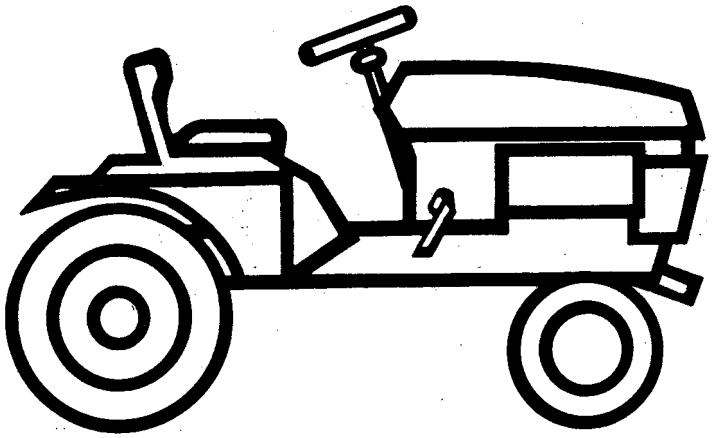
Ariens 931 Series

GT Hydrostatic Garden Tractor

⚠ SAFETY MESSAGE ⚠

The product for which you have requested information or replacement parts is not a current product. The replacement models incorporate product designs, safety features, safety instructions or warnings which represent the latest "State Of The Art" developments. For your safety and those around you please contact your nearest Ariens/Gravely Dealer for a demonstration of the current product safety provisions and features.

Repair Manual



Ariens Service

Models

Model 931004 (12 HP)
Model 931005 (14 HP)
Model 931006 (16 HP)
Model 931007 (12 HP)
Model 931008 (12 HP)
Model 931009 (14 HP)
Model 931010 (16 HP)
Model 931011 (10 HP)
Model 931012 (14 HP)
Model 931013 (14 HP)
Model 931014 (10 HP)
Model 931015 (18 HP)
Model 931016 (12 HP)
Model 931017 (14 HP)
Model 931018 (16 HP)
Model 931019 (17 HP)
Model 931020 (14 HP)
Model 931021 (14 HP)
Model 931022 (14 HP)
Model 931023 (16 HP)
Model 931024 (18 HP)
Model 931025 (12 HP)
Model 931026 (19 HP)
Model 931029 (19 HP)
Model 931030 (18 HP)
Model 931033 (18 HP)
Model 931034 (20 HP)

Attachments

Model 831006
34" Rotary Tiller

Model 831011
42" Rotary Mower

Model 831012
48" Rotary Mower

Model 831018
Vac Trailer

Model 831019
Vac Bagger

Model 831025
48" Sno-Thro

Model 831026
60" Rotary Mower

Model 831027
48" Rotary Tiller

Model 831028
48" Rotary Mower

Model 831029
42" Rotary Mower

Model 831031
48" Rotary Mower

Model 831032
48" Sno-Thro

Model 831038
42" Rotary Mower

Model 831039
42" Rotary Tiller

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Section

RM-931
Part No. 000127A
Repair Manual
Printed in U.S.A. 7/90

A Message To Ariens Repair Manual User

Your Ariens Dealer will be happy to supply any service or advice which may be required to keep your Ariens equipment operating at peak efficiency. He stocks genuine Ariens parts and lubricants; manufactured with the same precision and skill as the original equipment. His factory trained staff is kept well informed on the best methods of servicing Ariens equipment and is ready and able to serve you. If engine or service are required, they can be obtained from an Ariens dealer or from an authorized engine manufacturer's service center. If service is required, be prepared to supply the service person with the Model and Serial Numbers of the equipment and engine, as well as a full description of the problem encountered.

The information contained herein is intended for use by Ariens Dealers' trained servicemen and serves as a supplement to and reminder of training sessions conducted by Ariens Company. Before you attempt any repair, adjustment or maintenance project be certain that you have read and fully understand the instructions in your Owner's Manual. Understand and follow each Danger, Warning, Caution and all instructions exactly as given. Also be sure that you have Parts Manuals, all tools, replacement parts and other materials required to complete the project.

IMPORTANT: All fitting, measurements, torque recommendations and instructions are significant and approximations or substitutions must be avoided, improper repair, maintenance and/or adjustments or service attempted by anyone other than an authorized Ariens Service Dealer could void future warranty claims, and damage unit and/or result in injury to operator and/or bystanders.

Introduction

How To Use Your Service Manual

This Ariens Service manual is arranged for quick, easy reference and is divided into numbered sections. Each section is then divided into sub-sections. To use this manual proceed as follows:

Refer to the Index to determine section within which desired information will be contained and proceed to front of that section for its Table of Contents.

Locate subject desired. Page number is listed across from subject and consists of section number and page number.

NOTE: Read all information for servicing a part or system before repair work is started to avoid needless disassembly.

Preparation For Service

Proper preparation is very important for efficient service work. A clean work area at the start of each job will allow you to perform the repair as easily and quickly as possible, and reduce incidences of misplaced tools and parts. A tractor that is excessively dirty should be cleaned before work starts. Cleaning will occasionally uncover trouble sources. Tools, instruments and parts needed for the job should be gathered before work is started. Interrupting a job to locate tools or parts is a needless delay. Special tools required for a job are listed at the end of this Introduction.

Service Bulletins

In addition to the information contained in this Ariens Service Manual, Ariens Service Bulletins are issued to Ariens Dealers from time to time, which cover interim engineering changes and supplementary information. Service Bulletins should be consulted to complete information on models covered by this manual.

Replacement Parts

When replacement parts are required, use only genuine Ariens parts. Failure to do so may result in product malfunction and possible injury to operator and/or bystander.

NOTE: All references to "Left", "Right", "Front" and "Back" are given from operators position.

NOTE: The descriptions and specifications contained in this manual were in effect at the time the manual was approved for printing. Ariens company reserves the right to discontinue models without notice and without incurring obligation. The equipment identified as either standard or optional and the various illustrations may not all be applicable to your unit. If you have questions, always check with your Ariens dealer.

Safety Alert Symbol And Notations

The following safety notations are used throughout this manual to call attention to special information or operating procedures. Understand the message in each notation and be alert to unsafe conditions and the possibility of personal injury.

NOTE: A **NOTE** points out general reference information regarding proper operation and maintenance practices.

IMPORTANT: An **IMPORTANT** statement indicates specific procedures or information that is required to prevent damage to the machine or its attachments.

This safety alert symbol is used to attract your attention! PERSONAL SAFETY IS INVOLVED! When you see this symbol - BECOME ALERT – HEED ITS MESSAGE.

CAUTION: A CAUTION identifies safe operating practices or indicates unsafe conditions that could result in personal injury.

WARNING: A WARNING describes a condition where failure to follow the instructions could result in severe personal injury.

DANGER: A DANGER designates a condition where failure to follow instructions or heed warning will most likely result in serious injury or death.

Safety Precautions

Before test operating or making repairs of adjustments to the unit, read and understand the operating and safety instructions in the Owner's Manual.

Disengage power to attachment, place Speed Selector in PARK/START, set Parking Brake Lock, stop engine, remove key and wait for moving parts to stop before performing any repair or maintenance adjustment procedures. DO NOT make any adjustment or perform any maintenance or repair procedures while engine is running unless specifically instructed to do so in this manual.

DO NOT touch tractor or attachment parts which might be hot from operation. Before attempting to maintain, adjust or service allow such parts to cool.

Open doors if engine is run in garage, exhaust fumes are dangerous. DO NOT run engine in an enclosed area.

Do repair work in a well-lighted, ventilated area.

To prevent accidental starting, disconnect wire to spark plug(s) and position wire away from plug.

Always wear safety goggles when cleaning or making repairs to parts or machine.

Gasoline is highly flammable and its vapors are explosive. Handle with care. Use an approved fuel container. DO NOT smoke or allow open flame (match, pilot light, etc.) or sparks near equipment or fuel container when refueling or servicing fuel system.

Use non-flammable solvent to clean parts - DO NOT use gasoline.

Use only Ariens original replacement parts when making repairs.

After all repair procedures are performed, make sure that unit is in good operating condition and all safety devices and shields are in place and in good working condition. Be sure all fasteners are tight, all adjustments are correct and all tools are removed.

DO NOT change engine governor setting or over speed engine.

Never store equipment with fuel in tank inside a building where fuel fumes may reach an open flame or spark. Allow engine to cool before storing in any enclosure.

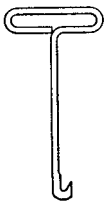
Special Tools

It is assumed that Authorized Ariens Dealers have all common tools needed to repair Ariens equipment.

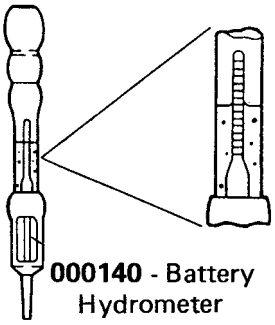
Specialized tools in addition to common tools required to analyze, repair and restore equipment are listed below.

NOTE: Product brand names given in some instances are for reference, any tool or test instrument of equivalent accuracy is acceptable.

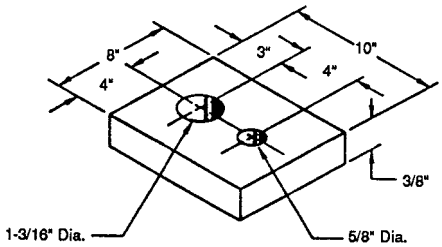
Name	Part No.	Use
Telescopic Gauges	Starret S579H	Measure pinion depth.
Dial Indicator	Starret	Measure ring gear backlash.
0 to 4-inch Micrometers	Starret 230RL Starret 2RL Starret 436 XRL	Checking thickness of shims.
Sliding Hammer Puller	Owatonna Tool Co. Snap-On Tool Co.	Pulling bearings from housing.
Retaining Ring Pliers	Tru-Arc No. 2	Removing snap ring from pinion shaft.
Seal Aligning Sleeve	Service Tools Inc. 1901 Indiana Avenue Chicago, Illinois 60616	Centering axle seals.
Pinion Depth Tool	Service Tools, Inc. 1901 Indiana Avenue Chicago, Illinois 60616	Measuring shim pack required for pinion drive gear.
Hub and Drum Puller	OTC 967	Pulling brake drum and hub.
Hydro Gauge	Ariens Co. Part No. 000115	Taking hydro readings on Sunstrand transmissions.
Spring Tool	Ariens Co. Part No. 000246	Used for removal or installation of pro spring.
Battery Hydrometer	Ariens Part No. 000140	Used for battery testing.
Seal Starter	Ariens Part No. 000091	Used to start rear seal on Sundstrand transmission.
Seal Driver	Ariens Part No. 000092	Used to install rear seal in Sundstrand transmission.



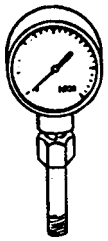
000246 - Spring Tool. For most Ariens Springs.



000140 - Battery Hydrometer



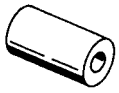
Sundstrand Transmission Repair Stand. Use a wood fixture as shown above to facilitate transmission disassembly and assembly.



000115 - Hydro Gauge 0-1500 PSI

Ariens Part Numbers shown

000091 - Seal Starter. Rear Seal of Sundstrand Transmission.



000092 - Seal Driver. Rear Seal of Sundstrand Transmission.

Specifications

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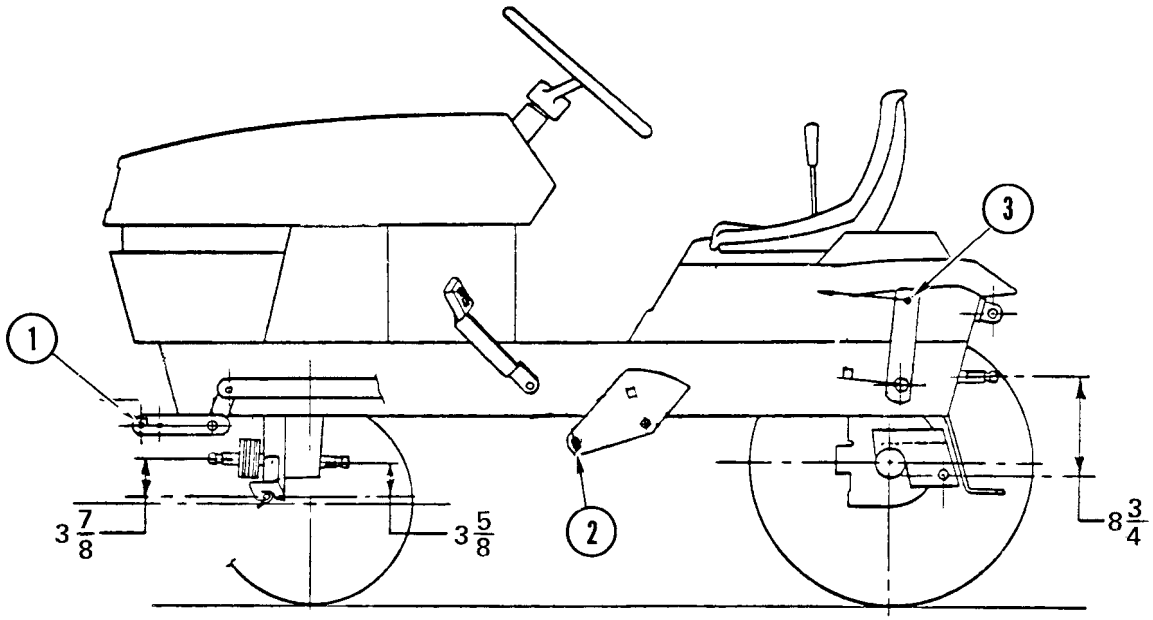
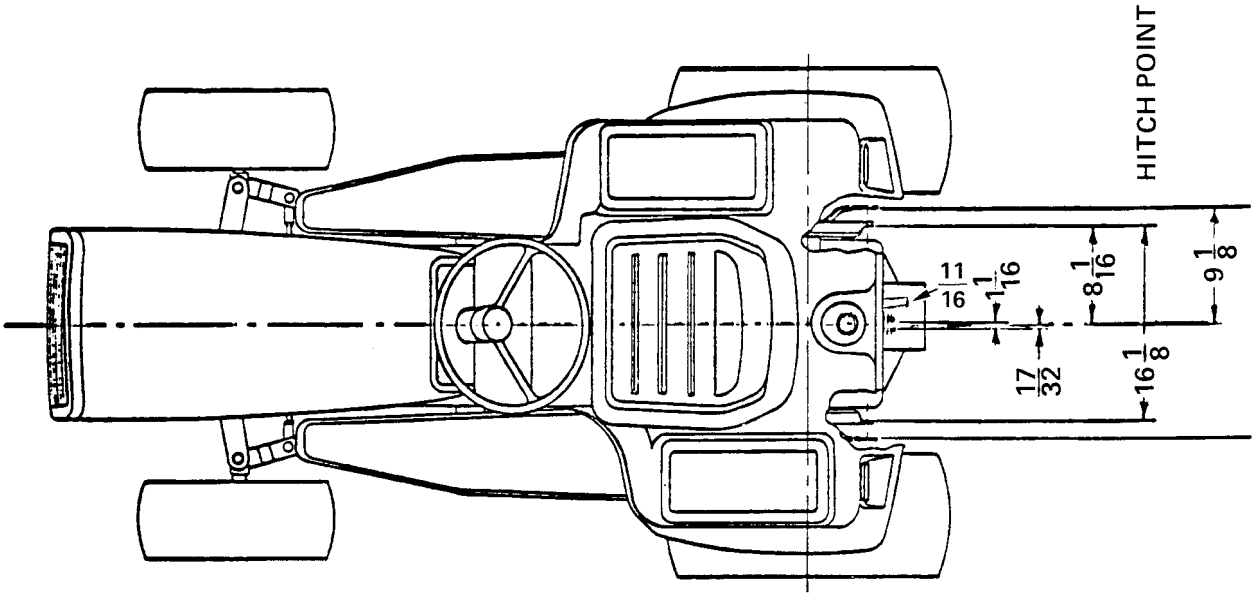


LIFT FORCE

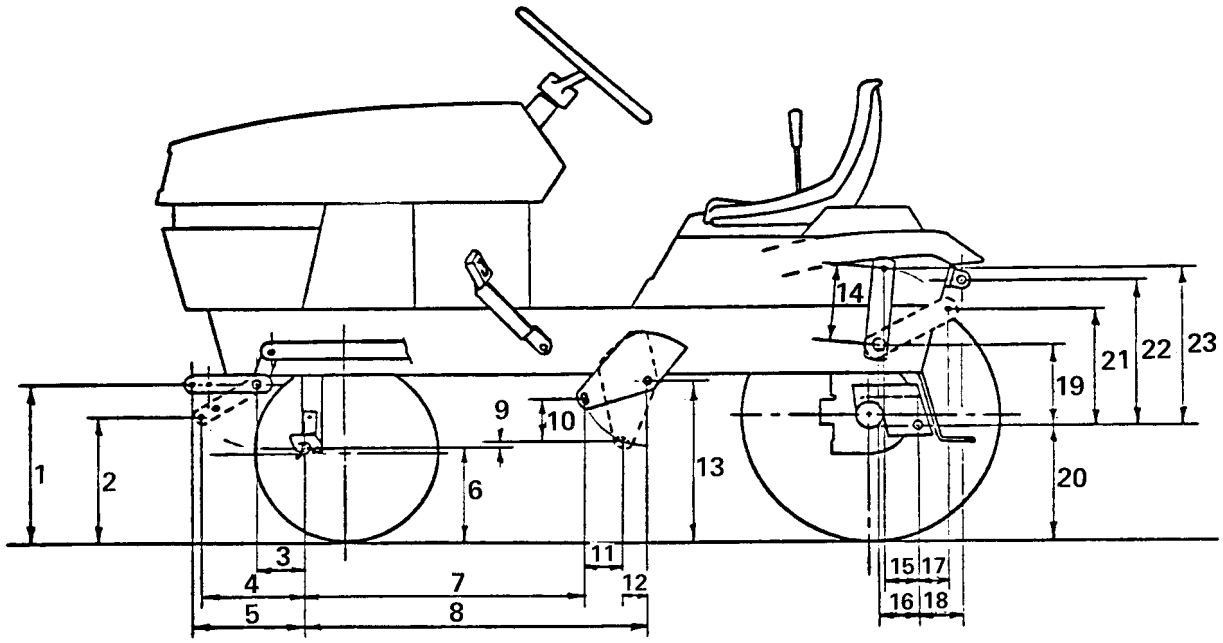
1. **Lift Force at Front Arm: 350 lbs.**
2. **Lift Force at Center Arm: 400 lbs.**
3. **Lift Force at Rear Arm: 335 lbs.**

The information contained herein is general in nature and is not intended for specific application purposes. Ariens reserves the right to make changes in specifications shown herein or discontinue manufacture at any time without notice or obligation.

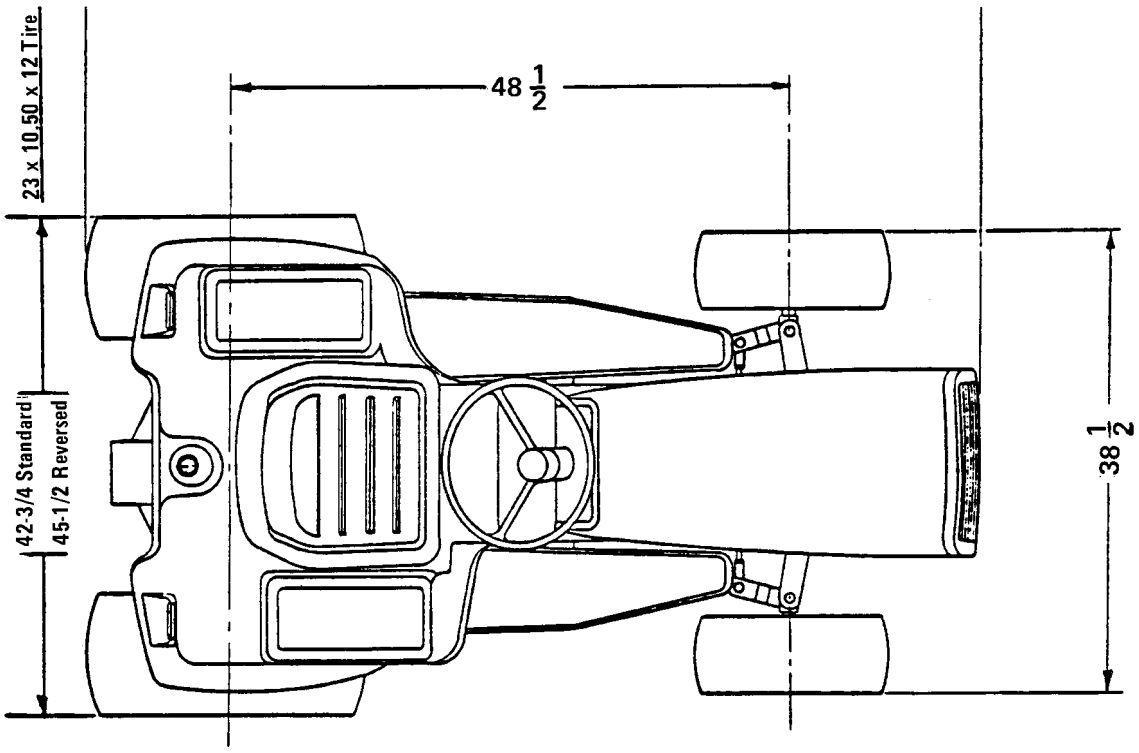
Specifications

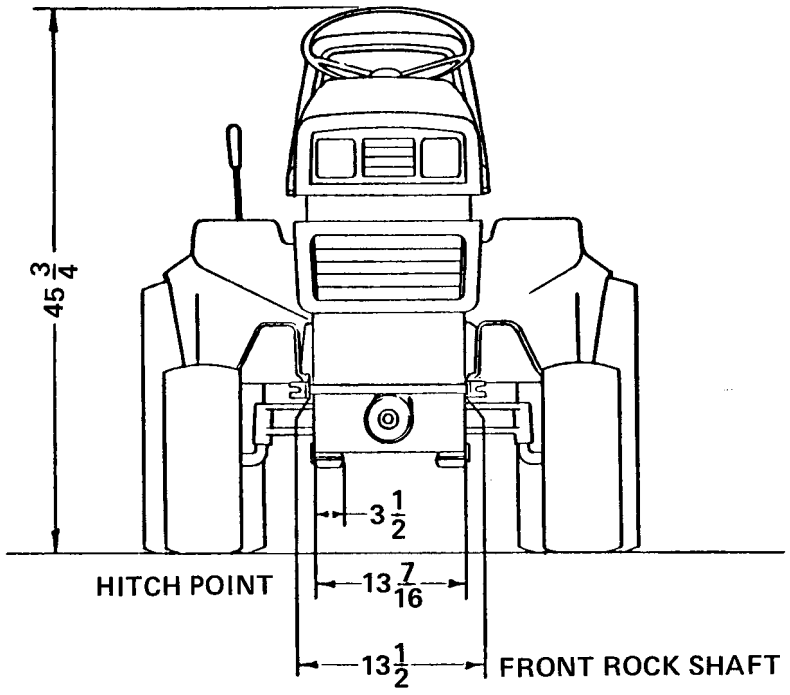


1 = 14 1/2	5 = 9 5/8	9 = 1 5/8	13 = 14 1/16	17 = 1 9/16	21 = 10 13/16
2 = 11 5/8	6 = 7 7/8	10 = 3 1/4	14 = 7	18 = 2 1/2	22 = 12 7/8
3 = 4	7 = 29 5/8	11 = 2 1/4	15 = 4 1/2	19 = 7 1/2	23 = 14 3/8
4 = 8 3/4	8 = 35 1/8	12 = 3 1/4	16 = 4 5/8	20 = 9 7/8	



Specifications





Specifications

Model	931004 12 HP	931005 14 HP	931006 16 HP	931007 12 HP
Length	74¾"			
Height	47¾"			
Width	43"			
Wheel Base	48"			
Shipping Weight	895 lbs.			
Battery	12V Neg. Ground, 39 Amp Hrs. at 20 Hr. Rating, Cold Crank Amps 255 Min.			
Hour Meter	Optional			
Brakes	Drum Brakes			
Steering	Gear			
Turning Radius	31" (78.7 cm)			
Tire Turf Size Front Rear	16-6.50x8 23-10.50x12			16-6.50x8 23-8.50x10
Engine	Single Gas			
Manufacturer	Kohler			
Fuel	Unleaded			
Displacement	29.07 CI	31.27 CI	35.90 CI	29.07 CI
Idle R.P.M.	1800			
Governed R.P.M.	3250			
Bore	2"			
Stroke	4"			
Compression Ratio	6.6:1	7.0:1	7.3:1	6.6:1
Crank Case Capacity	2 Qts.			
Air Cleaner	Dry Element, Foam Precleaner			
Fuel Consumption Gal./Hr. @ 3250 RPM	1	1.35	1.50	1
Charging Capacity	Regulated 15 Amp Flywheel Alt.			
Fuel Tank Capacity	4.5			
Fuel Filter	120 Micron, 2½ GPA Capacity			
Engine Oil Type	Above 32°F - SAE 30, Below 32°F - SAE 10W30			
Spark Plug Gap	.025			
Gear Ration Engine to Rear Wheels	Infinite 30:1			
Transmission	Hydrostatic			
Speed - Forward Max. Reverse Max.	7 MPH 3.5 MPH			
Transmission Oil & Capacity	SAE 5W30 5.5 Qts.			
Drive Clutch	Neutralizing Hyd. Trans.			
Gross Weight Capacity	Front 830 lbs., Rear 1780 lbs.			
Axle Capacity	Front 425 lbs., Rear 395 lbs.			
Allowable Added Weight	Front 405 lbs., Rear 1385 lbs.			
Rear Axle Maximum Load	1800 lbs.			
Tire Pressure With Loads Light Medium Heavy	 8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 12 PSIF - 10 PSIR			
Differential Type	Dana GT120 Automotive Type Ring and Pinion			
Lift System	Hydraulic Four Function			
Capacity Front Center Rear	350 lbs. 400 lbs. 335 lbs.			
Pump and Capacity	550-800 PSI Implement Relief Setting			
Cylinder	2 in. Bore, 1 in. Rod, 4 in. Stroke, 1000 PSI Max.			
Force Developed @ Cylinder Rod Extended Collapsed	 1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI			
Rockshaft Pivot Torque Front Center Rear	728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI			
Power Take Off Front and Center	Electrically Clutched, 3600 RPM			
Rear	Optional - Solid Shaft, 3250 RPM			

Specifications

Model	931008 12 HP	931009 14 HP	931010 16 HP	931011 10 HP
Length	74¾"			
Height	47¾"			
Width	43"			
Wheel Base	48"			
Shipping Weight	895 lbs.			
Battery	12V Neg. Ground, 39 Amp Hrs. at 20 Hr. Rating, Cold Crank Amps 255 Min.			
Hour Meter	Optional			
Brakes	Drum Brakes			
Steering	Gear			
Turning Radius	31" (78.7 cm)			
Tire Turf Size Front Rear	16-6.50x8 23-8.50x10	16-6.50x8 23-10.50x12		16-6.50x8 23-8.50x10
Engine	Single Gas			
Manufacturer	Kohler			
Fuel	Unleaded			
Displacement	29.07 CI	31.27 CI	35.90 CI	
Idle R.P.M.	1800			
Governed R.P.M.	3250			
Bore	2"			
Stroke	4"			
Compression Ratio	6.6:1	7.0:1	7.3:1	
Crank Case Capacity	2 Qts.			
Air Cleaner	Dry Element, Foam Precleaner			
Fuel Consumption Gal./Hr. @ 3250 RPM	1	1.35	1.50	
Charging Capacity	Regulated 15 Amp Flywheel Alt.			
Fuel Tank Capacity	4.5			
Fuel Filter	120 Micron, 2½ GPA Capacity			
Engine Oil Type	Above 32°F - SAE 30, Below 32°F - SAE 10W30			
Spark Plug Gap	.025			
Gear Ration Engine to Rear Wheels	Infinite 30:1			30:1
Transmission	Hydrostatic			Gear
Speed - Forward Max. Reverse Max.	7 MPH 3.5 MPH			
Transmission Oil & Capacity	SAE 5W30 5.5 Qts.			
Drive Clutch	Neutralizing Hyd. Trans.			Belt
Gross Weight Capacity	Front 830 lbs., Rear 1780 lbs.			
Axle Capacity	Front 425 lbs., Rear 395 lbs.			
Allowable Added Weight	Front 405 lbs., Rear 1385 lbs.			
Rear Axle Maximum Load	1800 lbs.			
Tire Pressure With Loads Light Medium Heavy	8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 12 PSIF - 10 PSIR			
Differential Type	Dana GT120 Automotive Type Ring and Pinion			Gear - Peerless
Lift System	Hydraulic Four Function			Mechanical
Capacity Front Center Rear	350 lbs. 400 lbs. 335 lbs.			
Pump and Capacity	550-800 PSI Implement Relief Setting			N/A
Cylinder	2 in. Bore, 1 in. Rod, 4 in. Stroke, 1000 PSI Max.			N/A
Force Developed @ Cylinder Rod Extended Collapsed	1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI			N/A
Rockshaft Pivot Torque Front Center Rear	728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI			N/A
Power Take Off Front and Center	Electrically Clutched, 3600 RPM			
Rear	Optional - Solid Shaft, 3250 RPM			

Specifications

Model	931012 14 HP	931013 14 HP	931014 10 HP	931015 18 HP
Length	74¾"			
Height	47¾"			
Width	43"			
Wheel Base	48"			
Shipping Weight	895 lbs.			
Battery	12V Neg. Ground, 39 Amp Hrs. at 20 Hr. Rating, Cold Crank Amps 255 Min.			
Hour Meter	Optional			
Brakes	Drum Brakes			
Steering	Gear			
Turning Radius	31" (78.7 cm)			
Tire Turf Size Front Rear	16-6.50x8 23-10.50x12	16-6.50x8 23-8.50x10	16-6.50x8 23-10.50x12	
Engine	Single Gas			
Manufacturer	Kohler			
Fuel	Unleaded			
Displacement	31.27 CI	31.27 CI		36.9 CI
Idle R.P.M.	1800			
Governed R.P.M.	3600	3250		
Bore	2"			
Stroke	4"			
Compression Ratio	7.0:1	7.0:1		8.1:1
Crank Case Capacity	2 Qts.			
Air Cleaner	Dry Element, Foam Precleaner			
Fuel Consumption Gal./Hr. @ 3250 RPM	1.35	1.35		1.8
Charging Capacity	Regulated 15 Amp Flywheel Alt.			
Fuel Tank Capacity	4.5			
Fuel Filter	120 Micron, 2½ GPA Capacity			
Engine Oil Type	Above 32°F - SAE 30, Below 32°F - SAE 10W30			
Spark Plug Gap	.025			
Gear Ration Engine to Rear Wheels	30:1	Infinite 30:1		30:1
Transmission	Gear	Hydrostatic	Gear	
Speed - Forward Max. Reverse Max.	7 MPH 3.5 MPH		6.5 MPH 3 MPH	
Transmission Oil & Capacity	SAE 5W30 5.5 Qts.			
Drive Clutch	Belt	Neutralizing Hyd. Trans.		Belt
Gross Weight Capacity	Front 830 lbs., Rear 1780 lbs.			
Axle Capacity	Front 425 lbs., Rear 395 lbs.			
Allowable Added Weight	Front 405 lbs., Rear 1385 lbs.			
Rear Axle Maximum Load	1800 lbs.			
Tire Pressure With Loads Light Medium Heavy	8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 12 PSIF - 10 PSIR			
Differential Type	Gear - Peerless			Dana GT120
Lift System	Hyd. Four Function		Mechanical	Hyd. Four Function
Capacity Front Center Rear	350 lbs. 400 lbs. 335 lbs.		N/A	350 lbs. 400 lbs. 335 lbs.
Pump and Capacity	550-800 PSI Implement Relief Setting		N/A	550-800 PSI Imp. Relief Setting
Cylinder	2" Bore, 1" Rod, 4" Stroke, 1000 PSI Max.		N/A	2" Bore, 1" Rod, 4" Stroke
Force Developed @ Cylinder Rod Extended Collapsed	1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI		N/A	1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI
Rockshaft Pivot Torque Front Center Rear	728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI		N/A	728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI
Power Take Off Front and Center	Electrically Clutched, 3600 RPM			
Rear	Optional - Solid Shaft, 3250 RPM			

Specifications

Model	931016 12 HP	931017 14 HP	931018 16 HP	931019 17 HP
Length	74¾"			75"
Height	47¾"			47"
Width	43"			
Wheel Base	48"			
Shipping Weight	895 lbs.			925 lbs.
Battery	12V Neg. Ground, 39 Amp Hrs. at 20 Hr. Rating, Cold Crank Amps 255 Min.			
Hour Meter	Optional			Standard
Brakes	Drum			Dual 6-7/8" Dia. Disc
Steering	Gear			
Turning Radius	31" (78.7 cm)			
Tire Turf Size Front Rear	 16-6.50x8 23-8.50x10	 16-6.50x8 23-10.50x12		
Engine	Single Gas			Twin Gas
Manufacturer	Kohler			
Fuel	Unleaded			
Displacement	29.07 CI	31.27 CI	35.90 CI	42.18 CI
Idle R.P.M.	1800			1200
Governed R.P.M.	3250			
Bore	2"			3.12"
Stroke	4"			2.75"
Compression Ratio	6.6:1	7.0:1	7.3:1	6:1
Crank Case Capacity	2 Qts.			3 Pts.
Air Cleaner	Dry Element, Foam Precleaner			
Fuel Consumption Gal./Hr. @ 3250 RPM	1.00	1.35	1.50	1.7
Charging Capacity	Regulated 15 Amp Flywheel Alt.			
Fuel Tank Capacity	4.5			
Fuel Filter	120 Micron, 2½ GPA Capacity			
Engine Oil Type	Above 32°F - SAE 30, Below 32°F - SAE 10W30			
Spark Plug Gap	.025			
Gear Ration Engine to Rear Wheels	Infinite 30:1			
Transmission	Hydrostatic			
Speed - Forward Max. Reverse Max.	6.5 MPH 3 MPH			
Transmission Oil & Capacity	SAE 5W30 5.5 Qts.			
Drive Clutch	Neutralizing Hyd. Trans.			
Gross Weight Capacity	Front 830 lbs., Rear 1780 lbs.			
Axle Capacity	Front 425 lbs., Rear 395 lbs.			
Allowable Added Weight	Front 405 lbs., Rear 1385 lbs.			
Rear Axle Maximum Load	1800 lbs.			
Tire Pressure With Loads Light Medium Heavy	 8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 12 PSIF - 10 PSIR			
Differential Type	Dana GT120 Automotive Type Ring and Pinion			
Lift System	Hydraulic Four Function			
Capacity Front Center Rear	 350 lbs. 400 lbs. 335 lbs.			
Pump and Capacity	550-800 PSI Implement Relief Setting			
Cylinder	2" Bore, 1" Rod, 4" Stroke, 1000 PSI Max.			
Force Developed @ Cylinder Rod Extended Collapsed	 1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI			
Rockshaft Pivot Torque Front Center Rear	 728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI			
Power Take Off Front and Center	Electrically Clutched, 3600 RPM			
Rear	Optional - Solid Shaft, 3250 RPM			Electrically Clutched, 3250 RPM

Specifications

Model	931020 10 HP	931021 14 HP	931022 14 HP	931023 16 HP
Length	74¾"			
Height	47¾"			
Width	43"			
Wheel Base	48"			
Shipping Weight	895 lbs.			
Battery	12V Neg. Ground, 39 Amp Hrs. at 20 Hr. Rating, Cold Crank Amps 255 Min.			
Hour Meter	Optional			
Brakes	Dual 6-7/8" Dia. Disc			
Steering	Gear			
Turning Radius	31" (78.7 cm)			
Tire Turf Size Front Rear	16-6.50x8 23-8.50x10	16-6.50x8 23-10.50x12		
Engine	Single Gas			
Manufacturer	Kohler			
Fuel	Unleaded			
Displacement		31.27 CI	31.27 CI	35.90 CI
Idle R.P.M.	1800			
Governed R.P.M.	3250			
Bore	2"			
Stroke	4"			
Compression Ratio		7.0:1	7.0:1	7.3:1
Crank Case Capacity	2 Qts.			
Air Cleaner	Dry Element, Foam Precleaner			
Fuel Consumption Gal./Hr. @ 3250 RPM		1.35	1.35	1.50
Charging Capacity	Regulated 15 Amp Flywheel Alt.			
Fuel Tank Capacity	4.5			
Fuel Filter	120 Micron, 2½ GPA Capacity			
Engine Oil Type	Above 32°F - SAE 30, Below 32°F - SAE 10W30			
Spark Plug Gap	.025			
Gear Ration Engine to Rear Wheels	30:1	30:1	Infinite 30:1	
Transmission	Gear		Hydrostatic	
Speed - Forward Max. Reverse Max.	6.5 MPH 3 MPH			
Transmission Oil & Capacity	SAE 5W30 5.5 Qts.			
Drive Clutch	Belt	Belt	Neutralizing Hyd. Trans.	
Gross Weight Capacity	Front 830 lbs., Rear 1780 lbs.			
Axle Capacity	Front 425 lbs., Rear 395 lbs.			
Allowable Added Weight	Front 405 lbs., Rear 1385 lbs.			
Rear Axle Maximum Load	1800 lbs.			
Tire Pressure With Loads Light Medium Heavy	8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 12 PSIF - 10 PSIR			
Differential Type	Gear - Peerless	Dana GT120 Automotive Type Ring & Pinion		
Lift System	Mechanical	Hydraulic Four Function		
Capacity Front Center Rear		350 lbs. 400 lbs. 335 lbs.		
Pump and Capacity	N/A	550-800 PSI Implement Relief Setting		
Cylinder	N/A	2" Bore, 1" Rod, 4" Stroke, 1000 PSI Max.		
Force Developed @ Cylinder Rod Extended Collapsed	N/A	1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI		
Rockshaft Pivot Torque Front Center Rear	N/A	728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI		
Power Take Off Front and Center	Electrically Clutched, 3600 RPM			
Rear	Optional-Solid Shaft,3250 RPM	Electrically Clutched, 3250 RPM		

Specifications

Model	931024 18 HP	931025 12 HP	931026 19 HP	931029 19 HP
Length	74¾"			75"
Height	47¾"			47"
Width	43"			
Wheel Base	48"			
Shipping Weight	895 lbs.			930 lbs.
Battery	12V Neg. Ground, 39 Amp Hrs. at 20 Hr. Rating, Cold Crank Amps 255 Min.			
Hour Meter	Standard	Optional	Standard	Standard
Brakes	Dual 6-7/8" Dia. Disc			
Steering	Gear Ratio 14:1	Gear Ratio 14:1	Gear Ratio 14:1	Hyd. Power
Turning Radius	31" (78.7 cm)			
Tire Turf Size Front Rear	16-6.50x8 23-10.50x12	16-6.50x8 23-8.50x10	16-6.50x8 23-10.50x12	
Engine	Single Gas			Twin Gas
Manufacturer	Kohler			
Fuel	Unleaded			
Displacement	36.9 CI	29.07 CI	47.0 CI	46.98 CI
Idle R.P.M.	1800		1200	
Governed R.P.M.	3250			
Bore	2"			3.12"
Stroke	4"			3.06"
Compression Ratio	8.1:1	6.6:1	6.7:1	6.7:1
Crank Case Capacity	3.5 Pts.	2 Qts.	3 Pts.	3 Pts.
Air Cleaner	Dry Element, Foam Precleaner			
Fuel Consumption Gal./Hr. @ 3250 RPM	1.8	1.00	1.8	1.8
Charging Capacity	Regulated 15 Amp Flywheel Alt.			
Fuel Tank Capacity	4.5			
Fuel Filter	120 Micron, 2½ GPA Capacity			
Engine Oil Type	Above 32°F - SAE 30, Below 32°F - SAE 10W30			
Spark Plug Gap	.025			
Gear Ration Engine to Rear Wheels	Infinite 30:1			
Transmission	Hydrostatic			
Speed - Forward Max. Reverse Max.	6.5 MPH 3 MPH			
Transmission Oil & Capacity	SAE 5W30 5.5 Qts.			
Drive Clutch	Neutralizing Hyd. Trans.			
Gross Weight Capacity	Front 830 lbs., Rear 1780 lbs.			
Axle Capacity	Front 425 lbs., Rear 395 lbs.			
Allowable Added Weight	Front 405 lbs., Rear 1385 lbs.			
Rear Axle Maximum Load	1800 lbs.			
Tire Pressure With Loads Light Medium Heavy	8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 12 PSIF - 10 PSIR		8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 16 PSIF - 10 PSIR	
Differential Type	Dana GT120 Automotive Type Ring and Pinion			
Lift System	Hydraulic Four Function			
Capacity Front Center Rear	350 lbs. 400 lbs. 335 lbs.			
Pump and Capacity	550-800 PSI Implement Relief Setting			
Cylinder	2" Bore, 1 " Rod, 4" Stroke, 1000 PSI Max., 4.2 Gallons Per Minute			
Force Developed @ Cylinder Rod Extended Collapsed	1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI			
Rockshaft Pivot Torque Front Center Rear	728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI			
Power Take Off Front and Center	Electrically Clutched, 3600 RPM			
Rear	Electrically Clutched, 3250 RPM			

Specifications

Model	931030 18 HP Diesel	931033 18 HP Gas	931034 20 HP Gas
Length	79"	75"	75"
Height	47"	47"	47"
Width	43"	43"	43"
Wheel Base	52"	48"	48"
Shipping Weight	1060 lbs.	938 lbs.	960 lbs.
Battery	12 Volt Neg. Ground, 39 AMP Hrs. at 20 Hr. Rating, CCA 550 Min.	CCA 225 Min.	CCA 225 Min.
Hour Meter	Standard	Standard	Standard
Brakes	Dual 6-7/8" Dia. Disc	Dual 6-7/8" Disc	Dual 6-7/8" Disc
Steering	Hydraulic Power	Hydraulic	Hydraulic
Turning Radius	33½" (85.5 cm)	31" (78.7 cm)	31" (78.7 cm)
Tire Turf Size Front Rear	 16-6.50x8 23-10.50x12	 16-6.50x8 23-10.50x12	 16-6.50x8 23-10.50x12
Engine	Twin Diesel	Kohler Mag.	Kohler Mag.
Manufacturer	Ruggerini	Twin Gas	Twin Gas
Fuel	No. 2 Diesel	Unleaded	Unleaded
Displacement	46 CI	42.18 CI	46.98 CI
Idle R.P.M.	1200 + 50	1200	1200
Governed R.P.M.	3250 + 75-0	3250	3250
Bore	3.15"	3.12"	3.12"
Stroke	2.95"	2.75"	3.06"
Compression Ratio	19.3:1	6-1	6.6-1
Crank Case Capacity	3 Qts.	1.5 Qts. + 1/2 for filter	1.5 Qts. + 1/2 for filter
Air Cleaner	Oil Bath	Foam Precleaner, Paper Element	Foam Precleaner, Paper Element
Fuel Consumption Gal./Hr. @ 3250 RPM	.84	1.8	1.8
Charging Capacity	Regulated 20 Amp Flywheel Alt.	Regulated 20 Amp Flywheel Alt.	Regulated 20 Amp Flywheel Alt.
Fuel Tank Capacity	4.5	4.5	4.5
Fuel Filter	120 Micron, 2½ GPA Capacity	120 Micron,2-1/2 GPA Capacity	120 Micron,2-1/2 GPA Capacity
Engine Oil Type	Diesel Oil	Above 32°F - SAE 30, Below 32°F - SAE 10W30	
Spark Plug Gap	None	RV15YS .020	RV15YS .020
Gear Ration Engine to Rear Wheels	Infinite 30:1	Infinite 30:1	Infinite 30:1
Transmission	Hydrostatic	Hydrostatic	Hydrostatic
Speed - Forward Max. Reverse Max.	6.5 MPH 3 MPH	6.5 MPH 3 MPH	6.5 MPH 3 MPH
Transmission Oil & Capacity	SAE 5W30 5.5 Qts.	SAE 5W30 5.5 Qts.	SAE 5W30 5.5 Qts.
Drive Clutch	Neutralizing Hyd. Trans.	Neutralizing Hydro Transmission	
Gross Weight Capacity	Front 830 lbs., Rear 1780 lbs.	Front 830 lbs., Rear 1780 lbs.	Front 830 lbs., Rear 1780 lbs.
Axle Capacity	Front 425 lbs., Rear 395 lbs.	Front 425 lbs., Rear 395 lbs.	Front 425 lbs., Rear 395 lbs.
Allowable Added Weight	Front 405 lbs., Rear 1385 lbs.	Front 405 lbs., Rear 1385 lbs.	Front 405 lbs., Rear 1385 lbs.
Rear Axle Maximum Load	1800	1800	1800
Tire Pressure With Loads Light Medium Heavy	 8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 12 PSIF - 10 PSIR	 8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 12 PSIF - 10 PSIR	 8 PSIF - 6 PSIR 12 PSIF - 8 PSIR 12 PSIF - 10 PSIR
Differential Type	Dana GT120 Automotive Type Ring and Pinion	Dana GT120 Automotive Type Ring and Pinion	
Lift System	Hyd. Four Function	Hyd. Four Function	Hyd. Four Function
Capacity Front Center Rear	350 lbs. 400 lbs. 335 lbs.	350 lbs. 400 lbs. 335 lbs.	350 lbs. 400 lbs. 335 lbs.
Pump and Capacity	550-800 PSI Implement Relief Setting	1000 PSI	1000 PSI
Cylinder	2" Bore, 1" Rod, 4" Stroke, 1000 PSI Max.	2" Bore,1" Rod,4" Stroke,1000 PSI Max.	
Force Developed @ Cylinder Rod Extended Collapsed	 1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI	 1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI	 1728 lbs. @ 550 PSI 1296 lbs. @ 550 PSI
Rockshaft Pivot Torque Front Center Rear	728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI	728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI	728 ft. lbs. @ 550 PSI 842 ft. lbs. @ 550 PSI 576 ft. lbs. @ 550 PSI
Power Take Off Front and Center	Electrically Clutched, 3600 RPM	Electrically Clutched, 3600 RPM	Electrically Clutched, 3600 RPM
Rear	Electrically Clutched, 3250 RPM	Optional	Electrically Clutched, 3250 RPM

Electrical
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Electrical

2.1 Safety Interlock System

DANGER: Failure of Interlock, together with improper operation of unit, could result in severe personal injury.

Check the safety interlock system to make sure that it is functioning properly. With operator on seat, tractor must not start unless Speed Selector is in neutral (N), Brake/Neutralizer pedal is depressed and Implement Power is disengaged (OFF). Engine MUST stop if operator leaves seat when Speed Selector is in any drive position or with implement lever engaged (ON).

Interlock system grounds engine ignition if Brake/Neutralizer and Implement Power switches are not closed. Also, interlock system will ground ignition if seat switch is not closed when opening Brake/Neutralizer or Implement Power switches.

2.2 Trouble Shooting

Check that all wiring connections are secure and that switches are being activated properly before performing electrical tests. (Safety switch may be out of adjustment and not activating properly.)

Check engine electrical function. If engine has no spark or voltmeter does not register 12 to 15 volts when engine is running (at any speed above a slow idle) problem is in engine, refer to engine repair manual.

When voltmeter indicates 11 or fewer volts, battery or engine service may be required.

If engine electrical system functions properly and has spark, check that all wires of units electrical system are connected properly (refer to electrical schematics in this section). Then check switches per the following instructions.

2.3 Switches

IMPORTANT: When checking switches electrically, remove them from their respective circuits by disconnecting the wires from the switch at the connector(s) before testing or damage could result to meter or interlock module. (DO NOT remove switches from unit when checking them.)

2

To test a normally open key, safety or seat switch, connect an ohmmeter across switch terminals. Meter should indicate high resistance (open circuit). Activate the switch. Meter should read up scale to .01 to .1 resistance (closed circuit) indicating switch is operating properly. Check from each terminal to switch case (if case is metal), reading should show high resistance indicating no short to ground.

The ignition switch has three positions; OFF, RUN and a momentary START position.

In the OFF position, there should be no continuity between contacts.

In the RUN position, there should be continuity between contacts "B"+"I"+"A" and "X"+"Y".

In the START position, there should be continuity between "B"+"I"+"S" and "X"+"Y".

If after performing the above checks the engine does not start, refer to Trouble Shooting.

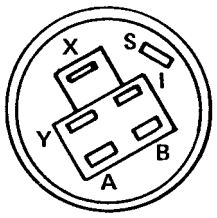


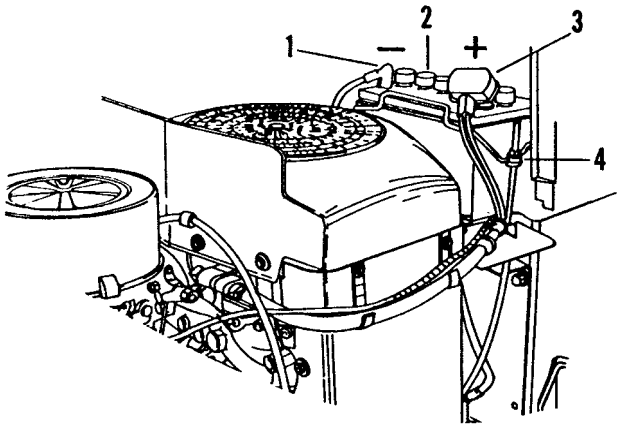
Figure 2-1: Ignition Switch

Electrical (Continued)

2.4 Battery

WARNING: Batteries produce explosive gases which can cause personal injury. DO NOT allow flames, sparks or any ignited object to come near battery. When charging or working near a battery, always shield your eyes and provide ventilation.

CAUTION: Keep batteries out of reach of children. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. In case of acid contact with skin, eyes or clothing, flush immediately with water for a minimum of 15 minutes. If acid is swallowed, drink large quantities of milk, egg or vegetable oil. Call a physician immediately.



1. **Negative (-) Terminal**
2. **Caps**
3. **Positive (+) Terminal**
4. **Tie Down**

Figure 2-2: Battery

Every 25 hours or each week check electrolyte level of each cell by removing caps one at a time. The electrolyte level should be at level indicator. Use distilled water to fill each cell if needed. Install and tighten each cap after checking.

IMPORTANT: When distilled water is added to battery during freezing weather, battery must be charged to mix water with electrolyte, or water will remain at top and freeze.

Keep battery and its terminals clean, and inspect monthly to maintain best performance.

WARNING: DO NOT allow tools or other objects to come in contact with both terminals at same time. When removing battery from tractor, remove negative (-) cable first to reduce risk of sparks.

To clean terminals remove battery from tractor by removing cables. Loosen tie down rod nuts and lift battery out. Clean or service battery away from unit. Remove corrosion from battery terminals and cable connections with a wire brush, then wash with a weak baking soda solution.

After cleaning, install battery and apply a thin coat of grease or petroleum jelly to terminals and cable ends to retard corrosion.

CAUTION: Connect positive (+) cable first, negative (-) cable last.

To charge battery remove battery from tractor, remove vents, and charge at a rate of 4 to 6 amps. (Specific Gravity reading of 1260 plus or minus 5 points on all cells indicates a fully charged battery.)

IMPORTANT: DO NOT fast charge. Charging at a higher rate will damage or destroy battery.

WARNING: When charging battery, remove it from tractor and make certain that you connect positive (+) lead of charger to positive (+) terminal, and negative (-) lead to negative (-) terminal. Reverse connections can cause sparks and potential unsafe conditions.

