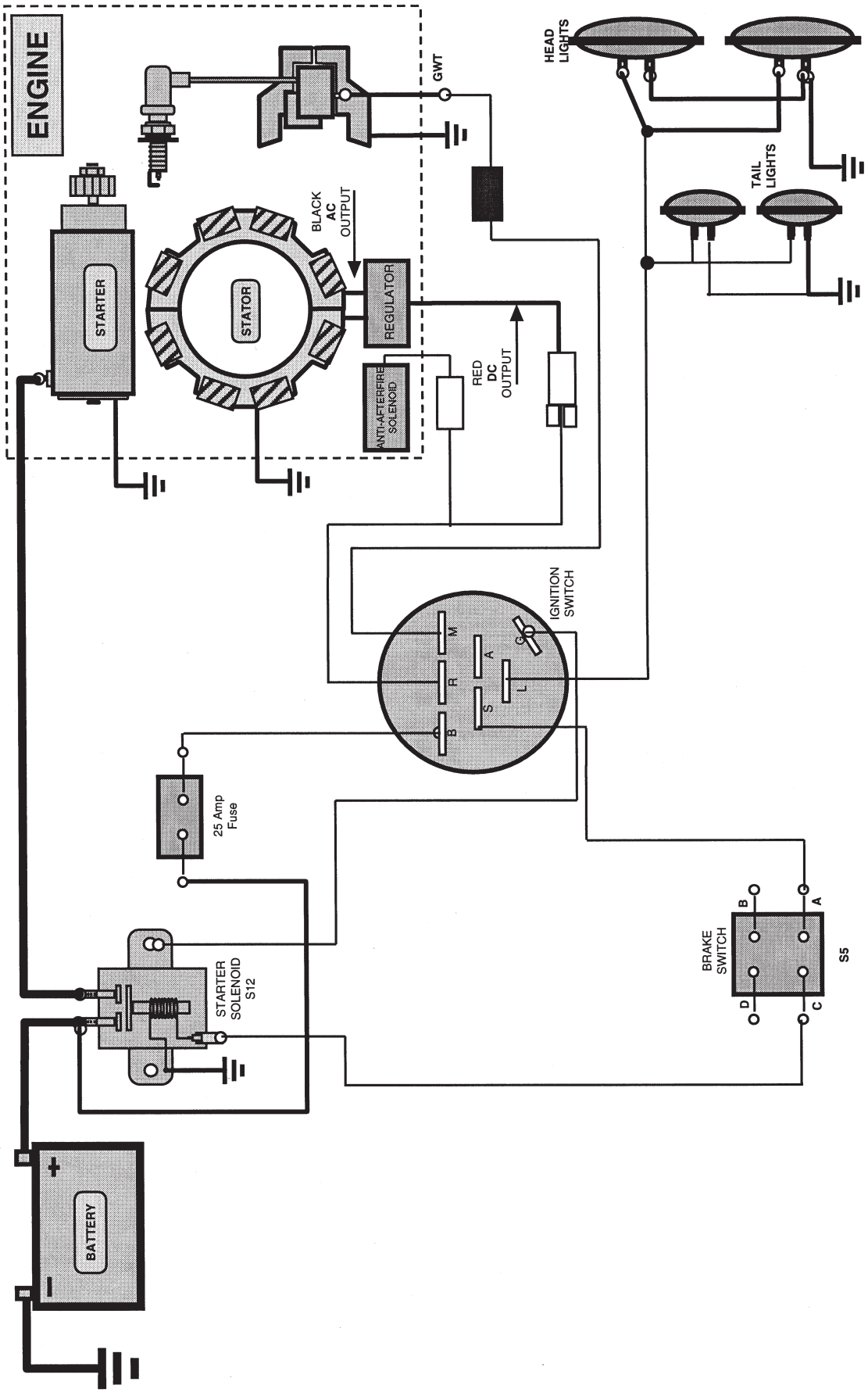
3000 Series — B&S Engine

629-3057 Wiring Harness



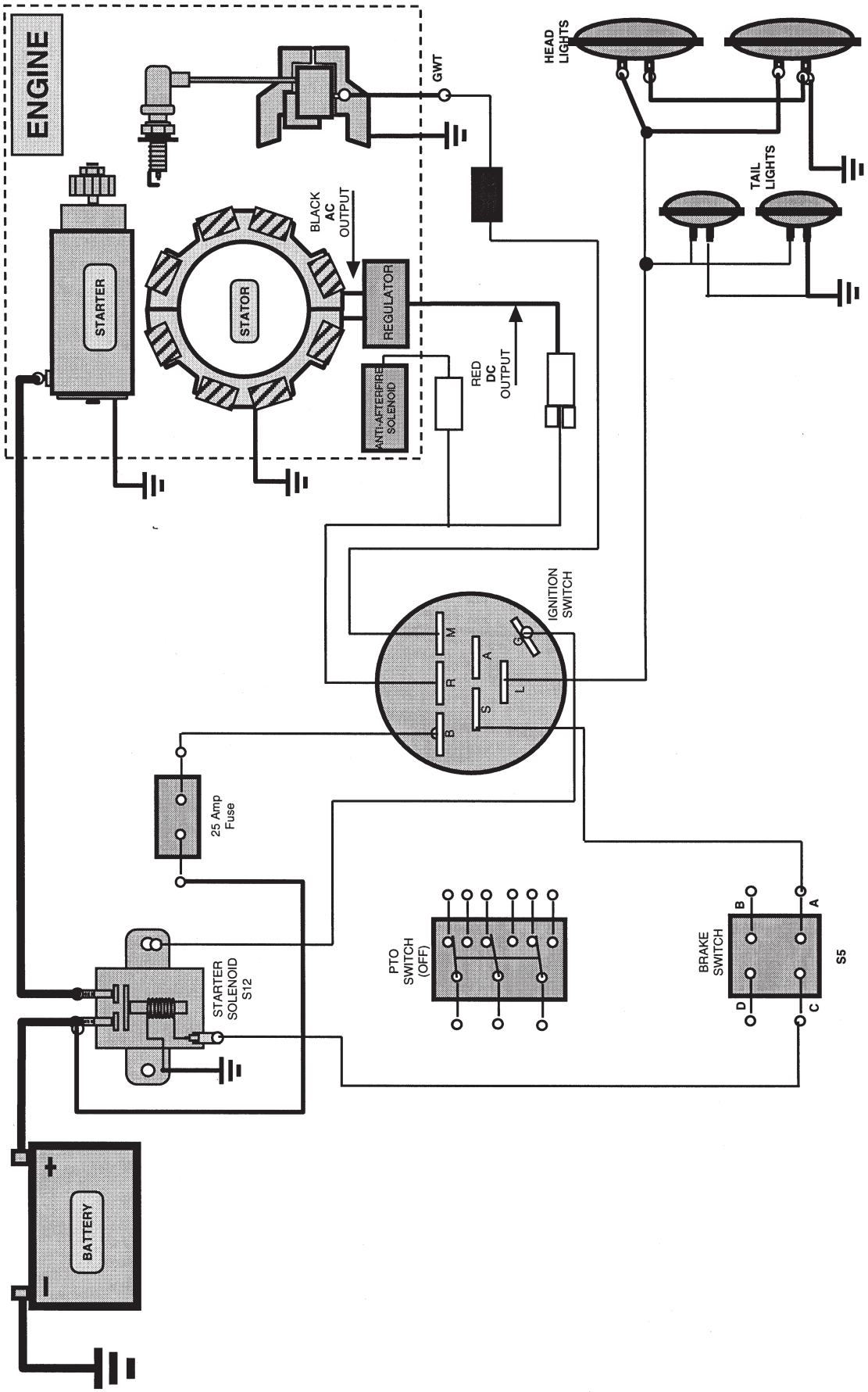
629-3057 Wiring Harness

3000 Series — B&S Engine



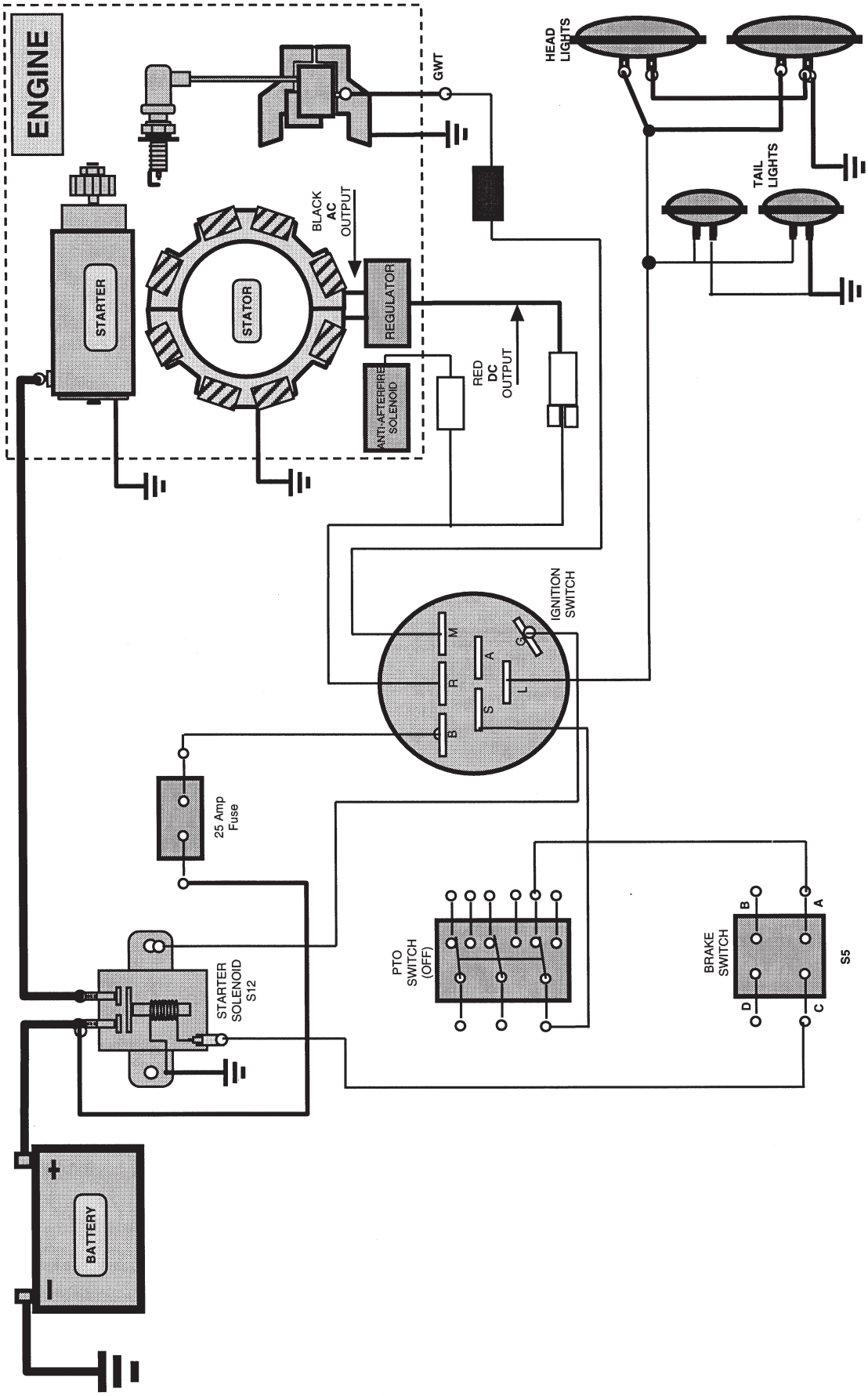
629-3057 Wiring Harness

3000 Series — B&S Engine



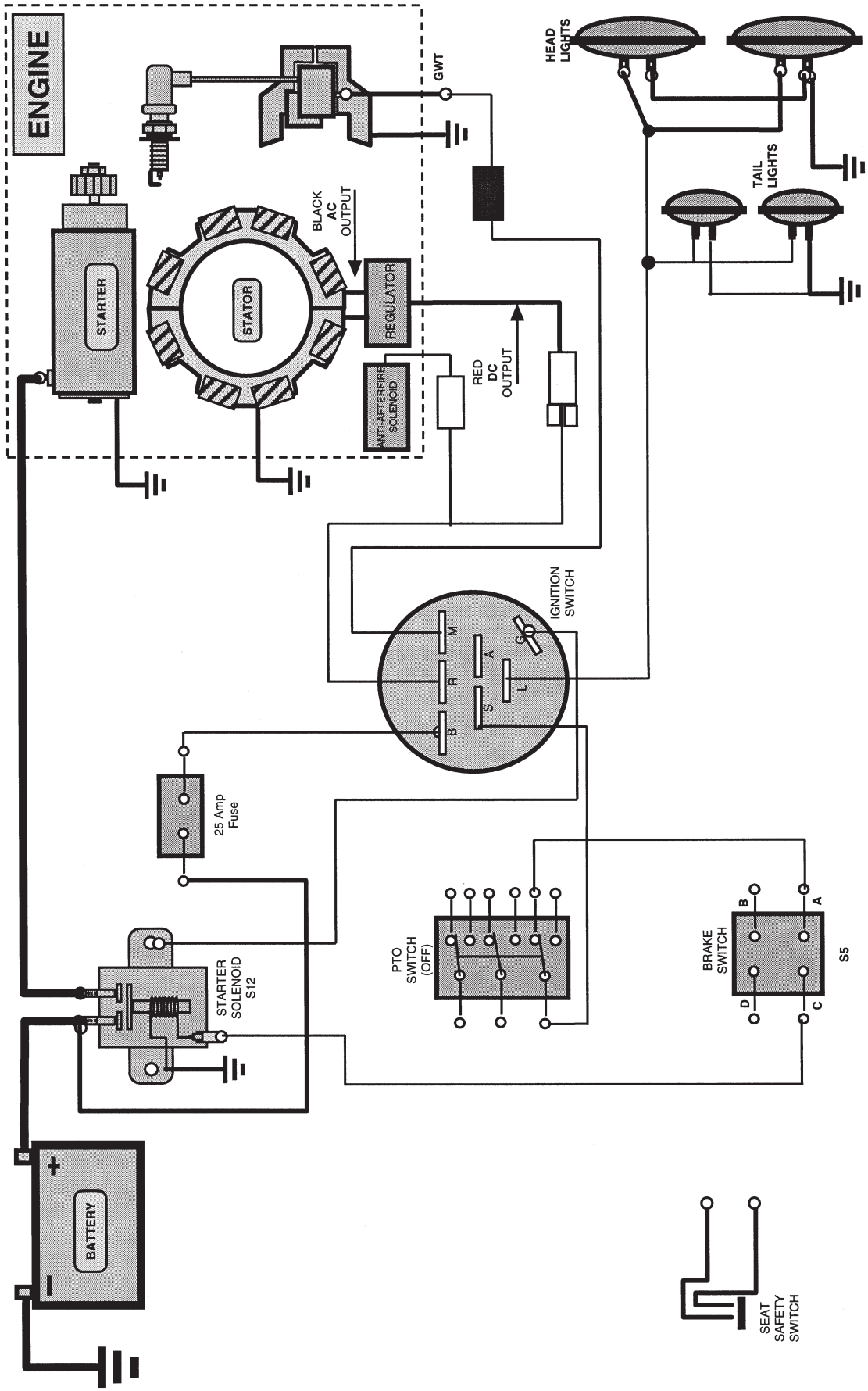
3000 Series — B&S Engine

629-3057 Wiring Harness



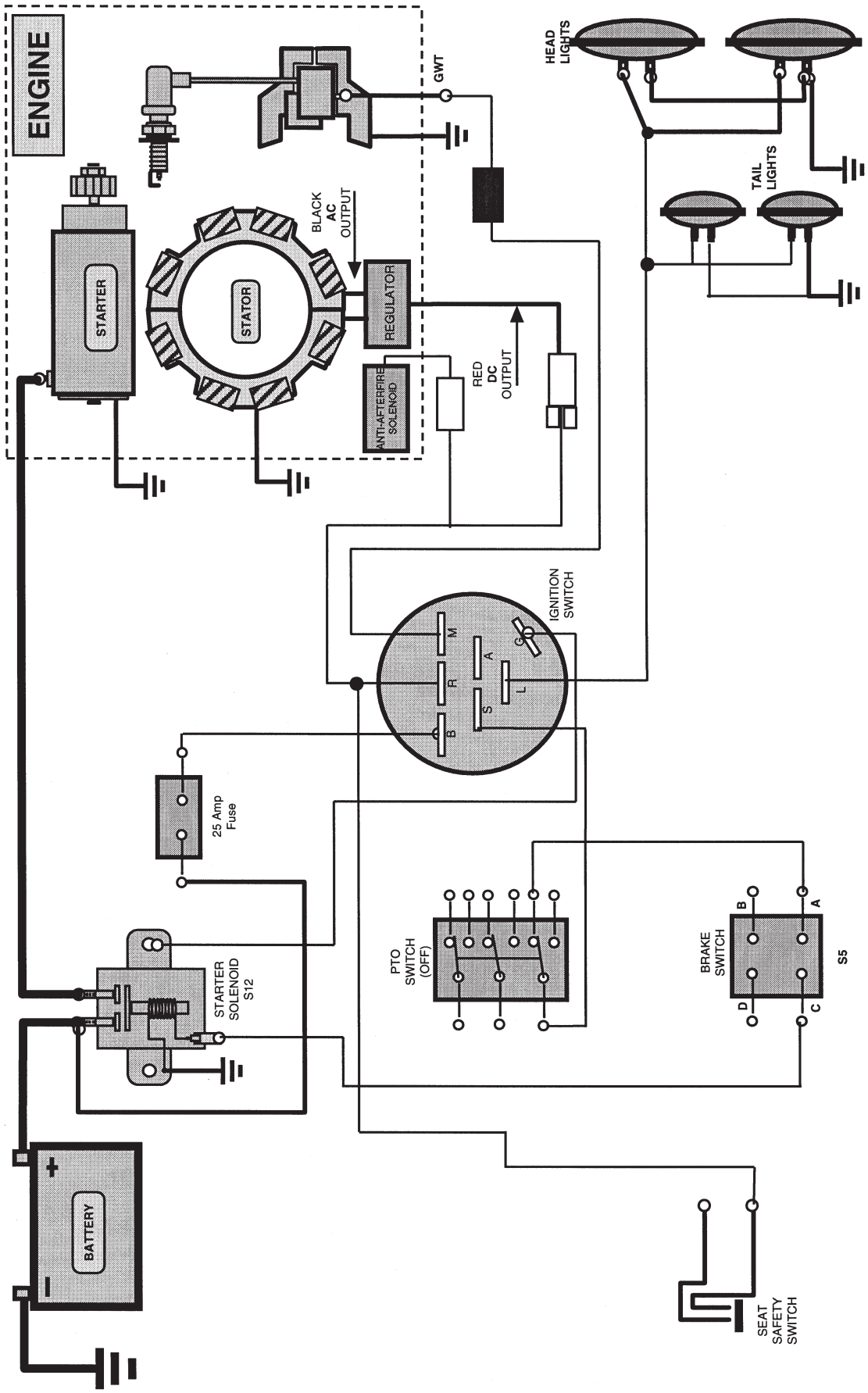
629-3057 Wiring Harness

3000 Series — B&S Engine

