Sabre Lawn Tractor

38–Inch and 46–Inch (96 cm and 117 cm)

Models:

1338 Gear	1546 Gear
1538 Gear	1638 Hydro
1538 Hydro	1646 Gear
15538 Gear	1646 Hydro
15538 Hydro	

Technical Manual

John Deere Consumer Products Group

TM–GX10131 (Mar–97)

LITHO IN U.S.A. (New)

This technical manual is written for an experienced technician and contains sections that are specifically for this product. It is a part of a total product support program.

The manual is organized so that all the information on a particular system is kept together. The order of grouping is as follows:

- Table of Contents
- Specifications
- Component Location
- System Schematic
- Theory of Operation
- Troubleshooting Chart
- Diagnostics
- Tests & Adjustments
- Repair

Note: Depending on the particular section or system being covered, not all of the above groups may be used.

Each section will be identified with a symbol rather than a number. The groups and pages within a section will be consecutively numbered.

We appreciate your input on this manual. If you find any errors, or want to comment on the layout of the manual, please mail your comments back to us.

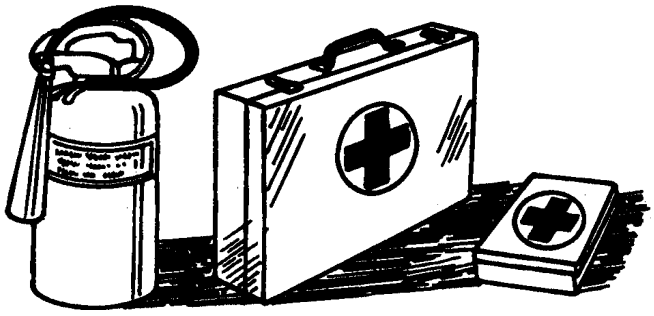
All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

John Deere Worldwide Lawn and Grounds Care Division

Power Products Group
P.O. Box 7047
Charlotte, NC 28241

HANDLE FLUIDS SAFELY-AVOID FIRES

- **BE PREPARED FOR EMERGENCIES**



When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

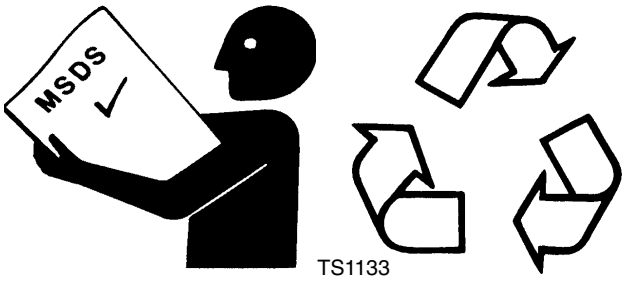
Do not store oily rags; they can ignite and burn spontaneously.

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

HANDLE CHEMICAL PRODUCTS SAFELY



TS1133

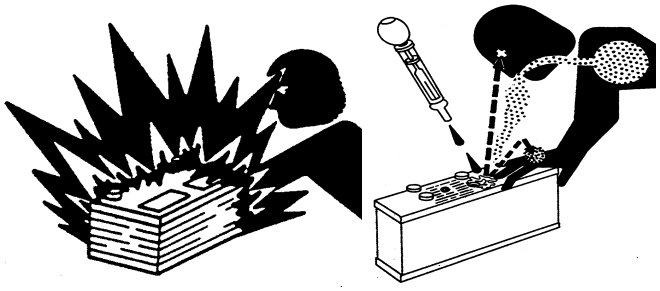
Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques. Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

- **DISPOSE OF WASTE PROPERLY**

Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste includes oil, fuel, coolant, brake fluid, filters, and batteries. Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them. Do not pour waste onto the ground, down a drain, or into any water source. Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center.

USE CARE IN HANDLING AND SERVICING BATTERIES



- **PREVENT BATTERY EXPLOSIONS**
  - Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.
  - Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.
  - Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).

- **PREVENT ACID BURNS**
  - Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

- **Avoid acid burns by:**
  1. Wearing eye protection and rubber gloves.
  2. Avoiding breathing fumes from electrolyte.
  3. Avoiding tipping battery.
  4. Use proper jump start procedure.

- **If you spill acid on yourself:**
  1. Flush your skin with water.
  2. Apply baking soda to help neutralize the acid.
  3. Flush your eyes with water for 10–15 minutes.
  4. Get medical attention immediately.

- **If acid is swallowed:**
  1. Drink large amounts of water or milk.
  2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
  3. Get medical attention immediately.

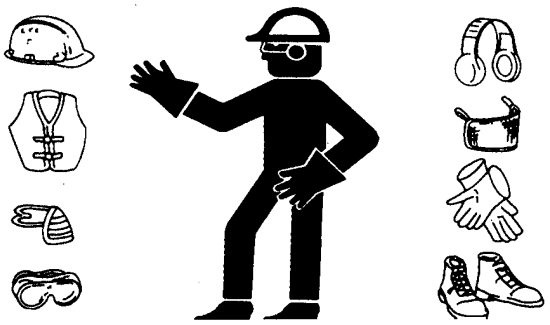
USE SAFE SERVICE PROCEDURES

- **WEAR PROTECTIVE CLOTHING**

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.



- **SERVICE MACHINES SAFELY**

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

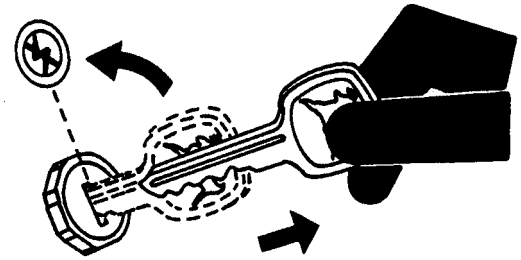
Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.

- **USE PROPER TOOLS**

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards. Use power tools only to loosen threaded parts and fasteners. For loosening and tightening hardware, use the correct size tools. **DO NOT** use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches. Use only service parts meeting John Deere specifications.

- **PARK MACHINE SAFELY**

1. Depress brake pedal fully.
2. Move park lever into lock position.
3. Check that shift lever has returned to neutral.
4. Make sure blade drive lever is pulled back fully.
5. Move throttle lever to SLOW IDLE position and allow engine to idle for approximately 30 seconds before turning key switch to OFF position. Remove the ignition key to prevent accidental starting.

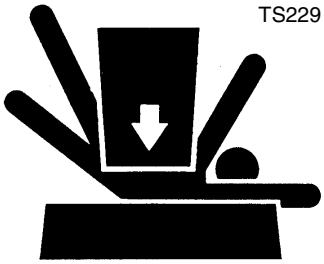


- **Before working on the machine:**

1. Lower all equipment to the ground.
2. Stop the engine and remove the key.
3. Disconnect the battery ground strap.
4. Hang a “DO NOT OPERATE” tag in operator station.

- **SUPPORT MACHINE PROPERLY AND USE PROPER LIFTING EQUIPMENT**

TS229



If you must work on a lifted machine or attachment, securely support the machine or attachment with jack stands rated to support the lifted load.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.

Lifting heavy components incorrectly can cause severe personal injury or machine damage. Follow recommended procedure for removal and installation of components in the manual.

- **WORK IN CLEAN AREA**

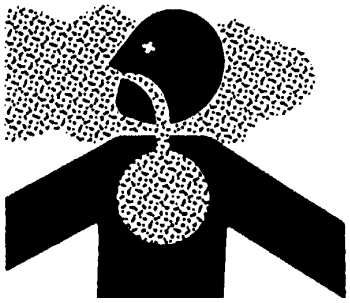
- **Before starting a job**

1. Clean work area and machine:
2. Have all the necessary tools to do your job
3. Have the right parts on hand.
4. Read all instructions thoroughly; do not attempt shortcuts.

- **ILLUMINATE WORK AREA SAFELY**

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

- **WORK IN VENTILATED AREA**



Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area.

WARNING: California Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Gasoline engine exhaust from this product contains chemicals known to the State Of California to cause cancer, birth defects, or other reproductive harm.

- **REMOVE PAINT BEFORE WELDING OR HEATING**

Avoid potentially toxic fumes and dust. Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. Do all work outside or in a well ventilated area. Dispose of paint and solvent properly. Remove paint before welding or heating: If you sand or grind paint, avoid breathing the dust. Wear an approved respirator. If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

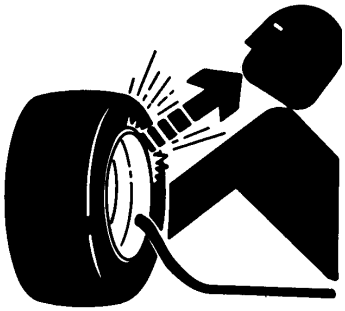
- **AVOID HARMFUL ASBESTOS DUST**

Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

Components in products that may contain asbestos fibers are brake pads and some gaskets. The asbestos used in these components is usually found in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust containing asbestos is not generated.

Avoid creating dust. Never use compressed air for cleaning. Avoid brushing or grinding material containing asbestos. When servicing, wear an approved respirator. A special vacuum cleaner is recommended to clean asbestos. If not available, apply a mist of oil or water on the material containing asbestos. Keep bystanders away from the area.

- **SERVICE TIRES SAFELY**



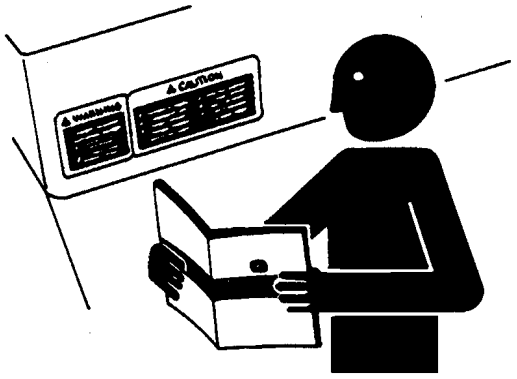
Explosive separation of a tire and rim parts can cause serious injury or death.

Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job. Always maintain the correct tire pressure. Do not inflate the tires above the recommended pressure. Never weld or heat a wheel and tire assembly. The heat can cause an increase in air pressure resulting in a tire explosion. Welding can structurally weaken or deform the wheel.

When inflating tires, use a clip-on chuck and extension hose long enough to allow you to stand to one side and NOT in front of or over the tire assembly. Use a safety cage if available.

- **Check wheels for low pressure, cuts, bubbles, damaged rims or missing retaining hardware.**

REPLACE DECALS



Replace missing or damaged Decals. See the machine operator's manual for correct safety sign placement.

LIVE WITH SAFETY

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.

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SPECIFICATIONS & INFORMATION

SPECIFICATIONS

Engine:

Make	Briggs and Stratton
Style	Vertical Shaft
Models:	
13 Horsepower	28M707
15 Horsepower	28N700
16 Horsepower (Cast Iron Sleeve)	28Q777
Type	Gasoline, Air Cooled, Single Cylinder, 4-Cycle
Crankcase Oil Capacity	3 Pints
Oil: Warm Climate (Above 40°F)	SE, SF, SG, SAE 30W
Cold Climate (Below 40°F)	SE, SF, SG, SAE 10W30

Electrical:

Ignition System	Magnetron® Magneto Ignition
Magneto Air Gap	0.25 -0.35 mm (0.010 - 0.014 in.)
Charging System	Dual Circuit (AC/DC)
Charging Capacity	2-4 amps, 14 volts DC@3600 rpm (Unregulated)
Spark Plugs	
13 Hp	TY6129 (Champion RJ-19 LM)
15 & 16 Hp	M78543 (Champion RC-12 YC)
Spark Plug Air Gap	0.76 mm (0.030 in.)
Battery Type	BCI Group, U1
Battery Cranking Amps	230 amps at 0° C (32° F)
Battery Cold Cranking Amps	190 amps at 0° C (32° F)
Battery Specific Gravity	Above 1.225 Points
Starter Type	Bendix Inertia Drive
Fuel Shut-Off Solenoid (16 H.P. Only)	Replaceable (Below Carburetor Float Bowl)
Headlight Bulbs	Type 1156, 12 Volt

Fuel/Air System:

Carburetor Make	Briggs & Stratton
Carburetor Type	Side Draft
Throttle/Choke	Unitized Control Linkage
Carburetor Fuel Shut-Off Solenoid (Optional)	Electric
Fuel Delivery	Gravity Flow
Fuel Filter	Replaceable Inline type
Fuel Type	Unleaded (87 Octane Minimum)
Fuel Tank Capacity	4.7 L (1.25 gal)
Air Filter	Paper Element with Foam Pre-cleaner
Muffler Type	Anti-Backfire

Power Train—K55 Transmission:

Gear Transaxle—
- Make . . . . . Dana
- Model. . . . . Spicer Heavy-Duty 4360 Transaxle
- Type. . . . . Five-Speed/Linear Shift

Domestic Ground Speeds (at FAST idle—3350 rpm) and Gear Ratios:
- 1st Gear. . . . . 2.4 km/hr (1.5 mph)—61.67:1
- 2nd Gear . . . . . 3.2 km/hr (2.0 mph)—46.67:1
- 3rd Gear . . . . . 5.0 km/hr (3.1 mph)—30.00:1
- 4th Gear . . . . . 6.4 km/hr (4.0 mph)—23.48:1
- 5th Gear . . . . . 8.0 km/hr (5.0 mph)—18.46:1
- Reverse. . . . . 3.7 km/hr (2.3 mph)—40.00:1

Brake Type . . . . . Single, External Brake Disc With Dual Friction Pucks

Lubrication—Input Shaft Needle Bearings . . . . . Multi-Purpose Grease

Lubrication—Transaxle . . . . . Multi-Purpose Grease

Capacity—Transaxle. . . . . 0.64 kg (1.406 lbs)

Hydro Transaxle—
- Make . . . . . Kanzaki
- Model. . . . . Tuff Torq® K55 Transaxle
- Type. . . . . Hydrostatic

Ground Speeds (at FAST idle—3350 rpm):
- Forward . . . . . 0—8.66 km/hr (0—5.38 mph)
- Reverse. . . . . 0—4.24 km/hr (0—2.62 mph)

Brake Type . . . . . Single, External Disc Brake With Friction Pucks

Lubrication. . . . . 10W30 Engine Oil, Class CD

Reservoir. . . . . Internal

Capacity . . . . . 1.6 L (3.4 pt)

Power Train—K51 Transmission:

Gear Transaxle—
- Make . . . . . Dana
- Model. . . . . Spicer K51 Transaxle
- Type. . . . . Five-Speed/Linear Shift

Domestic Ground Speeds (at FAST idle—2950 rpm) and Gear Ratios:
- 1st Gear. . . . . 2.4 km/hr (1.5 mph)
- 2nd Gear . . . . . 3.2 km/hr (2.0 mph)
- 3rd Gear . . . . . 5.0 km/hr (3.1 mph)
- 4th Gear . . . . . 6.4 km/hr (4.0 mph)
- 5th Gear . . . . . 8.0 km/hr (5.0 mph)
- Reverse. . . . . 3.7 km/hr (2.3 mph)

Brake Type . . . . . Single, Internal Brake Disc

Lubrication—Input Shaft Needle Bearings . . . . . Multi-Purpose Grease

Lubrication—Transaxle . . . . . Multi-Purpose Grease

Capacity—Transaxle Oil . . . . . 2.3 kg (5.07 lbs)

Hydro Transaxle—
- Make . . . . . Kanzaki
- Model. . . . . Tuff Torq® K51 Transaxle
- Type. . . . . Hydrostatic

Ground Speeds (at FAST idle—2950 rpm):
- Forward . . . . . 0—8.5 km/hr (0—5.3 mph)
- Reverse. . . . . 0—5.3 km/hr (0—3.3 mph)

Brake Type . . . . . Single, Internal Disc Brake

Lubrication. . . . . 10W30 Engine Oil, Class CD

Reservoir. . . . . Internal

Capacity . . . . . 2.5 L (2.4 qt)

Traction Drive Belt:

Gear—
- New Belt Length . . . . . 2660±8 mm (104.7±0.3 in.)
- Minimum Effective Length . . . . . 2631 mm (103.6 in.)
- Maximum Effective Length . . . . . 2710 mm (106.7 in.)

Hydro—K55 Transmission
- New Belt Length . . . . . 2485±8 mm (97.8±0.3 in.)
- Minimum Effective Length . . . . . 2477 mm (97.5 in.)
- Maximum Effective Length . . . . . 2530 mm (99.6 in.)

Hydro—K51 Transmission
- New Belt Length . . . . . 2400±8 mm (94.5±0.3 in.)
- Minimum Effective Length . . . . . 2392 mm (94.2 in.)
- Maximum Effective Length . . . . . 2424 mm (94.9 in.)

Mower Deck Drive Belt

38-Inch Deck—
- Actual effective length . . . . . 2425±10 mm (95.5±0.4 in.)

46-Inch Deck—
- Actual effective length . . . . . 3492±10 mm (137.5±0.4 in.)

Mower Deck:

38-Inch Mower Deck—
- Type . . . . . Rotary—Dual Spindles (Non-Serviceable)
- Material Type . . . . . Stamped 2.5 mm (0.098 in.) Nominal Gauge Steel
- Cutting Blade . . . . . Two—76 x 5 x 496 mm (3 x 0.2 x 19.5 in.)
- Blade Cutting Edge . . . . . 30±5° Angle
- Blade Wing Lift/Height . . . . . 40±3 mm (1.57±0.12 in.)
- Overall Cutting Width . . . . . 965 mm (38 in.)
- Overall Width (w/o discharge chute) . . . . . 1026 mm (40.4 in.)
- Drive Type . . . . . Single V-Belt (With Spring Tension Idler)
- Spindle Lubrication . . . . . None—Sealed Bearings
- Lift Type . . . . . Manual—Operator's Station
- Cutting Settings . . . . . Seven: 31.8—89 mm (1.25—3.5 in.)

46-Inch Mower Deck—
- Type . . . . . Rotary—Triple Spindles (Non-Serviceable)
- Material Type . . . . . Stamped 2.5 mm (0.098 in.) Nominal Gauge Steel
- Cutting Blade . . . . . Three—50.8 x 5 x 407.4 mm (2 x 0.2 x 16 in.)
- Blade Cutting Edge . . . . . 30±5° Angle
- Blade Wing Lift/Height . . . . . 20.3±3 mm (0.8±0.12 in.)
- Overall Cutting Width . . . . . 1168.4 mm (46 in.)
- Overall Width (W/O Discharge Chute) . . . . . 1308 mm (51.5 in.)
- Drive Type . . . . . Single V-Belt (With Spring Tension Idler)
- Spindle Lubrication . . . . . None—Sealed Bearings
- Lift Type . . . . . Manual—Operator's Station
- Cutting Settings . . . . . Seven: 31.75 mm—89 mm (1.25—3.5 in.)

Chassis:
- Wheelbase . . . . . 1135 mm (44.69 in.)
- Overall Length . . . . . 1524 mm (60 in.)
- Overall Width (W/O Mower Deck) . . . . . 908 mm (35.75 in.)
- Height . . . . . 980 mm (38.6 in.)
- Average Overall Weight 38 inch (With Mower Deck, No Fuel) . . . . . 195.05 kg (430 lbs)

Average Overall Weight 46 inch (With Mower Deck, No Fuel) . . . . . 204.12 kg (450 lbs)
Hitch Capacity—
Export:
Horizontal Pull Maximum. . . . . .25 kg (56 lbs)
Tongue Weight Maximum . . . . . 6.8 kg (15 lbs)
Domestic:
Trailer Load Maximum. . . . . .136 kg (300 lbs)
Trailer Tongue Weight Maximum. . . . . 22.6 kg (50 lbs)

Steering:

Type . . . . . Manual—Pinion/Sector
Axle Pivot Hub. . . . . Shim Adjustable
Lubrication. . . . . .Multipurpose Grease
Lubrication Interval . . . . . 10 hrs (Maximum)
Toe-In . . . . . 6 mm (0.24 in.) — Non-Adjustable
Turning Radius . . . . . .584 mm (23 in.)

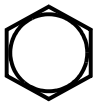
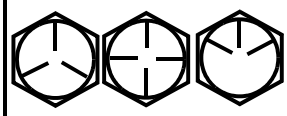
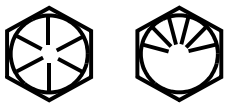
Wheels:

Size—
Front . . . . . .6.0 x 4.50
Rear. . . . . .8.0 x 6.18

Tires:

Size—
Front . . . . . 13 x 6.50—6 NHS (2 Ply)
Rear. . . . . 18 x 9.50—8 NHS (2 Ply)
Pressure—
Front (with mower deck) . . . . . 97 kPa (14 psi)
Rear (with mower deck) . . . . . 69 kPa (10 psi)

UNIFIED INCH TORQUE VALUES

SAE Grade and Head Markings	No Marks 1 or 2[b] 	5 5.1 5.2 	8 8.2 
SAE Grade and Nut Markings	No Marks 2 	5 	8 

Size	Grade 1				Grade 2[b]				Grade 5, 5.1 or 5.2				Grade 8 or 8.2			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
1/4	3.8	2.8	4.7	3.5	6	4.4	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.7	9.8	7.2	12	9	15.5	11.5	19.5	14.5	25	18.5	28	20.5	35	26
3/8	13.5	10	17.5	13	22	16	27.5	20	35	26	44	32.5	49	36	63	46
7/16	22	16	28	20.5	35	26	44	32.5	56	41	70	52	80	59	100	74
1/2	34	25	42	31	53	39	67	49	85	63	110	80	120	88	155	115
9/16	48	35.5	60	45	76	56	95	70	125	92	155	115	175	130	220	165
5/8	67	49	85	63	105	77	135	100	170	125	215	160	240	175	305	225
3/4	120	88	150	110	190	140	240	175	300	220	380	280	425	315	540	400
7/8	190	140	240	175	190	140	240	175	490	360	615	455	690	510	870	640
1	285	210	360	265	285	210	360	265	730	540	920	680	1030	760	1300	960
1-1/8	400	300	510	375	400	300	510	375	910	670	1150	850	1450	1075	1850	1350
1-1/4	570	420	725	535	570	420	725	535	1280	945	1630	1200	2050	1500	2600	1920
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2140	1580	2700	2000	3400	2500
1-1/2	990	730	1250	930	990	730	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

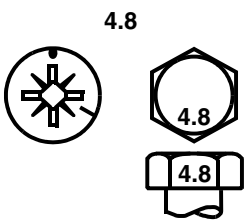
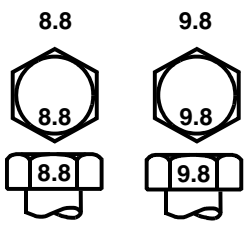
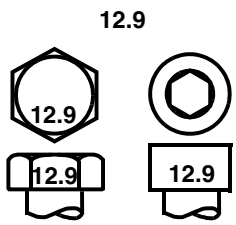
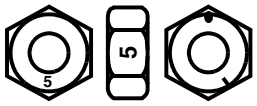
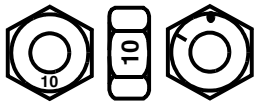
Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head.

Tighten toothed or serrated-type lock nuts to the full torque value.

[a] *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.*

[b] *Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6 in.) long. Grade 1 applies for hex cap screws over 152 mm (6 in.) long, and for all other types of bolts and screws of any length.*

METRIC TORQUE VALUES

Property Class and Head Markings	4.8 	8.8 9.8 	10.9 	12.9 
Property Class and Nut Markings	5 	10 	10 	12 

Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
M6	4.7	3.5	6	4.4	9	6.6	11.5	8.5	13	9.5	16.5	12.5	15.5	11.5	19.5	14.5
M8	11.5	8.5	14.5	10.7	22	16	28	20.5	32	23.5	40	29.5	37	27.5	47	35
M10	23	17	29	21	43	32	55	40	63	46	80	59	75	55	95	70
M12	40	29.5	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	46	80	59	120	88	150	110	175	130	220	165	205	150	260	190
M16	100	74	125	92	190	140	240	175	275	200	350	225	320	235	400	300
M18	135	100	175	125	265	195	330	245	375	275	475	350	440	325	560	410
M20	190	140	245	180	375	275	475	350	530	390	675	500	625	460	790	580
M22	265	195	330	245	510	375	650	480	725	535	920	680	850	625	108	800
M24	330	245	425	315	650	480	820	600	920	680	115	850	108	800	135	100
M27	490	360	625	460	950	700	1200	885	1350	1000	1700	1250	1580	1160	200	1500
M30	660	490	850	625	1290	950	1630	1200	1850	1350	2300	1700	2140	1700	2700	2000
M33	900	665	1150	850	1750	1300	2200	1625	2500	1850	3150	2325	2900	2150	3700	2730
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2770	4750	3500

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class.

Fasteners should be replaced with the same or higher property class. If higher property class fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

[a] *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.*

GASOLINE SPECIFICATIONS

CAUTION

Handle fuel with care, it is highly flammable. DO NOT refuel machine:

- **Indoors. Always fill fuel tank outdoors.**
- **While you smoke.**
- **When machine is near and open flame or sparks.**
- **When engine is running. STOP engine.**
- **When engine is hot. Allow it to cool.**

Help prevent fires:

- **Fill fuel tank only to bottom of filler neck.**
- **Clean oil, grease and dirt from machine.**
- **Clean up spilled fuel immediately.**
- **Do not store machine with fuel in tank in a building where fumes may reach an open flame or spark.**

To prevent fire and explosion caused by static electric discharge while you fill tank:

- **Use approved, non-metal fuel container.**
- **When using a funnel, MAKE SURE it is PLASTIC.**
- **Avoid using a funnel which has a metal screen or filter.**

IMPORTANT: To avoid engine damage:

- DO NOT mix oil with gasoline
- Use only clean oil and fuel
- Use clean approved containers and funnels.
- Store oil and fuel in an area protected from dust, moisture and other contamination.

Unleaded fuel is recommended because it burns cleaner and leaves less unburned deposits in engine combustion chamber. Regular unleaded gasoline with an anti-knock index of 85 octane or higher may be used. Use of gasohol is acceptable as long as the ethyl alcohol blend does not exceed 11 percent. Do not use gasoline that contains Methanol.

Fill fuel tank at end of each day's operation. Fill only to bottom of filler neck.

GASOLINE STORAGE

Keep fuel in a clean container in a protected area. Do not use deicers to remove water from fuel. Do not depend on fuel filters to remove water.

If possible, install a water separator at the storage tank outlet.

IMPORTANT: Keep all dirt, scale, water or other foreign material out of fuel.

If mower is stored for the winter, add gasoline storage stabilizer to the fuel. Follow directions on can.

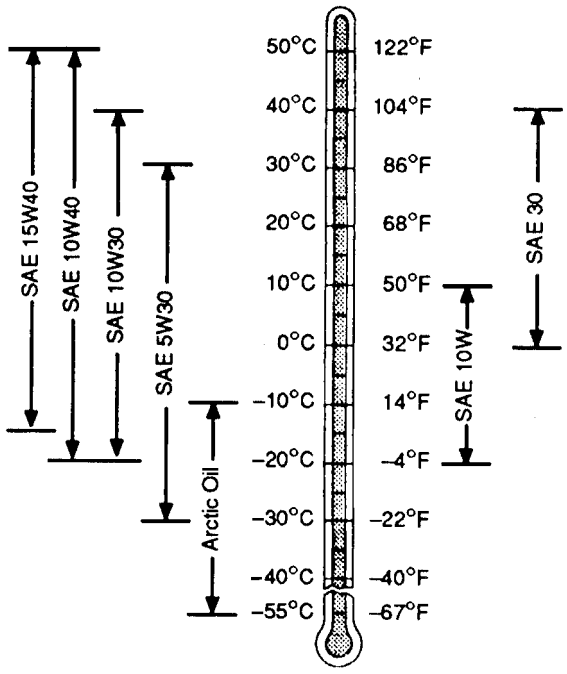
LUBRICANT SPECIFICATIONS

ENGINE OIL

Use oil viscosity based on the expected air temperature range during the period between oil changes.