Electrical

DASH, CONTROLS AND ELECTRICAL

Models 931004, 5, 6

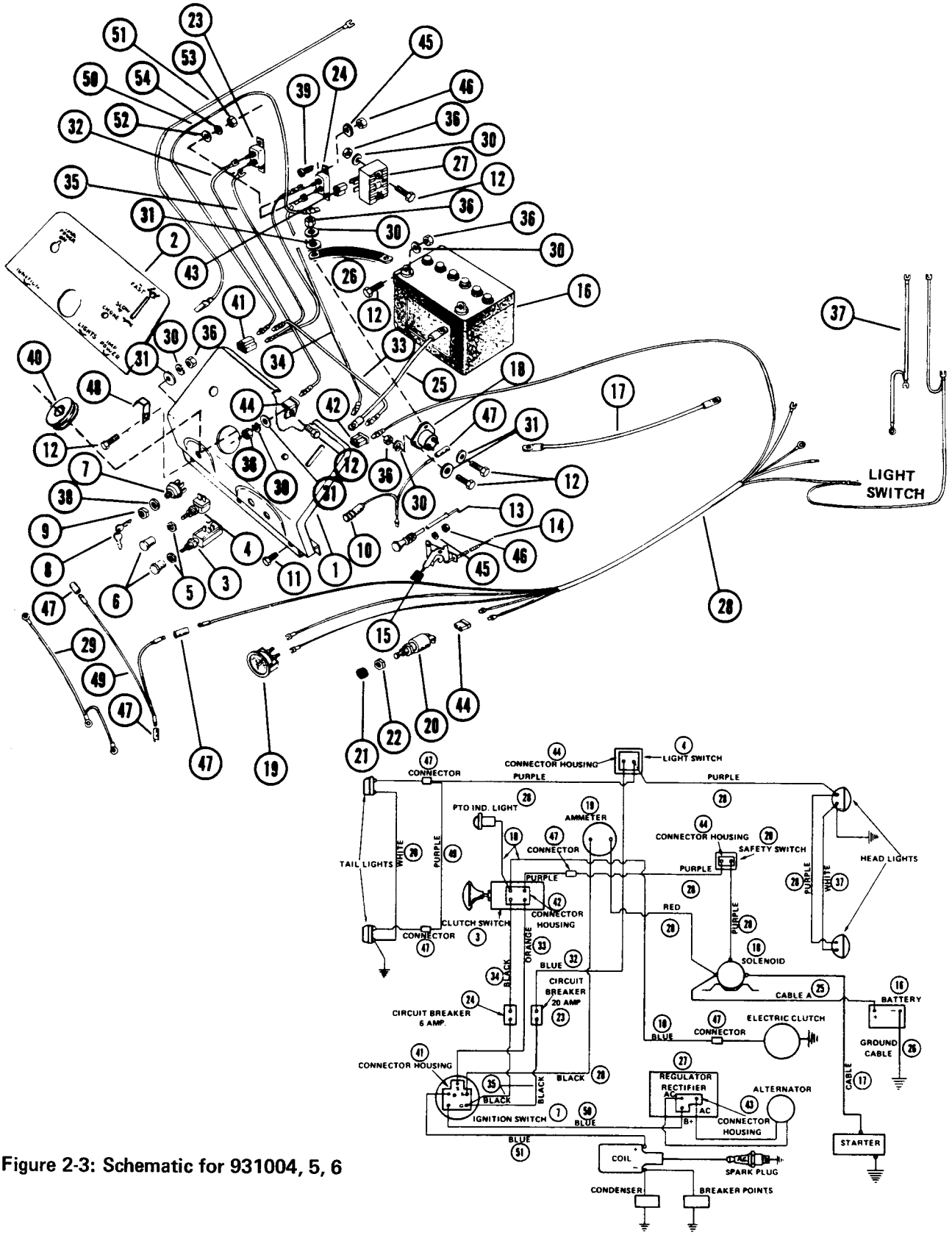


Figure 2-3: Schematic for 931004, 5, 6

Electrical

Models 931007 thru 931012

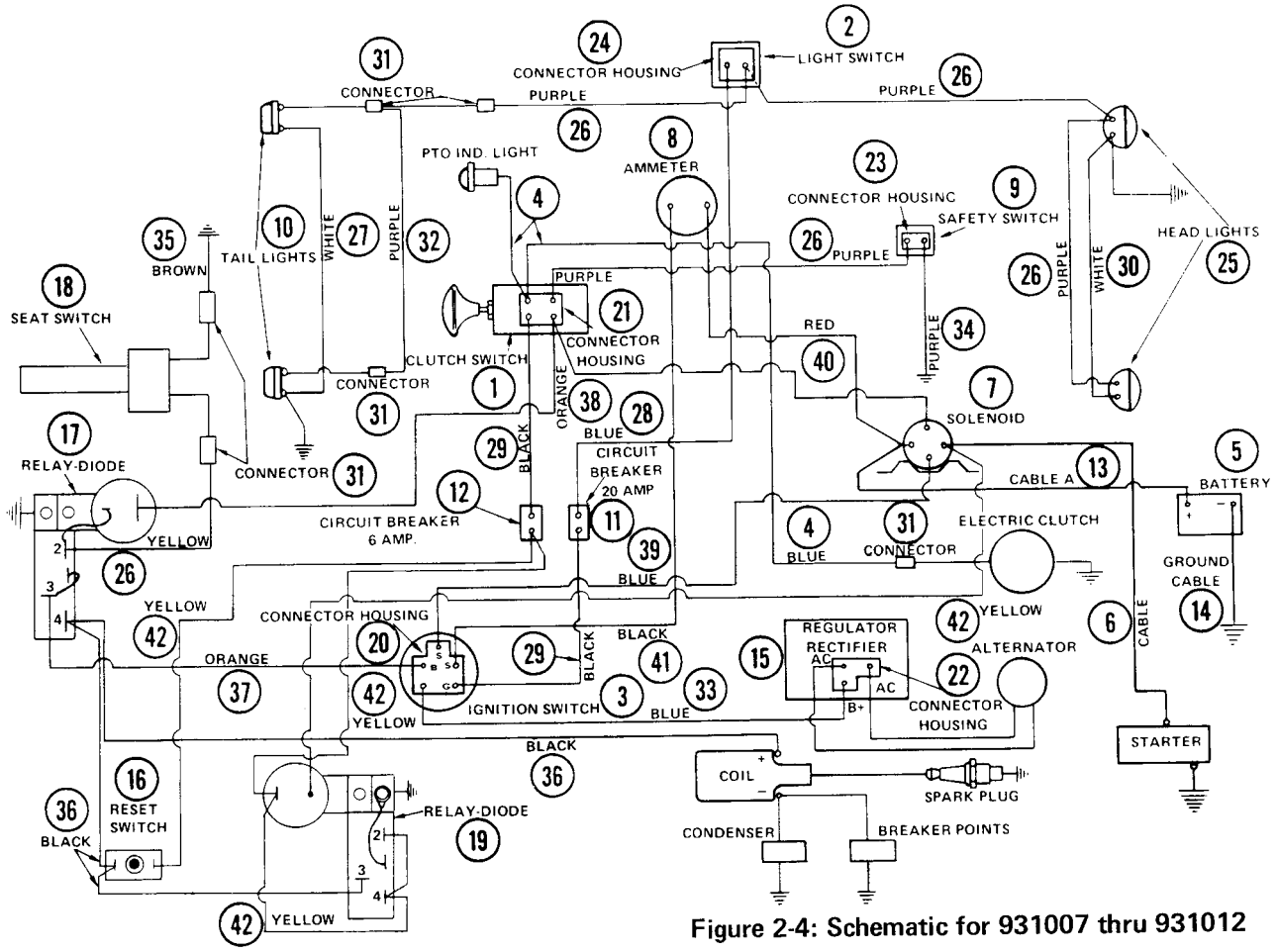


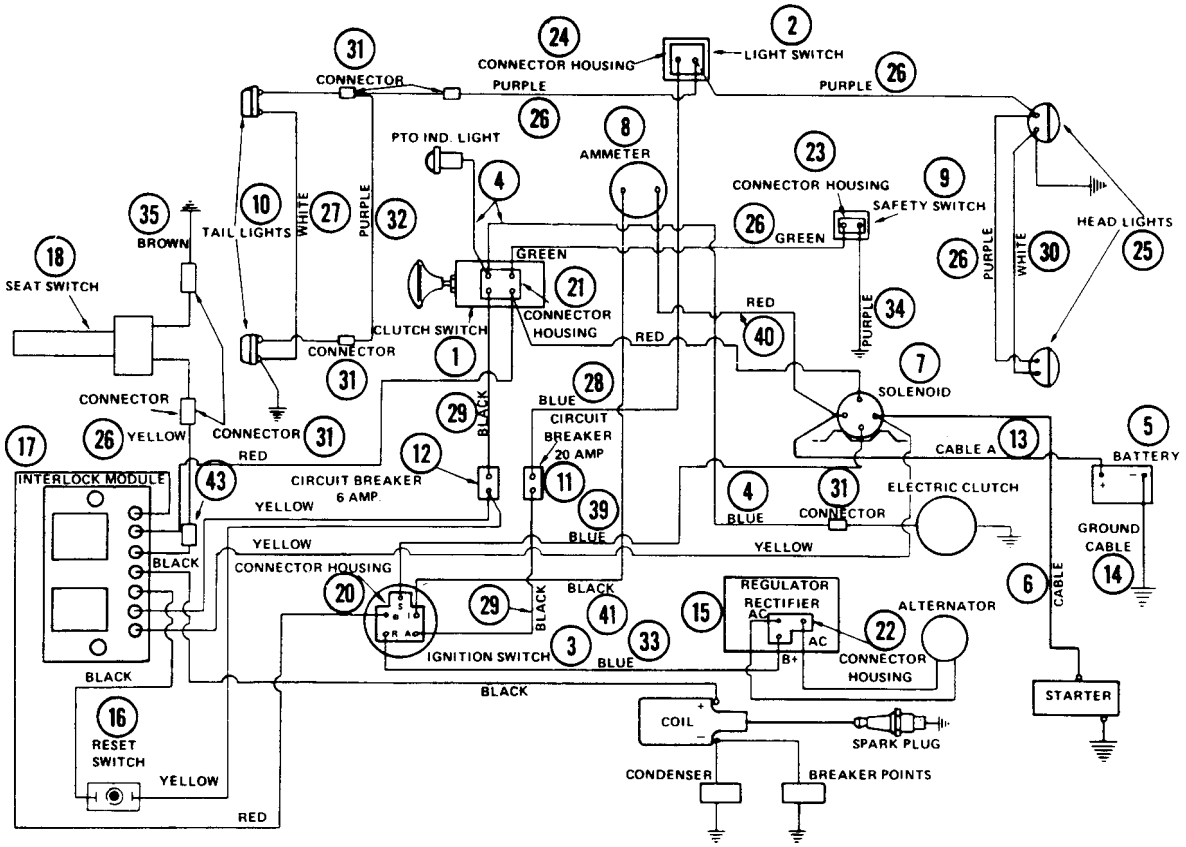
Figure 2-4: Schematic for 931007 thru 931012

1	SWITCH, Clutch
2	SWITCH, Lights
3	SWITCH, Ignition
4	PTO Indicater & Wire Ass'y
5	BATTERY, 12 Volt
6	CABLE ASS'Y, Solenoid to Starter
7	SOLENOID STARTER SWITCH
8	AMMETER
9	SWITCH, Safety
10	TAIL LIGHT
11	CIRCUIT BREAKER, 20 Amp
12	CIRCUIT BREAKER, 6 Amp
13	CABLE ASS'Y, Battery to Solenoid
14	CABLE ASS'Y, Battery to Ground
15	REGULATOR RECTIFIER
16	SWITCH
17	RELAY - Diode
18	SEAT SWITCH
19	RELAY - Clutch Control
20	CONNECTOR HOUSING, 5 Wire
21	CONNECTOR HOUSING, 4 Wire
22	CONNECTOR HOUSING, 3 Wire
23	CONNECTOR HOUSING, 2 Wire
24	CONNECTOR
25	HEAD LIGHT
26	WIRE HARNESS, 2 Wire
27	WIRE HARNESS, 35" Long (white) Ground for Tail Lites
28	WIRE HARNESS, 6½" Long (blue) Brake to Lite Switch
29	WIRE HARNESS, 7½" Long (black) 20 Amp Circuit Breaker to Ign. Switch. 6 Amp Circuit Breaker to Clutch Switch
30	WIRE HARNESS, (white) Ground for Head Lite
31	WIRE CONNECTOR
32	WIRE ASS'Y, 44½" Long
33	WIRE, Ignition to Rectifier (blue)
34	WIRE, Wire to Ground (purple)
35	WIRE , Seat Switch to Ground
36	WIRE ASS'Y (black) Relay-Diode to 6a C.B. and Coil
37	WIRE, (orange) Relay-Diode to Switch
38	WIRE, (orange) Relay-Diode to Imp. Switch
39	WIRE, (blue) Switch to Solenoid
40	WIRE, (red)
41	WIRE, (black) Ammeter to Switch
42	WIRE, YELLOW RELAY

Electrical

Equipped With Interlock Module 531074 (7 Terminals, Item 17)

Models 931008 thru 931018



Item	Description
1	SWITCH, Clutch
2	SWITCH, Lights
3	SWITCH, Ignition
4	PTO Indicater & Wire Ass'y
5	BATTERY, 12 Volt
6	CABLE ASS'Y, Solenoid to Starter
7	SOLENOID STARTER SWITCH
8	AMMETER
9	SWITCH, Safety
10	TAIL LIGHT
11	CIRCUIT BREAKER, 20 Amp
12	CIRCUIT BREAKER, 6 Amp
13	CABLE ASS'Y, Battery to Solenoid
14	CABLE ASS'Y, Battery to Ground
15	REGULATOR RECTIFIER KOHLER 237335
16	SWITCH, Reset
17	INTERLOCK MODULE
18	SEAT SWITCH
20	CONNECTOR HOUSING, 5 Wire
21	CONNECTOR HOUSING, 4 Wire
22	CONNECTOR HOUSING, 3 Wire

Item	Description
23	CONNECTOR HOUSING, 2 Wire
24	CONNECTOR
25	HEAD LIGHT
26	WIRE HARNESS, 2 Wire
27	WIRE HARNESS, 35" Long (white) Ground for Tail Lites
28	WIRE HARNESS, 6½" Long (blue) Brake to Lite Switch
29	WIRE HARNESS, 7½" Long (black) 20 Amp Circuit Breaker to Ign. Switch. 6 Amp Circuit Breaker to Clutch Switch
30	WIRE HARNESS, (white) Ground for Head Lite
31	WIRE CONNECTOR
32	WIRE ASS'Y, 44½" Long
33	WIRE, Ignition to Rectifier (blue)
34	WIRE, Wire to Ground (purple)
35	WIRE , Seat Switch to Ground
39	WIRE, (blue) Switch to Solenoid
40	WIRE, (red)
41	WIRE, (black) Ammeter to Switch
43	CONNECTOR BULB (For Item No. 4, PTO Light)

Figure 2-5: Schematic for 931008 thru 931018 with 531074 Module

Figure 2-6: Interlock, Power, Cranking, Ignition

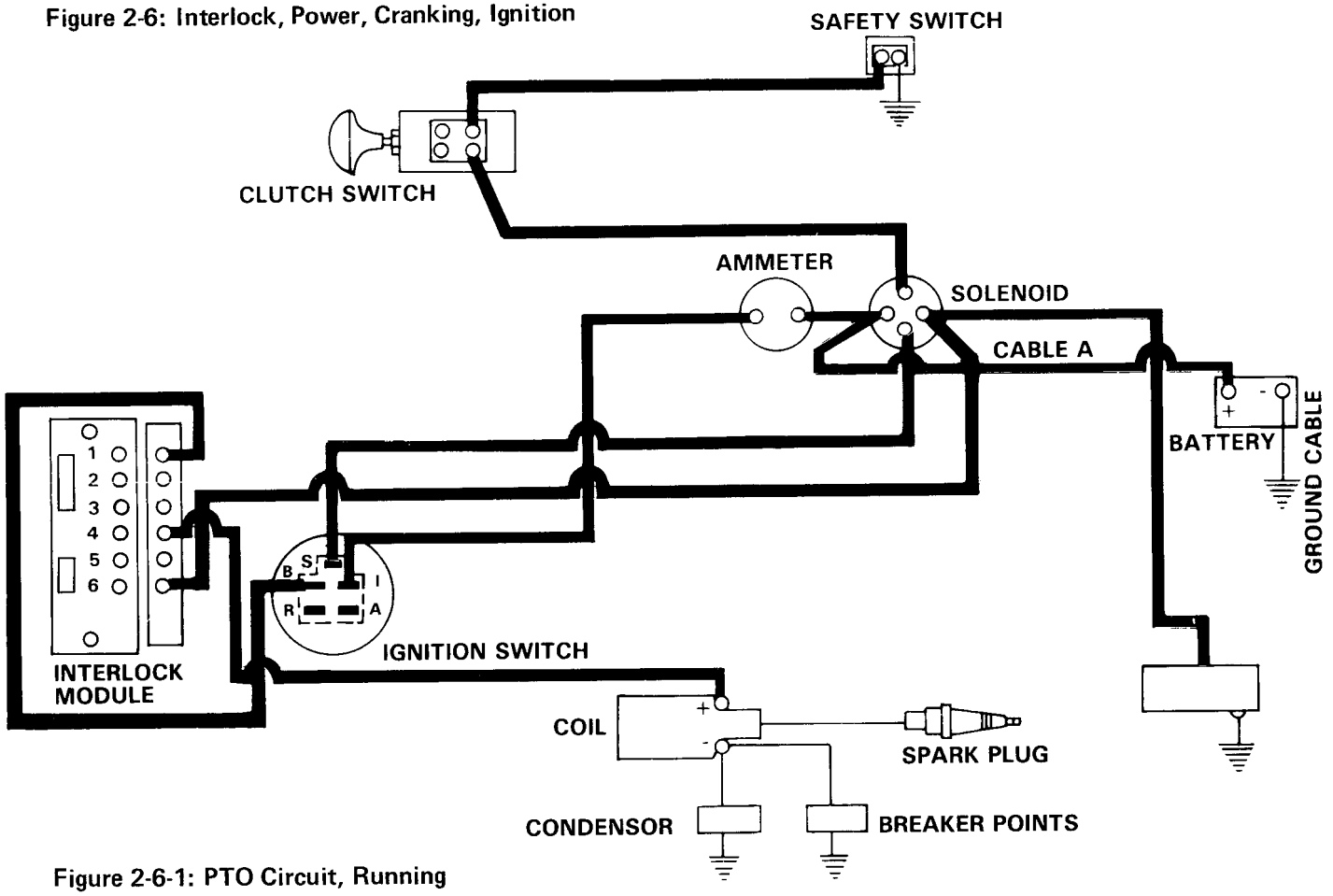
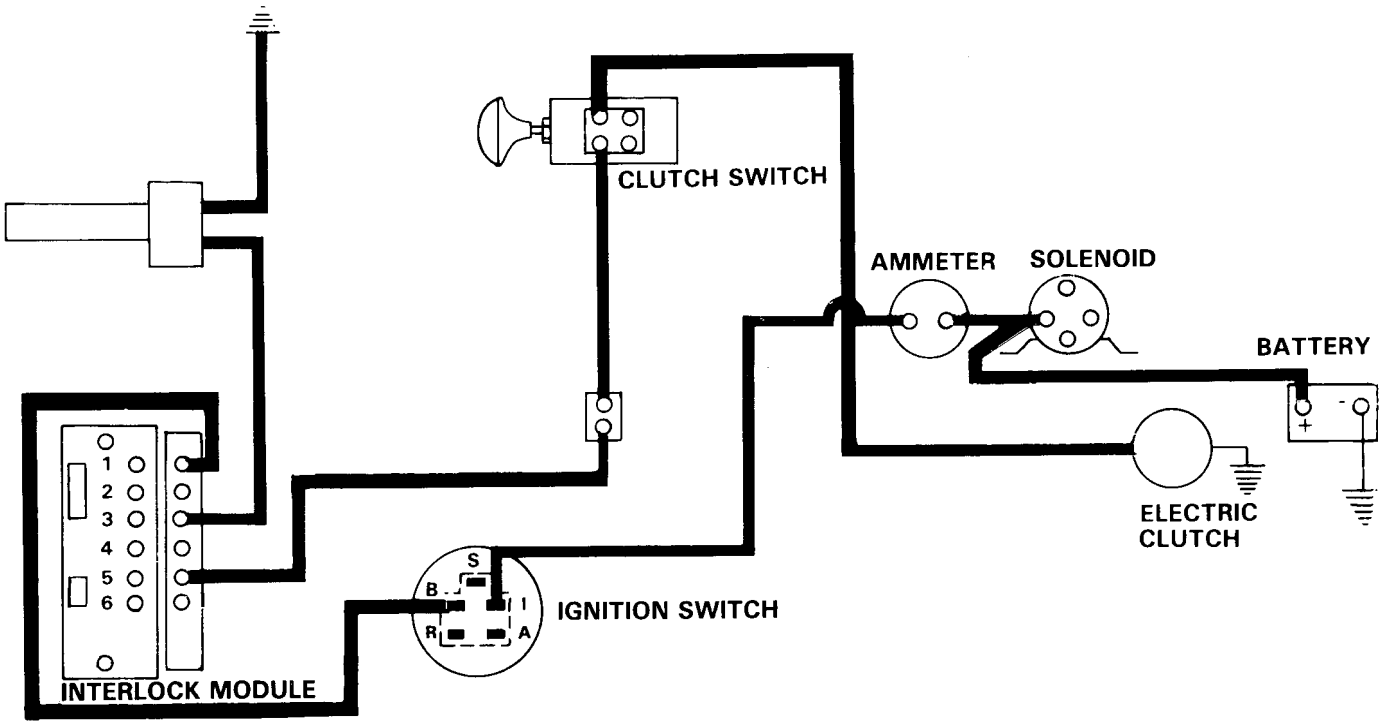


Figure 2-6-1: PTO Circuit, Running



CIRCUIT REFERENCE DIAGRAM

Equipped With Interlock Module 531074 (7 Terminals, Item 17)

Figure 2-6-2: Lighting

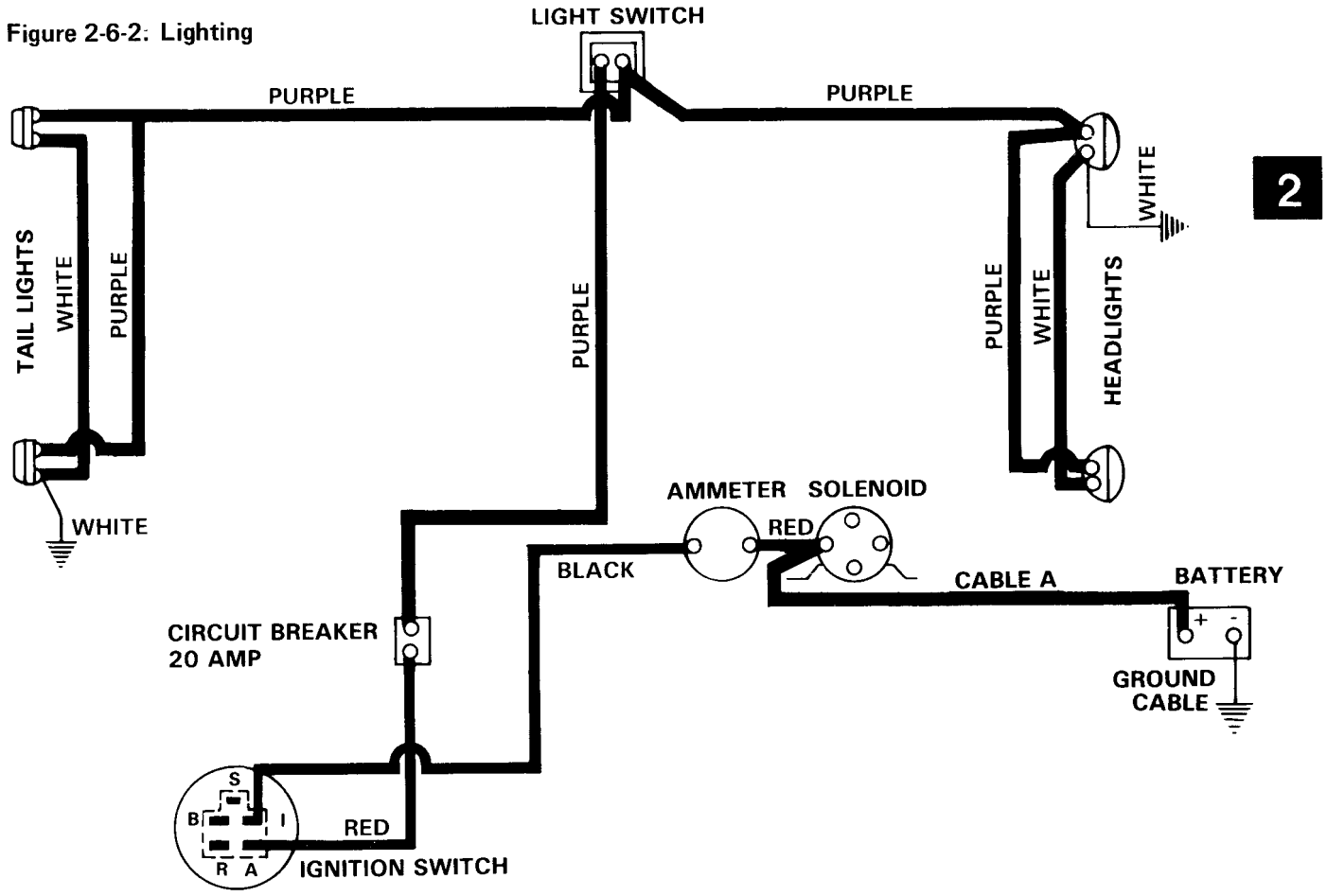


Figure 2-6-3: Reset Switch

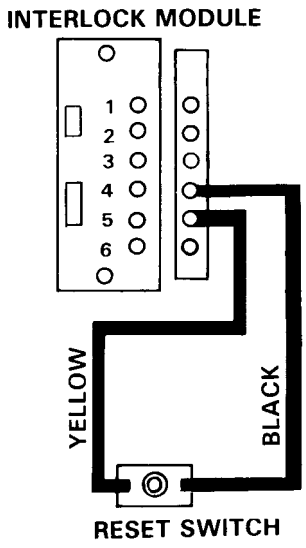
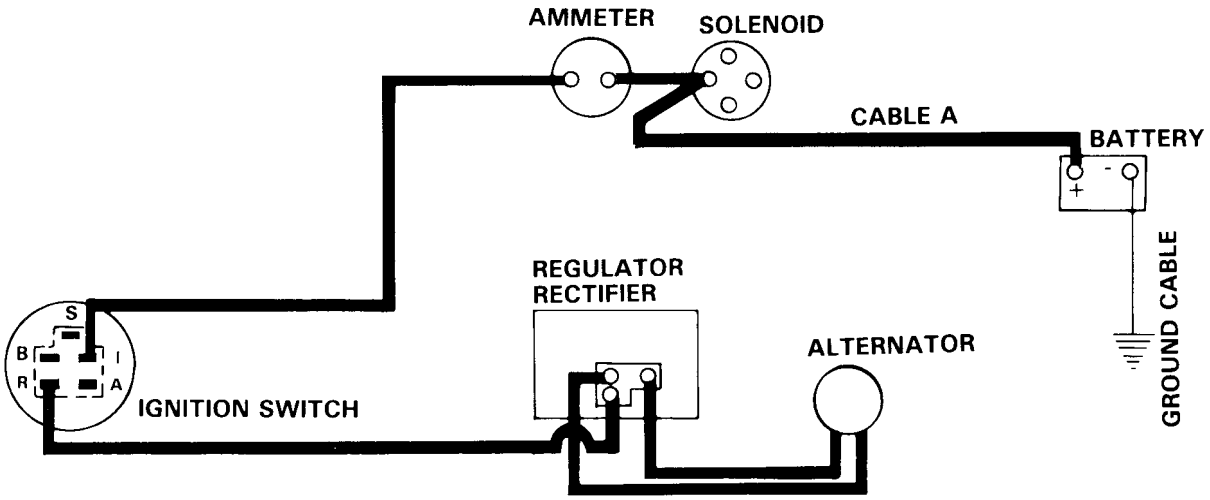


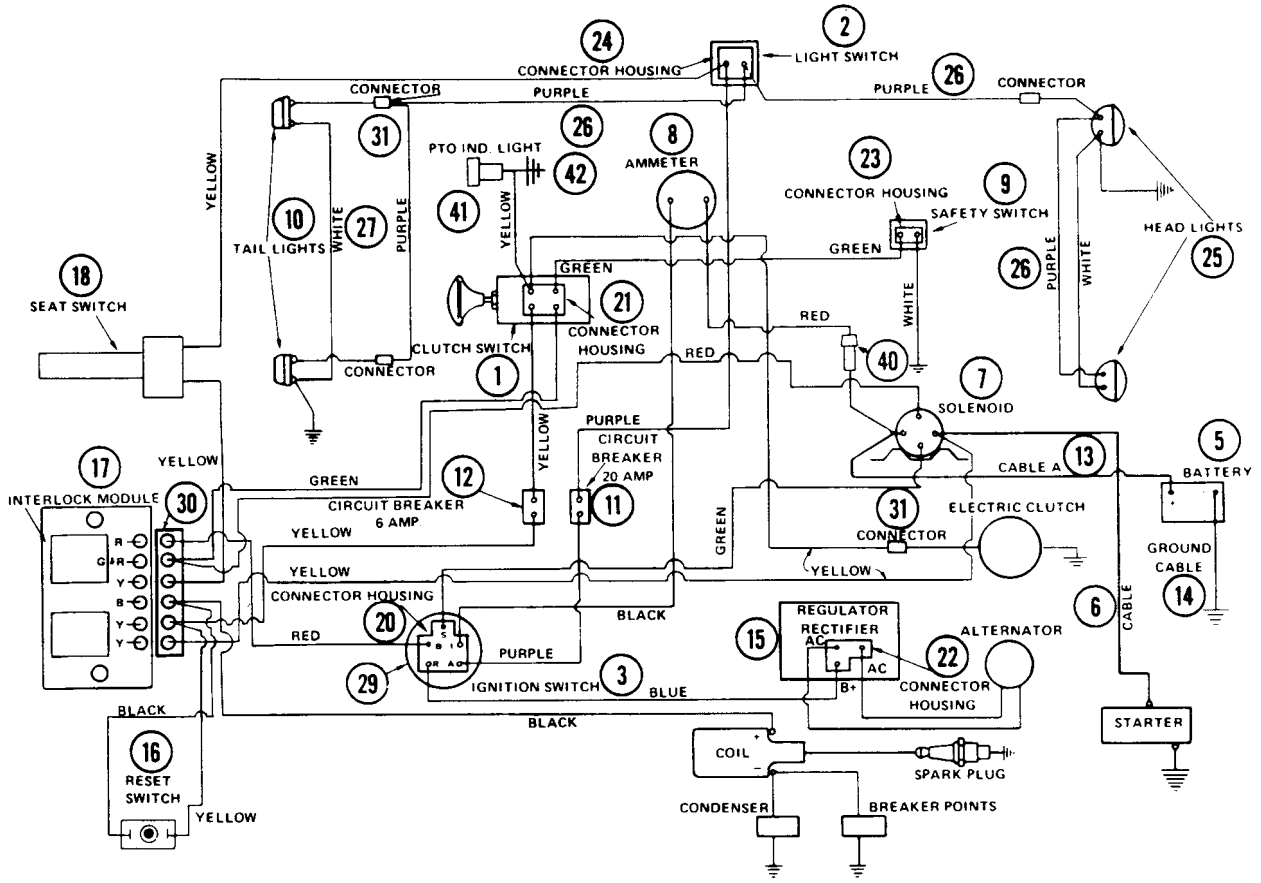
Figure 2-6-4: Charging



Electrical

Equipped With Interlock Module 31976 or 531099 (6 Terminals, Item 17)

Models 931013, 14, 15, 16, 17, 18



Item	Description
1	SWITCH, Clutch
2	SWITCH, Lights
3	SWITCH, Ignition
5	BATTERY, 12 Volt
6	CABLE ASS'Y, Solenoid to Starter
7	SOLENOID STARTER SWITCH
8	AMMETER
9	SWITCH, Safety
10	TAIL LIGHT
11	CIRCUIT BREAKER, 20 Amp
12	CIRCUIT BREAKER, 6 Amp
13	CABLE, Battery to Solenoid
14	CABLE, Battery to Ground
15	REGULATOR RECTIFIER KOHLER 237335
16	SWITCH, Reset
17	INTERLOCK MODULE
18	SEAT SWITCH

Item	Description
20	CONNECTOR HOUSING, 5 Wire
21	CONNECTOR HOUSING, 4 Wire
22	CONNECTOR HOUSING, 3 Wire
23	CONNECTOR HOUSING, 2 Wire
24	CONNECTOR
25	HEAD LIGHT
26	WIRE HARNESS, Headlight & Clutch
27	WIRE HARNESS, Tail Light
29	DASH HARNESS
30	INTERLOCK MODULE HARNESS
31	WIRE CONNECTOR
40	STD, 30a SAE FUSE
41	PTO INDICATOR LIGHT STD, 12 PSB LAMP
42	GROUND WIRE

Figure 2-7: Schematic for 931013 thru 931018 with Module 31976 or 531099

Electrical

Charging Circuit Revisions

Models 931019, 20, 21, 22, 23 & 24

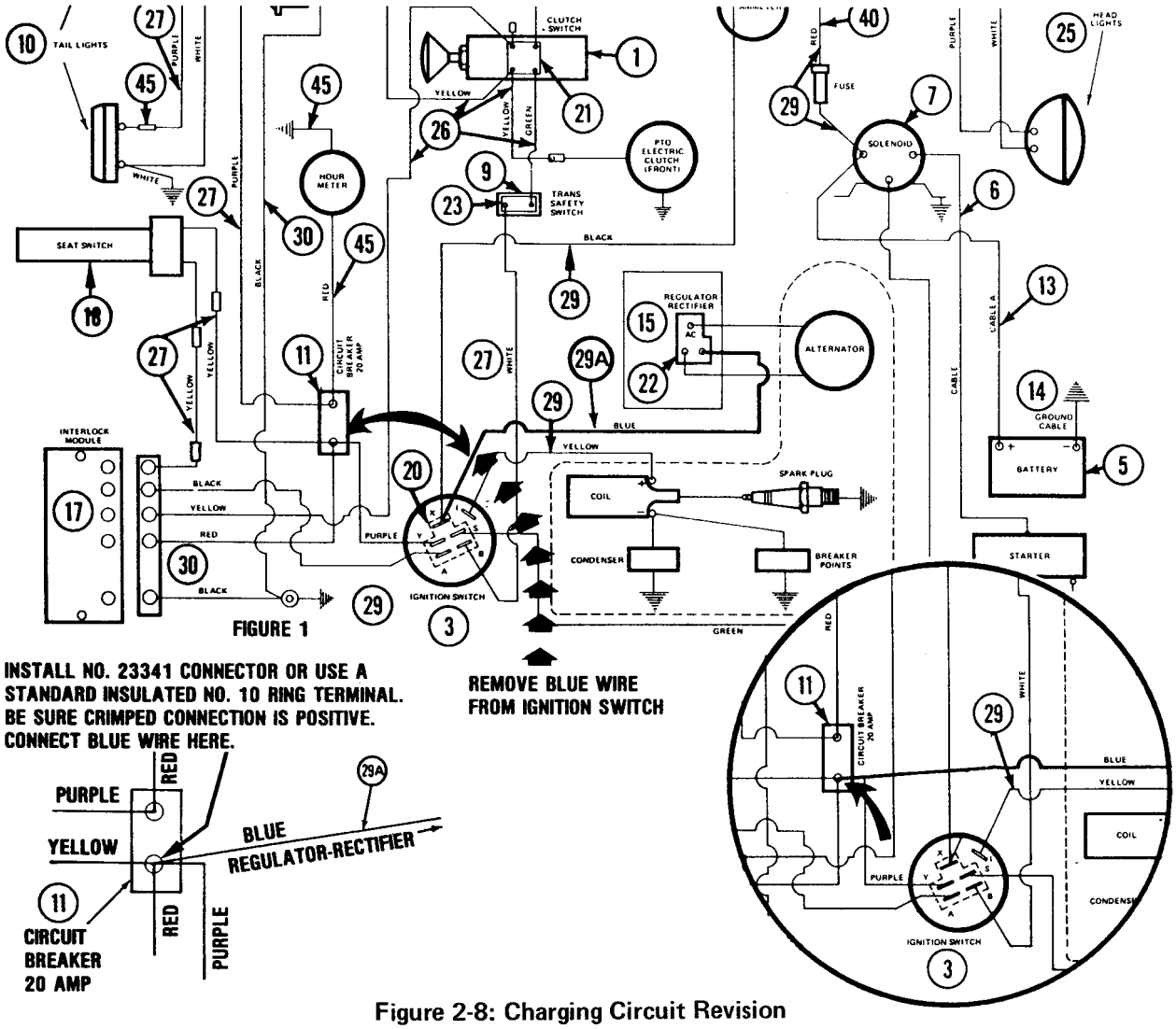


Figure 2-8: Charging Circuit Revision

Problems in maintaining the battery charge or in the need for frequent charging may be caused by diode tolerances in the regulator-rectifier. A high tolerance diode allows drain from the battery when the tracctor is not in use and charging the battery. A low tolerance diode allows negligible current drain.

To rectify these problems, revise the wiring as follows:

1. Remove the Blue Wire (29A) from the Ignition Switch (3). This is the wire that runs to the switch from the regulator-rectifier.

2. Install a No. (23341) Connector or a standard insulated No. 10 ring terminal on the end of the Blue Wire (29A).

3. Connect the end of the Blue Wire to the terminal on the 20 amp. Circuit Breaker (11). This is the terminal with Yellow, Red and Purple wires already connected. See Figure 9-13.

This procedure will remove the Regulator-Rectifier from the power source when the tractor is not in use.

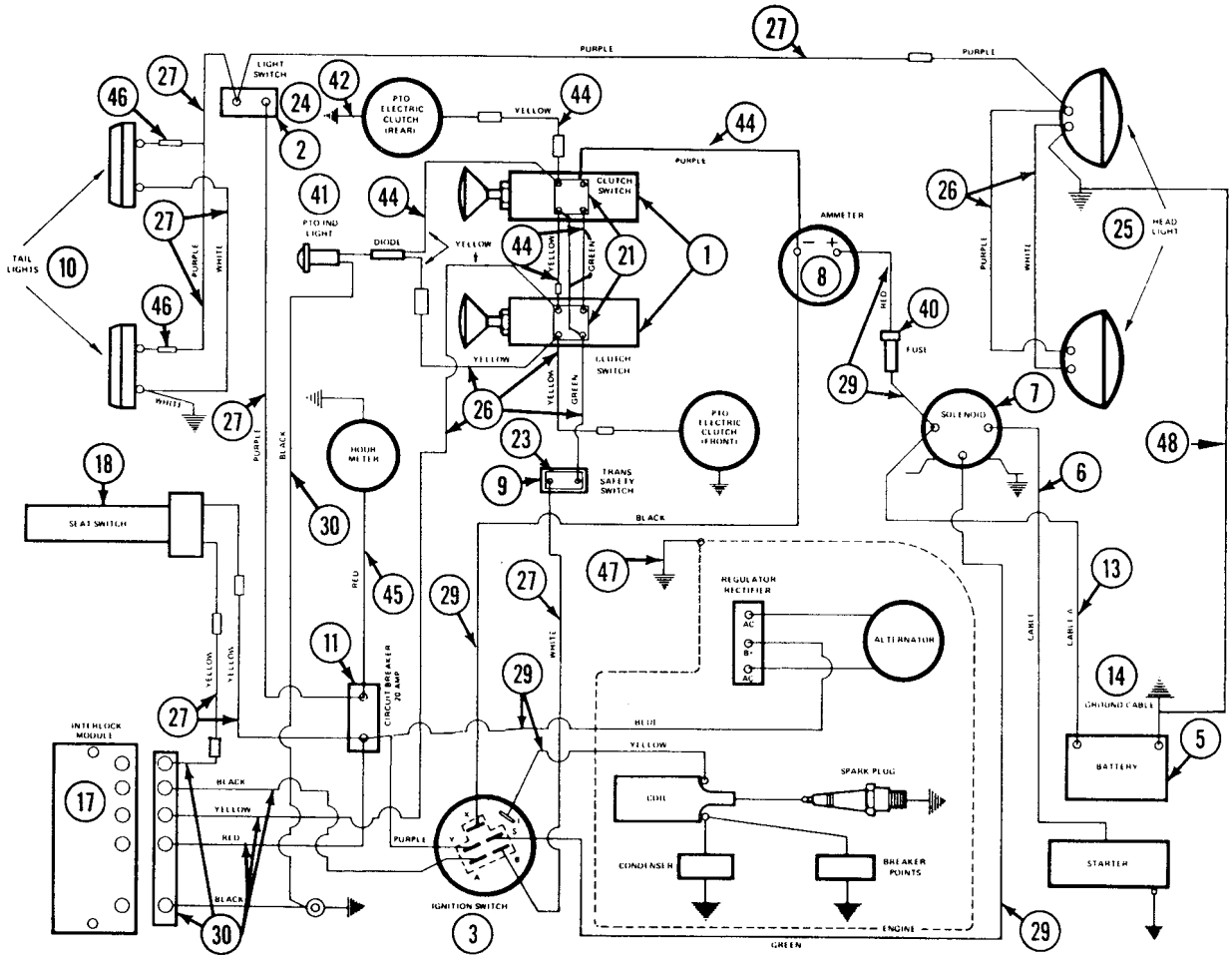
This product change has been instituted in all new production of tractors starting with the following serial numbers:

Model 931019 – 003560
Model 931020 – 000101
Model 931021 – 000401
Model 931022 – 001624
Model 931023 – 002871
Model 931024 – 001429

Electrical

With 30172 Interlock Module (5 Terminals, Item No. 17)

Models 931019 thru 931026



REF. NO.	DESCRIPTION	REF. NO.	DESCRIPTION
1	Switch, Clutch	26	Wire Harness, Headlight & Clutch
2	Switch, Lights	27	Wire Harness, Tail Light
3	Switch, Ignition	29	Dash Harness
5	Battery, 12 Volt	30	Interlock Module Harness
6	Cable Ass'y, Solenoid to Starter	40	Std. 30 a SAE Fuse
7	Solenoid Starter Switch	41	PTO Indicator Light (Consists of)
8	Ammeter		Lens
9	Switch, Safety		Lamp Socket
10	Tail Light		Speed Nut
11	Circuit Breaker, 20 Amp	42	Ground Wire
13	Cable, Battery to Solenoid	44	PTO Harness
14	Cable, Battery to Ground	45	Wire Harness Hour Meter
17	Interlock Module	46	Clip
18	Seat Switch	47	Cable, Engine to Ground
20	Connector Housing, 5 Wire	48	Ground Wire
21	Connector Housing, 4 Wire		
23	Connector Housing, 2 Wire		
24	Connector		
25	Headlight		

Figure 2-9: Schematic for Models 931019 thru 931026 with Module 30172

Electrical Wiring Diagram

Models 931019 thru 931026

Figure 2-10: Start

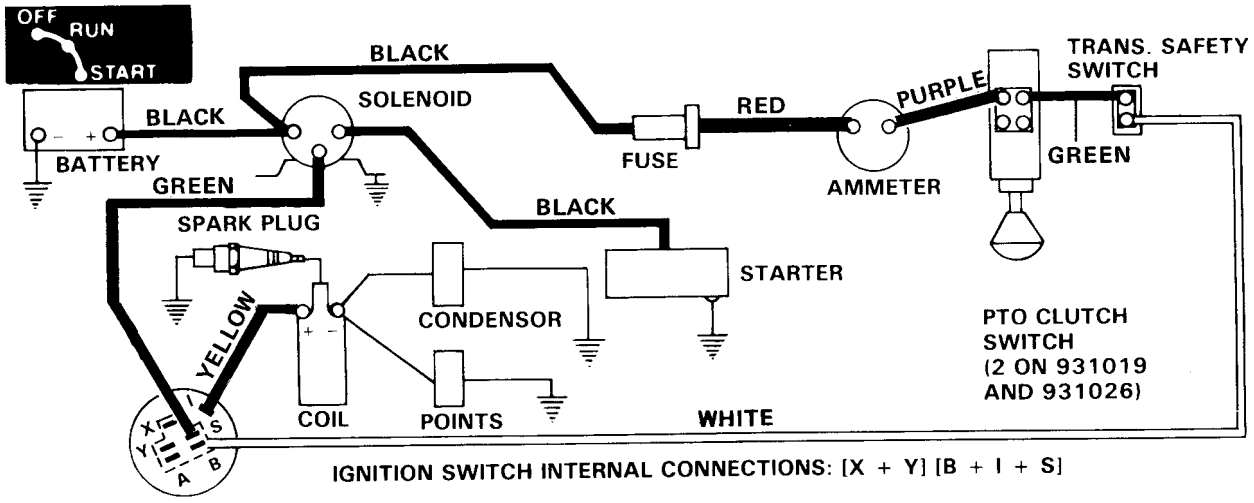
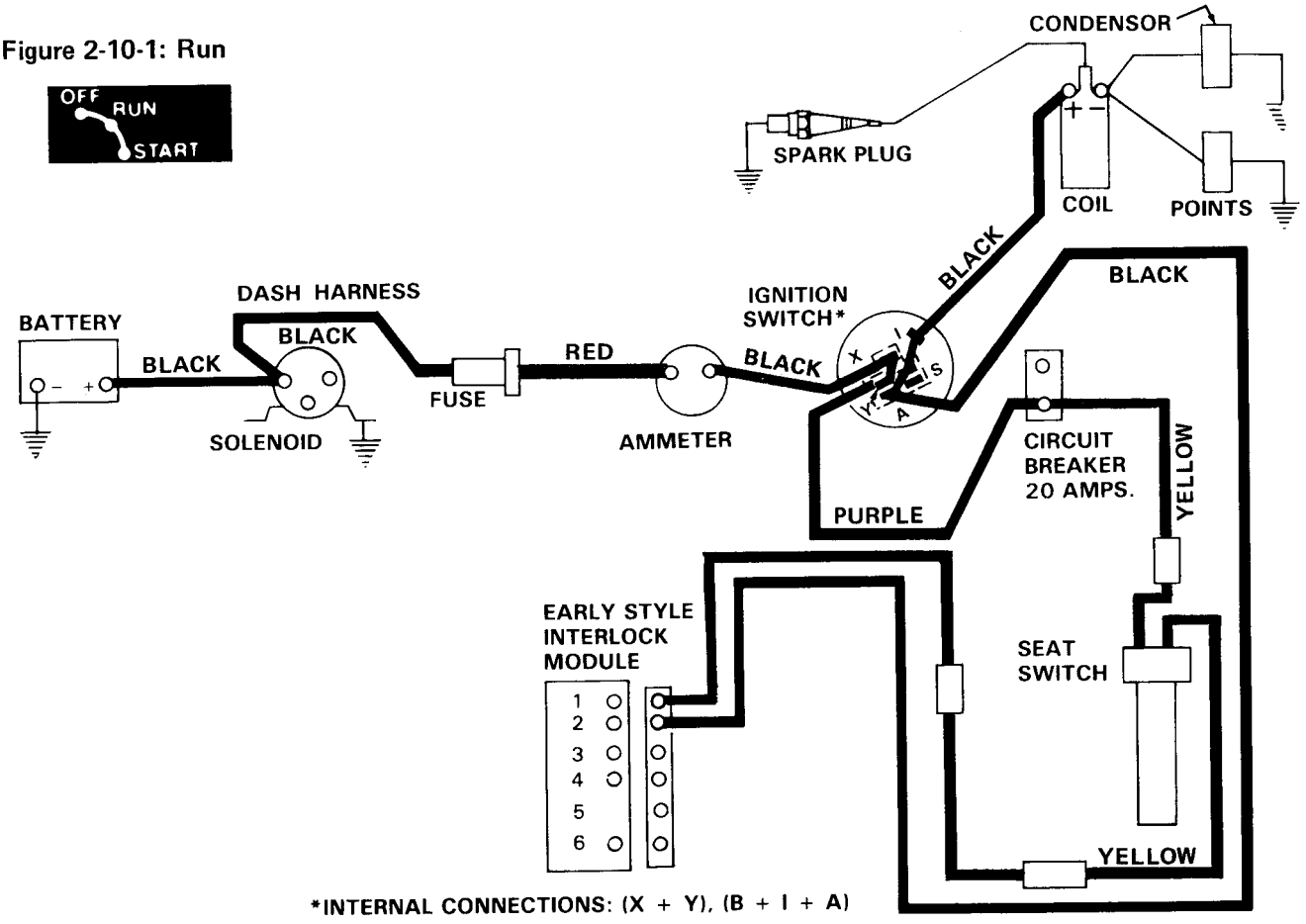


Figure 2-10-1: Run



Electrical Wiring Diagram

Models 931019 thru 931026

Figure 2-10-2: Lighting and Charging

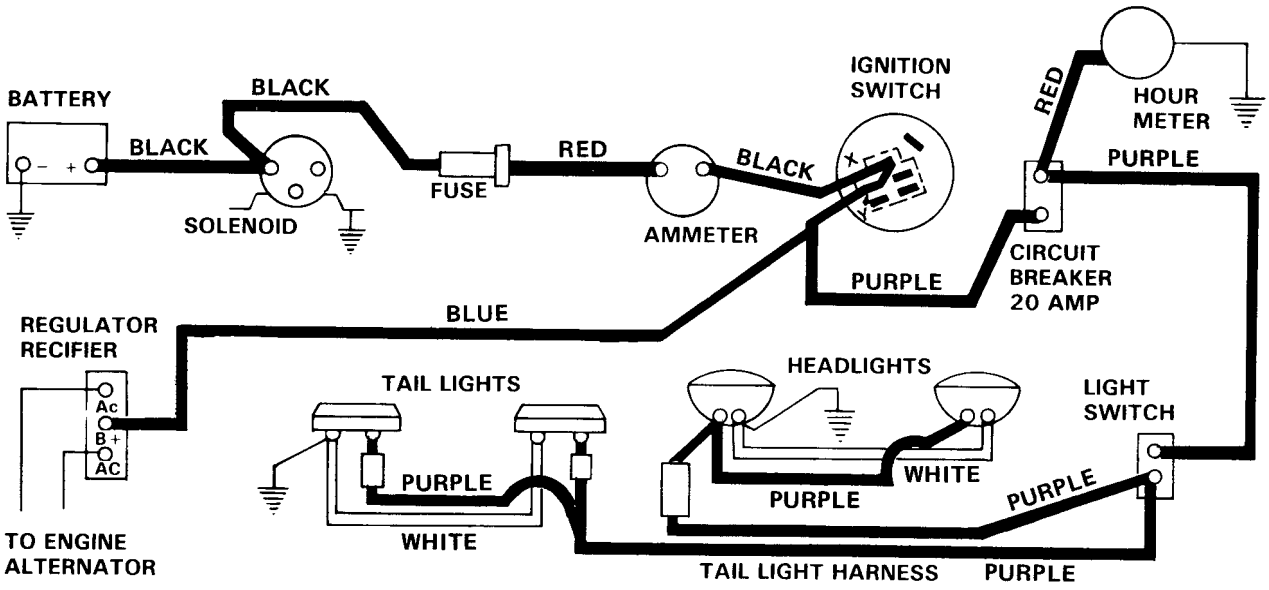
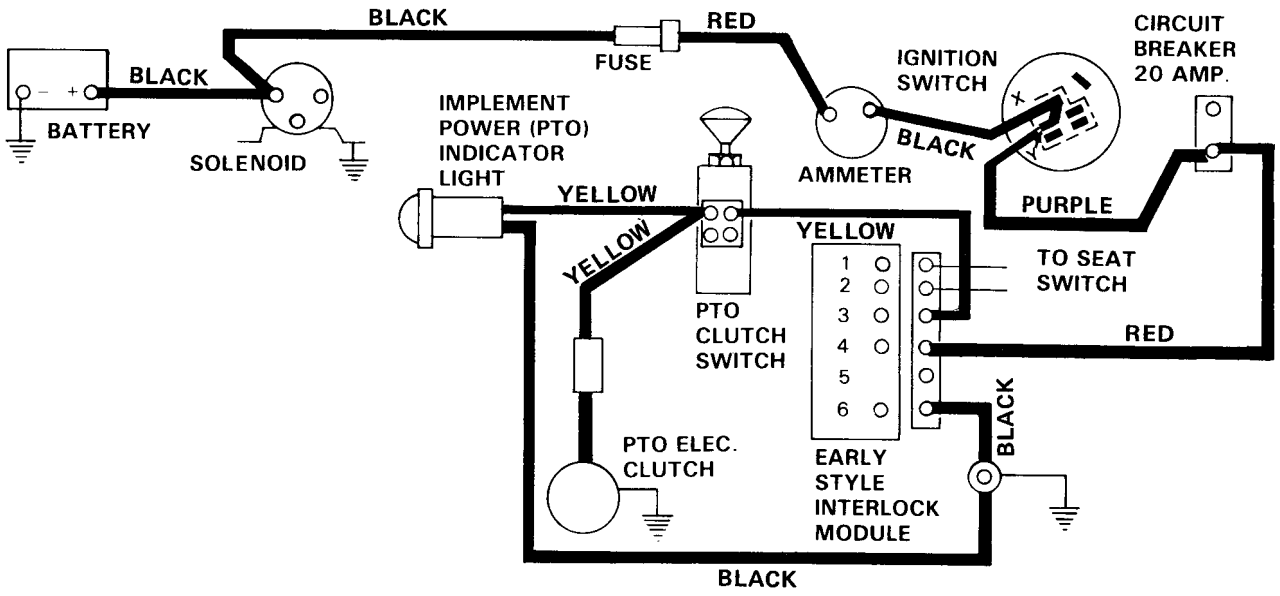


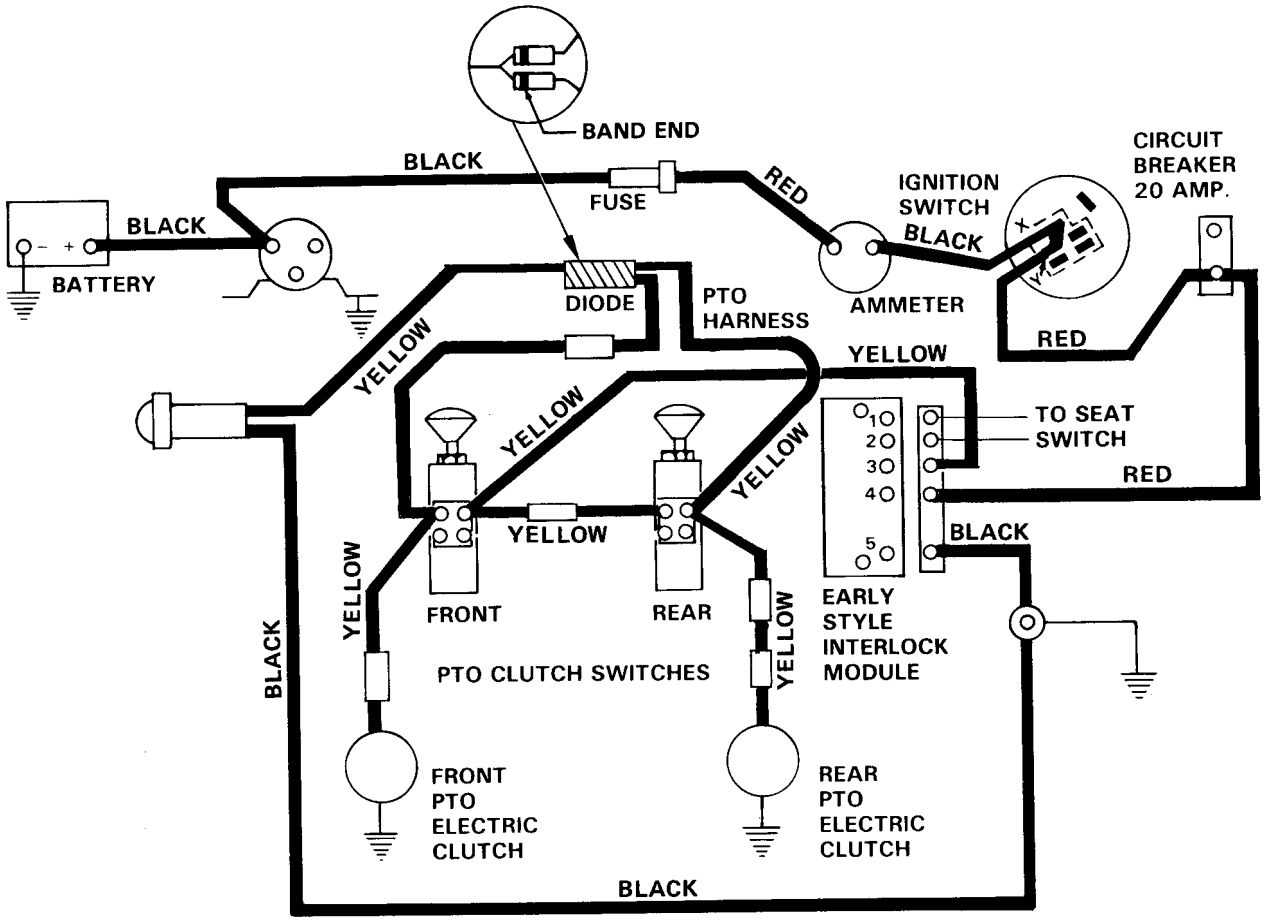
Figure 2-10-3: PTO Engaging (Front Only)



Electrical Wiring Diagram

Models 931019 thru 931026

Figure 2-10-4: PTO Engaging (Front and Rear)



Electrical

With 531160 and 531236 Interlock Time Delay Module (Item 17 & 27)

Models 931019 thru 931026

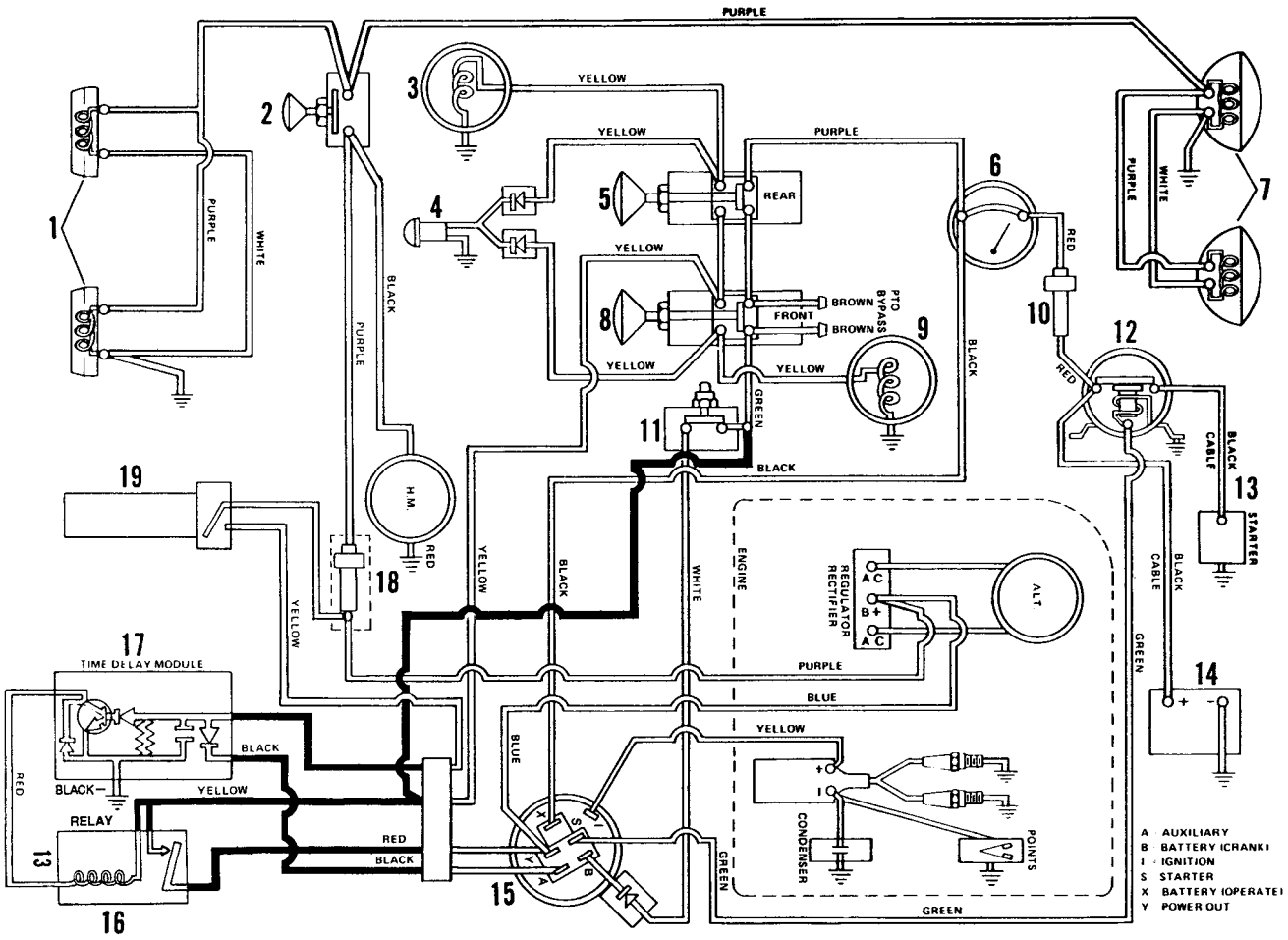


Figure 2-11: Schematic for Models 931019 thru 931026 with Module 531160 and 531236

ITEM NO	DESCRIPTION	QTY	ITEM NO	DESCRIPTION	QTY
1	Tail Lights	2	11	Neutral Switch	1
2	Light Switch	1	12	Solenoid	1
3	Rear PTO Clutch	1	13	Starter	1
4	PTO Indicator Light	1	14	Battery	1
5	Rear PTO Switch	1	15	Ignition Switch	1
6	Amp Meter	1	16	Relay	1
7	Head Lights	2	17	Time Delay Module	1
8	Front PTO Switch	1	18	20 Amp Circuit Breaker or Fuse	1
9	Front PTO Clutch	1	19	Seat Switch	1
10	7 Amp Fuse	1			

Notes

531160 and 531236 Interlock Module Service Assembly

FOR 931000 GARDEN TRACTORS MODELS 931019 THROUGH 931028, EQUIPPED WITH TRANSISTOR INTERLOCK MODULE BOARD.

Electrical

531160 & 531236 Interlock Module Service Assembly

Parts included in the 531160 assembly are as follows:

1. Adapter Module Harness
2. Receptical
3. Insulator
4. Diode Assy.
5. Interlock Plug
6. Time Delay Module
7. Relay
8. Terminal Housing

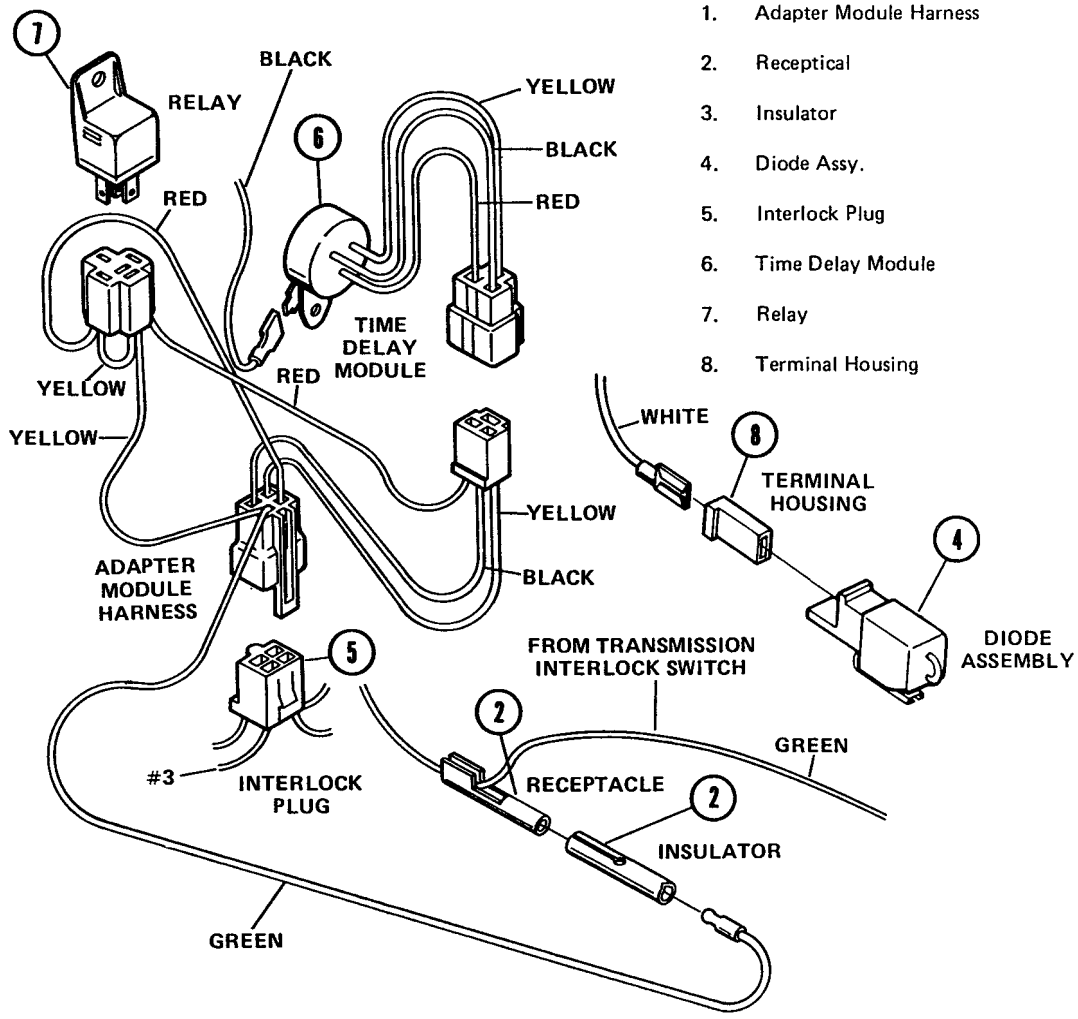


Figure 2-12: 531160 and 531236 Module Installation

Electrical

531160 & 531236 Interlock Module Service Assembly

WARNING: Storage batteries give off highly inflammable hydrogen gas. DO NOT allow sparks or flame near battery. DO NOT lay tools across battery terminals which may cause a spark resulting in an explosion.