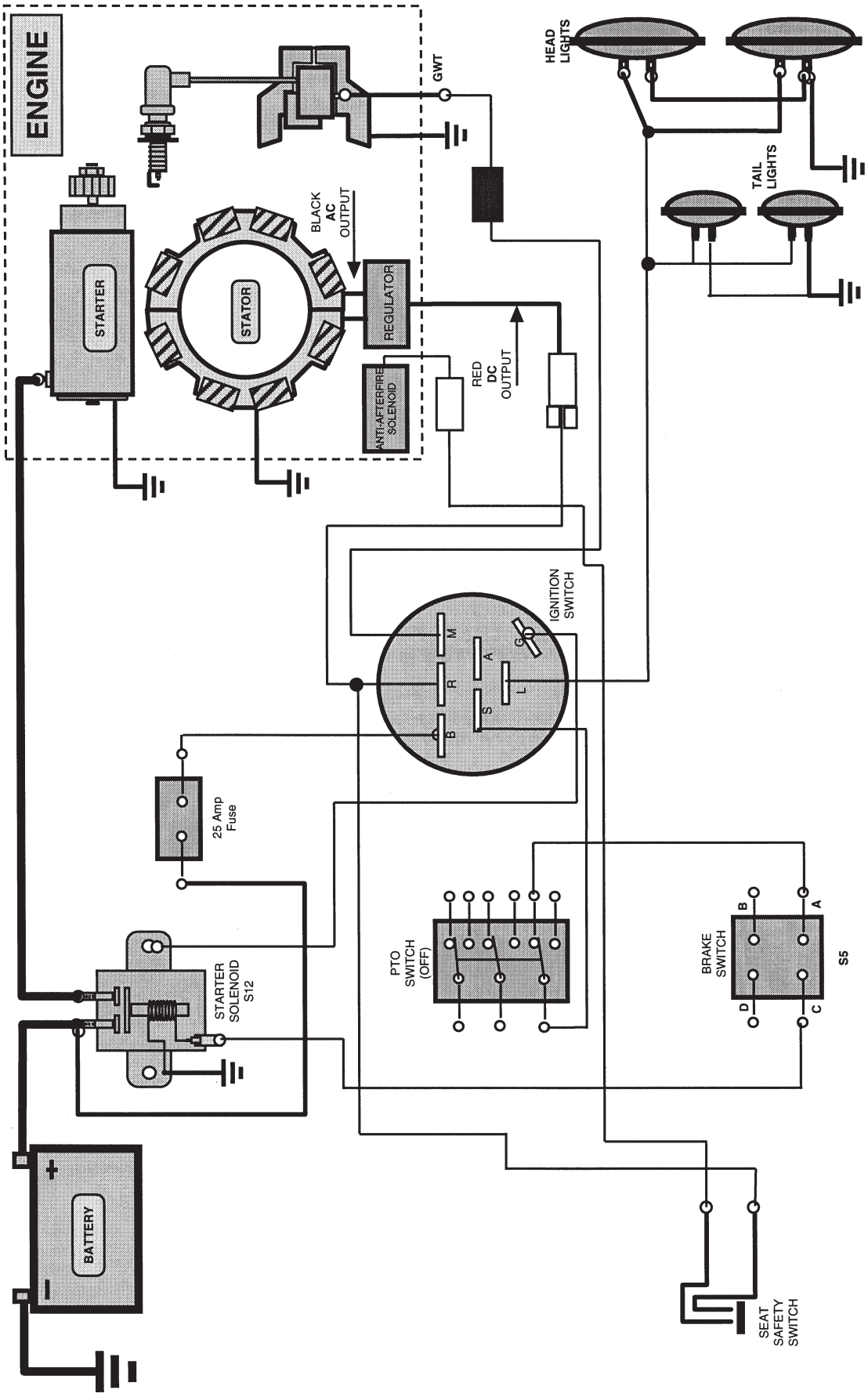


3000 Series — B&S Engine

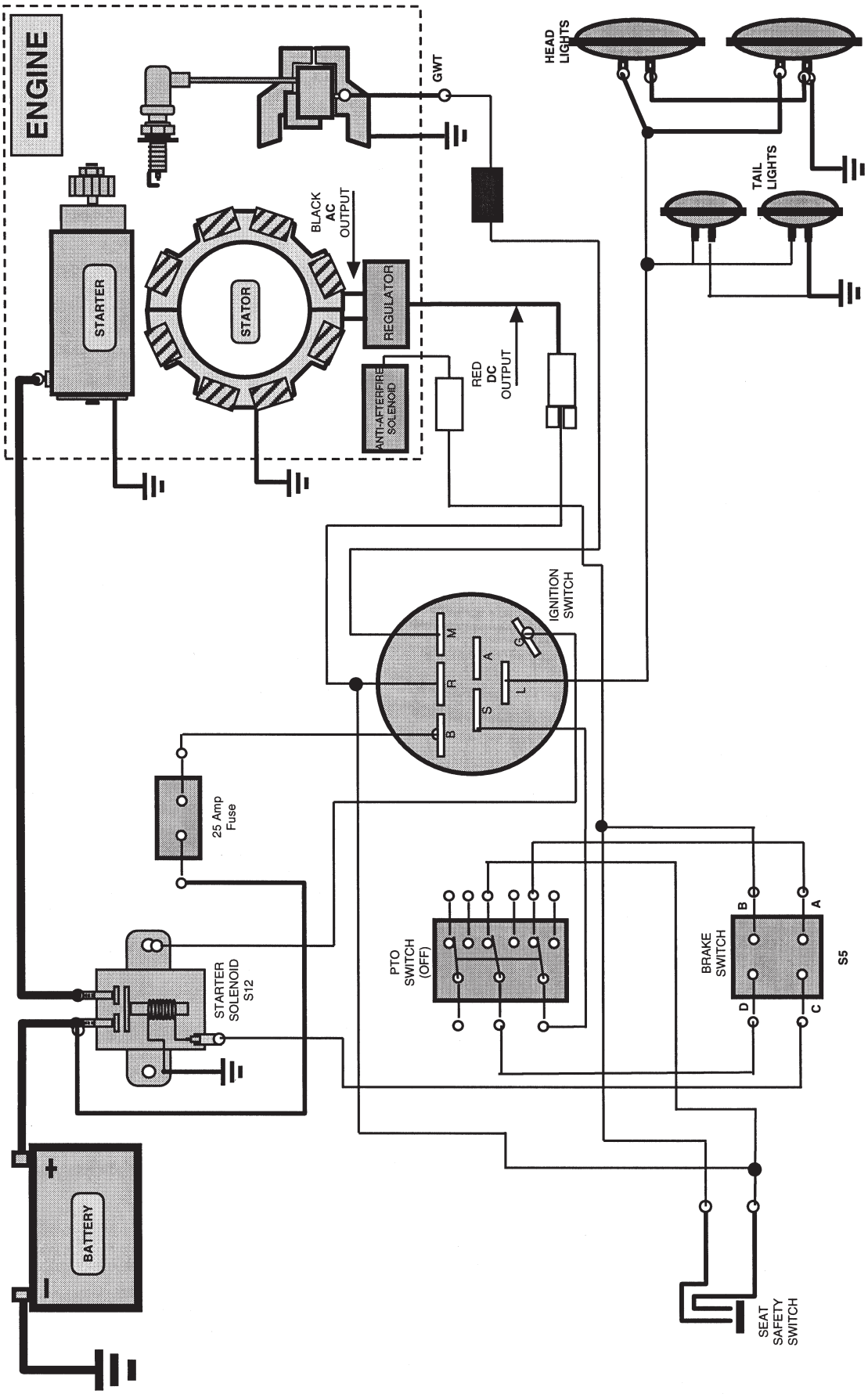
629-3057 Wiring Harness



629-3057 Wiring Harness **3000 Series — B&S Engine**

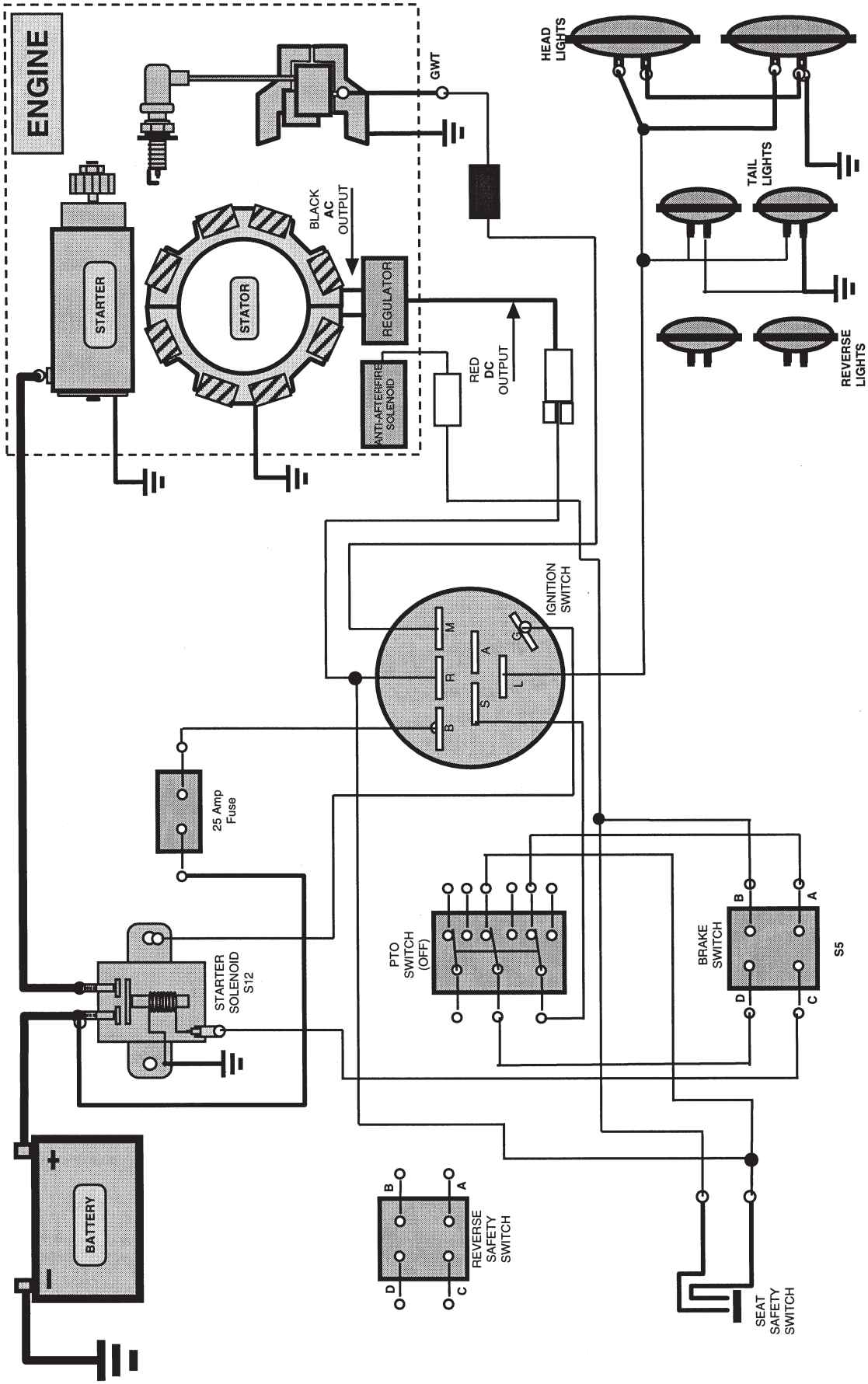


629-3057 Wiring Harness **3000 Series — B&S Engine**



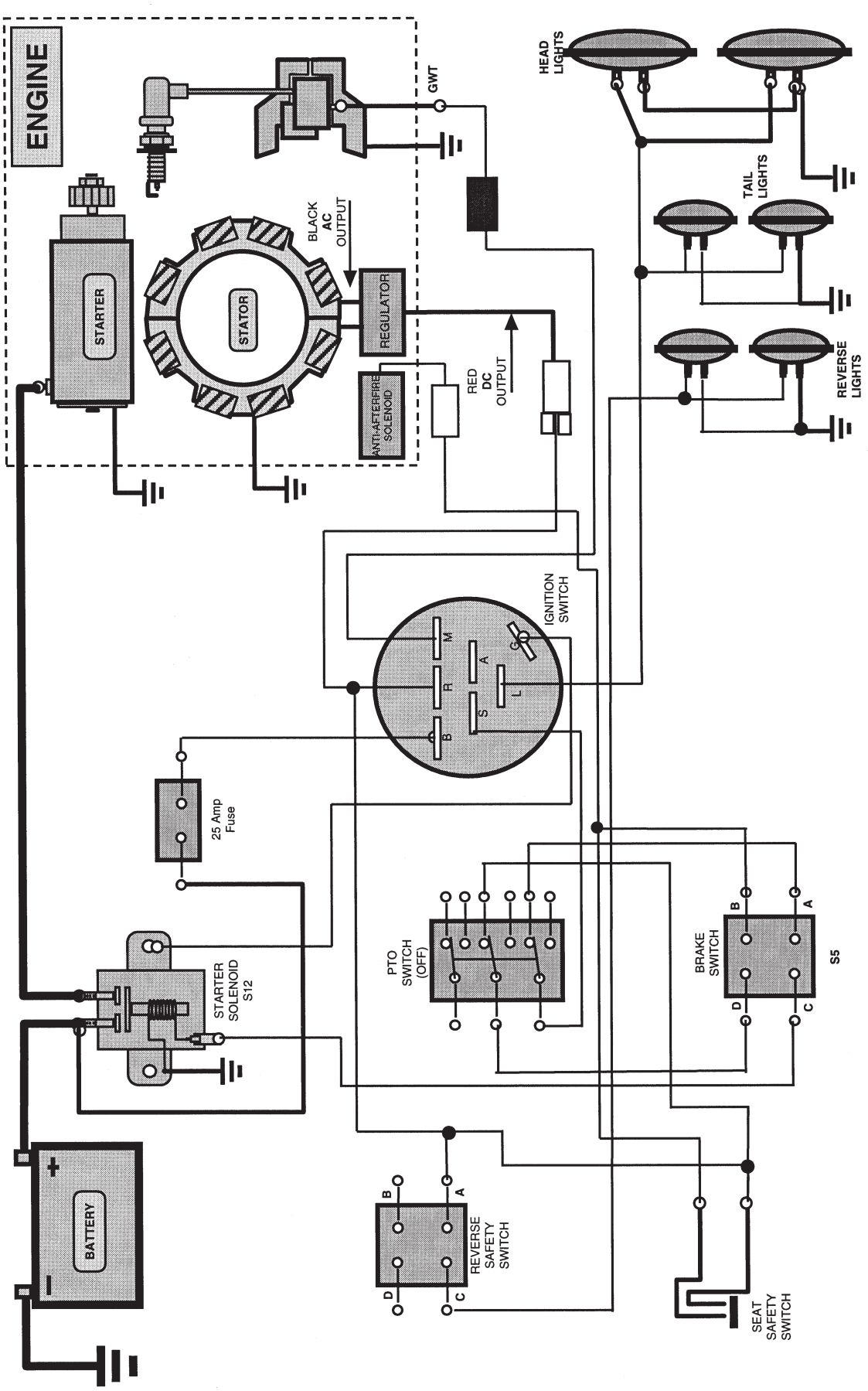
629-3057 Wiring Harness

3000 Series — B&S Engine

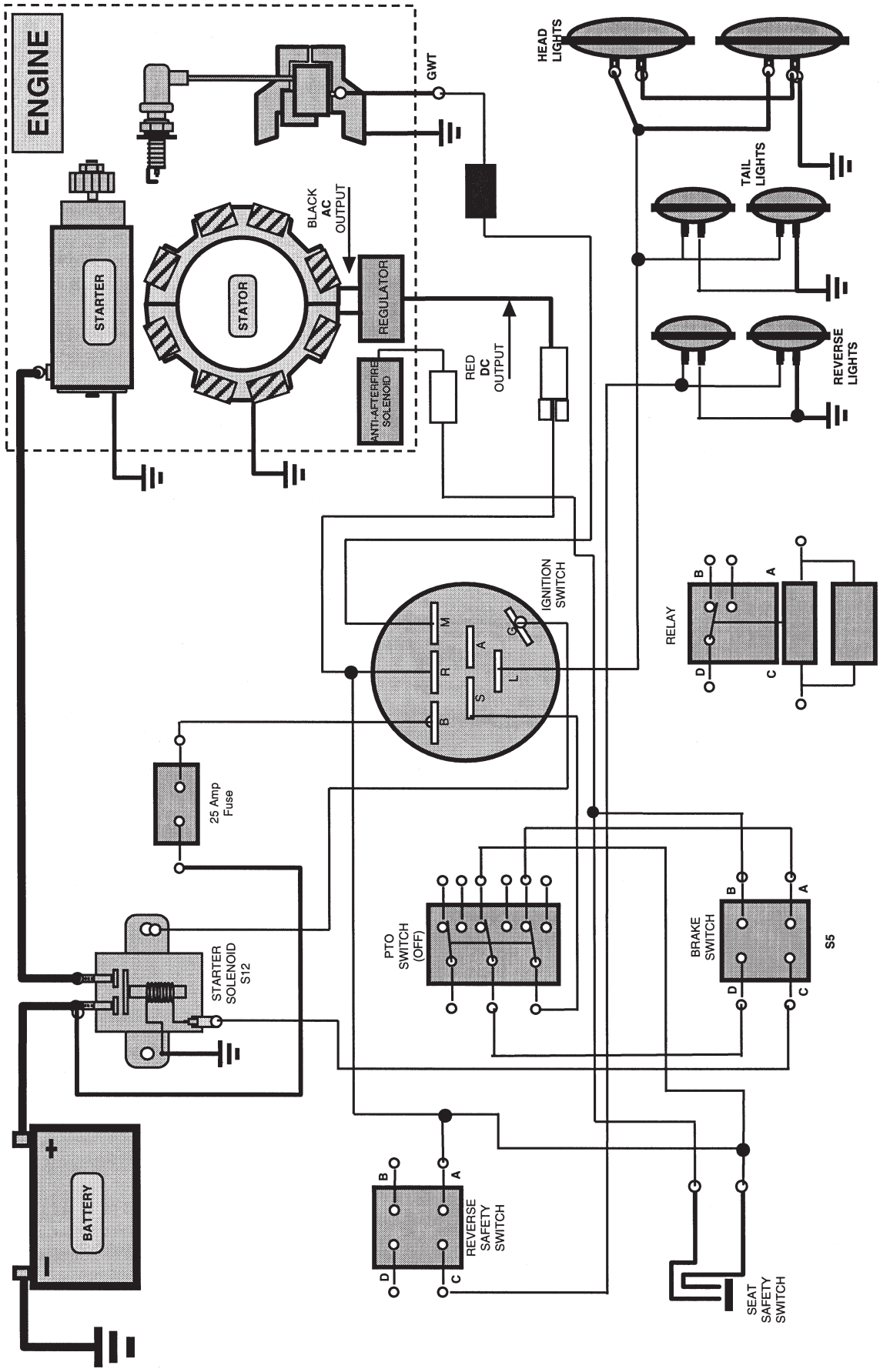


629-3057 Wiring Harness