The following oil is preferred:

- 10W30



Other oils may be used if they meet one of the following:

- API Service Classification SG
- API Service Classification SF
- CCMC Specification G4

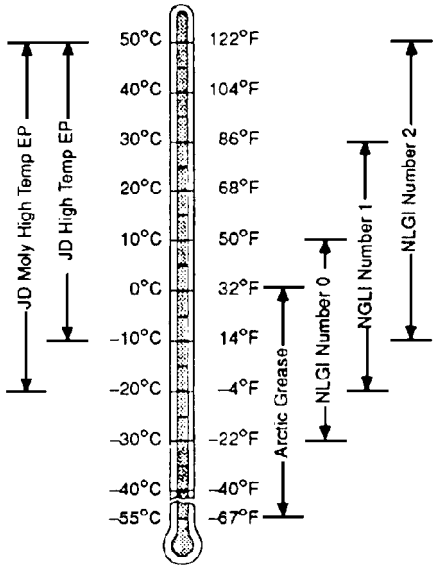
Oils meeting Military Specification MIL-L-46167B may be used as arctic oils.

GREASE

Use grease based on the expected air temperature range during the service interval.

The following greases are preferred:

- MOLY HIGH TEMPERATURE EP GREASE
- HIGH TEMPERATURE EP GREASE
- MULTI-PURPOSE GREASE



Other greases may be used if they meet one of the following:

- SAE Multipurpose EP Grease with a maximum of 5% molybdenum disulfide.
- SAE Multipurpose EP Grease

Greases meeting Military Specification MIL-G-10924F may be used as arctic grease.

ALTERNATIVE LUBRICANTS

Conditions in certain geographical areas outside the United States and Canada may require different lubricant recommendations than these printed in this manual or the operator's manual. Consult with your John Deere Dealer, or Sales Branch to obtain the alternative lubricant recommendations.

SYNTHETIC LUBRICANTS

Synthetic lubricants may be used in John Deere equipment if they meet the applicable performance requirements (industry classification and/or military specification) as shown in this group.

The recommended temperature limits and service or oil change intervals should be maintained as shown in the operator's manual.

Avoid mixing different brands, grades, or types of oil. Oil manufacturers blend additive in their oils to meet certain specifications and performance requirements. Mixing different oils can interfere with the proper functioning of these additives and degrade lubricant performance.

OIL FILTERS

Filtration of oils is critical to proper lubrication. Always change filters regularly.

Use filters meeting John Deere performance specification.

LUBRICANT STORAGE

This machine can operate at top efficiency only if clean lubricants are used.

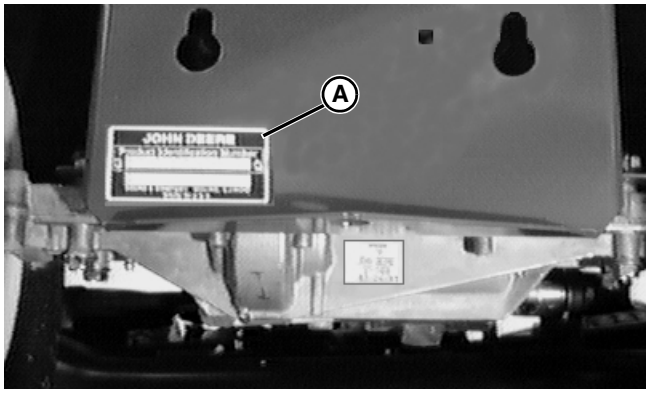
Use clean containers to handle all lubricants. Store them in an area protected from dust, moisture, and other contamination. Store drums on their sides.

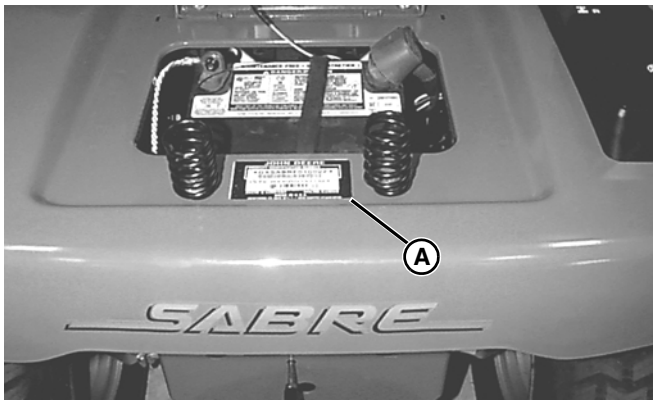
SERIAL NUMBER LOCATIONS

When working on machines or components that are covered by warranty, it is IMPORTANT that you include the tractor identification number and the component serial numbers on the warranty claim form.

The location of tractor identification number and component serial numbers are shown below.

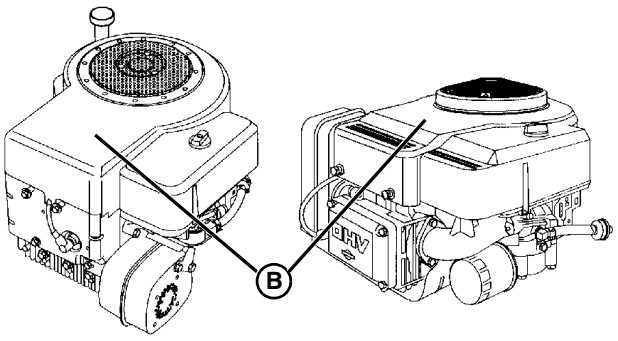
TRACTOR IDENTIFICATION NUMBER





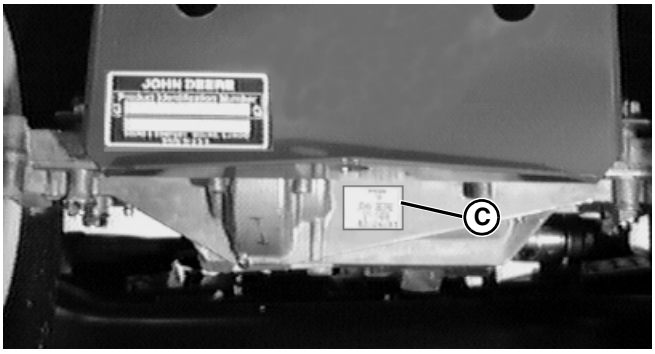
Tractor identification number plate (A) is located on the rear of frame or under seat.

ENGINE SERIAL NUMBER



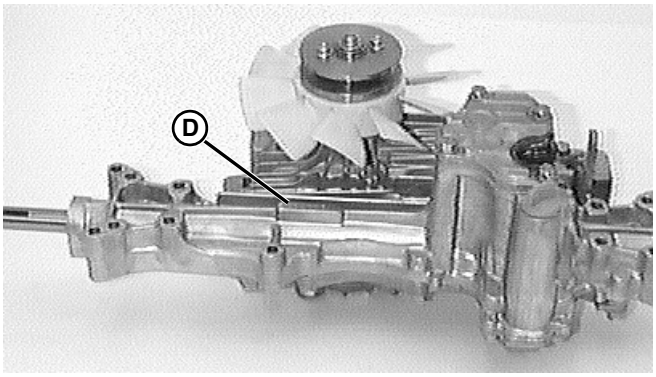
Tractor engine serial number sticker (B) is located on fan shroud.

GEAR TRANSAXLE SERIAL NUMBER



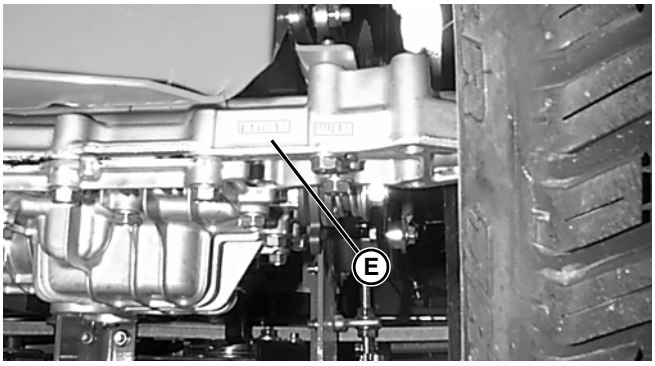
Gear transaxle serial number sticker (C) is on rear of housing.

HYDROSTATIC TRANSMISSION SERIAL NUMBER — K55



Serial number (D) is stamped into top of upper case half. It is only accessible with hydro removed.

HYDROSTATIC TRANSMISSION SERIAL NUMBER — K51



Serial number (E) is located on a bar coded label located on the right rear side of the transaxle.

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ENGINE

The engines used on Sabre products are warranted by the manufacturer - Briggs & Stratton Corporation.

Please refer to the Owners Manual supplied with your machine for applicable Briggs & Stratton Owners Warranty Policy.

SPECIFICATIONS

NOTE: Engine service specifications and procedures are available from your local Briggs & Stratton dealer or by writing:

BRIGGS & STRATTON CORPORATION
Milwaukee, WI. 53201

For Parts Request:

13HP . . . . . .Illustrated Parts List Diamond Plus Model Series 28M700 to 28M799
15HP . . . . . Illustrated Parts List Diamond Plus Model Series 28N700 to 28N788
16HP . . . . . Illustrated Parts List Vanguard Model Series 28Q700 to 28Q799

For Repair Manual Request:

13 Horsepower. . . . . REPAIR MANUAL For Single Cylinder 4-Cycle Engines
15 Horsepower. . . . . REPAIR MANUAL For Single Cylinder 4-Cycle Engines
16 Horsepower. . . . . REPAIR MANUAL For Single Cylinder 4-Cycle Engines

SERVICE EQUIPMENT AND TOOLS

Please refer to appropriate Briggs & Stratton Repair Manual, see above, for specific tools required to service the particular engine in your mower.

OTHER MATERIALS

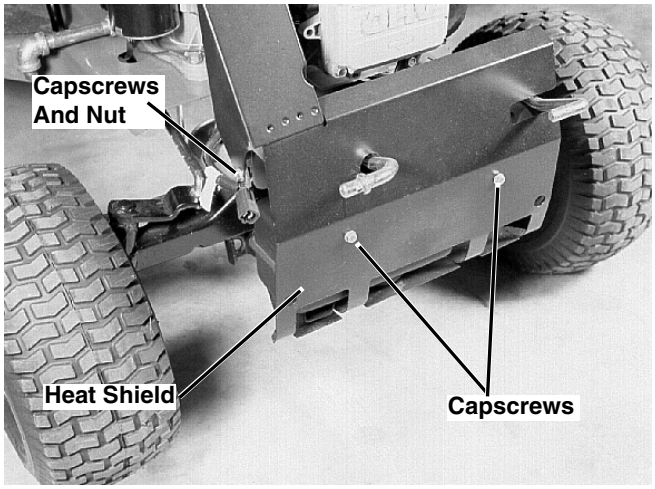
Name	Use
RTV Silicone Sealant	Seal valve cover.
Prussian Blue Compound	Check valve seat contact.
Valve Lap Compound	Lap valves.
SCOTCH-BRITE® Pad	Clean cylinder head.
Zinc Oxide/Wood Alcohol	Check block for cracks.

SCOTCH-BRITE® is a trademark of the 3M Company.

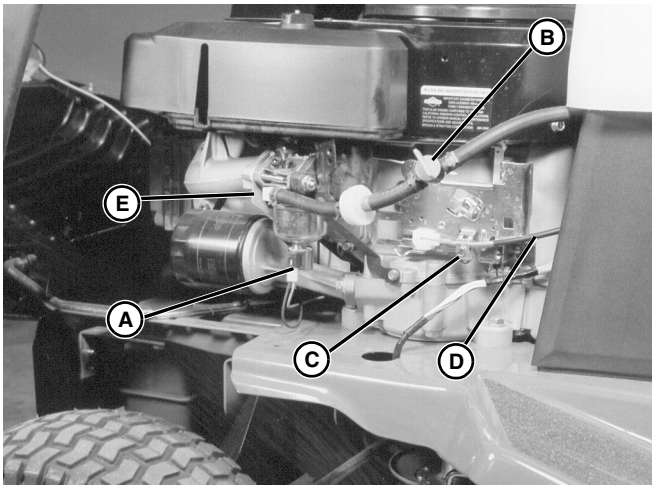
REPAIR

ENGINE REMOVAL

1. Turn all switches OFF and disconnect battery negative (-) cable.
2. Raise hood. Disconnect light harness on right side of hood. Lower hood to approximately 3/4 open and slide off bracket.



3. Remove two capscrews securing heat shield to frame. Remove capscrew and nut on side of heat shield. Remove heat shield.

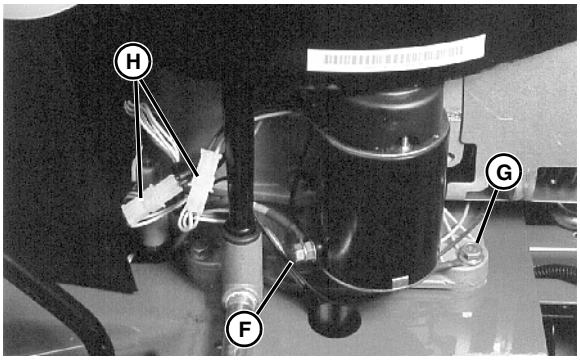


4. Disconnect fuel shutoff solenoid wire (A)(16 horsepower only).
5. Turn fuel shutoff valve (B) (early models only) to OFF position or pinch closed fuel hose to carburetor.
6. Loosen clamp (C) to disconnect throttle cable (D).

CAUTION

Gasoline is explosive. Do not expose to flame or spark. Serious injury can result. Store in a properly marked, safe container. Wipe-up any spills IMMEDIATELY.

7. Disconnect hose clamp (E) and slide fuel line off of hose barb on carburetor.

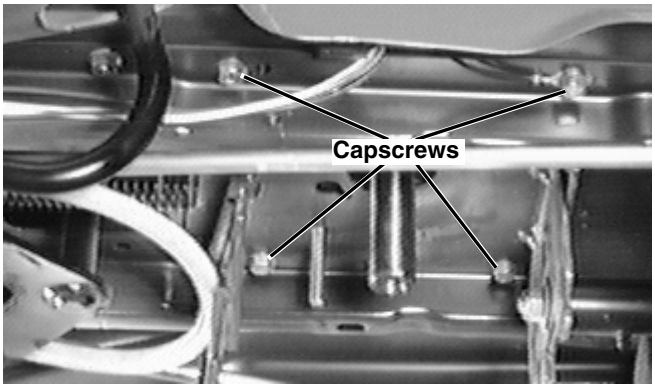


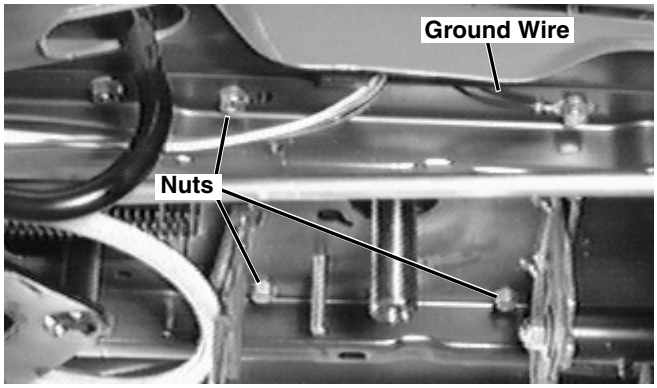
8. Disconnect wires from starter terminal (F).

NOTE: Ground terminal (G) will be disconnected when engine mounting bolt is removed.

9. Disconnect two (2) harness connectors (H).

10. Remove traction drive belt and mower drive belt.
11. Remove capscrew securing pulley assembly to engine output shaft. Remove pulley assembly.

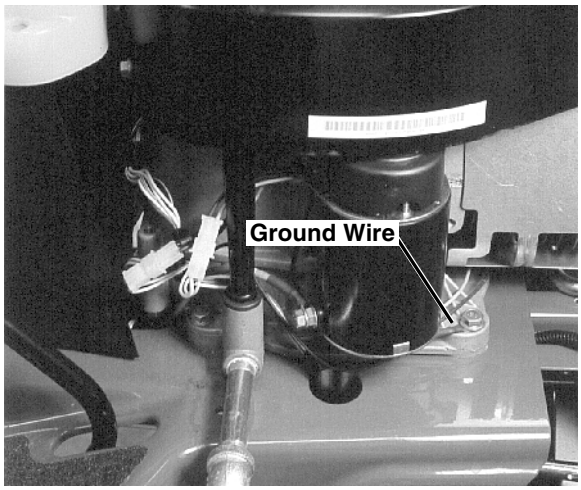




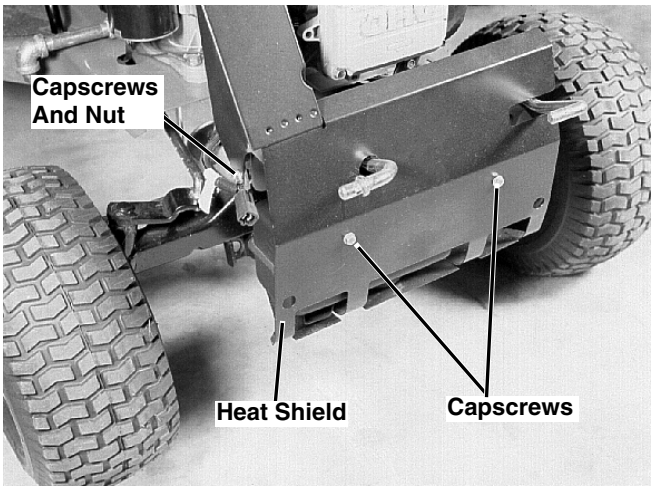
12. Remove four cap screws. Remove engine.

ENGINE INSTALLATION

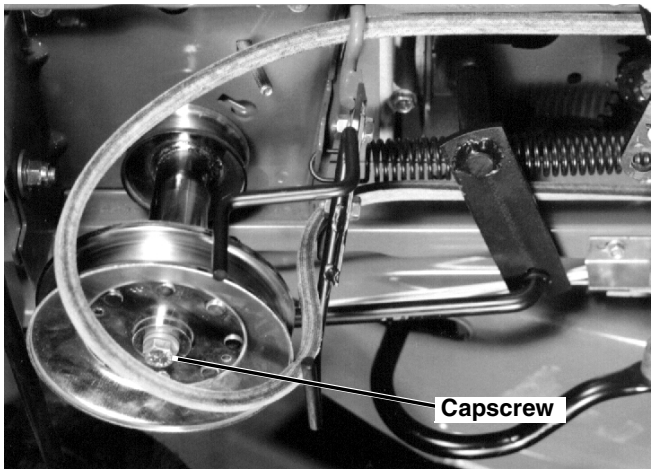
1. Install engine in mower frame.



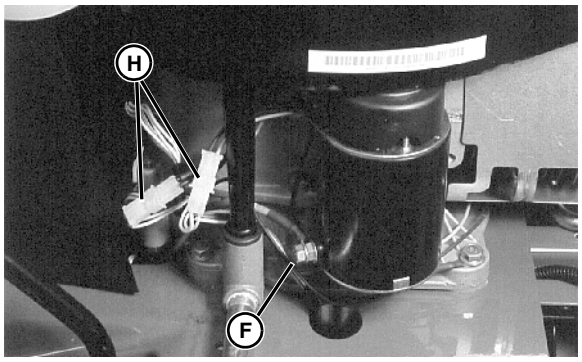
2. Put ground lead connector on top of front right hand engine mounting flange, and insert capscrew through connector, engine, and frame.
3. Install lower engine ground connector on capscrew installed in step 2, and secure with washer and nut.
4. Install other three capscrews, washers, and nuts. Torque to **32 N•m (24 lb-ft).**
5. If muffler was removed inspect muffler flange for flatness. Install muffler with new gasket. Torque mounting bolts to **24•m (18 lb-ft).**



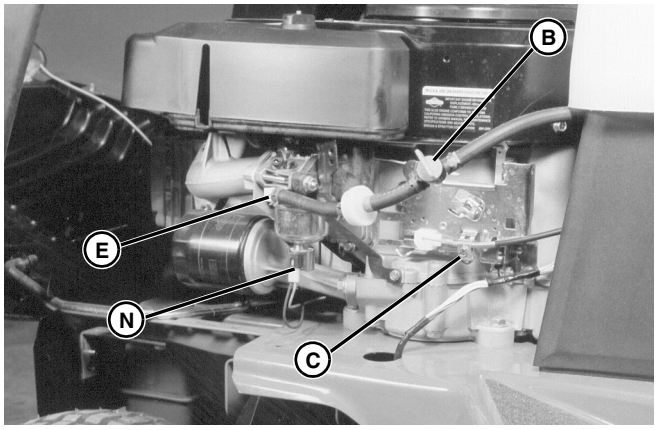
6. Install heat shield. Secure with two capscrews to front frame mounting brackets. Install capscrew and nut on side of heat shield.



7. Install engine output shaft key and pulley assembly. Secure with washer, lock washer and capscrew. Torque to **75 N•m (55 lb-ft).**

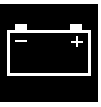


8. Connect wires to starter terminal (F).
9. Connect two (2) harness connectors (H).



10. Connect and adjust throttle cable (C) to obtain full throttle and choke when lever is full forward, and idle when lever is rearward.
11. Connect fuel solenoid wire (N) (16 horsepower only), and fuel line and clamp (E).
12. Open fuel shutoff valve (B) (early models only), or remove clamp from fuel line.

CONTENTS



SPECIFICATIONS

Battery:

Voltage	12
BCI group	U-1
Cold Cranking Amps at 0°C (32°F)	190 amps
Reserve Capacity At 0°C (32°F)	230 amps
Specific Gravity (Minimum)	1.225 points
Electrolyte Quantity (Approximate)	1.9 L (2.0 qt)

Ignition:

Primary Coil Resistance	
One direction	5 - 1000 Ohms
Other Direction (Minimum)	30 K Ohms
Secondary (Plug Wire And Core)	7.9 - 10.85 K Ohms
Air gap	0.2 - 0.3 mm (0.008 - 0.012 in.)

Spark Plug:

Type:	
13 HP	TY6129 (Champion RJ-19 LM)
15 and 16 HP	M78543 (Champion RC-12 YC)
Gap	0.76 mm (0.030 in.)
Torque	25 N•m (221 lb-in.)

Starter:

Starter Type	Bendix Inertia Drive
Amp draw	
Loaded (Engaging Engine)	180 amps at 225 engine rpm

Stator:

Stator size	15 amp
Unregulated Output At 3600 Rpm (No Lamps Attached):	
AC	14 volts AC
DC	2–4 amps DC

Headlight Bulbs:

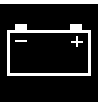
Headlight Bulbs	Type 1073, 12 Volt, 23 Watt

THEORY OF OPERATION

GENERAL INFORMATION

The theory of operation stories divide the electrical system into individual circuits by function. Each circuit is isolated from the main wiring schematic and only shows the components that are used in it. The story contains information on function, operating conditions, and theory of operation. The circuit schematics are drawn with the components in the operating position, with the power, or battery positive, into them across the top and the ground, or battery negative, across the bottom.

DIAGNOSTIC INFORMATION



The diagnostic procedures is used to test the complete circuit regardless of the problem or complaint. Select a symptom or system from the quick check or troubleshooting chart and follow the test procedures under that heading.

The diagnostic procedure lists:

- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

When performing the test or check, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The middle **"NORMAL"** column gives the reading or condition that should be obtained when performing the test or check. If the results of the test or check are not normal, perform the test, check, or adjustment listed in the third **"IF NOT NORMAL"** column to repair the malfunction. The detailed tests or adjustments referred to in the **"IF NOT NORMAL"** column are located at the end of that group. The system diagram that accompanies each test procedure is drawn to resemble machine components. The key number on the art matches the number in the **"TEST LOCATION"** column and the leader line points to the exact point the test is to be made.

READING SCHEMATICS

The schematic is made up of individual circuits laid out in a sequence of related functions. Current flow is generally from top to bottom through each circuit and component. All components are shown in the OFF position. The diagram does not list connector information unless needed to avoid confusion.

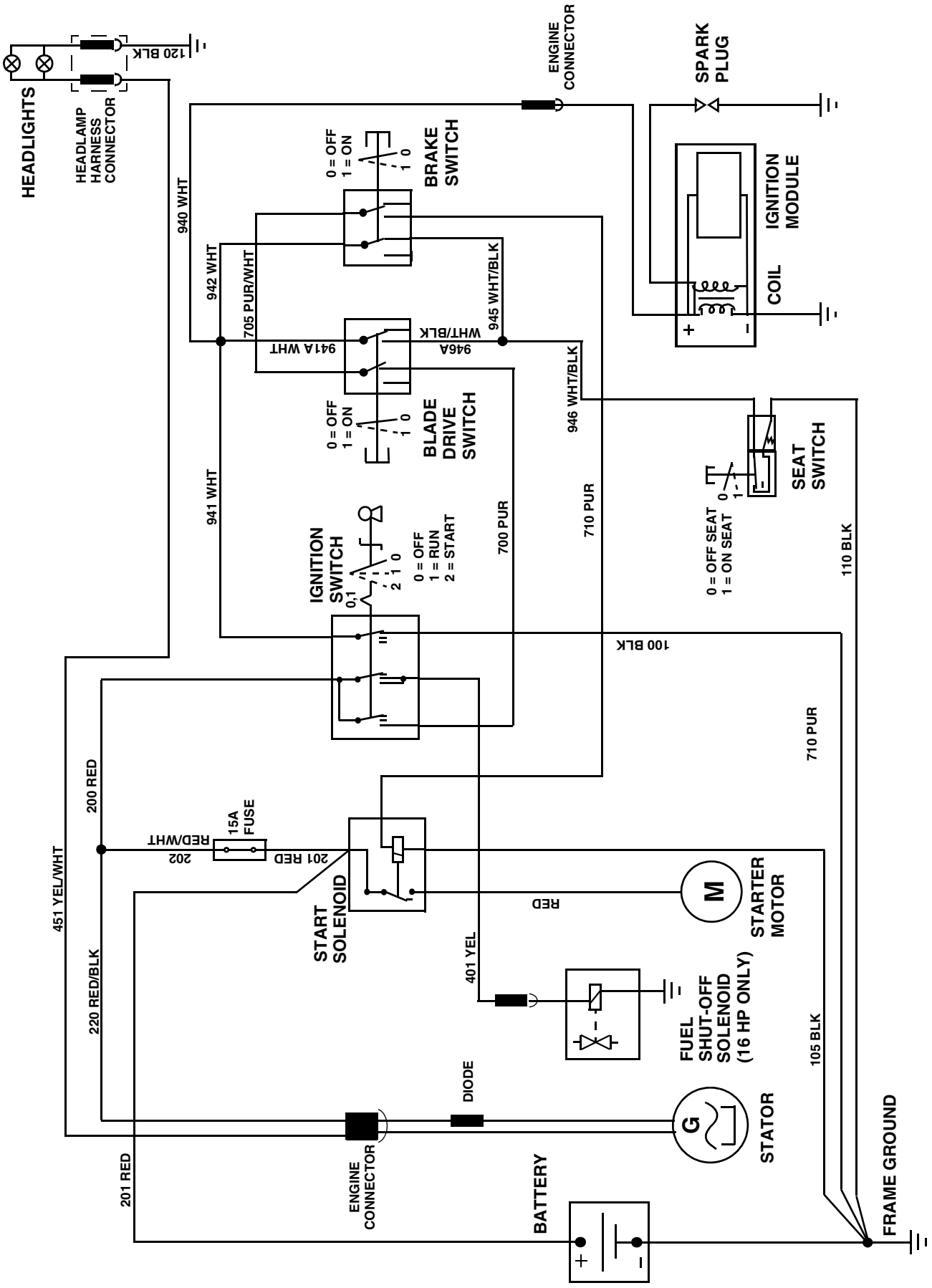
Each component is shown by a symbol and name. The identification code contains a device identifying letter and number.

The circuit number and wire color of the wires are shown directly next to the wire path.