CAUTION: Electrolyte contains sulphuric acid which is harmful to skin, eyes and clothing. Handle with EXTREME CARE. If spillage occurs on body or clothing, rinse at once with water.

NOTE: For ease of installation on gasoline engine models remove battery cables, battery, battery tray and battery stand from tractor.

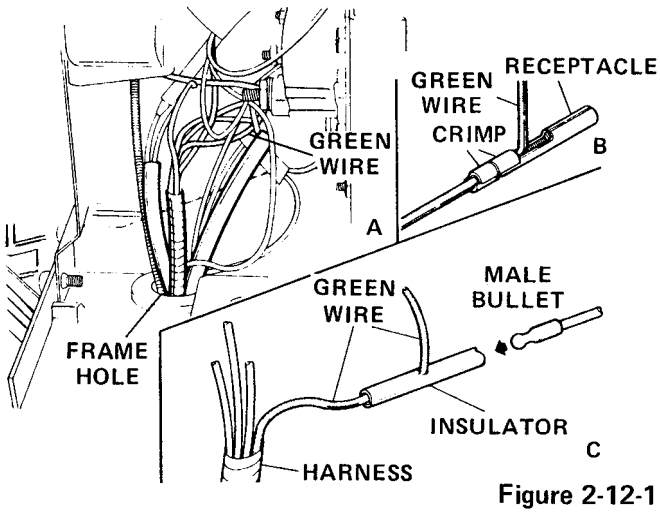


Figure 2-12-1

1. Install receptacle and insulator.

NOTE: Do Not cut wire or strip insulation.

   a. Locate green wire from the transmission interlock switch in wiring harness (Figure 2-11-1A) and install receptacle (Figure 2-22-1B).

   b. Slide insulator over end of receptacle (Figure 2-11-1C).

   c. Install green wire male bullet from new adapter harness (Figure 2-11-1C).

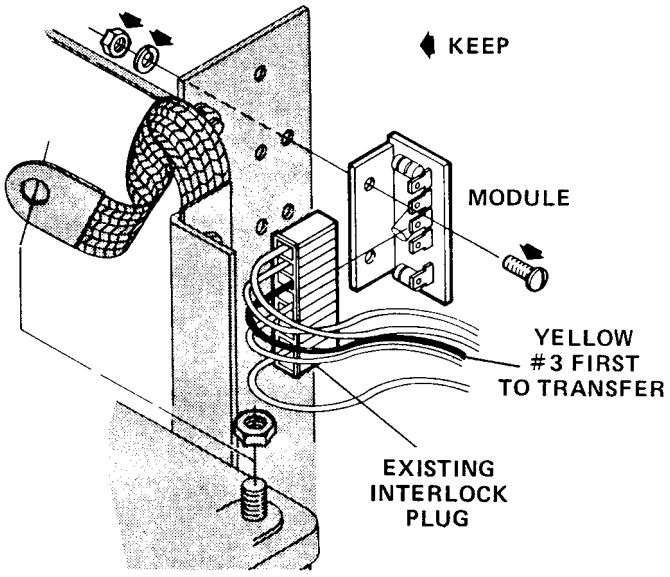


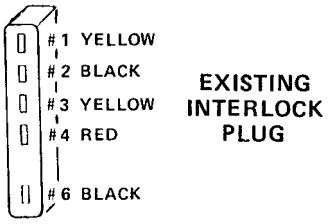
Figure 2-12-2

2. Remove (existing) interlock module. See Figure 2-11-2.

NOTE: DO NOT remove or disturb any other wiring at this time.

   a. Pull plug from module.

   b. Remove and discard module, keep screws, lock washers and nuts for re-use.



3. Install new interlock plug. See Figure 2-11-3.

NOTE: Transfer No. 3 wire first.

   a. Transfer leads one at a time. Use a small screwdriver to release locking tangs.

   b. Leave No. 6 (Black connected to old plug at this time.

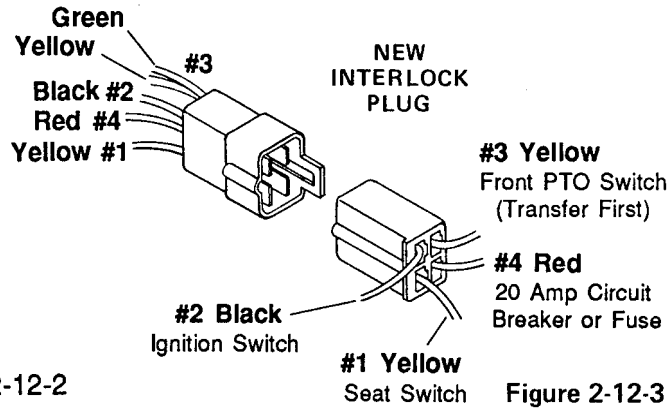


Figure 2-12-3

4. Install (new) time delay module and relay.

   a. Insert screw, removed before, through top hole in dash support through mounting ear of module (not connector tab) and plastic ear of relay.

   b. Secure with lockwasher and nut so that ears of the relay and module mesh flat.

   c. Transfer No. 6 black wire from existing interlock module to small tab on time delay module.

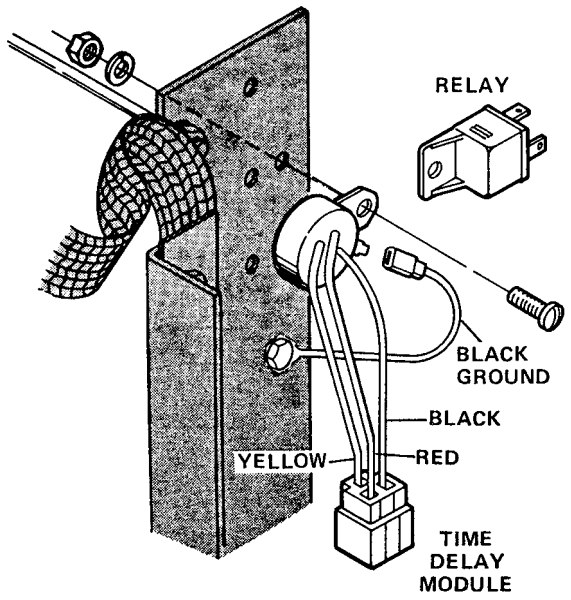


Figure 2-12-4

5. Connect plugs to relay, time delay module plug and interlock plug.

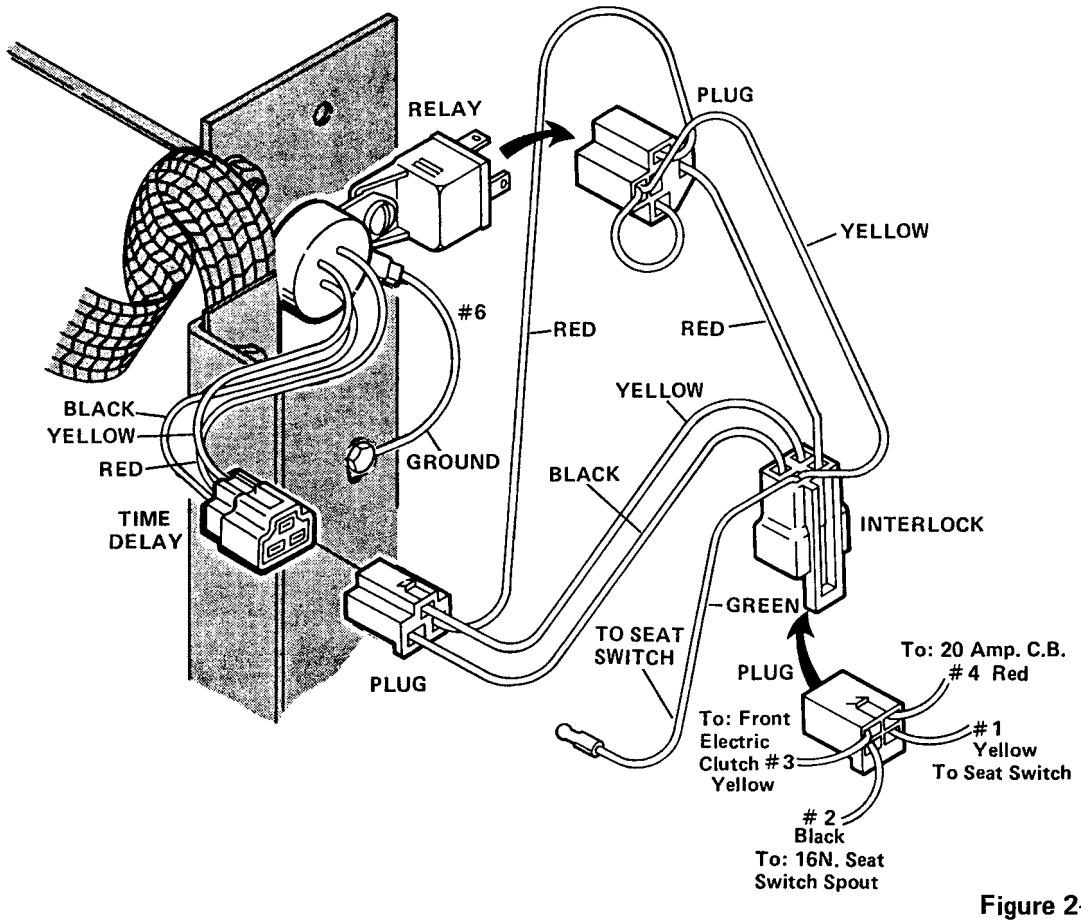


Figure 2-12-5

6. Install diode.

   a. Unplug plug from ignition switch.

   b. Remove white lead from B terminal of plug by depressing tang.

   c. Install terminal housing over white wire terminal and install to diode.

   d. Plug diode terminal into hole for white lead.

   e. Tape diode assembly to top of ignition switch plug.

   f. Plug assembly into ignition switch.

7. Reinstall battery.

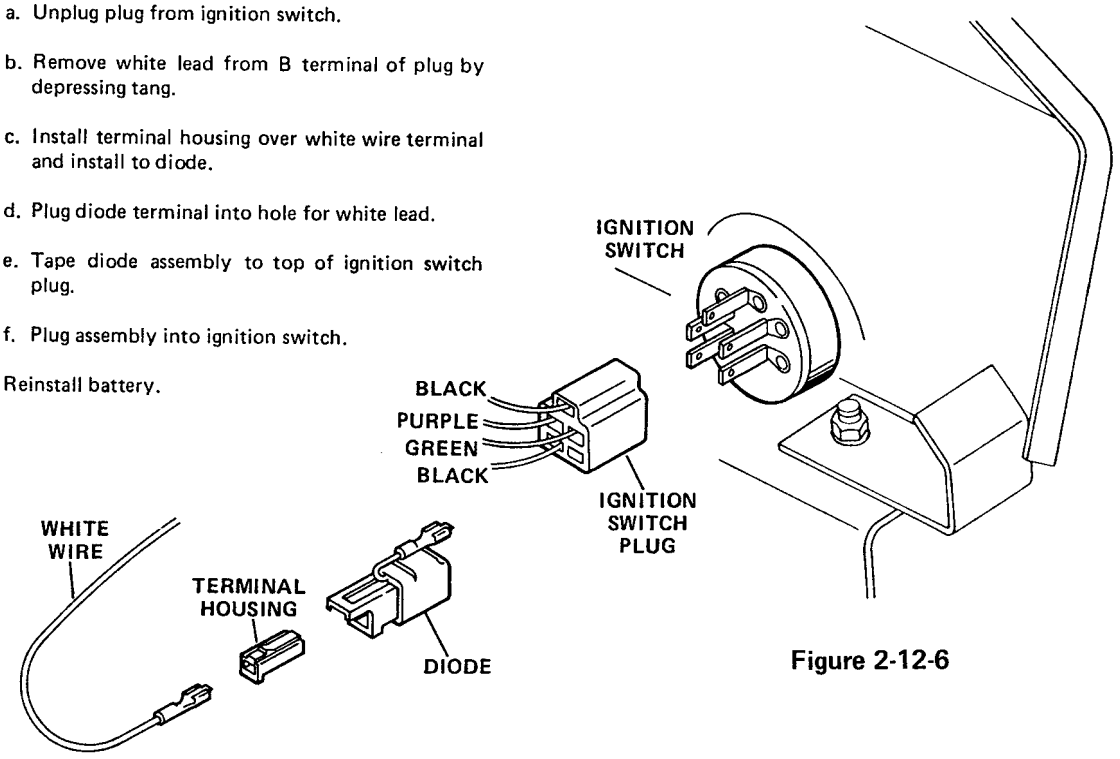


Figure 2-12-6

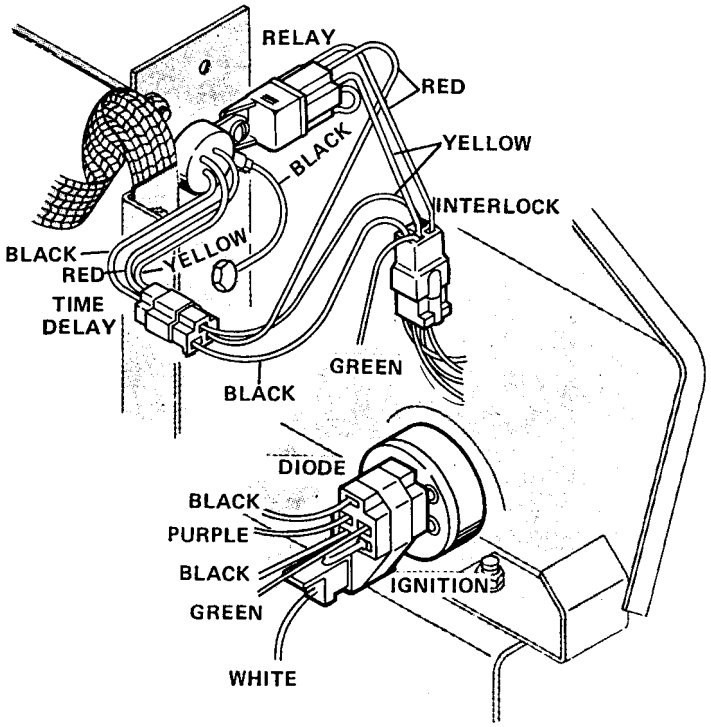


Figure 2-12-7

WARNING: Reversed battery cables or reversed cables from a battery charger or booster battery can cause damage to the product. Sparks and potential hazards to operator could result. Make certain the ground cable is connected to the frame and the positive cable is connected to the positive (+) terminal.

Electrical

GASOLINE ENGINE

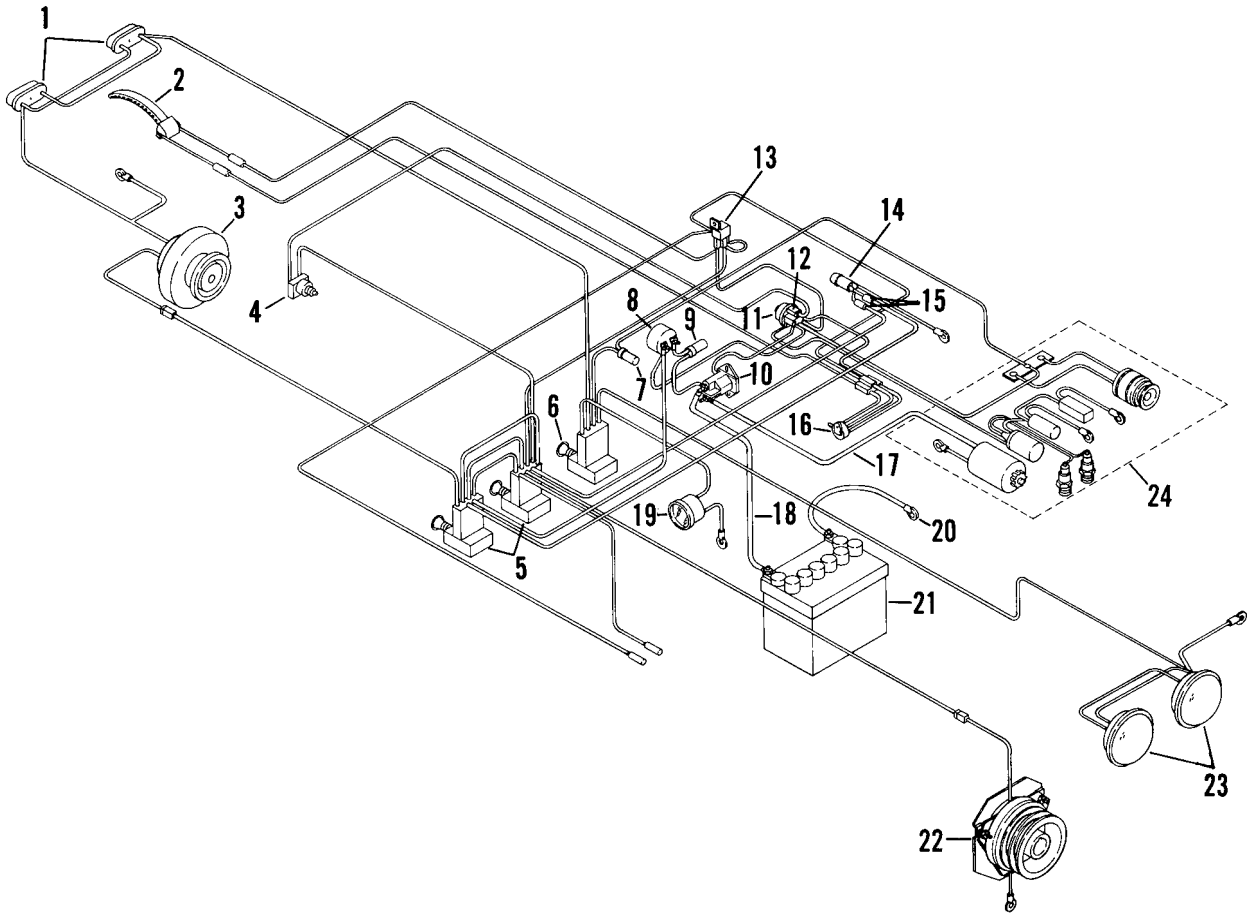


Figure 2-13: Wiring Pictorial - Gasoline Engine

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Tail Lights	13	Relay
2	Seat Switch	14	P.T.O. Light
3	Rear P.T.O. Clutch	15	Diodes
4	Safety Switch	16	Time Delay Module
5	Clutch Switch	17	Starter Cable
6	Light Switch	18	Battery Cable (Positive)
7	7 Amp Fuse	19	Hour Meter
8	Ammeter	20	Battery Cable (Negative)
9	30 Amp Fuse	21	Battery
10	Solenoid	22	Front P.T.O. Clutch
11	Switch and Key Set	23	Head Lights
12	Diodes	24	Engine

DIESEL ENGINE

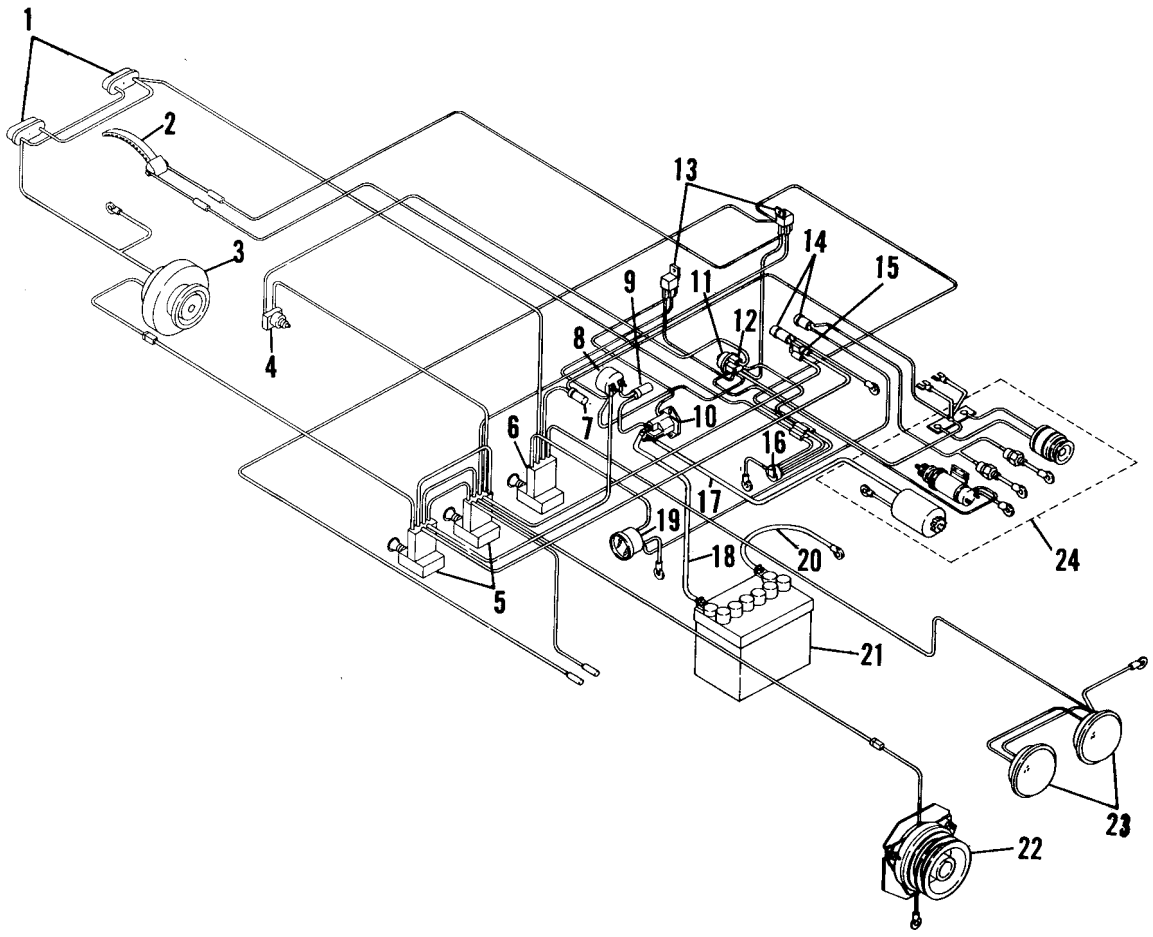


Figure 2-14: Wiring Pictorial - Diesel Engine

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Tail Lights	13	Relay
2	Seat Switch	14	P.T.O. Light
3	Rear P.T.O. Clutch	15	Diodes
4	Safety Switch	16	Time Delay Module
5	Clutch Switch	17	Starter Cable
6	Light Switch	18	Battery Cable (Positive)
7	7 Amp Fuse	19	Hour Meter
8	Ammeter	20	Battery Cable (Negative)
9	30 Amp Fuse	21	Battery
10	Solenoid	22	Front P.T.O. Clutch
11	Switch and Key Set	23	Head Lights
12	Diodes	24	Engine

Electrical Schematic

Models 931019, 29

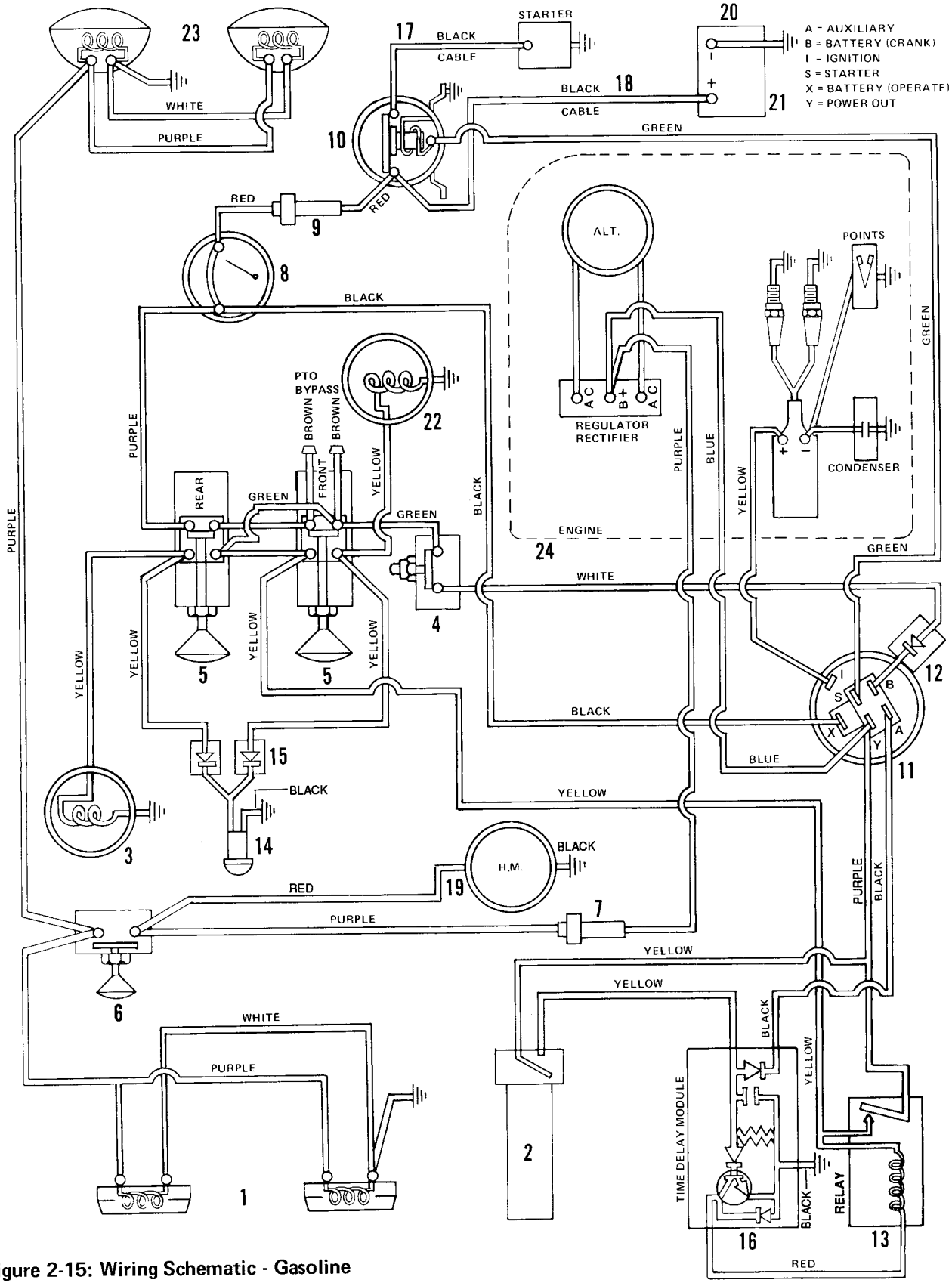


Figure 2-15: Wiring Schematic - Gasoline

Electrical Schematic

Models 931033,34

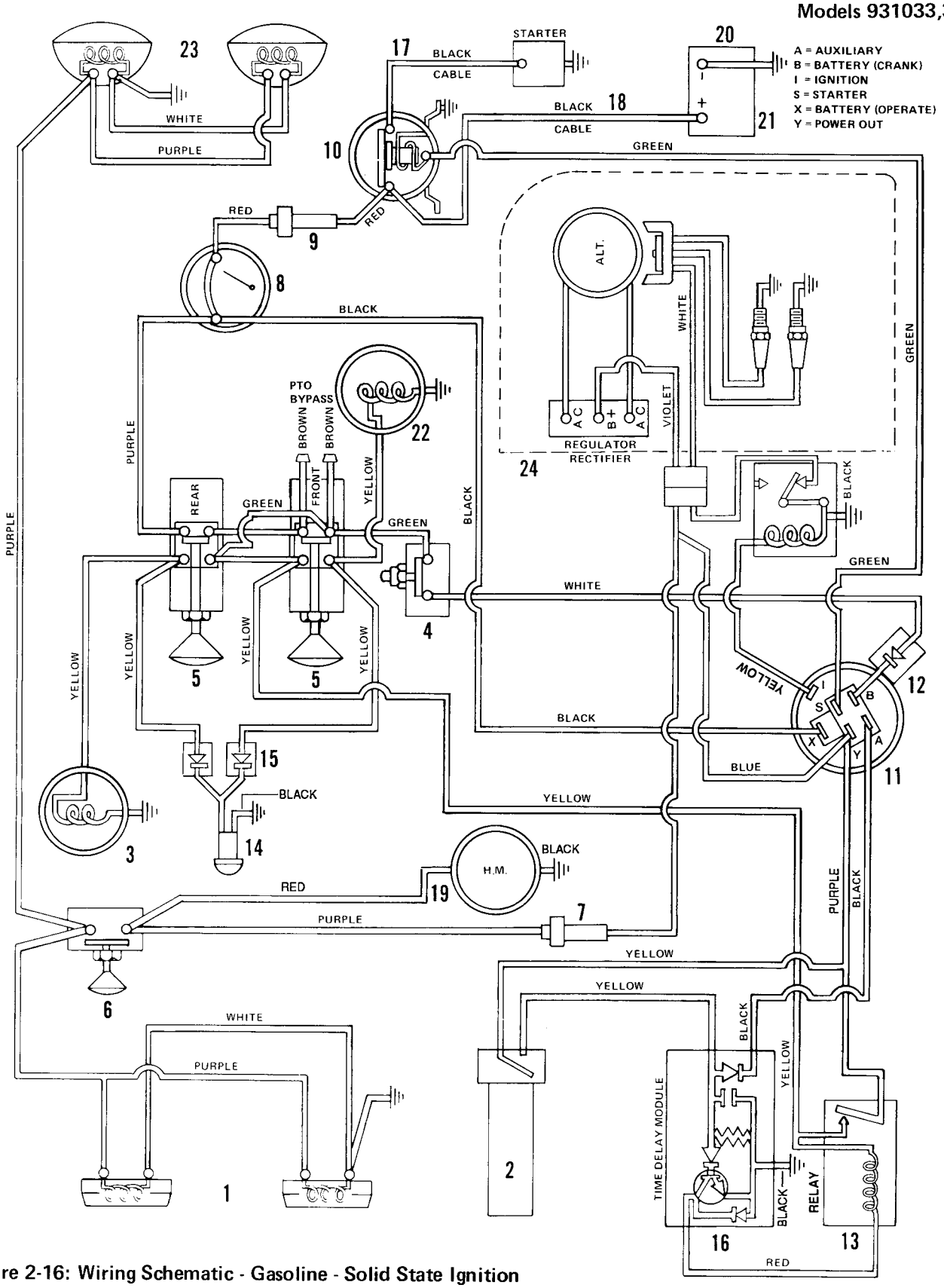


Figure 2-16: Wiring Schematic - Gasoline - Solid State Ignition

Electrical Schematic

Model 931030

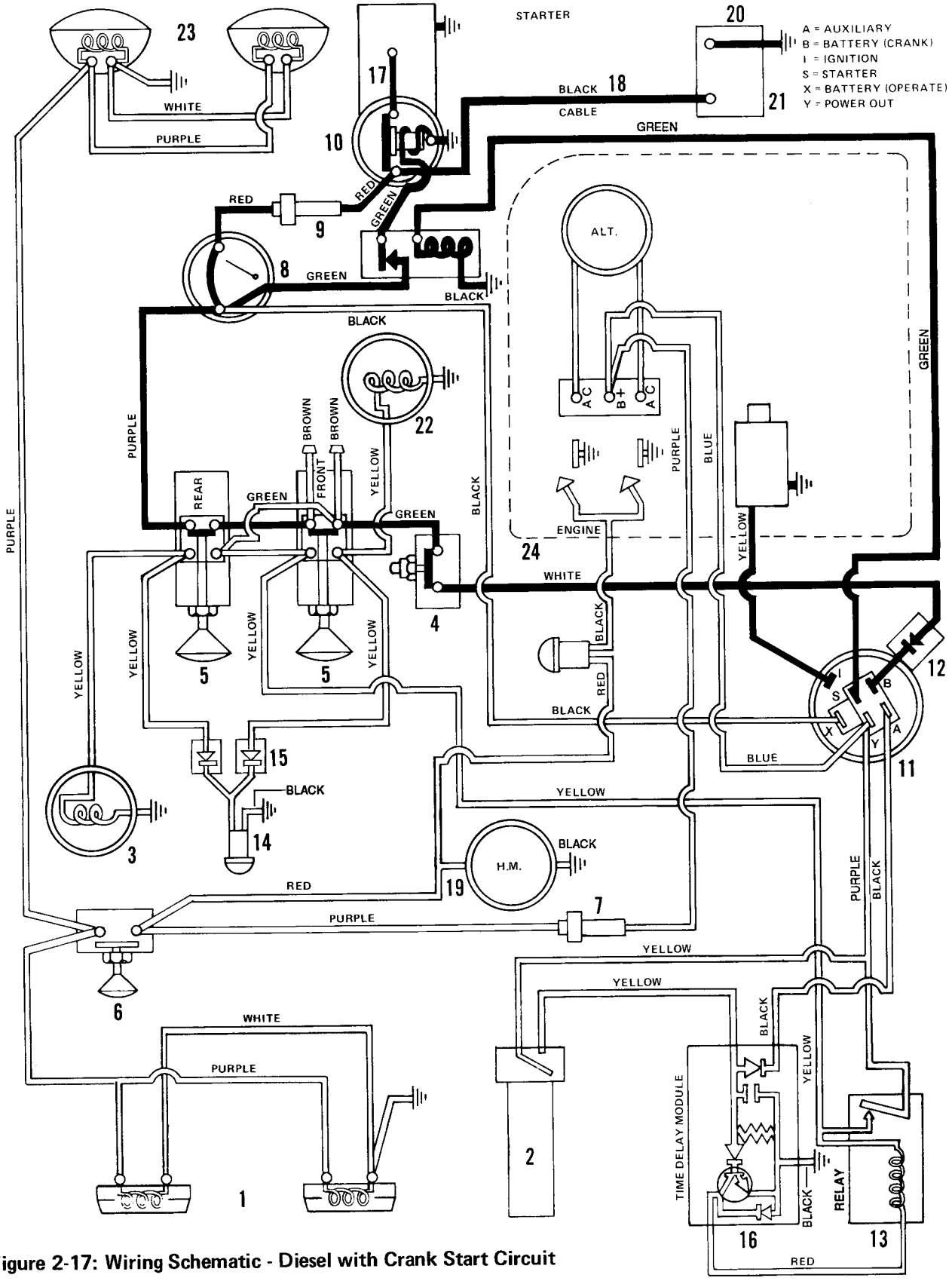


Figure 2-17: Wiring Schematic - Diesel with Crank Start Circuit

Electrical Schematic

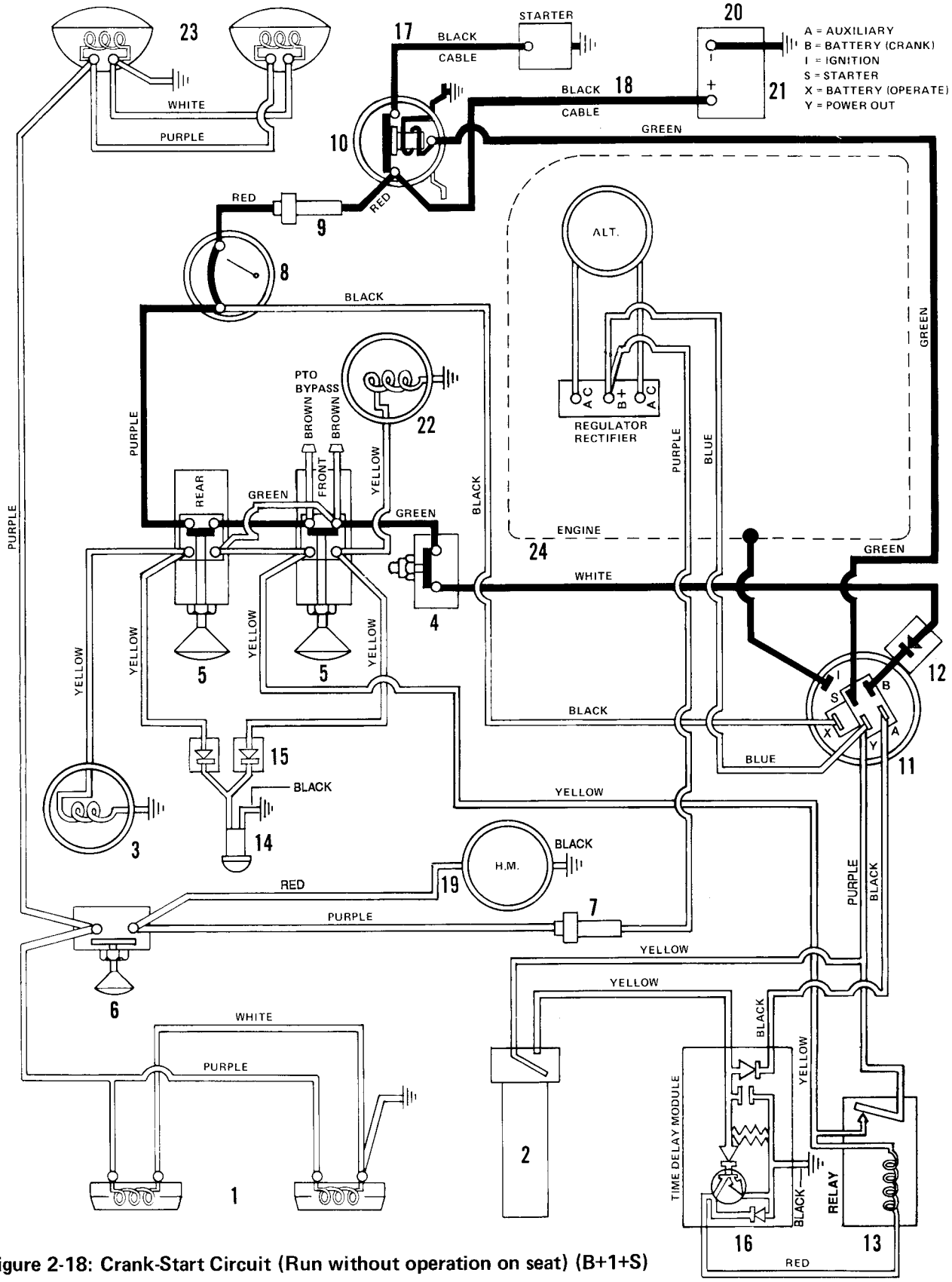


Figure 2-18: Crank-Start Circuit (Run without operation on seat) (B+1+S)

Electrical Schematic

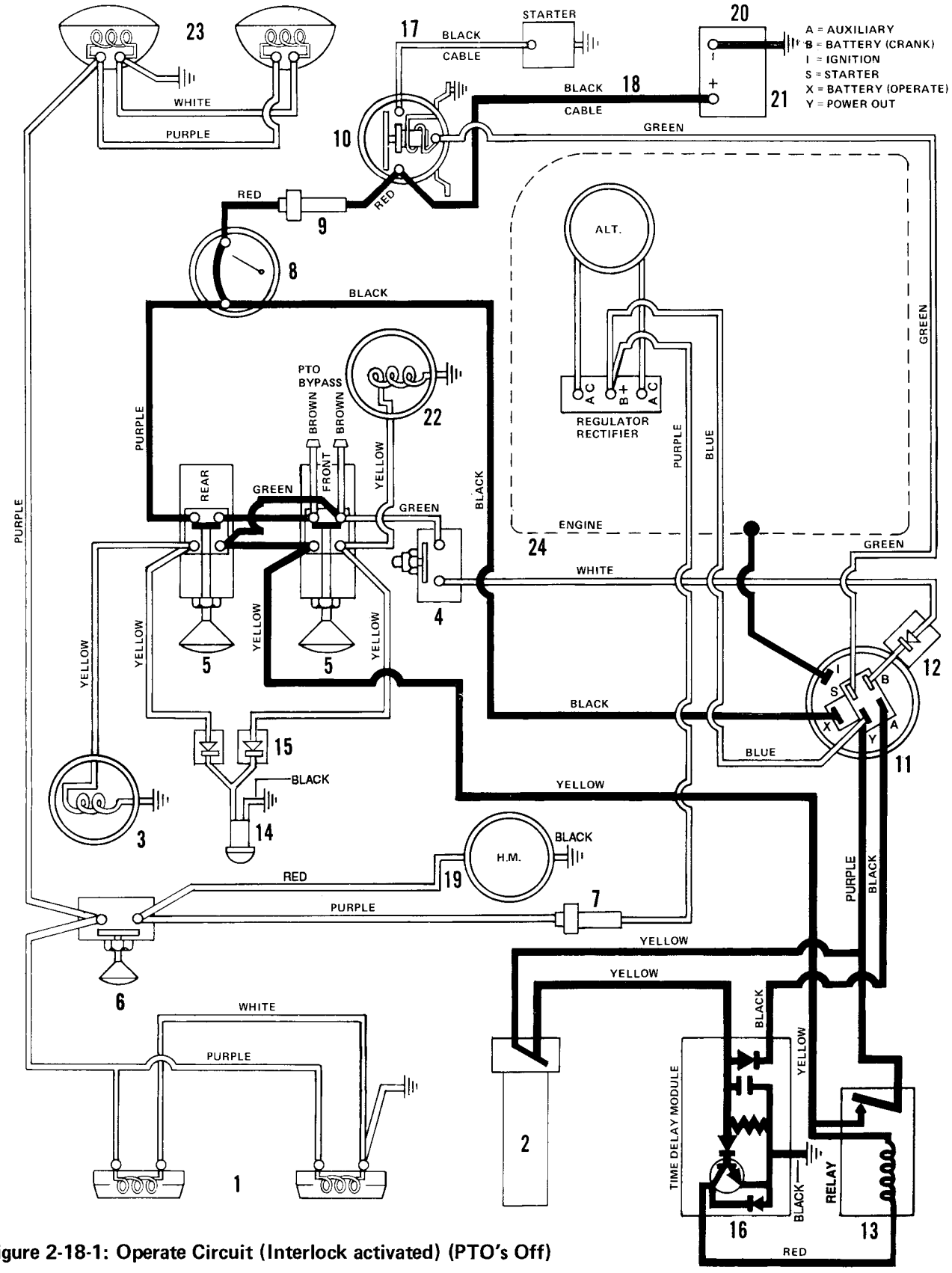


Figure 2-18-1: Operate Circuit (Interlock activated) (PTO's Off)

Electrical Schematic

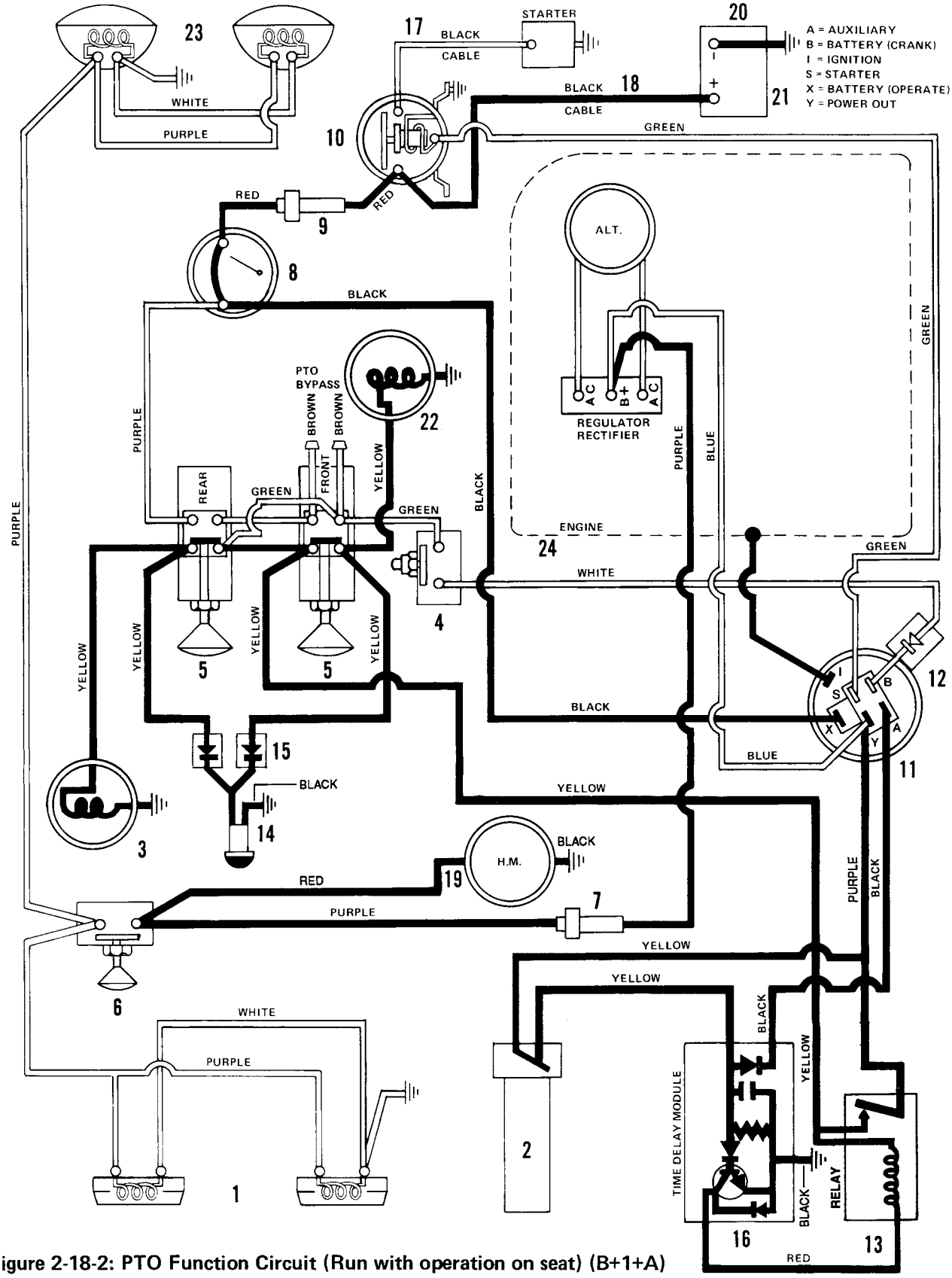


Figure 2-18-2: PTO Function Circuit (Run with operation on seat) (B+1+A)

Electrical Schematic

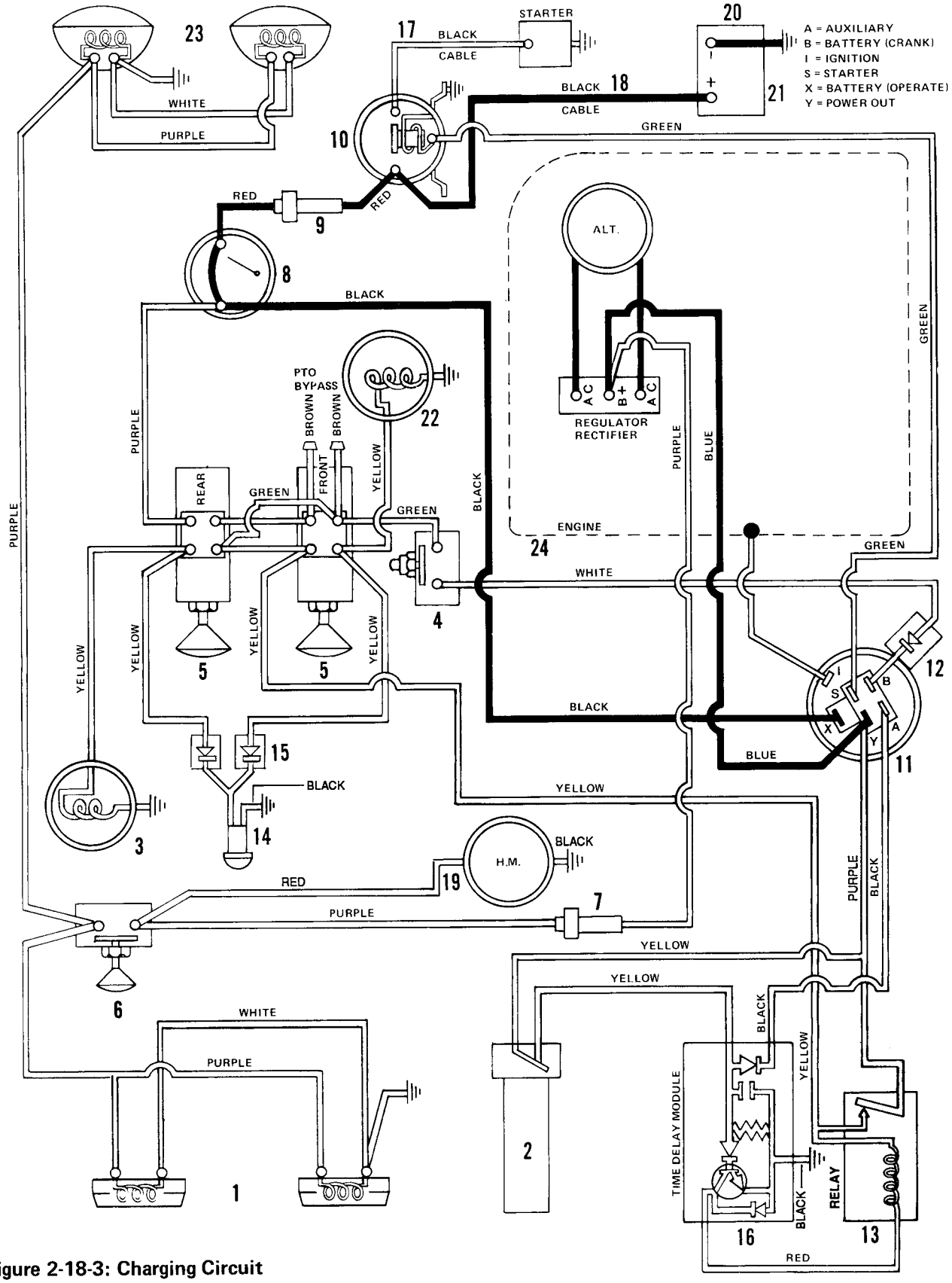


Figure 2-18-3: Charging Circuit

Electrical Schematic

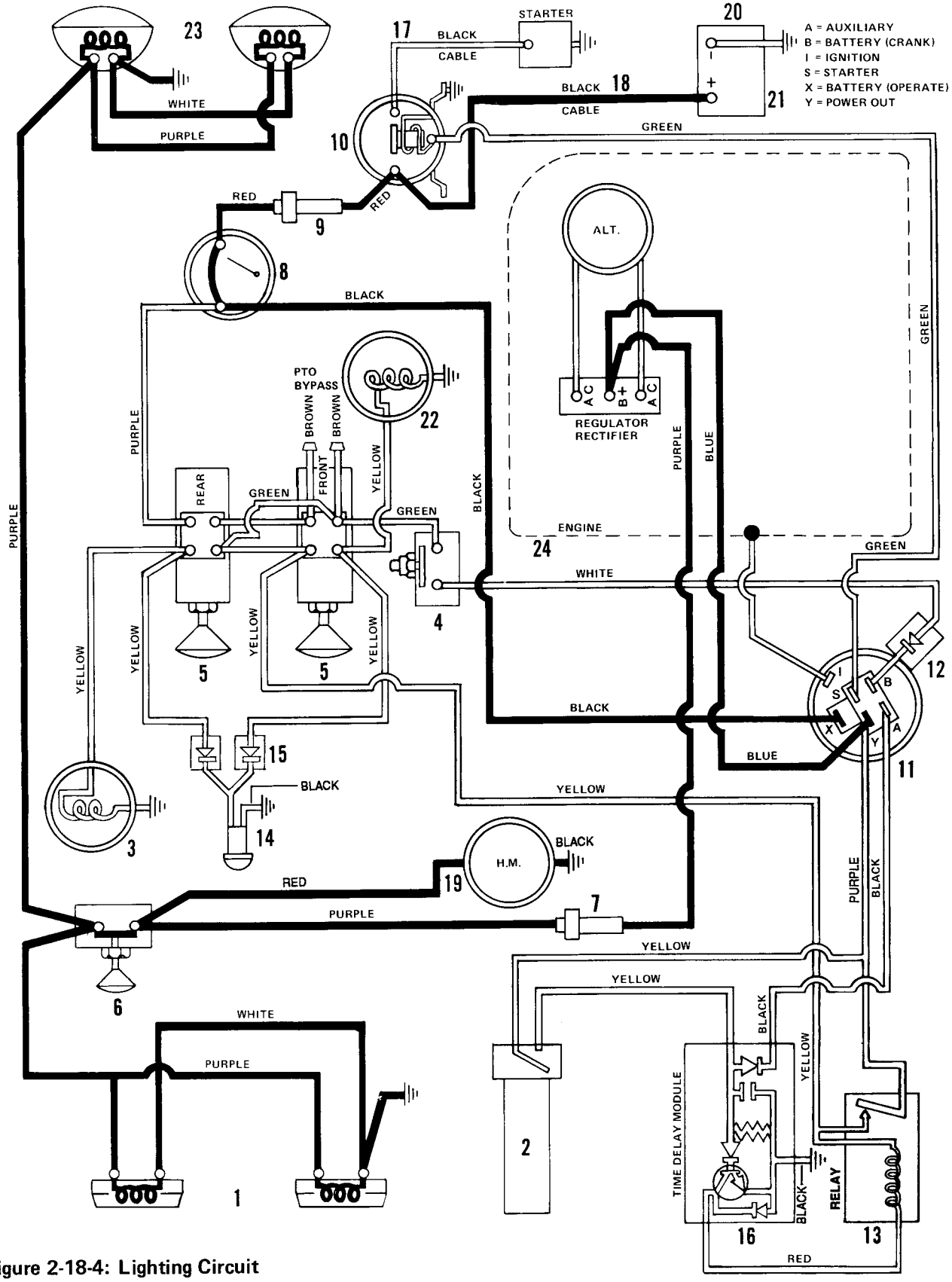


Figure 2-18-4: Lighting Circuit

2.5 Testing PTO Switches Front and Rear Console and Seat Switch

1. Connect black lead of meter to negative terminal of battery to common ground on frame. Place the red test lead on white wire located at the ignition switch. With console lever in park start and front and rear PTO switches in "off" position, the meter will read the same voltage as reached on the battery. When you move either PTO switches or console lever, the reading will drop to "0". If there is no power at the white wire, check console and PTO switches.

2. Place red lead of meter on yellow wire at module connector. Turn ignition switch on and push down on seat switch. The meter will read battery voltage. Engage front and (or) rear PTO switches, and you will notice the implement light will come on. You will also hear the PTO switches click on. Hold seat switch down and turn off the PTO switches and then the ignition switch to "off" position. The meter will read voltage until you lift your hand off of the seat. Notice that when the meter reading drops to "0" you can hear the relay release or click. If you jump the seat switch, you will not allow the relay to shut off, causing the battery to drain down. If implement light comes on and clutches don't work, check for 12 volts (battery voltage) at connector on clutch.

2.6 Electric Start Test For Solenoid and Wiring

1. Connect the black lead of meter to a common ground on the frame of the unit. Place the red lead on the green wire on solenoid. Turn the key to "start" and the meter should read battery voltage. This will test wiring and ignition switch.

2. Place red lead on starter terminal on solenoid and turn ignition key to "start". The meter should read battery voltage. If not, remove power from unit. check for resistance from solenoid base to frame and small terminal to the base. Both readings should be .01 ohms. If not, replace the solenoid.

(Earlier style wiring with No. 30172 printed on circuit board)

1. Testing PTO and console switches are the same as later style wiring.

2. Testing seat switch you will have to place test probe on top terminald and yellow wire on 30172 module board.

Troubleshooting - Electrical

531160 & 531236 Interlock Time Delay Module

PROBLEM	PROBABLE CAUSE
1. No Start	A. Blown Fuse or Diode. B. Receptacle Hooked To The Wrong Green Wire.
2. Starts But Engine Shuts Down When Shifting From Park Start To Neutral.	A. Yellow Wires Are Reversed.
3. After Installation of 531160, Battery Drains	A. Seat Switch is By-Passed.

Troubleshooting - Electrical

FOR TWO RELAY PLUG-IN TIME DELAY MODULE (NON-TRANSISTOR) MODULE NO. 31976

Models 931013, 14, 15, 16, 17, 18

WHEN THIS OPERATION IS ATTEMPTED...	THIS FUNCTION SHOULD OCCUR...	IF FUNCTION DOES NOT OCCUR, LOOK FOR A PROBLEM HERE.
Turn ignition key to start position.	Engine cranks.	1. Check battery voltage (12 v. min.) 2. Check fuse. 3. Check battery and power cable connections. Service or replace. 4. Check interlock switches, wiring, ground connections and ignition switch. Repair or replace. 5. Check solenoid. Replace.
Release key to run position.	Engine runs.	1. Check module mounting stud for good ground. 2. Check on module plug (unplugged) with positive connection (+) on #1 and negative connection (-) on ground. Turn key on, read battery voltage. Replace ignition switch. 3. Put jumper from plug #1 to plug #4. Replace module. 4. Put jumper from battery positive terminal (+) to ignition coil input. Trouble is in engine ignition system.
Engine Running and Operator on Seat; Turn PTO switch on* and shift out of "PARK".	Engine continues to run.	1. Check for proper seat switch wiring (this is especially true if updated - switch is no longer grounded on one side). 2. Check seat switch continuity (bypass for test only). 3. Check module mounting stud for good ground. 4. Remove plug from module and jumper from #1 to #4. Replace module.
*Ignore the actual clutch operation at this point, the desired result is to turn the cranking interlock switches "OFF"		
Operator leaves seat.	Ignition stops immediately clutch goes off delayed.	1. Remove bypass from seat switch. 2. Replace switch. 3. Replace module.
Operator sits back down while engine is rotating.	Ignition returns reset switch turns on PTO.	1. Check wiring to reset switch. Repair. 2. Check switch. Replace

NOTE: AT THIS POINT THE CHECK OUT OF THE CRANKING, SEAT SWITCH, IGNITION POWER AND RESET SWITCH IS COMPLETE.