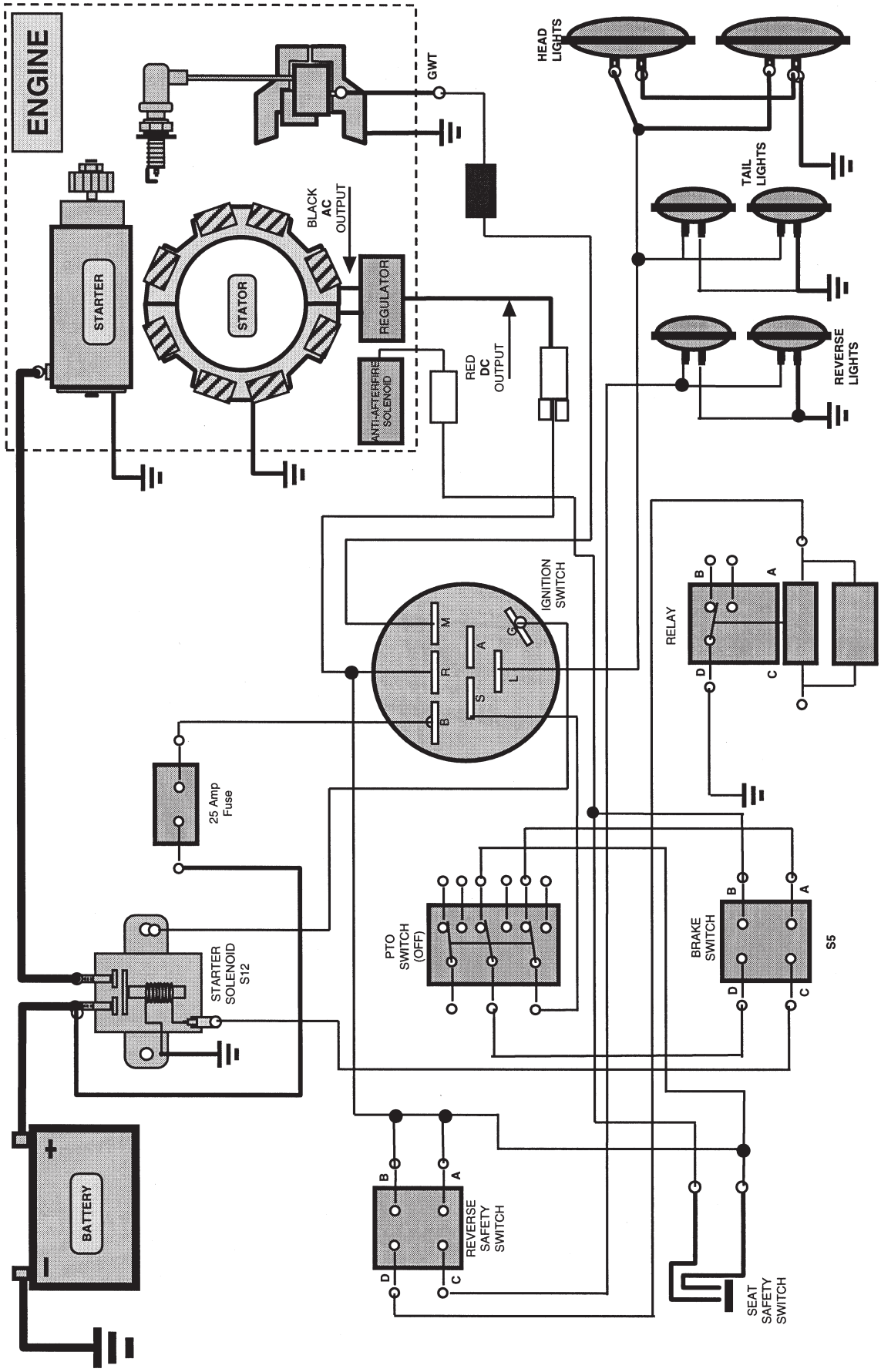
3000 Series — B&S Engine



629-3057 Wiring Harness **3000 Series — B&S Engine**

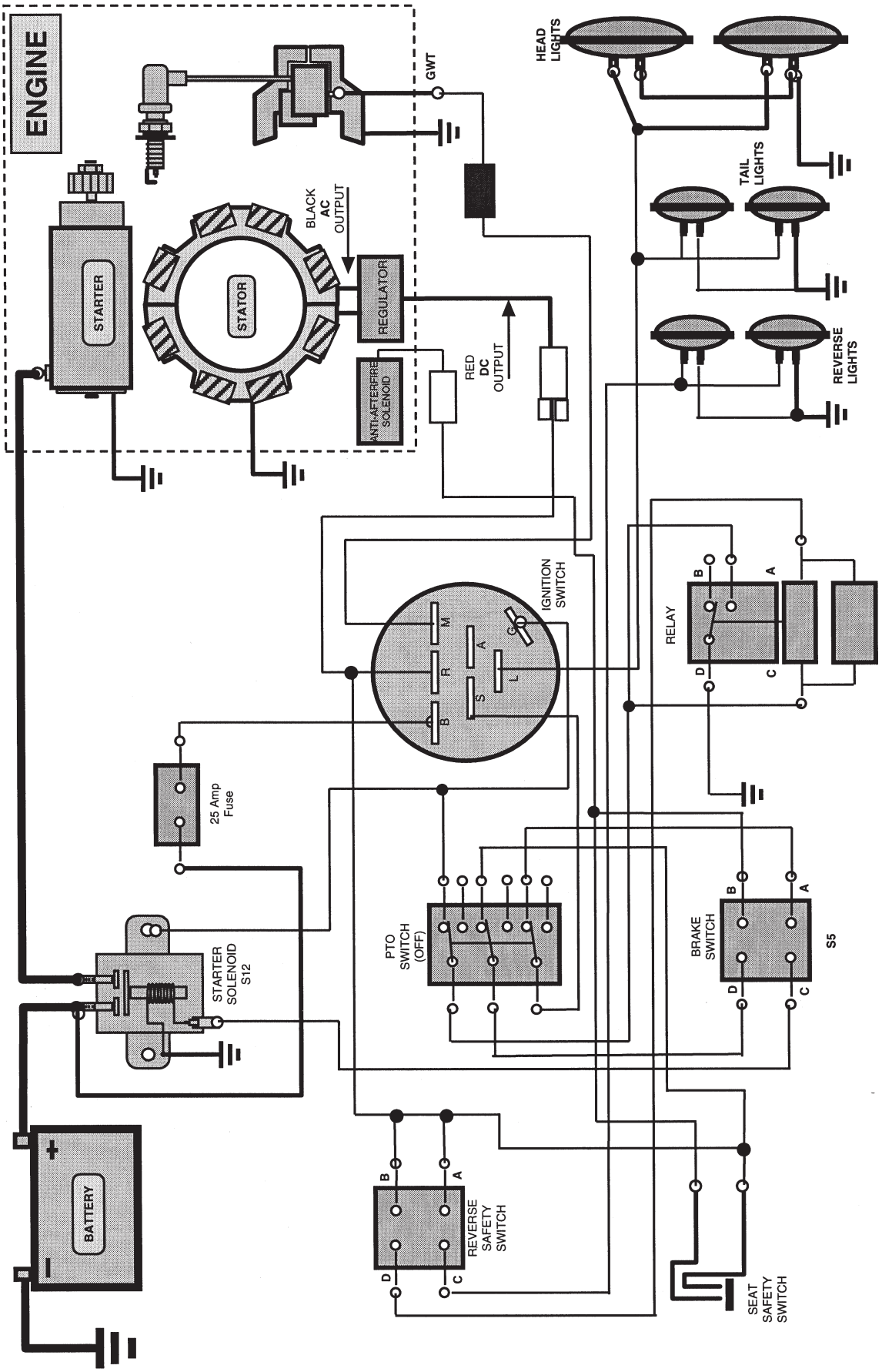


629-3057 Wiring Harness **3000 Series — B&S Engine**

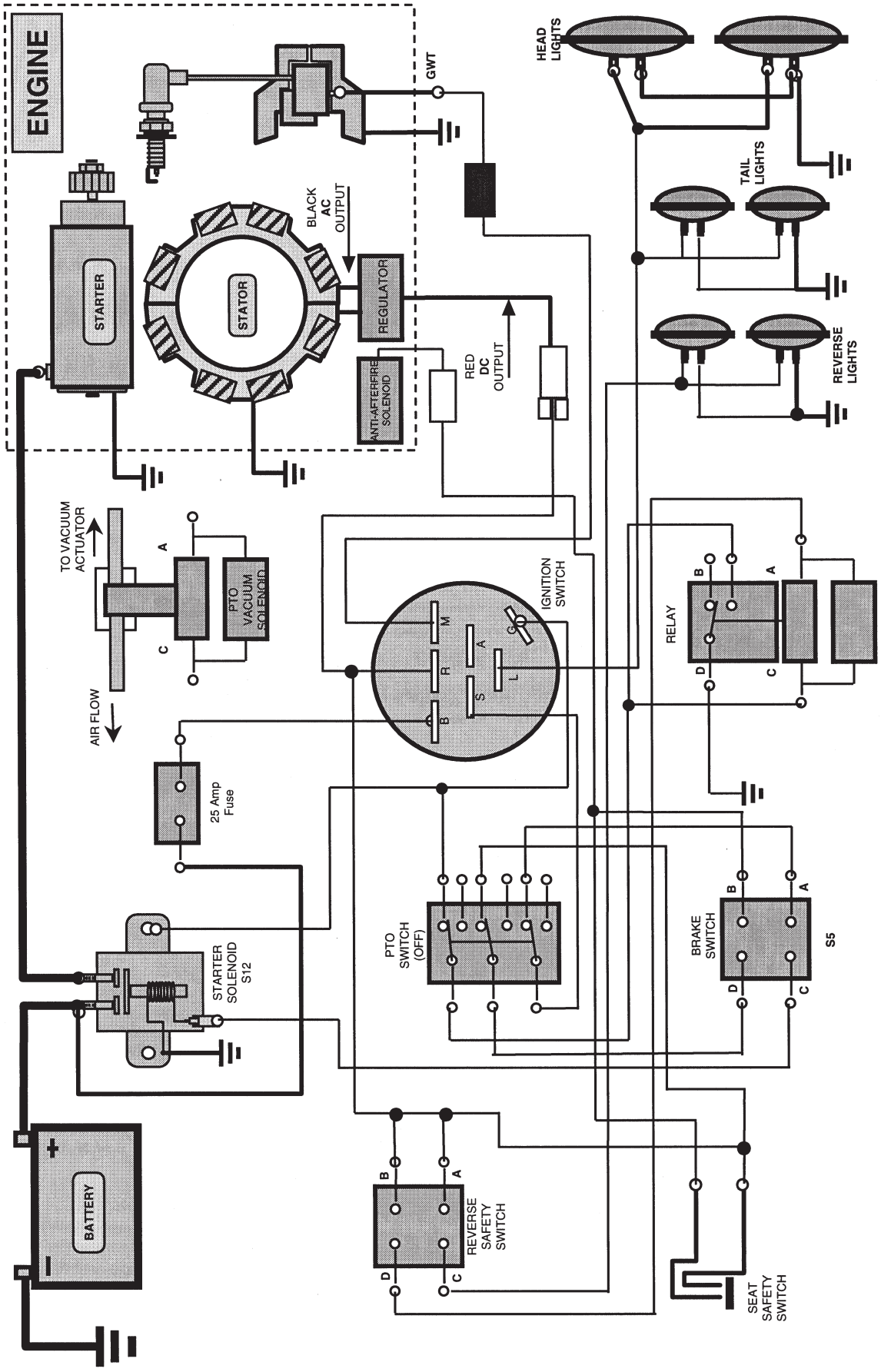


629-3057 Wiring Harness

3000 Series — B&S Engine

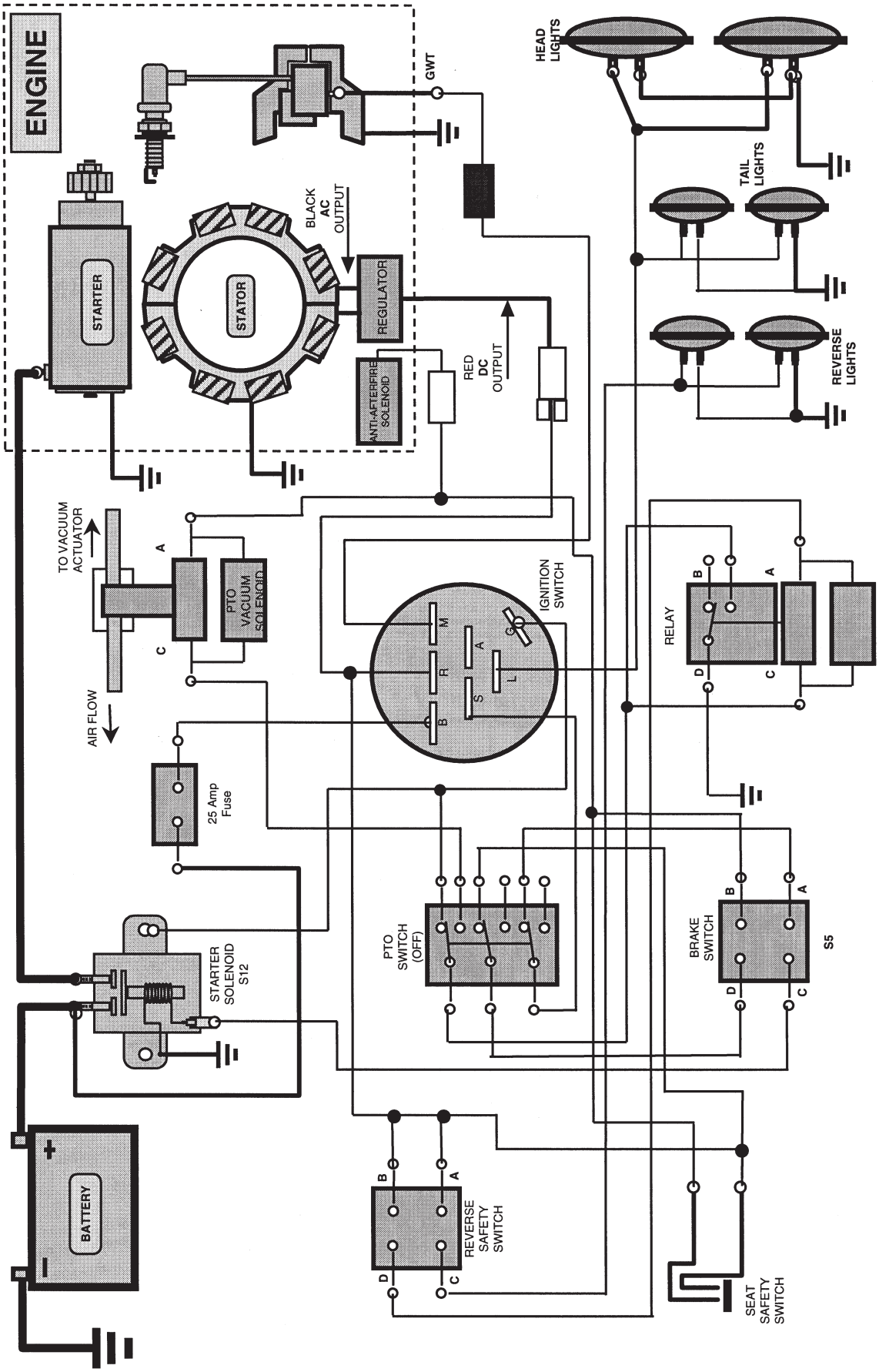


629-3057 Wiring Harness **3000 Series — B&S Engine**



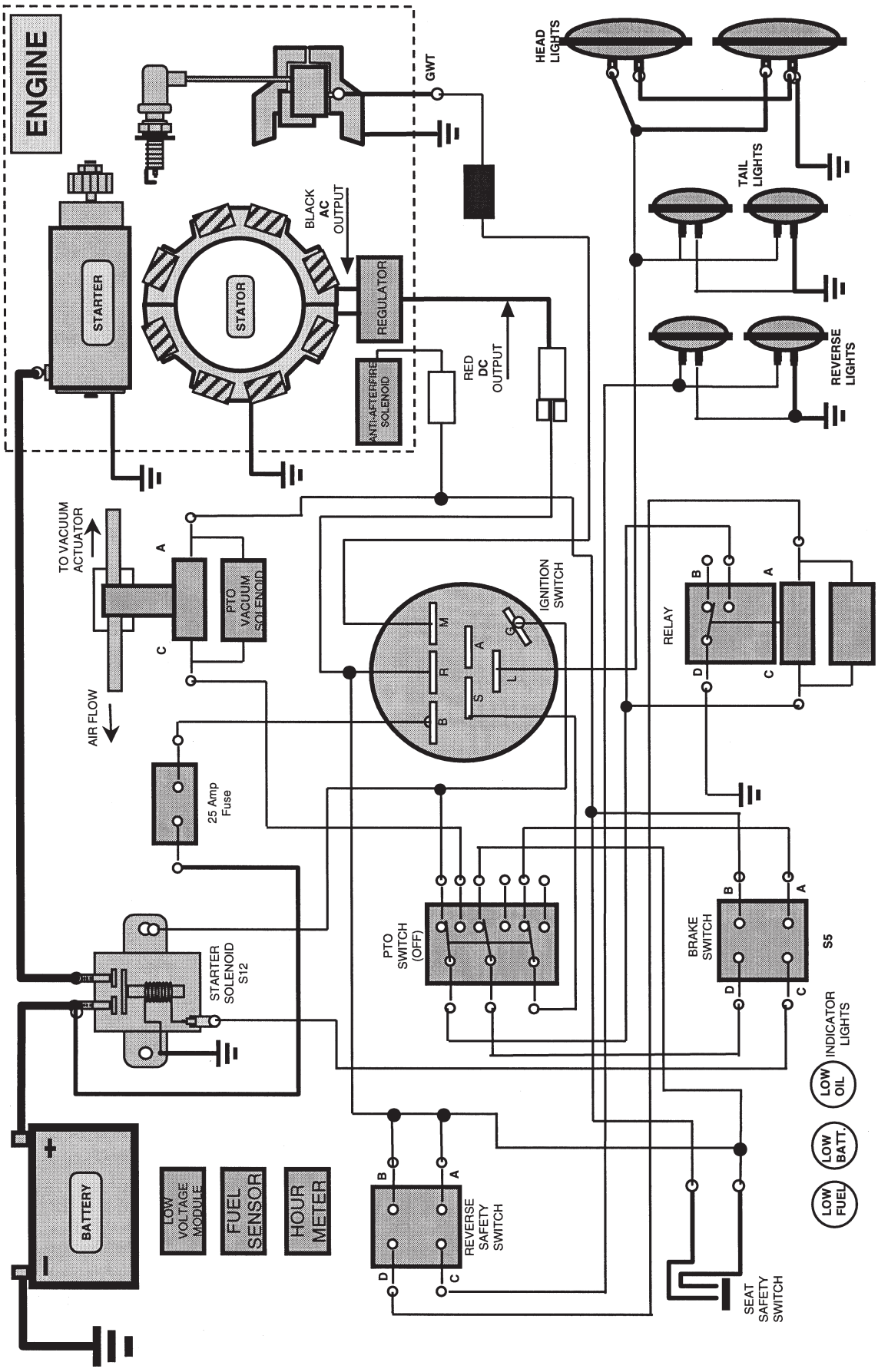