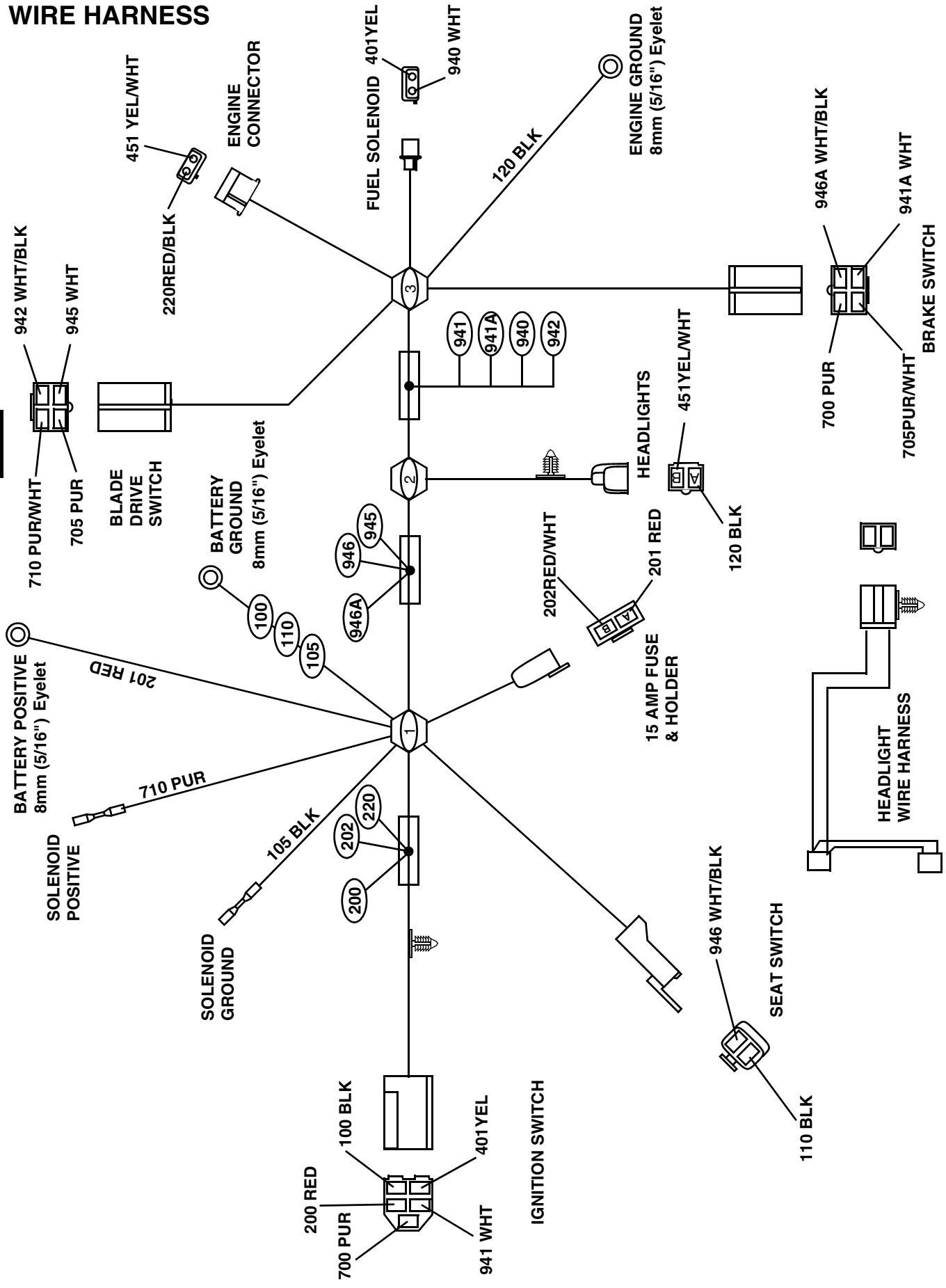
WIRE COLOR ABBREVIATION CHART

Blk	Black
Blu	Blue
Brn	Brown
Grn	Green
Gry	Gray
Org	Orange
Pnk	Pink
Pur	Purple
Red	Red
Tan	Tan
Wht	White
Yel	Yellow
Blk/Wht	Black/White
Blu/Wht	Blue/White
Brn/Wht	Brown/White
Brn/Yel	Brown/Yellow
Dk Blu	Dark Blue
Dk Brn/Lt Grn	Dark Brown/Light Green
Dk Brn/Red	Dark Brown/Red
Dk Brn/Yel	Dark Brown/Yellow
Dk Grn	Dark Green
Lt Blue	Light Blue
Lt Grn	Light Green
Org/Wht	Orange/White
Pnk/Blk	Pink/Black
Pur/Wht	Purple/White
Red/Blk	Red/Black
Red/Wht	Red/White
Wht/Blk	White/Black
Wht/Red	White/Red
Yel/Blk	Yellow/Black
Yel/Red	Yellow/Red
Yel/Wht	Yellow/White

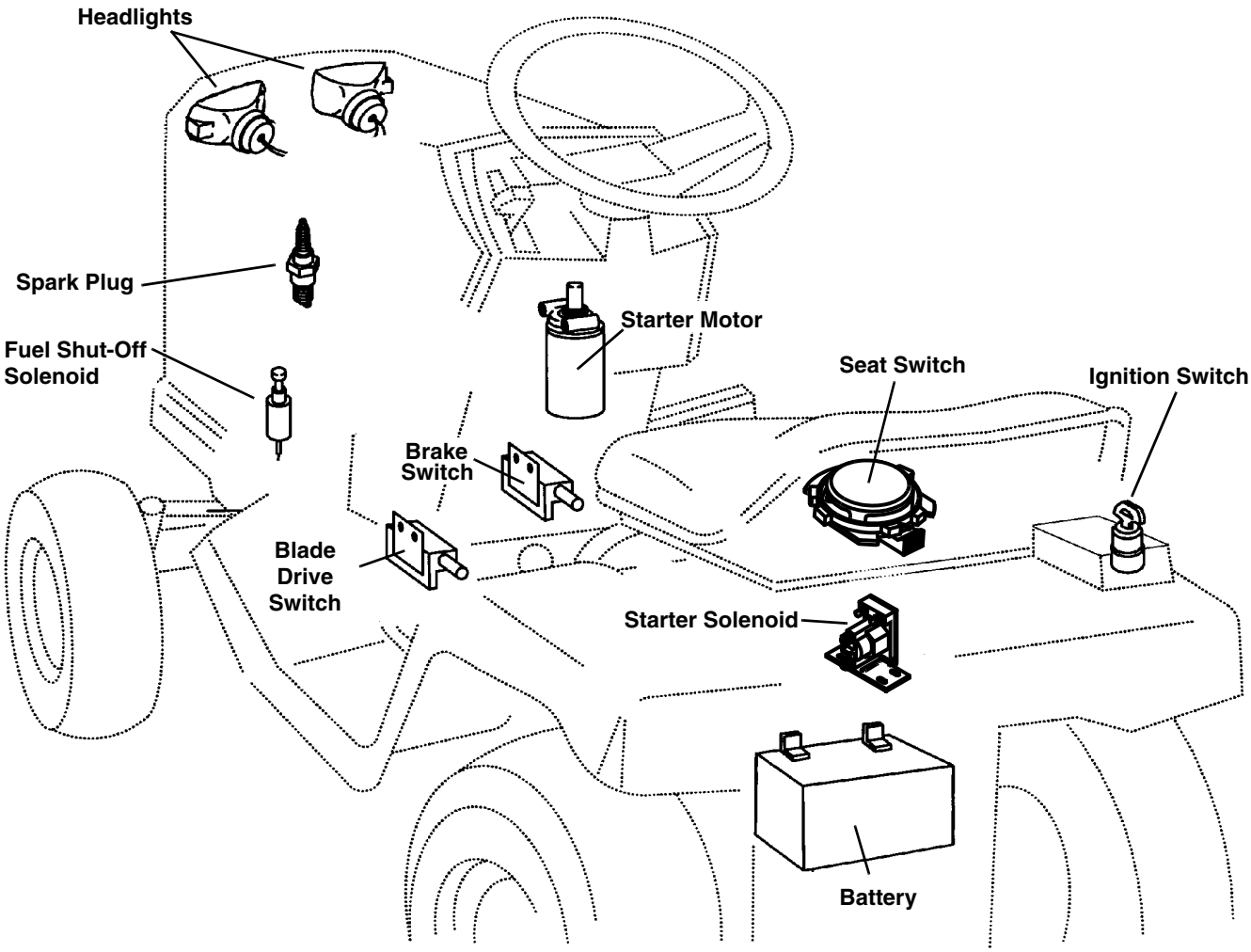
ELECTRICAL SCHEMATIC



WIRE HARNESS



COMPONENT LOCATION



TROUBLESHOOTING

Problem or Symptom / Check or Solution	Engine will not crank.	Engine cranks—will not start.	Engine starts hard or will not stay running.	Engine misses or runs rough.	Weak or no spark.	Engine will not shut off.	Battery goes dead, discharges or overcharges.	Headlights do not light or will not shut off.	Fuel shut-off solenoid will not open (16 hp only)	Fuel shut-off solenoid will not close (16 hp only)	Engine dies when brake lever is released.	Engine dies when blade lever is engaged.
See Cranking Circuit Diagnosis	●						●		●	●		
See Ground Circuit Tests	●	●		●	●	●	●	●	●		●	●
Test battery and connections.	●						●	●	●			
See Ignition Circuit Tests		●	●	●	●	●					●	●
See Charging Circuit Tests	●		●				●	●				
See Starter Solenoid Test	●											
See Seat Switch Tests		●	●								●	●
See headlight circuit test points.								●				
See fuel shut-off solenoid circuit test points (16 hp only)		●	●						●	●		
Check for short circuit.	●	●	●		●	●	●	●	●	●	●	●
Check for high resistance or open circuit.	●	●	●		●	●	●	●	●	●	●	●
Check for correct spark plug and spark plug gap.		●	●	●	●							
Check strength of flywheel ignition module magnet and/or flywheel stator magnets.		●	●	●	●		●					
See fuel and air system tests and adjustments.		●	●	●								
Check for stator shorted to ground					●		●					
Check seat switch connector is plugged in and interlock spring inside connector is good											●	●

DIAGNOSTICS

CRANKING & FUEL SHUTOFF SOLENOID CIRCUIT OPERATION

Function:

The cranking system is used to energize the starting motor.

Operating Conditions:

In order to crank the engine; the blade drive lever must be disengaged (blade switch plunger depressed), the brake pedal must be depressed (brake switch plunger depressed), and the ignition switch must be in the start position. The operator does not have to be on the seat to crank the engine if the above conditions are met.

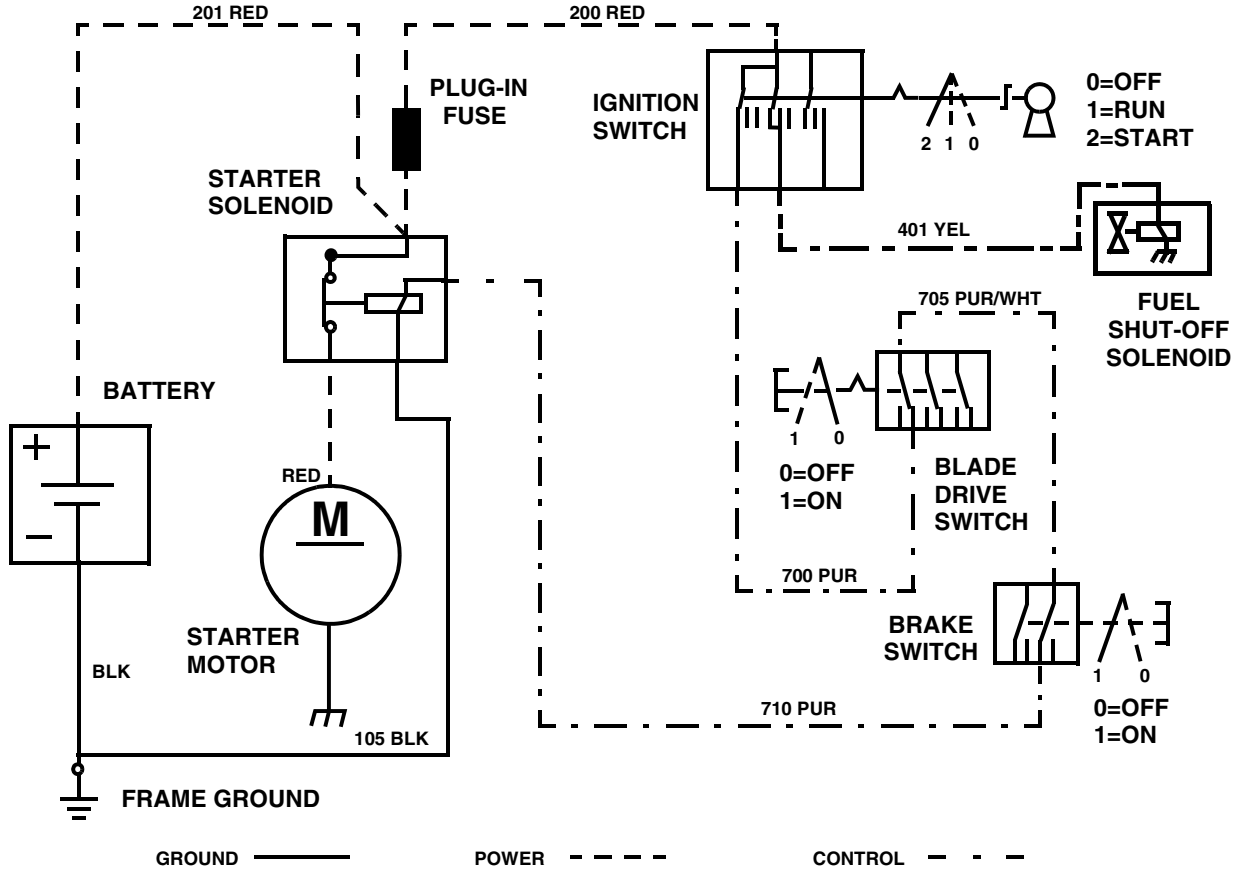
Theory of Operation:

The starting motor has a separate starter solenoid, located under the operator's seat. Current flows from the battery positive terminal to the starter solenoid secondary terminal, plug in fuse, and ignition switch.
With the ignition switch in the start position, current flows from the ignition switch, to the blade drive switch, brake switch, and to the starter solenoid primary terminal, energizing the pull-in windings of the solenoid and engaging the starter.

The 16 HP fuel shut-off solenoid is also energized by the ignition switch and allows fuel to flow to the carburetor.

The blade drive switch is located under the left side of the mower frame, at the end of the blade drive lever shaft. It is used to prevent the engine from cranking if the blade drive is engaged. With the blade drive lever disengaged, (blade drive switch plunger depressed), current flows through the 705 Pur/Wht wire to the brake switch.

The brake switch is located under the right side of the mower frame, in front of the brake pedal bell crank. When the park brake is engaged, the bell crank depresses the brake switch plunger and the switch is closed, energizing the starter solenoid primary coil.
The starter solenoid plunger is pulled in by the primary coil, closing the secondary terminals and supplying high battery current to the starter motor. The spinning of the starter motor extends the starter bendix drive into the engine flywheel, turning over the engine until the ignition circuit fires.
Once the engine starts, the operator releases the ignition switch to run position. The current flow to the starter solenoid primary coil is stopped, releasing the starter solenoid plunger, and cutting off the high battery current to the starter motor.



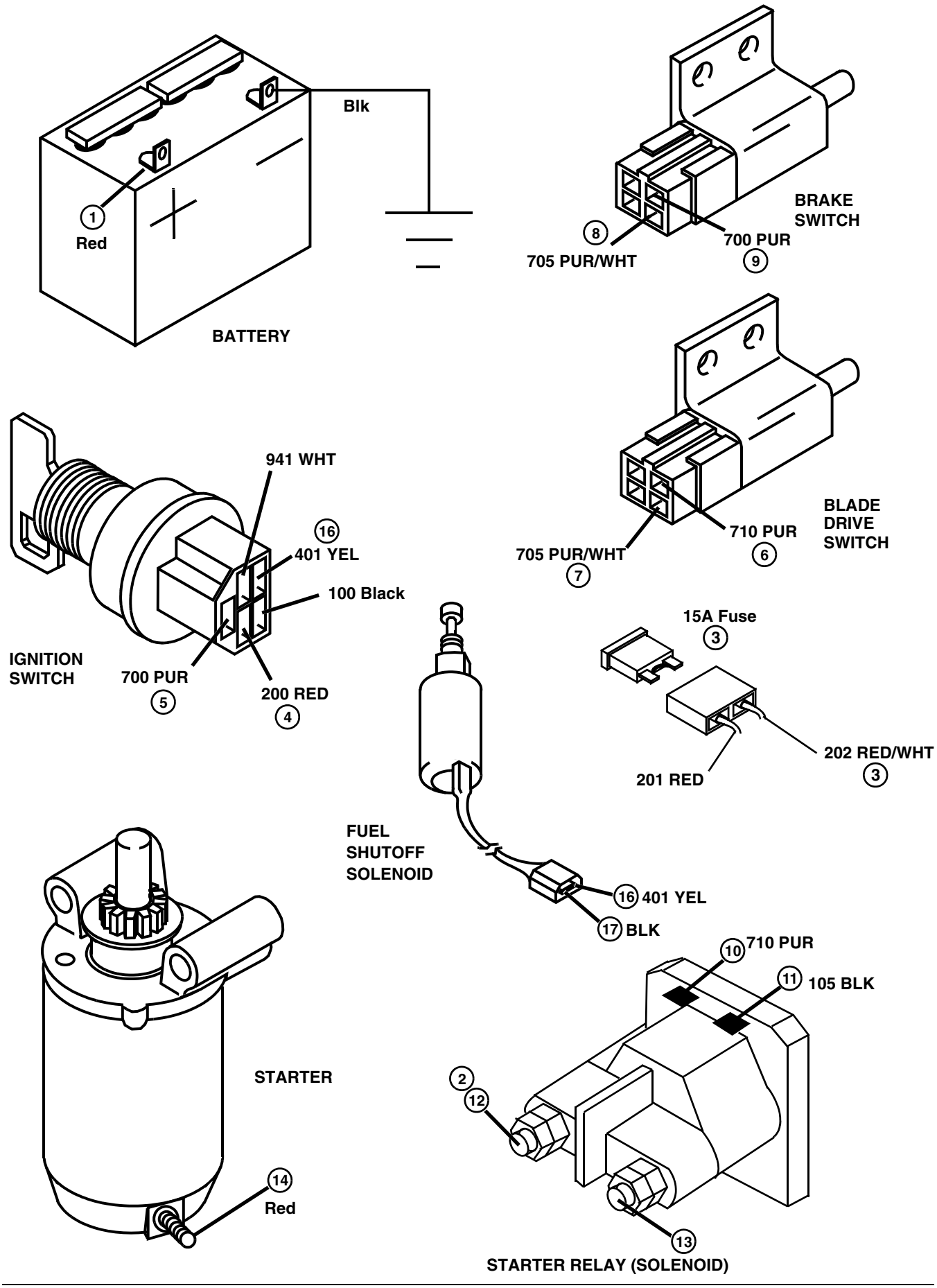
CRANKING & FUEL SHUTOFF SOLENOID CIRCUIT DIAGNOSIS

Test Conditions:	• Meter negative (—) lead on battery negative (—) terminal
• Ignition switch in OFF position	• Meter positive (+) lead on numbered test point

Test/Check Point	Normal	If Not Normal
1. Battery positive terminal	11.8-13.2 volts	Test battery
2. Starter solenoid front cable terminal	Battery voltage	Check positive battery cable
3. Plug in fuse under operator's seat	Battery voltage	Check fuse and red/wht ignition wires
4. Ignition switch terminal red wire	Battery voltage	Check red ignition wires
Test Conditions:	• Blade Drive OFF • Park brake engaged	• Transmission in neutral • Ignition switch in START position

NOTE: Perform the tests below one at a time, allowing the starter to cool between tests. Do not allow the starter to crank for more that 15 seconds, and allow 30 seconds for starter windings to cool. If starter mechanism is not turning, windings may still be conducting current and heating up. Disconnect starter cable from starter (and isolate cable terminal) if cranking circuit or fuel shutoff solenoid (and not starter) is being tested.

Test/Check Point	Normal	If Not Normal
5. Ignition switch terminal purple wire	Battery voltage	Replace ignition switch
6. Blade Drive Switch purple wire	Battery voltage	Test purple wire back to ignition switch
7. Blade Drive Switch purple/white wire	Battery voltage	Check Blade Drive Switch and lever
8. Park brake switch purple/white wire	Battery voltage	Test purple/white wire back to blade switch
9. Park brake switch purple wire	Battery voltage	Check park brake switch and lever
10. Starter solenoid purple wire	Battery voltage	Test purple wire back to park brake switch
11. Starter solenoid ground terminal (black wire)	Greater than 0 volts Less than 0.2 volts	Greater than 0.2 volts - check starter solenoid ground circuit black wire. 0 volts - replace solenoid
12. Starter solenoid battery terminal (red wire, rear terminal)	Battery voltage	Clean terminals at battery and solenoid Test red battery wire for shorts or breaks.
13. Starter solenoid starter terminal (red wire, front terminal)	Battery voltage	Clean battery terminals. Replace starter solenoid
14. Starting motor	Battery voltage	Clean battery terminals. Check red wire back to solenoid. Test starter (see engine manual)
Fuel Shutoff Solenoid Test: (16 hp only)	**(Ignition Switch In Start Position)**	
15. Ignition switch yellow wire	Battery voltage	Replace ignition switch
16. Fuel shut-off solenoid yellow wire	Battery voltage	Check yellow wire back to ignition switch
17. Fuel shut-off solenoid black wire	Greater than 0 volts Less than 0.2 volts	Greater than 0.2 volts: check engine ground 0 volts: replace fuel shut-off solenoid



IGNITION & SEAT SWITCH CIRCUIT OPERATION

Function:

To create a spark that ignites the fuel/air mixture in the engine. The ignition coil and module will produce a spark at the spark plug unless the ignition & seat switch circuit of the tractor chassis wiring acts to ground the coil primary and stop the engine.

This circuit is used as a safety interlock to prevent the engine from starting, or to stop the engine while running, if the operator attempts to use unsafe actions. This circuit is independent of the cranking circuit, but shares some components.

Operating Conditions:

To produce a spark the following conditions must be met:

- The ignition switch must be in the start or run position.
- The blade drive lever must be disengaged (back) if the operator is off the operator's seat.
- The park brake switch must be engaged (brake applied) if the operator is off the operator's seat.

Once the engine is running, the operator must be ON the seat to release the brake pedal, or engage the Blade Drive, or the ignition module will be grounded and the engine will stop.

Theory of Operation:

The ignition system is an electronic magneto design. Ignition timing is controlled by the ignition module and is NOT ADJUSTABLE.

Battery current is always present at ignition switch terminal "B". When the fuel shut-off solenoid (16 Horsepower engine only) is installed, it becomes energized when the ignition switch is in either START or RUN position, via ignition switch terminal "A", unseating the plunger and allowing fuel flow into the venturi of the carburetor. When the ignition switch is turned OFF, current flow is broken and internal spring force closes the solenoid plunger, stopping fuel flow.

As the electric starter turns the flywheel, a magnet in the flywheel produces current in the primary coil of the ignition module by electromagnetic induction. When the primary current builds to its highest level, the ignition module induces high voltage current into the secondary coil. This high voltage current then flows to the spark plug and jumps the spark plug gap and creates a spark that ignites the fuel/air mixture, causing the engine to start and run.

The ignition module will stop producing current to the spark plug if the 940 White wire from the coil is allowed to ground to the mower chassis. The engine is shut off by grounding the ignition module in one of two ways:

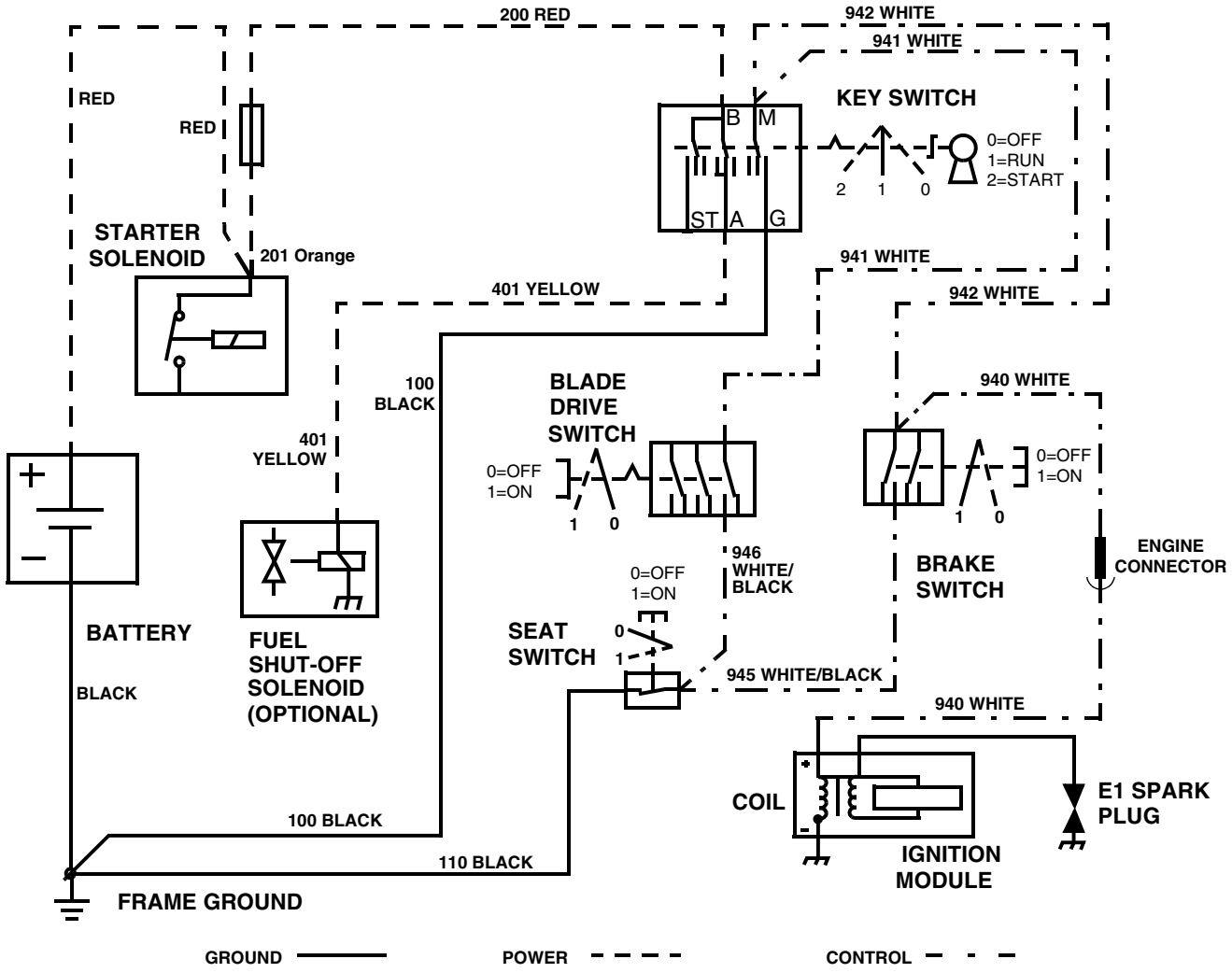
1. Through the ignition switch when key is moved to OFF position.
2. Through the brake switch, or blade drive switch, if the operator tries to get OFF the seat with the blade drive ENGAGED or the park brake NOT ENGAGED.

When the brake pedal is RELEASED, the brake switch creates a path for the ignition module to the seat switch. When the operator is OFF the seat, the seat switch (normally closed) completes the path to ground for the ignition module current, preventing high current induction into the secondary coil which prevents the spark plug from firing, killing the engine.

The blade drive switch is in parallel with the blade switch, and will also ground the ignition module when the blade drive is engaged with no operator on the machine, killing the engine.