Troubleshooting - Electrical

TRANSISTOR PLUG-IN TIME DELAY MODULE NO. 30172

Models 931019 thru 931026

WHEN THIS OPERATION IS ATTEMPTED...	THIS FUNCTION SHOULD OCCUR...	IF FUNCTION DOES NOT OCCUR, LOOK FOR A PROBLEM HERE.
Turn ignition key to start position:	Engine cranks.	1. Check fuse and battery and cable connections. 2. Check all PTO switches and transmission park switch. 3. Check solenoid. 4. Check ignition switch.
	Engine Starts.	1. Check coil wire from switch to coil. 2. Jumper from battery (+) to coil input. IF ENGINE DOES NOT START: Trouble shoot engine ignition system. IF ENGINE STARTS: Replace ignition switch.
Release Key to Run Position- Engine Running and Operator on seat: Turn PTO switch on* and shift out of "PARK".	Engine continues to run.	1. Check wiring from circuit breaker to seat switch, seat switch to #1 on module plug, #2 on plug to ignition switch, "A". Repair. 2. Remove plug and jumper #1 to #2. Replace module after checking for shorts. 3. Jumper seat switch to test. Replace switch.
Operator leaves seat.	Ignition dies immediately.	1. Check seat switch (remove bypass). Replace.
	Clutch deactivation delayed.	1. Remove bypass. 2. Replace module.
Operator returns to seat while crankshaft is turning.	Ignition cycles PTO switch to return PTO clutch to "ON".	See "ENGINE STARTS", above. See "CLUTCH CHECKOUT" section.

*Ignore the Actual Clutch Operation at this point. The desired result is to turn the Cranking Interlock Switches "OFF"

Troubleshooting - Electrical

TRANSISTOR PLUG-IN TIME DELAY MODULE NO. 30172

Models 931019 thru 931026

WHEN THIS OPERATION IS ATTEMPTED...	THIS FUNCTION SHOULD OCCUR...	IF FUNCTION DOES NOT OCCUR, LOOK FOR A PROBLEM HERE.
Clutch Checkout - With Operator on Seat and Engine Running:		
Turn on PTO Switch:	Indicator light goes on.	1. Check battery voltage. Replace, or service battery. 2. Check switch - jumper to test. Replace. 3. Replace bulb. 4. Jumper plug #3 to #4. Replace module. 5. Jumper plus 12 volts to clutch connector plug. Replace clutch.
	PTO clutch engages.	1. Check ammeter for discharge (4 amps) when PTO switch is turned on.
Turn on PTO switch on two clutch system:	PTO clutch engages.	1. Check armature gap (.015") If front clutch. Adjust clearance. Replace clutch.
	If both clutches engage from one switch.	1. Check diodes in heat shrink area going to PTO light for short and bar end toward light.
NOTE: IF EITHER CLUTCH WORKS THE PROBLEM CANNOT BE THE MODULE.		
Head and Tail Light:		
Turn light switch on.	Lights go on.	1. Check voltage. 2. Check switch - jumper to test. Replace. 3. Check circuit breaker - jumper to test. Replace. 4. Check connections & bulbs. Replace
Battery Charge:		
Start engine and operate at top speed.	Ammeter shows charging.	1. Check rectifier connections at regulator. 2. Check all wiring and battery cable connections. 3. Check ammeter for shorted condition (substitute). Replace. 4. Check engine charge output. Service charge system per Kohler Engine Service Manual. 5. Check battery condition.

Troubleshooting - Electrical

TRANSISTOR PLUG-IN TIME DELAY MODULE NO. 30172

Models 931019 thru 931026

WHEN THIS OPERATION IS ATTEMPTED. . . .	THIS FUNCTION SHOULD OCCUR. . . .	IF FUNCTION DOES NOT OCCUR, LOOK FOR A PROBLEM HERE.
Clutch Checkout With Operator on Seat and Engine Running:		
Turn on PTO switch.	Indicator Light goes on.	1. Check battery voltage (12V min.) 2. Check switch and wiring, jumper to test. 3. Replace bulb.
	PTO Clutch engages.	1. Check ammeter for discharge (4 amps) when PTO switch is turned on* 2. Check armature gap (.015") if front clutch. Adjust clearance. Replace clutch. 3. Check ground on module mounting stud. Secure 4. Check voltage at clutch connector plug. 5. Check voltage at interlock module plug #5. Replace module.
*AT THIS POINT PRESS THE RESET SWITCH. IF CLUTCH GOES ON ONLY WHILE RESET SWITCH IS HELD IN, CHECK MODULE GROUND. REPLACE MODULE IF REQUIRED.		
Repeat "Clutch Checkout" procedure, above, for Rear Clutch (if so equipped) but disregard armature gap adjustment.		
Head and Tail Lights.		
Turn light switch on.	Lights go on.	1. Check voltage. 2. Check switch - jumper to test. Replace 3. Check circuit breaker - jumper to test. Replace. 4. Check connections and bulbs. Replace.
Battery Charge:		
Start engine and operate at top speed.	Ammeter shows charging.	1. Check battery condition. 2. Check rectifier connections at regulator. 3. Check all wiring and battery cable connections. 4. Check ammeter for shorted condition (substitute). Replace. 5. Check engine charge output. Service charge system per Engine Service Manual.

Troubleshooting - Electrical

TRANSISTOR PLUG-IN TIME DELAY MODULE NO. 30172

Models 931019 thru 931026

PROBLEM	PROBABLE CAUSE
1. Battery runs down.	a. Improper Maintenance.
	b. Check location of rectifier charge lead
	c. Check rectifier output.
	d. Check rectifier input per Kohler Engine Service Manual.
	e. Check for a short in the wiring.
2. Starter doesn't function.	a. See Kohler Engine Service Manual.
3. One PTO switch turns on both clutches.	a. Replace 30171 wire harness.
4. Fuse blows.	a. Check for a short in the wiring to cable or frame.
	b. Check for a short in one of the components.
	c. Check for wrong fuse size or type.
5. Solenoid self engaging.	a. Check for ignition switch.
	b. Check for wire short.
	c. Check for bad solenoid or ground.
6. PTO light goes on but clutch won't engage.	a. Check PTO armature air gap to assure .010/.015" gap on front clutch.
	b. Check electrical supply to clutch.

Steering (Gear)

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3

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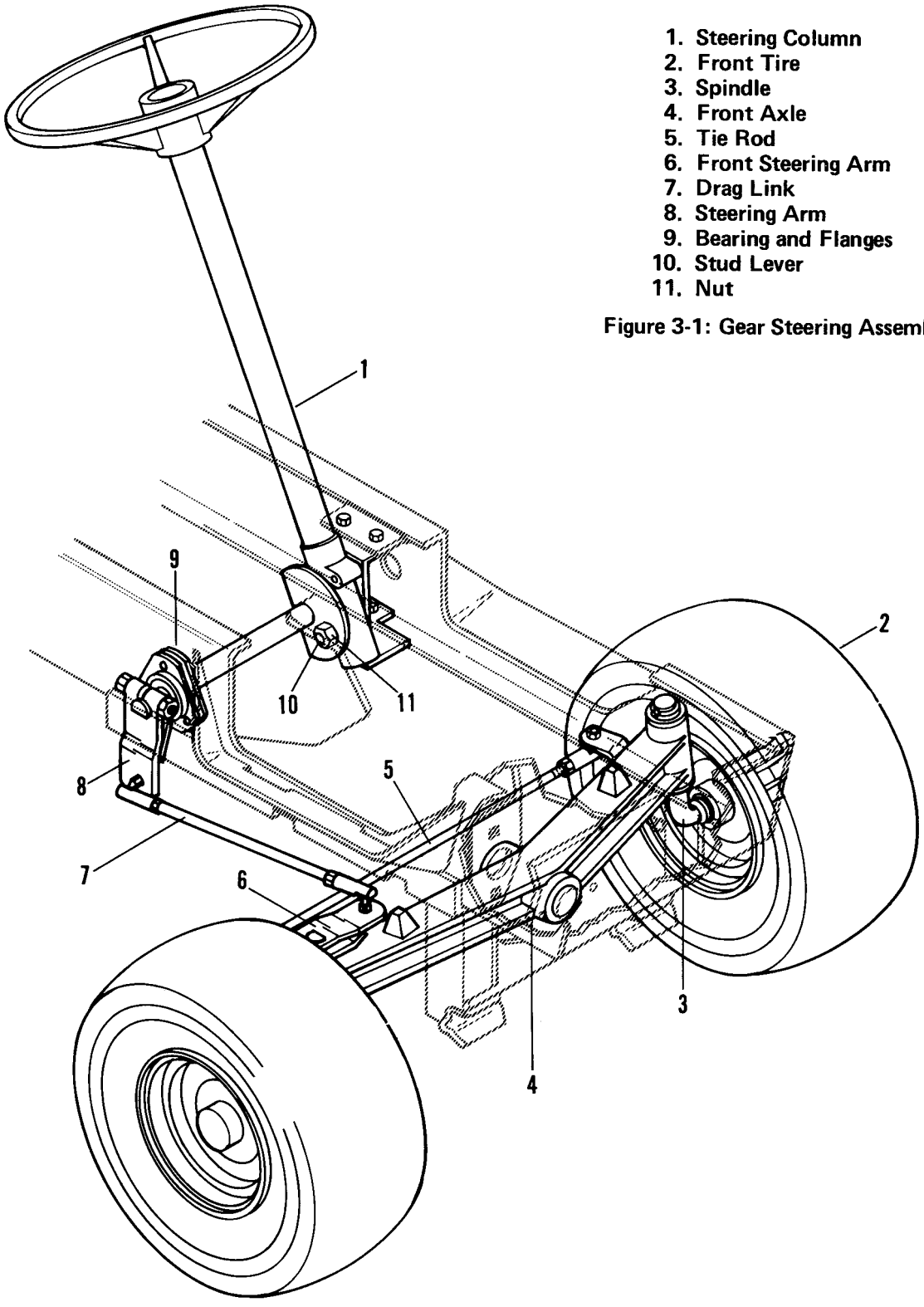
Steering Gear

1. Steering Column
2. Front Tire
3. Spindle
4. Front Axle
5. Tie Rod
6. Front Steering Arm
7. Drag Link
8. Steering Arm
9. Bearing and Flanges
10. Stud Lever
11. Nut

Figure 3-1: Gear Steering Assembly



Steering Gear

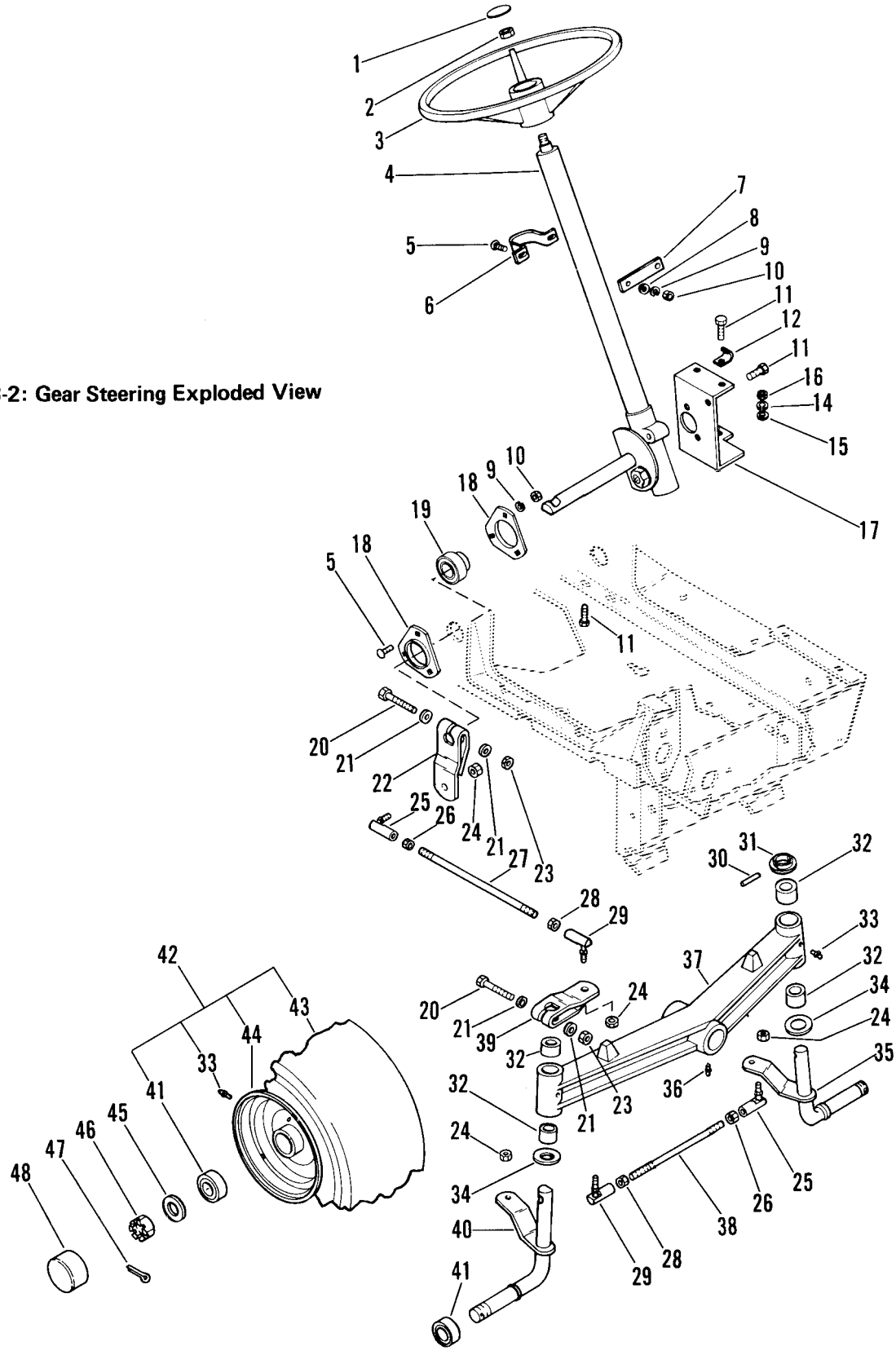


Figure 3-2: Gear Steering Exploded View

Steering Gear

ITEM NO.	DESCRIPTION
1	Cap
2	Nut 5/8-18
3	Steering Wheel
4	Steering Gear Assembly
5	Carriage Bolt 5/16-18 x 1"
6	Steering Column Clamp
7	Pad
8	Washer 3/8
9	Lock Washer 5/16
10	Nut 5/16-18
11	Cap Screw 3/8-16 x 1"
12	J-Clamp
14	Lock Washer
15	Washer 7/16
16	Nut 3/8-16
17	Mounting Bracket
18	Bearing Flange
19	Ball Bearing
20	Cap Screw 1/2-13 x 2-1/2
21	Washer 17/32
22	Steering Arm
23	Nut 1/2-13
24	Lock Nut 1/2-20
25	Ball Joint L.H.
26	Nut 1/2-20
27	Drag Link
28	Nut 1/2-20
29	Ball Joint R.H.
30	Roll Pin 1/4 x 1-3/4
31	Spindle Cap
32	Bushing
33	Zerk
34	Washer 1-1/32
35	Spindle L.H.
36	Zerk
37	Front Axle (Includes Item 32, 33 & 36)
38	Tie Rod
39	Front Steering Arm
40	Spindle R.H.
41	Radial Bearing
42	Front Tire & Rim Assembly
43	Tire
44	Rim Assembly
45	Washer 1"
46	Castle Nut 1" - 14
47	Cotter Pin 3/16 x 1-1/4
48	Front Hub Cap

Steering Gear

3.1 Steering Gear Adjustment

If looseness is noticed in steering system check hardware for tightness.

To remove excessive steering gear backlash between gears proceed as follows:

Raise front of tractor so that tires clear ground or floor and block unit securely.

With front wheels in the straight forward position, remove cotter pin from steering column at adjusting plug.

Loosen jam nut and turn stud lever out (counterclockwise) 1-1/2 turns.

Tighten adjusting plug to 4 to 6 foot pounds of torque. Loosen adjusting plug to align nearest slot in plug with cotter pin hole in steering column and secure with new 1/8 x 1/2 cotter pin.

Turn stud lever in (clockwise) until backlash is removed from steering wheel.

IMPORTANT: DO NOT force adjusting screw.

Torque jam nut to 35 to 45 foot pounds while keeping adjusting screw in position with screw driver.

Turn steering wheel from lock to lock checking for any binding or dragging of gears. If binding or dragging occurs, loosen adjusting screw and/or plug until steering wheel turns freely.

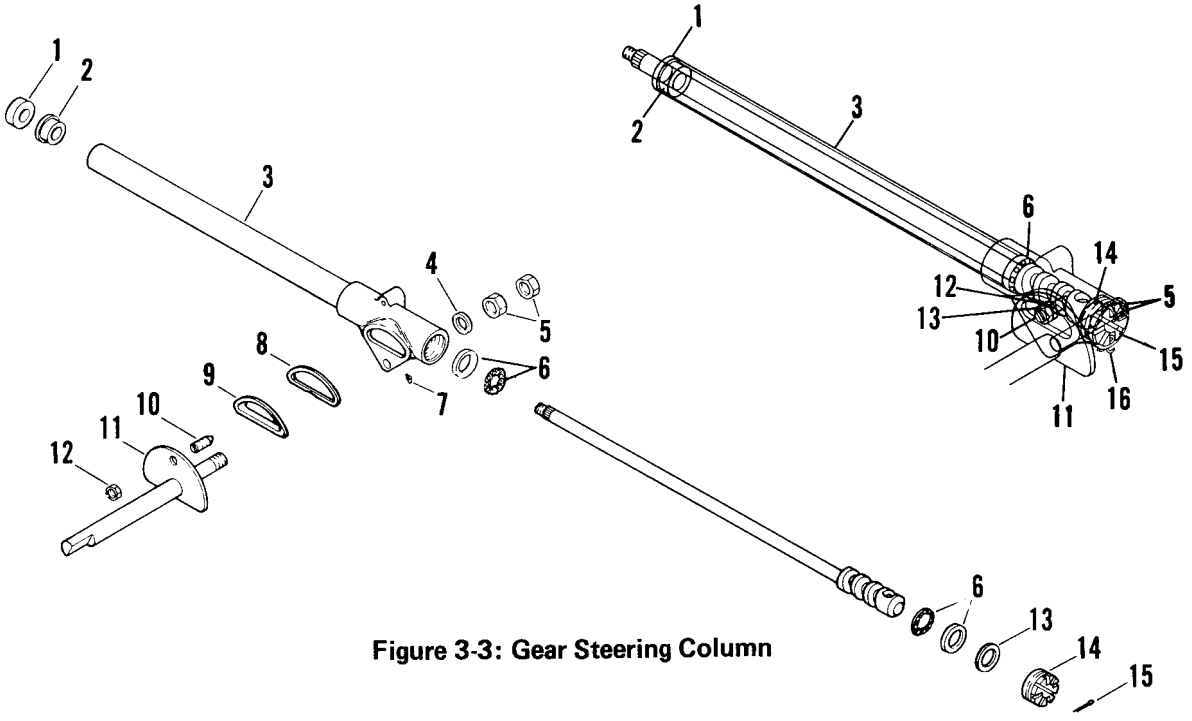


Figure 3-3: Gear Steering Column

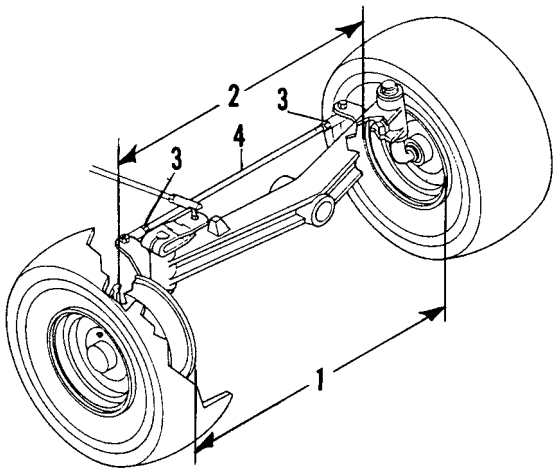
ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Dust Cover	9	Seal Retainer
2	Bushing	10	Stud Lever
3	Housing Assembly	11	Steering Arm
4	Washer 3/4	12	Nut 9/16-18
5	Jam Nuts 3/4-16	13	Washer 1"
6	Bearing Kit	14	Adjusting Plug
7	Hydraulic Drive Fitting	15	Cotter Pin 1/8 x 1/2
8	Seal		

Steering Gear

3.2 Front Wheel Toe In

Proper toe in is necessary to assure proper steering and to reduce tire wear.

To correct toe in (1/16 to 1/8" measured at horizontal center line of rim flange) loosen jam nuts, turn tie rod clockwise to decrease toe in, counterclockwise to increase and tighten jam nuts.



1. 1/16"-1/8" Less than 2
2. 1/16"-1/8" More than 1
3. Jam Nuts
4. Tie Rod

Figure 3-4: Front Wheel Toe In

3.3 Steering Stop

When making full right or left hand turns, spindle arms should contact axle stops. To adjust proceed as follows:

Turn front wheels to right, remove drag link rod end from steering arm and loosen jam nuts at both ends of drag link. Rotate drag link (while preventing loose rod end from rotating) until stud is approximately 1/2 it's diameter to rear of hole in steering arm with arm against stop and secure rod end stud. Tighten jam nuts on drag link.

Turn wheels completely to left, if left steering arm does not contact axle stop, shorten drag link until both spindle arms contact their respective axle stops. (Steering gear should not bottom before spindle arm contacts axle stops.)

3.4 Greasing

Rotate steering wheel full right and fill gear box with grease until grease is forced out around cam follower adjusting screw.

3

3.5 Removal

Raise hood and remove battery.

WARNING: DO NOT allow tools or other objects to come into contact with both terminals at same time. When removing battery from tractor, remove negative (–) cable first to reduce risk of sparks.

Remove air cleaner assembly.

IMPORTANT: Cover carburetor throat to prevent debris or hardware from falling into carburetor.

Remove steering wheel nut and steering wheel (use of puller is necessary) from steering column.

Remove floor plate, console mounting and support clamp hardware.

Remove steering arm from steering arm shaft, and bearing flange from inside of frame.

Remove drive shaft according to instructions in Engine And Drive Shaft, Section 4.

Remove hardware holding steering column mounting bracket to frame.

Lift console from steering column, tip column toward steering arm and remove from tractor.

Steering Gear

3.6 Steering Column Disassembly

Remove jam nuts, slide rod lever and steering arm assembly out; remove cotter pin from adjustment plug, adjustment plug and steering column from housing.

Remove bearings, special washer, clean all parts in a clean safe solvent. Inspect all parts for cracks, scoring or other damage and replace as necessary.

3.7 Steering Gear Assembly

Assemble steering gear assembly in reverse order applying grease to bearings and cam. Adjust per instructions in 3.1 Steering Gear Adjustment.

NOTE: Steering arm position is obtained by inserting a 1/16 shim between plate of steering arm and seal retainer. Snug nut, remove shim, position second jam nut and while holding first jam nut in position, torque second jam nut to 22 to 25 foot pounds.

NOTE: Steering stud lever adjustment is made at high point in cam (center of steering gear). Turn stud finger tight and secure with jam nut.

Troubleshooting - Steering

	PROBLEM		PROBABLE CAUSE
1.	Hard steering.	a.	Check backlash between worm gear and adjustment stud insufficient. Adjust backlash to zero at midpoint of steering and back off $^1/_8$ turn. Torque locking nut to 35 ft. lbs.
		b.	Worn adjustment stud which may not function because of condition.
		c.	Adjustment plug may be overtorqued. Loosen and torque to three (3) notches beyond initial set of bevel washer (about 4/6 ft. lbs.).
		d.	Check for improper tire inflation, tight spindles, bent spindle arms, improper toe-in, lack of lubrication at steering gear and spindles.
		e.	Bending of steering gear may be caused by misalignment: dash support to frame adjustment and/or console.
		f.	Check for damaged steering gear bearings or retainers.
2.	Loose steering.	a.	Check worn axle pivot.
		b.	Check for worn or loose ball joints and mounting nuts.
		c.	Check worn adjustment stud and/or excessive backlash.
		d.	Check for improper adjustment of stud and/or adjustment plug.
		e.	Check loose mounting hardware for steering mounting parts.
3.	Excessive end play in steering shaft.	a.	Check for loose adjustment plug.
		b.	Check for worn bearings or retainers.
4.	Interference with drive shaft.	a.	Use one 65096 special thin hardened nut in place of 65016 standard jam nuts. Torque to 35 ft. lbs.
		b.	Check for misalignment of steering gear from dash support and/or console to frame mounting.
5.	Turning radius shorter in one direction than another.	a.	**See 3.1 Steering Gear Adjustment.**
6.	Front Axle loose in frame.	a.	Check for worn axle duct tube, frame pivot holes, or bearing mounting flanges. Replace with new style axle pivot and bearing flanges.

TROUBLE SHOOTING - TIRES

	PROBLEM		PROBABLE CAUSE
1.	Front tire wear.	a.	Check for excessive toe-in or toe-out.
		b.	Check for bent spindle or linkage.
		c.	Check for proper inflation. section of this manual.
2.	Tire hits mower carrier in tight turns.	a.	Check for bent carrier arms.

Notes

Steering (Hydraulic)

Table of Contents

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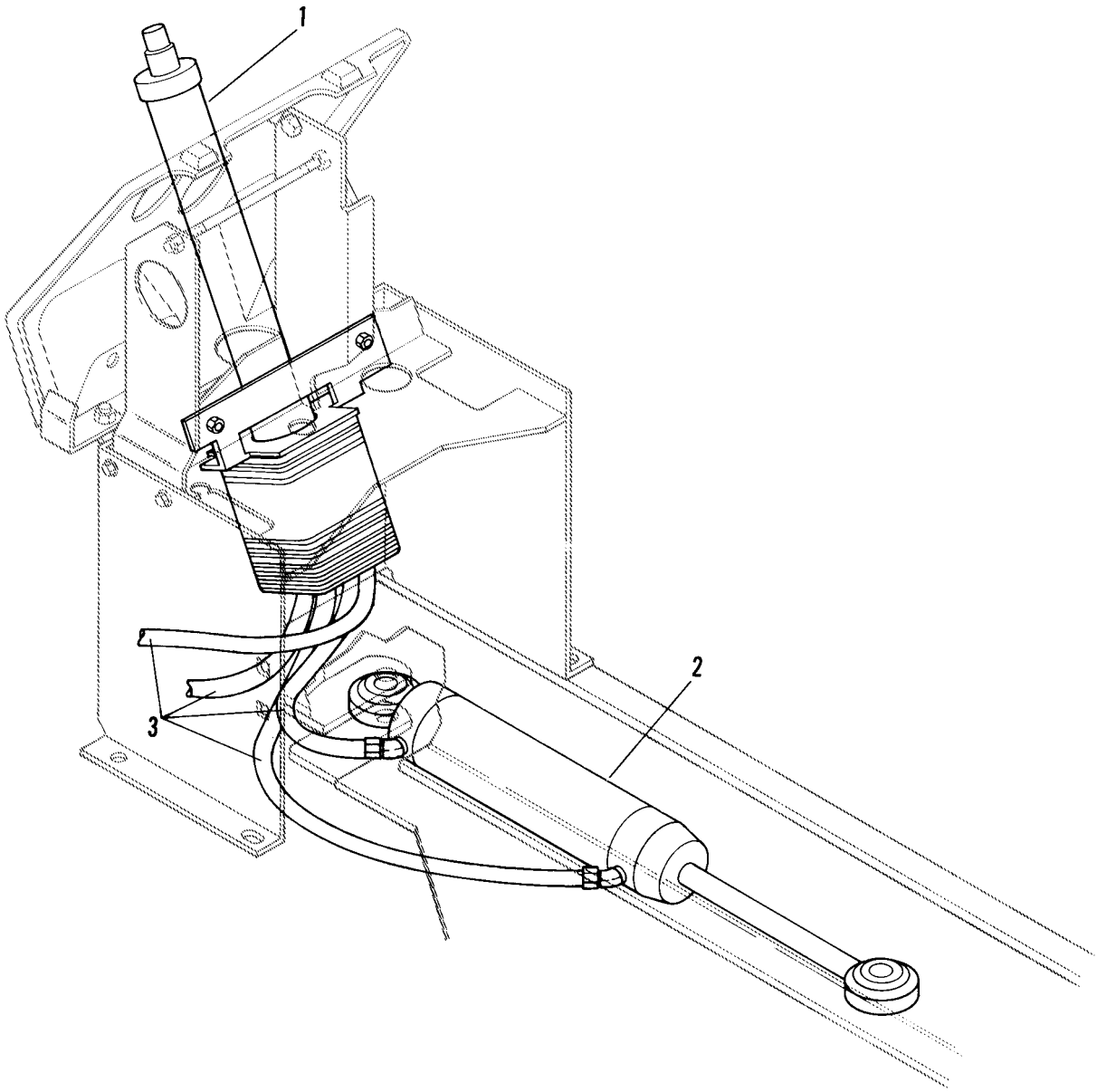
List of Illustrations

Notes

Steering
Hydraulic



1. Power Steering Unit
2. Power Steering Cylinder
3. Hydraulic Hoses

Figure 4-1: Power Steering Unit and Cylinder

Steering
Hydraulic

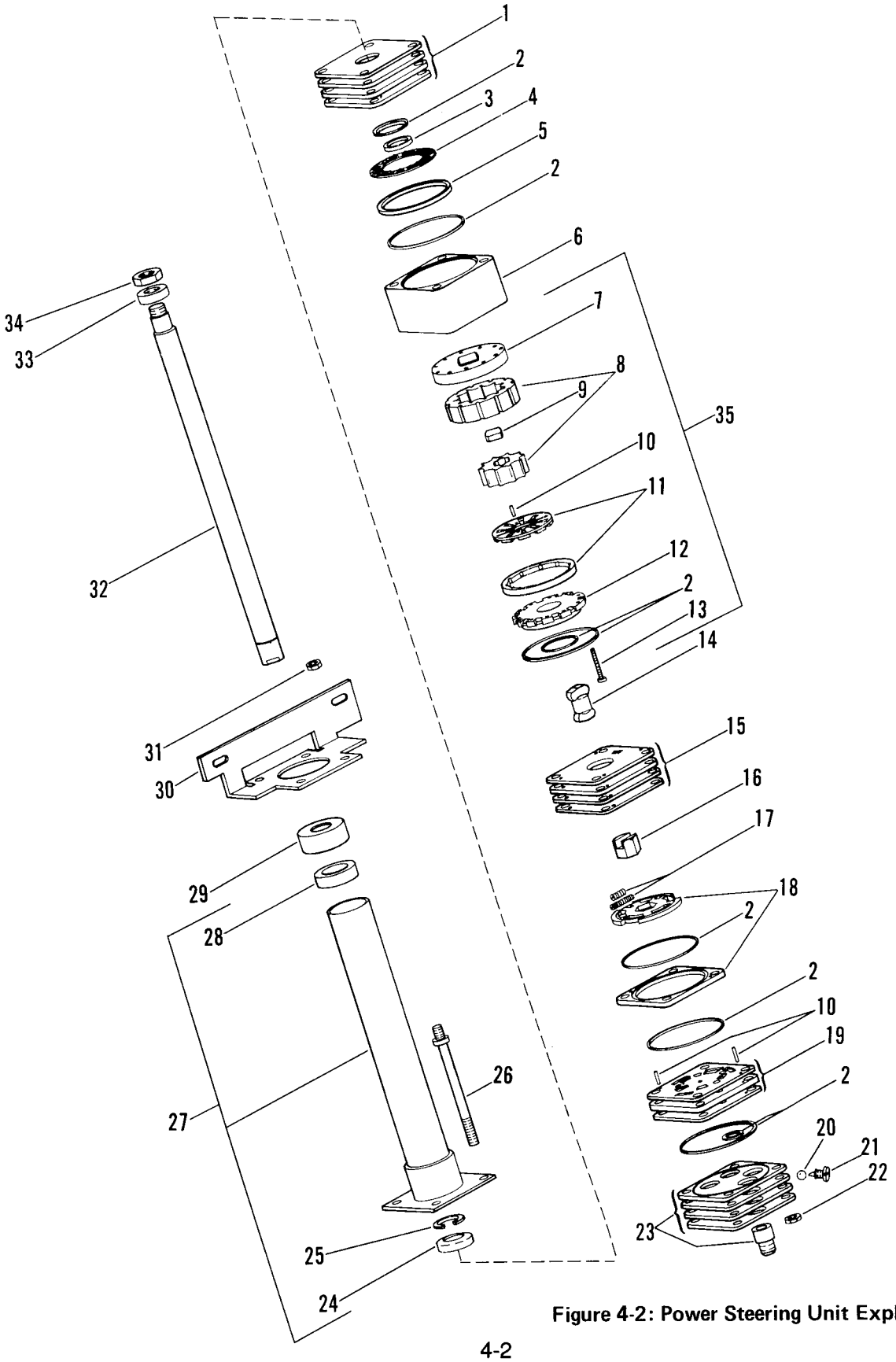


Figure 4-2: Power Steering Unit Exploded View

Steering
Hydraulic

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Upper Cover Plate	18	Valve and Ring Assembly
2	Seal Service Assembly	19	Port Manifold
3	Seal Spacer	20	Steel Ball
4	Thrust Bearing	21	Plug and O-Ring Assembly
5	Spacer	22	Lock Nut 5/16-24
6	Metering Ring	23	Port Cover & Check Valve Ass'y.
7	Drive Plate	24	Washer
8	Rotor	25	Retaining Ring
9	Spacer	26	Special Stud
10	Needle Roller Service Assembly	27	Upper Cover & Jacket Tube Ass'y.
11	Commutator and Ring Assembly	28	Column Bearing
12	Commutator Cover	29	Cap
13	Special Screw	30	Bracket
14	Drive Link	31	Lock Nut 5/16-24
15	Isolation Manifold	32	Input Shaft
16	Hex Drive	33	Dust Cover
17	Spring Service Assembly	34	Lock Nut 5/8-18
		35	Metering Assembly

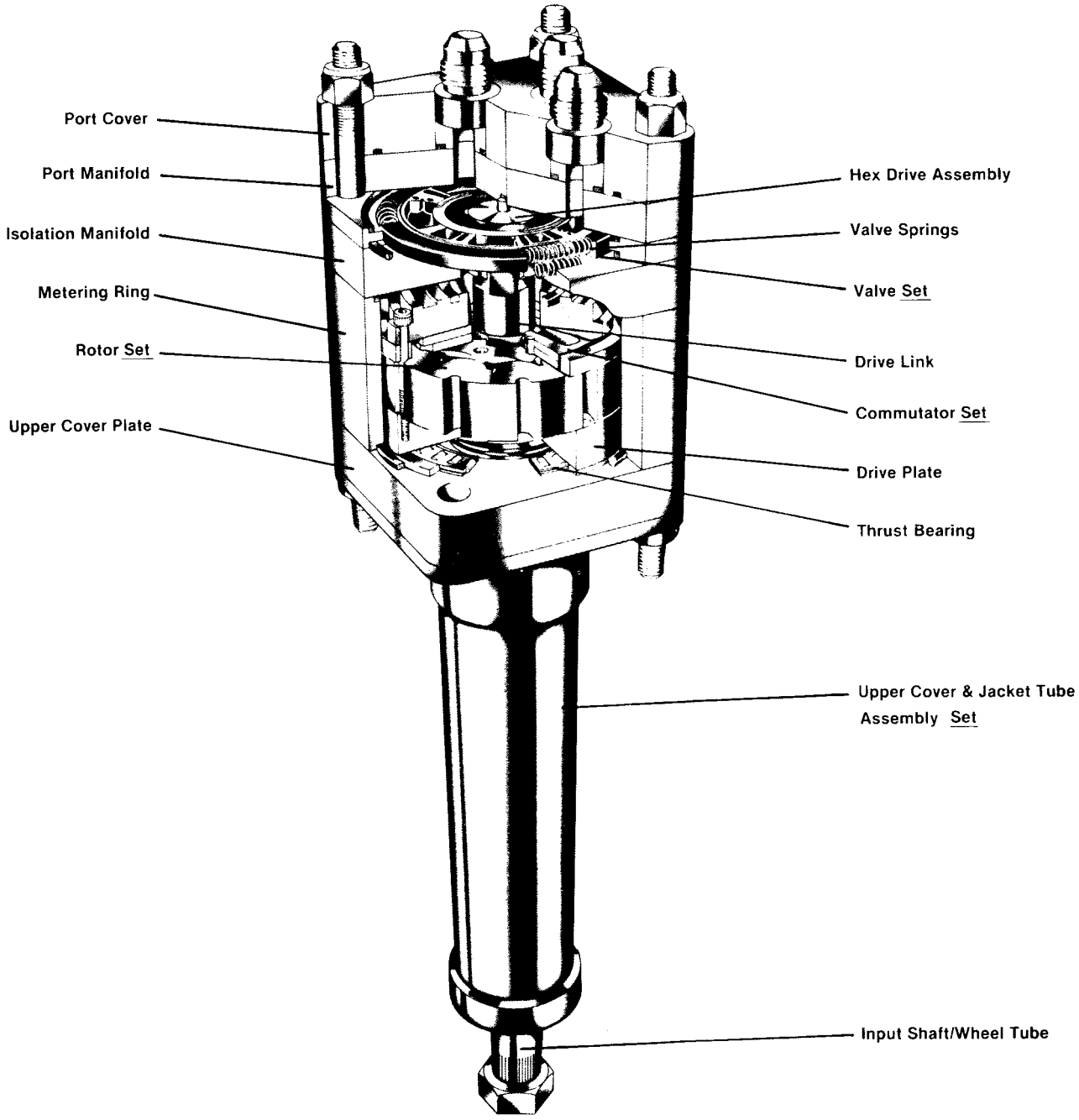
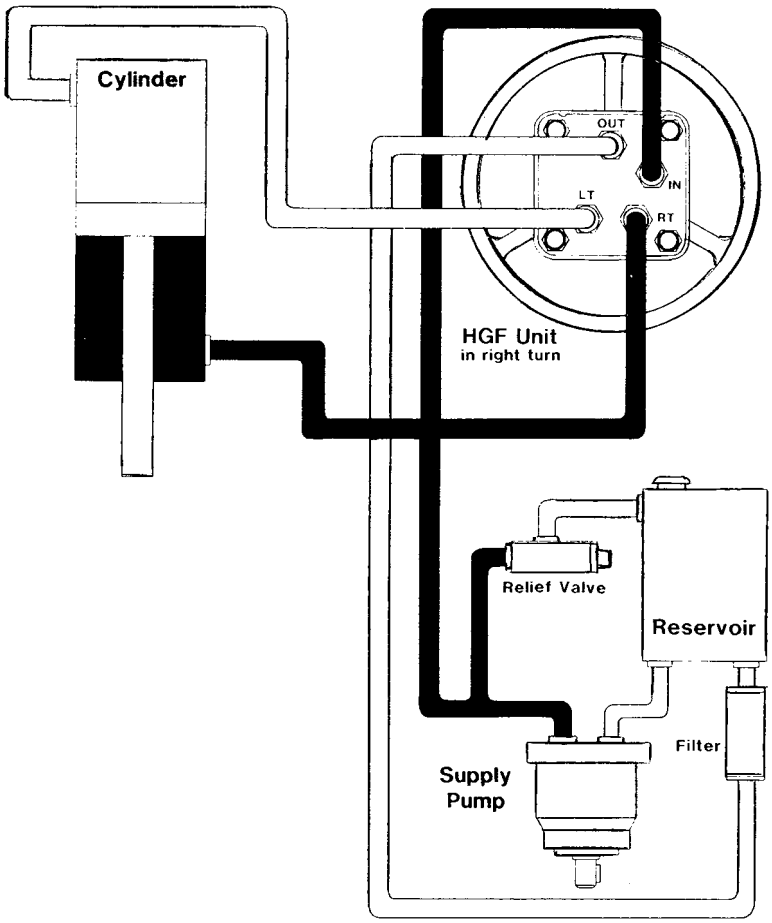


Figure 4-3: Power Steering Unit Assembly

Steering
Hydraulic



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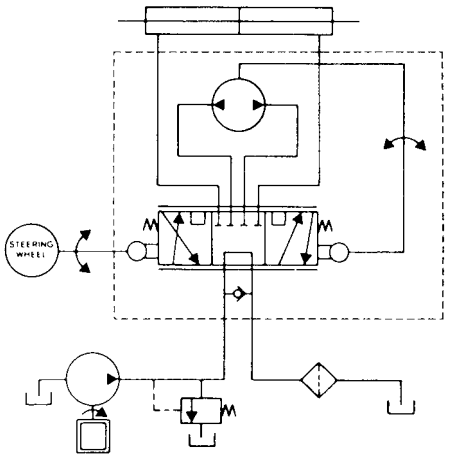
OPEN CENTER HYDRAGUIDE STEERING



POWER BEYOND HYDRAGUIDE STEERING

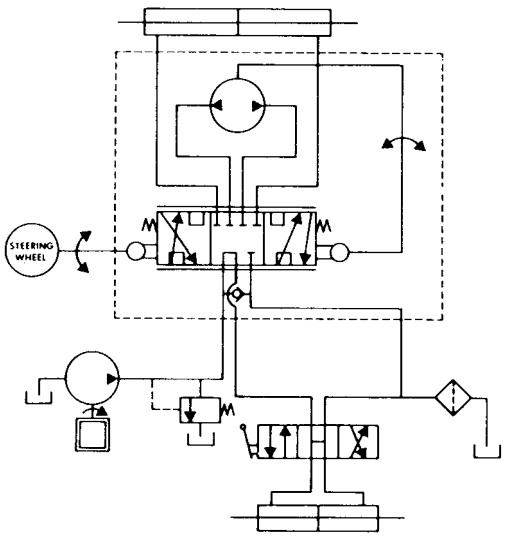


Figure 4-4: Hydraulic Diagrams

Steering
Hydraulic

4.1 Power Steering Removal

Raise hood, disconnect and remove battery.

WARNING: DO NOT allow tools or other objects to come into contact with both battery terminals at same time. When removing battery from tractor, remove negative (—) cable first to reduce risk of sparks.

Remove steering wheel nut and steering wheel (use of puller is necessary).

IMPORTANT: DO NOT loosen steering wheel with hammer, as internal damage to unit will result.

Remove floor plate and screen from tractor.

IMPORTANT: Before disconnecting any hoses, clean dirt from around all fittings. Plug port holes and hoses immediately after disconnecting hoses and before removing HGF from tractor. This is to prevent foreign material from entering HGF and damaging it when cleaning and assembling.

Remove hoses from HGF. Remove four (4) 5/16 lock nuts from mounting bolts and remove unit from tractor. Pass unit out through bottom of frame. Clean, dry and place unit on a clean work bench.

NOTE: Components throughout this assembly are stacked on four bolts and held in alignment with alignment pins designed to be a slip fit into the components. Use minimum force necessary and maximum care when disassembling or assembling components.

HGF Hydraguide unit has several components that are of brazed laminate construction, plates and parts bonded together permanently to form an integral component that is not subject to disassembly for service. Disassemble HGF unit only to extent shown in this section.

IMPORTANT: DO NOT force or abuse closely fitted parts, or you may damage them.

Avoid distorting or damaging HGF unit, DO NOT clamp it directly into a vise. Clamp Service assembly securely in vice and place HGF unit, input shaft/wheel tube first, into service assembly fixture. Attach unit to fixture with four 5/16-24 nuts.

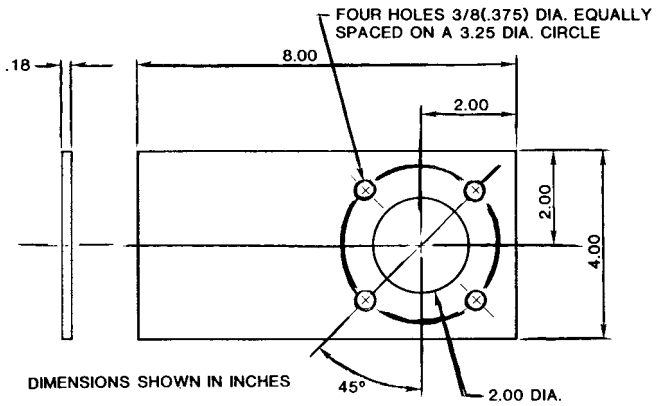


Figure 4-5: HGF Service Assembly Fixture
(To Be Fabricated By Customer)

NOTE: Before beginning disassembly of HGF unit, study relative positions of alignment grooves on side of components in assembly. Also, note jacket tube contact brush cover hole radial position relative to side of unit with alignment grooves. Relative alignment groove alignment, groove positions on components and jacket tube contact brush cover hole positions must be maintained at assembly (refer to alignment groove illustration). When disassembling unit place parts in proper order for reassembly.

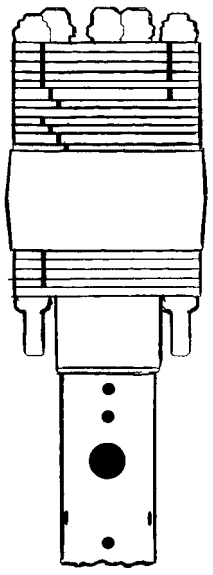


Figure 4-6: Alignment Grooves

4.2 HGF Disassembly

Loosen plug assembly in port cover for disassembly after port cover is removed from unit.

Remove four retaining lock nuts from port cover assembly. Be careful not to damage protruding ports. (Replace any lock nut that has damaged threads or hex).

NOTE: Nuts are special self locking type. DO NOT substitute. Use only approved replacement parts.

Lift port cover assembly (four plates bonded together) from unit. Discard four "O" rings and seal ring.

Remove plug loosened above and "O" ring assembly from port cover. Be ready to catch steel check ball as it falls from its cavity. Discard "O" ring.

Inspect port cover for port fitting sealing surface scratches and thread damage. Replace port cover if these conditions are present.

Lift port manifold (3 plates bonded together) from unit. Three springs in port manifold may fall when removing port manifold, if not remove them.

NOTE: Unit has two different length spring sets. Set removed from port manifold are 3/4 inch (19 mm) long. Keep this set separate from next set to be removed.

Inspect springs for bent or distorted coils. If a spring is broken or deformed, all six springs in unit should be replaced.

Inspect ground surfaces of port manifold. A polished pattern due to rotation of valve plate and hex drive assembly is normal. All edges should be sharp and free of nicks and burrs. Surfaces of port manifold should be free of scratches or scoring. If any of these wear conditions exist, replace port manifold.

NOTE: Many components in unit have finely ground surfaces. Be careful not to nick or scratch these surfaces.

Remove valve ring and discard two seal rings. Valve ring should be free of nicks and scoring.

Remove valve plate from isolation manifold and inspect slot edges and ground surfaces. If valve plate shows nicks, scoring or edges are not sharp, it must be replaced.

NOTE: Valve ring and valve plate are a matched set and must be replaced as a set.

Remove three 1/2 inch long springs from isolation manifold pockets. (Keep separate from set removed earlier.)

Inspect springs for bent or distorted coils. If a spring is broken or deformed, all six springs in unit must be replaced.

Remove hex drive assembly from drive link. Pin in hex drive assembly should not show wear and must be firmly pressed in place. Sides of hex and slot should not have grooves or scoring. If it shows signs of this type of wear, it must be replaced.

Remove two alignment pins that align port manifold, valve ring and isolation manifold. (A service kit of nine alignment pins is available for servicing unit.)

Remove isolation manifold (four plates bonded together) and inspect ground surfaces of it. A polished pattern due to rotation of valve plate and on opposite side a pattern die to action of commutator cover and commutator seal is normal. Holes and edges should be free of nicks. Manifold surfaces should be free of nicks or scoring. Replace if any of these conditions has developed. Remove two isolation manifold metering ring alignment pins and drive link from unit.

Inspect each end of drive link. Four crowned contact surfaces should not be worn or scored. Replace if wear or scoring is evident.

Remove metering ring and discard two seal rings. If ring bore is scored, it should be replaced.

Place metering package on a clean surface (DO NOT clamp in vise, as this could damage components).

Remove (and discard) commutator seal from cover and eleven hex socket head screws that hold metering package together using a 3/32 inch allen wrench. Inspect screws for thread and socket damage and replace as required.

Remove commutator cover and inspect ground surfaces, a polished pattern due to rotation of commutator in normal. If it has nicks, burrs or scoring it must be replaced.

Remove commutator ring and inspect for cracks, burrs or scoring. Replace as needed.

NOTE: Handle commutator ring with care, as it is easily broken.

Remove commutator from rotor.

NOTE: Five alignment pins connect commutator to rotor with a slip fit. Care and minimum force should be used to separate the two components.

Remove five alignment pins.

Remove drive link spacer. Replace it if it is grooved or worn.

Commutator is made up of two round plates pinned and bonded together as a permanent assembly and is not subject to further disassembly. Inspect ground surfaces of commutator. Holes and edges should be free of nicks. Ground surfaces should be free of scoring and edges sharp.

NOTE: Commutator and commutator ring are a matched set. If either is worn or damaged, replace set.

With rotor set lying on drive plate, rotor should rotate and orbit freely within stator. Commutator side of stator face must be free of grooves or scoring. Replace as matched set if either is worn or damaged.

Check rotor lobe "tip" to stator lobe "tip" clearance using appropriate feeler gage. Rotor lobe, directly across from rotor lobe tip being gaged, must be centered between stator lobes during gaging process. A rotor and stator that is .75 inches (19mm) or less in height has a maximum allowable "tip" clearance of .003 inches (.08mm). A rotor and stator that is 1.00 inch (25.4mm) or more in height has a maximum allowable "tip" clearance of .005 inches (.13mm). A rotor and stator that exceeds maximum allowable "tip" clearance, must be replaced.

Remove rotor set from drive plate, drive plate side of rotor set also must be free of grooves or scoring.

Rotor side of drive plate should show the spiral pattern die to rotor movement. Inspect thrust bearing side of plate for brinelling (dents) or spalling (flaking). Flat sides of input shaft engagement hole should not be grooved or worn. If any of these conditions are present, drive plate must be replaced.

Remove face seal, back-up ring and face seal spacer from upper cover plate. Discard face seal and back-up ring while retaining metal spacer.

Remove thrust bearing and bearing spacer from upper cover plate.

Inspect thrust bearing for brinelling (dents) or spalling (flaking), if either exists, or if one or more of the rolls are lost or broken, replace bearing assembly. Replace seal spacer or bearing spacer if worn or broken.

NOTE: For assembly purposes, note radial position of alignment grooved edge of upper cover plate relative to jacket tube contact brush hole if unit is so equipped.

Remove upper cover plate (four plates bonded together). Inspect upper cover plate, there should be some polishing due to action of seal. Plate should be free of brinelling (dents) or spalling (flaking). If it is damaged, upper cover plate must be replaced.

Slide seal from jacket tube and replace if worn or damaged.

Remove input shaft/wheel tube assembly by sliding it out of upper cover end of assembly.

NOTE: If input shaft/wheel tube assembly has 7/8 serrations, washer and retaining plate will be removed with input shaft/wheel tube assembly.

Inspect input shaft/wheel tube and subassembly components as assembled. Inspect input shaft/wheel tube for worn or damaged serrations, wheel nut threads, bearing diameter and flats on lower end. Inspect other components of subassembly for wear damage. If subassembly passes inspection, set it aside and go to disassembly procedure for upper cover and jacket tube assembly.

If subassembly does not pass inspection, use appropriate external retaining ring pliers and remove retaining ring from input shaft/wheel tube. Discard if deformed or broken.

Remove washer and retaining plate from input shaft/wheel tube or upper cover and jacket assembly. Discard if deformed or damaged.

NOTE: Retaining plate cannot be serviced separately, but is a part of an upper cover and jacket tube assembly service kit as a matched set.

Remove upper cover and jacket tube assembly. Jacket tube has been pressed in and welded to upper cover plate support tube so that retainer plate is flush with upper cover plate surface when seated against jacket tube. Any sign of looseness or movement of jacket tube will require replacement of upper cover and jacket assembly, retainer plate and bushing as a set. A loose or worn input shaft/wheel tube bushing in upper cover and jacket assembly can be serviced separately.

To replace bushing, place upper cover and jacket tube assembly in a vise (DO NOT deform jacket tube). Uncrimp or relieve two crimped areas on bushing end of jacket tube. Remove bushing using a bearing or seal type puller and discard bushing. Set upper cover and jacket tube assembly aside.

Remove nuts holding four bolts to fixture and remove the bolts. Bolts with square shoulder or threads damaged such that nuts cannot be properly torqued must be replaced.

HGF disassembly is complete.

4.3 HGF Assembly

Replace all seals and "O" rings with new ones and be sure that they remain seated correctly when components are assembled.

NOTE: A seal kit (Ariens Part No. 531181) with all required seals except column and jacket seal is available for service.

Before assembly of HGF unit wash and dry all parts in a clean safe solvent.

Place four bolts into fixture with shortest threaded end of bolts through fixture holes. Secure bolts to fixture with four 5/16-24 nuts. Tighten nuts to secure assembly to fixture but loose enough to turn bolts and facilitate stacking of components.

If bushing was removed from upper cover and jacket tube for replacement, press a new bushing into upper end of jacket tube with end of bushing that has recesses toward jacket tube. (This may be done using an arbor press or clamping jacket tube and using wood handle end of hammer.) Bushing must be seated firmly in jacket tube and below end of jacket tube. Crimp end of jacket tube over bushing in two places approximately 90 degrees away from original crimped areas, using pliers and/or a blunt end punch.

Apply clean grease to bushing and stack upper cover and jacket tube assembly on tour bolts with jacket tube pointing down through hole in fixture. Make sure square shoulder of bolts engage square holes in upper cover.

4.4 Power Steering Cylinder

With front wheels of tractor turned full right, remove left running board.

Remove hardware at front of power steering cylinder, then at rear and remove hoses.

Check rod for side play in rod cap.

Remove rod and piston from cylinder.

Check shaft for wear, "O" rings for damage and replace damaged parts.

Assemble in reverse order. (Extend rod before attaching hoses).

IMPORTANT: Oil must be added to transmission after this procedure.

Steering
Hydraulic

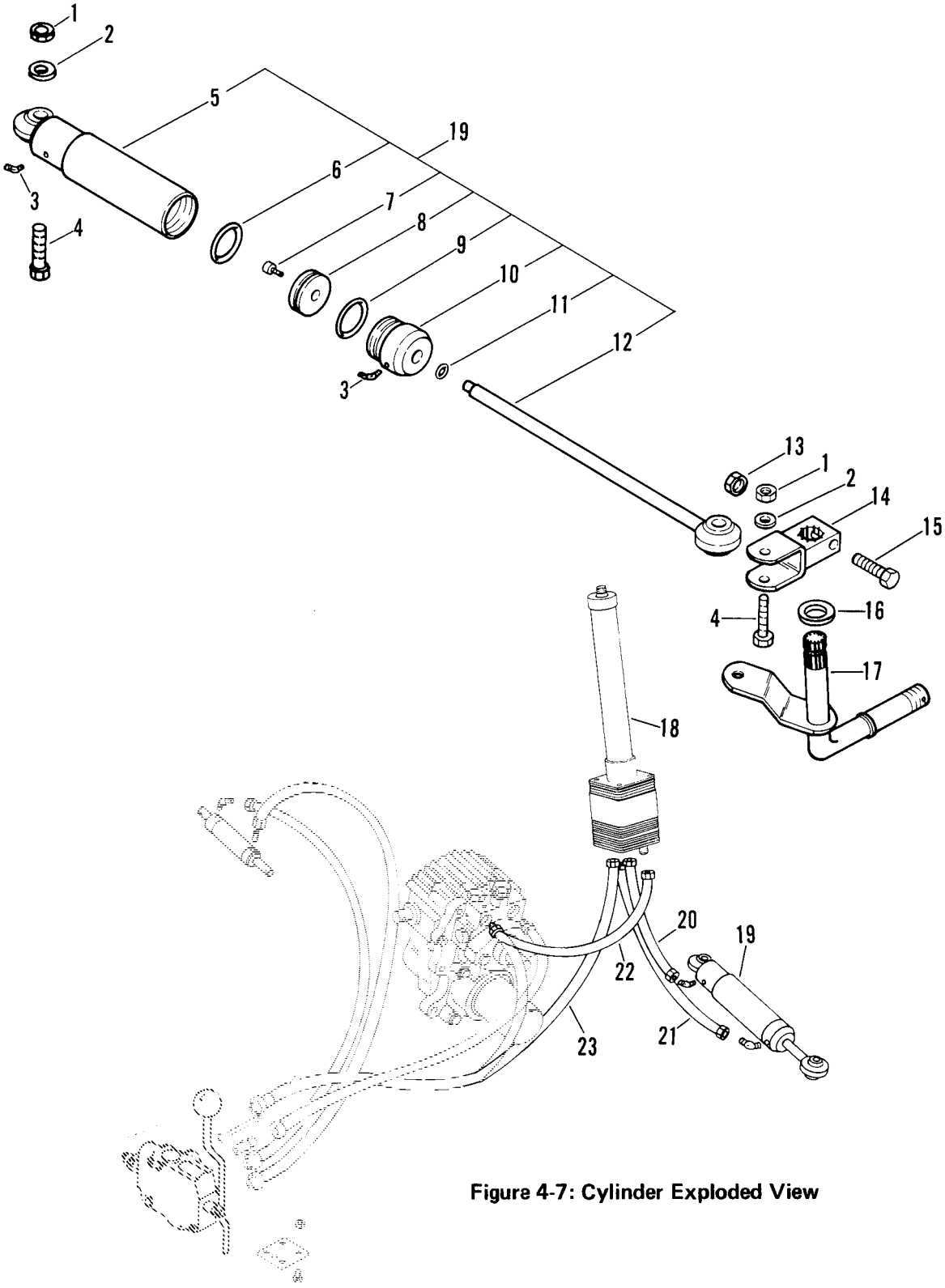


Figure 4-7: Cylinder Exploded View

Steering
Hydraulic

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Nut 5/8-18	13	Lock Nut 1/2-13
2	Washer 5/8	14	Steering Arm
3	Adapter	15	Lock Bolt
4	Cap Screw 5/8-18 x 2" (Grade 5)	16	Washer 1"
5	Cylinder	17	Spindle L.H.
6	"O" Ring 1-5/8	18	Power Steering Unit
7	Cap Screw 3/8-24 x 1"	19	Power Steering Cylinder
8	Piston	20	Hydraulic Hose
9	"O" Ring 2-1/8	21	Hydraulic Hose
10	Rod Cap	22	Hydraulic Hose
11	"O" Ring 5/8	23	Hydraulic Hose
12	Rod		

Troubleshooting - Steering

NOTE: Before troubleshooting a steering problem, check service literature published by the vehicle and component manufacturers. Follow their instructions, if given, for checking any component but the HGF Hydraguide unit.

preparation

Make your troubleshooting easier by preparing as follows:

- work in a clean, well-lighted place;
- have proper tools and materials nearby;
- have a space set aside where you can lay components, parts, and tools; and
- have an adequate supply of clean petroleum-based solvent.