629-3057 Wiring Harness

3000 Series — B&S Engine

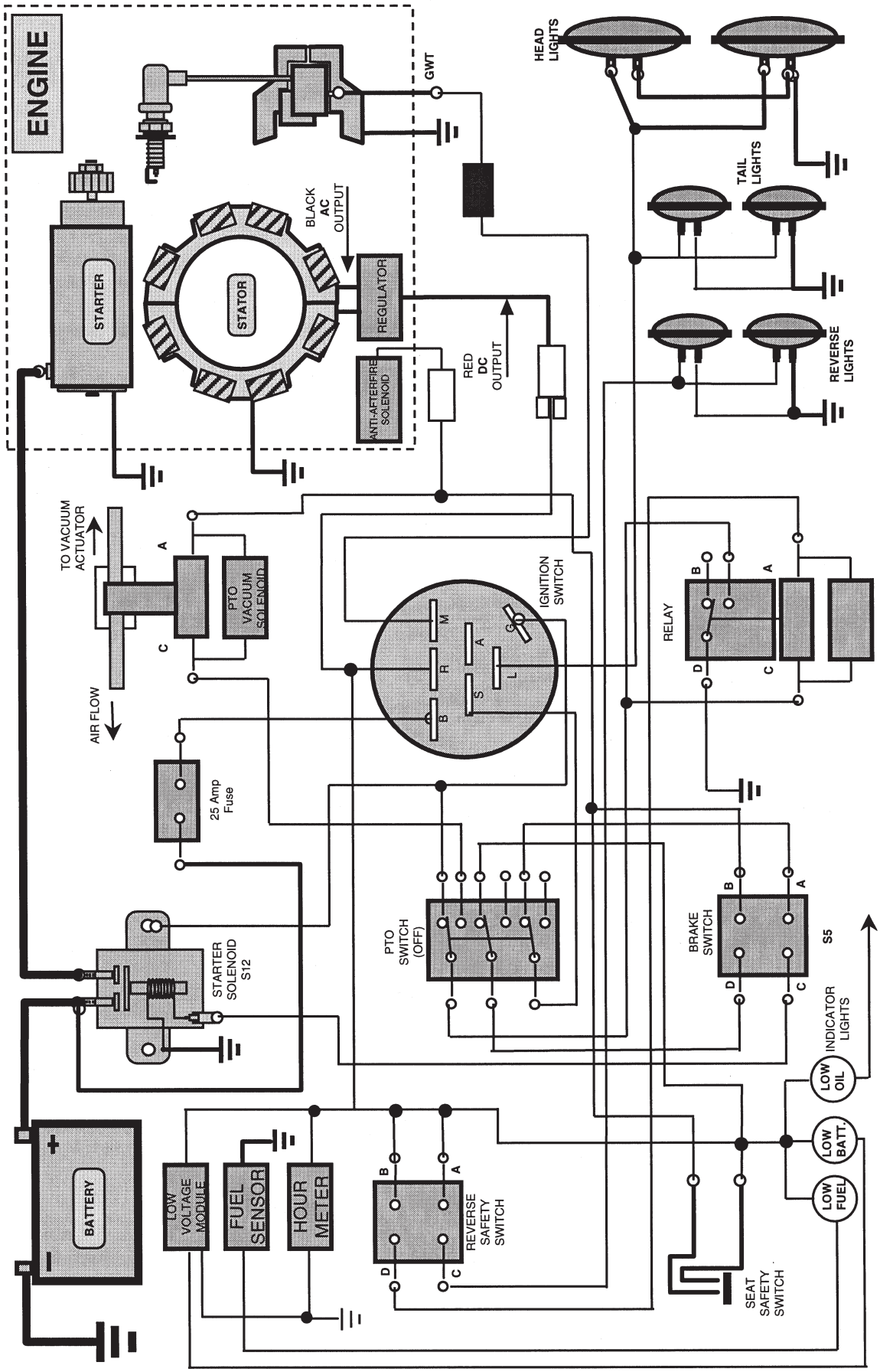


629-3057 Wiring Harness **3000 Series — B&S Engine**

Electrical



629-3057 Wiring Harness **3000 Series — B&S Engine**



629-3057 Wiring Harness **3000 Series — B&S Engine**

NOTES

The BDU-21L transmission offers an optional Implement (auxiliary) pump. The auxiliary circuit provides a rated flow of 1.5 gpm and 500 PSI operating pressure at a 3200 RPM pump speed.