The blade drive and brake switches are also used to prevent the engine from cranking if the blade drive lever is ENGAGED or park Brake is NOT ENGAGED when ignition switch is moved to START. (See Cranking Circuit Operation Section)

The operator's seat switch has an interlock built into it's connector which prevents the mower from being used with the seat switch disconnected. An internal spring will short the two cavity connectors together when disconnected from the seat switch. This has the effect of grounding the ignition module when the blade drive lever is engaged or the brake pedal is released, stalling the engine.



IGNITION CIRCUIT TEST POINTS

When diagnosing an ignition problem, isolate magneto circuit from ground circuit by separating engine connector. If engine will not start check magneto circuit first and then check ground circuit. If engine will not shut off, check ground circuit. Remember engine is stopped by grounding ignition coil through either key switch, seat switch or the brake switch and PTO switch.

Test Conditions:		
• Ignition switch in run position	• Park Brake engaged	• Blade Drive Lever disengaged
• Meter positive (+) lead on numbered test point	• Meter negative (—) lead on engine ground	• Engine connector disconnected

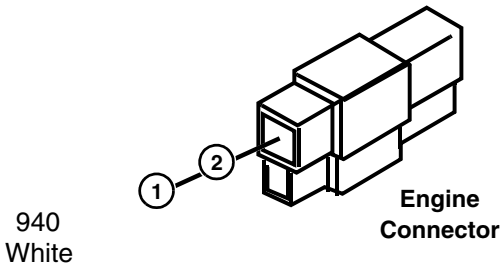
Test/Check Point	**Normal**	**If Not Normal**
1. Engine connector 940 white wire (wiring harness side of connector)	Infinite resistance	Check that blade drive switch plunger is being fully depressed by blade drive lever
	Infinite resistance	Check that brake switch is being fully depressed by brake arm
	Infinite resistance	Check for shorted 940, 941, 942, white wires to chassis
	Infinite resistance	Check for faulty ignition switch (internal short)

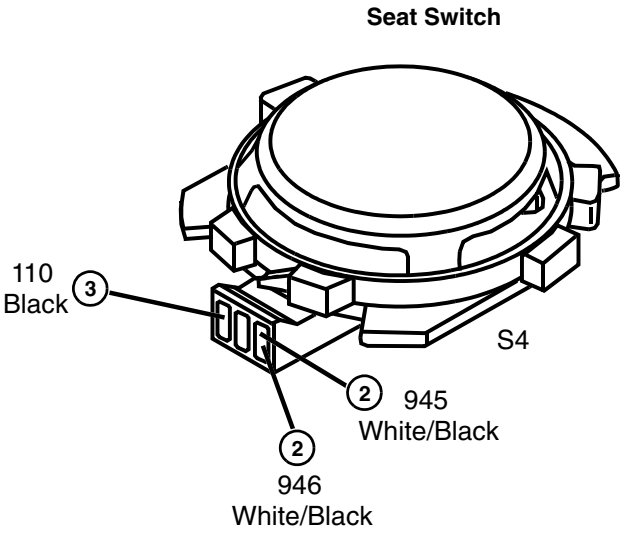
Test Conditions:	
• Park brake disengaged	• Seat switch depressed

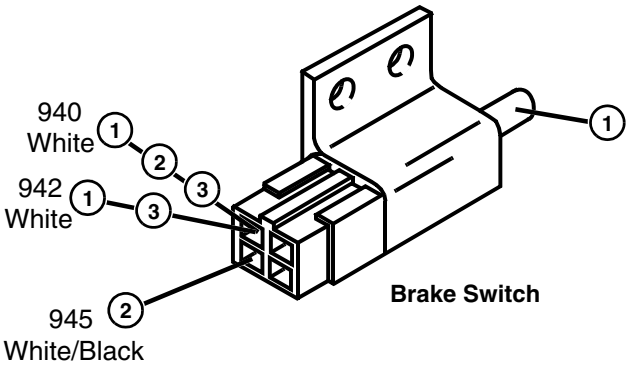
Test/Check Point	**Normal**	**If Not Normal**
2. Engine connector 940 white wire	Infinite resistance	Check for shorted 945/946 white/ black wires
		Check for faulty seat switch

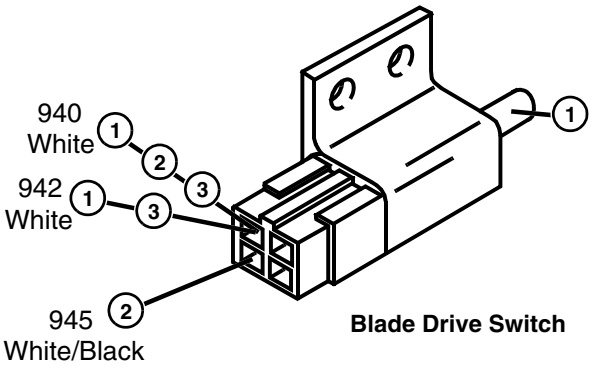
Test Conditions:		
• Key switch in off position	• Seat switch released	• Brake switch released

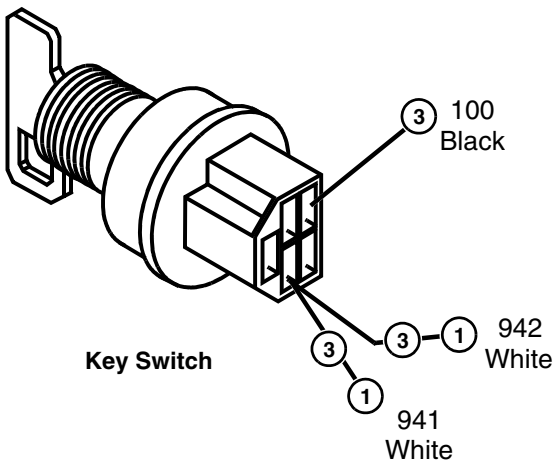
Test/Check Point	**Normal**	**If Not Normal**
3. Engine connector 940 white wire	Maximum 0.1 ohms	Check for open 940/941/942 white wires
		Check for open 100/110 black wires











CHARGING & HEADLIGHT CIRCUIT OPERATION

Function:

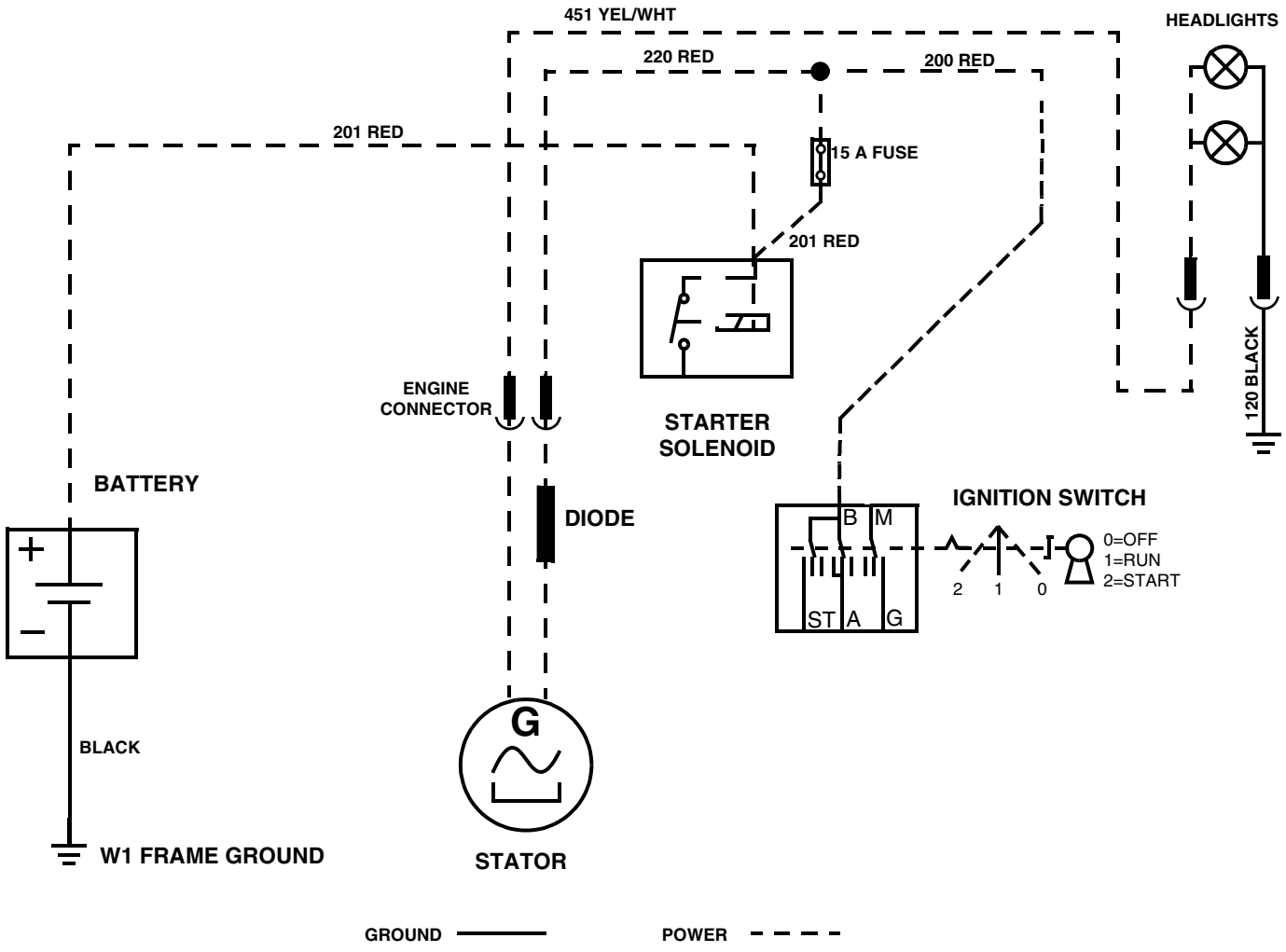
To maintain battery voltage between 11.8 and 13.2.

Operating Conditions:

The engine must be running for the charging system to operate. Headlights are on only when the engine is running.

Theory of Operation:

The charging system is of the permanent magnet and stator design. Magnets imbedded into the crankshaft flywheel pass a multi-pole stator mounted under the flywheel, inducing alternating current into the stator coils. Alternating current is routed to the headlamp bulbs anytime the engine is running through the 451 Yel/Wht wire. One half of the stator output current is rectified by an in-line diode in the 220 Red/Blk circuit, and used to charge the battery. Charging output is unregulated.



CHARGING CIRCUIT DIAGNOSIS

Test Conditions:

• Brake engaged, blade drive lever disengaged	• Engine running at fast idle (3600 rpm)
• Engine connector disconnected	• Meter negative (–) lead on battery negative (–) terminal
• Ignition switch in run position	• Meter positive (+) lead on numbered test point

NOTE: Be sure to set multimeter to read AC or DC voltage or amperage as test requires:

Test/Check Point	Normal	If Not Normal
1. Engine connector 451 Yel/Blk wire	Unregulated voltage 14 VAC	See Briggs & Stratton engine manual for charging system repair
2. Engine connector 220 Red/Blk wire	2–4 Amps DC	See Briggs & Stratton engine manual for charging system repair
3. Headlamps	Remain on with engine running	Go to step 4
4. Headlamp connector 451 Yel/ Wht connector at engine cover	11.8-13.2 DC voltage Check headlamp bulbs	See Briggs & Stratton engine manual for charging system repair

Test Conditions:

• Meter negative (—) lead grounded to engine frame	• Stop engine
• Meter positive (+) lead on numbered test point	• Disconnect engine connector

Test/Check Point	Normal	If Not Normal
5. Engine connector wires: Red Wire Black wire	Infinite resistance from wire to ground Infinite resistance from wire to wire	Check stator for short to ground Check stator for internal short See Briggs & Stratton manual

Test Conditions:

• Reconnect engine connector	• Start engine	• Multimeter negative to ground

Test/Check Point		
6. Plug in fuse	11.8-13.2 DC volts (both sides of fuse)	Check 220 Red/Blk circuit
7. Red wire at ignition switch	11.8-13.2 DC volts	Check 220 Red circuit
8. Battery positive terminal	11.8-13.2 DC volts	Check 201 Red Battery Positive lead and terminal connector

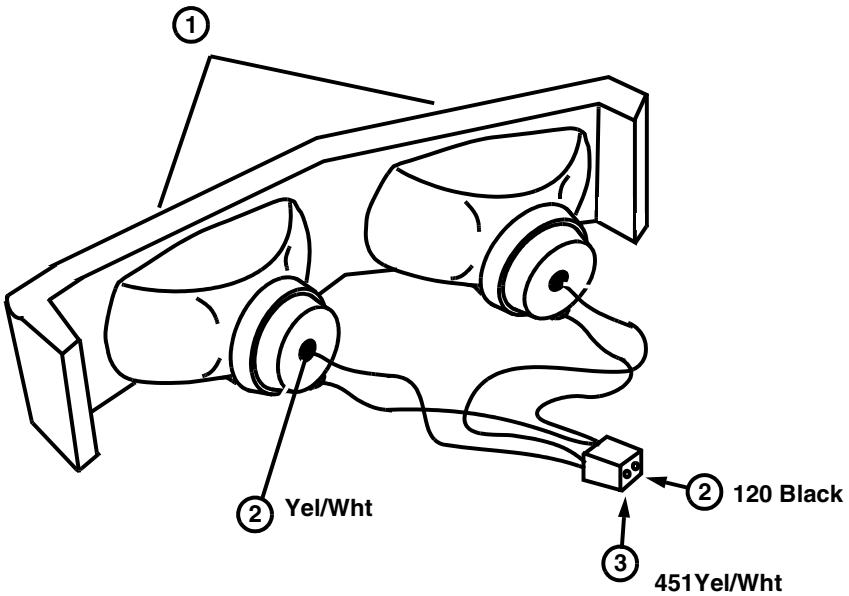
HEADLIGHTS CIRCUIT DIAGNOSIS

Test Conditions:

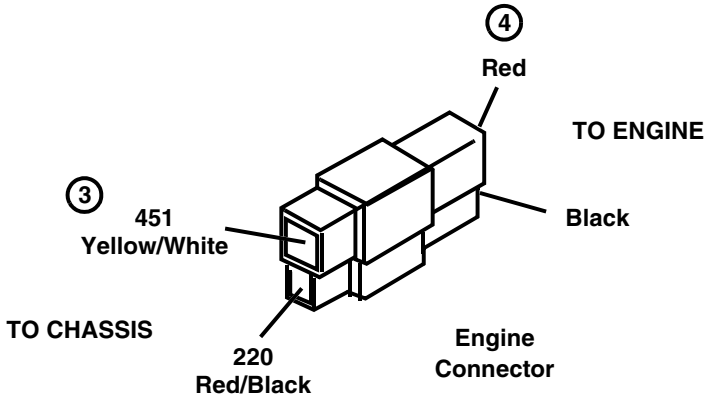
• Park brake engaged, blade drive disengaged	• Engine running at fast idle
• Meter negative (—) lead on battery negative (—) terminal	• Meter positive (+) lead on numbered test point

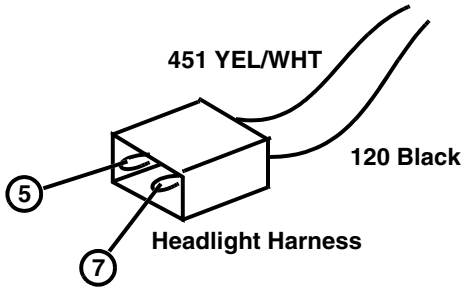
NOTE: But sure to set multi-meter to measure AC or DC voltage or amperage as required by test:

Test/Check Point	Normal	If Not Normal
1. Headlamps	Bulbs are lit whenever engine is running	Check for burned out bulbs
2. Yellow/White wire at headlamp socket connector	12—14 Volts AC. Test ground circuit	Go to step 3
3. Yellow/White wire at connector at engine cover hinge.	12—14 Volts AC. Replace headlamp harness under engine cover	Go to step 4
Test Conditions:		
• Stop engine		
Test/Check Point		
4. Remove engine connector and test for voltage at Red wire from engine. See Charging Circuit Diagnosis Section in this manual	12—14 Volts AC	See Briggs & Stratton engine manual for service and repair



Headlight Harness





TESTS AND ADJUSTMENTS

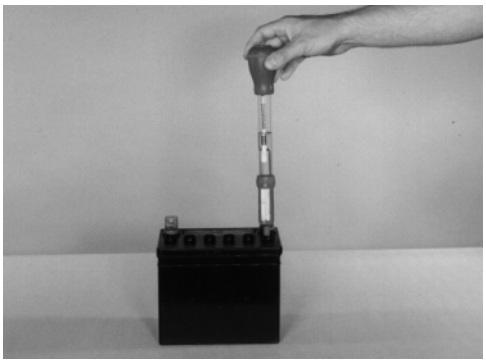
BATTERY TEST

Reason:

To check condition of battery and determine battery voltage.

Equipment:

- Hydrometer
- Voltmeter or Battery Tester



Procedure:

1. Clean battery terminals and top of battery.
2. Inspect battery terminals and case for breakage or cracks.
3. Check electrolyte level in each battery cell. Add clean, soft water as needed. If water was added, charge battery for 20 minutes at 10 amps.
4. Remove surface charge by placing a small load on the battery for 15 seconds.
5. Check specific gravity of each cell with a hydrometer.
6. Check battery voltage with voltmeter or Battery Tester.

Specifications:

Minimum specific gravity
. . . . . 1.225 with less than 50 point variation
Minimum battery voltage. . . . . 12.4 volts

Results:

- Battery voltage less than 12.4 VDC, charge battery.
- Battery voltage more than 12.4 VDC, test specific gravity.
- All cells less than 1.175, charge battery at 10 amp rate.
- All cells less than 1.225 with less than 50 point variation, charge battery at 10 amp rate.
- All cells more than 1.225 with less than 50 point variation, load test battery.
- More than 50 point variation: replace battery.

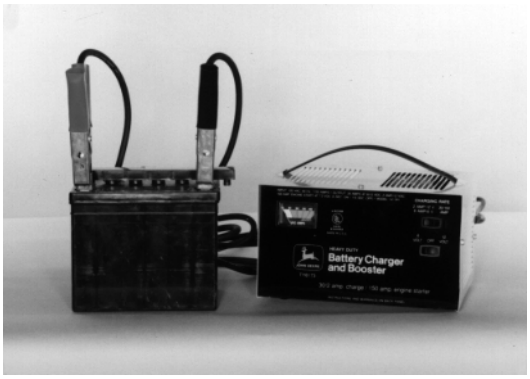
CHARGE BATTERY

Reason:

To increase battery charge after battery has been discharged.

Equipment:

- Battery charger (variable rate)



Procedure:

NOTE: See BATTERY TEST in this group before charging battery.

1. Connect variable rate charger to battery.

NOTE: Maximum charge time at boost setting is 10 minutes. Allow additional 5 minutes for each 10 degrees below 70 degrees F.

2. Start charger at slow rate. Increase charge rate one setting at a time. Check charger ammeter after 1 minute at each setting. Maintain 10 amp charge rate. Use boost setting as necessary.
3. Check if battery is accepting a 10 amp charge after 10 minutes at boost setting.

Battery will not accept 10 amp charge after 10 minutes at boost setting: replace battery.

Battery is accepting 10 amp charge after 10 minutes at boost setting, and battery did not need water: go to steps 6 and 7.

Battery is accepting 10 amp charge after 10 minutes at boost setting, but battery did need water or all cells were below 1.175: go to steps 4 and 5.

4. Set charger at 15-25 amps.

IMPORTANT: Decrease charge rate if battery gases or bubbles excessively or becomes too warm to touch.

5. Check specific gravity after 30 minutes (60 minutes for maintenance-free battery).

More than 50 point variation between cells: replace battery.

Less than 50 point variation between cells: go to steps 6 and 7.

NOTE: If battery was discharged at slow or unknown rate, charge at 10–15 amps for 6–12 hours. (Maintenance-free battery: 12–24 hours.)

If battery was discharged at fast rate, charge at 20–25 amps for 2–4 hours. (Maintenance-free battery: 4–8 hours.)

6. Continue charging battery until specific gravity is 1.230-1.265 points.
7. Load test battery.

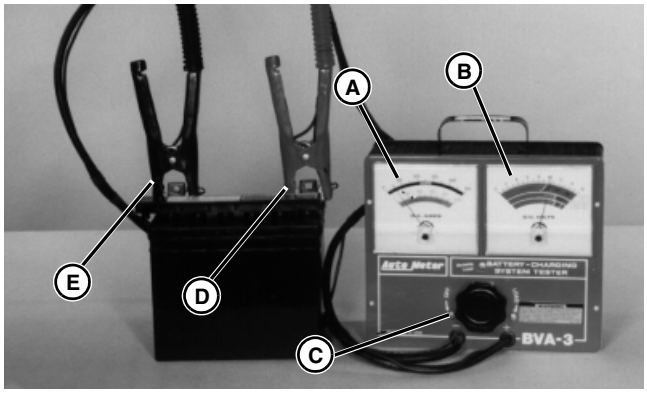
BATTERY LOAD TEST

Reason:

To check condition of battery under load.

Equipment:

- Battery Tester



Connections:

1. Turn load knob (C) of tester counter-clockwise to off.
2. Connect tester positive cable (D) to battery positive terminal.
3. Connect tester negative cable (E) to battery negative terminal.

Procedure:

1. Turn load knob of tester clockwise until amperage reading (A) is equal to:

a.Cold cranking amperage rating (use blue scale).

— OR —

b.Three times ampere hour rating (use black scale).

2. Hold for 15 seconds and turn load knob of tester off.
3. Repeat procedure steps 1 and 2 from above and read condition of battery at DC Volts scale (B).

Results:

- If the battery does not pass the test and has not been charged, charge battery and retest.
- If the battery does not pass the test and has been charged, replace the battery.

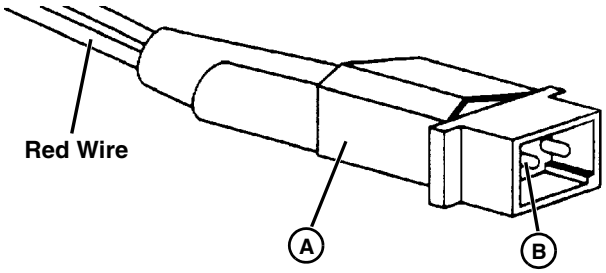
DC AMPERAGE OUTPUT TEST

Reason:

To determine direct current amperage output of the engine.

Equipment:

- Multimeter



Connections:

1. Remove surface charge from battery by cranking engine for 15 seconds.
2. Set multimeter to read DC amperage
3. Disconnect engine connector (A).
4. Connect red multimeter red lead to red wire from engine connector at terminal (B).
5. Connect black multimeter lead to chassis ground.

Procedure:

1. Start and run engine at 3600 rpm while watching multimeter.

Specifications:

DC Amperage (Max). . . . . 2 Amps

Results:

- If engine fails to produce DC amperage, see the Briggs & Stratton service manual for repair information.

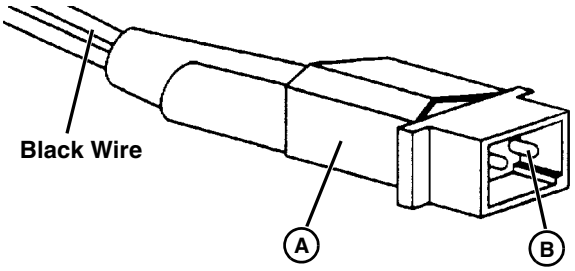
AC VOLTAGE OUTPUT TEST

Reason:

To measure engine alternating current voltage output to determine stator condition.

Equipment:

- Multimeter



Connections:

1. Disconnect engine connector (A).
2. Set multimeter to read AC voltage.
3. Connect red multimeter lead to black wire from engine connector at terminal (B).
4. Connect black multimeter lead to chassis ground.

Procedure:

1. Start and run engine at 3600 rpm while watching multimeter.

Specifications:

AC Voltage Output (3600 rpm): . . . . . .14 Volts

Results:

- If reading is less than specifications, see Briggs & Stratton service manual for electrical system repair.

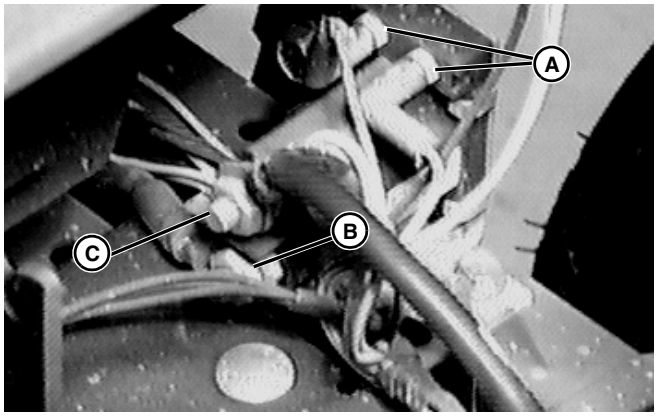
STARTER SOLENOID TEST

Reason:

To determine if starter solenoid or starter is defective.

Equipment:

- Jumper wire



Connections:

1. Put transaxle in neutral. Move key switch to off position.
2. Engage park brake.
3. Disconnect and ground spark plug lead.
4. Disconnect purple wire from small starter solenoid engagement terminals (A).

Procedure:

1. Connect jumper wire to positive battery terminal and briefly jump to bare small starter solenoid engagement terminal (A).

Results:

- Starter runs: solenoid is good, check circuit wiring.
- Starter does not run: go to step 2.

2. Connect jumper wire between starter solenoid large terminals (B and C).

Results:

- Starter runs: Replace solenoid.
- Starter does not run: Check battery cables then replace starter.

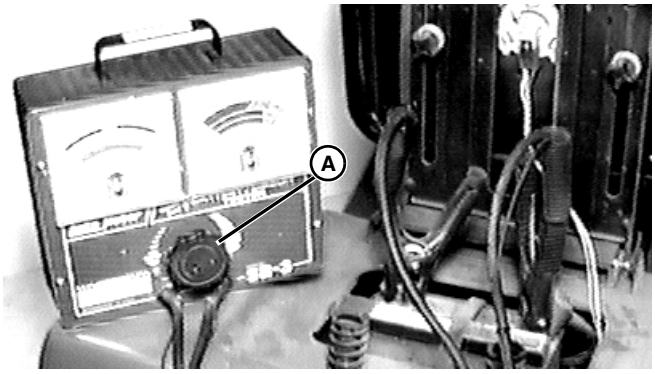
STARTER AMP DRAW TEST

Reason:

To determine the amperage required to crank the engine and check starter motor operation under load.

Equipment:

- Battery Tester
- Photo Tachometer



Connections:

1. Put transaxle in neutral. Engage park brake.
2. Test system ground connections and battery.
3. Turn knob (A) of tester counter-clockwise to off.
4. Connect red clamp of battery tester to positive terminal of battery and black clamp of tester to negative terminal of battery.
5. Install tachometer reflective tape on flywheel screen.
6. Remove spark plug high tension lead and ground to engine.

Procedure:

1. Crank engine and read voltage on DC voltage scale of battery tester and check engine rpm.
2. Turn key switch to off position.

IMPORTANT: Perform the following procedure within 15 seconds to prevent electrical damage to components.

3. Turn knob of battery tester clockwise until the DC voltage is the same as when cranking.
4. Read DC amperage on battery tester.
5. Turn load knob fully counterclockwise.

Specifications:

Maximum starter amp draw
. . . . . .180 amps at 225 rpm

Results:

- If amperage is above specification, or rpm is low, check starter for binding or damaged.
- If starter is good, check internal engine, traction or PTO drive for binding or damage.