WARNING: SINCE THEY ARE FLAMMABLE, BE EXTREMELY CAREFUL WHEN USING ANY SOLVENT. EVEN A SMALL EXPLOSION OR FIRE COULD CAUSE INJURY OR DEATH.

WARNING: WEAR EYE PROTECTION AND BE SURE TO COMPLY WITH OSHA OR OTHER MAXIMUM AIR PRESSURE REQUIREMENTS.

preliminary checks

For all their complexity, hydraulic systems are often trouble-free. The steering problem an operator complains of could be caused by something other than the hydraulic components.

Thus, once you have determined the problem and test driven the vehicle (if possible), start with the easy-to-check items.

On some vehicles, the conditions of the tires, especially on the steered wheels, may affect steering. Make sure pressures are at manufacturer's specifications. Make sure tires are balanced and that they show no signs of damage or severe wear. Check that they are mounted properly.

Check steering and front end linkage. Broken, loose, or binding parts could cause certain steering problems. See if something in the steering column is loose or binding.

If belts are present, check all of them. A tight belt could also be glazed and a slipping belt doesn't always squeal.

In addition, the following could also contribute to a steering problem:

- an overloaded vehicle;
- parts damaged from impact not properly repaired, or that should have been replaced; and
- improper replacement parts.

hydraulic components

If you think the problem is caused by a hydraulic component, start by checking the easy-to-reach items.

Check all hoses and lines for cracks, hardening, or other signs of wear. Reroute any useable hoses that are kinked, severely bent, or that rest against hot engine parts. Look for leaks, especially at couplings. Replace any hoses or lines that don't meet system flow and pressure ratings.

Next, go to the reservoir and filter or filters. Check fluid level and look for air bubbles. Examine the filter; if it's clogged, follow manufacturer's instructions for cleaning or replacing it. A filter with a minimum 25 micron filtration is recommended for the HGF system.

Visually check other components to see if they are loosely mounted, show signs of leaks, or other damage or wear.

It may be necessary that you perform hydraulic tests on the pump and other hydraulic components. To do so, consult the manuals published by the vehicle or component manufacturers.

Troubleshooting - Steering

I. NOISE

NORMAL NOISE

—A low hissing from the HGF control valve section during a turn
—A noise from the system relief valve when it is actuated
—Pump growl from some types of power steering pumps

ABNORMAL NOISE

—A squealing noise during a turn may indicate that the belt or belts should be tightened or replaced.
—A clicking noise during a turn may indicate that some component is loose and shifting under load.

II. POSSIBLE STEERING PROBLEMS AND CAUSES

STEERING WANDER

—Different size tires
—Tire pressure incorrect or unequal left to right
—Loose or worn steering linkage parts
—Improperly adjusted or worn wheel bearings
—In some vehicles, front end out of alignment

NO RECOVERY FOR OPEN-CYLINDER UNIT

—Tire pressure low.
—Steering linkage parts binding.
—Tight front axle kingpins.
—Steering column binding or misaligned.

SHIMMY

—Improperly mounted tire or wheel
—Components in steering linkage loose, worn, or out of adjustment
—Wheels or brake drums out of balance
—Wheel bearings improperly adjusted
—Air in the hydraulic system

HIGH STEERING EFFORT IN ONE DIRECTION

—Vehicle overloaded
—Low hydraulic system pressure
—Excessive system heat causing HGF plate valve to stick. See checklist under Excessive Heat.

Troubleshooting - Steering

HIGH STEERING EFFORT IN BOTH DIRECTIONS

—Different size tires
—Vehicle overloaded
—Low hydraulic fluid level
—Low flow or pressure from pump
—Components in steering linkage binding
—Restriction in fluid return line, or line too small

LOST MOTION (LASH) AT THE STEERING WHEEL

—Steering wheel loose on column
—Components in steering linkage loose or worn
—HGF unit loose at mounting
—Air in hydraulic system

EXCESSIVE HEAT [200°F MAXIMUM (93.3°C)]

—Undersized replacement hose or line
—Kinked or severely bent hose or line
—Restricted oil coolers
—Restricted recentering of HGF unit
—Excessive fluid flow

WARNING: IF THE HYDRAULIC SYSTEM FLUID BECOMES OVERHEATED [IN EXCESS OF 200°F (93.3°C)], SEALS IN THE SYSTEM CAN SHRINK, HARDEN, OR CRACK, THUS LOSING THEIR SEALING ABILITY.

Tools and Materials Required for Servicing

HGF Service Manual

HGF service ass'y fixture
(See Figure 1)

Clean, petroleum-based solvent

Vise

Pliers

Screw driver

Blunt ended punch

6 pieces of .007 inch (.18 mm) shim stock, approximately .5 inch (13 mm) wide x 1.5 inch (38 mm) long.

External retaining ring pliers

Tape, plastic electrical

Breaker bar

Sockets: 1/2 inch

3/32 inch Allen wrench socket

Slot type screw driver socket

5/16-24 UNF hex. nut (4) required

3/4 inch (19 mm) to 7/8 inch (22 mm) bearing puller

Clean grease

Light weight oil

Torque wrenches: 11 to 13 in. lb. & ft. lb. or Newton Meter

Feeler gauge .003 in. (.08 mm) or .005 in. (.13 mm)

(See disassembly procedure #37)

Electrical continuity checking device

4

CONVERSIONS

INCHES	mm
.18	4.6
.375	9.6
2.0	51.
3.25	82.6
4.0	102.
8.0	203.

Torque Chart

Part Name	Exploded View Item Number	Torque
Socket Head Cap Screws	18	11-13 in-lbs. (1.24-1.47 N m)
Plug and O-Ring Ass'y	6,7	8-12 ft-lbs. (11-16 N m)
Hex. Nut 5/16-24	1	16-19 ft-lbs. (22-26 N m)
Jam Nut 5/8-18	41	25-30 ft-lbs. (34-41 N m)
Jam Nut 13/16-20 UNEF	41	33-38 ft-lbs. (45-52 N m)

Notes

Engine and Drive Shaft

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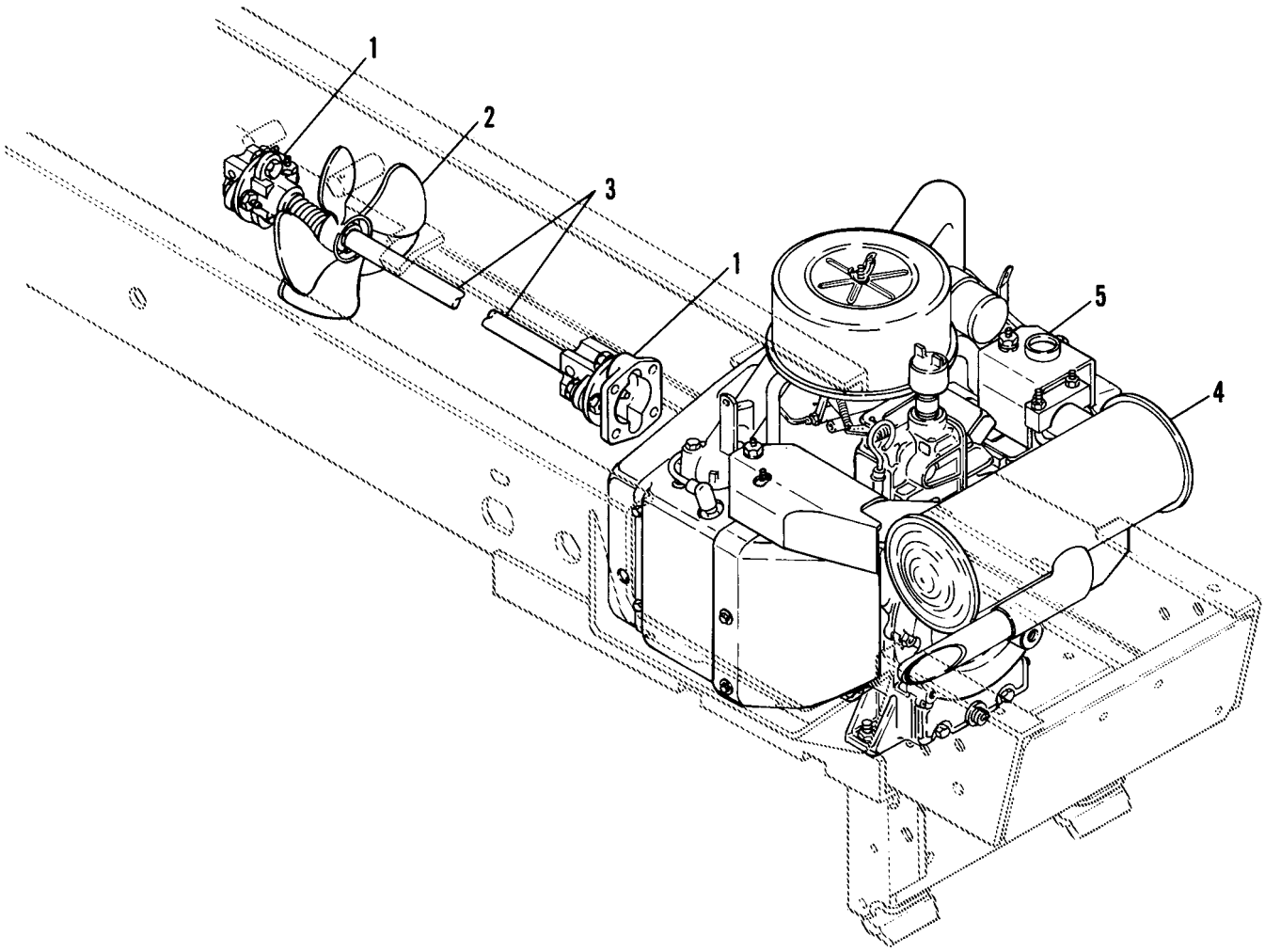
List of Illustrations

Notes

Engine and Drive Shaft
Gasoline



1. Coupling Assembly
2. Fan
3. Drive Shaft
4. Muffler
5. Engine (Gasoline)

Figure 5-1: Engine and Drive Shaft - Gasoline

Engine and Drive Shaft
Gasoline

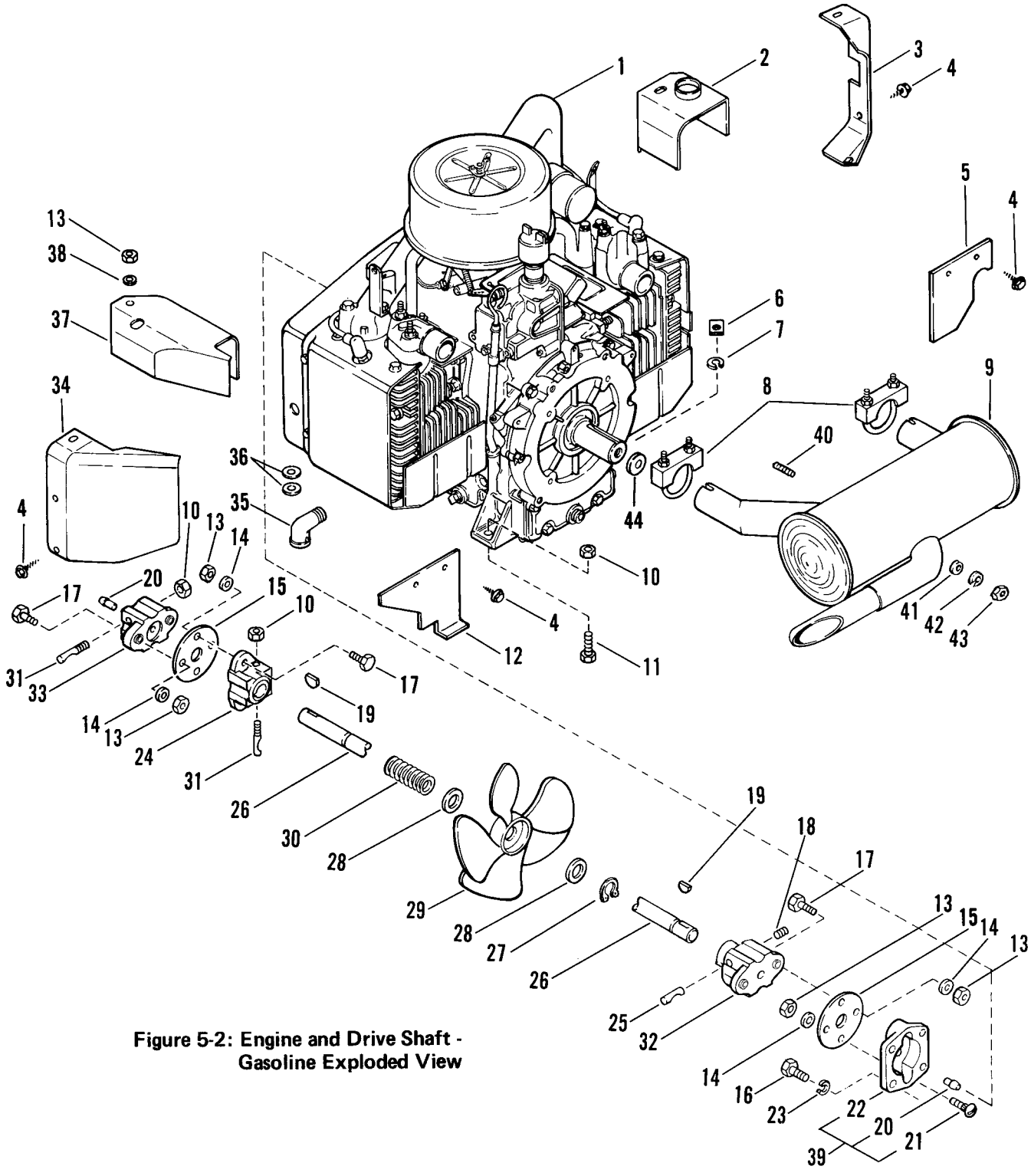


Figure 5-2: Engine and Drive Shaft - Gasoline Exploded View

Engine and Drive Shaft
Gasoline

ITEM NO.	DESCRIPTION
1	Order Engine and Parts from Engine Manufacturers Dealer Engine Kohler KT17S-PS-24317 Engine Kohler KT19S-PS-49202
2	Left Exhaust Shield
3	Cylinder Baffle L.H.
4	Tapping Screw No. 12-14 x 5/8
5	Baffle L.H. (931029)
6	Special Nut 3/8-16 Gr. 5
7	Lock Washer 3/8
8	Exhaust Clamp
9	Muffler - Twin Exhaust
10	Nut 3/8-16
11	Cap Screw 3/8-16 x 1-1/4
12	Baffle R.H.
13	Nut 5/16-18
14	Washer 11/32
15	Spacer Coupling
16	Cap Screw 3/8-16 x 7/8
17	Cap Screw 5/16-18 x 7/8
18	Set Screw 3/8-16 x 1/2
19	Woodruff Key 3/16 x 3/4
20	Pin 5/16 x 3/4
21	Bolt 5/16-18 x 7/8
22	Drive Hub
23	Lock Washer 3/8
24	Drive Shaft Hub
25	Lock Stud
26	Drive Shaft
27	Snap Ring Ext. 3/4
28	Washer 3/4
29	Fan
30	Comp. Spring
31	Lock Stud
32	Drive Hub
33	Drive Hub
34	Cylinder Baffle R.H.
35	Street Elbow
36	Washer 3/8
37	Exhaust Shield R.H.
38	Washer 5/16
39	Coupling Assembly
40	Engine Stud
41	Washer 1/4
42	Lock Washer 1/4
43	Nut 1/4-20
44	Spacer (Required with Engine Spec KT17S 24105A)

Engine and Drive Shaft
Gasoline

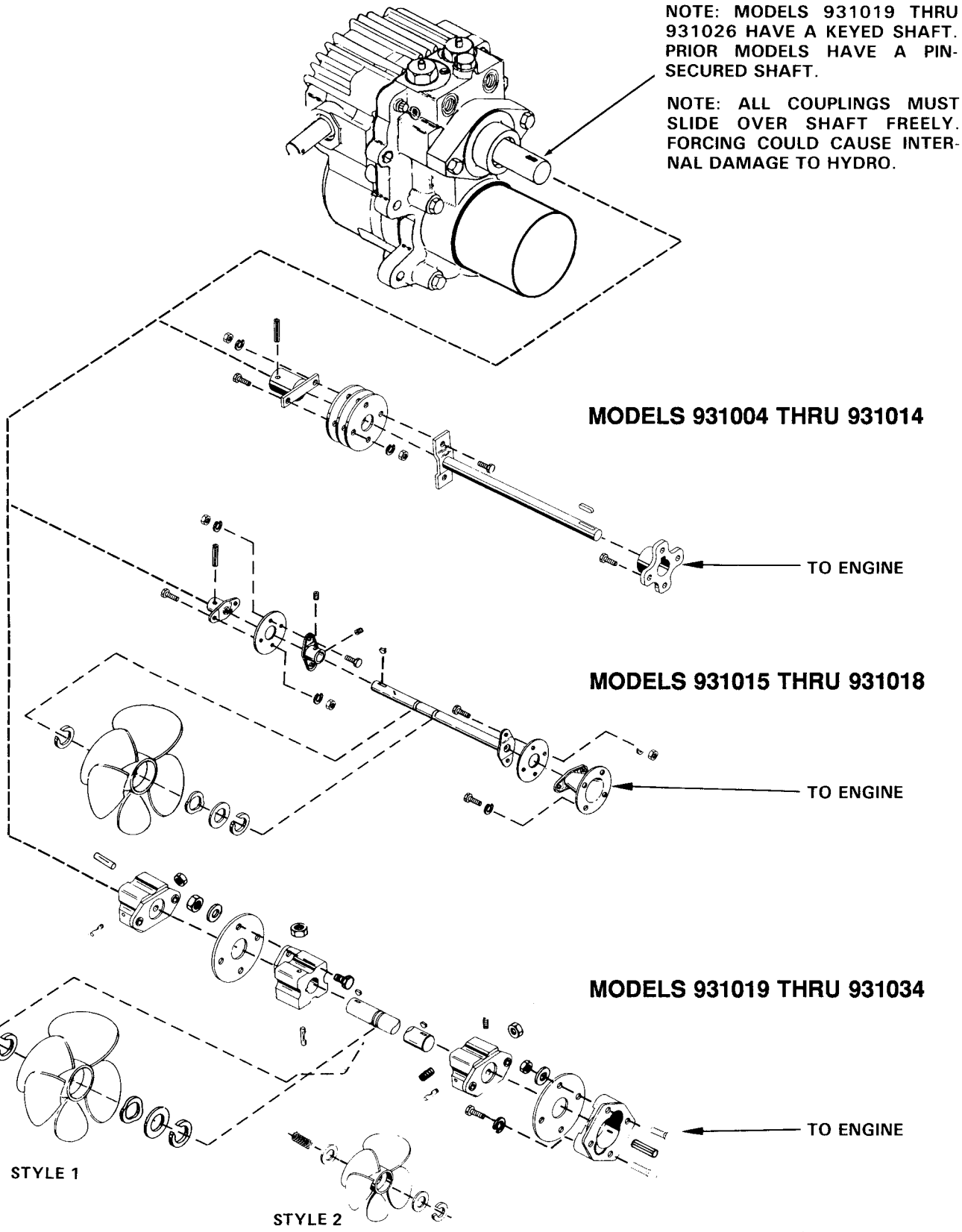
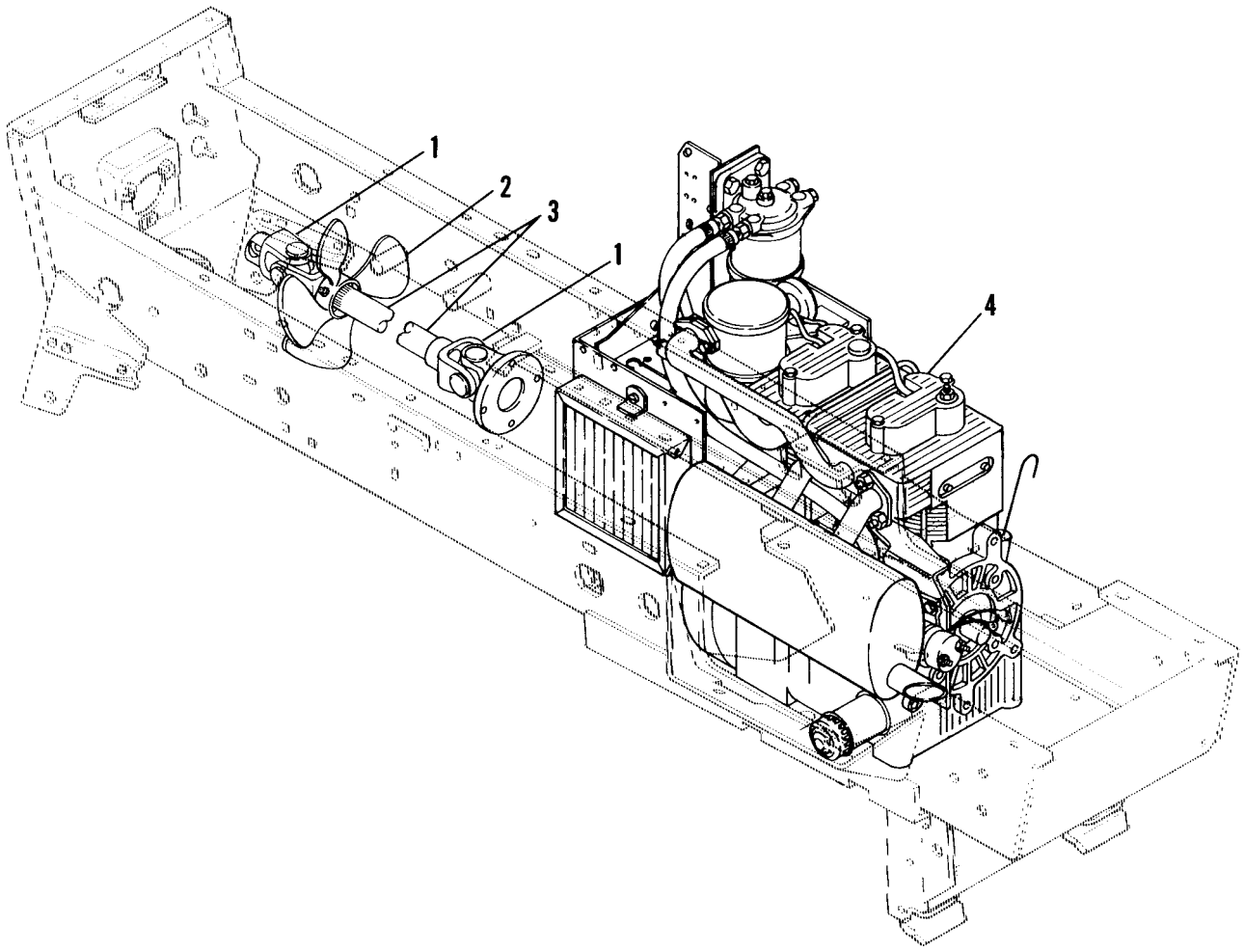


Figure 5-3: Drive Shaft Variations

Engine and Drive Shaft
Diesel



1. Universal Assembly
2. Fan
3. Drive Shaft
4. Engine (Diesel)

Figure 5-4: Engine and Drive Shaft - Diesel

Engine and Drive Shaft

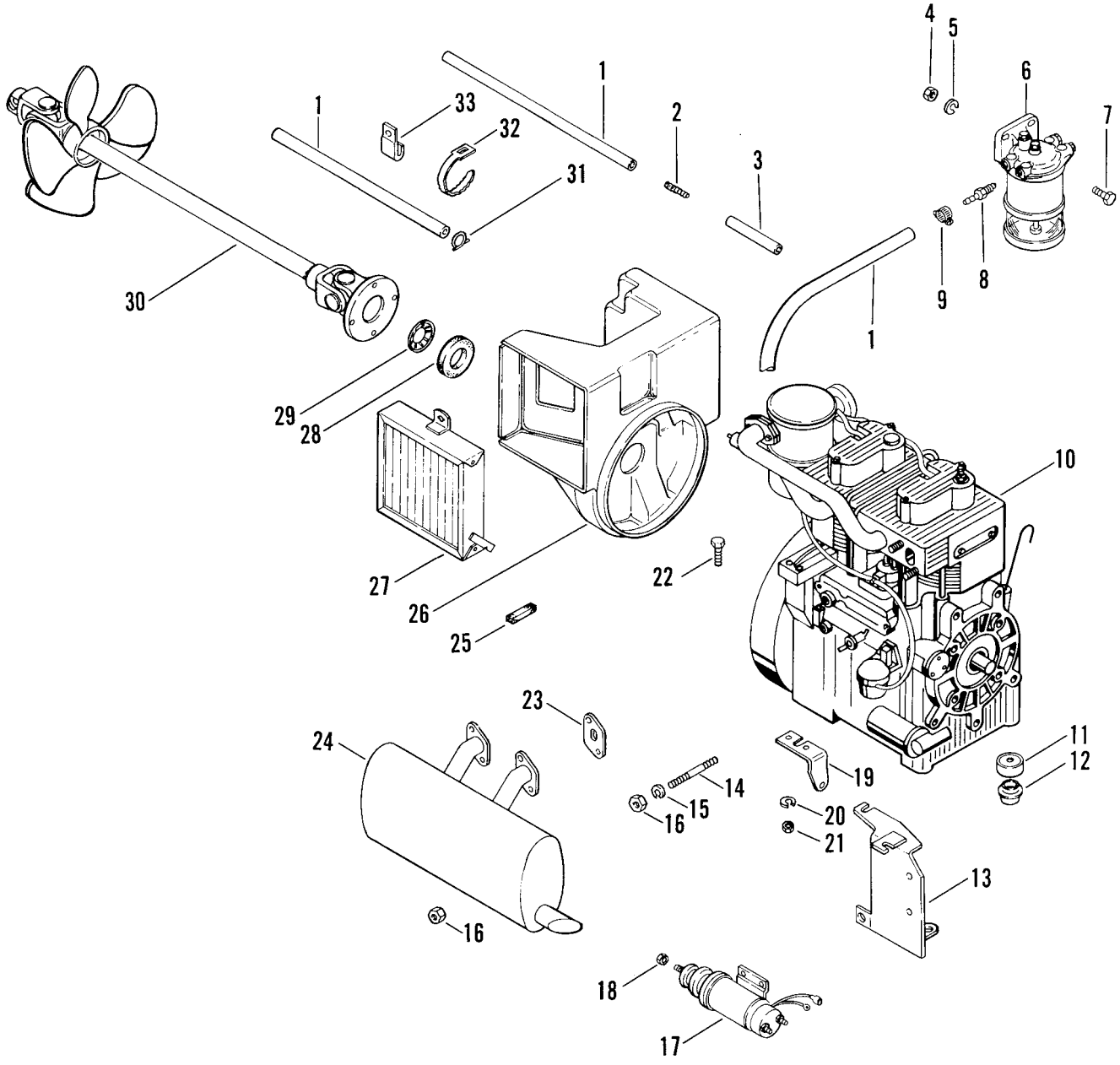


Figure 5-5: Engine and Drive Shaft - Diesel
Exploded View

Engine and Drive Shaft

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	67" Fuel Line (Return Line 67") (Tank to Filter 60") (Filter to Eng. 30")	15	Lock Washer 5/16
		16	Nut Hex (M8 - 1.25)
		17	Solenoid
2	Reducer	18	Nut No. 10-24
3	4" Hose	19	Throttle Cable Anchor
4	Nut 3/8-16	20	Lock Washer 5/16
5	Lock Washer 3/8	21	Nut 5/16-18
6	Fuel Filter Cartridge (Only)	22	Cap Screw 5/16-18 x 1-3/4
		23	Muffler Gasket
7	Cap Screw 3/8-16 x 1"	24	Muffler
8	Hose End	25	Foam Tape
9	Hose Clamp	26	Air Duct
10	Order Engine and Parts from Engine Manufacturers Dealer Engine Ruggerini RD180	27	Air Filter
		28	Sealing Washer
		29	Push Nut
11	Top Isolation Mount	30	Drive Shaft
12	Bottom Isolation Mount	31	Hose Clamp
13	Solenoid Bracket	32	Tie
14	Metric Stud	33	J-Clamp

Engine and Drive Shaft

5.1 Drive Shaft - Gasoline

Remove floor plate.

IMPORTANT: NEVER attempt to use a hammer to drive coupling on or off shaft of transmission. Coupling is designed to slide freely on shaft. Striking on or against transmission could result in damaging charge pump or transmission.

To remove drive shaft coupling proceed as follows:

Remove nuts and bolts from spacer coupling at drive hub that is going to be slid-off.

Loosen nut on lock studs that lock hubs to drive shaft and using a rubber mallet, tap lightly on nut to free lock stud's grip on shaft.

Remove drive shaft from tractor.

Reassemble in reverse order.

5.2 Drive Shaft - Diesel

Remove Floor Plate.

Loosen 3/8" locknut on drive shaft and tap with rubber mallet to drive shaft back.

Slide the universal forward off the transmission shaft. Push down on shaft and back off of drive shaft.

Remove battery according to removal instructions in Electrical Section.

Loosen muffler clamps and remove muffler which opens access to disconnect throttle cable, grounding cable, fuel shut off wire, oil pressure wire and route wires back.

Disconnect wires on left side of tractor, PTO clutch, starter solenoid, oil temperature gauge, voltage regulator and headlights.

Remove fuel tank and route seat switch wire, rear deck light wire, PTO clutch wire, transmission wire and park wires back to engine.

Remove fuel filter from top of tower and set on engine with hoses left on.

Remove left side foot rest and remove bolts holding power steering to frame.

Plug hoses from transmission when removing to avoid an oil leak.

To remove push nut on shaft cut nut with a tin shears and slide felt washer down shaft.

Remove (4) four carriage bolts holding console to frame.

Wrap electrical wires around console and left console from tractor.

Remove (4) four capscrews holding drive shaft to flywheel and remove drive shaft.

5.3 Engine Removal (For Engine Service refer to Engine Manufacturer's Manual)

Remove battery according to removal instructions in Electrical Section.

Disconnect wires to headlights.

Remove hardware securing side plates to frame (on gasoline powered units, raise muffler shield). Remove hood, grill and side plate assembly as a unit from tractor.

Disconnect throttle (and choke on gasoline powered units) cable(s) from engine.

Disconnect rectifier, positive wire from coil, and cable at starter.

Disconnect fuel line from fuel pump. (On diesel remove return line.)

To remove push nut on shaft cut nut with a tin shears and slide felt washer down shaft.

Remove (4) four capscrews holding drive shaft to engine flywheel.

Remove spring and PTO belts on front of engine.

Remove (4) four engine mounting bolts holding engine to frame.

Using a hoist attached to lift points on engine remove engine from tractor.

Disconnect drive shaft according to instructions in Drive Shaft Section 5.1 or 5.2.

Reinstall engine in reverse order.

5.4 Fuel Tank

WARNING: Fuel is highly flammable and must be handled with care in a well ventilated area. DO NOT fill tank when engine is running or hot from operation. NEVER allow open flame, matches or smoking in area. DO NOT overfill. Wipe up any spills. Use approved fuel container.

Raise rear deck and brace it securely. Deck must be braced so that it will not fall when hardware that secures channel, that support cable is attached to, is removed.

Remove hardware securing tank channels and set aside (cable does not have to be removed from channel).

On models with fuel connection located at top of tank disconnect fuel line at tank.

On models with fuel connection located at bottom of tank, remove floor plate, clamp fuel line before filter and disconnect fuel line at filter.

Remove fuel tank from tractor.

Assemble in reverse order.

Troubleshooting - Gasoline Engines

	PROBLEM		PROBABLE CAUSE
1.	Engine will not crank.	a.	Check for dead battery or improperly charged battery.
		b.	Check for poor battery connections.
		c.	Check if controls are in the "safe start" position.
		d.	Check for a bad starter or connections.
		e.	Check for bad solenoid switch.
		f.	Check for electrical problems - see "ELECTRICAL SYSTEMS" Trouble Shooting sections procedure in manual.
		g.	Check if the PTO clutch-brake is installed properly.
2.	Engine will not start.	a.	Check for electrical problems - see "ELECTRICAL SYSTEMS" Trouble Shooting sections procedure in manual.
		b.	Check for engine ignition problems - see Kohler Engine Service Manual.
3.	Engine stops.	a.	Check gas. Use only clean gasoline.
		b.	Check spark.
		c.	Check for safety interlock shut down - see "ELECTRICAL SYSTEMS" Trouble Shooting sections.
4.	Engine power, noise, idle and shut down.	a.	See Kohler Engine Service Manual.
5.	Engine carburetor iceing.	a.	Install 531164 Carburetor Heater Package. (931019)

NOTE: THIS PRODUCT IS EQUIPPED WITH AN INTERNAL COMBUSTION TYPE ENGINE. DO NOT USE UNIT ON OR NEAR ANY UNIMPROVED, FOREST-COVERED OR BRUSH-COVERED LAND UNLESS THE EXHAUST SYSTEM IS EQUIPPED WITH A SPARK ARRESTER MEETING APPLICABLE LOCAL, STATE OR FEDERAL LAWS. A SPARK ARRESTER, IF IT IS USED, MUST BE MAINTAINED IN EFFECTIVE WORKING ORDER BY THE OPERATOR. SEE YOUR ARIENS DEALER OR ENGINE MANUFACTURER'S SERVICE CENTER.

Troubleshooting - Diesel Engines

PROBLEM / PROBABLE CAUSE	Does not start	Starts and stops	Lack of power	Oil consumption	Low oil pressure	Blue smoke	Black smoke	Hunting	Overheated	Poor acceleration
Empty fuel tank	■									
Drilling in tank cap blocked	■	■								
Injection pump drawing in air	■	■	■							■
Piping choked	■	■	■							
Choked fuel filter	■	■	■							
Air filter choked		■	■				■			
Not set to deliver excess fuel	■									
Oil breather valve damaged					■					
Worn oil pump					■					
Worn main/connecting rod bearings					■					
Worn valve guides				■		■				
Worn cylinder and piston rings			■	■		■				
Too much oil in crankcase				■		■				
Lubrication circuit blocked					■					
Defective injector	■	■	■				■		■	
Defective injection pump	■	■								■
Overload							■		■	
Seized rack bar								■		■
Defective governor spring								■		
Cylinder head and cylinder fins choked			■						■	
Wrong timing		■	■						■	
Excessive cylinder head clearance	■		■							

5

Notes

Speed Selector and Brakes
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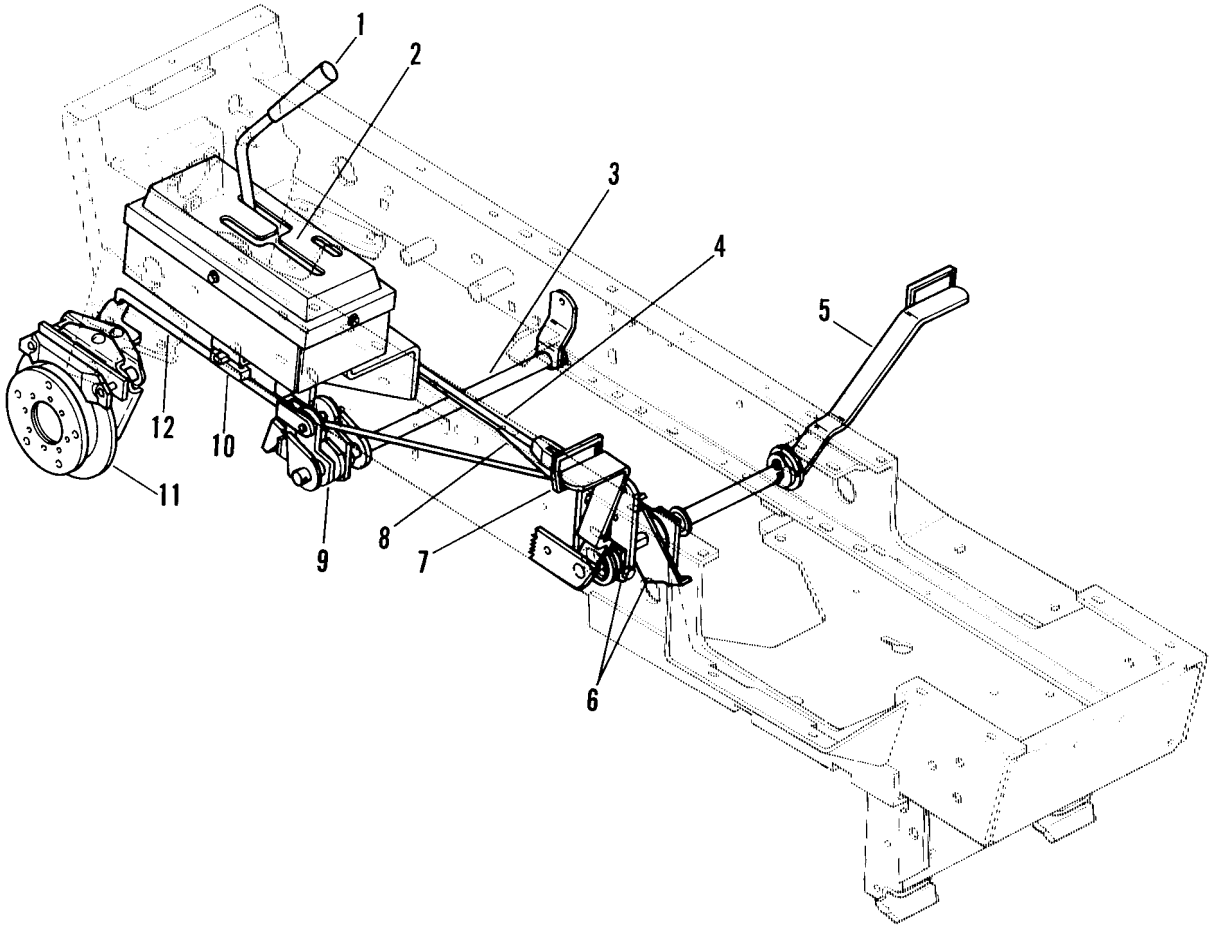
Speed Selector and Brakes (Linear)



1. Shift Rod
2. Control Box
3. Brake Shaft
4. Shift Rod
5. Neutralizer Peddle
6. Neutralizer and Brake Linkage
7. Brake Peddle
8. Neutralizer Rod
9. Brake Arms
10. Shift Lever
11. Brake
12. Brake Rod

Figure 6-1: Speed Selector and Brake Assembly

Speed Selector and Brakes (Linear)

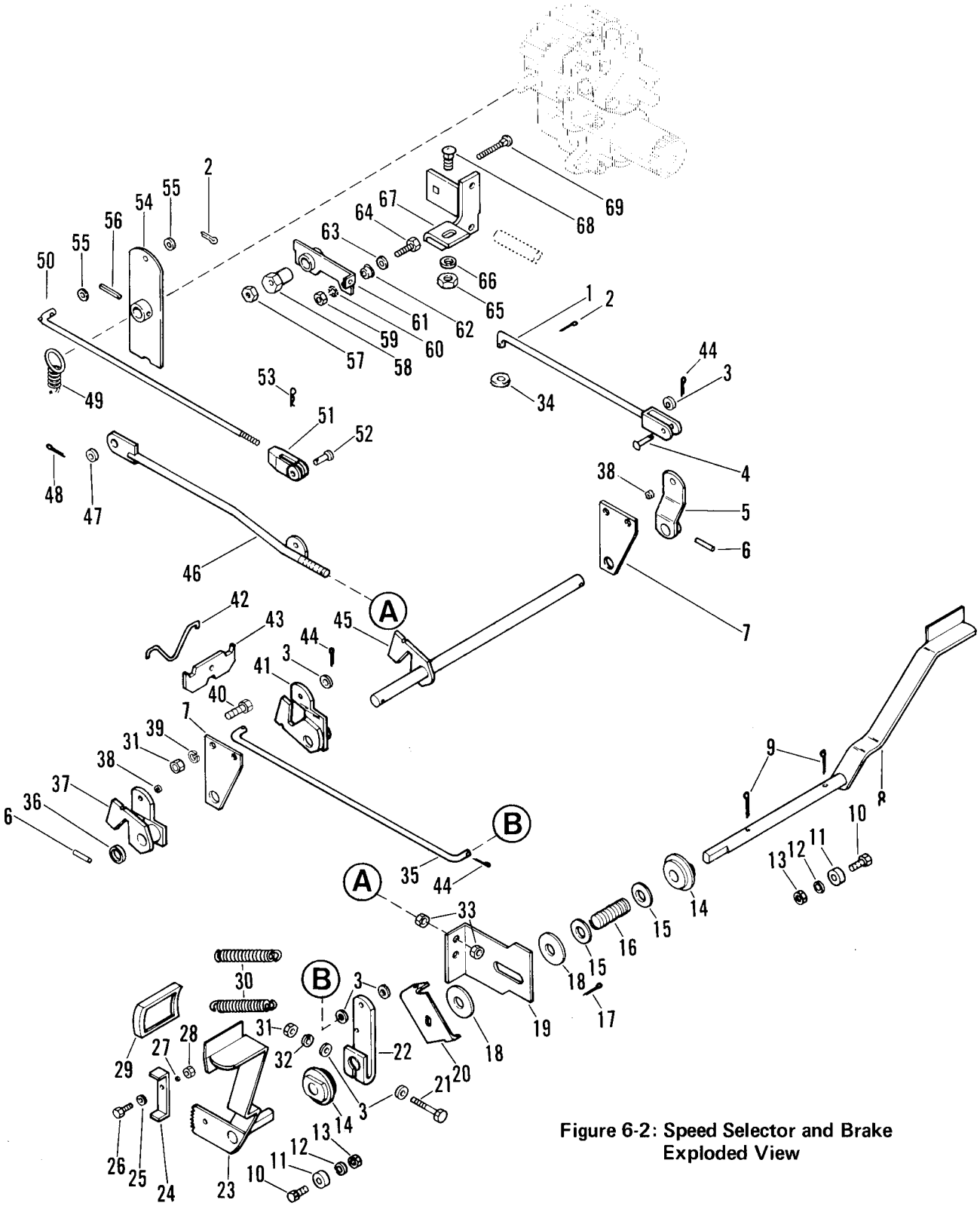


Figure 6-2: Speed Selector and Brake Exploded View

Speed Selector and Brakes (Linear)

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Brake Rod	36	Washer 3/4
2	Cotter Pin 3/32 x 3/4	37	Brake Arm
3	Washer 11/32	38	Grommet
4	Pin	39	Lock Washer 3/8
5	Brake Arm	40	Carriage Bolt 3/8-16 x 1"
6	Groove Pin 1/4 x 1-1/4	41	Arm
7	Plate	42	Clip
8	L.H. Lever	43	Balance Link
9	Cotter Pin 3/16 x 1-1/4	44	Cotter Pin 1/8 x 3/4
10	Cap Screw 5/16-18 x 7/8	45	Brake Shaft
11	Spacer	46	Neutralizer Rod
12	Washer 3/8	47	Washer 1/2
13	Lock Nut 5/16-18	48	Cotter Pin 1/8 x 1"
14	Bushing	49	Extension Spring
15	Washer 3/4	50	Shift Rod
16	Comp. Spring	51	Yoke
17	Cotter Pin 3/32 x 1"	52	Clevis Pin
18	Washer 3/4	53	Hair Pin 3/32 x 1-5/16
19	Neutralizer Plate	54	Shift Arm
20	Neutralizer Arm	55	Washer 3/8
21	Cap Screw 3/8-16 x 2-1/4	56	Roll Pin
22	Arm	57	Lock Nut 5/16-18
23	R.H. Lever	58	Eccentric
24	Latch	59	Lock Nut 1/4-20
25	Washer 1/4	60	Lock Washer Ext. 1/4
26	Cap Screw 1/4-20 x 3/4	61	Detent Arm
27	Spacer Bushing	62	Ball Bearing 1/4
28	Lock Nut 1/4-20	63	Washer 9/32
29	Pedal Pad	64	Cap Screw 1/4-20 x 1"
30	Extension Spring	65	Lock Nut 1/2-13
31	Nut 3/8-16	66	Washer 1/2
32	Lock Washer 3/8	67	Mount Weldment
33	Lock Nut 1/2-13	68	Carriage Bolt 1/2-13 x 1-1/4
34	Washer 3/8	69	Carriage Bolt 5/16-18 x 2-1/4
35	Brake Rod		

Speed Selector and Brakes (Linear)

6.1 Neutral Setting - Eccentric

CAUTION: When raising tractor, block securely with jack stands.

Raise and block rear of tractor with both tires off floor.

CAUTION: Keep hands, feet, hair, clothing and tools away from rotating parts.

Raise rear deck and loosen lock nut on carriage bolt (that holds eccentric in position) enough so that eccentric can be moved with wrench.

With Speed Selector in Park/Start, start engine and shift Speed Selector to neutral "N".

Slowly rotate eccentric clockwise (counterclockwise if wheel rotation speeds up) until wheel rotation stops. Continue rotating eccentric until wheel starts rotating in opposite direction. Position eccentric at a position midway between wheel rotation.

Stop engine and tighten lock nut on eccentric locking carriage bolt.

If wheel rotation cannot be stopped by the above procedure as follows.

6.2 Neutralizer

Remove floor plate.

Loosen lock nut on eccentric locking carriage bolt and turn eccentric to its down position. Secure in this position.

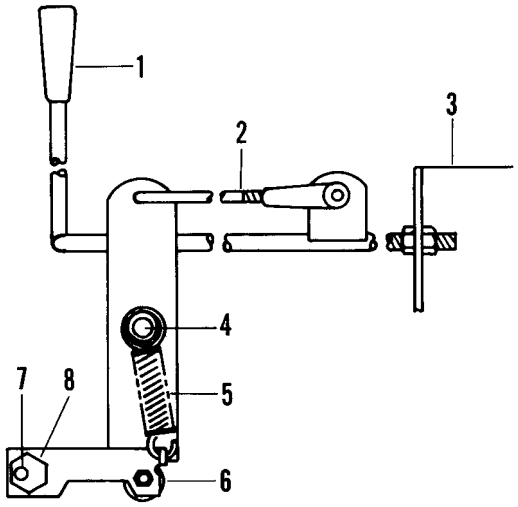
With Speed Selector in Park/Start position start engine. Slowly shift from Park/Start toward neutral "N". Stop moving Speed Selector at point where wheels stop rotating and shut engine off.

On models with shift rod, remove hair and clevis pin from yoke on shift rod. Move shift rod to side.

Loosen jam nuts on neutralizer rod(s). Depress and clamp Neutralizer Pedal.

Tighten jam nuts on neutralizer rod. Unclamp Neutralizer pedal. Speed Selector must return to neutral "N" from either full forward or reverse position when Neutralizer Pedal is depressed.

Adjust yoke on shift rod to line up with hole in tab on neutralizer rod (with bent end of shift rod in center of slot on transmission arm) and secure with clevis and hair pins.

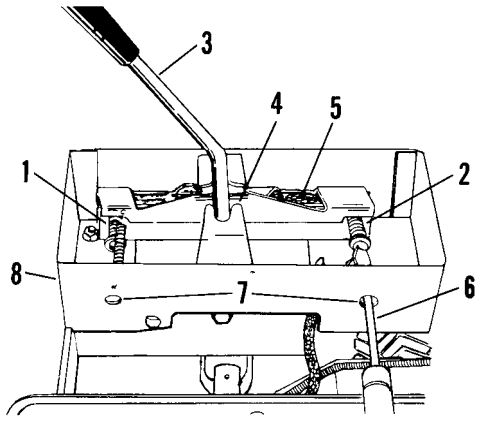


1. Shift Lever
2. Shift Rod
3. Neutralizer Plate
4. Pintle Arm Transmission
5. Spring
6. Bearing
7. Locking Nut
8. Eccentric

Figure 6-3: Neutral Setting

Check neutral setting according to instructions in Section 6.1.

6.3 Speed Selector Friction



1. Screw No. 1
2. Screw No. 2
3. Control Lever
4. Control Fork
5. Friction Plates
6. Screw Driver
7. Access Holes
8. Control Console

Figure 6-4: Speed Selector

Speed Selector and Brakes (Linear)

There must be spring pressure applied to friction angles to keep Speed Selector at selected setting. (Friction angles must be parallel.)

If tractor slows down or speeds up without touching Speed Selector, increase spring pressure of friction angles by tightening screws (1) and (2) equally. To adjust, raise rear deck and insert screw driver thru access holes.

If tractor speeds up, tighten screw (1) 1/4 turn more than (2). If tractor slows down, tighten screw (2) 1/4 turn more than (1).

6.4 Park Lock Pin

Positioning Speed Selector in Park/Start from neutral engages park-lock pin in reduction gear of differential housing, locking differential input and actuating safety switch located under console cover.

When moving Speed Selector from neutral "N" toward Park/Start, the overcenter pivot plate actuates at point (c) which is approximately 1/2 to 2/3 length of slot and park-lock pin completely engages at point (B).

NOTE: A distinct "click" can be heard when over center latch actuates.

Park-lock pin should completely disengage at point (A) when moving Speed Selector from Park/Start to neutral (N).

1. Park Lock Disengages
2. Overcenter Latch Actuates
3. Park Lock Engages

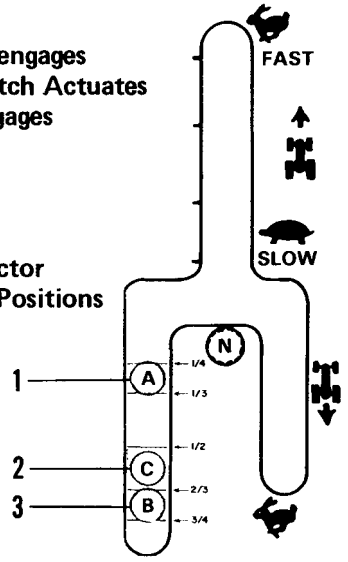
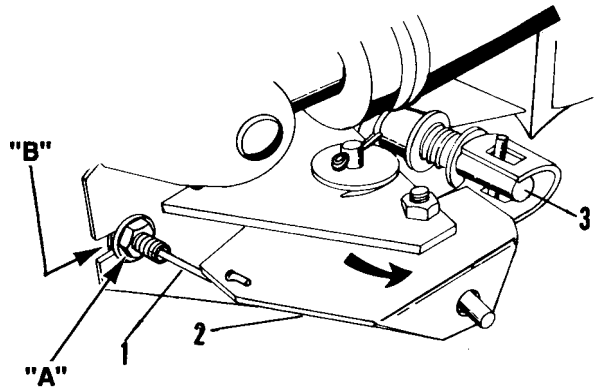


Figure 6-5: Speed Selector Park Lock Positions

To adjust start with nut "B" all the way on and nut "A" at end of threads. Rotate plate (2) as arrow shows and be sure (3) is engaged. Check that shift lever is completely in "park" position. Bring both nuts up evenly to the plate and tighten.

NOTE: The installation at the upper end should be approximately centered on the threaded length.



1. Cable
2. Overcenter Pivot Plate
3. Park Lock Pin (Engaged)

Figure 6-6: Park Lock Assembly

6.5 Greasing Hydrostatic Control Lever

Raise Rear Deck and grease zerk fitting located on the shaft just inside control console at operator's right. Wipe zerk clean before and after lubrication. Use Ariens Multi-Purpose Grease every 50 hours of operation or at least once each season.

Speed Selector and Brakes (Linear)

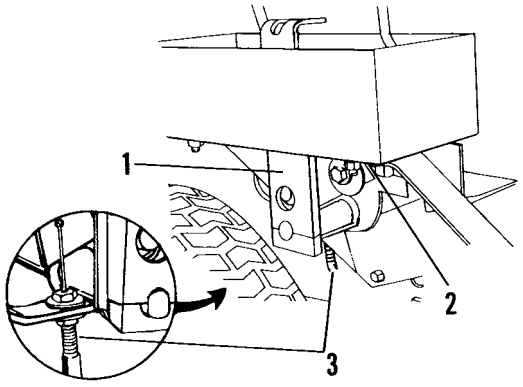
6.6 Oiling Hydrostatic Control Linkage

For early style tractors, oil roller in cam slotted plate with a few drops of light oil every 25 hours of operation or monthly.

Oil control cable.

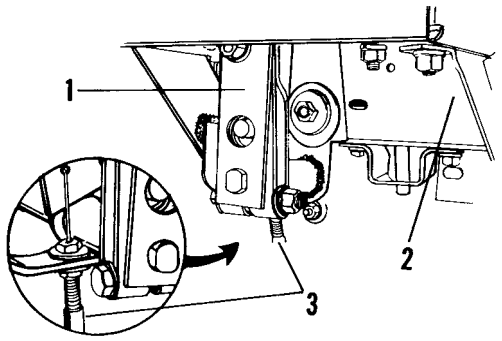
Periodically oil hydrostatic control pivot shaft.

Periodically lubricate all lift linkage pivot areas.



1. **Hydrostatic Control Fork**
2. **Zerk Fitting Inside Console**
3. **Control Cable**

Figure 6-7: Hydrostatic Control Linkage



1. **Hydrostatic Control Fork**
2. **Zerk Fitting Inside Console**
3. **Control Cable**

Figure 6-8: Linear Linkage

6.7 Hydrostatic Control Set-Up Procedure

CAUTION: When raising tractor, block securely with jack-stands.

Jack up rear of tractor, and block securely!

Loosen bolt and turn eccentric so cam follower roller pin is in down position and secure.

Shift to "PARK" and start tractor.

Move Control Lever out of "PARK-START" position into "NEUTRAL" slot and move forward or back until rear wheels stop. (You now have neutral in hydro).

Turn OFF engine.

Remove floor plate.

Loosen and back off jam nuts on neutralizer and shift rod.

Now carefully move shift handle to neutral slot in shift console.

Note: DO NOT move cam plate (you now have neutral at hydro and shift console).

Depress Neutralizer Pedal and hold or clamp in down position.

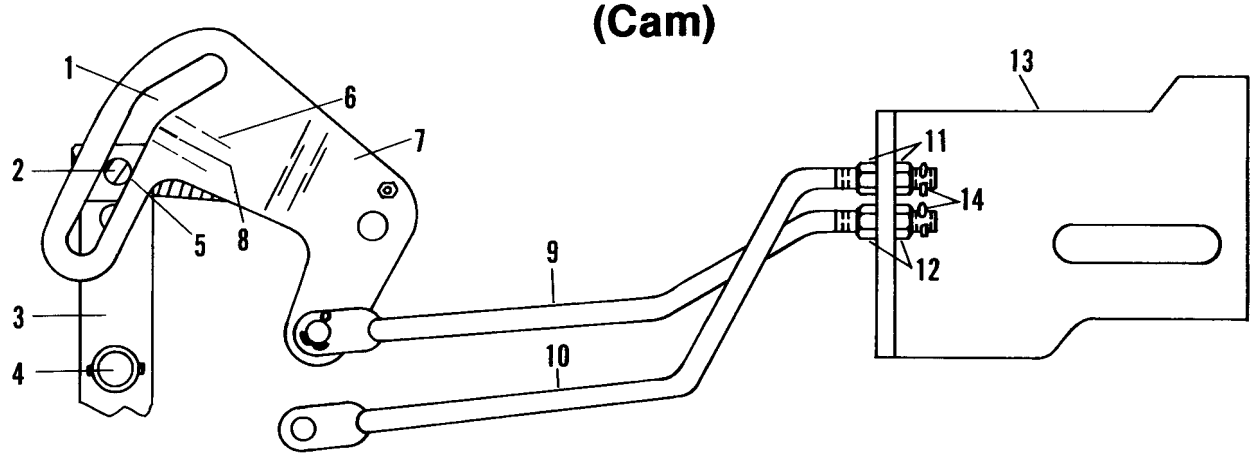
Secure (4) jam nuts to neutralizer plate.

Release Neutralizer Pedal.

Start tractor and if wheels move when Shift Lever is in "NEUTRAL" position adjust at eccentric.

If more travel is needed in shift console area make an adjustment at pintle lever or at shift fork arm and clevis.

Speed Selector and Brakes (Cam)



1. Cam Slot
2. Eccentric
3. Pintle Lever
4. Pintle Shaft
5. Cam Follower Roller
6. Dwell Angle
7. Cam
8. Dwell Center Mark
9. Neutralizer Rod
10. Shift Rod
11. Jam Nuts
12. Jam Nuts
13. Neutralizer Plate
14. Cotter Pins

Figure 6-9: Cam Type Linkage

6.8 Hydrostatic Control Adjustment - Cam

CAUTION: When raising tractor, block securely with jack-stands.

If tractor creeps when Hydrostatic Control Lever is in "NEUTRAL" (N) position on control console, make the following adjustment:

Hydrostatic controls should be adjusted so tractor does not creep forward or backward when control lever is in "NEUTRAL" (N) slot in control console. Control lever should automatically be shifted to this position from either "FORWARD" or "REVERSE" when Neutralizer Pedal is fully depressed.

Jack up rear of tractor until the drive wheels clear ground and BLOCK SECURELY. Wheels must be free to revolve.

With Hydrostatic Control Lever in "PARK-START" position, raise rear deck. Activate seat switch to allow engine to start.

Start engine; place Hydrostatic Control Lever in "NEUTRAL" position and increase engine speed to full throttle.

Loosen Clamp Bolt a sufficient amount to allow eccentric on pintle arm to rotate. Turn eccentric "clockwise" or "counterclockwise" as required until rear tractor wheels completely stop. Retighten Clamp Bolt.

Check adjustment by moving Hydrostatic Control Lever to both "FORWARD" and "REVERSE" positions several times. Each time lever is returned to "NEUTRAL", rear wheels should stop completely. If they drift, re-adjust eccentric until a true "NEUTRAL" position is found.

CAUTION: Use extreme caution when adjusting hydrostatic linkage with engine running due to rotating drive shaft coupling and fan.

If a positive "NEUTRAL" cannot be found by adjusting eccentric, it will be necessary to adjust hydrostatic linkage using the following procedure:

Jack up rear of tractor until the drive wheels clear ground and BLOCK SECURELY. Wheels must be free to revolve.

Speed Selector and Brakes (Cam)

CAUTION: Rear Axle must be raised and blocked securely so that rear wheels are free to revolve.

With Hydrostatic Control Lever in "PARK/START" position, raise rear deck.

Loosen Clamp Bolt and rotate the eccentric until the flats on the eccentric are parallel to the cam slot. Retighten Bolt. This will assure a maximum fine adjustment range.

Move Speed Selector until the cam follower roller is lined up with cam dwell center mark. DO NOT adjust Hydrostatic Control Fork, if Hydrostatic Control Lever is not in "NEUTRAL" (N) slot of console.

Depress free-wheeling valves by rotating cam up.