Fluid from the charge pump flows first to the implement control valve, then to the charge relief valve and charge check valves in the center section. This requires an "open center" type control valve to allow fluid flow to return to the transmission. A check valve is included to allow oil to be drawn into the charge circuit should flow returning from the implement circuit be insufficient to charge the closed loop. A relief valve must be included in addition to the implement control valve.

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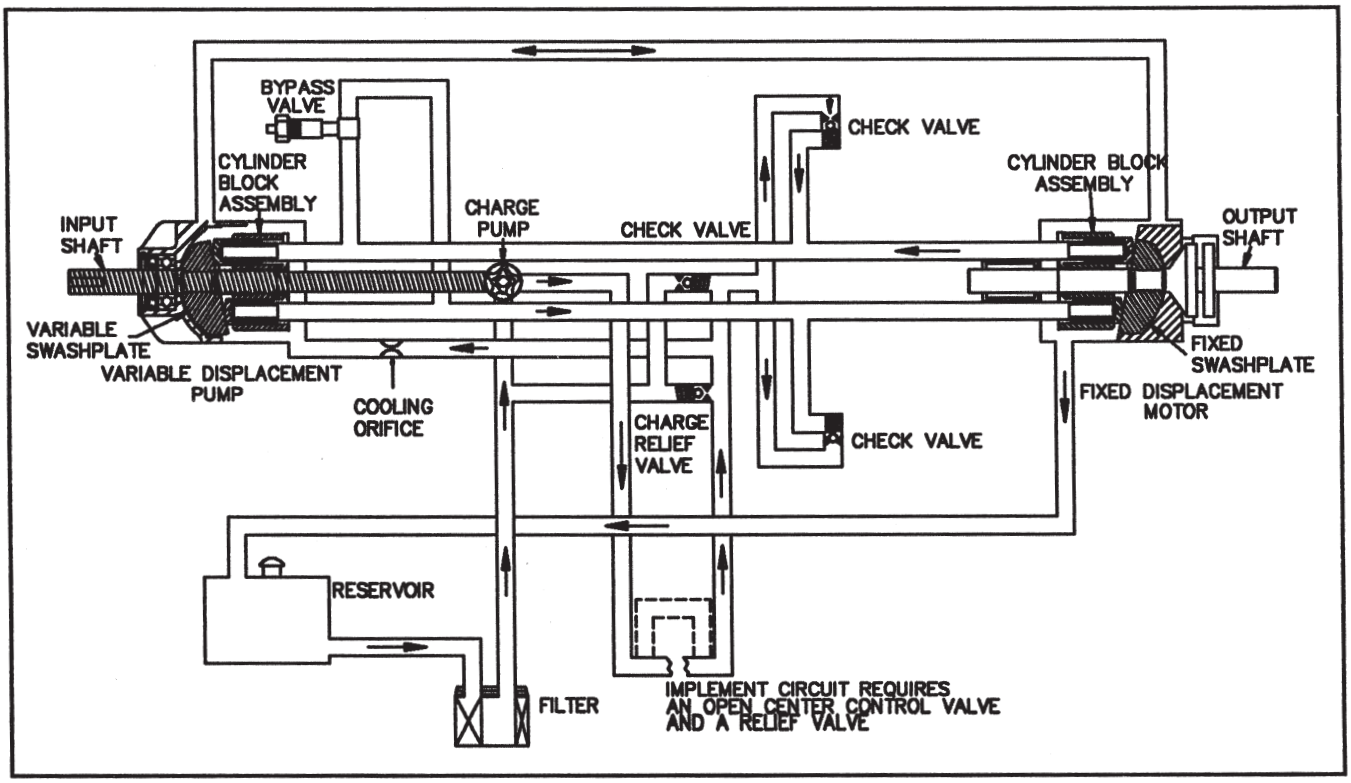
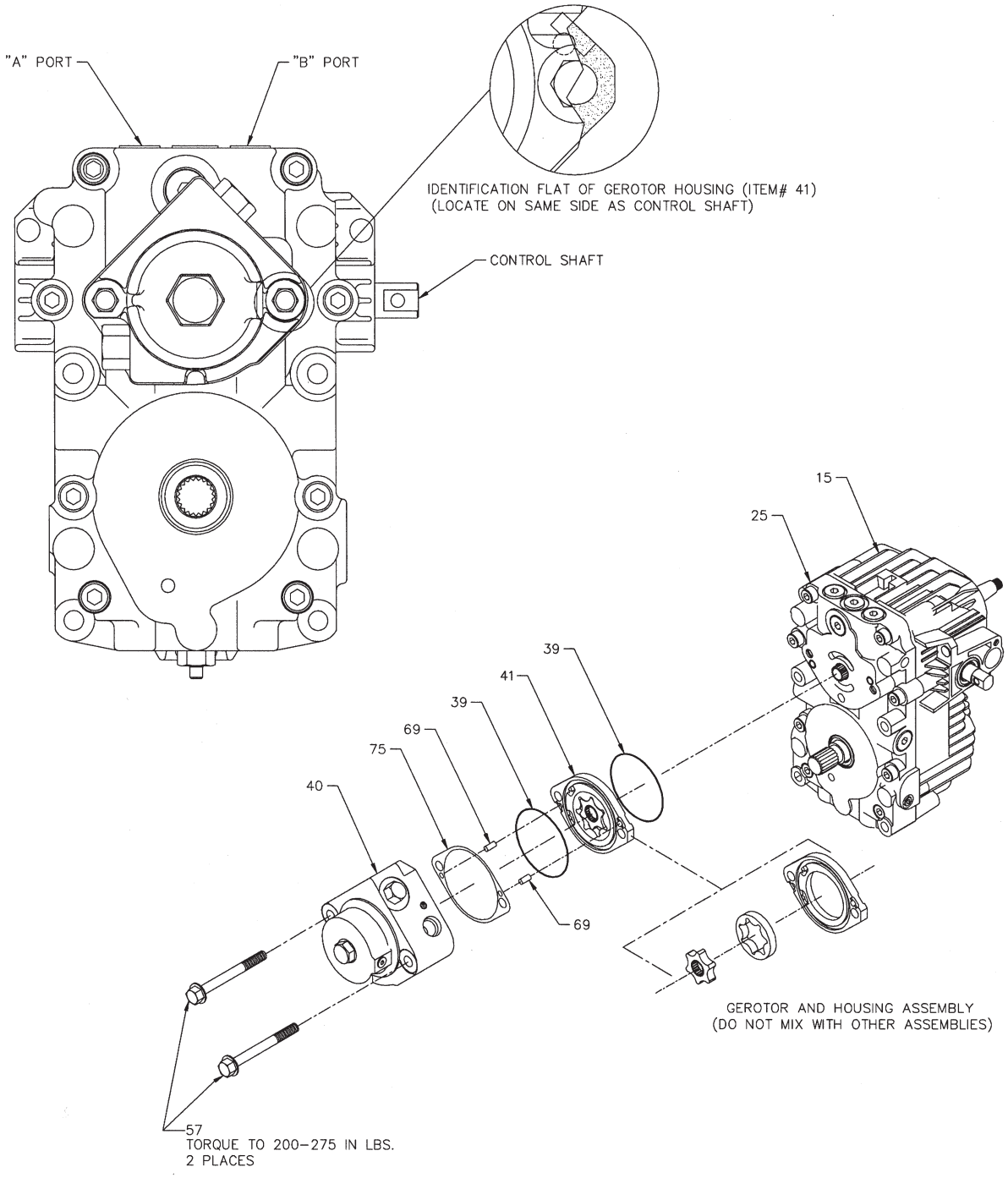
The BDU-21L offers an Easy Ride Valve option. The Easy Ride Valve acts like a high pressure spike suppressor in the system loop. The valve opens under high acceleration loads. The result is a dampening of the aggressiveness, without affecting the overall efficiency of the transmission.