SEAT SWITCH TEST

Reason:

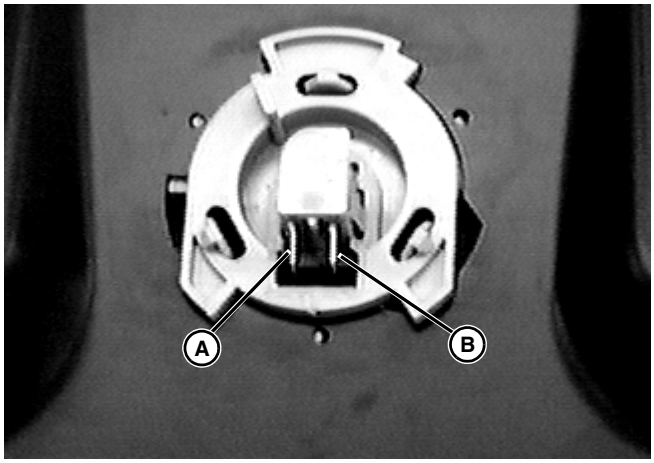
To ensure proper operation of seat switch.

Equipment:

- Ohmmeter

Procedure:

1. Park machine on level surface and turn key switch OFF.
2. Shift lever in NEUTRAL and park brake LOCKED.
3. Disconnect harness connector from seat switch.



4. Check continuity across switch terminals (A) and (B).

Results:

- There should BE continuity between terminals (A and B) when seat is RELEASED,
- There should NOT BE continuity between terminals (A and B) when plunger is DEPRESSED.
- If continuity is NOT correct, replace switch.

NOTE: The seat switch connector has an interlock spring which shorts the 3 wires together when removed from seat switch terminals. Check that spring mechanism is releasing properly when center tab is depressed.

BRAKE SWITCH / BLADE DRIVE SWITCH TEST

Reason:

To make sure the brake pedal switch and blade drive switch operate properly.

Equipment:

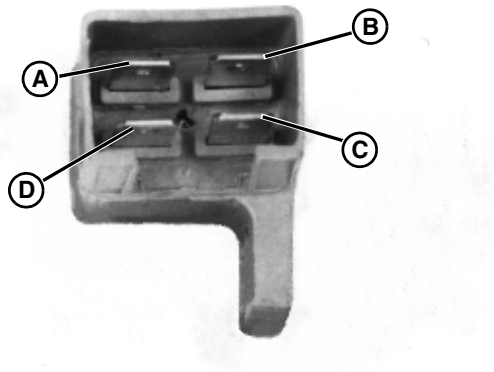
- Ohmmeter

Procedure:

1. Park machine on level surface and turn ignition switch OFF.
2. Shift lever in NEUTRAL and park brake LOCKED.
3. Blade drive DISENGAGED.
4. Locate switch being tested as follows:

   Brake switch is located under right side frame at brake pedal bellcrank.

   Blade drive switch is located under left side frame at bottom of blade drive lever actuating arm.
5. Disconnect harness connector from switch being tested.



6. Check continuity as follows using terminals shown above.

- there should BE continuity between terminals (B and C) when plunger is RELEASED,
- there should NOT BE continuity between terminals (B and C) when plunger is DEPRESSED.
- there should NOT BE continuity between terminals (A and D) when plunger is RELEASED,
- there should BE continuity between terminals (A and D) when plunger is DEPRESSED.

Results:

- If continuity is NOT correct, replace switch.

BRAKE SWITCH ADJUSTMENT

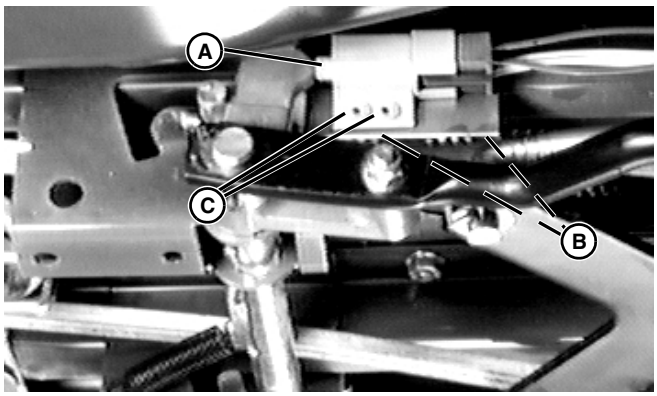
Reason:

To ensure proper that engine starts only when brake fully applied.

Procedure:

1. Depress brake pedal and set park brake.

.



2. Check condition of both mounting rivets (C). If not tight, damaged, or improperly installed, they could affect adjustment and function of start and safety circuits. If rivets are bad, go to Step 3; if rivets are good, go to Step 4.
3. Disconnect harness connector and remove switch assembly to bench vise. Remove rivets, as necessary, using a 4.76 mm (3/16 in.) drill bit and replace with 4.75 x 14.61 mm (0.187 x 0.575 in.) aluminum pop rivets (M67899). Loosely install switch and solidly connect harness connector.
4. Loosen switch bracket hardware (B).
5. Move switch until plunger (A) is about 3 mm (1/8 in.) from bottoming.
6. Check that switch does not bottom when brake pedal fully depressed. Increase clearance if needed.
7. Tighten bracket hardware.
8. Check switch operation.

- Engine should NOT turn over or start when brake pedal is not depressed.
- Engine should turn over and start when brake pedal is fully depressed.
- If operation is not correct, test switch.

IGNITION SWITCH TEST

Reason:

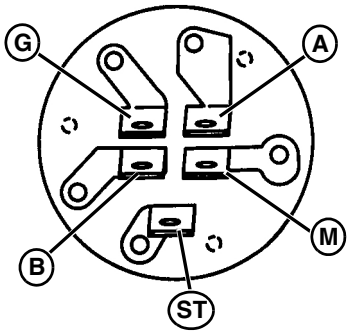
To verify ignition switch functions are operating properly.

Equipment:

- Ohmmeter or Continuity Tester

Procedure:

1. Park machine on level surface and turn ignition switch OFF.
2. Shift lever in NEUTRAL and park brake LOCKED.
3. Remove ignition switch cover (see Repair Section page 27 for Ignition Switch Removal & Installation)
4. Disconnect ignition switch connector.



NOTE: Ignition *switch terminals are identified to coincide with electrical schematic designations.*

5. Use an ohmmeter to test ignition switch continuity in OFF, RUN, and START positions.

Ignition Switch Continuity

Switch Position	Terminal Continuity
OFF	**(G and M)**
RUN	**(A and B)**
START	**(A and B and ST)**

Results:

- If any continuity is NOT correct, replace ignition switch.

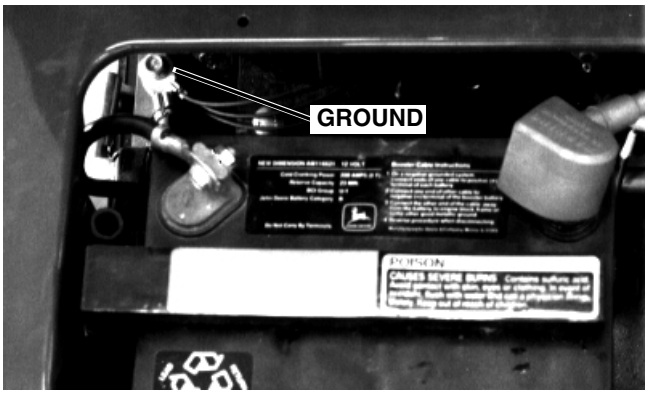
GROUND CIRCUIT TESTS

Reason:

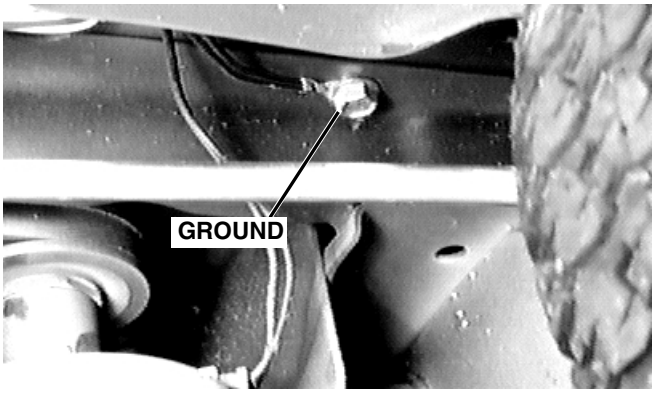
To check for opens, loose terminal wire crimps, poor connections, or corrosion in the ground circuit. The voltmeter method checks ground connections under load.

Equipment:

- Ohmmeter or voltmeter



Chassis Ground



Engine Ground

Procedure:

OHMMETER METHOD:

1. Turn ignition switch to off position. Engage park brake.
2. Connect ohmmeter negative (black) lead to negative terminal of battery. Put meter positive (red) lead on negative terminal of battery and record reading.
3. Put meter red lead on ground terminal of circuit or component to be tested that is closest to the battery negative terminal. Resistance reading must be very close to or the same as the battery negative terminal reading. Work backwards from the battery on the ground side of the problem circuit until the resistance reading increases above 0.1 ohms. The problem is between the last two test points. If a problem is indicated, disconnect the wiring harness connector to isolate the wire or component and check resistance again. Maximum allowable resistance in the circuit is 0.1 ohms. Check both sides of connectors closely as disconnecting and connecting may temporarily solve problem.

VOLTMETER METHOD:

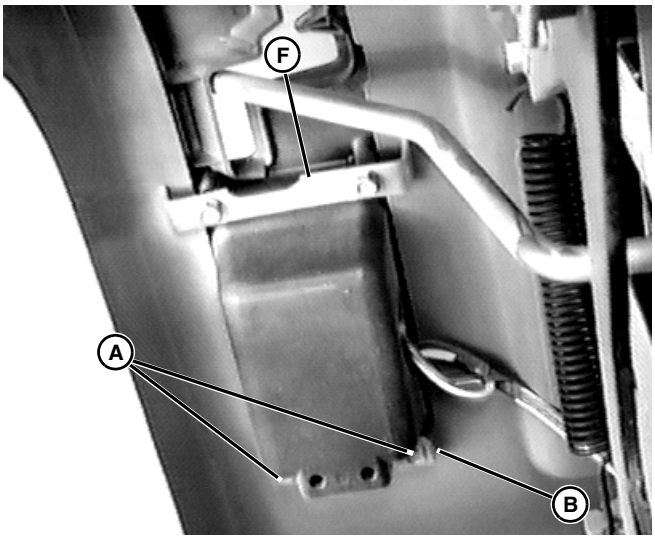
1. Put transmission in neutral. Engage park brake. Put blade drive switch in disengaged position. Turn ignition switch to on position.
2. Connect voltmeter negative (black) lead to negative terminal of battery.
3. Put meter positive (red) lead on ground terminal of component to be tested. Be sure the component circuit is activated (key on, switches closed) so voltage will be present at the component. Record voltage. Voltage must be greater than 0 but less than 1 volt. Some components will have a very small voltage reading on the ground side and still be operating correctly.

Results:

- If resistance is above 0.1 ohms, check for open wiring, loose terminal wire crimps, poor connections, or corrosion in the ground circuit.
- If voltage is 0, the component is open.
- If voltage is greater than 1 volt, the ground circuit is bad. Check for open wiring, loose terminal wire crimps, poor connections, or corrosion in the ground circuit.

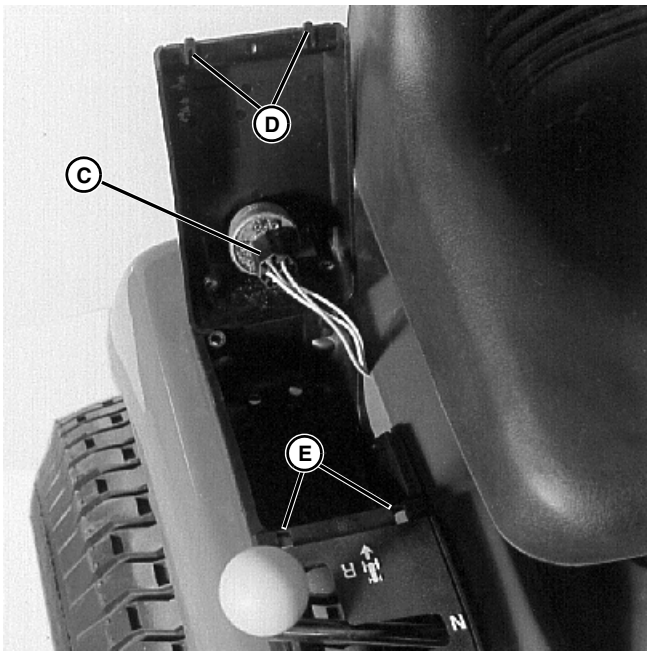
REPAIR

IGNITION SWITCH REMOVAL & INSTALLATION



1. Remove rear retaining screws (A) and Bracket (B).

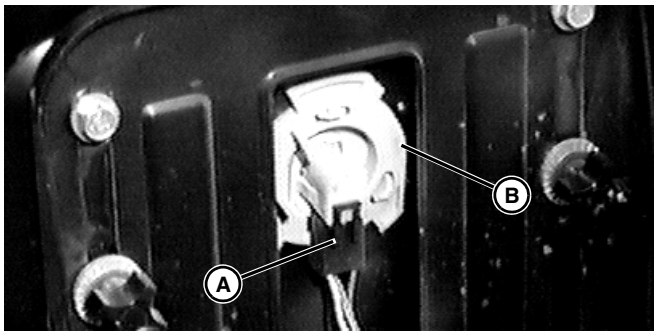
NOTE: Front bracket (F) does not have to be removed.



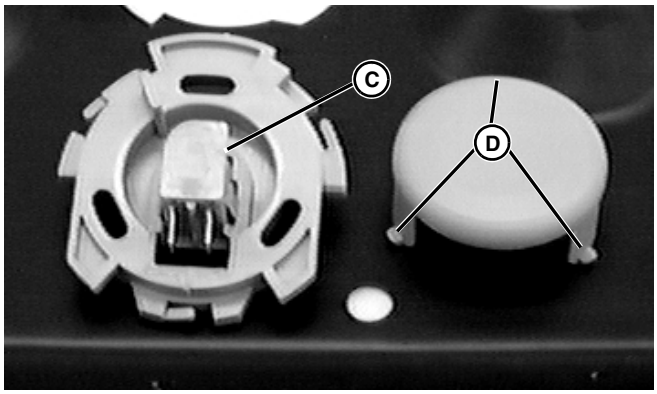
2. Remove ignition switch connector (C).
3. Check and/or replace ignition switch as required.
4. Install new switch and replace cover by inserting lugs (D) into slots (E). Secure from underside of tractor fender with two screws (A) and bracket (B). DO NOT overtighten screws, they are threaded into plastic.

SEAT SWITCH REMOVAL & INSTALLATION

NOTE: Seat switch connector has an internal spring which will short cavities of connector together when it is disconnected from seat switch. This prevents operator from defeating seat switch by leaving connector disconnected.



1. Tilt seat forward.
2. Disconnect connector (A).
3. Rotate switch assembly (B) counterclockwise to remove switch from seat pan.

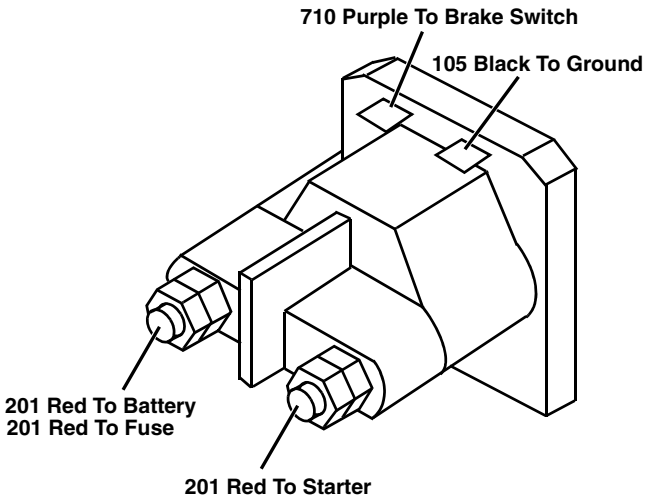


4. Depress tabs (D) of cover and remove.
5. Unsnap switch (C) from housing.
6. Assemble in reverse order of disassembly.

STARTER SOLENOID REMOVAL & INSTALLATION

Procedure:

1. Park machine on level surface, park brake ON, engine OFF.
2. Lift seat and remove negative battery cable from battery terminal.
3. Remove positive battery cable from battery terminal.
4. Remove battery hold-down (rubber strap) from frame, and lift battery from tractor.
5. Starter solenoid is located under operator's seat in front of battery.



6. Follow wiring above to remove and replace solenoid from frame.
7. When connecting battery, always connect positive cable to battery terminal first, and negative cable last.

CONTENTS

Page

GEAR POWER TRAIN

SPECIFICATIONS

Dimensions:

Overall Axle Width (End-To-End)	735.4 mm (29 in.)
Overall Case Width	432.5 mm (17. in.)
Overall Case Length (Front-To-Rear)	272 mm (11 in.)
Overall Height (Top Of Input Shaft-To-Bottom Case)	183.4 mm (7.2 in.)
Overall Case Height (Top Case-To-Bottom Case)	154.2 mm (6 in.)

Gear Teeth:

Bevel Pinion Gear (Input Shaft)	14
Drive Shaft:	
Bevel Drive Gear	42
Drive Sprocket Gear	9
1st Gear	12
2nd Gear	15
3rd Gear	20
4th Gear	23
5th Gear	28
Spur Gear	14
Intermediate Shaft:	
Drive Sprocket Gear	18
1st Gear	37
2nd Gear	35
3rd Gear	30
4th Gear	27
5th Gear	22
Combination Gear (Idler Shaft)	12 and 35
Differential Spur Gear	32
Differential Miter Bevel Gears (Axle Shafts)	15
Differential Miter Bevel Gears (Cross Shaft)	15

Drive Belt:

Effective Length	
New	2660 (104.725 in.)
Minimum	2631 mm (103.6 in.)
Maximum	2710 mm (106 in.)
Top Width	
New	12.7 mm (0.500 in.)
Minimum	.11 mm (0.43 in.)
Depth	
New	7.9 mm (0.31 in.)
Minimum	7 mm (0.28 in.)

Lubrication:

Grease Type, (Case)	Multi-Purpose EP
Capacity (Grease)	.638 gms (1.4 lbs)
Overall Weight (With Grease)	.14.2 kg (31.3 lbs)

Rear Axle Loading:

Maximum	450 lbs.

Gear Ratios:

1st Gear	61.67:1
2nd Gear	46.67:1
3rd Gear	30.00:1
4th Gear	23.48:1
5th Gear	15.71:1
Reverse	40.00:1

Ground Speeds:

1st Gear	2.20 km/hr (1.37 mph)
2nd Gear	2.91 km/hr (1.81 mph)
3rd Gear	4.54 km/hr (2.82 mph)
4th Gear	5.79 km/hr (3.60 mph)
5th Gear	8.66 km/hr (5.38 mph)
Reverse	3.40 km/hr (2.11 mph)

TORQUE SPECIFICATIONS

Brake Assembly Mounting Cap Screws	20 N•m (15 lb-ft.)
Clutch Bellcrank Mounting Cap Screw	34 N•m (25 lb-ft.)
Detent Ball and Spring Set Screws	Flush Only
Gear Shift Lever Cap Screws	115 N•m (11 lb-ft.)
Hanger Bracket to Frame Cap Screws (Front)	27 N•m (20 lb-ft.)
PTO Clutch to Crankshaft Cap Screw	75 N•m (55 lb-ft)
Front Hanger capscrews to frame	30 N•m (22 lb-ft.)
Front Transaxle Cap Screws To Hangers	27 N•m (20 lb-ft.)
ReAr Axle Cap Screws & Nuts To Frame	30 N•m (22 lb-ft.)
ShIft Linkage Lock Nut	15 N•m (11 lb-ft.)

OTHER MATERIALS

Form-In-Place Gasket Silicone Sealant
Never-Seez®—PT506 or PT569

SERVICE PART KITS

Brake Friction Puck Assembly Kit	AM119620
Clutch Keys Assembly Kit	AM119611
Combination Gear Assembly Kit	AM119607
Detent Assembly Kit	AM119619
Differential Miter Gear Assembly Kit	AM119612
Differential Ring Gear Assembly Kit	AM119879
Drive Chain and Sprocket Assembly Kit	AM119613
Drive Shaft Assembly Shim Kit	AM119610
Input Shaft Assembly Kit	AM119602
Input Shaft Assembly Shim Kit	AM119603
Pinion and Gear Assembly Kit	AM119606
Transaxle Assembly Kit (Complete)	AM121563
Right Hand Axle	AM122525
Left Hand Axle	AM122524
Gear Set Assembly Kit 1st	AM119614
Gear Set Assembly Kit 2nd	AM119615
Gear Set Assembly Kit 3rd	AM119616
Gear Set Assembly Kit 4th	AM119617
Gear Set Assembly Kit 5th)	Use Parts Manual For Specific Model

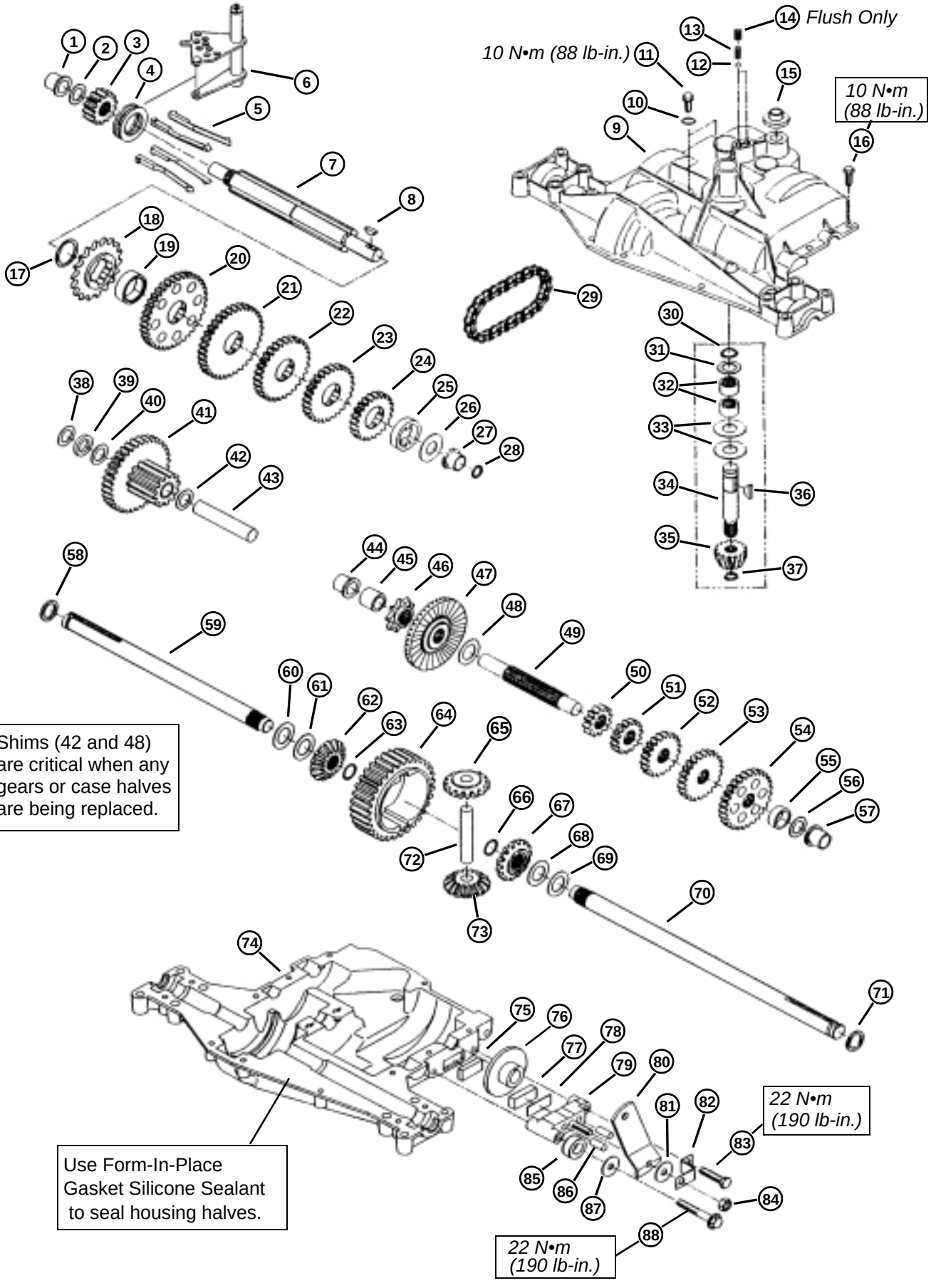
TROUBLESHOOTING

Problem or Symptom / Check or Solution	Belt jumping off or slapping	Lack of drive in one or both directions	Loses power under load, belt slips, or erratic drive	Jerky or aggressive engagement	Cannot get all forward gears	Cannot get reverse gear	Jumps out of gear or must hold into	Shifts hard	Noisy operation	Leaking grease	Brakes will not stop tractor	Park brake will not hold
Belt sheaves, idlers, & guides loose, out of adjustment, worn, or damaged	●	●	●	●					●			
Belt worn, frayed, glazed, or stretched—replace belt	●	●	●	●					●			
Clutch/brake pedal linkage out of adjustment	●	●	●	●			●	●			●	●
Clutch/brake components worn, bent, or broken—replace and adjust	●	●	●	●	●	●	●	●	●		●	●
Shift lever and linkage bent, worn, out of adjustment, or broken—replace or adjust properly					●	●	●	●				
Input sheave, input shaft, and axle keys or keyways worn or damaged—replace		●	●	●					●		●	●
Internal transaxle components worn, stripped, or broken	●	●	●	●	●	●	●	●	●		●	●
Transaxle case halves worn or broken—replace	●	●	●	●	●	●		●	●	●		
Incorrect type or volume of lubricant used—replace with correct type and volume	●	●	●	●	●	●	●	●	●	●		
Intermediate shifter/brake shaft or axle seals worn or damaged—replace seals		●	●		●	●	●	●	●	●		
Transaxle cap screws loose or case holes stripped		●	●		●	●	●	●	●	●		
Poor application of sealant on transaxle case halves										●		
Incorrect type sealant—replace with proper sealant										●		

COMPONENT LOCATION

1. Flange bearing
2. Shim
3. Spur gear (14 teeth)
4. Shift collar
5. Shift key (4 used)
6. Shifter Fork
7. Intermediate shifter/brake shaft
8. Woodruff key
9. Upper case housing
10. O-ring seal (2 used)
11. Screw (2 used)
12. Detent ball (2 used)
13. Detent spring (2 used)
14. Set screw (2 used) Flush Only
15. Shifter shaft rubber boot
16. Screw (14 used)
17. Retaining ring
18. Drive chain large sprocket /reverse gear (18 teeth)
19. Spacer
20. Intermediate shaft 1st gear (37 teeth)
21. Intermediate shaft 2nd gear (35 teeth)
22. Intermediate shaft 3rd gear (30 teeth)
23. Intermediate shaft 4th gear (27 teeth)
24. Intermediate shaft 5th gear (22 teeth)
25. Spacer w/internal keys
26. Washer
27. Flange bearing
28. Square-cut rubber seal (open lip to inside)
29. Drive chain (24 pitches)
30. Retaining ring
31. Shim
32. Needle bearing (2 used)
33. Washer (2 used)
34. Input shaft
35. Bevel pinion gear (14 teeth)
36. Woodruff key
37. Retaining ring
38. Washer
39. Spacer
40. Washer
41. Idler gear (12 & 35 teeth)
42. Shim
43. Idler shaft
44. Flange bearing
45. Spacer
46. Drive chain drive sprocket (9 teeth)
47. Drive shaft bevel gear (42 teeth)
48. Shim
49. Drive shaft
50. Drive shaft 1st gear (12 teeth)
51. Drive shaft 2nd gear (15 teeth)
52. Drive shaft 3rd gear (20 teeth)
53. Drive shaft 4th gear (23 teeth)
54. Drive shaft 5th gear (28 teeth)
55. Spacer
56. Washer
57. Flange bearing
58. Square-cut rubber ring
59. Left axle shaft
60. Washer (0.758x1.25x0.031 in.)
61. Washer (0.758x1.25x0.031 in.)
62. Differential bevel gear (15 teeth)
63. Retaining ring
64. Differential ring gear (32 teeth
65. Differential bevel gear (15 teeth)
66. Retaining ring
67. Differential bevel gear (15 teeth)
68. Shim
69. Shim
70. Right axle shaft
71. Square-cut rubber ring
72. Differential cross shaft
73. Differential bevel gear (15 teeth)
74. Lower case housing
75. Thin friction puck
76. Brake disc
77. Thick friction puck
78. Friction puck striker plate
79. Brake housing
80. Brake lever
81. Washer
82. Lever stop bracket
83. Cap screw (5/16x1.44.)
84. Lock nut (5/16)
85. Lever Stop bushing
86. Actuator dowel pin (2 used)
87. Washer
88. Cap screw (5/16x2.25)