Loosen Pintle Lever Clamp Bolt a sufficient amount to allow Pintle Lever to move freely. Move the Hydrostatic Control Lever, in "PARK-START" position, start engine and run at idle. Return Hydrostatic Control Lever to "NEUTRAL" (N) slot in control console.

Release free-wheeling valves by rotating cam down.

6.9 Neutral Setting - Cam Follower

Check that cam follower roller is lined up with cam dwell center mark. Move pintle arm back and forth until wheels stop turning. Carefully tighten Bolt. Neutral adjustment is extremely sensitive and this procedure is a course adjustment.

Loosen (4) jam nuts on neutralizing plate and depress Neutralizer Pedal completely. The cam follower roller should remain in line with cam dwell center mark. Snug (4) jam nuts up against neutralizer plate. Release pedal and securely tighten jam nuts.

Check Hydrostatic Control Lever. If Neutralizer Pedal does not automatically shift Control Lever to the "NEUTRAL" (N) position from either "FORWARD" or "REVERSE" when pedal is fully depressed, loosen hydrostatic control fork adjustment Bolt. Move fork so that it aligns with neutral slot in control console. Securely tighten Bolt.

If wheels still move slowly when neutralized, increase engine speed to full throttle. Loosen Clamp Bolt and adjust eccentric roller until wheels stop completely. Tighten Clamp Bolt.

6.10 Disc Brake Adjustment

Tractor brakes require adjustment when brake pedal depresses over two inches.

NOTE: Open free wheeling valve.

CAUTION: When raising tractor, block securely with jack stands.

Raise and block securely rear of tractor so that wheels can be rotated by hand to feed brake drag.

Position Speed Selector in neutral "N".

Adjust the two hex head lock nuts evenly on each wheel, while rocking wheel back and forth, until brakes start to drag. After brake starts to drag, back each not off 1/8 turn.

6.11 Drum Brake Adjustment

Tractor brakes require adjustment when brake pedal depresses over two inches.

NOTE: Open free wheeling valve.

CAUTION: When raising tractor, block securely with jack stands.

Raise and block securely rear of tractor with wheels off the ground and remove wheel lug nuts, hub cap and wheel.

Position Speed Selector in neutral "N".

Using a screwdriver, tighten star wheel (teeth move up) until brakes are tight almost to the point of being locked. Back off on star wheel (teeth move down) one full turn.

Speed Selector and Brakes (Cam)

After adjusting both brakes, secure wheel and hub cap with lug nuts.

6.12 Disc Brake Disassembly

Raise and block tractor securely. Remove wheel lug nuts, hub cap and wheel.

Remove cotter pin, nut, washer and axle flange from axle.

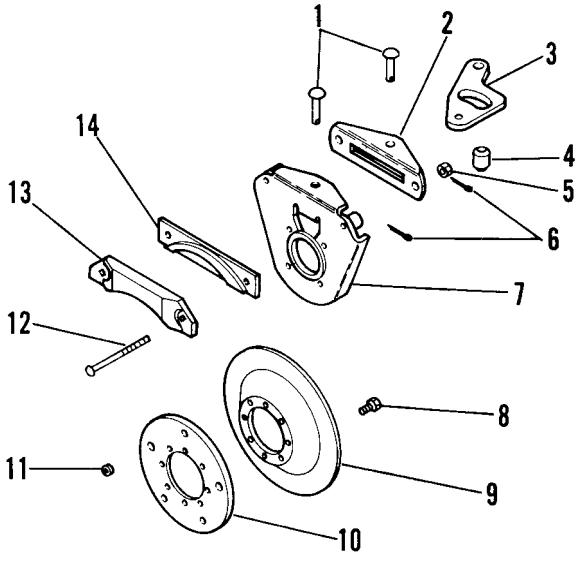
Remove two carriage bolts, caliper plate, lining carrier and disc.

Remove four taptites securing disc to carrier if necessary.

Remove cotter pins and pins from brake arm.

Remove four cap screws securing caliper mounting plate to axle.

Assemble in reverse order and adjust per instructions in paragraph



1. Pin
2. Pressure Plate
3. Brake Arm
4. Roller
5. Lock Nut
6. Cotter Pin
7. Mounting Plate
8. Taptite
9. Disc
10. Carrier
11. Grommet
12. Carriage Bolt
13. Caliper Plate
14. Lining

Figure 6-10: Disc Brake

6.13 Drum Brake Disassembly

Raise and block tractor securely. Remove wheel lug nuts, rear wheel hub cap and wheel.

NOTE: If you are not thoroughly familiar with procedures involved in brake replacement, disassemble and assemble one side at a time, leaving other wheel intact, as a reference.

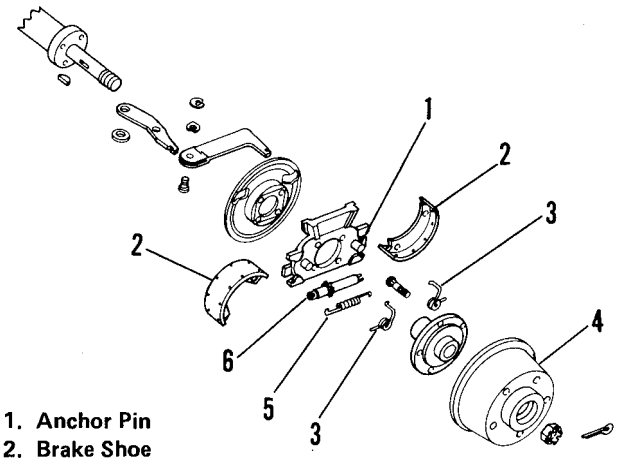
Remove brake drum.

CAUTION: Be careful that springs do not slip during removal, as springs could break loose and cause personal injury.

Remove brake retaining springs from brake shoe anchor pin.

Remove adjuster spring, adjuster screw assembly and brake shoes.

Install new shoes in reverse order being sure to clean threads on adjusting screw and apply a light coating of high temperature grease to threads. Screw adjuster closed, then open it one-half turn.



1. Anchor Pin
2. Brake Shoe
3. Retaining Spring
4. Brake Drum
5. Adjuster Spring
6. Adjuster Screw

Figure 6-11: Drum Brake

Notes

Drive Train (Gear)

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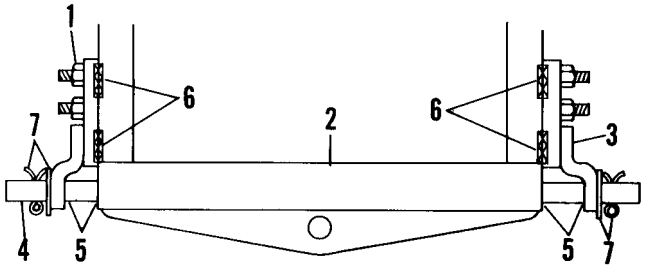
Gear Drive Train

7.1 Transmission and Frame Alignment



1. Torque Locknut
2. Tractor Frame
3. Axle Support
4. 5/8" Diameter Rod
5. Lower Hitch Pin Holes
6. Tack Weld
7. Cotter Pin and Washer

Figure 7-1: Gear Transmission and Frame Alignment

CAUTION: When raising tractor, block securely with jack stands.

Lift and block rear of tractor at frame and remove right hand rear wheel.

Loosen hardware securing frame to axle and install a 5/8" diameter rod through rear axle supports and tractor frame. Secure rod with washers and cotter pins.

Torque axle support nuts to 50-60 ft. lbs. and tack weld axle supports to frame.

7.2 Drive Belt Alignment

NOTE: Place straight edge against inside of drive and driven sheaves to check alignment.

To align, loosen set screws on driven sheave and adjust sheave to align belts (on some models it may be necessary to remove snap ring to obtain alignment).

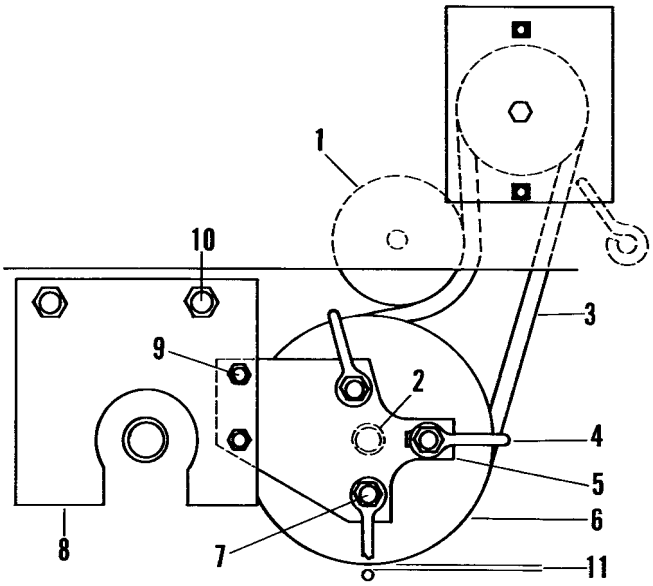
7.3 Drive Belts and Finger Adjustment

NOTE: A belt and finger package, Part No. 531102, is available to improve belt retention and adjustment on gear driven tractors.

When clutch pedal is depressed, idler pulley should move to a point of declutching (not away from belts) which allows belts to move up and off "T" box pulley.

Belt adjustment is made at turnbuckle at end of clutch cable under floor plate.

Belt fingers should clear belts by 1/32". To adjust, loosen hardware, adjust and tighten hardware.

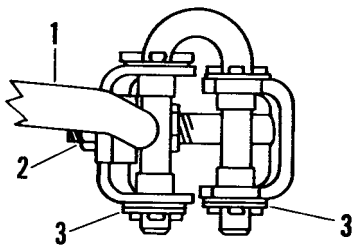


1. Idler Pulley
2. Snap Ring Set Screw
3. "V" Belt
4. Belt Finger
5. Mounting Bracket
6. Driven Sheave
7. Carriage Bolt Locknut
8. Axle Mounting Bracket
9. Cap Screw Locknut
10. Carriage Bolt Locknut
11. 1/32" Clearance

Figure 7-2: Gear Drive Belts

7.4 Speed Selector "U" Rod

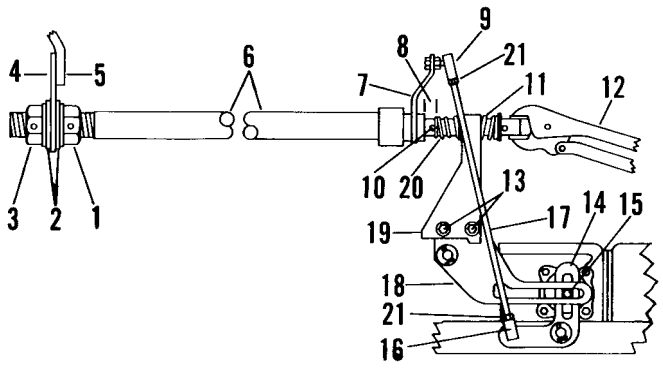
Add flat washer to each side of "U" rod to take up any clearance existing between washer and cotter pins.



1. Speed Selector Lever
2. Shift Handle Mounting Bolt
3. Flat Washers

Figure 7-3: Gear "U" Rod

Gear
Drive Train



1. Inner Locknut
2. Washer
3. Outer Locknut
4. Grommet Washer
5. Speed Selector Lever
6. Shift Rod
7. Shift Lever
8. 1/16"
9. Upper Ball Joint
10. Roll Pin
11. Inside Spring
12. Vise Grips
13. Nut
14. Bellcrank
15. Transaxle Shift Lever
16. Ball Joint
17. Shift Rod
18. Bellcrank
19. Bracket
20. Outside Spring
21. Jam Nut

Figure 7-4: Gear Shift Rod

7.5 Shift Rod Adjustment

IMPORTANT: Lock nuts are required on shift rod to insure proper adjustment.

Use a vise grip to hold shift rod and loosen inner lock nut. With Speed Selector in neutral "N" slot of console, hold lever against left (seat) side of slot. Adjust outer lock nut on shift rod so roll pin comes within 1/16" of hub of shift lever. Tighten inner lock nut until it just touches grommet washer (grease shift rod). Shift lever should move freely side to side.

7.6 Shift Rod Spring Adjustment

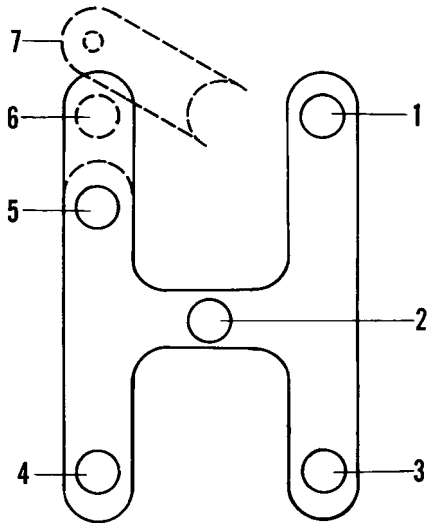
Torque (50-55 in. lbs.) nuts securing bracket to bell crank so that there is equal compression to both inner and outer springs as Speed Selector is moved against sides of console.

7.7 Speed Selector Neutral "N" Adjustment

Disconnect shift rod upper ball joint from shift lever and loosen ball joint jam nut. With transaxle shift lever in its neutral (detent) position, center Speed Selector in neutral "N" slot of console and turn ball joints on shift rod to align with shift lever. Secure upper ball joint to shift lever and tighten jam nuts.

7.8 Speed Selector Third Gear Adjustment

There must be clearance between Speed Selector and end of third gear slot in console when Speed Selector and transaxle shift lever are in third gear and detent. To obtain clearance, loosen lock nuts that secure Speed Selector lever to shift rod, adjust lever and torque lock nuts to 10-12 ft. lbs.

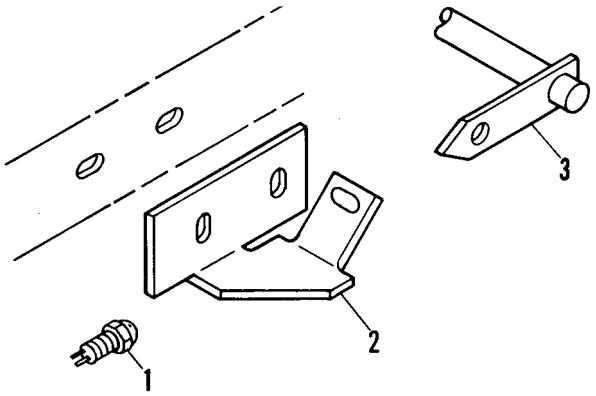


1. Third Gear
2. Center of "Neutral" Slot
3. Fourth Gear
4. Reverse Gear
5. Second Gear
6. First Gear
7. Locknut Cove

Figure 7-5: Gear Speed Selector

7.9 Safety Interlock Switch

Safety Interlock switch must be activated by shift lever when Speed Selector is in neutral "N" position. Loosen hardware and adjust as required.



1. Interlock Switch
2. Switch Bracket
3. Shift Lever

Figure 7-6: Gear Interlock Switch

Drive Train
Hydrostatic Transmission

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Drive Train
Hydrostatic Transmission

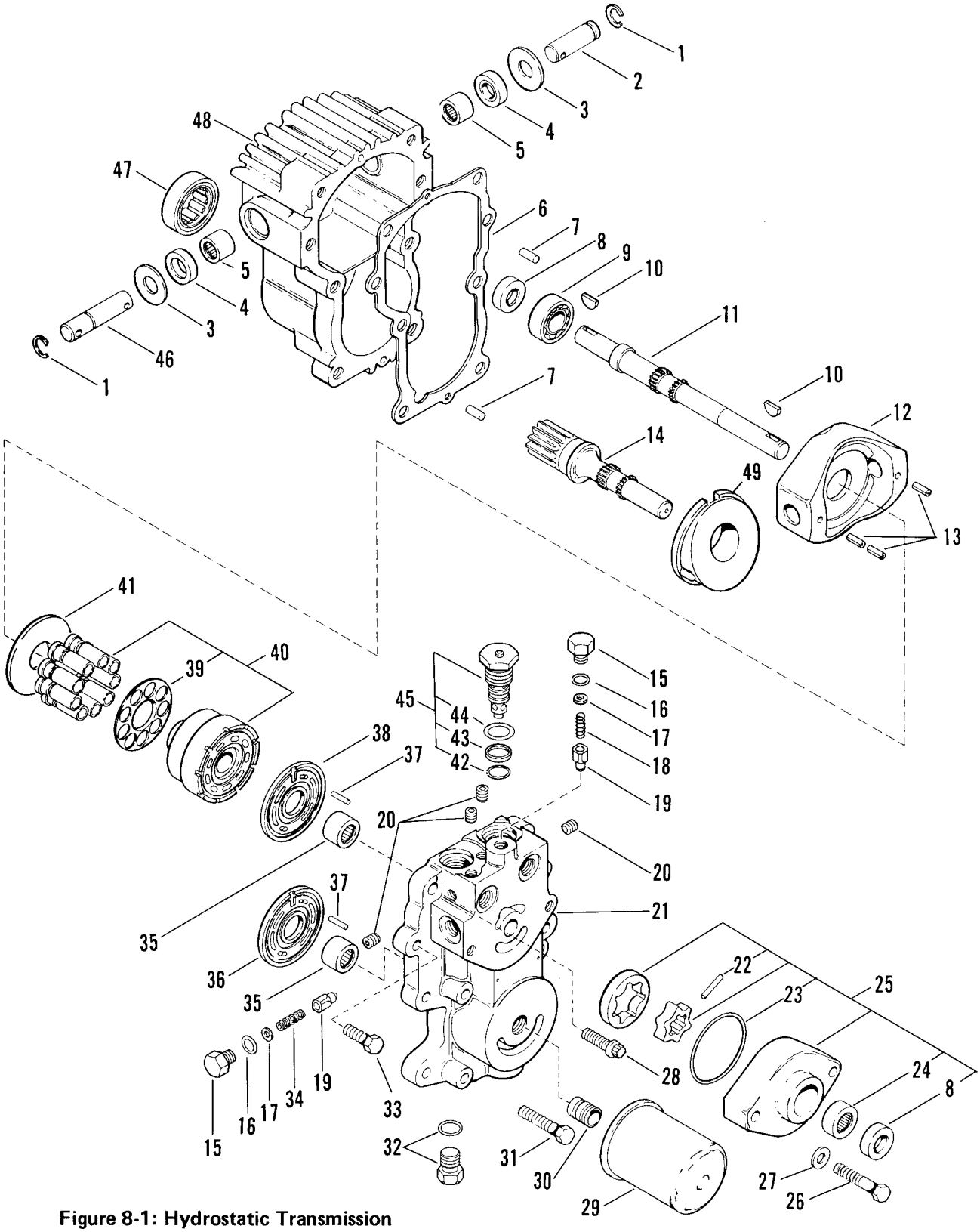


Figure 8-1: Hydrostatic Transmission

Drive Train
Hydrostatic Transmission

ITEM NO.	DESCRIPTION
1	Snap Ring Ext. 11/16
2	Shaft
3	Special Washer 11/16
4	Seal 5/8
5	Bearing
6	Gasket
7	Pin
8	Seal 5/8
9	Bearing
10	Key 3/16 x 3/4 x 5/16
11	Pump Shaft
12	Swash Plate
13	Groove Pin 3/16 x 5/8
14	Shaft
15	Plug
16	"O" Ring 7/16
17	Shim Pack Kit
18	Spring
19	Cone
20	Plug
21	Housing Center Section
22	Pin
23	"O" Ring 2-3/8
24	Bearing
25	Charge Pump Kit
26	Cap Screw 7/16-14 x 2"
27	Washer 7/16
28	Cap Screw 3/8-16 x 1-1/4
29	Oil Filter
30	Union
31	Cap Screw 3/8-16 x 2"
32	Plug includes "O" Ring
33	Cap Screw 3/8-16 x 1-1/2
34	Spring
35	Bearing
36	Plate
37	Pin
38	Plate
39	Slipper Retainer
40	Cylinder Block Kit
41	Thrust Plate
42	"O" Ring 5/8
43	Back Up Ring 5/8
44	"O" Ring 2-5/32
45	Check Valve Assembly
46	Shaft
47	Bearing
48	Housing
49	Swash Plate (On models w/removable swash plate)

Drive Train
Hydrostatic Transmission

8.1 Introduction

An open (air breathing) reservoir should have hydraulic oil changed every 500 hours (more often in dusty dirty conditions).

If oil becomes contaminated with any foreign material (dirt, water, solvent, grease, etc.) or has been subjected to abnormal operating conditions, oil should be changed frequently.

Filter must be changed every 500 hours or each season (more often in dusty dirty conditions), and should always be replaced when changing fluid.

Hydrostatic transmission, power steering (if applicable), differential and hydraulic lift systems all operate from a common reservoir which is rear axle housing. Reservoir should be checked monthly or every twenty-five (25) hours of operation, which comes first for proper oil level, presence of water (noted by cloudy or milky appearance), and/or rancid odor (indicates excessive heat). When adding oil, use only clean fresh oil of same type used in transmission.

IMPORTANT: To prevent severe damage to transmission maintain proper oil level. Oil level should be at top of filler elbow. (Refer to Owner's Manual)

NOTE: 5W-30 or equivalent detergent type motor oil meeting requirements of American Petroleum Institute (A.P.I.) Service Classification SE should be used in hydrostatic system for normal operations. Change oil to SAE 30 if ambient temperature exceeds 80 degrees F and tractor is worked heavily (such as plowing, tilling or when lift is continuously used to capacity).

8.2 Transmission Oil Filter

Important: Be very careful to prevent dirt and foreign materials from entering reservoir or oil filter when changing oil and filter.

Be sure breather is not clogged. Wipe clean with a rag and solvent.

To change transmission oil filter, position tractor on a flat level surface.

CAUTION: Before changing filter, place Speed Selector in Park/Start, turn ignition OFF, remove key and set Parking Brake.

Place a container under filter to catch oil spillage as filter is removed. Raise rear deck. Use an oil filter removal tool to unscrew filter and discard old filter.

Fill new filter with fresh clean same type oil used in transmission to saturate element.

NOTE: Some oil may spill out of filter as it is rotated from vertical to horizontal position as you are installing it. Keep container in place to catch spilled oil.

Lubricate gasket with oil and spin filter on threaded adaptor to gasket contact. Hand tighten additional 1/2 to 3/4 turn. DO NOT over tighten.

IMPORTANT: Transmission must be primed before operation, after changing oil, to prevent internal transmission damage.

8.3 Transmission Priming

To prime transmission, remove implement plug, spring and cone. Pour one pint of oil in port. Replace cone, spring and tighten plug.

Start engine and remove transmission filler plug. Run engine and add fresh clean oil to bring oil level to top of filler elbow. Replace and tighten filler plug.

NOTE: Check for oil leaks.

8

8.4 Transmission Cooling

Check transmission cooling fan condition and keep it clean.

Debris accumulating on transmission cooling fins causes overheating. Check cooling fins and clean every fifty (50) operating hours of every 3 months whichever comes first (more often under dusty, dirty conditions).

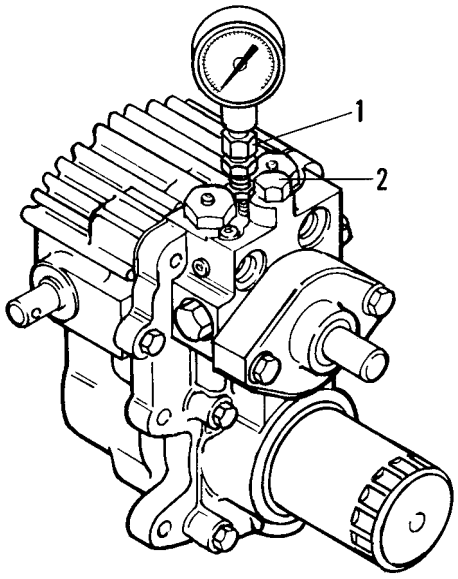
8.5 Implement and Charge Pressure

To check implement and charge pressure, install pressure gauge (Ariens Part No. 000115) in charge port.

Start engine and run at about 1/3 throttle. Charge pressure should read as follows:

Charge Valve . . . . . .70-160 PSI
Implement Valve. . . . . 500-1000 PSI

Increase engine speed to full R.P.M., if charge pressure is not maintained, stop engine and determine cause. (Refer to Trouble Shooting) Pressure may increase but not decrease.



1. **Snubber in Charge Pressure Port**
2. **Implement Relief Plug**

Figure 8-2: Charge Pressure

If pressure is low but steady, it can be increased with the use of a shim (Ariens Shim Pack Part No. 031613). **Note:** One .015 shim put on top of implement relief valve port spring equals approximately 100 P.S.I.

8.6 Directional Valves

If tractor moves in one direction but not in the other, switch the two directional valves and if problem reverses repair or replace defective valve.

NOTE: Oil valve stems frequently to prevent them from sticking.

8.7 Charge Pump

Charge pump may be serviced without removing it from tractor. Refer to instructions in Transmission Disassembly for procedures.

NOTE: Clean shaft extension to remove all sharp edges, burrs and abrasive residue to prevent shaft seal damage.

NOTE: When charge pump is assembled, to transmission, be sure that it is properly oriented so that side with flat is on side matching flat in housing. Rotating charge pump 180 degrees will cause pump to operate in reverse.

8.8 Shaft Seals

Lip seals (except input or output) can be replaced without disassembly of transmission.

Remove necessary components from shaft. On control shaft remove snap ring and washer (replace if bent or distorted) before removing seal.

Pry seal carefully out of housing bore, take care not to damage housing bore or shaft. (Once seal is removed it is not reusable.)

NOTE: Clean shaft extension to remove all sharp edges, burrs and abrasive residue to prevent shaft seal damage.

Place seal over shaft and press into housing bore. Replace components removed earlier.

8.9 Transmission Removal

To remove transmission from tractor, disconnect drive shaft per instructions in Section 5.

IMPORTANT: Before disconnecting any hoses, clean dirt from around all fittings. Plug port holes and hoses immediately after disconnecting hoses and before removing transmission from tractor. This is to prevent foreign material from entering transmission and damaging it when cleaning and assembling.

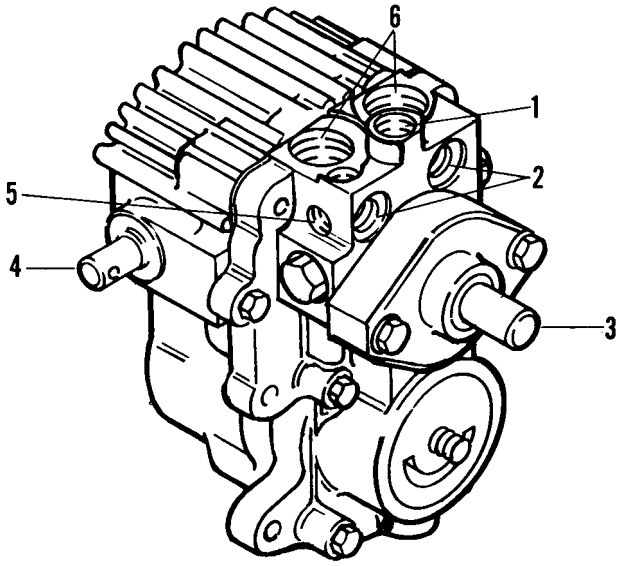
Place oil catch pan under tractor and remove hose clamp and hose from fitting at axle. To facilitate drainage, remove hose clamp and hose from transmission and stand hose in catch pan (so it drains out).

Remove hoses from transmission to lift valve by loosening fittings at valve and rotating hoses with fittings from transmission. (On units with power steering, remove hose between transmission and HGF unit at transmission.) Loosen rear P.T.O. locking stud if so equipped.

Remove four cap screws securing transmission to axle (bolts are all same length, but spacers are two different lengths with shorter spacers positioned at shaft bracket).

Remove cotter pin from shift rod at shift arm and shift rod from arm.

Release tension on spring and tilt transmission back and raise up and out of tractor.



1. **Implement Relief Valve Port**
2. **Hydraulic System Outlets**
3. **Pump Drive Shaft**
4. **Control Shaft**
5. **Charge Pump Relief Valve Port**
6. **Check Valve Port**

Figure 8-3: Hydrostatic Transmission Ports

8.10 Transmission Disassembly

Drive roll pin from shift arm and remove shift arm from transmission shaft.

NOTE: Clean shaft extension to remove all sharp edges, burrs and abrasive residue to prevent shaft seal damage.

Remove cap screws securing charge pump to transmission and slide assembly from shaft.

NOTE: When charge pump is assembled, to transmission, be sure that it is properly oriented so that side with flat is on side matching flat in housing. Rotating charge pump 180 degrees will cause pump to operate in reverse.

Remove charge pump generator cartridge and drive pin. Inspect bearing, "O" ring and shaft seal, if replacement is necessary. Remove shaft seal and bearing from housing.

Examine wear surfaces of pump for excessive scratching or heavy wear patterns. Replace cartridge if necessary. DO NOT replace or interchange individual parts within cartridge. Drive pin must always be replaced.

Remove charge cone plug, spring and cone. (These control oil flow to lift valve).

Remove implement nut, spring and cone.

NOTE: If implement lift and charge pressure readings were low, install a shim washer behind cone before replacing cones, spring and nut. (Shim washer will increase lift pressure and reading).

Remove check (free wheeling) valves. (They allow oil to bypass system, by disabling hydrostatic transmissions dynamic braking function).

Remove oil filter.

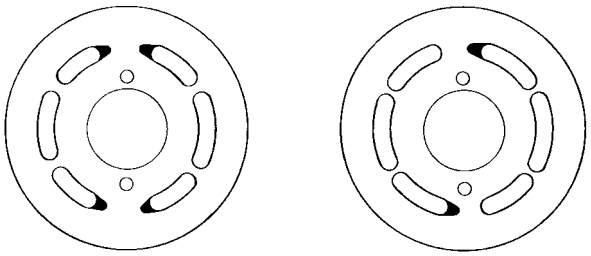
Place transmission with shafts in a vertical position.

Remove all but two center cap screws securing two halves of transmission housing together.

Remove two center cap screws (halves of housing separate because of spring loading on locator pins) and separate halves. Internal parts may fall when separating housing sections.

IMPORTANT: All exposed surfaces are critical - avoid damage.

Remove valve plates (keep separate motor and pump valve plates are not interchangeable).



Motor **Pump**

Figure 8-4: Valve Plates

Remove gasket, valve plate pins and locating pins.

NOTE: Pump and motor cylinder block assemblies are identical and may be interchanged. There is no special orientation of piston to bore. DO NOT attempt to disassemble spring and other parts from center bore of cylinder block. Entire assembly should be replaced if any of its components are damaged.

Drive Train
Hydrostatic Transmission

Remove upper (pump) and lower (motor) cylinder block assemblies one at a time.

Inspect wear surfaces of valve plate, cylinder block, ring holding pistons and slippers for damage (pistons must be free in bores).

NOTE: Slipper and piston assemblies may be installed into any one of nine bores of piston housing. Check that they do not bind. Install group which has sharpest slippers in pump side of housing.

Remove thrust plates and inspect for damage and flatness. (If either thrust plate is scratched on one side it can be turned over so smooth side is toward pistons of rotating group.)

NOTE: Valve plates fit over bearings with tops and bottoms with slots that fit over locating pins. Valve plate with two "V" shaped cuts is for pump and plate with four "V" shaped cuts is for motor.

On models without stationary motor swash plate cast in housing, remove cap screws then swash plate and inspect surface for excessive wear or damage.

8.11 Pump and Motor Shafts

Press pump and motor shafts out through large cavity of housing.

Inspect bearings and replace as necessary.

Upper bearing can be pressed out of housing from back. Lower bearing is capped off. To remove, pack center full of grease and place a tight wad of tissue into bearing. Using a shaft or rod of equal outside diameter as inside diameter of bearing, drive against wad of tissue. This will force bearing to pop out of housing.

NOTE: When replacing bearings, press into center section leaving 3/32 to 1/8 inch of bearing protruding beyond face (valve plates pilot on these bearings).

8.12 Control Shaft and Swash Plate

Place housing with large cavity up. Make certain the shaft bearing is seated in the boss. Tilt swash plate to its full forward angle with a 3/16" diameter punch and with a second 3/16" punch drive pin from shaft with single pin until pin contacts housing.

IMPORTANT: DO NOT continue driving pin further as housing will be damaged.

Drive both pins in control side of shaft until first pin contacts housing, rotate swash plate until first pin falls into housing and then drive out second pin until it contacts housing.

1. Punch
2. Swashplate
3. Pins
4. Housing
5. Control Shaft

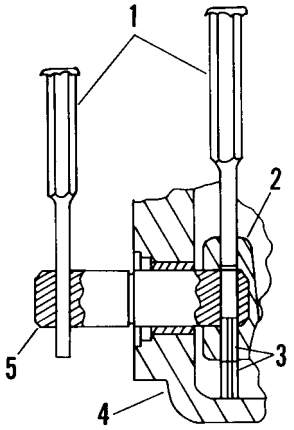
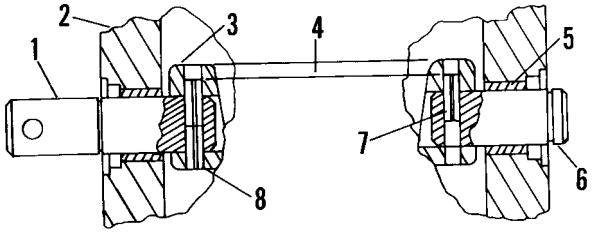


Figure 8-5: Control Shaft Removal

Drive control shafts out of swash plate bore toward outside of housing and remove swash plate.



1. Control Shaft
2. Housing
3. Swashplate
4. 1/4 + 1/32
5. Bearing
6. Trunning Shaft
7. Pin (1)
8. Pin (2)

Figure 8-6: Control Shaft Roll Pin Positions

NOTE: When installing new pins through swash plate and shafts use two pins on control side of shaft. Drive first pin until second pin can be started, then drive both pins together until second pin is 1/4" below swash plate.

Inspect needle bearings and seals. To remove needle bearing (if necessary) press toward outside of housing.

NOTE: When installing needle bearings, press until flush to 1/64" below counter bore for lip seal.

8.13 Transmission Assembly

Assemble transmission in reverse order coating each component with fresh clean oil. Use sealer on gasket when installing transmission on axle.

Troubleshooting - Drive Train

	PROBLEM		PROBABLE CAUSE
1.	Tractor will not move with engine running, or loss of power.	a.	Check if free wheeling valves are depressed or stuck down.
		b.	Check for low oil level.
		c.	Check the charge pressure — should be 70-150 PSI.
		d.	Check if park lock is engaged.
		e.	Possible damage to motor piston group if towed.
2.	No charge pressure.	a.	Upon initial start up, charge pump should be primed.
		b.	Check if oil filter was prefilled when changing.
		c.	Check if drive pin for charge pump is broken.
		d.	Check if the charge pump housing was installed 180° from proper position.
		e.	Check to insure that oil is getting to pump.
		f.	Check for excessive internal clearance. Tolerance should not be more than .007.
		g.	Check to see if hydro is air locked.
		h.	Inspect charge and implement relief valve.
3.	Charge pump will not prime.	a.	Check for damaged charge pump set or drive pin.
		b.	Check if the pump housing was installed 180° from proper position.
		c.	Check for low oil in reservoir.
		d.	Check for blocked suction tube or filter.
		e.	Check to see if hydro is air locked; bleed system and fill reservoir with oil with engine running.
		f.	Check if the pump is sucking air: a. Filter not tight. b. Wrong filter. c. Damaged fittings or suction hose.
		g.	Check to see if the suction side of pump is syphoning down over night. See Service Letter L-132.
		h.	Check for worn or excessive internal clearance.
		i.	Check for damaged O-ring seal in charge pump housing.
		j.	Check for a loose charge pump housing.
4.	Low charge pressure — recommended range 70-150 PSI.	a.	Check for low check valve spring pressure: shim or replace. (Shim Pack No. 31613).
		b.	Check for worn or damaged charge pump or check valve.
		c.	Check for restricted oil flow on suction side of charge pump, or low oil.
		d.	Check system for overheating usually caused by dirt in fins of hydro or broken fan.
		e.	Check for foaming at implement valve. This indicates air in system. Check for loose hoses or filter.

Troubleshooting - Drive Train

5. Low implement pressure — recommended range 550-800 PSI.	a.	Check for low check valve spring pressure.
	b.	Check for worn or damaged check valve or seat.
	c.	Check for restricted oil flow or low oil.
	d.	Check for foaming at implement valve. This indicates air in system. Check for loose hoses or filter.
6. System overheating.	a.	Check reservoir for low oil.
	b.	Check for incorrect oil — should be 5W20 or 10W30.
	c.	Check for overloading. Unit should be run wide open throttle.
	d.	Check charge pressure.
7. Leakage.	a.	Check for worn or damaged seals.
	b.	Check for cracked charge housings.
	c.	Check for porous weld at park lock plate tube.
	d.	Check for damaged fittings.
	e.	Check for misalignment of shafts at seals.
8. Creeping in neutral.	a.	See "Speed Selector and Brakes" section of this manual for adjustment.
	b.	Check for loose linkage or transmission/axle mount.
	c.	Check for missing spring from eccentric and cam.
	d.	Check for collapsed roll pins in hydro, or walled out pin hoses.
9. Will not maintain neutral adjustment.	a.	Check for loose linkage and/or mounting hardware.
	b.	Check for worn parts.
10. Noisy system.	a.	Check if the park lock pin is not adjusted properly or engaged. See "Speed Selector and Brakes" section of this manual.
	b.	Check if the system is neutralized.
11. Slow ground speed.	a.	Check for improper linkage adjustment.
	b.	Check for loose linkage and/or mounting hardware.
	c.	Check for low oil in reservoir.
	d.	Check if linkage travel is restricted.
12. Hard shifting.	a.	Check for improper adjustment of linkage and friction pad or alignment.
	b.	Check for foreign material in linkage.

Drive Train - Rear Axle

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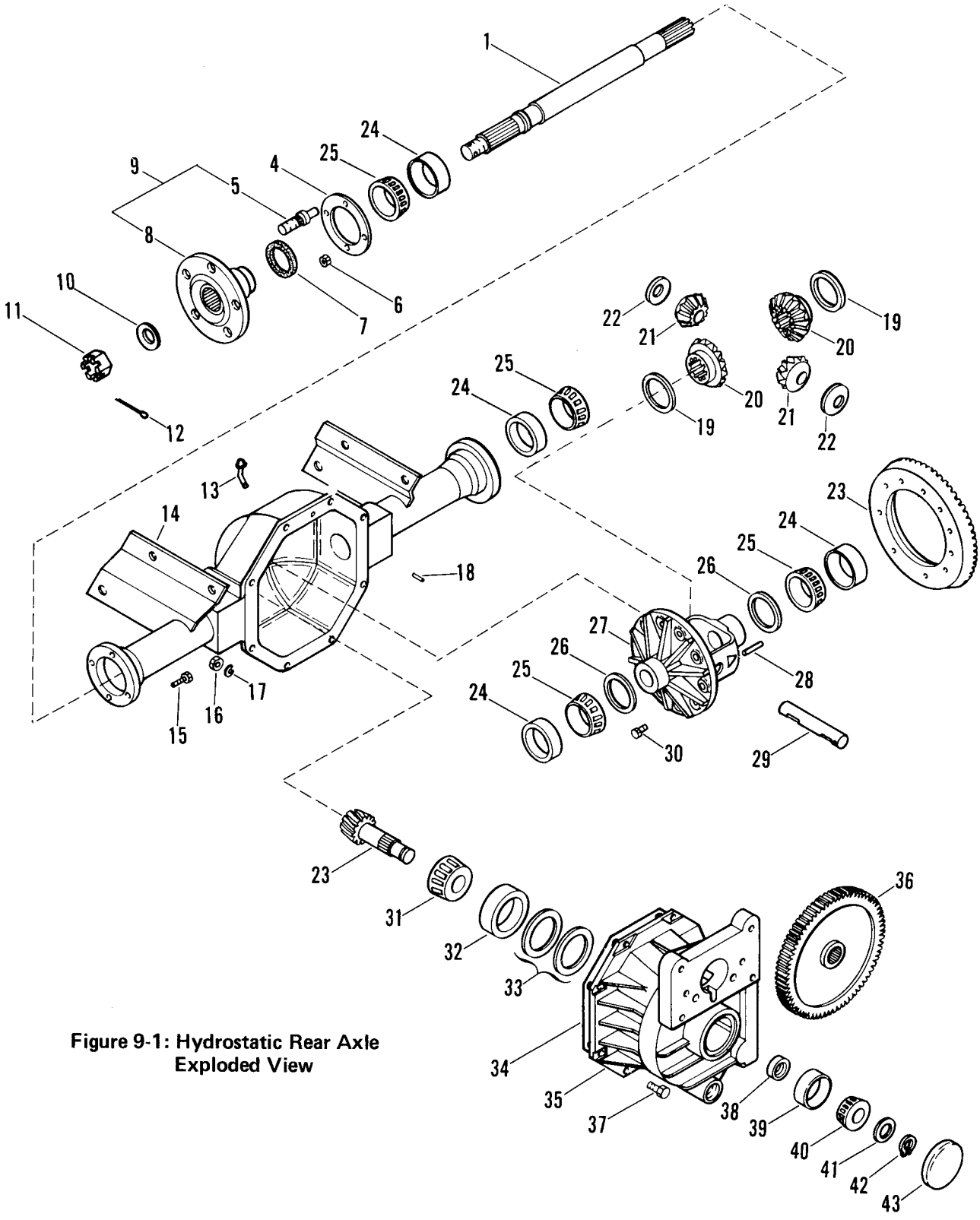


Figure 9-1: Hydrostatic Rear Axle Exploded View

9

Drive Train Rear Axle - Hydrostatic

ITEM NO.	DESCRIPTION
1	R.H. Axle Shaft
	L.H. Axle Shaft
2	Seal
3	Bearing
4	Gasket
5	Lug Bolt
6	Flanged Lock Nut 5/16-24
7	Seal
8	Axle Flange
9	Axle Flange Assembly
10	Washer 29/32
11	Nut 7/8-14
12	Cotter Pin 5/32 x 1-1/2
13	Vent Tube Assembly
14	Lower Housing
15	Cap Screw 5/16-24 x 1-1/4
16	Nut 5/16-18
17	Lock Washer Int. 5/16
18	Dowel Pin
19	Washer 1-9/16
20	Side Gear
21	Bevel Gear
22	Washer 45/64
23	Pinion and Gear
24	Bearing Cup
25	Bearing Cone
26	Shim
27	Differential Case
28	Lock Pin
29	Pinion Shaft
30	Special Bolt 3/8-24 x 13/16
31	Bearing Cone
32	Bearing Cup
33	Shim
34	Housing Gasket (805121) Use RTV Sealant; or Silmate 1473 or Dow 732 (805129, 146)
35	Front Housing
36	Spur Gear
37	Cap Screw 5/16-18 x 1"
38	Spacer
39	Bearing Cup
40	Bearing Cone
41	Shim Kit
42	Retaining Ring 7/8 (805121) Snap Ring Extension 13/16 (805129, 146)
43	Cup Plug

Drive Train Rear Axle - Hydrostatic

9.1 Introduction

Rear axle and differential housing of your hydrostatic garden tractor acts as a common reservoir for rear axles, differential, hydrostatic transmission, power steering (if applicable) and hydraulic lift.

Refer to Section 8.1 for lubricant type, frequency of oil change and other important information.

9.2 Rear Axle

Oil seals, axle shafts, axle bearings and axle flange can be serviced without removing rear axle and differential housing from tractor.

CAUTION: When raising tractor, block securely with jack stands under rear of tractor frame.

Raise and block rear of tractor with tire(s) off floor. Remove wheel(s) lug nuts, hub cap(s) and wheel(s).

Drain oil into a suitable container by removing hose at rear axle housing.

Remove cotter pin, nut and washer from axle. Remove axle flange from axle with a universal puller.

Remove brake(s) per instructions in Section 6.6.

Remove seal, gasket, bearing retainer and "O" ring from shaft. Pull axle shaft from housing.

Press axle bearing from axle shaft (support inner bearing race and apply pressure to splined end of shaft).

Clean parts in a safe solvent. Bearings should be free from rust, foreign material and rotate very smoothly without excessive play. Replace if any defects are detected.

Inspect splines for wear or breaks. Replace if defects are found.

Inspect oil seals for cuts or cracks. Spring goes on inside of seal lip.

Inspect sealing surfaces of axle and replace if seal has grooved surface more than 1/64 inch.

Assemble in reverse order being sure bearing is firmly seated against shaft shoulder when pressing bearing onto shaft.

IMPORTANT: DO NOT hammer hub onto installed axle shaft, bearing damage will result.

9.3 Differential

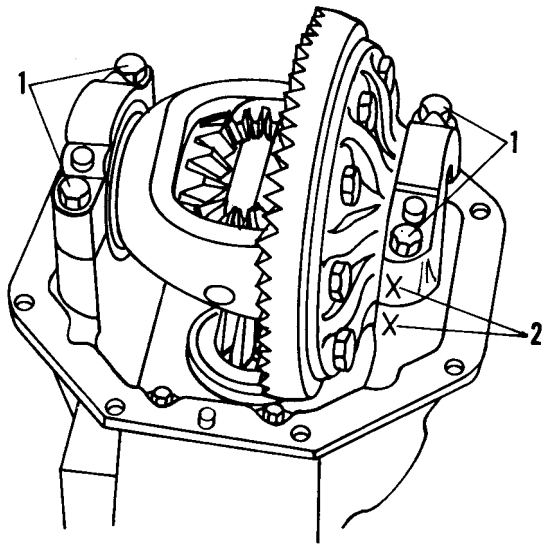
Remove rear axle housing and transmission as a unit.

Remove right and left axle shaft assemblies from housing per instructions in Section 9.2.

Remove eight cap screws that secure front and rear housings.

Remove four cap screws and bearing caps.

NOTE: Bearing caps are marked for assembly. Place them in a safe place to avoid damaging their machined surfaces.



1. **Bearing Cap Screws**
2. **Bearing Cap Marks**

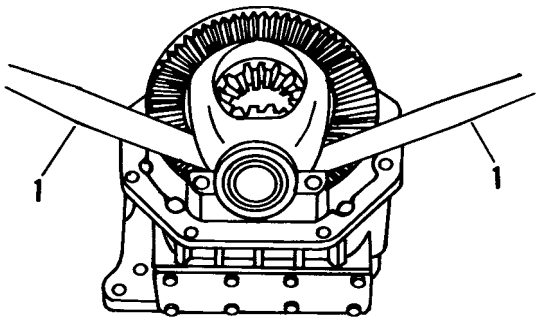
Figure 9-2: Differential Assembly

9

Drive Train Rear Axle - Hydrostatic

Remove differential assembly by placing two wooden handles under differential case and pry sharply upward.

NOTE: Bearings are preloaded by housing.



1. Wooden Handles
Figure 9-3: Differential Removal

IMPORTANT: Support differential to avoid bearing or ring gear damage during disassembly.

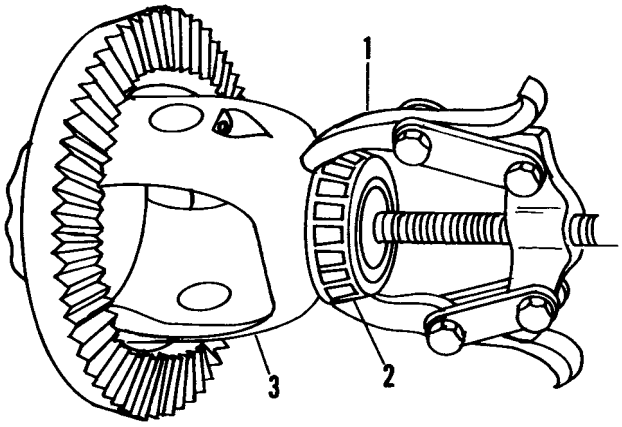
Drive lock pin out of pinion shaft with a long thin drift punch.

Drive pinion shaft from differential case with a long drift punch.

IMPORTANT: DO NOT strike ring gear with hammer as damage may result.

Remove pinion gears and thrust washers by rotating both gears 90 degrees to the openings in differential housing.

Remove axle drive gears and thrust washers from case.



1. Pulley Puller
2. Bearing
3. Differential Case

Figure 9-4: Bearing Removal

NOTE: If bearings are good do not remove them from differential housing as they are easily damaged in removal.

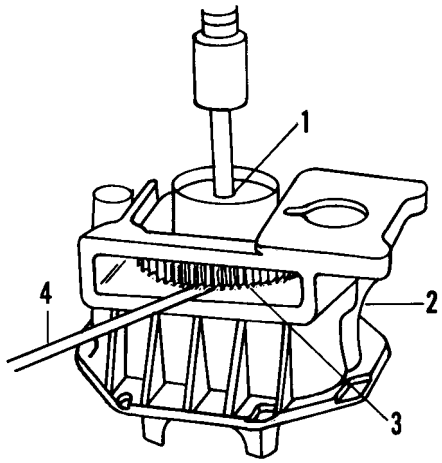
Remove case side bearings with a narrow jaw puller. Insert jaws into indentations provided in differential case.

Remove ring retaining cap screws, drive ring gear off differential case with a hard wood block and hammer.

Remove expansion plug by punching a hole about 3/8" from outer edge with a pointed punch, insert a large screw driver and pry outward.

Remove snap ring and shim from end of pinion, and side cover.

Before pressing gear remove side cover. Place a 1/8" piece of steel under the edge of spur gear to prevent spur gear from cocking and cracking housing.



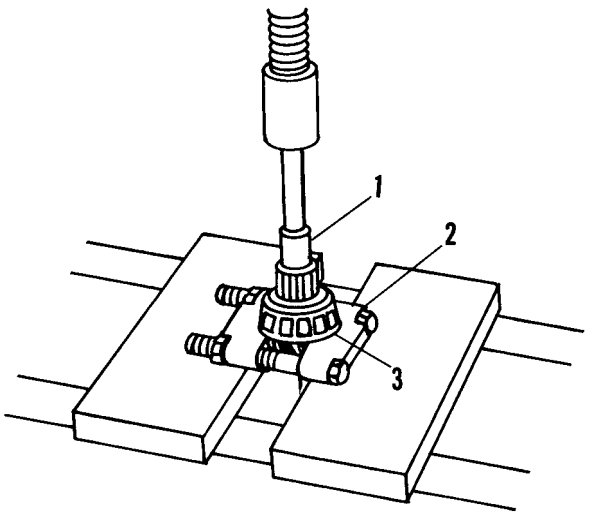
1. Pinion Shaft
2. Front Housing
3. Spur Gear
4. 1/8" Piece of Steel

Figure 9-5: Spur Gear Removal

When pinion gear is almost pressed off, place hand under the housing to prevent gear from falling and causing damage to gear.

Remove spur gear, spacer and outer pinion bearing. Clamp inner pinion bearing in a universal gear remover with a thin edge. Carefully push pinion drive gear out of bearing.

NOTE: DO NOT allow drive gear to drop on floor. Damage may result.



1. Pinion Drive Gear
2. Universal Gear Remover
3. Inner Pinion Gear

Figure 9-6: Bearing Cup Removal

To remove outer pinion bearing cup, position housing in press. Place press plate of the proper size against cup and press cup out of housing.

Position front housing on press bed with bearing saddles resting on press bed.

NOTE: Protect bearing saddles with a strip of wood if press bed is rough.

Insert a press plate of proper size and press bearing cup toward inside of housing. Retain shims located under bearing cup.

9.4 Inspecting Differential Parts

Bearings

Inspect all bearing rollers and cups for galling, rust or flaking.

Replace any bearing that is discolored or looks questionable.

Gears

Check ring, pinion, and pinion drive gears for abnormal wear and damage. Replace if worn.

Inspect spur gear for spline and tooth wear. Replace if worn.

Axle Housing

Inspect housings for cracks and external damage that could affect the operation of axle assembly.

Differential Case

Inspect differential case for wear in axle gear and pinion gear area. Replace case if machined areas are scored or if pinion shaft fits loosely in bore.

Assembling Differential

Press inner pinion bearing on pinion drive gear.

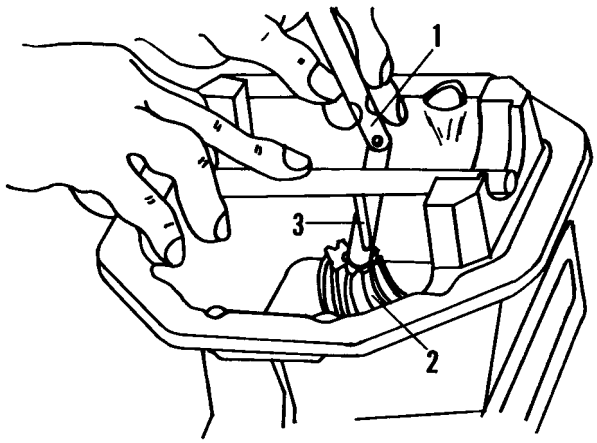
NOTE: Support bearing on inner cup only when installing.

Position front housing on press. Using a press plate, push outer pinion bearing cup into housing until it bottoms in housing.

When installing a new inner pinion bearing and cup in the original housing, reuse original shim pack.

Use a press plate to push bearing cup into housing until it bottoms against housing.

NOTE: If a new housing is installed, measure for proper shim pack thickness.



1. Feeler Gauge
2. Pinion Gear
3. Tool Depth Pin

Figure 9-7: Housing Measurement

When installing a New front housing, press inner pinion bearing cup, into housing WITHOUT shims. Place pinion drive gear (with bearing installed) into cup.

Drive Train Rear Axle - Hydrostatic

Measure from bottom of bearing cradles to pinion head surface. Subtract measured dimension from 1.2097. The difference will be thickness of shim pack required under inner pinion bearing cup.

NOTE: Shims are available in the following sizes: .003, .005, .010 and .030 inch.

Select and combine shims as needed to equal measured distance between tool depth pin and pinion gear. Remove inner pinion bearing cup. Install required shim pack and reinstall bearing cup into housing.

Insert spur gear into front housing with chamfered area of center spline toward pinion drive gear.

Insert pinion drive gear into spur gear. Place spacer over pinion drive gear shaft.

Position housing and pinion drive gear assembly into press. With pinion drive gear supported, place outer pinion bearing over shaft. With a press sleeve of proper diameter push bearing onto pinion shaft until a slight drag is noticed when gear is turned by hand. If drag is too severe, tap pinion shaft with a soft mallet until drag is reduced.

Install shim and snap ring on end of pinion shaft. Use thickest shim possible which will permit installation of snap ring.

After pinion drive gear is positioned satisfactorily, install expansion plug and spur gear cover. Use Permatex when installing both parts.

When installing new differential bearings, reuse original shims or use new shims of same thickness.

If a new differential case is being installed, start with a .020" pack of shims under each differential bearing.

Position ring gear on differential case and start cap screws into gear with fingers. Proceed to tighten screws, alternating back and forth across gear to allow gear to be pulled evenly into place. Torque cap screws to 50-55 ft. lbs.

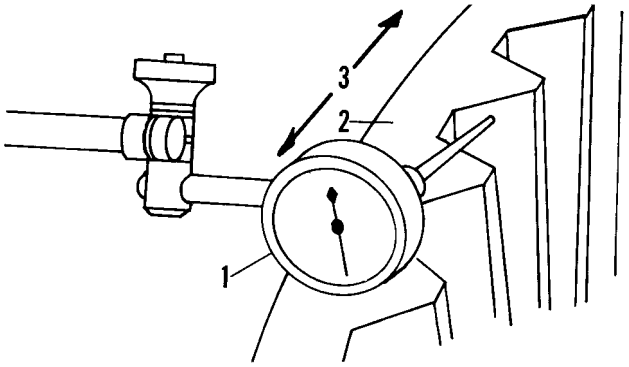
Install thrust washers behind axle gears and place gears in differential case. Install differential pinion gears and thrust washers. Rotate both pinion gears at same time until pinion shaft can be inserted. Install pinion shaft, secure with pinion pin. Grease to aid in assembly.

To assemble differential to front housing, position differential bearing caps on bearings and insert assembly into bearing cradles. Position assembly with ring gear facing same side as spur gear cover.

The bearing cradles are designed to apply a slight preload to bearings. Therefore, it is important to push both bearing assemblies simultaneously into their saddles.

Install bearing caps in their original position as previously marked. Torque cap screws to 40-45 ft. lbs.

Using a dial indicator, check ring gear backlash. Ring gear backlash should be .003 to .007 inch.



1. **Dial Indicator**
2. **Ring Gear**
3. **Back Lash**

Figure 9-8: Ring Gear Backlash

If backlash is not in this range, move shims, which are located beneath differential bearings from one side to the other until correct backlash is attained.

To check ring gear and pinion pattern, paint teeth of ring and pinion gear with gear pattern compound. Rotate pinion gear until ring gear has made one complete revolution while applying light load to ring gear. Study the patterns illustrated and correct if necessary.

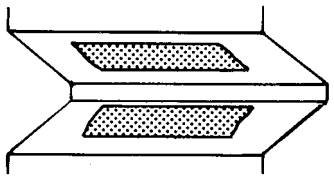


Figure 9-9: Preferred Pattern

This is the preferred pattern on both sides of ring gear tooth.

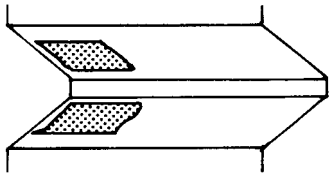


Figure 9-10: Toe Pattern

To move toe pattern toward heel, increase backlash within .003 to .007 inch limits by shimming ring gear away from pinion gear.

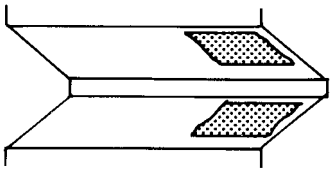


Figure 9-11: Heel Pattern

To move heel pattern toward toe, decrease backlash within .003 to .007 inch limits by shimming ring gear toward pinion gear.

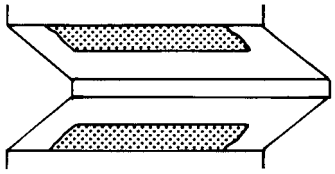


Figure 9-12: Deep Pattern

To correct a deep pattern on ring gear, reduce shim pack thickness under inner pinion bearing cup.

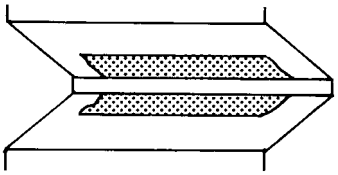


Figure 9-13: Shallow Pattern

To correct a shallow pattern on the ring gear, increase shim pack thickness under inner pinion bearing cup.

Position a new housing gasket between front and rear axle housings and install eight housing cap screws. Tighten cap screws to 18 to 23 ft. lbs. torque. Add sealant to gasket.