BDU-21L/A Hydrostatic Flow Illustration

Cub Cadet 3000



FLUIDS

Fluids used in Cub Cadet 3000 Series tractors have been carefully selected. Only use Cub Cadet oil part no. 737-3055A for quarts or 737-3054A for gallons.

SAFETY PRECAUTIONS

Certain procedures may require the vehicle to be disabled (wheels raised off the ground, engine disconnected, etc.) in order to prevent possible injury to the technician and bystanders.

Some cleaning solvents are flammable. To avoid possible fire, do not use cleaning solvents in an area where a source of ignition may be present.

The loss of hydrostatic driveline power may result in the loss of hydrostatic braking capacity. Proper brake maintenance becomes very important should this condition develop.

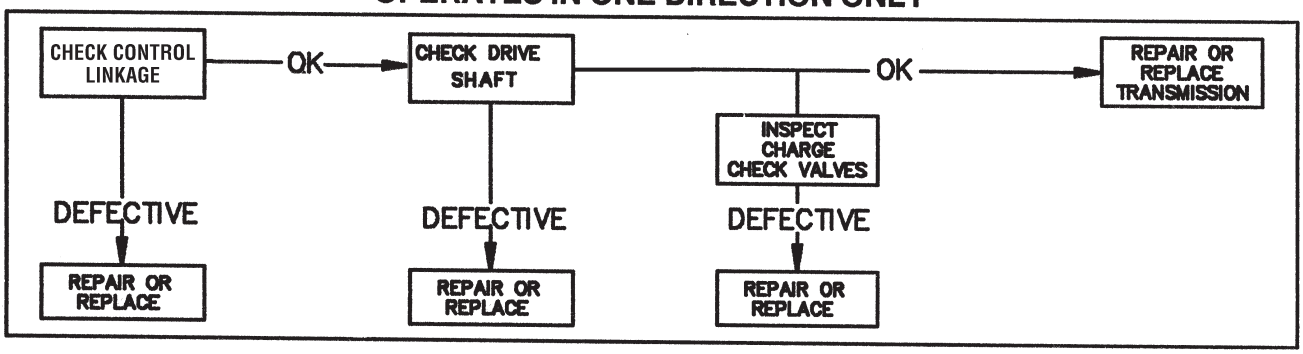
MAINTENANCE

Check the transmission cooling fan for broken or distorted blades, and check to see that the fan is securely fastened. Replace the fan if damaged.

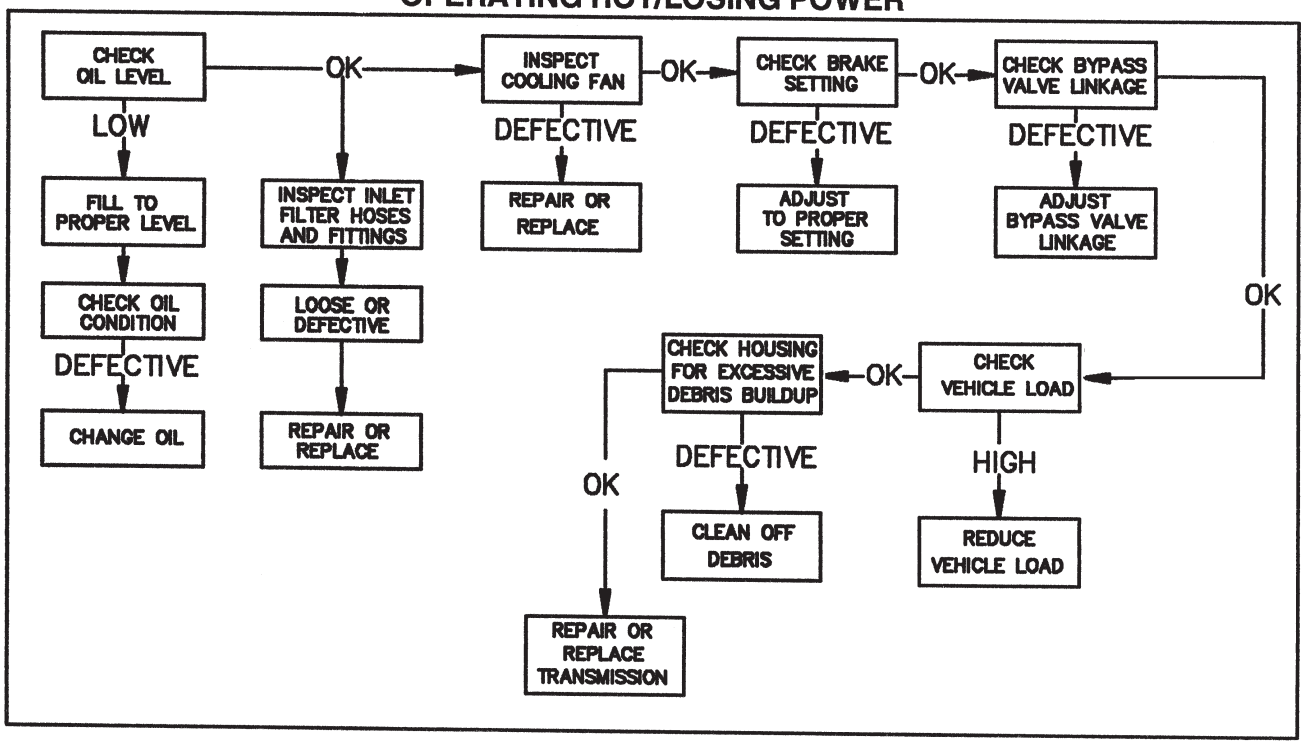
Keep the transmission clean. Grass clippings and dirt will influence the cooling efficiency of the fins on the transmission housings. Avoid high pressure fluid washes, compressed air is the preferred method of removing loose debris. Avoid the immediate area of the lip seals or damage may occur.

Inspect the transmission for leaks at the lip seals, damage to fittings, hoses, the filter, or to the housings. Check the oil level and add oil as necessary to bring it up to the proper level. Refer to vehicle owners manual.

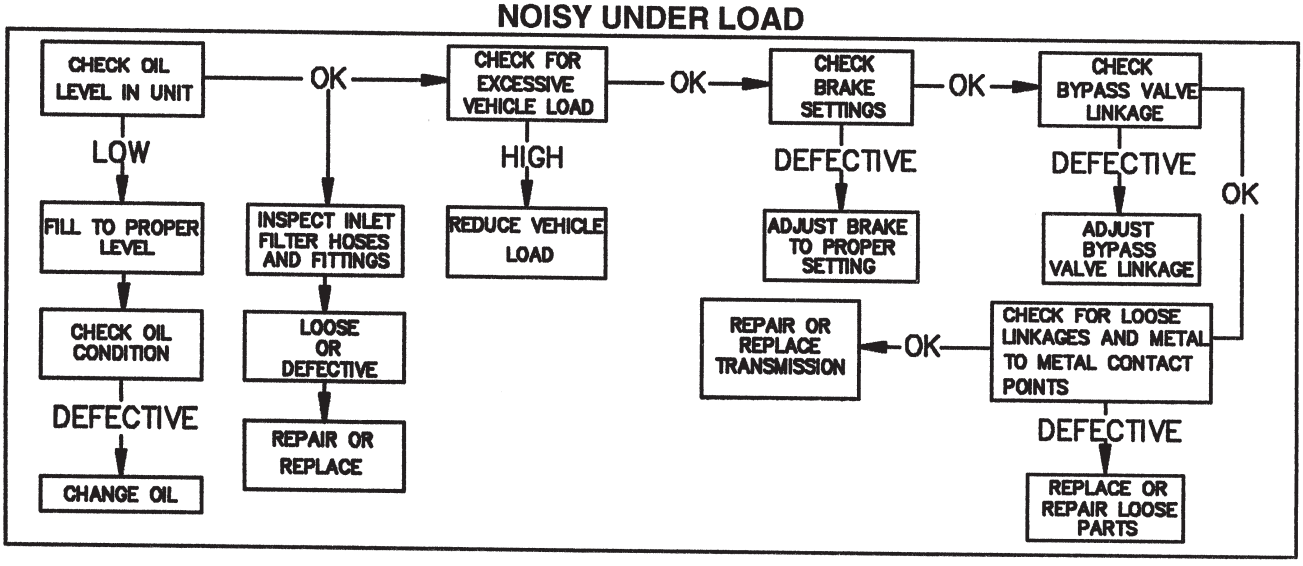
OPERATES IN ONE DIRECTION ONLY



OPERATING HOT/LOSING POWER



NOISY UNDER LOAD



WARNING!!!
THE VEHICLE SHOULD BE ON LEVEL GROUND AND
THE ENGINE DISABLED BEFORE PERFORMING ANY ADJUSTMENTS

SYMPTOM - OPERATES IN ONE DIRECTION ONLY

POSSIBLE CAUSE	CORRECTIVE ACTION
-Inspect control linkage	-Repair or replace
-Inspect check valves	-Repair or replace

SYMPTOM - NOISY

POSSIBLE CAUSE	CORRECTIVE ACTION
-Check oil level & condition	-Fill to proper level or change oil
-Check for excessive loading	-Reduce vehicle loading
-Check brake setting	-Adjust brake to proper setting
-Check for loose parts	-Repair or replace loose parts
-Check bypass valve operation	-Repair or replace valve or linkage
-Check inlet flow conditions	-Repair or remove obstruction or leaks
-Inspect check valves	-Repair or replace
-Inspect auxiliary circuit	-Repair or replace

SYMPTOM - LOW POWER

POSSIBLE CAUSE	CORRECTIVE ACTION
-Check engine RPM	-Adjust to correct setting
-Check oil level & condition	-Fill to proper level or change oil
-Check for excessive loading	-Reduce vehicle loading
-Check brake setting	-Adjust brake to proper setting
-Check for loose parts	-Repair or replace loose parts
-Check bypass valve operation	-Repair or replace valve or linkage
-Check inlet flow conditions	-Repair or remove obstruction or leaks
-Check operating temperature	-Repair or replace unit
-Inspect check valves	-Repair or replace
-Inspect auxiliary circuit	-Repair or replace

SYMPTOM - OPERATING HOT

POSSIBLE CAUSE	CORRECTIVE ACTION
-Check bypass valve operation	-Repair or replace
-Check for debris buildup	-Clean off debris
-Check oil level & condition	-Fill to proper level or change oil
-Check for excessive loading	-Reduce vehicle loading
-Check brake setting	-Adjust brake to proper setting
-Check cooling fan for damage	-Repair or replace
-Inspect check valves	-Repair or replace
-Inspect auxiliary circuit	-Repair or replace

MINOR REPAIR

GENERAL INFORMATION

Minor repairs may be performed, following the procedures in this section, without voiding the unit warranty.