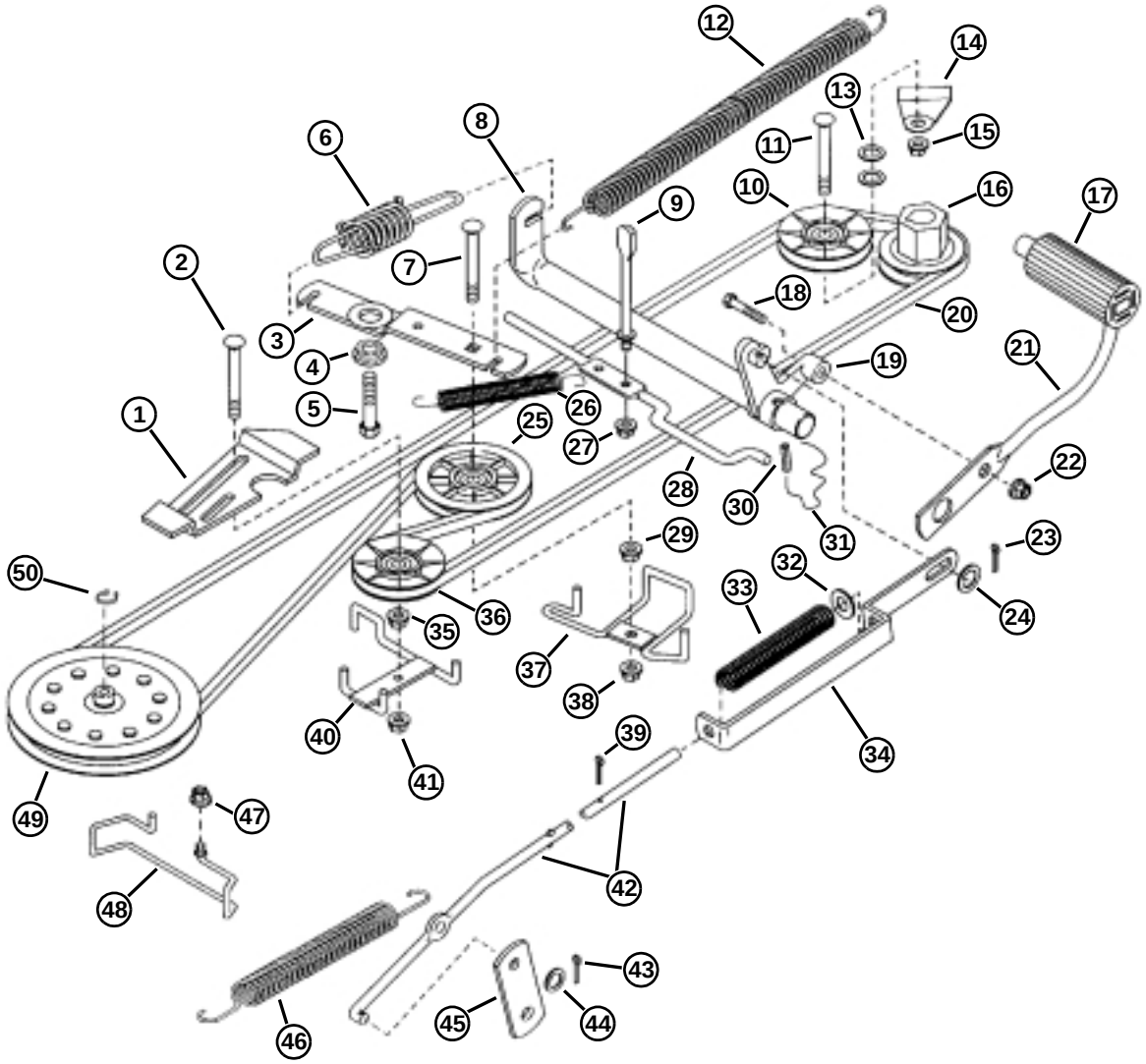
TRANSAXLE COMPONENT LOCATION



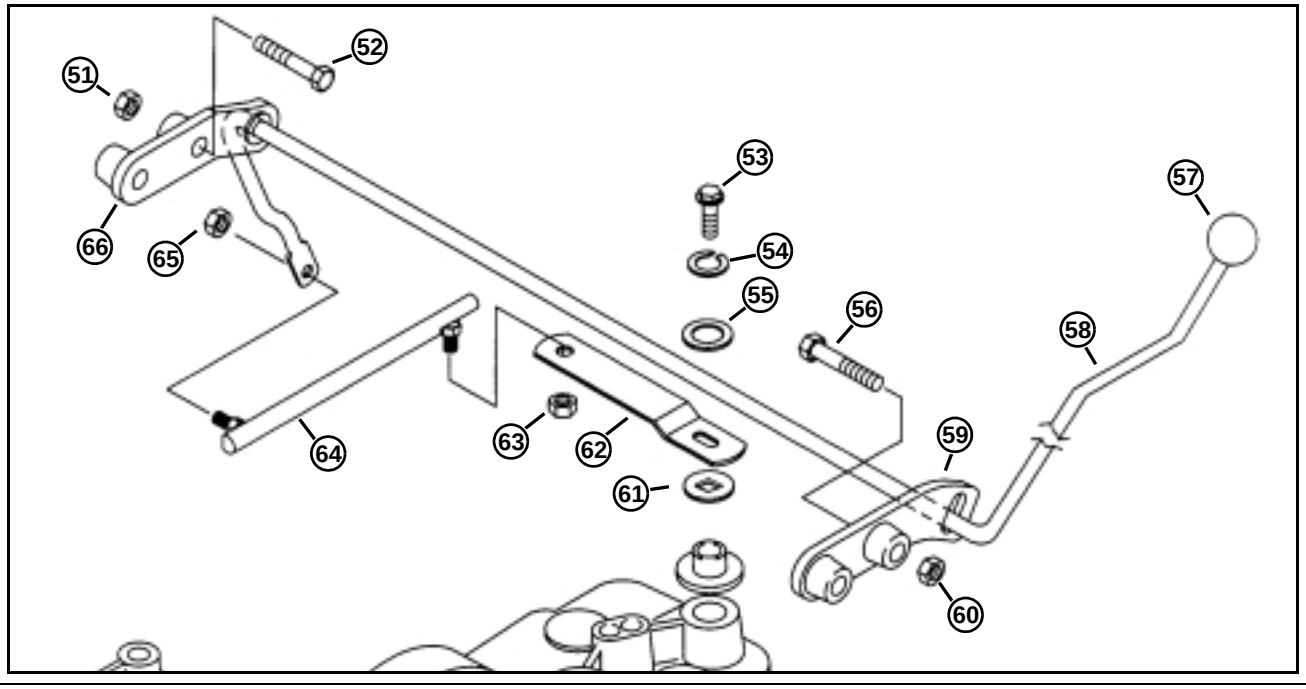
TRACTION DRIVE SYSTEM COMPONENT LOCATION

1. Frame weldment—idler adjustment
2. Carriage bolt (M8x45)
3. Clutch bellcrank bracket
4. Bushing
5. Cap screw
6. Clutch assist spring assembly
7. Carriage bolt (M8x45)
8. Clutch cross shaft
9. Park lever
10. Idler
11. Carriage bolt (M8x50)
12. Clutch spring
13. Washer (2 used)
14. Belt guide
15. Flange nut (M8)
16. Crankshaft drive sheave
17. Foot pad
18. Cap screw (M8x35)
19. Bellcrank
20. Drive belt
21. Clutch/brake pedal
22. Flange lock nut (M8)
23. Cotter pin
24. Washer
25. Clutch sheave
26. Park locking rod tension spring
27. Flange nut (M6)
28. Park locking rod
29. Flange nut (M8)
30. Rolled pin (M4x20)
31. Safety wire
32. Washer
33. Brake rod compression spring
34. Brake compression spring strap
35. Flange nut (M8)
36. Adjustable idler
37. Belt guide
38. Flange nut (M8)
39. Cotter pin
40. Belt guide
41. Flange nut (M8)
42. Brake rod
43. Cotter pin
44. Washer
45. Brake lever
46. Brake rod return spring
47. Flange nut (M6)
48. Belt guide
49. Transaxle drive sheave
50. Snap ring
51. Lock nut (M8)
52. Cap screw (M8x30)
53. Special patch lock cap screw
54. Lock washer (1/4 in.)
55. Washer
56. Cap screw (M8x30)
57. Shift knob
58. Shift lever
59. Right shift lever mounting bracket
60. Lock nut (M8)
61. Special square hole washer
62. Shift arm
63. Lock nut (M8)
64. Universal shift link
65. Lock nut (M8)
66. Left shift lever mounting bracket

TRACTION DRIVE SYSTEM COMPONENT LOCATION

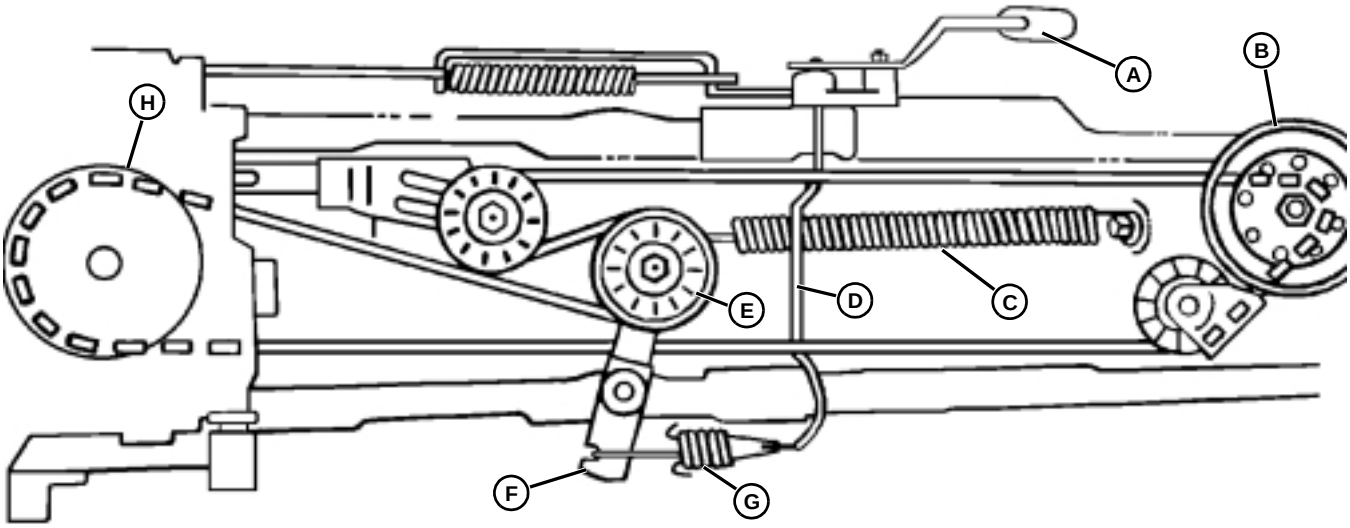


SHIFT LINKAGE SYSTEM COMPONENT LOCATION



THEORY OF OPERATION

TRACTION DRIVE SYSTEM OPERATION



A. Clutch Pedal
B. Engine Drive Sheave
C. Tensioning Spring
D. Clutch Shaft
E. Tensioning Sheave
F. Bellcrank Assembly
G. Actuating Spring Assembly
H. Transaxle Drive Sheave

Function:

The belt traction drive transfers power from the engine to the 5-speed transaxle. The clutch pedal controls the belt traction drive, and allows the transaxle to be shifted through it's five speed range.

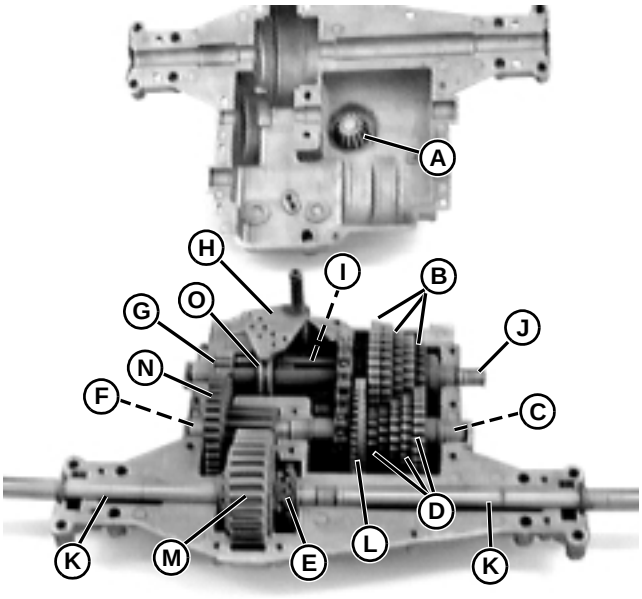
With engine running and clutch engaged (clutch pedal (A) released), the engine drive sheave (B) pulls the drive belt and transmits power to the transaxle drive sheave (H). As clutch/brake pedal (A) is depressed by the operator, clutch shaft (D) pulls the clutch actuating spring assembly (G) forward. Initial movement of the pedal compresses the spring in the actuating spring assembly (G) and, once compressed, pivots the bellcrank assembly (F). As the bellcrank assembly pivots, the tensioning sheave (E) moves rearward, releasing drive belt tension. This allows the engine drive sheave to rotate without transferring any power through the slackened drive belt.

As the bellcrank pivots rearward, belt tensioning spring (C) is stretched, building additional tension in the spring. As the operator begins to ease-up on the clutch/brake pedal (A), tensioning spring (C) pulls the bellcrank tensioning sheave (E) into the drive belt, causing the belt to tighten and seat in the grooves of the transaxle drive sheave (H) and the engine drive sheave (B). This interaction of components results in turning the transaxle drive sheave rapidly in a clockwise direction, transferring power from the engine to the 5-speed transaxle.

TRANSAXLE OPERATION

Function:

The transaxle transmits power from the engine to the drive axles and rear wheels, and provides gear selection of five forward speeds, one reverse, and neutral.



A. Input Pinion Gear
B. Intermediate Gears
C. Drive Shaft
D. Forward Drive Gears
E. Cross Shaft Bevel Gears
F. Idler Shaft
G. Spur Gear
H. Shift Fork
I. Shift Keys
J. Intermediate Shaft
K. Drive Axles
L. Beveled Drive Gear
M. Differential Ring Gear
N. Idler Gear
O. Shift Collar

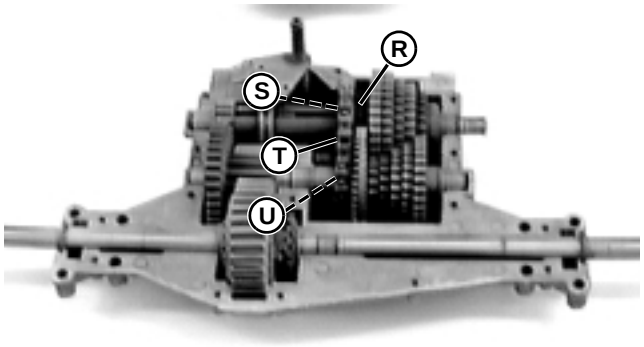
Forward Gears:

With engine running and clutch engaged, the transaxle drive sheave, input shaft, and input pinion gear (A), are driven by the engine and traction drive belt.

The input pinion gear (A), which is splined to the input shaft and retained by a snap ring, drives the beveled drive gear (L). The beveled drive gear turns the drive shaft (C), and the five forward drive gears (D).

A forward gear is selected when the operator moves the shift lever. The shift linkage moves the shift fork (H), shift collar (O), and shift keys (I) into one of the five intermediate gears (B). The selected gear is keyed to the intermediate shaft (J). Power is transferred by the intermediate gear (B) on the right side of the intermediate shaft, to the splined spur gear (G) on the left side of the shaft.

The spur gear (G) drives the idler gear (N), splined to the idler shaft (F), which transfers power into the differential ring gear (M). Power is transferred by the cross shaft and bevel gears (E) to both drive axles (K) out to the wheels and tires. The keyed drive wheels are retained by an E-Ring.



Reverse Gears:

With engine running and clutch engaged, the transaxle drive sheave, input shaft, and input pinion gear (A), are driven by the engine and traction drive belt.

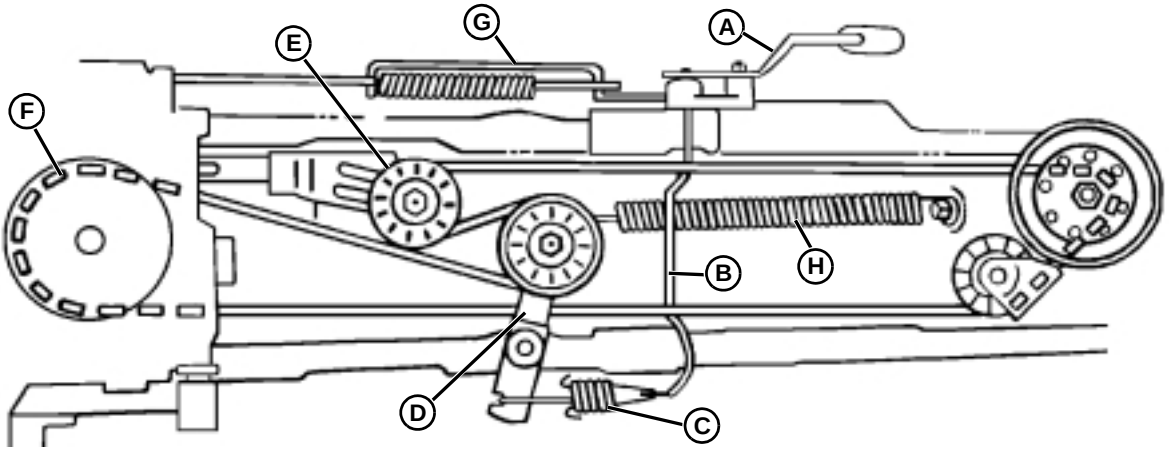
Power is transferred to the bevel drive gear (L), and drive shaft (C), which drives the small drive chain sprocket (U), the drive chain (T), and the large drive chain sprocket (S) on the intermediate shaft (J).

When the operator shifts into reverse, the shift fork (H), shift collar (O), and shift keys (I) become keyed to the large drive chain sprocket (S). The large drive chain sprocket (S) turns the intermediate shaft (J) and the spur gear (G). The idler shaft (F) and idler gear (N) are driven by the spur gear in reverse, which turn the differential, drive axles, and drive wheels in reverse.

Neutral:

When the operator moves the shift lever into neutral position, the shifter fork (H) places the shift keys (I) under the free-floating spacer (R), allowing no power to be transmitted into the intermediate shaft (D), which also allows neutral to be maintained with clutch pedal released and engine running.

BRAKE SYSTEM OPERATION



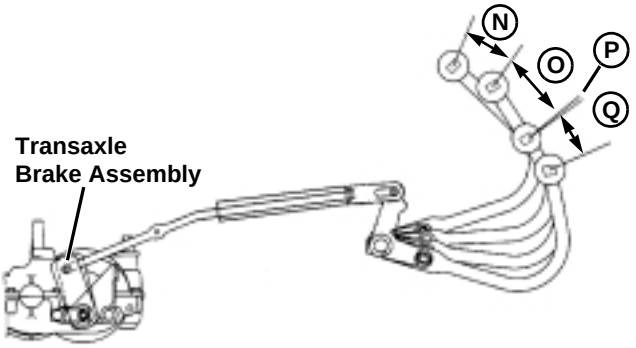
A. Clutch/Brake Pedal
B. Clutch Cross Shaft and Bellcrank
C. Clutch Actuating Spring Assembly
D. Clutch Bellcrank and Tensioning Idler Assembly
E. Adjustable Idler Assembly
F. Transaxle Drive (Input) Sheave
G. Brake Rod Assembly
H. Clutch Tensioning Spring

Function:

The brake system allows the operator to slow down, stop, or lock the tractor into park position.

Theory of Operation:

NOTE: Clutch/brake pedal has approximately 127 mm (5 in.) of travel, and operates as follows:

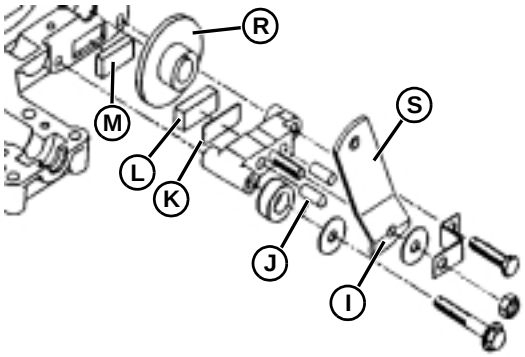


The first movement of the clutch/brake pedal (N) is used for taking-up freeplay in the linkage and the beginning of compressing the clutch actuating spring assembly (C).

The next segment of pedal travel (O) is fully compressing the clutch actuating spring assembly (C), and pulling the clutch bellcrank and idler assembly (D) fully rearward, overcoming the belt tensioning spring (H) and fully disengaging the traction drive system.

As the pedal is released, belt tensioning spring (H) pulls the clutch bellcrank and tensioning idler assembly (D) forward into the belt, tensioning the belt and fully engaging the traction drive system.

There is a small segment of pedal travel (P) that briefly allows the tractor to free-wheel so the operator can shift-on-the-go before the brake starts to engage. This segment can be adjusted to allow more overlap between clutch and brake functions, if desired.



The last segment of travel (Q) fully engages the brake system. The brake lever (S), with the bottom cam surface contour (I), pushes the two dowel pins (J) against the striker plate (K). The striker plate forces the thicker, outer friction puck (L) against the brake disc (H). The two friction pucks (L and M) become compressed against both sides of the brake disc (R). The brake disc is keyed to the end of the intermediate shifter/brake shaft (not shown). When the compression force of the friction pucks is great enough to stop the brake disc rotation, the transaxle and wheels stop turning. This works in conjunction with the clutching system.

With the clutch/brake pedal (A) fully depressed and the traction drive system disengaged (fully clutched), the park brake lever assembly (not shown) can be engaged, locking the clutch/brake pedal linkage and the brake disc in the park position.

DIAGNOSIS

Test Conditions:

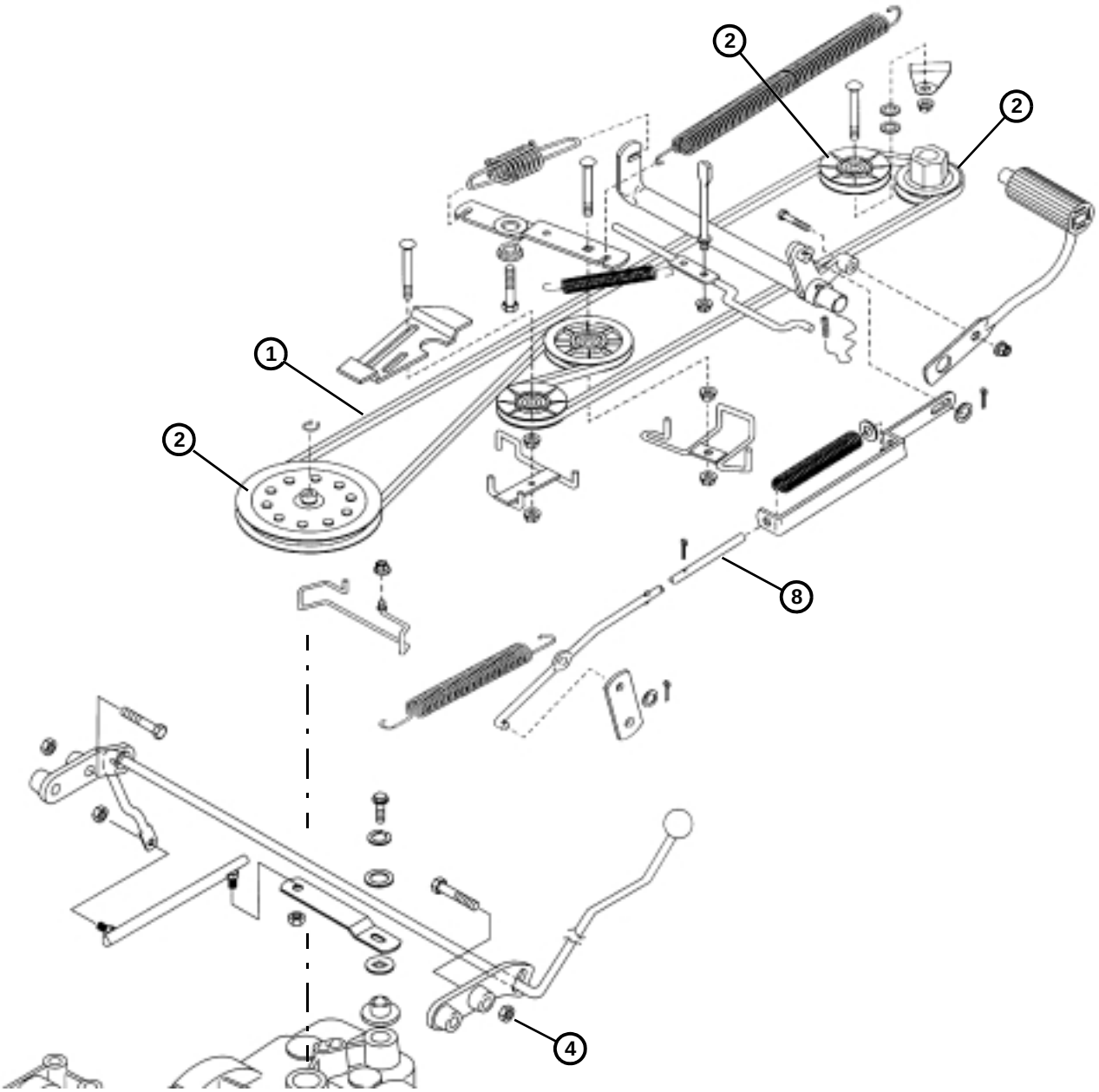
- Mower on level surface
- Mower deck removed
- Engine OFF
- Front wheels blocked
- Rear wheels raised off ground with axle housings on jack stands.
- Park brake ON

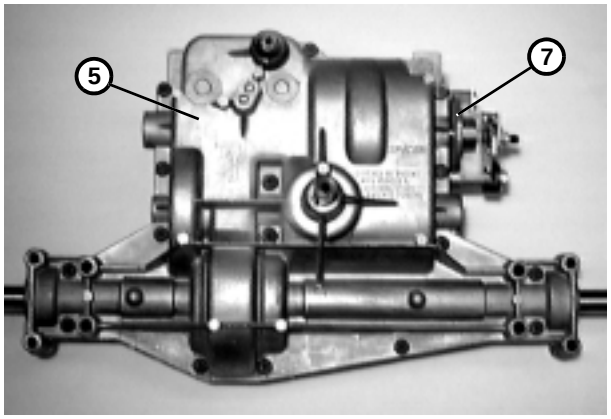
Test/Check Point	Normal	If Not Normal
1. Inspect traction drive belt.	Belt in good condition, not glazed, split, unraveled, or stretched. Minimum width 11 mm (0.43 in.).	Replace traction drive belt See Repair section for removal/ installation instructions
2. Inspect engine and transaxle sheaves, idlers and idler bearings, and belt guides.	Sheaves, idlers and guides in good condition.	Replace any loose, worn, or damaged components. (See Repair section for removal/ installation instructions)
	Guides installed, properly adjusted and tight.	
3. Test drive mower up 17° slope in first, second, third and reverse gears.	Mower pulls up slope with no clutch slippage (traction drive belt adjusted properly).	Adjust traction drive belt rear idler (See clutch actuating spring adjustment)
4. Shift linkage adjustment.	Linkage shifts smoothly, obtains all gears & neutral (See shift linkage adjustment section for test)	Adjust linkage. (See shift linkage adjustment section for procedure)
5. Inspect exterior of transaxle housing.	No cracks, leaks, or loose hardware.	Repair or replace as necessary. If case seal is leaking, reseal case
6. Perform brake test (See tests and adjustments)	Mower holds on 17° slope, and stops in 0.9-1.5 M (3-5 ft) or less.	Go to step 7 and 8
7. Inspect brake pads & disk	Pads and disks not worn beyond specifications. Disc not rubbing on transaxle case.	Replace pad & disk as needed. If disk is rubbing case, rebuild transaxle
8. Inspect brake linkage	Brake spring adjustment is 7.5-8 mm (0.30-0.32 in.)(See tests & adjustments section)	Adjust brakes (See tests & adjustments section)
9. Inspect rear tires	Tire pressures are equal	Adjust air pressure.
	Tire outside diameters are equal	Match tires for same size.
10. Inspect rear wheels	Wheels not bent or out of round.	Replace wheels.
11. Remove rear wheels and inspect axles.	Keys, keyways and E-rings in good shape and seated correctly.	Repair or replace as needed.