Specifications

Component	
Ring Gear-to-Pinion Gear Backlash	.003 to .007 inch
Pinion Gear End Play	.003 to .005 inch

9

Torque For Hardware

Location	Torque
Front-to-Rear Housing	18 to 23 ft-lbs.
Transmission-to-Rear Axle	25 to 30 ft-lbs.
Differential Bearing Caps	40 to 45 ft-lbs.
Ring Gear to Differential Case	50 to 55 ft.-lbs.
Hub to Axle Shaft	35 to 40 ft-lbs.
Oil Seal - Wheel End	25 to 30 ft-lbs.
Spur Gear Side Cover	30 to 40 in-lbs.

Notes

Lift Systems

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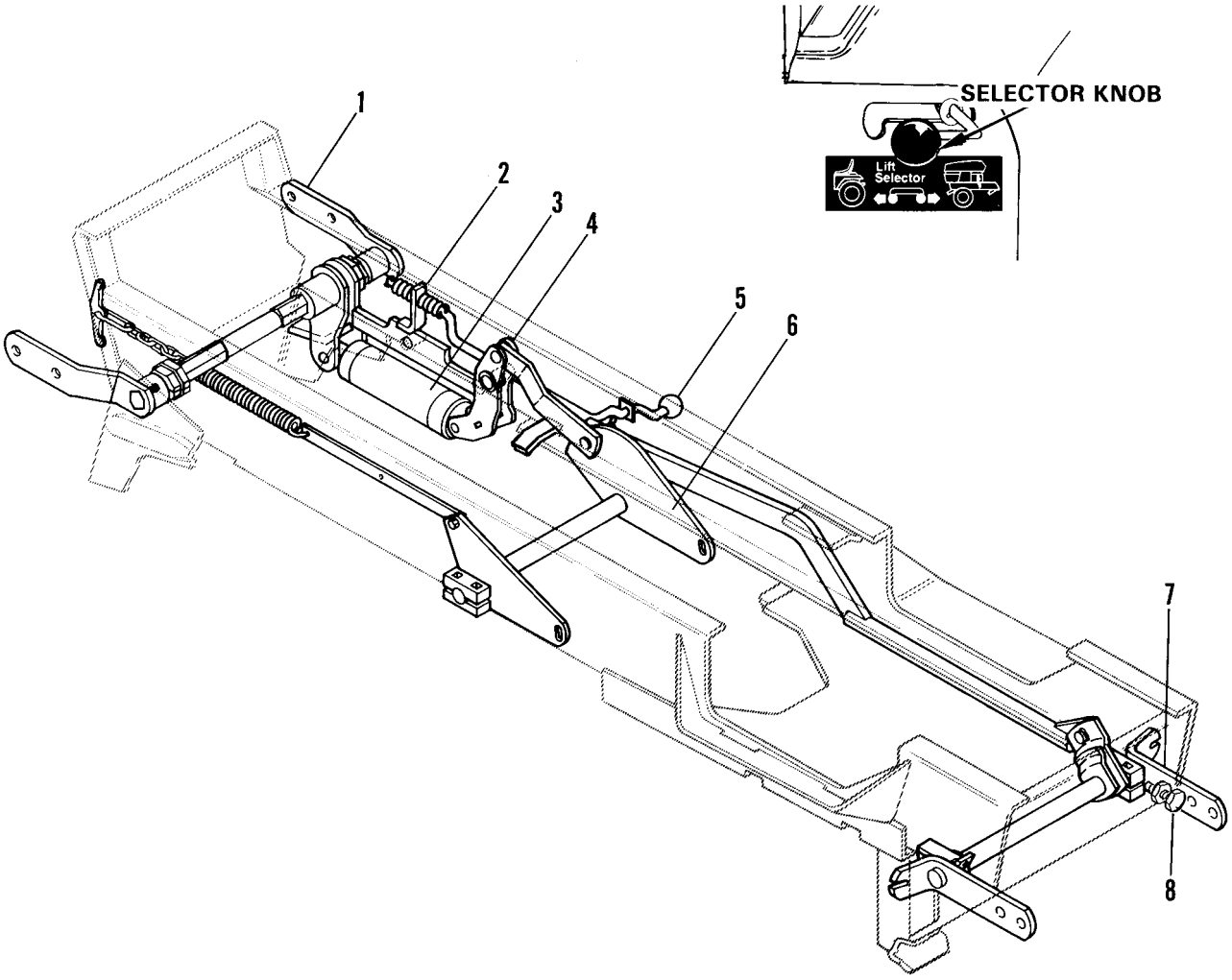


1. Rear Rockshaft
2. Latch
3. Cylinder
4. Bellcrank
5. Latch Rod
6. Center Rockshaft
7. Front Rockshaft
8. Adjustment Stud

Figure 10-1: Lift System Assembly

Lift System

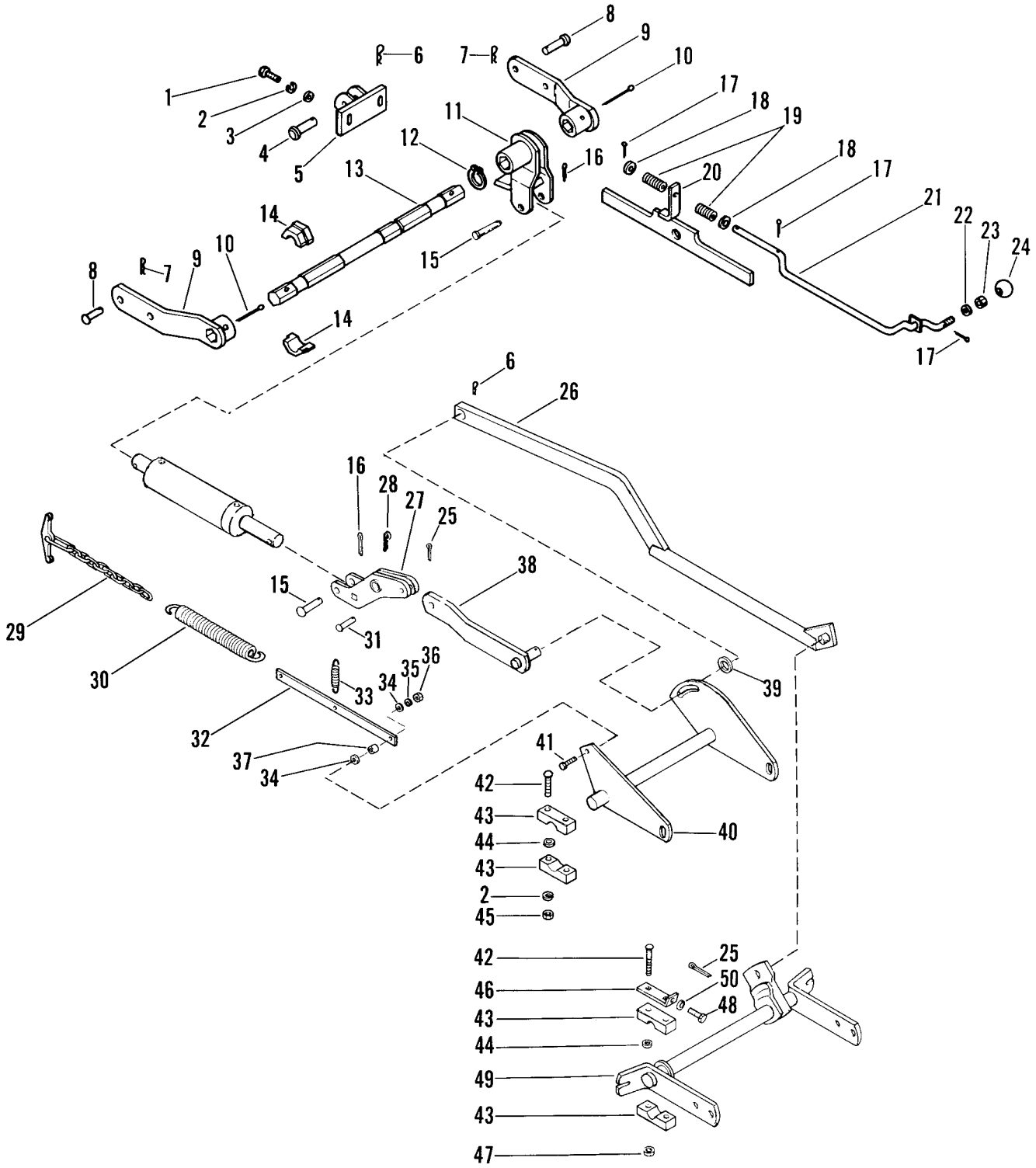


Figure 10-2: Lift System Exploded View

Lift System

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Cap Screw 3/8-16 x 1"	26	Connector Link
2	Lock Washer 3/8	27	Bellcrank
3	Washer 7/16	28	Cotter Pin 3/16 x 1-1/4
4	Pin	29	Chain
5	Plate	30	Extension Spring
6	Hair Pin 3/32 x 1-7/8	31	Rivet Button 5/8 x 1-1/2
7	Hair Pin 9/64 x 2-3/4	32	Link
8	Rivet Button 1/2 x 1-1/4	33	Extension Spring
9	Arm	34	Washer 9/32
10	Cotter Pin 3/16 x 2"	35	Lock Washer 1/4
11	Arm	36	Nut 1/4-20
12	Snap Ring Ext. 1-1/8	37	Spacer
13	Shaft	38	Link
14	Bushing	39	Washer 13/16
15	Clevis Pin	40	Center Rockshaft
16	Cotter Pin 1/8 x 1"	41	Cap Screw 1/4-20 x 1"
17	Cotter Pin 1/8 x 3/4	42	Carriage Bolt 3/8-16 x 2-1/4
18	Washer 13/32	43	Block
19	Comp. Spring	44	Washer 13/32
20	Latch	45	Nut 3/8-16
21	Latch Rod	46	Brace
22	Washer 13/32	47	Lock Nut 3/8-16
23	Nut 3/8-16	48	Cap Screw 5/16-18 x 1-1/4
24	Knob	49	Rockshaft - Front
25	Cotter Pin 3/16 x 1"	50	Lock Washer 5/16

Lift System

531186 Hydraulic Lift Valve Installation Instructions

For installation of 30310 valve on Models 931001 - 931026 equipped with 31160 Control Box.

For installation of 30310 valve into control box 31160, proceed as follows:

1. Mark console for enlarged clearance notch.
   a. Extend current notch to 4-1/4" at b.
   b. Mark Line b-c.
   c. Mark Line c-d (side).
   d. Mark Line d-e (top).
   e. Mark Line e-f.
2. Drill (2) holes in corners for saw clearance at points (g) and (h).
3. Cut out notch.
4. Mark console for revised control lever mounting.
   a. Scribe line at 1-15/16 from edge. (See top view).
   b. Position pivot bracket (030403) on scribed Line (i) as shown with (3) holes centered on centerline of slots.
   c. Drill (2) 11/32 diameter holes (j) using 030403 as template.
   d. Lengthen slot to 1-5/8 long (k) toward front.
5. Mount Valve
   a. Position valve on mounting bracket using mounting hardware at hole (l).
   b. Slide valve all the way back to rear in the slot.
   c. Using the valve as a template - drill a 17/64 diameter hole at location (m).

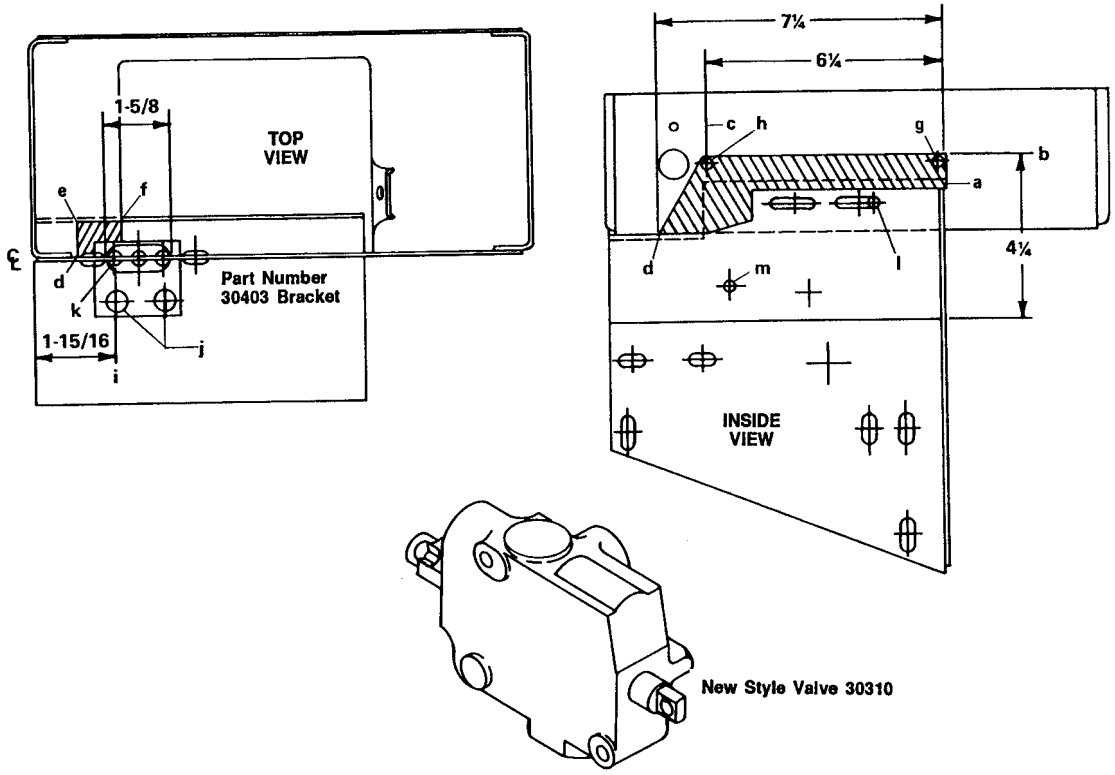


Figure 10-3: 030310 Valve Installation

Lift System

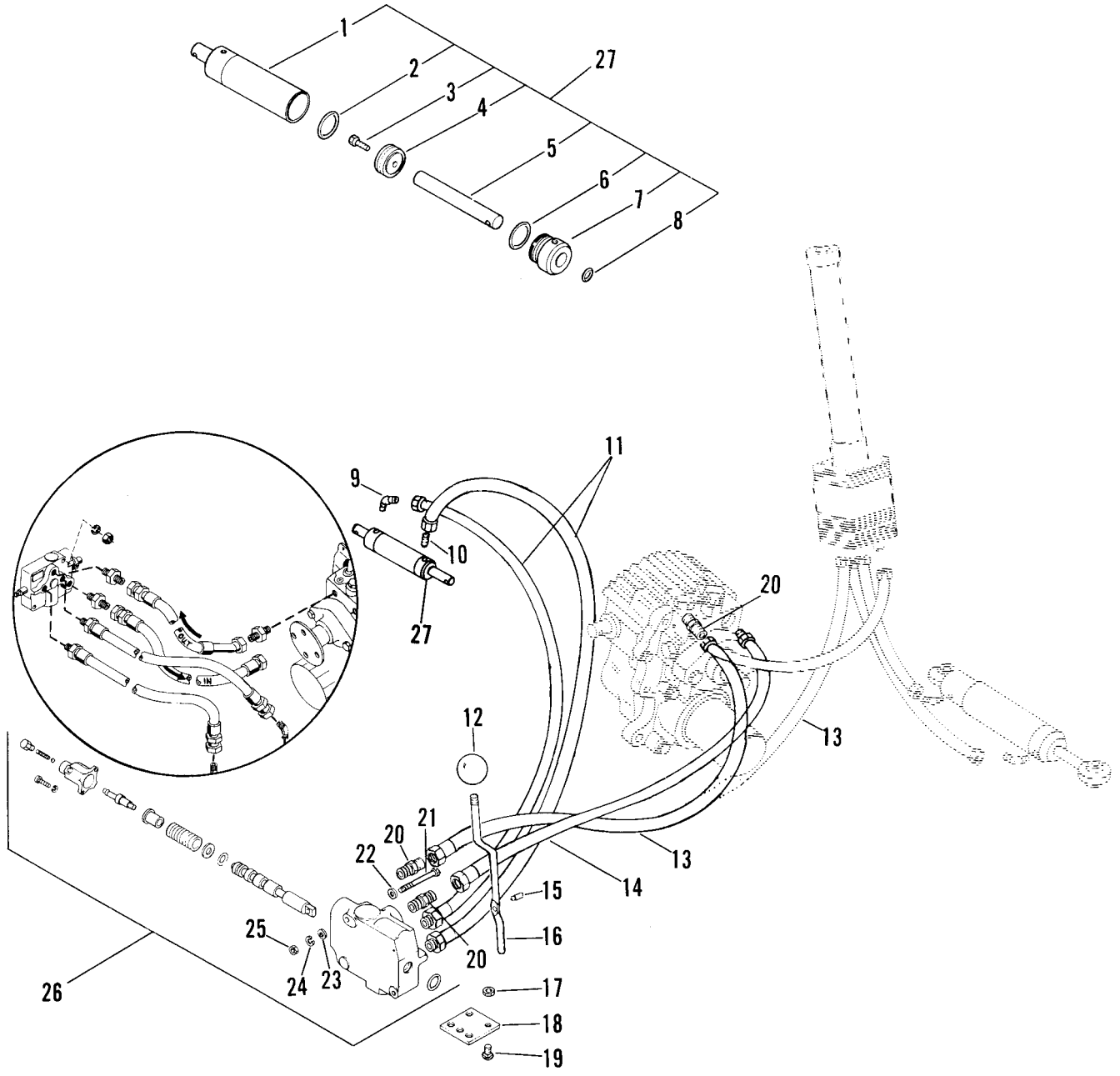
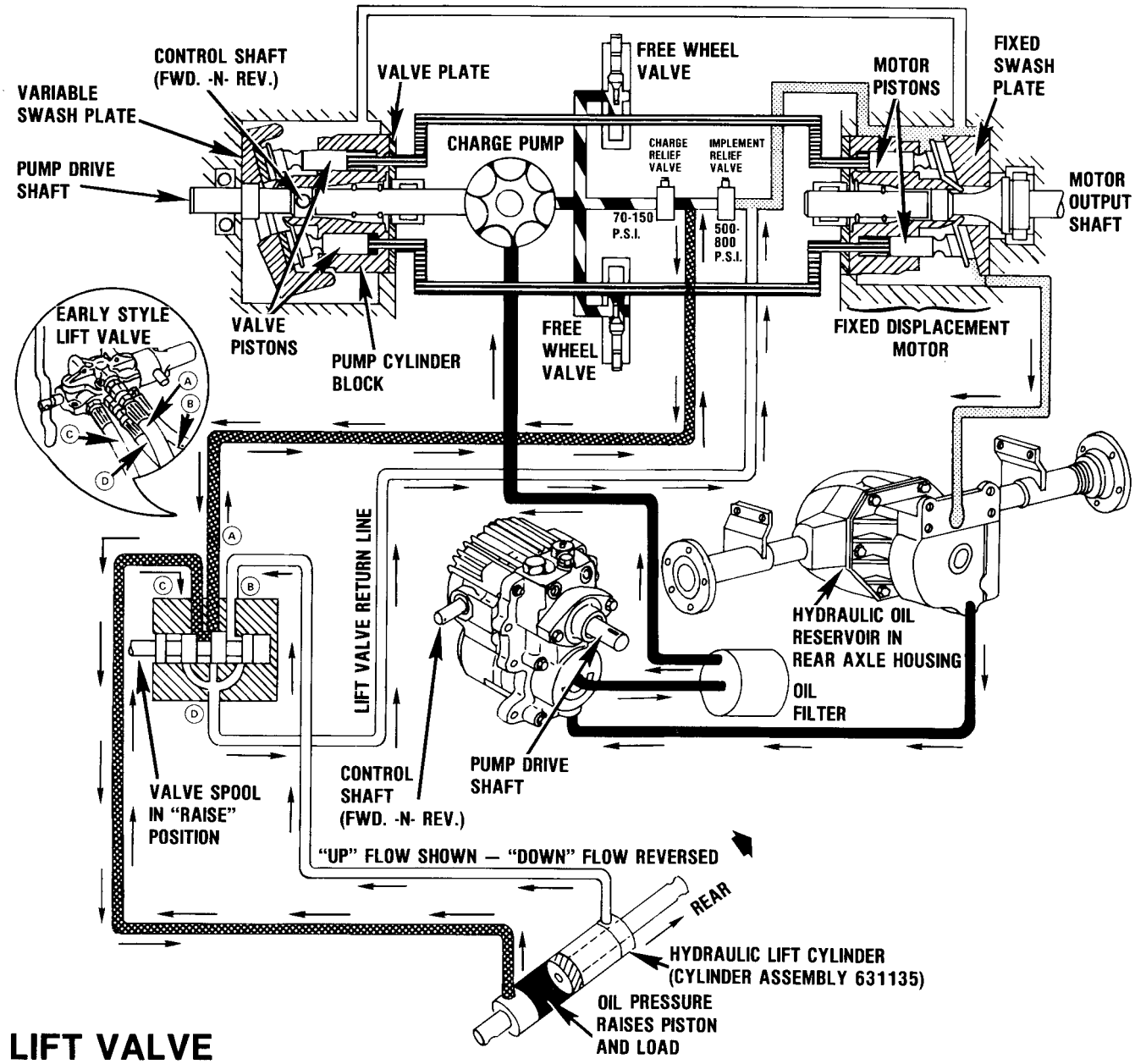


Figure 10-4: Lift System Hydraulic Exploded View

Lift System

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Cylinder	14	Hydraulic Hose
2	"O" Ring 1-5/8	15	Pin Groove
3	Cap Screw 3/8-24 x 1"	16	Control Rod
4	Piston	17	Flanged Lock Nut 5/16-18
5	Rod	18	Pivot Bracket
6	"O" Ring 2-1/8	19	Carriage Bolt 5/16-18 x 1/2
7	Rod Cap	20	Connector
8	"O" Ring 1"	21	Cap Screw 1/4-20 x 2-1/4
9	Adapter	22	Washer 1/4
10	Adapter	23	Washer 1/4
11	Hydraulic Hose	24	Lock Washer 1/4
12	Steering Lock Knob	25	Nut 1/4-20
13	Hydraulic Hose	26	Hydraulic Control Valve
		27	Cylinder Assembly

Lift System



LIFT VALVE

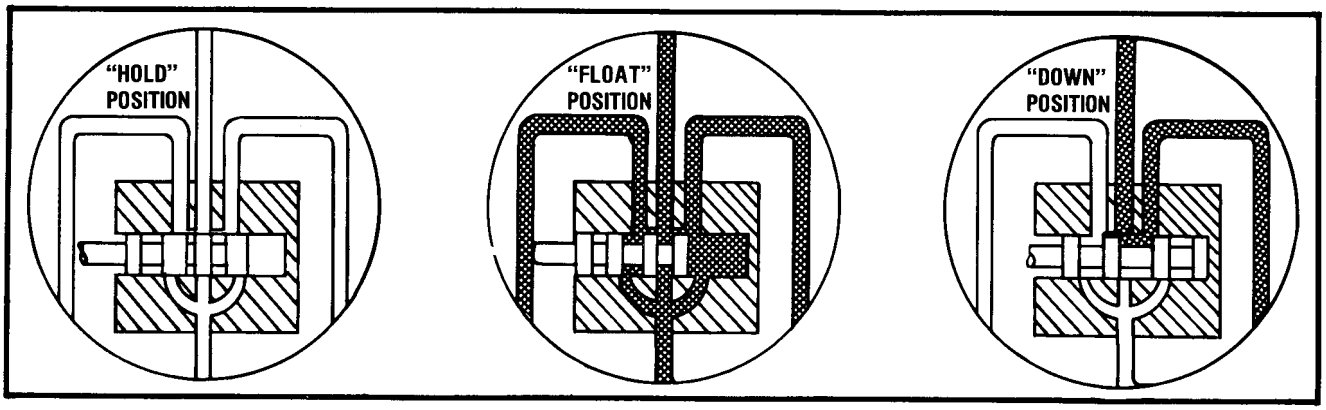


Figure 10-5: Lift System Hydraulic Diagram

Lift System

10.1 Lift Valve

Loosen and remove two screws which secure spring housing to back of valve and remove housing.

With an allen wrench, remove float valve stem and spring assembly.

Remove allen head float adjusting screw, spring and ball. Remove back cover and center section by sliding them off valve stem.

Remove three bolts securing side covers and side covers from casting.

Push valve stem out of valve body casting and inspect for scratches or pit marks.

NOTE: Use new "O" rings when assembling lift valve.

Assemble in reverse order.

10.2 Lift Valve Float Adjustment*

With tractor running at slightly above idle R.P.M. if hydraulic lift lever is moved to "Float" and it pops out, the float adjustment screw can be rotated (clockwise) in small increments until lever remains in position.

***NOTE:** No adjustment on cast iron body valve.

10.3 Hydraulic Lift Operation

Hydraulic Lift Control Lever is located on control console. It is a four position lever to perform four functions. "UP", "HOLD", "DOWN" and "FLOAT". Normal out-of-use position is "HOLD" position and attachment will not lower or raise. When it is desired to raise attachment, lever is pulled to "UP" position and cylinder is actuated to lift attachment. When lever is moved to "DOWN" position, oil pressure in cylinder is reversed and cylinder forces attachment down.

The hydrostatic transmission charge pump supplies oil flow from rear axle transmission oil reservoir. Oil flow to and from cylinder is controlled by valve. Back end of the cylinder is anchored to rear rock shaft. Forward end of the cylinder is pinned to lower end of bell crank.

When cylinder is extended or retracted, bell crank pivots and raises or lowers both front and center rock shafts at same time through front and center rock shaft linkages. Connection to center rock shaft is made through slotted hole which allows center rock shaft to move up and down, allowing mower to float independent of flotation, provision in hydraulic system.

10.4 Center Rockshaft Flotation Chain

The center rockshaft flotation chain allows for reduction of mower attachment weight on height gauge rollers. Thus it floats easier and independently of tractor hydraulic system. Hydraulic lift lever may be held in "DOWN" position until end of stroke and then retained in "HOLD" position. Mower deck will still float with chain adjusted for minimum weight on rollers.

CAUTION: Always grasp chain handle firmly when adjusting chain tension. Tension on chain could cause injury to hand. DO NOT grasp chain.

Adjust chain tension by placing chain third link into notch on back of tractor frame when mower is on tractor. Decrease tension for more weight on mower height gauge rollers and increase tension for less weight. Release tension when mower is removed.

Troubleshooting - Lift System

	PROBLEM		PROBABLE CAUSE
1.	Front to rear lift selector not locking one or the other out.	a.	Check latch bar (31498) not pivoting or engaging properly. Check for burrs on end of latch bar and lubricate.
		b.	Last used attachment may not have been in the highest position. Add lift assist springs to attachment, or increase tension on assist springs.
2.	No hydraulic lift action.	a.	**Check for low or no charge pressure - should be 70-150 PSI. Check implement relief pressure - should be 1000 PSI.**
		b.	Lift selector may not be properly engaged.
		c.	Check for blocked or kinked hydraulic hoses.
3.	Erratic hydraulic lift.	a.	Check for low charge pressure, low oil level, overheated oil (foaming), or cold oil.
		b.	Check for partially clogged oil filter, hydraulic hose, or control valve.
		c.	Check for properly located hoses.
		d.	Check for faulty circuit control by control valve.
		e.	Check for worn or damaged O-rings in valve or cylinder.
		f.	Check for faulty hydraulic cylinder: piston to rod mounting loose, binding between rod and end cap, or end cap hydro fitting location not correct.

Notes

Power Take-Off's (PTO)

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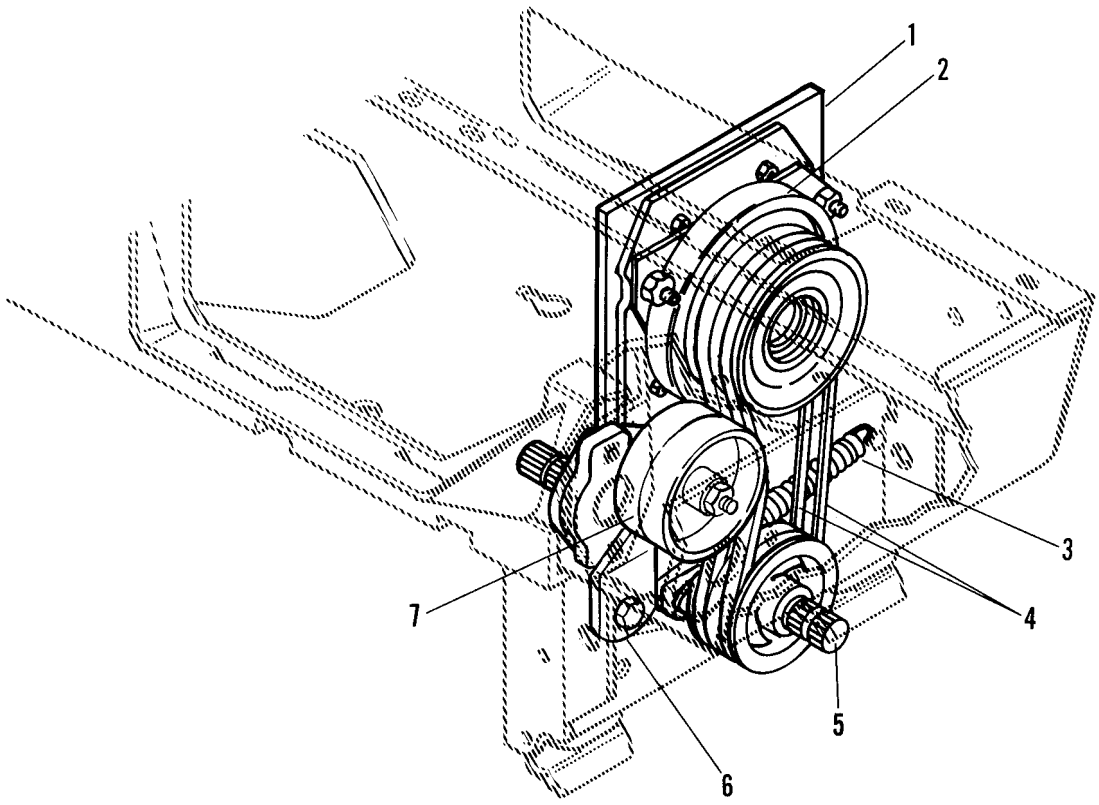
Notes

Power Take-Off (PTO)
(Front)



1. Engine Mounting Plate (Diesel)
2. Electric Clutch
3. Tension Spring
4. V-Belts
5. P.T.O. Shaft
6. Idler Bracket
7. Idler

Figure 11-1: Front Power Take-Off Belts

Power Take-Off (PTO)
(Front)

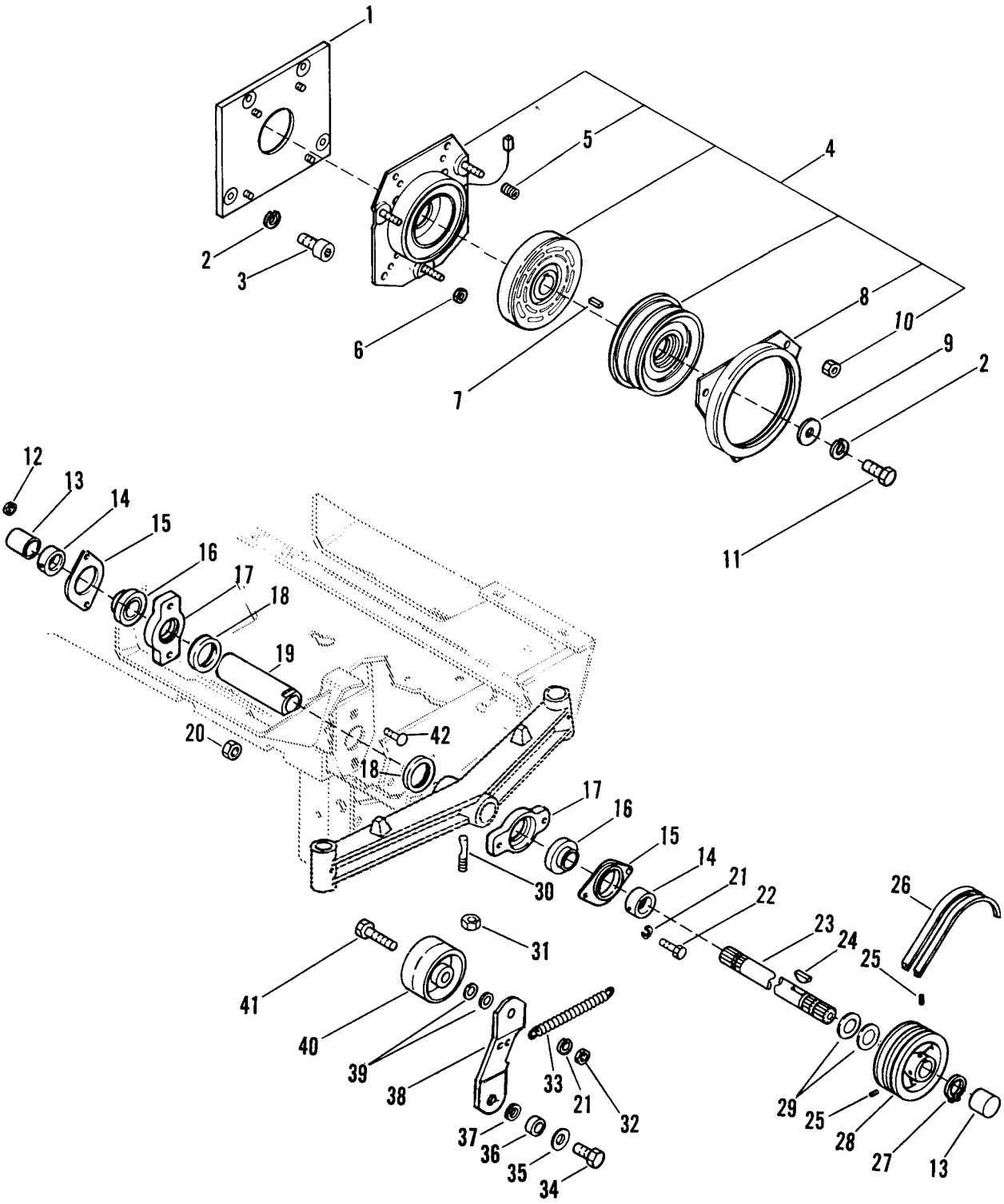


Figure 11-2: Front Power Take-Off
Exploded View

Power Take-Off (PTO)
(Front)

Item No.	Description	Qty	Item No.	Description	Qty
1	Clutch Adapter	1	22	Cap Screw 3/8-16 x 1-1/2	2
2	Lock Washer 7/16 ID	5	23	Front PTO Shaft	1
3	Cap Screw 7/16-14 x 3/4	4	24	Feather Key 1/4 x 1-1/4 x 1/4	1
4	Electric Clutch	1	25	Set Screw 5/16-18 x 3/8	2
5	Compression Spring	3	26	V-Belt 4L-RMA 34.12 x 17/32	1
6	Nut 3/8-16	1	27	Snap Ring 1" x .042	1
7	Straight Key 1/4 x 5/8 x 1/4	1	28	Pulley	1
8	Brake Drum	1	29	Washer 1" x 1.5 x .062	2
9	Washer	11	30	Lock Stud (Not used below <33)	1
10	Lock Nut	3	31	Top Lock Nut 3/8-16 Gr C	1
11	Cap Screw 7/16-20 x 1-1/2 Gr 5	1	32	Nut 3/8-16	1
12	Two Way Lock Nut 3/8-16 Gr A	2	33	Extension Spring 6"	1
13	Shaft Cover	2	34	Cap Screw 1/2-13 x 1-1/4	1
14	Bearing Collar	2	35	Washer .513 x 2" x .105	1
15	Flange	2	36	Spacer	1
16	Ball Bearing 1" ID x 2-3/64 OD	2	37	Shim Spacer	1
17	Bearing Flange	2	38	Idler Arm	1
18	Bushing (Not used on <33)	2	39	Washer .370 x .875 x .083	2
19	PTO Tube	1	40	Idler 3/8 x 3-1/4	1
20	Center Lock Nut 1/2-13	1	41	Cap Screw 3/8-16 x 2"	1
21	Lock Washer 3/8 ID	3	42	Carriage Bolt 3/8-16 x 1-1/2	2

Power Take-Off (PTO)
(Rear)

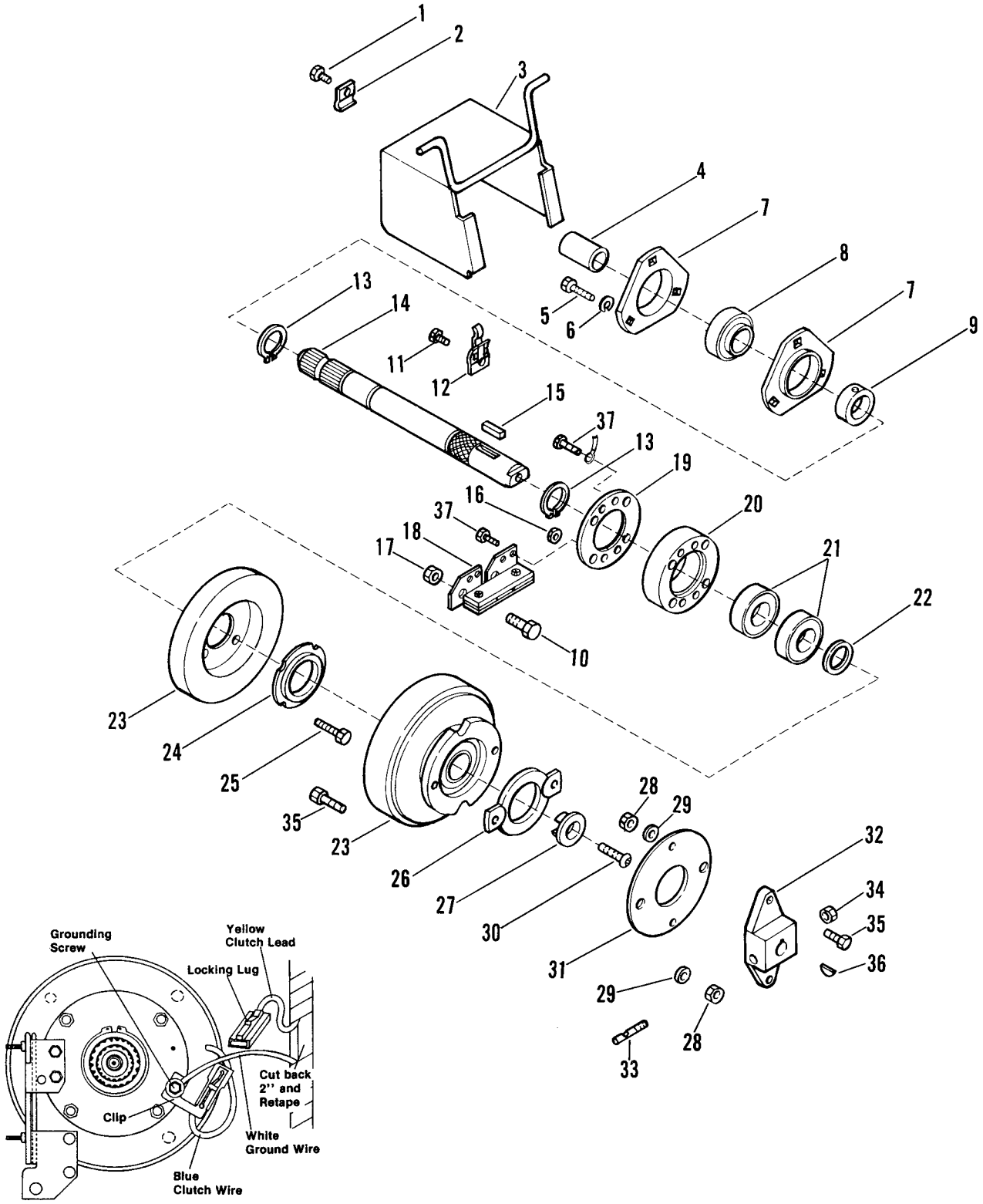
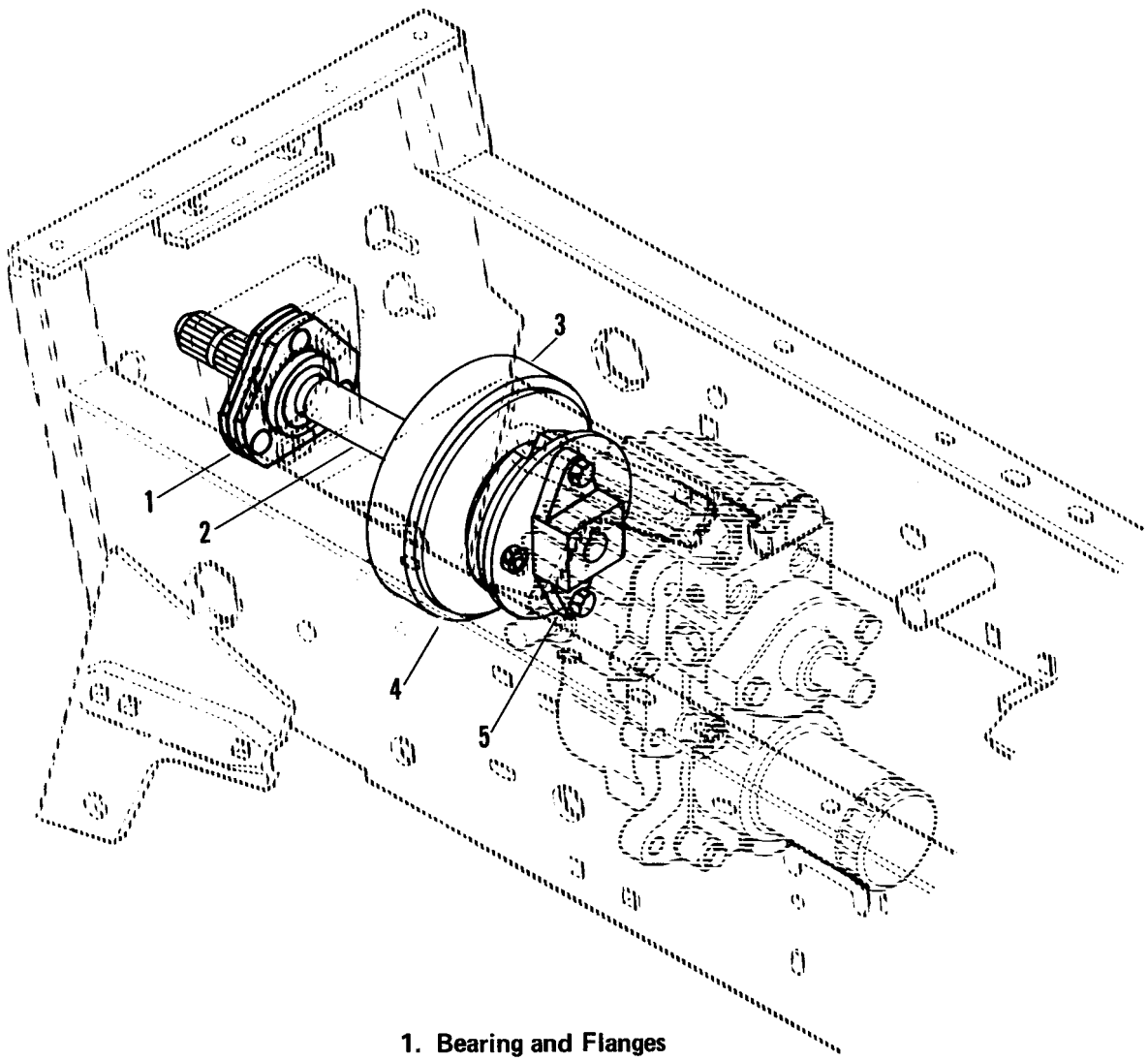


Figure 11-3: Rear Power Take-Off Exploded View

Power Take-Off (PTO)
(Rear)

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Taptite 1/4 x 20 x 1/2	20	Bearing Mount
2	Clip	21	Ball Bearing 1"
3	P.T.O. Shield	22	Washer 1-1/32
4	Dust Cover	23	Electric Clutch
5	Cap Screw 5/16-18 x 3/4	24	Bearing Flange
6	Lock Washer 5/16	25	Machine Screw No. 10-24 x 1-1/4
7	Bearing Flange	26	Pilot Plate
8	Ball Bearing 1"	27	Retainer
9	Bearing Collar	28	Lock Nut 5/16-18
10	Cap Screw 5/16-18 x 1-1/2	29	Washer 11/32
11	Taptite No. 10-24 x 3/8	30	Cap Screw 3/8-16 x 1-1/4
12	Snap Fastener	31	Spacer Coupling
13	Snap Ring 1"	32	Coupling
14	Rear P.T.O. Shaft	33	Lock Stud 3/8-16 x 1-7/8
15	Key 1/4 x 1 x 1/4	34	Lock Nut 3/8-16
16	Lock Nut No. 10-24	35	Cap Screw 5/16-18 x 7/8
17	Lock Nut 5/16-24	36	Woodruff Key 3/16 x 3/4 x 5/16
18	Torque Bracket Assembly	37	Taptite No. 10-24 x 3/4
19	Ring		

Power Take-Off (PTO)
(Rear)



1. Bearing and Flanges
2. Rear P.T.O. Shaft
3. Torque Bracket
4. Electric Clutch
5. Coupling

Figure 11-4: Rear Power Take-Off

Power Take-Off (PTO)

11.1 Front PTO Belts

NOTE: Replace front PTO belts as a set. A spring hook is needed to release idler spring tension.

CAUTION: Idler spring is under tension, grasp spring hook firmly by handle when releasing tension.

Insert spring hook through access hole, hook spring, pull spring toward access hole and turn spring away from anchor rivet. Release idler spring tension carefully and remove belts.

Reverse above procedure to install new set of belts.

11.2 PTO Idler

Remove nut and bolt holding bottom of Idler to frame and pry Idler away from frame.

Detach spring from idler arm and remove idler and spring from tractor.

NOTE: Two holes are provided for hooking spring into idler arm. When reattaching spring use left hand hole and be sure to route through hole from swivel end to idler arm.

11.3 PTO Shaft

Loosen set screws in rear locking collar of PTO shaft.

Tap side of collar with a pin punch to rotate it off lip of rear bearing. Remove rear collar from PTO shaft.

Remove bolts securing front bearing housing to frame and slide shaft assembly out of housing and frame.

Loosen set screws holding pulley to shaft and remove pulley and backup snap ring behind pulley.

Slide front bearing housing from shaft.

Loosen setscrew in front collar and rotate collar of lip of front bearing. Slide collar and front bearing housing off PTO shaft.

Remove bolts securing rear bearing housing to frame. Remove flange cover and press bearing out of housing.

NOTE: Axle pivot tube DOES NOT have to be removed.

11.4 Front Electromagnetic Clutch

Open hood and remove belts from pulley.

Remove four nuts securing brake plate to clutch assembly.

Remove brake plate and four compression rings behind plate.

Remove bolt in center of clutch.

Remove woodruff key from crankshaft.

Remove four threaded studs securing backplate.

Remove backplate and magnetic field.

Check all parts for wear or damage and replace as necessary.

Reverse procedure to reassemble clutch.

NOTE: Before replacing backplate, turn it over and inspect reverse side to make sure that small, round wire is NOT damaged or broken and that insulation is NOT scorched or worn-away.

When front clutch components are replaced, the following procedures and measurements must be accomplished.

Position and loosely attach backplate with four threaded studs. DO NOT tighten studs at this time so that backplate can be shifted and aligned.

Slide center portion of clutch onto crankshaft and all the way over protruding portion of backplate. While rotating center portion, alternately and equally tighten four studs making sure that center portion rotates freely.

Temporarily remove center portion and woodruff key into slot in crankshaft. Replace center portion and tightly secure it with bolt in middle.

Using a feeler gauge, check for a 0.062 gap between plate and field.

NOTE: If gap is less than 0.062, remove center portion of clutch and install the required thickness shim washer behind center portion of clutch before replacing and resecuring it to crankshaft.

Replace four springs onto threaded studs and reinstall brake plate. Loosely fasten brake plate with four nuts.

Alternately and equally (gauging by amount of threads exposed on top of nuts), attach brake plate so that a final gap of 0.015 can be measured with feeler gauge at all four locations between plate and field.

11.5 Gas Tank and Floorplate Removal

Unlatch and open rear deck.

Remove two bolts at front of holddown straps, one bolt at center (which is anchoring rear deck cable) and one bolt (which is support bracket) at front of gas tank.

Loosen, but do NOT remove, two bolts at back of holddown straps. Swing straps to sides and out of way.

Pinch-off hose underneath tractor os that it can be disconnected from fuel filter.

NOTE: Do NOT attempt to remove hose from fitting on tank as fitting could very easily be pulled out of tank.

With hose detached from fuel filter, gas tank can be detached and removed from tractor.

11.6 Rear PTO and Clutch Removal

Remove cover plate which is laying over top of rear electromagnetic clutch.

Using a screwdriver, uncouple connector to detach wire lead to electromagnet. Detach ground lead by removing anchor bolt at rear of frame.

Detach ground strap by removing anchor bolt which is threaded into rear axle.

Remove rear locking collar by backing-off head set screw. Using a pin punch, tap side of collar to rotate it off lip of rear bearing.

With collar loosened and against snap ring and, from behind tractor, remove three bolts that fasten bearing flange to back of tractor. Remove flange plate, rear bearing and rear locking collar.

Remove two bolts which are holding electromagnetic clutch to flex-coupling; only those two bolts that are connecting clutch to flex-coupling and NOT the other two bolts.

Push-back on clutch and shaft assembly to clear other two bolts in flex-coupling and then lift assembly out and away from frame.

11.7 Rear Clutch and PTO Dismantling

Using an allen wrench, remove bolt which is connected to collar that secures outer ring to PTO shaft. Next, remove bolt and collar and slide-off outer ring.

Remove key from slot in PTO shaft and uncouple shaft from clutch.

NOTE: Inspect clutch for a broken or damaged ground lead connection.

11.8 Rear PTO Reassembly and Replacement

The steps to follow for reassembling rear clutch and rear PTO shaft and placing assembly back into tractor are accomplished by reversing disassembly and removal procedures. BE SURE that, when clutch is reinstalled into tractor or after a new clutch is installed, a gap of NOT more than 0.062 exists between outer ring and clutch.

11.9 GT Front PTO Check Out

Verify that gap on clutch is .010 to .012 of an inch. If wider, adjust to the correct setting. If too close, open the gap to prevent wear on moving parts.

Electrical check out of clutch, (A) remove power lead from clutch and (B) check coil resistance with a meter (.3 to .5 ohms is a good coil). No reading shows an open coil. High resistance shows broken coils or heat damage.

11.10 Rear PTO Check Out

Verify that gap between rotating and stationary pulls is .005 - .045. Make sure that clutch is free spinning and not binding.

Electrical check out of clutch (A) remove power lead to clutch and (B) check coil resistance with a meter (.3 to .5 ohms is a good coil). No reading shows an open coil. High resistance shows broken coils or heat damage.

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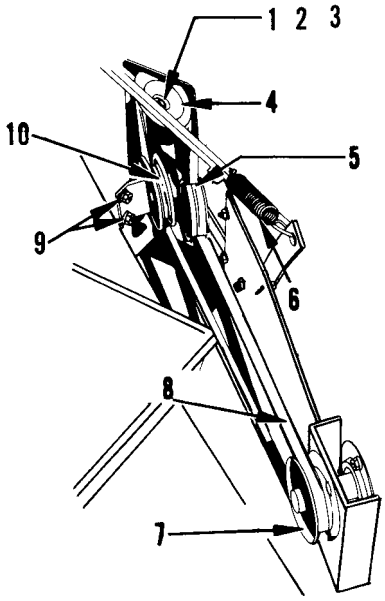
Attachments

12.1 Vacuum Belt

Attach "V" belt from vacuum unit to PTO sheave. Be sure spring loaded flat idler rides on back of belt. "V" belt must sit in vee of idler and in vee of PTO sheave. Adjust mounting hardware on "V" idler and slots in "Vee" idler bracket so that center of idler lines up with center of PTO sheave. Proper alignment is a "must" if belt is to run smoothly and remain in position. Install belt guard.

NOTE: If it should become necessary to move PTO sheave further out from rear of tractor in order to line up sheaves, use as many cupped washers between PTO shaft and PTO sheave as may be required.



NOTE: SHOWN WITH BELT SHIELD REMOVED. INSTALL BELT SHIELD BEFORE OPERATING!

1. Cap Screw
2. Lockwasher
3. Shim Washers
4. PTO Sheave
5. Spring Loaded Idler
6. Idler Spring
7. Fan Sheave
8. "V" Belt
9. Mounting Screws
10. Adjustable "Vee" Idler

Figure 12-1: Vacuum Belts

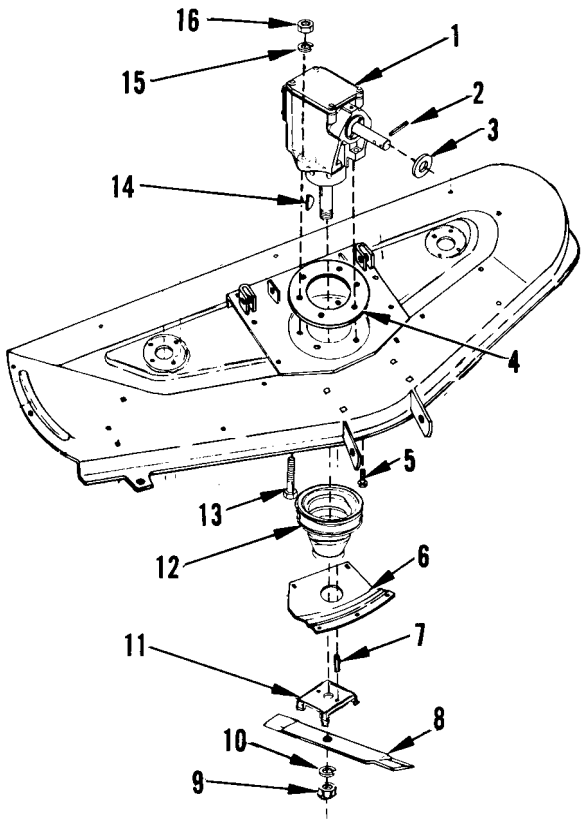
12.2 Rotary Mower Gearbox Assembly

Remove access plates from top of mower deck.

Remove drive shaft, and blade from old gearbox.

Disconnect idler spring to free belt. Remove belt from around sheave and remove sheave.

Remove gearbox assembly from mower.



1. Mower Gear Box
2. Roll Pin
3. Washer
4. Shim
5. Taptite Torx-Hexhead
6. Shield (48RM & 60 RM Only)
7. Groove Pin (2)
8. Mower Blade
9. Locknut
10. Lockwasher
11. Tray
12. Sheave
13. Capscrew
14. Key
15. Shim
16. Locknut

Figure 12-2: Output Shaft Assembly

Attachments

12.3 Assembly of Output Shaft

Disassemble gear box replacing all damaged and worn parts.

Press upper bearing cup into gear case, if necessary.

CAUTION: Do Not use cover and mounting hardware to press bearing cup into case, as this will deform and bend cover, after which it will not seal properly.

Assemble bearing cone, key and gear and secure with locknut on output shaft. Torque locknut to 50 ft. lbs. Insert assembly into gear box.

Place washer (.032 thick), bearing cup, bearing cone, spacer and sheave on output shaft and secure with nut. Torque to 50-60 ft. lbs.

Check shaft end play. End play must be between .003-.008 and provide free spin.

If end play is greater than .008, remove washer and replace with one of the following washers to obtain end play (.003-.008):

64119 – .025th
64118 – .015th
64117 – .005th

If end play is less than .003, add one of the above washers to obtain correct end play.

Once correct end play is determined, remove output shaft and pack bearing cones with Ariens No. 150 Grease. Re-assemble, packing lower cavity with grease, using washer selected to give correct end play. Add seal, spacer and key.

12.4 Assembly of Input Shaft and Related Parts

Press bearing cup in FLUSH with end of gear-case.

CAUTION: Do Not use cover and mounting hardware to press bearing cup into case, as this will deform and bend cover, after which it will not seal properly.

Install key and the groove pin and roll pin 58016 into input shaft.

Prepack bearing cones with Ariens No. 150 Grease. Slide gear and cone onto shaft and position in gear case.

Install opposite bearing cone and cup on shaft.

Apply gasoila sealant (or equivalent) to thread on plug. Install plug into gear box, pressing cup into place until there is approximately .005 to .015 inch backlash between gears. If there is more than .015 backlash turn adjustment plug back several turns and lightly tap bearing cup opposite adjustment plug (use bearing driver No. 57) into gear box until there is no backlash between gears. Repeat above until .005 to .015 in backlash is obtained.

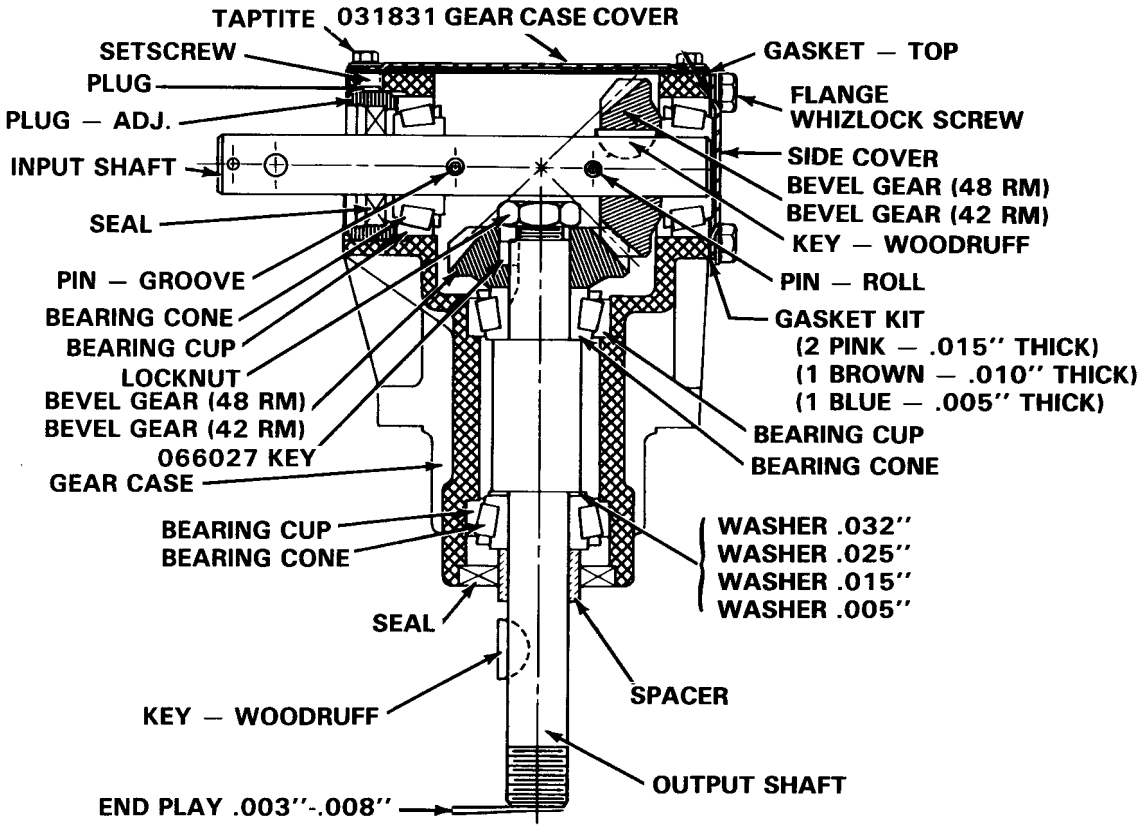


Figure 12-3: Input Shaft and Related Parts

Turn adjustment plug back ¼ to ½ turn. With punch centered on end of input shaft, tap shaft and bearing back against adjustment plug to obtain .003 to .008 inch end play between input shaft and shaft bearings.