Cleanliness is a primary means of assuring satisfactory life on either new or repaired units. Cleaning parts by using a clean solvent wash and air drying is usually adequate. As with any precision equipment, all parts must be kept free of foreign materials and chemicals.

Protect all exposed sealing surfaces and open cavities from damage and foreign material. The outer surfaces must be cleaned before beginning any repairs.

It is recommended that all O-rings and seals be replaced. Lightly lubricate all O-rings and seals with a clean petroleum jelly prior to assembly.

PLUG/FITTING TORQUES

If any plugs were removed during servicing, they should be torqued as indicated in the accompanying table:

TORQUE SPECIFICATIONS		
OPERATION	**TORQUE**	**PART DESCRIPTION**
Bypass Plug	84-120 in lbs	7/16-20 SAE Straight Thread
Check Plug(s)	180-240 in lbs	9/16-18 SAE Straight Thread
Easyride Plug	180-240 in lbs	9/16 SAE Straight Thread
Steel Plug/Fitting	96-120 in lbs	7/16 SAE Straight Thread
Steel Plug/Fitting	180-240 in lbs	9/16 SAE Straight Thread
Steel Plug/Fitting	180-240 in lbs	3/4 SAE Straight Thread
Steel Plug/Fitting	180-240 in lbs	7/8 SAE Straight Thread

SHAFT SEALS

Lip type seals are used on the input shaft, pump through shaft (not all models use the through shaft), motor output shaft and displacement control shaft. These seals can be replaced without major disassembly of the unit. However, replacement of the seals generally requires removal of the transmission from the machine.

To replace the pump input shaft seal, first remove the retaining ring from the housing.

Carefully pull the seal out of the housing bore. A "hook" type tool may be used to grasp the seal and pull it out, or a slide hammer type puller may be used to remove the seal. Care must be taken so as not to damage the housing bore, shaft sealing surface, or bearing. Once removed, the seal is not reusable.

Inspect the sealing area on the shaft for rust, wear, or contamination. Polish the sealing area on the shaft if necessary.

Wrap the spline or keyed end of the shaft with a thin plastic or cellophane to prevent damage to the seal lip during installation.

Lubricate the new seal with petroleum jelly and slide the seal over the shaft and press it into the housing bore. Be careful not to damage the seal.

Install the retaining ring in the housing.

The pump through shaft, motor output shaft and displacement control shaft may be replaced following a similar procedure as outlined for the pump input shaft seal. These seals are not held in position by a retaining ring.

CHARGE CHECK VALVES

Remove the check valve plug with a 1/4" internal hex wrench.

Remove the check valve spring and check ball (or poppet) from the center section.

CAUTION: Do not allow the check ball to fall into the closed loop passages in the center section. Removal may be difficult but can be accomplished with a magnet, or by removing the plug from the end of the center section. Do not allow contaminants to be introduced to the system.

Inspect the check balls (or poppets) and mating seats in the center section for damage or foreign material.

Position the transmission so that the check valve port will be in the upright position (as shown) and install the check ball (or poppet), spring and plug (with o-ring) into the center section. Make sure the plug stem is properly positioned into the poppet or damage and failure will occur. Be certain the check ball does not fall into the closed loop passage.

Torque the plug to 15-35 ft. lbs.

Turn the unit over and repeat the procedure for the other side.

BYPASS VALVE

Remove the bypass valve plug with a 9/16" hex wrench.

Remove the bypass valve plug, spool and spring from the transmission center section.

Inspect the valve spool and mating bore in the center section for damage or foreign material. The spool must move freely. It is recommended that the o-rings be replaced.

Retain the valve spring to the valve spool with petroleum jelly. Install the valve spool, spring and plug (with o-ring) into the center section. Torque the plug to 7-10 ft. lbs.

Depress the bypass valve several times to insure that it operates smoothly and fully closes. The bypass "button" should extend from the hex plug approximately 0.22" when fully released (closed).

CHARGE PUMP

ASSEMBLY PROCEDURES

For BDU-21L with implement circuit: Install the drive pin. Install a new o-ring on each side of the gerotor assembly and position the gerotor assembly onto the aligning pins in the same orientation as it was removed. Install the charge pump shim and the charge pump cover. Torque the bolts evenly to 18-25 ft. lbs.

MAJOR REPAIR

GENERAL INFORMATION

Major repairs described in the following sections are for the complete disassembly and reassembly (Major Repair) of the transmission and will void all product warranty, unless license to perform said major repairs was previously obtained from an authorized representative of Cub Cadet.

Cleanliness is a primary means of assuring satisfactory life on repaired units. Cleaning parts by using solvent wash and air drying is usually adequate. As with any precision equipment, all parts must be kept free of foreign materials and chemicals.

Protect all exposed sealing surfaces and open cavities from damage and foreign material. The outer surfaces should be cleaned before beginning any repairs.

It is recommended that all O-rings and seals be replaced. Lightly lubricate all O-rings and seals with a clean petroleum jelly prior to assembly.

It is recommended that parts requiring replacement be replaced with the complete assembly (kit) as shown in the service parts drawings.

Prior to performing major repairs on the BDU Hydrostatic Transmission, remove the transmission from its installed location and remove any external components such as a cooling fan and input pulley or frame mounting hardware.

NOTE: Thoroughly clean all exposed surfaces prior to any further disassembly.

Remove the oil lines (hoses and fittings) so that as much oil as possible can be drained from the housing.

DISASSEMBLY PROCEDURES

Prior to performing major repairs on the BDU remove the external components as described in the Minor Repairs section of this manual. These include the following:

Bypass Valve
Charge Check Valves
Charge Pump Assembly

Using a 6 mm internal hex wrench, remove the eight screws which retain the center section to the housing.

The internal springs of the pistons should separate the center section from the housing. Remove the center section from the housing.

CAUTION: The cylinder blocks may stick to the surface of the center section. Exercise caution to prevent damage to the components.

Remove the gasket and two aligning pins from the housing. The gasket will not be reusable.

For BDU remove the filter element, filter washer and spring from the housing.

Remove the pump cylinder block kit from the pump shaft. Inspect the splines on the shaft and in the pump block for damage or excessive wear. Check the pistons and block bores for excessive wear. The pistons should fit with very little side clearance in the block bores, but must slide freely.

Remove the pump cylinder block spring and thrust washer from the pump shaft.

Remove the motor cylinder block kit and shaft assembly from the housing. Check the pistons and block bores for excessive wear. The pistons should fit with very little side clearance in the block bores, but must slide freely. Inspect the splines for damage or unusual wear. Replacement of the complete assembly is recommended if damage or excessive wear is found.

Remove the motor thrust bearing assembly from the housing.

Remove the swashplate assembly and cradle bearings from the housing.

NOTE: The cradle bearings in newer BDU-21L transmissions are not removable from the housing. If damage is present, a new housing kit is necessary.

Inspect the cradle bearing's low friction coating for wear. Inspect the swashplate and thrust bearing for any unusual wear or damage. If damage to the swashplate or cradle bearings is found then inspect the housing for possible damage. Replace complete assemblies as necessary.

Remove the slot guide block from the displacement control shaft.

Remove the input shaft lip seal retaining ring.

Pull the lip seal out of the housing bore. A hook type tool may be used to pry the seal out. Care must be taken to avoid damage to the housing bore, shaft sealing surface or bearing. Once removed, the seal is not reusable.

Remove the bearing spacer washer.

Remove the pump shaft assembly from the housing.

Inspect the splines on the shaft for damage or unusual wear.

Inspect the bearing. Replacement of the assembly is recommended if any damage or excessive wear is found.

Remove the displacement control shaft from the housing.

Remove the displacement control shaft lip seal from the housing. Care must be taken to avoid damage to the housing bore. Inspect the housing for damage.

DISASSEMBLY PROCEDURES

Inspect the control shaft journal bearing for excessive wear. The BDU 21 control shaft journal bearing should be 0.5904 to 0.5908.

Inspect the BDU-21 motor shaft needle bearing for damage.

If excessive wear or damage is found, replace the complete housing assembly.

Inspect the center section for damage to the cylinder block running surface.

Inspect the needle bearing for damage. If any damage or excessive wear is found, replace the complete center section assembly.

RECONDITIONING AND REPLACEMENT OF PARTS

After disassembly, all parts should be thoroughly cleaned in a suitable solvent.

Inspect all parts for damage, nicks or unusual wear patterns. Replace all parts having unusual, excessive wear or discoloration.

Inspect the sealing surfaces, bearing surfaces, and shaft splines. Polish the sealing areas on the shafts if necessary. Replace any worn or damaged parts.

The running surfaces of the cylinder blocks MUST be flat and free from scratches. If scratches or wear are found on the running surface of the cylinder block or center section, polish or replace the parts. When polishing these surfaces, up to 0.0004 in. may be removed. If this is not sufficient to obtain a flat surface free of scratches, the part should be replaced.

ASSEMBLY PROCEDURES

Clean and lightly oil parts prior to assembly of the BDU transmission.

Be sure to torque all threaded parts to the recommended torque levels.

Replace all o-rings, gaskets and shaft seals.

CAUTION: Most parts have critical high tolerance surfaces. Care must be exercised to prevent damage to these surfaces during assembly. Protect exposed surfaces, openings, and ports from damage or foreign material.

Install the displacement control shaft.

Install the pump shaft assembly into the housing.

Install the bearing spacer washer.

Install the lip seal and retaining ring as described in the minor repair section.

Install the slot guide block onto the displacement control shaft.

Install the swashplate into the housing. The slot on the swashplate must engage the slot guide block on the displacement control shaft. Use a tool such as a screwdriver or scribe to hold the guide block in position while installing the swashplate.

Hold the swashplate in position and measure the end play of the displacement control shaft using a dial indicator or a depth gauge. Using a suitable sleeve, press the control shaft bearing into the housing until the control shaft end play is between 0.020" and 0.060".

Install the thrust washer and pump cylinder block spring onto the pump shaft.

Install the springs piston washers and pistons into the cylinder block. The pistons must move freely in their bores.

ASSEMBLY PROCEDURES

NOTE: To simplify the installation of both the motor block and the pump block kits, wrap a rubber band snugly around the pistons. This is intended to hold the pistons in their bores as the block kits are handled during installation.

With the swashplate in the “neutral” (0 angle) position and the transmission housing laying on its side, install the pump cylinder block kit onto the pump shaft in the housing.

Install the motor thrust bearing into the housing.

NOTE: It will be necessary to have a DRY journal bearing to prevent a hydraulic lock while installing the motor shaft.

Install the motor shaft/cylinder block kit. Use caution to prevent damage to the journal bearing while guiding the shaft into position. Once installed, it will be necessary to hold the assembly in position until the center section has been installed.

Install the two aligning pins, and install a new gasket onto the housing.

Lubricate the running surfaces of the cylinder blocks and the center section.

Position the housing with the housing opening UP, and install the center section onto the housing while holding the motor shaft in position in the housing journal bearing.

CAUTION: Make sure all parts are properly aligned. Do not use excessive force.

Install the eight bolts and torque evenly to 18-21 ft. lbs.

Rotate the shafts a minimum of two turns to assure correct assembly. When properly assembled the shafts should require minimal torque to turn. (Approximate 15 in. lbs. - maximum)

Refer to the Minor Repairs section in this manual to complete reassembly of the BDU transmission.

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