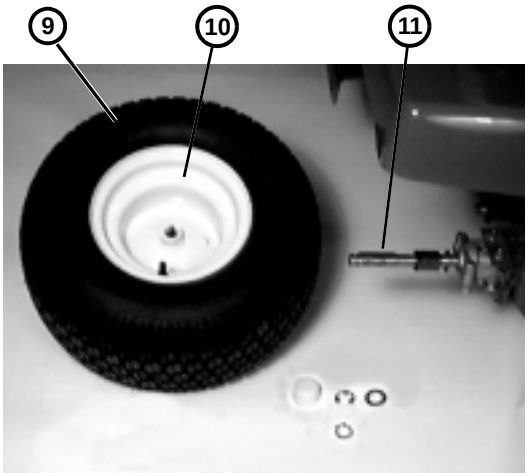
Test Conditions:

- Mower on level surface
- Front wheels blocked
- Park brake OFF
- Rear wheels raised off ground with axle housings on jack stands.
- Operator on seat, engine running at operating temperature.

1. Depress clutch pedal and shift into all 5 speeds and reverse	Rear wheels remain still with no axle rotation (Clutch pedal down)	Adjust clutch actuating spring.
2. Shift transaxle through gears, using clutch to shift	Shifts smoothly, and obtains all forward and reverse gears (both rear wheels are being driven)	Adjust shift linkage If still no drive, check transaxle drive sheave shaft key, or remove transaxle for internal inspection.







TESTS AND ADJUSTMENTS

CLUTCH/BRAKE LINKAGE &TRACTION DRIVE ADJUSTMENT

Reason:

To ensure clutch/brake pedal linkage and traction drive system maintains traction in all three lower gears up a 17° slope. Also, to ensure it disengages traction drive belt, engages brake to slow down or stop tractor within a specified distance, and holds tractor stationary in PARK position on a 17° slope or less.

Procedure:

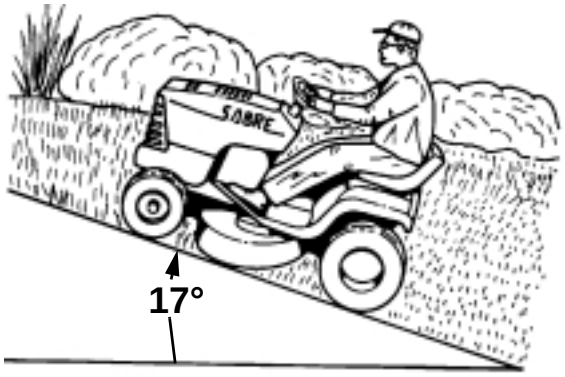
NOTE: This is a four part test and adjustment procedure:

1. Test drive on 17° slope,
2. Brake spring adjustment,
3. Clutch spring adjustment,
4. Repeat test drive on 17° slope.

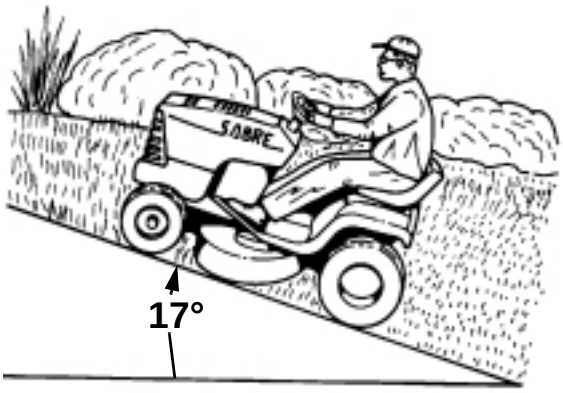
TRACTION BELT DRIVE TEST

⚠ CAUTION

DO NOT engage clutch/brake pedal too aggressively or tractor may tip over backwards. It is recommended that you install the mower deck before performing the test drive on a 17° slope.



1. Test drive tractor to see if traction drive system pulls tractor up a 17° slope in all three lower gears.
2. Look for a steady pull in all three lower gears up the slope.
3. If traction test fails in any or all of the three lower gears, the belt tension must be adjusted.



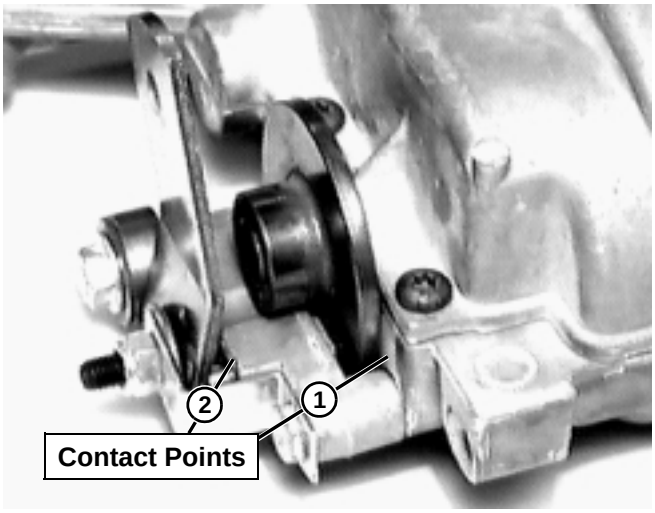
BRAKE TEST

1. Drive or push tractor onto a 17° slope and lock clutch/brake pedal in PARK position.
2. Park brake must hold tractor stationary on slope and tractor must not roll downward once park brake is set.
3. Drive tractor on dry pavement in a safe, open, and level area at fast idle in high gear. Apply a “panic stop” force (no more than 50 pounds of force) to brake pedal—tractor must stop within 0.9—1.5 M (3—5 ft) and both wheels should lock-up, leaving skid marks on pavement.
4. Repeat Steps 4—6 for reverse.
5. If any test fails, the clutch and brake linkages must be adjusted or components replaced.

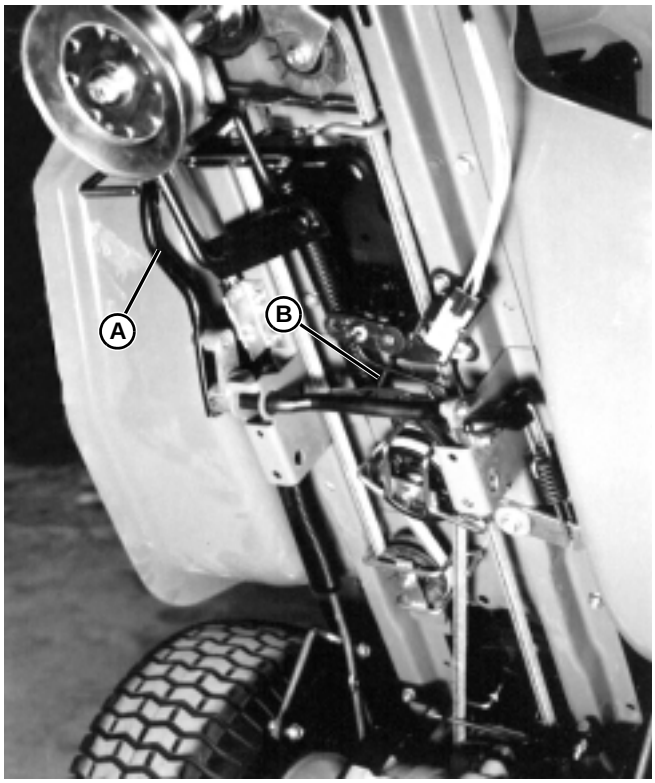
IMPORTANT: Anytime the brake or clutch spring need to be adjusted, both must be examined to ensure desired results will be obtained.

NOTE: These adjustment procedures can be performed with tractor on the floor; however, you may want to safely raise the tractor for easier access. If you do, remove the battery to avoid spilling any electrolyte solution.

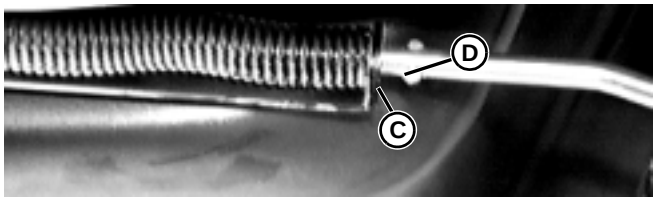
BRAKE SPRING ADJUSTMENT—



1. First check for brake disc contacting the case (1) and/or brake lever contacting its mounting bracket (2), top or bottom. If so, replace friction pucks and disc before making any adjustments.

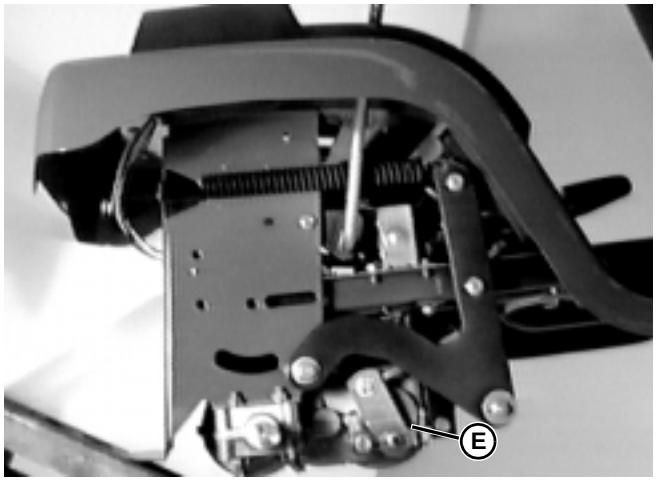


2. Remove the mower deck.
3. Depress clutch/brake pedal (A) and lock park brake lever (B) into PARK position from operator's station.



4. Measure distance between end of compression spring bracket (C) and front edge of brake rod stop tabs (D).

• If distance is less than 2 mm (0.08 in.)—



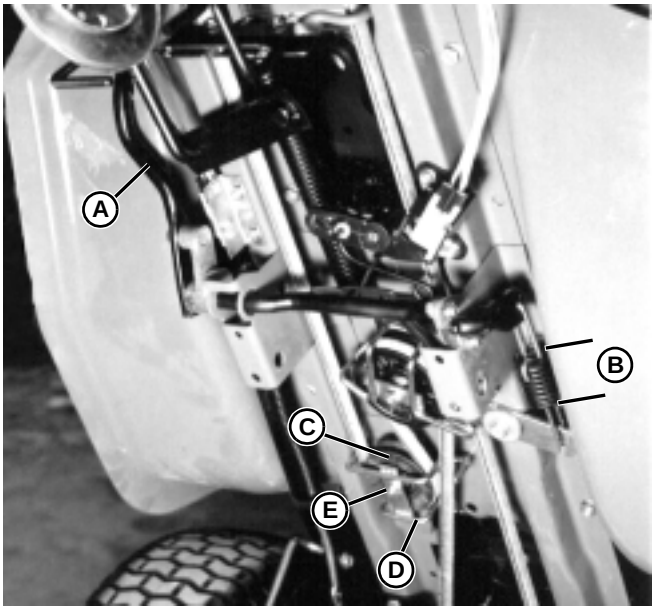
5. Tighten lock nut (E) until distance between end of compression spring bracket (C) and front edge of brake rod stop tabs (D) is **7.5—8 mm (0.30—0.32 in.)**
6. Once above measurement is obtained, cycle clutch/brake pedal.
7. Remeasure distance, it should be the same. This brake setting should hold the tractor stationary on a 17° slope.

If distance is greater than 8 mm (0.32 in.)—

8. With park brake set, gradually loosen lock nut (E) until distance of **7.5—8 mm (0.30—0.32 in.)** is obtained.
9. Cycle park brake and measure distance again (see Step 7).
10. If tractor fails either brake test, inspect brake assembly components, replace as necessary, and repeat all adjustment procedures and drive tests.

CLUTCH ACTUATING SPRING ADJUSTMENT

IMPORTANT: Anytime the brake or clutch spring need to be adjusted, both must be examined to ensure desired results will be obtained.



1. Unlock park brake and release pedal (A).
2. Measure clutch actuating spring length (B). Measurement should be **42—45 mm (1.65—1.77in.)**. Clutch actuating spring length is adjusted by sliding rear idler sheave (C) on it's slotted mounting bracket, as follows:
3. Depress brake/clutch pedal (A) and lock park brake.
4. Remove belt guide (D) to access idler sheave mounting nut (E). Loosen mounting nut and adjust idler as follows:
   - If spring length is less than **42 mm (1.65 in.)**, slide idler rearward.
   - If spring length is greater than **45 mm (1.77 in.)**, slide idler forward.
5. Tighten idler nut (E).
6. Cycle pedal in and out two or three times measuring clutch spring length each time. Measurement must fall within **42—45 mm (1.65—1.77 in.)** each time. If not, continue to adjust rear idler slightly until it does.
7. Install belt guide (D). This clutch spring setting should provide proper belt tension to pull tractor up a 17° slope in all three lower gears.
8. Install battery, if removed.

REPEAT TEST DRIVE

1. Repeat test drive in at beginning of this section.
2. If tractor fails either brake test, inspect brake assembly components, replace as necessary, and repeat all adjustment procedures and drive tests.
3. If belt is not excessively worn, make small adjustments to idler sheave to obtain proper response in traction drive system as follows:
   - **lengthening** the clutch spring causes **increased** drive traction and aggressiveness
   - **shortening** the clutch spring causes **decreased** drive traction and aggressiveness.

SHIFT LINKAGE ADJUSTMENT

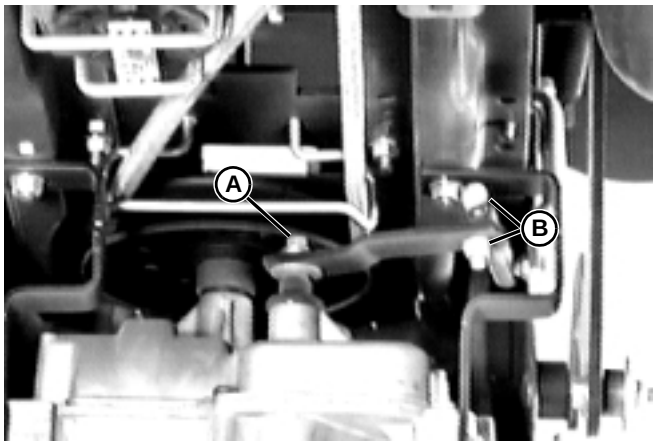
Reason:

To ensure shift lever obtains all shift positions and that neutral position does not allow transaxle to rotate.

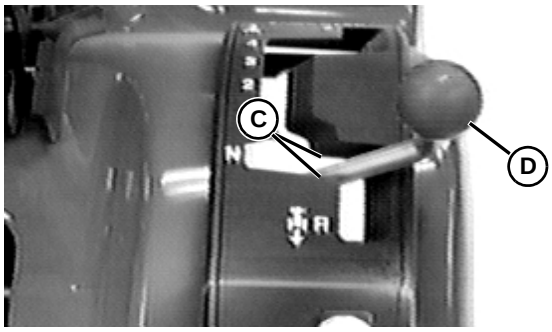
Conditions:

- Remove deck
- Safely raise rear wheels 51 mm (2 in.) off ground and block front wheels (front and rear).
- Shift lever in neutral.
- Park brake off.

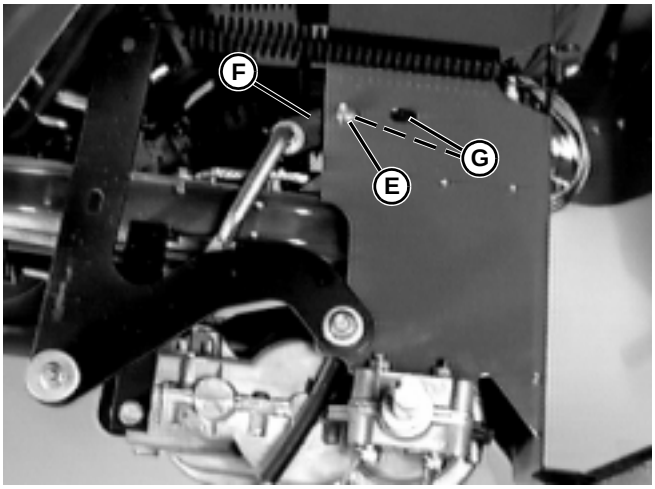
Procedure:



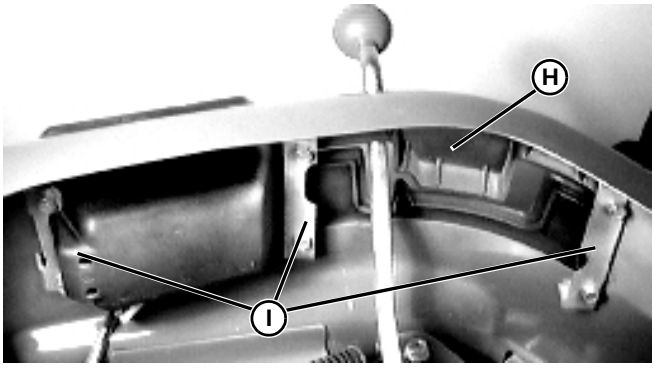
1. Check that shift linkage hardware (A and B) is in good condition and tight.
2. Start and run engine at fast idle.
3. Check that transaxle does not rotate while shift lever (D) is in neutral position (C), and clutch/brake pedal released.



4. If transaxle rotates, move shift lever (D) slightly until transaxle shift lever clicks firmly into it's neutral detent. (This may occur while shift lever (D) is in the reverse or first gear range of shift gate).
5. Stop engine.



6. Raise seat and loosen left side lock nut (E) holding shift linkage bracket to frame. (Left wheel removed for clarity purposes only).
   Slide shift linkage bracket (F) forward or rearward in slots (G) until shift lever is centered in neutral shift gate. Tighten lock nut (E).



7. If left side bracket adjustment (Step 6) does not allow enough shift lever movement to center shift lever in neutral gate, loosen three mounting brackets (I) holding shift quadrant (H) to fender.
8. Adjust quadrant forward or rearward until shift lever is centered in the neutral gate.
9. Tighten mounting brackets (I). Restart engine and move shift lever through all gears (using clutch to shift). Re-check for axle rotation in neutral (steps 2 through 4 this section).
10. Lower tractor to surface and remove blocks.

Results:

- Test drive tractor to ensure all forward and reverse gears are obtained and that tractor does not move when shifter is in neutral position.
- If adjustments are not satisfactory, repeat procedure until proper results are obtained.
- If adjustments are still not satisfactory, internal transaxle repair is needed.

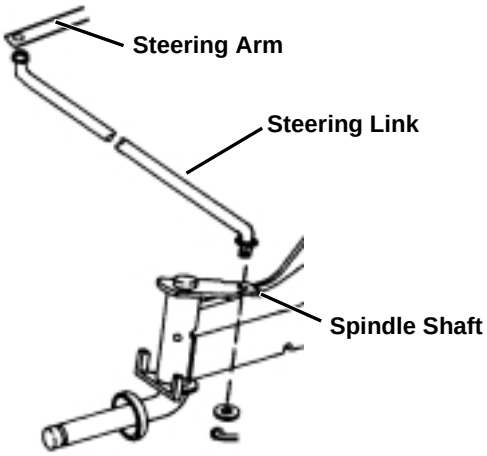
REPAIR

TRACTION DRIVE BELT REMOVAL

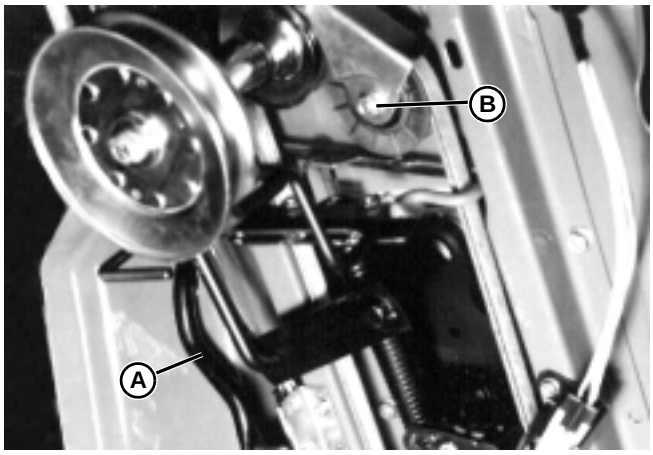
NOTE: If drive belt is in good condition, it does not need to be removed when removing transaxle. Engage park brake and remove belt from transaxle drive sheave.

1. Park mower on level surface.
2. Remove mower deck.
3. Safely raise and block tractor to gain easy access to underside of frame.

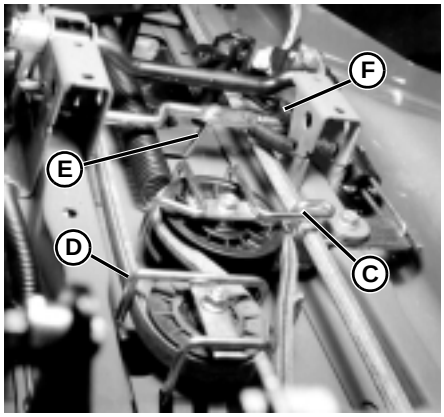
NOTE: If mower is to be raised at an angle, remove battery from frame before jacking.



4. Remove cotter key and washer holding steering link to right front spindle shaft.
5. Rotate steering link to align tabs on link with slots in steering arm. Remove link from arm.



6. Depress and lock brake pedal (A) with park brake lever.
7. Remove front idler belt guide and sheave (B).

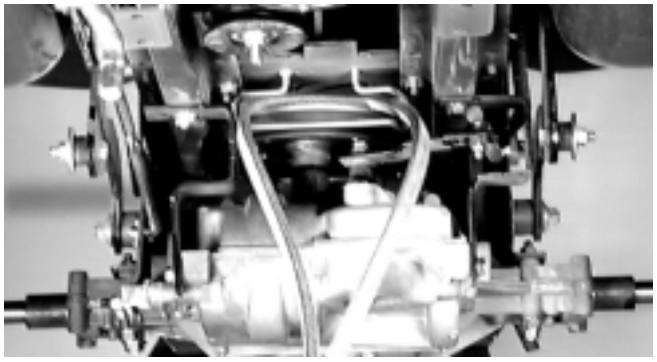


8. Remove clutch bellcrank belt guide (C).
9. Remove adjustable idler belt guide (D).
10. Remove park lever (E).

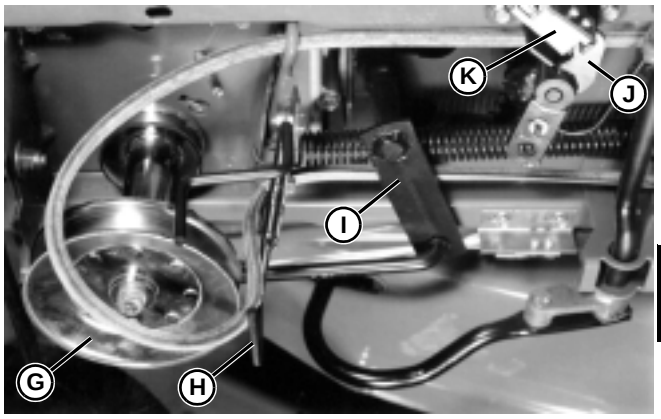
⚠ CAUTION

Mower drive lever return spring is under tension and located inside frame. Use pliers or spring puller tool to remove spring. Protect your eyes and face from the possibility of spring being released at high speed.

11. Remove mower drive lever return spring (F)



12. Remove belt from transaxle drive sheave, and pull through transaxle belt guide.



13. Pull belt from around engine drive sheave (G), and past front belt guide (H). Pull belt under belt guide and around steering arm (I).
14. Rotate mower drive lever to allow belt to pass between lever (J) and switch (K).
15. Remove belt from clutch bellcrank and idler sheave, and remove belt from mower.

TRACTION DRIVE BELT INSPECTION

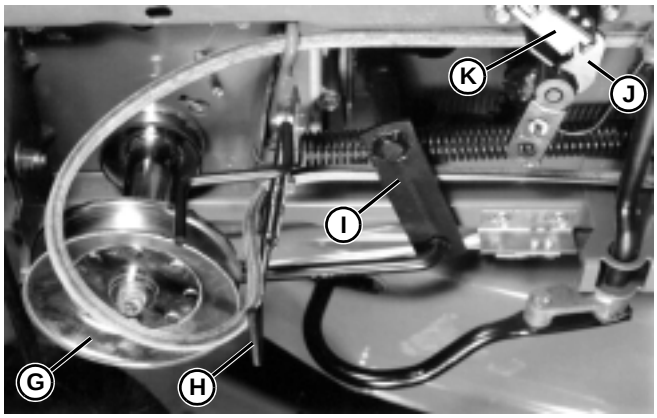
1. Examine belt to determine if it is worn, stretched, cracked, frayed, or damaged beyond the point of continued use.
2. Measure and compare removed belt to the following:

New Belt Dimensions:

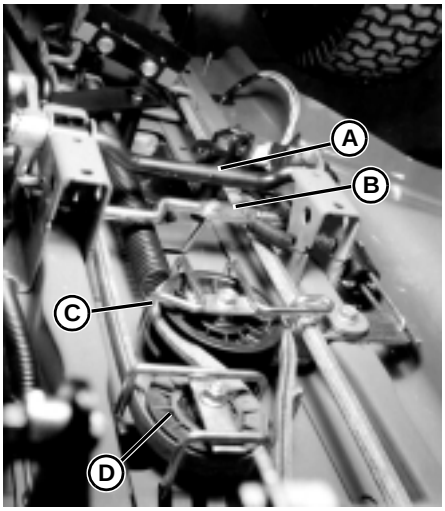
Length . . . . . 2660±8 mm (104.7±0.3 in.)
Minimum length . . . . . 2631 mm (103.6 in.)
Maximum length. . . . . 2710 mm (106.7 in.)
Top width . . . . . 12.7 mm (0.500 in.)
Minimum top width . . . . . 11 mm (0.43 in.)
Depth . . . . . 7.874 mm (0.31 in.)
Minimum depth. . . . . 7 mm (0.28 in.)

3. Replace belt if any of above dimensions are not found.

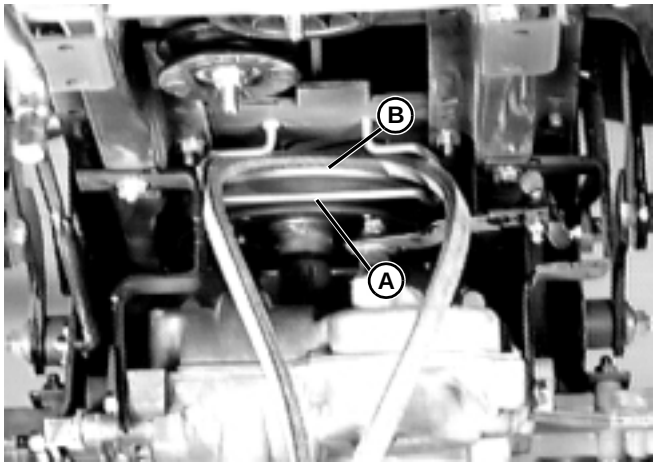
TRACTION DRIVE BELT INSTALLATION



1. Install end of drive belt under belt guide (H), and pull belt up between guide (H) and sheave (G). Pull belt over large sheave (G) and down into small sheave.
2. Route belt between mower drive lever (J) and switch (K), and around steering arm (I).