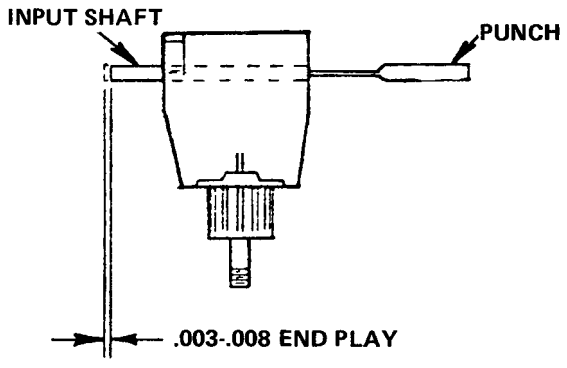


Figure 12-4: Input Shaft End Play

Position cover on gear box. Using feeler gauge check gap between cover and gear box. Select number of gaskets required per Gasket Kit. Always round up to the next number of gaskets required as they will compress slightly. Select correct gaskets and position in place against gear box. Apply gasoila sealant or equivalent to capscrews and mount cover to gear box. Torque capscrews to 10-11 ft. lbs.

Secure adjustment plug with setscrew and plug. Place plug between setscrew and adjustment plug. This plug will not allow setscrew to deform threads on adjustment plug.

Fill gear case with No. 150 Grease to top of input shaft.

Install top cover with gasket and hardware.

12.5 Gearbox Assembly Installation

Mount new gearbox on mower pan using only one shim. If more than one shim was previously used, add same amount under outer spindles to compensate. Blade tip heights must align within 1/16 inch of each other. Fasten gearbox to mower with six washers, four taptites (Torx Hex Head) and two each cap screws GR. 5, shim and locknut GR. C.

NOTE: The taptites are a self threading screw, therefore, holes are not previously tapped in gearbox. Use caution when installing these taptites, to be sure to get them started straight. This type of fastening provides a greater clamp load and locking feature. Torque taptites to 21-26 ft. lbs. Torque capscrews to 13-17 ft. lbs.

Be sure key is in place. Guide mower belt and position sheave on output shaft. Mount blade tray and blade with lockwasher and nut. Be sure pin in sheave is positioned in hole in blade tray. Torque nut to 50-60 ft. lbs.

Be sure belt is positioned around drive sheave and reconnect idler spring.

Push drive shaft on input shaft as far as possible. Install washer and roll pin.

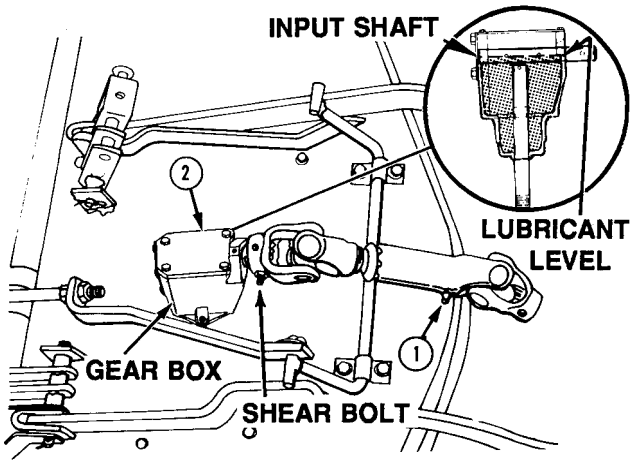


Figure 12-5: Gearbox Assembly

Align hole in drive shaft with gear box input shaft hole and insert special capscrew and secure with locknut.

Lubrication: Check lubricant level every 25 hours of operation or once a season by removing cover on top of gearbox. Lubricant level should be to center line of input shaft. If lubricant level is not correct, fill gearbox to proper level and replace cover and screws. Use Ariens No. 000150 Multi-Purpose Grease.

12.6 Adjusting Blade Level and Pitch

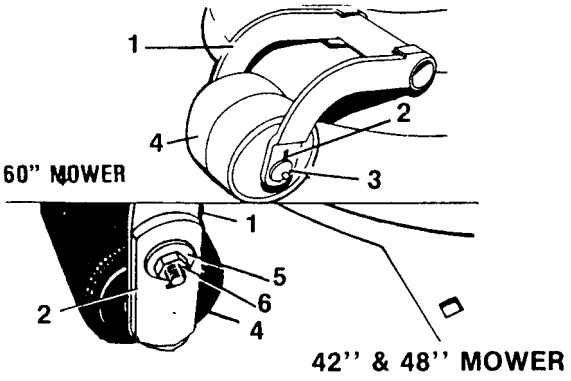
WARNING: Lower attachment, stop engine, remove key, wait for moving parts to stop before leaving operator's position and attempting to make adjustments.

NOTE: A wood block (about 1" square by 5" long) may be used under pan for blade measurement. Wrap block with masking tape, mark tape with cutting edge of blades and measure distance from end of block to mark(s). (This method avoids errors by having to read any measurements under pan.)

Level

NOTE: Release flotation spring tension (per mower flotation instructions in this section).

Adjust rollers, by loosening nuts, so that they are down then tighten nuts. This positions mower pan (when lowered) at its greatest clearance at various cutting height settings.

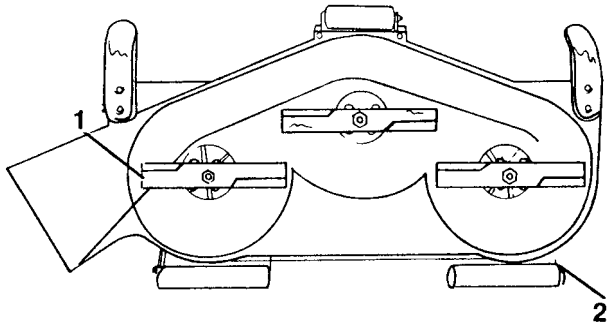


1. Roller Bracket
2. Slot
3. Zerk
4. Roller
5. Washer
6. Nut

Figure 12-6: Roller Adjustments

With rotary mower lowered, rollers on floor, and blades parallel to rollers, measure distance of blade tips to floor at right and left side of mower pan. Rotate blades 180 degrees and check again. The measurements should be equal within 1/8 of an inch.

To correct for difference in height of blade tips, loosen nuts for roller that is on side of mower pan where highest blade tip measurement was taken, raise roller (this lowers blade), to compensate for difference in height and tighten nuts.



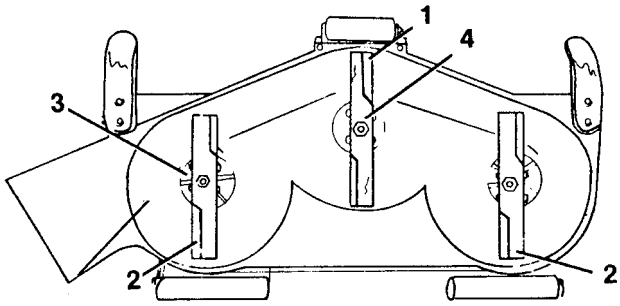
1. Measure at Outer Blade Tips
2. Roller Assembly

Figure 12-7: Mower Level Adjustment

Pitch

NOTE: Release flotation spring tension (per mower flotation instructions in this section).

With rotary mower blades perpendicular to rollers, front tip of center blade must be 1/8 to 1/4 inch lower than rear outside blade tips.



1. Front of Center Blade
2. Rear of Outside Blades
3. Roller Assembly
4. Center Blade

Figure 12-8: Mower Pitch Adjustment

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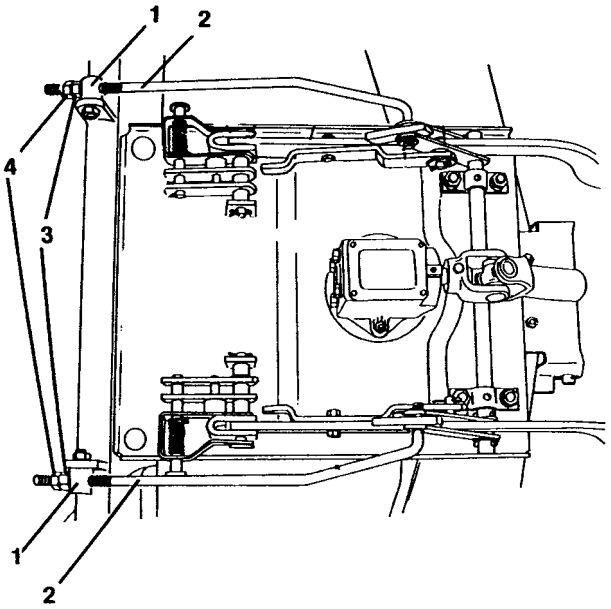
Lower rotary mower with rollers on floor and blades perpendicular to rollers. Measure distance of center blade front tip, right and left blade rear tips to floor. Rotate blades 180 degrees and check again. Measurement difference front to rear should remain at 1/8 to 1/4 inch.

NOTE: Turn nuts on adjustment rods equally (to share load) toward front to increase and rear to decrease height of blade tips at front or rotary mower.

To correct for difference in height of blade tips, loosen nuts on adjustment rods, raise or lower front of rotary mower pan as required and tighten nuts.



1. **Yoke**
2. **Adjustment Rod**
3. **Adjustment Nut**
4. **Locking Nut**

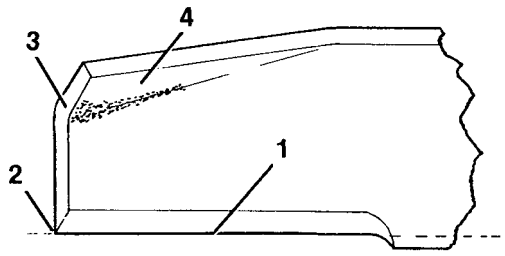
Figure 12-9: Pitch Adjustment Rod

12.7 Blade Care

CAUTION: Use sturdy gloves or padding to protect hands when working with mower blades.

Regularly check mower blades for wear and that lock washers are fully compress by nuts (50-60 ft. lbs. of torque on nuts).

When blades need sharpening, block blade to prevent rotation, remove nut, lock washer and blade from shaft.



1. **Sharpened Edge Must Remain Straight**
2. **Do Not Round Corner**
3. **Watch for Wear at This Point**
4. **Air Lift**

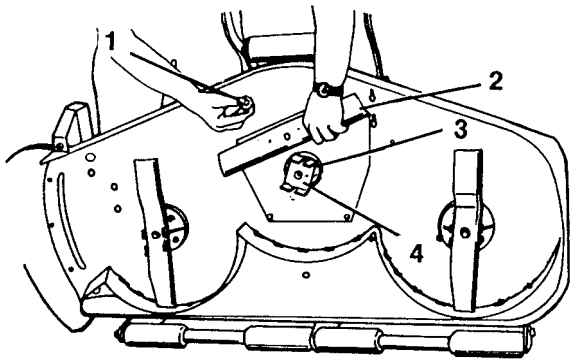
Figure 12-10: Blade End

Sharpen both ends of blade at original angle (25 degrees), removing equal amounts of material from each end to maintain proper blade balance. New blades are balanced to within 1.3 inch ounces at factory. DO NOT grind around corner at tip of blade. If cutting edge of blade cannot be sharpened in straight line to within 1/8 of an inch of its end, replace complete set of blades with Ariens replacement blades only. They are available through your Ariens Dealer.

Install blades, lock washers and tighten nuts until lock washers are fully compressed (50-60 ft. lbs. of torque on nuts).

IMPORTANT: If mower is used under sandy soil conditions, replace blades when air lifts become eroded through at end.

IMPORTANT: Center blade has drive pins which shear when blade strikes a solid object. If you strike a solid object, check and replace drive pins, if necessary, with Ariens drive pins only. They are available through your Ariens Dealer.



1. Hex Nut (50-60 ft. lbs. torque)
2. Center Blade
3. Blade Tray
4. Groove Pins

Figure 12-11: Center Blade Replacement

12.8 Drive Belt Replacement

To replace mower drive belt, remove rotary mower from tractor according to instructions in Operation Section.

Remove center blade per Blade instructions.

Remove belt cover hardware and belt covers.

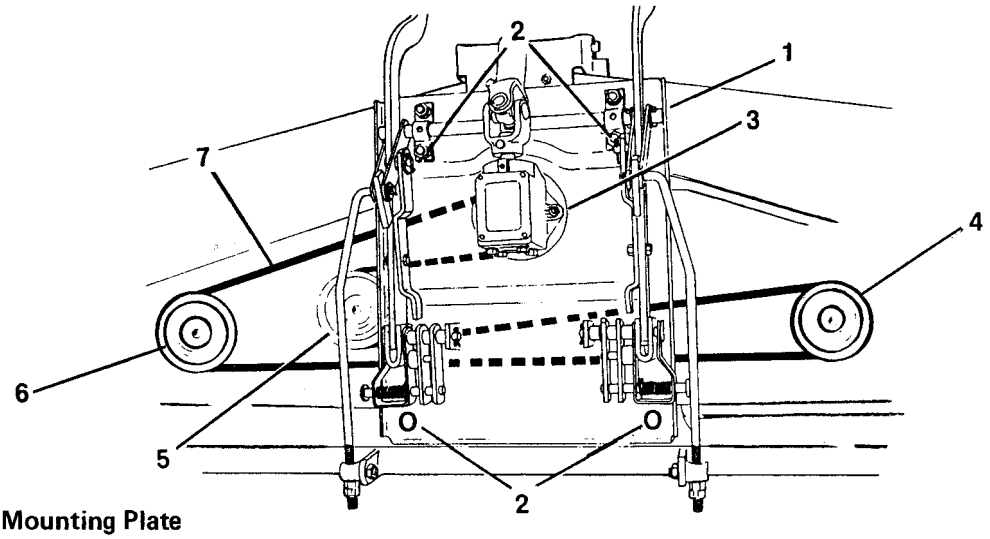
Grasp belt on both sides of pulley, pull horizontally on belt and lift belt off pulley.

Remove front and back mounting plate hardware. Note location of shims at front, idler pivot and spacer at back for replacement at proper position.

Tip mounting plate, etc. up and back, remove belt from center drive pulley then idler and blade pulleys.

Install new Ariens belt around center drive pulley, spring loaded idler and left hand blade pulley. With belt positioned as illustrated, replace mounting plate, install shims, (idler pivot on 48") spacer and secure with hardware removed earlier. Replace belt and secure belt covers with their respective hardware.

Replace center blade, lock washer and tighten nut until lock washer is fully compressed (50-60 ft. lbs. of torque on nut).



1. Mounting Plate
2. Mounting Plate Hardware
3. Center Drive Pulley (under Mounting Plate)
4. R.H. Spindle Pulley
5. Idler Pulley
6. L.H. Spindle Pulley
7. Mower Drive Belt

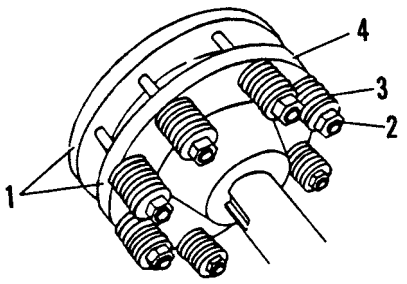
Figure 12-12: Mower Belt Replacement (Belt Covers Removed)

12

Attachments

12.9 Torque Limiter

Adjust torque limiter by tightening locknuts until springs are fully compressed and tight against hub end plate. Back locknuts off 1 full turn.

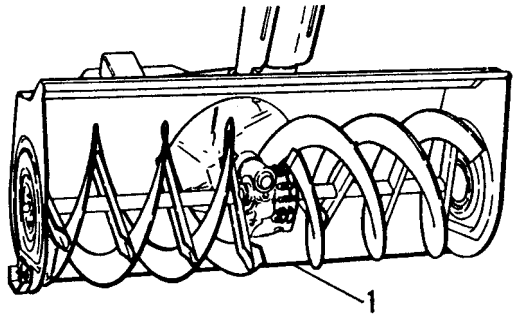


1. Torque Limiter
2. Lock Nuts
3. Spring
4. Hub End Plate

Figure 12-13: Torque Limiter Adjustment

IMPORTANT: DO NOT leave springs fully compressed as damage to Sno-Thro or tractor will result.

12.10 Scraper Blade



1. Scrapper Blade

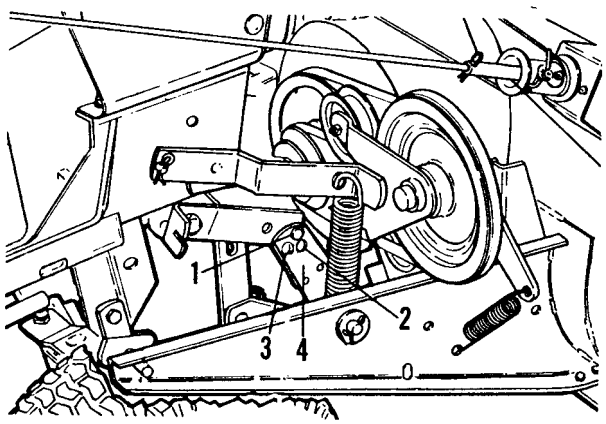
Figure 12-14: Scrapper Blade

IMPORTANT: If scraper blade wears too far auger/ impeller housing may be damaged.

Scraper blade is adjustable to compensate for wear.

To adjust scraper blade, raise and block Sno-Thro, and loosen nuts retaining blade. With runners adjusted to their full up position, reposition scraper blade down, flush with runners and tighten locknuts.

12.11 Lift Straps



1. Maximum Down Float
2. Maximum Up Float
3. Normal Float
4. Lift Strap(s)

Figure 12-15: Lift Strap(s)

Lift straps have three holes that provide various float modes. Top hole is for maximum down float, center hole is for normal float and bottom hole is for maximum up float. Adjust as required.

12.12 Shear Bolt Replacement

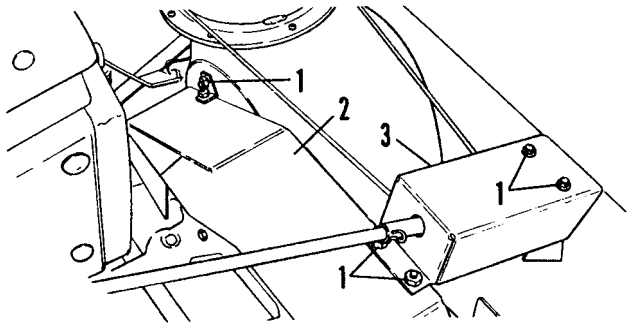
WARNING: Stop engine, remove key, wait for moving parts to stop and remove wire from spark plug before leaving operator's position and attempting to maintain or inspect auger.

IMPORTANT: Use only Ariens Shear Bolts for replacement. Use of any other type of shear bolt may result in severe damage to unit.

Occasionally an object may enter auger/impeller housing and jam auger, breaking shear bolts which secures auger to shaft. This allows auger to turn freely on shaft preventing damage to gear drive.

To replace shear bolt, slide auger outward against roll pin and align hole in shaft with hole in auger (holes in shaft for roll pins and shear bolts line up). Drive shear bolt through hole (if shear bolt was broken this will drive remaining part from shaft) and secure with nut.

12.13 Sno-Thro Belts



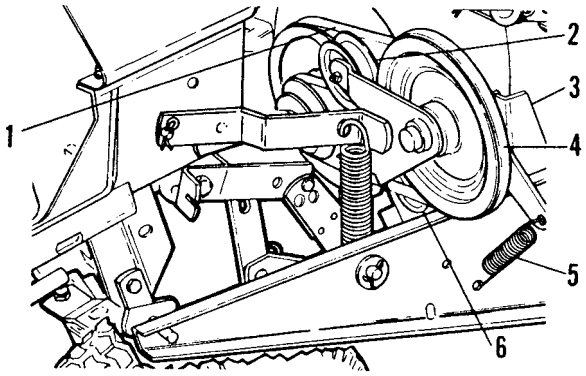
1. Locknuts
2. Belt Guard
3. Chute Spindle Cover

Figure 12-16: Belt & Chute Spindle Guards

Disconnect idler springs and loosen (DO NOT remove) large flange nut; plate is slotted for adjustment.

Remove old belts and install new belts. Adjust sheaves so that belts have slack removed and tighten large flange nut.

Connect idler springs, secure belt guard using hardware removed above and connect universal drive shaft.



1. Front Belt
2. Idler
3. Large Flange Nut
4. Rear Belt
5. Idler Spring
6. Idler

Figure 12-17: Sno-Thro Belts

12

12.14 Gearcase

Remove four bolts from bearing flange.

Remove flange and gasket.

NOTE: At this point bronze gear cannot be removed.

Using bearing adjustment wrench remove adjustment plug.

While holding input shaft in one hand and using a mallet, strike case until bearing cone pops out of the case.

Bronze gear can then be removed from case.

After bronze gear is removed, input shaft can then be removed.

NOTE: It is not necessary to remove the end cap from case.

To remove worm gear and bearings, simply remove bolt and washer from end of shaft.

Assembly is done by inserting bronze and worm gear at same time.

Using adjustment wrench, tighten down on adjustment plug until input shaft is snug.

Replace side cover using a sealant on threads of two bottom bolts.

Fill gear case with L-2 oil until level reaches bottom of threads in filler hole.

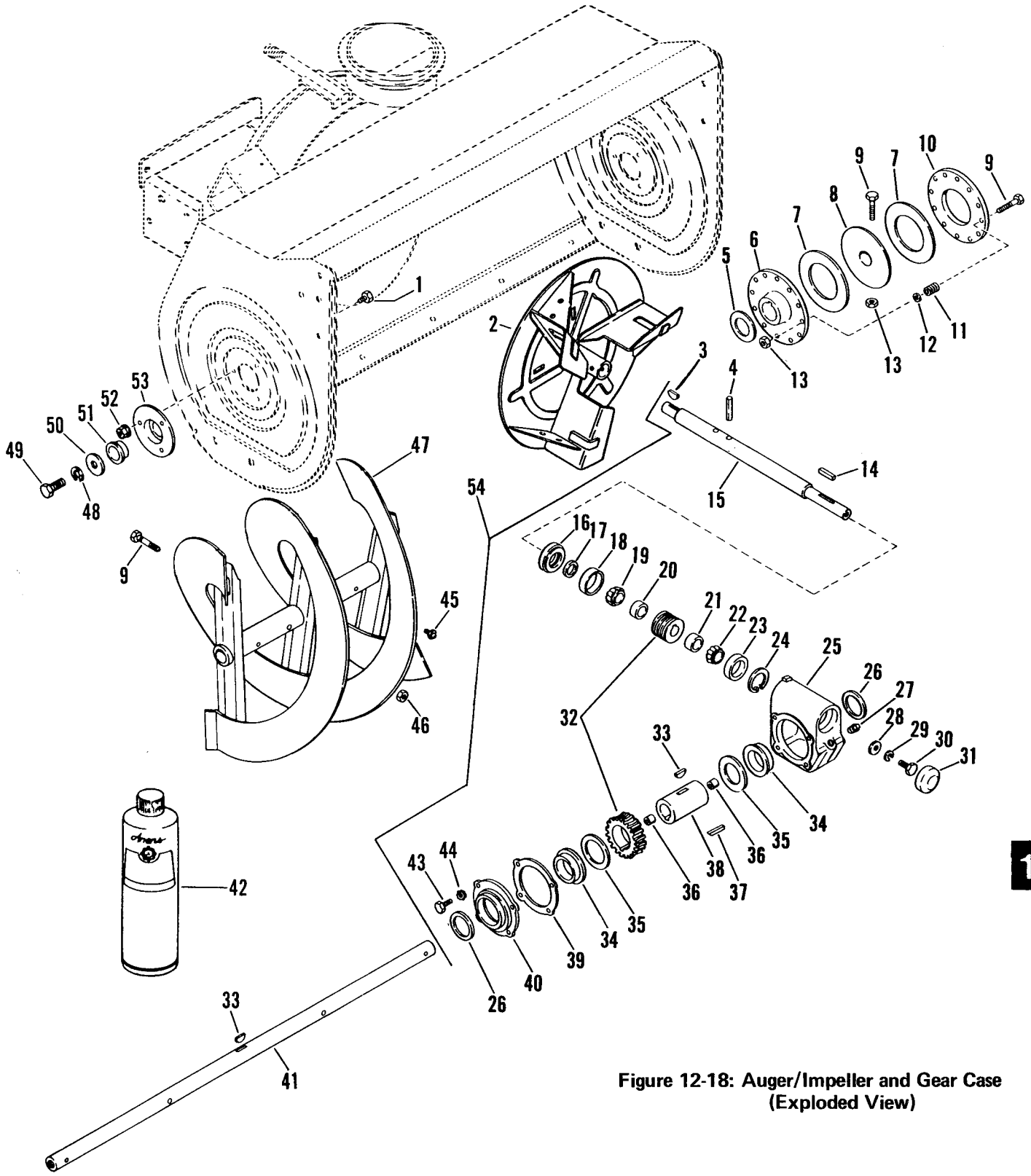


Figure 12-18: Auger/Impeller and Gear Case (Exploded View)

Attachments

ITEM NO	PART NO	DESCRIPTION	QTY
1	70058	Rib Neck Bolt 1/4 - 20 x 1/2	6
2	30845	Impeller	1
3	66001	Woodruff Key 3/16 x 7/8 x 3/8	1
4	58015	Roll Pin 5/16 x 1 -3/4	2
5	64211	Washer 1.625/1.688 x 2.50 x .060	1
6	30550	Driver	1
7	30551	Friction Disc	2
8	30552	Driven Plate	1
9	59170	Cap Screw 5/16 - 18 x 2" Gr 5	15
10	30553	Pressure Plate	1
11	83216	Compression Spring 3/4	12
12	64057	Washer .312/.343 x .625 x .062	12
13	65124	Top Lock Nut 5/16 - 18 Gr C	13
14	66013	Straight Key 3/16 x 1" x 3/16	1
15	34612	Worm Shaft	1
16	31882	Adjustment Plug	1
17	56046	Seal 1 - 1/8 ID	1
18	54070	Bearing Cup 1 - 63/64 OD	1
19	54069	Bearing Cone 1" ID	1
20	31881	Bearing Spacer	1
21	2005	Bearing Spacer	1
22	54045	Bearing Cone 3/4 ID	1
23	54044	Bearing Cup 1 - 25/32 OD	1
24	57075	Snap Ring	1
25	31879	Gear Case	1
26	56070	Seal 1 - 5/8	2
27	1138	Pipe Plug	1
28	64082	Washer .323/.333 x 1.000 x .094	1
29	63003	Lock Washer 5/16 ID	1
30	59022	Cap Screw 5/16 - 18 x 3/4 Gr 2	1
31	4037	Dust Cap	1
32	31884	Worm and Gear Set	1
33	66048	Feather Key 1/4 x 7/8 x 1/4	1
34	55059	Flange Bushing 1 - 5/8 x 1 - 7/8 x 11/16	2
35	64087	Washer 1.623/1.627 x 2.500 x .012	2
36	55139	Sleeve Bushing 1 - 1/8 x 1 - 1/4 x 1"	2
37	66047	Straight Key 1/4 x 5/8 x 3/8	1
38	30547	Gear Case Shaft	1
39	2008	Gasket	1
40	24013	Gear Case Cover	1
41	34364	40" Auger Shaft	1
42	80	16 oz.L2 Compound	5
43	59001	Cap Screw 1/4 - 20 x 3/4 Gr 2	4
44	63017	Lock Washer 1/4 ID	4
45	22093	Zerk Fitting	4
46	65042	Two Way Lock Nut 5/16 - 18 Gr A	2
47	34457	L.H. Auger w/Zerk	1
	34365	R.H. Auger w/Zerk	1
48	63006	Lock Washer 1/2 ID	2
49	59024	Cap Screw 1/2 - 13 x 1" Gr 2	2
50	64047	Washer .506/.516 x 1.441 x .125	2
51	55035	Flange Bushing 1" x 1 - 1/8 x 5/8	2
52	65056	Flange Whiz-Lock Nut 1/4 - 20	6
53	24374	Bearing Support	2
54	534021	Gear Case Assembly	1
		Requires 5 Oz. L-2 Compound	

12.15 Cable Installation

Sno-Thro attachment is shipped with chute control cable in place and properly adjusted to operate when discharge chute is installed on blower housing. In event cable is damaged or worn, replace as follows:

With chute in position on Blower Housing turn chute all the way until long taptite screw is against the stop.

Fasten one end of cable to top of spool with carriage bolt, lockwasher, and nut.

Run cable around spool to rear of chute and through clamp. Clamp should be loose or, if required, off at this point.

Run cable through hole "B", down and around underside of flange of chute to hole "A".

Run cable through hole "A", up and through clamp.

Run cable around (clockwise) front of chute, around spool one and one-half times (clockwise) to bottom of spool. Fasten this end with lockwasher and nut on cap screw in bottom hole of spool.

Secure clamp on chute by tightening taptite.

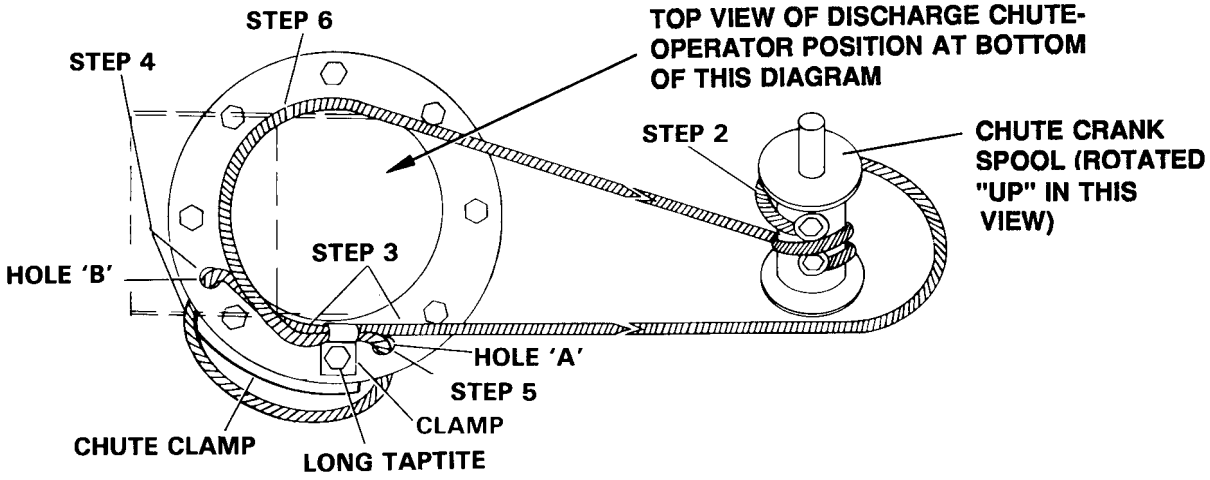


Figure 12-19: Cable Installation

12

12.16 Stabilizer Bracket Adjustment

With Tiller Clutch Lever engaged, loosen 3/8" x 1" Carriage Bolts (G) at top and bottom of mounting frame. Adjust both stabilizers together against idler bar arm. Retighten hardware. Operate Clutch Lever, idler bar arm should operate freely throughout stabilizer bars.

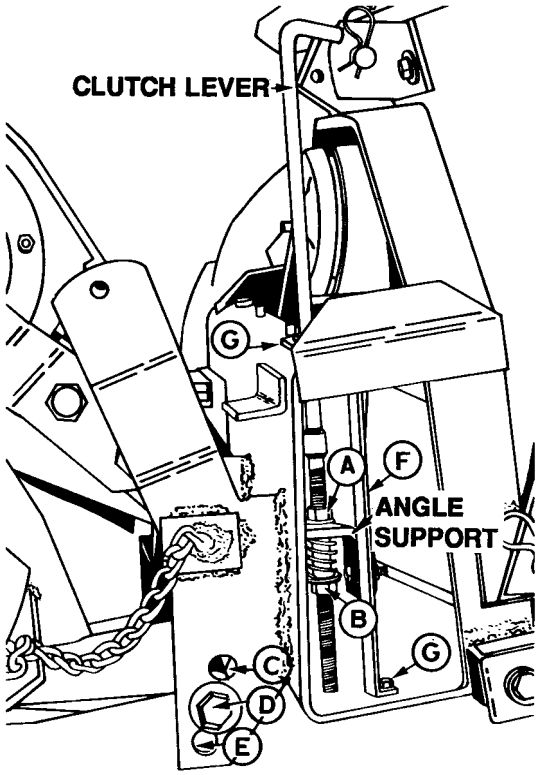


Figure 12-20: Stabilizer Bracket Adjustment

12.17 Tiller

Lower link of tiller can be adjusted to any one of three positions to increase or decrease tendency of tiller to propel tractor forward. Tiller is factory-assembled in center hole. This setting is usually desirable for most tilling operations.

Top hole C is most aggressive setting. Setting may be used when operating in soft soil conditions.

12.18 Enclosed Drive Chain Tension

Use following procedure to adjust enclosed drive chain tension.

Raise tiller high enough so tines can be rotated.

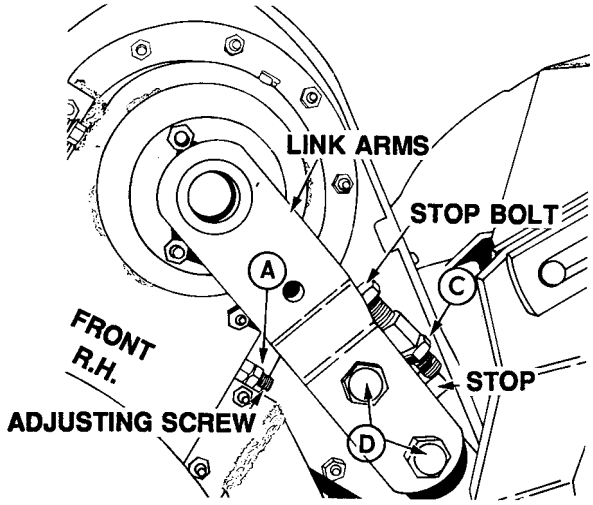


Figure 12-21: Drive Chain Tension

Loosen jam nut A, and turn adjusting screw "in" until a slight drag is felt on chain.

Move tines back and forth by hand until chain slack or "backlash" is felt. Continue to turn adjusting screw "in" while moving tines until backlash is removed and a slight drag is felt on chain.

Turn adjusting screw out approximately ½ turn or as necessary until tines turn freely. Tighten jam nut A securely.

CAUTION: Do Not overtighten chain as excessive wear on chain and sprockets will result.

12.19 External Drive Chain Tension

External drive chain is properly adjusted when distance B is from ¾" to 1".

Use following procedure to adjust drive chain.

NOTE: Chain shield has been removed for clarity. It is not necessary to remove shield when adjusting chain tension.

Loosen jam nut C.

Loosen bolts D, enough so that link arms can move up.

Pry link arms up until chain pushes curved tightener spring rod outward ¾" to 1".

Turn stop bolt down against stop. Tighten jam nut C and link arm bolts D.

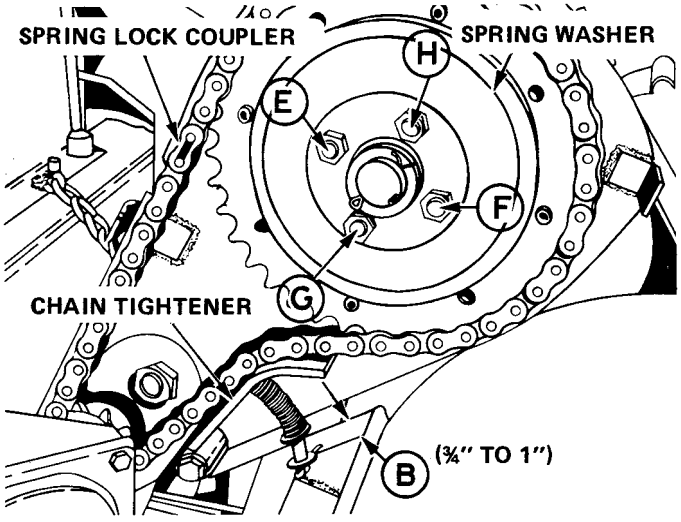


Figure 12-22: Clutch Pressure

12.20 Clutch Pressure Adjustment

Before clutch slips excessively, it is necessary to re-adjust spring washer pressure. Use following procedure:

Remove external drive chain shield.

Loosen nuts E, F, G and H, then tighten them finger-tight.

Retighten nuts a full 2½ turns to provide correct spring washer pressure. The following sequence must be used to tighten nuts or improper spring washer deflection will result:

Tighten nut E, F, G, H, ½ turn.

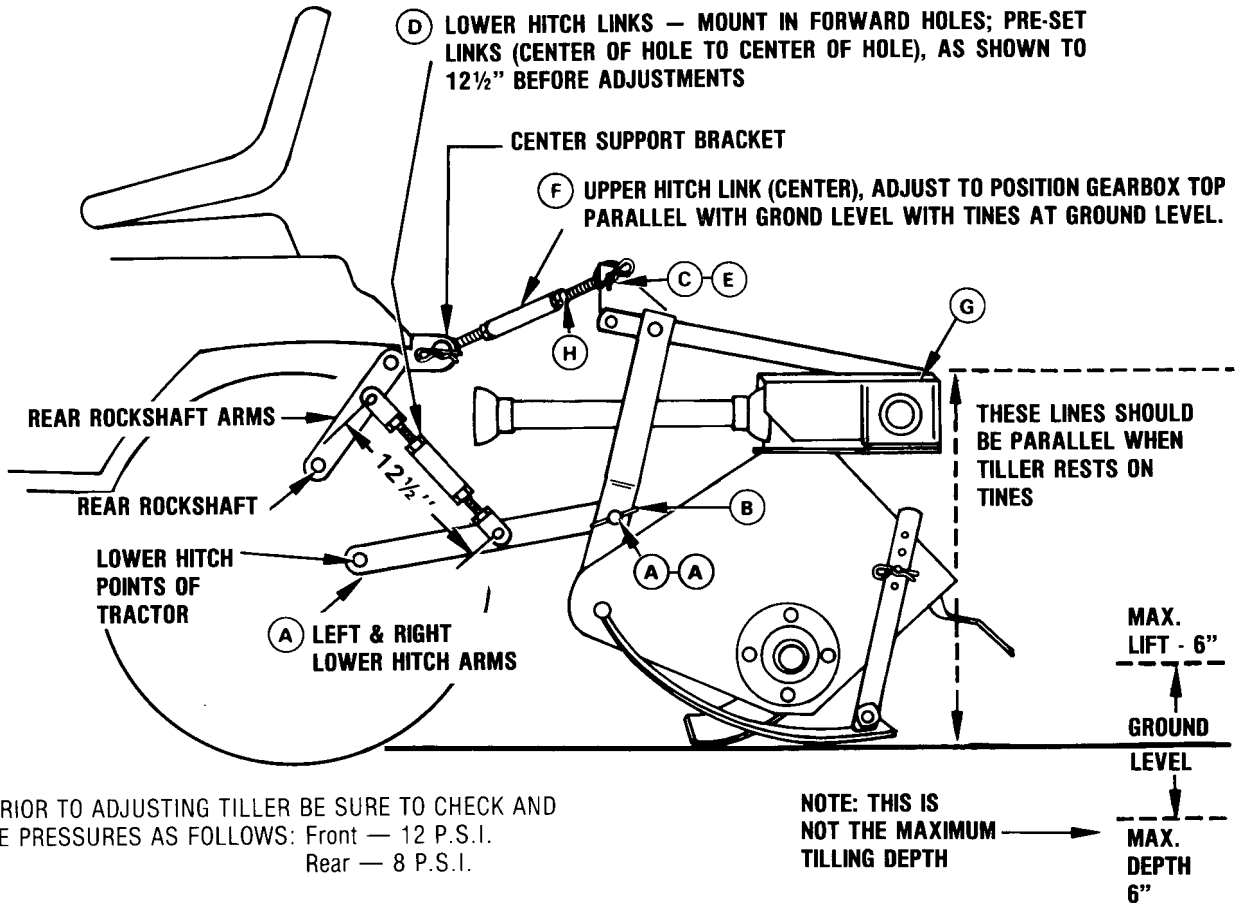
Continue to tighten nuts E, F, G, and H in above order until each nut is tightened 2½ turns.

CAUTION: DO NOT OVERTIGHTEN! Overtightening will eliminate slip feature of clutch and will result in damage to gear case if tiller hits some solid object.

Replace drive chain shield.

Attachments

12.21 Tiller Adjustment



NOTE: PRIOR TO ADJUSTING TILLER BE SURE TO CHECK AND SET TIRE PRESSURES AS FOLLOWS: Front — 12 P.S.I.
Rear — 8 P.S.I.

Figure 23: Tiller Adjustment

Adjust tiller and 3-point hitch arms and links. Pre-set lower hitch links (D) to 12-1/2" (center of hole to center of hole). With tiller tines resting on ground check to see if the top surface of gearbox (G) is parallel to ground level. Adjust upper hitch link (F) to make top of gearbox level. Lift tiller to highest position. Tines should be 6" (plus or minus 1/2") above ground level. Adjust lower hitch links (D) to obtain this ground clearance. Lower tiller to ground again and recheck and level top of tiller gearbox (G). Recheck lift height. A total of approximately 12" of travel up and down is provided with this tiller. The tilling depth will be more than 6" under normal conditions unless reduced by adjustment of depth shoes. Be sure to lock upper hitch link (F) jam nut (H) against threaded tube of upper link arm to prevent rotation of upper link.

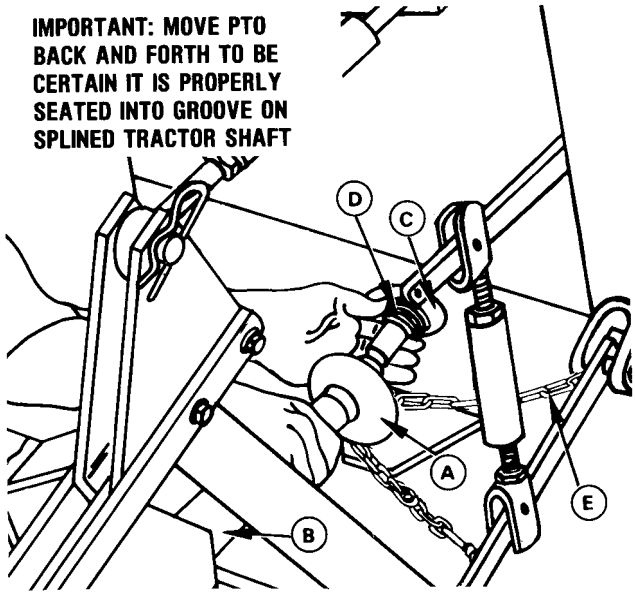


Figure 12-24: Tiller Power Take-Off

12.22 Chain Drive Adjustment

CAUTION: Before making any adjustments disengage PTO, shut off engine, lower tiller to ground (make sure tines have stopped), and remove ignition key.

Raise tiller to clear tines from ground. Disengage PTO, shut off engine and remove ignition key. Loosen jam nut (A) and turn adjusting screw (B) "in" until a slight drag is felt on chain. Move tines back and forth by hand until chain slack or "backlash" is felt. Continue to turn adjusting screw (B) "in" while moving tines until backlash is removed and a slight drag is felt on chain. Turn adjusting screw (B) "out" approximately 1/2 turn or as necessary until tines turn freely. Tighten jam nut (A).

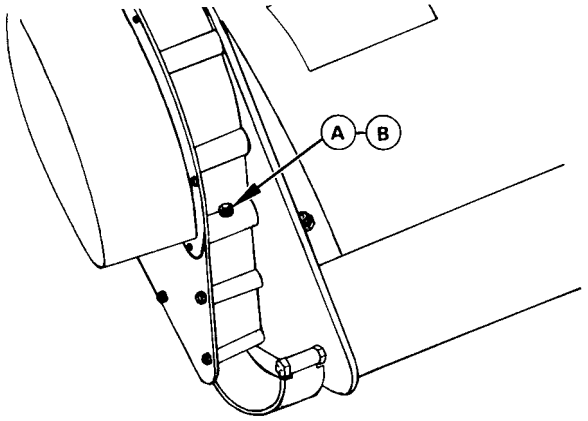


Figure 12-25: Chain Drive Adjustment

12.23 Torque Limiter Adjustment

If torque limiter slips excessively, check and adjust spring tension. Remove shield from top of tiller shroud by removing the 5/16" hex bolts and lockwashers. On torque limiter assembly (B), tighten hex locknuts (C) until spring (D) is tight against hub end plate (E), and compressed solid; then back off two (2) full turns. IMPORTANT: Always adjust in this manner. Do not leave springs fully compressed. Doing so could cause damage to your tiller or tractor. Replace shield and test adjustment by placing tiller under normal load. If torque limiter continues to slip excessively, have your dealer check and replace necessary parts if worn.

NOTE: ALWAYS "BACK-OFF" EACH NUT TWO (2) FULL TURNS FROM TIGHT.

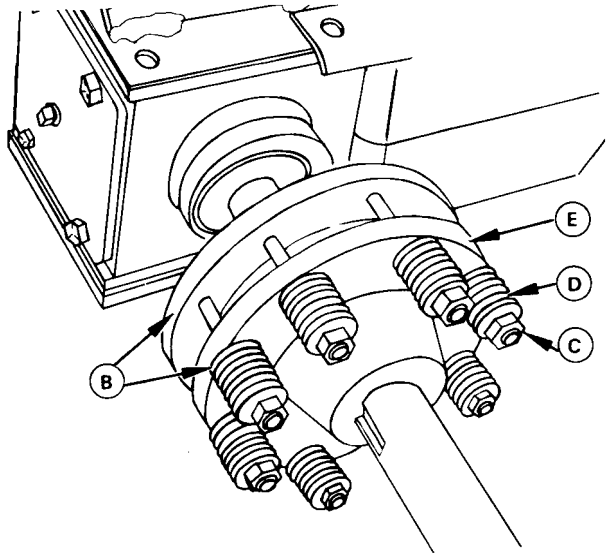


Figure 12-26: Torque Limiter

Attachments

12.24 Outer Chain Drive Adjustment

Remove the 5/16" x 1/2" hex bolts (A) holding outer shield (B) in place. Loosen chain idler adjusting bolt (C) and move idler (D) toward chain until chain has approximately 1/4" movement at center. Retighten adjusting bolt and check chain tension. DO NOT OVERTIGHTEN BOLT. Reinstall outer shield.

NOTE: Lubricate chain case each time chain is inspected or adjusted. See "Lubrication" Section.

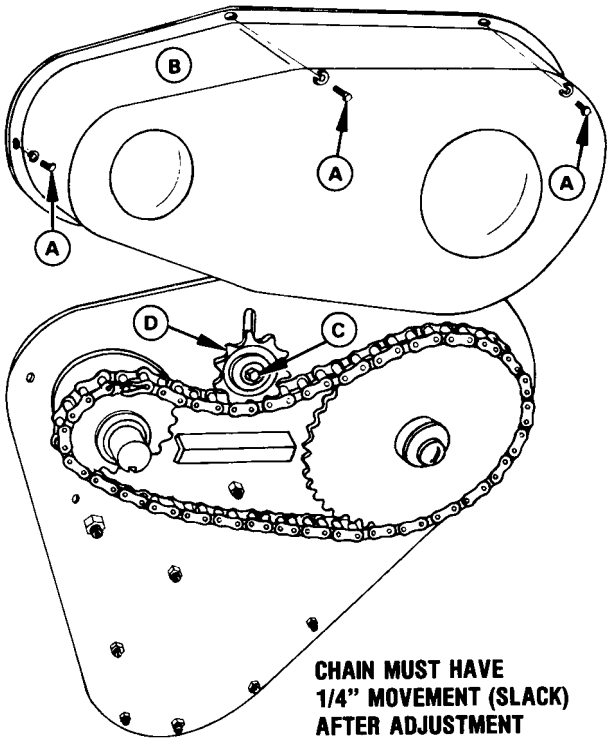


Figure 12-27: Outer Chain Drive

12.25 Tine Replacement

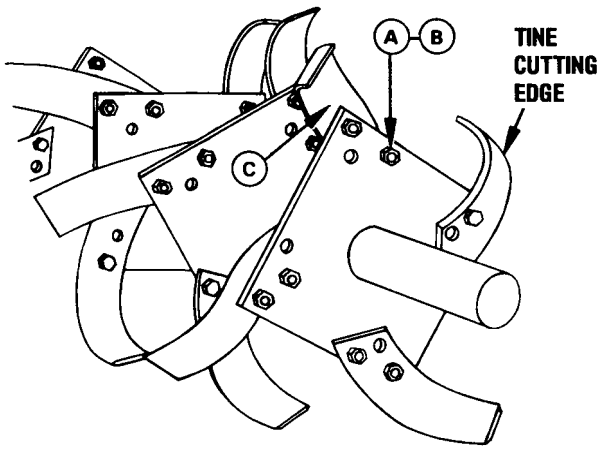


Figure 12-28: Tine Replacement

If tine replacement should become necessary, detach tiller (see "Installation" Section) from tractor, hook leveler blade in up position, and place tiller upside down. Remove flanged hex bolts (A) and flanged hex lock nuts (B) and replace broken or worn tine (C) with tine marked "BR" (right-hand) or marked "BL" (left-hand). Tighten flanged hex bolts and nuts. They should be torqued to 50-55 foot pounds. Use only correct Ariens replacement hardware. IMPORTANT: Always install tine with cutting edge facing direction of rotation and positioned as shown. When all tines are assembled properly, the four rows of tines should appear to be in a "spiral" pattern around tine shaft. Refer to imprint stamp on tine when ordering replacement tines. Always tighten hardware to specified torque.

CAUTION: Before lubricating tiller place hydrostatic control lever in "PARK-START" position, set parking brake, disengage PTO, stop engine and remove ignition key. Lower tiller to ground. Tiller should be level.

Oil leveler blade hinges and outer chain drive daily. Periodically grease telescoping PTO and check gear box oil level. Fill gearbox by removing breather plug and oil level plug. Fill with gear and axle oil (EP 90 or equivalent) until it seeps out level hole. Reinstall both plugs securely.

Periodically (every 25 hours) remove outer chain cover. Apply Ariens Multi-Purpose Grease (part no. 000150) to chain. Replace cover.

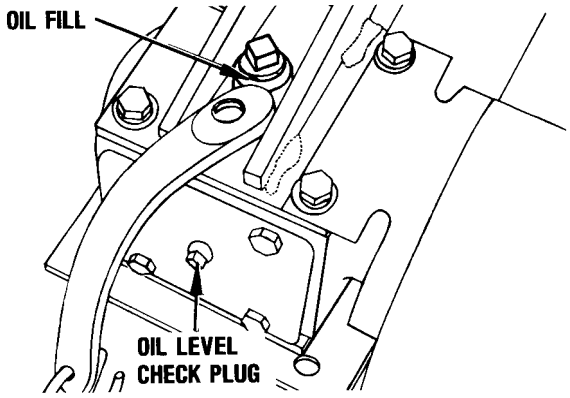


Figure 12-29: Tiller Lubrication

12.26 Outer Chain Drive Replacement

Remove the 5/16" x 1/2" hex bolts holding outer chain drive shield. Loosen chain idler adjusting bolt (A) and move idler (B) away from chain. Detach master link (C) and remove chain. Replace with new Roller Chain, adjust tension. Lubricate chain by liberally applying Ariens Multi-Purpose Grease (Part No. 000150). Replace shield.

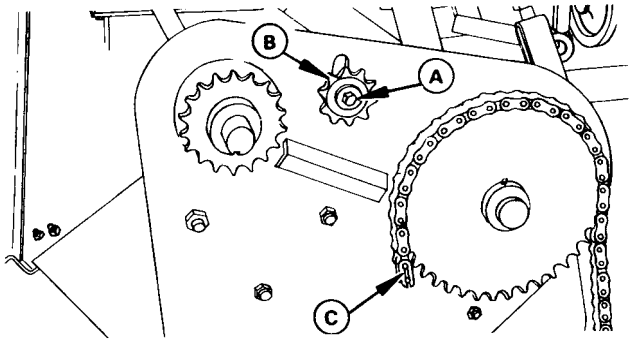


Figure 12-30: Outer Chain Drive Replacement

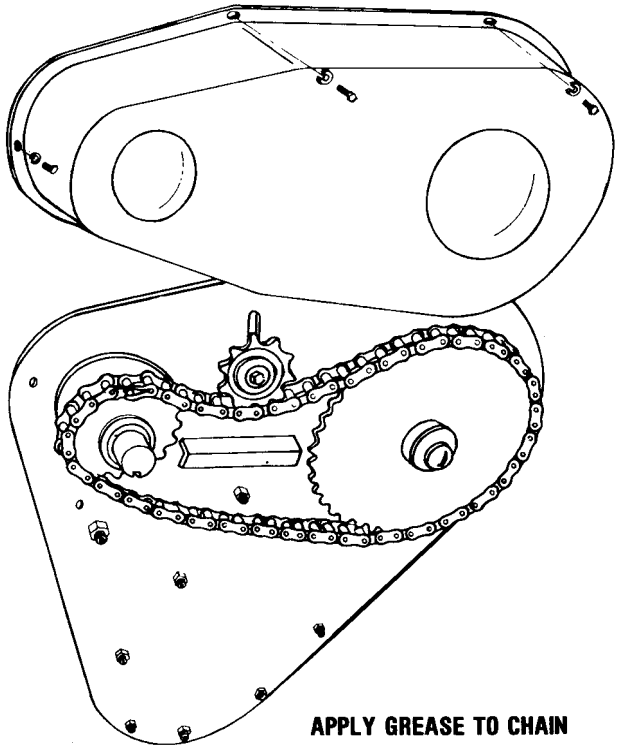


Figure 12-31: Chain Lubrication

12

Troubleshooting - Attachments

Rotary Tiller

PROBLEM	POSSIBLE CAUSE	CORRECTION
Insufficient traction (wheels skid).	1. Wheel weights and /or cleat tread tires not installed.	1. Make sure Lift Lever is in "FLOAT" position. 2. Install one or two wheel weights to each rear wheel and use cleat tread tires or chains on turf tires. 3. Check depth shoes for proper depth setting.
Tines do not rotate	1. Torque Limiter slipping excessively. 2. Material wrapped around tine shaft (Rock or stump wedged between tine and housing).	1. Adjust. 2. Remove material wrapped or wrapped around shaft.
Tines rotate but tiller does not till.	1. Chains climb sprocket teeth 2. Ground too hard. 3. Ground too wet (Dirt and weeds on tine shaft). 4. Tines do not dig. 5. Tall grass or weeds wind up on tines. 6. Tiller climbs out of ground and propels tractor forward.	1. Adjust chain tension. 2. Set tiller depth for shallow penetration, then deepen progressively. 3. Postpone tilling 4. Cutting edge of tines must be installed toward direction of rotation. 5. Cut, burn or defoliate long material prior to tilling. 6. Till at a shallower depth — add wheel weights to tractor. Hydraulic Lift Lever should be in "Float" position.

PROBLEM	POSSIBLE CAUSE	CORRECTION
Erratic operation of tiller.	1. Material wrapped on tines/shaft. 2. Tine shaft jerks (rotates erratically).	1. Remove foreign materials from the tine shaft. 2. Tine Shaft out of balance. Replace any broken tines. 3. Torque limiter spring pressure incorrect.
Tiller noisy/vibrates excessively in transport position.	1. Tractor hitch adjusted for excessive transport height — PTO shaft at undesirable angle.	1. Readjust lower link arms on tractor hitch for not more than 16" of clearance. Measured from ground to center of lower link pins with hitch in "UP" position. This should provide 6" of tine to ground clearance. 2. Lower Hitch Links may be mounted in wrong hole of rear rockshaft arms. Reposition links to inner set of holes.

Troubleshooting - Attachments

42", 48", 60" Mowers

	PROBLEM		PROBABLE CAUSE
1.	Belt failures.	a.	Snapped belts: 1. High shock loads. 2. Idler pulley not smoothly following belt.
		b.	Shredding: 1. Interference with hardware. 2. Interference with other pan parts, edges or foreign objects. 3. Failed idler.
2.	Uneven cut, stripping or scalping.	a.	Check for improper level. See Mower Attachment Owner's Manual.
		b.	Check for proper blade length, cutting angle, or cutting edge.
		c.	Improper ground speed for conditions.
		d.	Low air flow for conditions. Use newer high lift blades.
		e.	Turn radius too short.
		f.	Check for proper float adjustment. Use lift assist chains.
3.	Mower gear box noisy.	a.	Check for proper shaft end play or gear backlash.
		b.	Check for burr underneath bearing causing improper gear alignment.
		c.	Check for low lubricant level. Use Ariens #150.
		d.	Check for loose mounting hardware.
4.	Leveling of mower.	a.	See Mower Attachment Owner's Manual for proper procedure.
		b.	Check for incorrect hanger parts.
		c.	Check for correct carrier arm.
		d.	Check for correct center rockshaft.
5.	Rollers hitting wheels.	a.	Check for proper tire pressure.
		b.	Check for correct hanger parts and/or leveling.
6.	Cracking mower deck.	a.	Mowing in rough conditions causing fatigue failure.
		b.	Check for loose gear box or spindle housing mounting.

Ask your dealer for information about these other fine Ariens Products:

- Lawn Edger
- Front and Rear Tine Tillers
- 21" Walk-Behind Lawn Mowers
- Walk-Behind Sno-Thros
- Rear Engine Riding Mowers
- Yard and Garden Tractors
- Commercial Walk-Behind and Riding Mowers
- Line Trimmers
- Brush Cutters
- Hedge Trimmers
- Power Blowers
- Chain Saws
- Engine Drills
- Water Pumps

Ariens

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