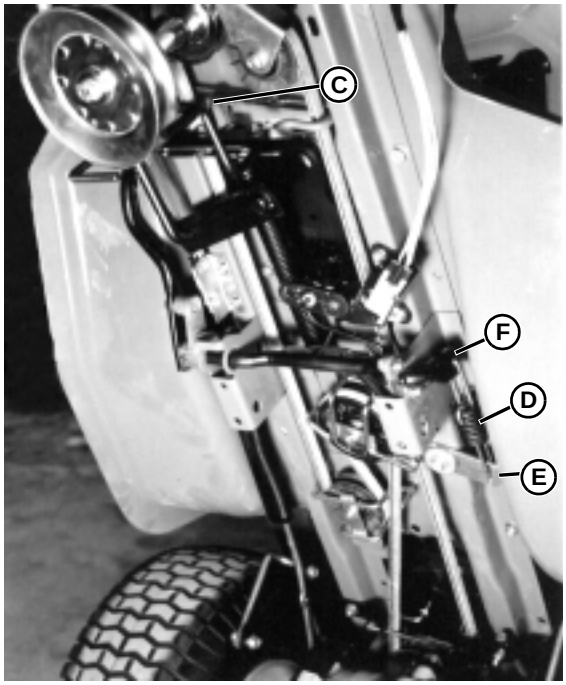
3. Route drive belt over the top of clutch cross shaft (A) and park brake locking rod (B).
4. Route through clutch sheave (C) and adjustable idler (D) as shown

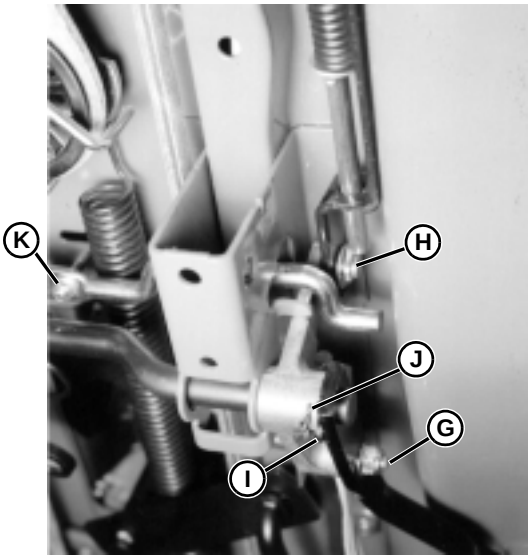


5. Install drive belt through rear belt guide (A) and over transaxle drive sheave (B).
6. Install belt guides on clutch sheave and adjustable idler.
7. Install park brake lever and mower drive lever return spring.
8. Release park brake and check that belt is seated in grooves of all sheaves and idlers.
9. Perform Clutch/Brake Pedal Linkage Adjustments, shown earlier in this section.

TRACTION DRIVE SYSTEM REMOVAL

1. Remove mower deck.
2. Block mower wheels securely at front and rear.
3. Engage park brake.
4. Remove traction drive belt from transaxle sheave.
5. Disengage park brake.





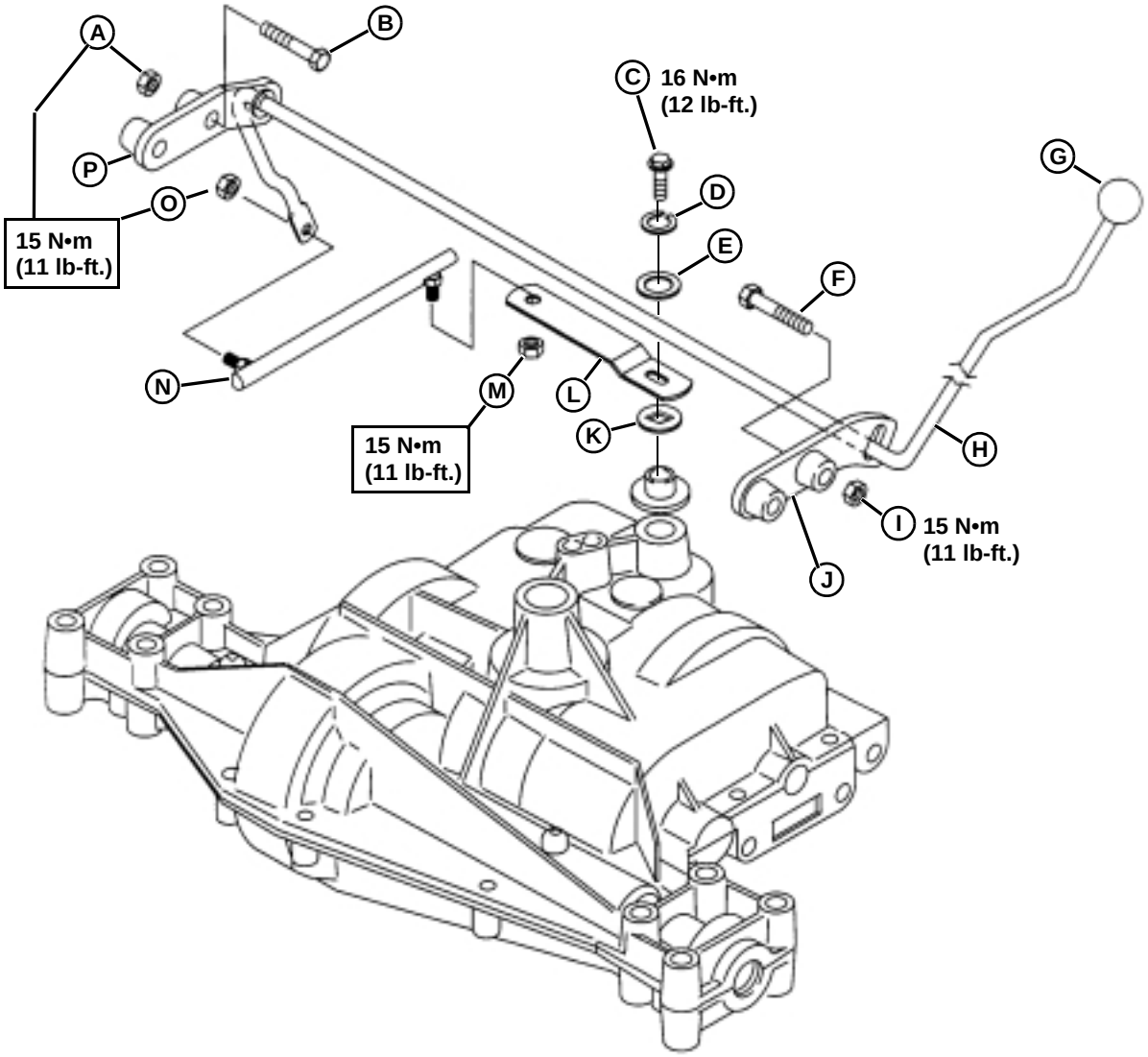
CAUTION

Clutch tension spring is capable of causing extreme injury if allowed to be released quickly from mower frame. Protect your face, eyes and hands before releasing spring.

6. Thread one end of a three foot long piece of starter rope under the front hook of clutch tension spring (C). Pull rope half way through spring until ends meet, and wrap ends around a bar several times to make a temporary handle. Pull handle until spring hook is free from frame, and release tension from spring. Tension is now off traction drive system and it may be worked on safely.
7. Remove clutch actuating spring (D) from clutch bellcrank (E) and cross shaft (F).
8. Remove clutch/brake pedal by removing mounting nut (G) and pulling pedal through frame.
9. Remove brake bracket from bellcrank by removing cotter key and washer (H).
10. Remove bellcrank from clutch shaft by removing safety wire (I) securing roll pin, then driving out roll pin (J) and removing bellcrank.
11. Remove two bolts and nuts through retainer plate holding left end of clutch shaft, and remove shaft from frame.
12. Remove nut (K) holding parking brake lock lever to parking brake locking rod.
13. Remove spring from frame to parking brake locking rod and slide rod out of frame.
14. Bellcrank assembly is held to frame with one bolt and bushing.

SHIFT LINKAGE REMOVAL & INSTALLATION

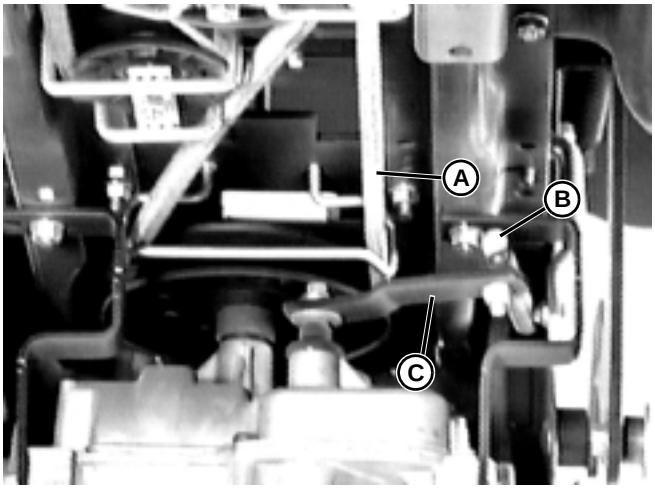
1. Remove battery.
2. Block rear of tractor off ground. Remove left drive wheel.
3. Remove shift knob (G).
4. Remove lock nuts (M and O) to remove shift link (N).
5. Remove lock nuts (A and I) and cap screws (B and F).
6. Adjust mounting brackets (J and P) so shift rod (H) can be removed from the left side of the frame. You will have to “snake” the shift rod from the tractor.
7. Remove cap screw (C) to remove shift lever (L) and washers (D, E, and K).
8. Replace necessary components.
9. Install shift linkage in reverse order of removal.
10. Tighten shift lever cap screw and lock nuts to specifications shown.



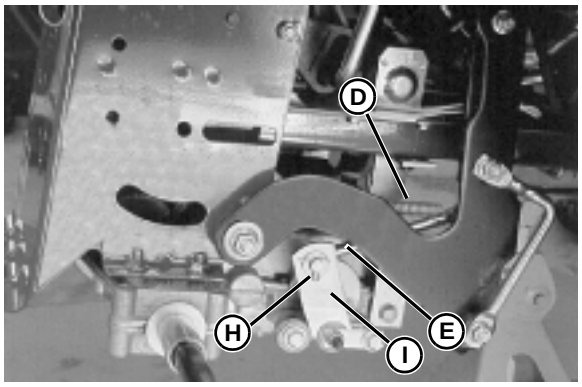
A–Lock Nut
B–Cap Screw
C–Shift Lever Cap Screw
D–Lock Washer
E–Washer
F–Cap Screw
G–Shifter Knob
H–Shift Rod
I–Lock Nut
J–Right-Hand Bracket
K–Special Square-Hole Washer
L–Shift Lever
M–Lock Nut
N–Shift Link
O–Lock Nut
P–Left-Hand Bracket

TRANSAXLE REMOVAL & INSTALLATION

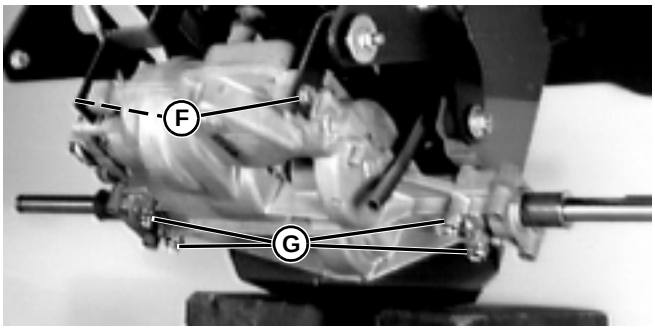
1. Raise mower off ground and support with jackstands under frame and not transaxle case.
2. Remove rear wheels.



3. Disconnect shift linkage (B) from shift arm (C).
4. Remove traction drive belt (A).
   Hint: Lock park brake to loosen belt. Release park brake after removal.



5. Disconnect clutch/brake rod return spring (D).
6. Remove cotter pin (H) and disconnect clutch/brake rod (E) from brake lever (I).



7. Support transaxle with jack stands or have a helper hold transaxle in place while you remove hardware.
8. Remove front cap screws (F) and rear hardware (G).
9. Carefully remove transaxle to workbench.
10. Install transaxle in reverse order of removal.
11. Tighten mounting hardware to the following specifications:

Front Hanger capscrews to frame . . . . . 30 N•m (22 lb-ft.)
Front transaxle cap screws to hangers . . . . . 27 N•m (20 lb-ft.)
Rear axle cap screws & nuts to frame . . . . . 30 N•m (22 lb-ft.)
Shift linkage lock nut . . . . . 15 N•m (11 lb-ft.)

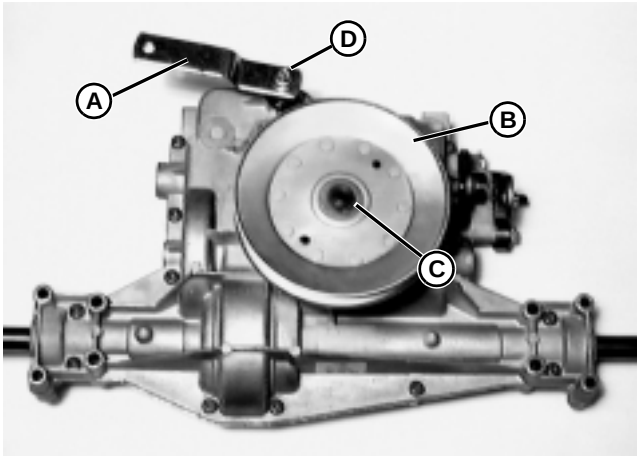
12. Install traction drive belt (A).
13. Install drive wheels.
14. Lower tractor to ground.

TRANSAXLE DISASSEMBLY

IMPORTANT: Maintain absolute cleanliness when working on transaxle. The close tolerances in this unit will not tolerate ANY dirt. Use only clean fresh multipurpose EP grease during assembly.

IMPORTANT: Pay close attention to the order and orientation of all components inside the transaxle. Tag and label parts, if necessary. This will aid assembly and prevent transaxle damage

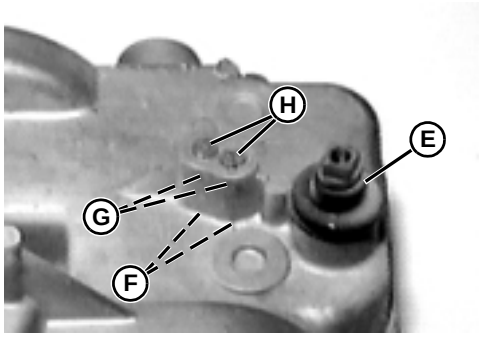
Remove Drive Sheave/Shift Arm:



1. Remove drive sheave snap ring (C).
2. Remove drive sheave (B).
3. Remove shift arm lock nut (D), lock washer, and flat washer.

4. Remove shift arm (A), and square-hole flat washer from transaxle shifter shaft

Remove Shifter Detent Assembly:

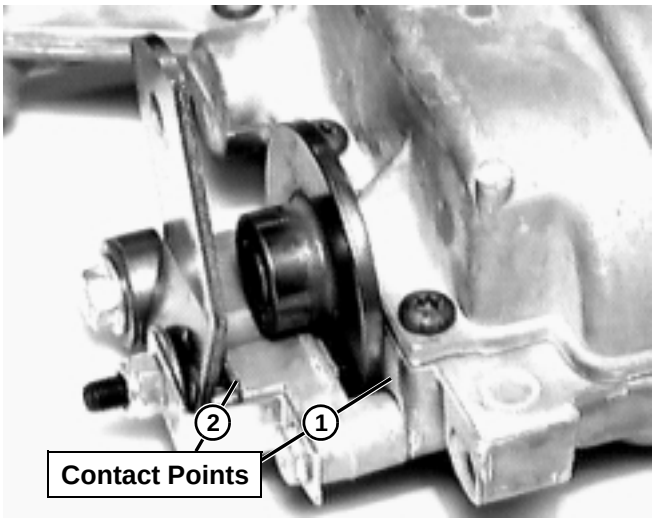


1. Remove shifter shaft rubber boot (E).
2. Remove both set screws (H) and detent springs (G).

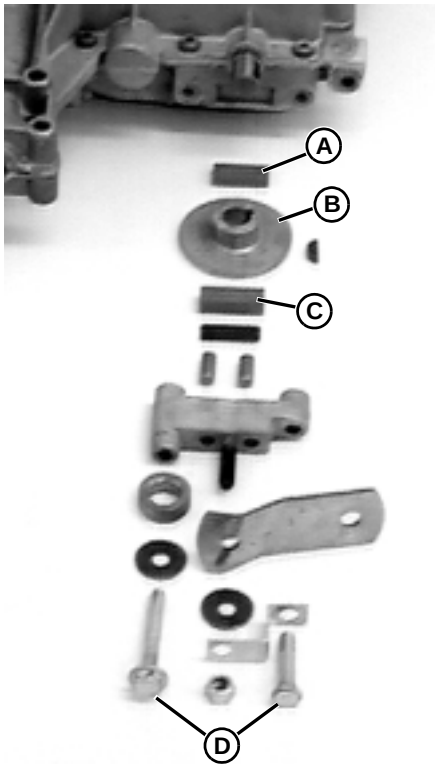
IMPORTANT: DO NOT drop or lose detent balls.

3. Use a magnet or place a shop cloth over holes and turn transaxle upside-down to catch both detent balls (F) in cloth.
4. Inspect detent balls and springs for wear or damage. Replace components as necessary. Do not install springs or detent balls until final assembly.

Remove Brake Assembly:



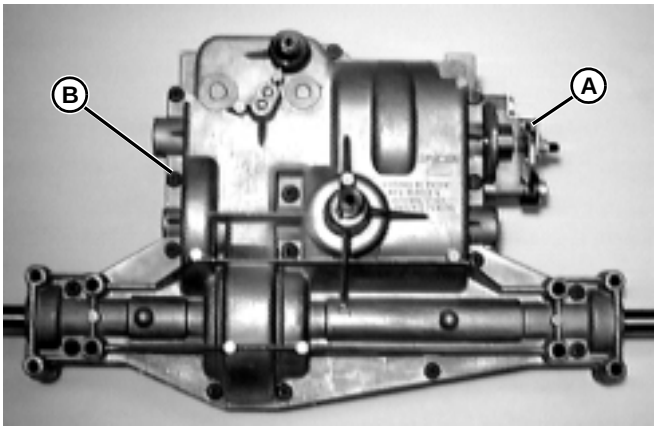
IMPORTANT: Before removal, inspect brake components for wear. Check that brake disc is not contacting transaxle case (1), brake lever is not contacting its mounting bracket (2) (top or bottom). If so, all worn components must be replaced.



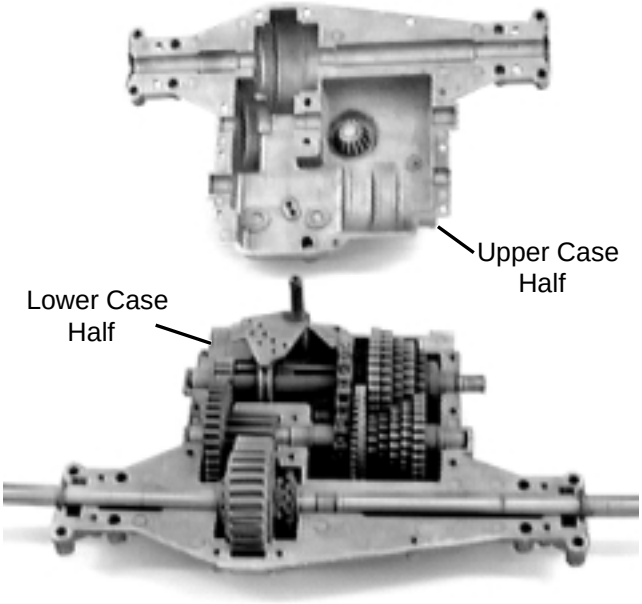
1. Remove brake assembly by removing two outer capscrews (D) holding caliper to transaxle.
2. It is recommended that inside (thin) brake pad (A), and outside (thick) brake pad (C), and brake disc (B), all be replaced when transaxle is disassembled.
3. Inspect remaining components for wear or damage. Replace components as necessary, but do not install this assembly until transaxle has been completely assembled.

Separate Transaxle Housing Case Halves:

IMPORTANT: Maintain absolute cleanliness when working on transaxle. The close tolerances in this unit will not tolerate ANY dirt. Use only clean fresh multipurpose EP grease during assembly.

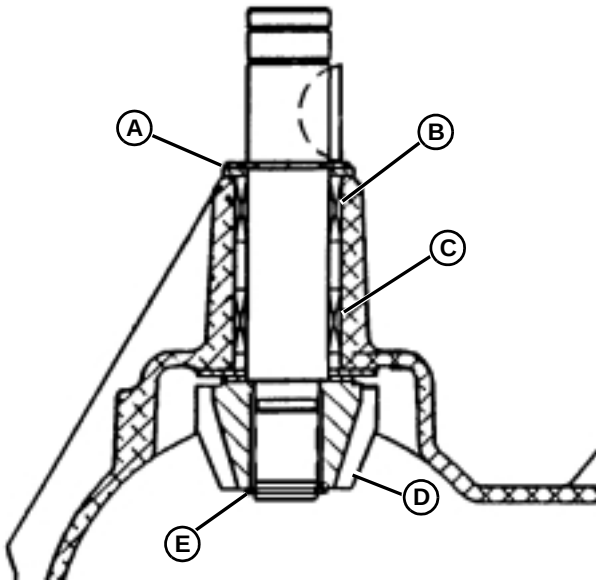


1. Remove brake assembly (A) (see previous procedure). Remove sixteen transaxle housing socket head screws (B).



2. Carefully separate transaxle housing case. Remove upper case from lower case assembly.
3. Inspect overall condition of transaxle without removing any components. Visually target worn or damaged parts for replacement.
4. Remove most of the grease without removing any components.

Input Shaft & Pinion Gear Inspection:

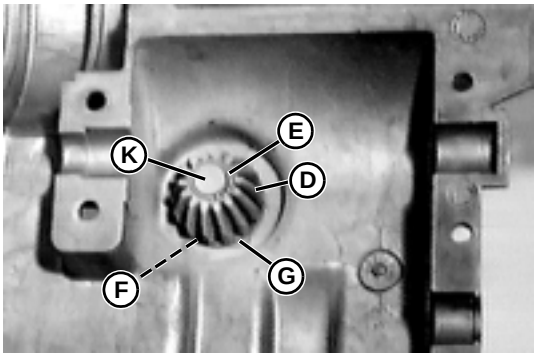


1. Visually check overall condition of assembly, including the key and keyway, and the drive sheave hub keyway.
2. Check condition of pinion gear (D) - look for wear, pitting, broken teeth, etc.
3. Grasp the input shaft and try to rock it left or right inside case housing. If movement is noticeable, replace needle bearing (B and C).
4. Use a feeler gauge to measure clearance between pinion gear (D) and snap ring (E):

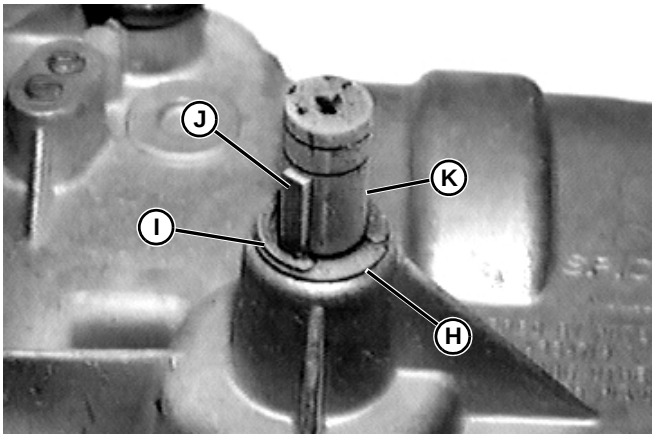
Clearance . . . . . .0.127 mm (0.005 in.) or less.

5. If clearance is excessive, shim thickness (A) needs to be changed or worn components must be replaced.

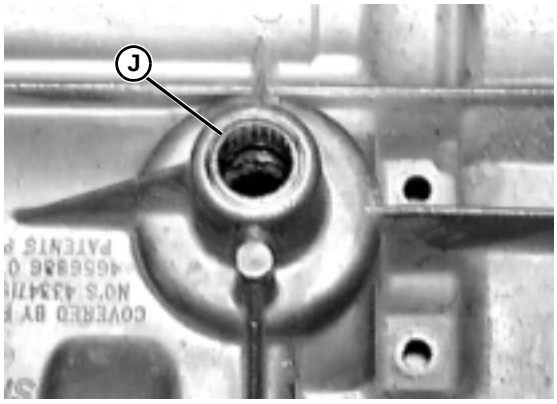
Input Shaft/Pinion Gear Disassembly:

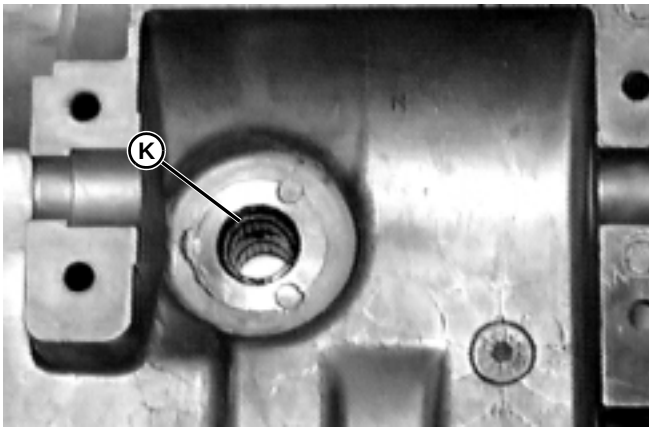


1. Remove snap ring (E), bevel pinion gear (D), small washer (F), and large washer (G) from input shaft (K) inside upper case half.



2. Turn upper case half so input shaft is facing up.
3. Remove woodruff key (J), E-ring (I), shim washer (H), and input shaft (K).





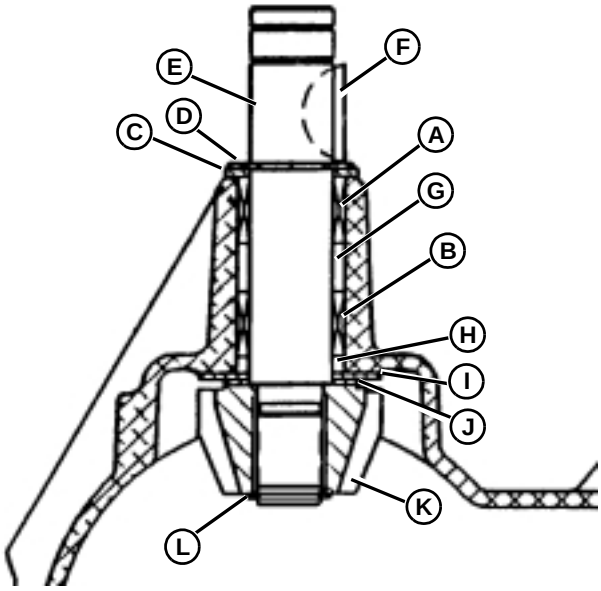
IMPORTANT: DO NOT scratch or deform upper case half bore when removing needle bearings.

4. Visually inspect condition of needle bearings, upper bearing (J) and lower bearing (K). If needles are discolored, spalled, scratched, missing, broken, etc. replace bearings.
5. Measure inside diameters of each bearing:

Bearing Inside Diameter . . . . . 15.89–15.92 mm (0.625–0.627 in.)

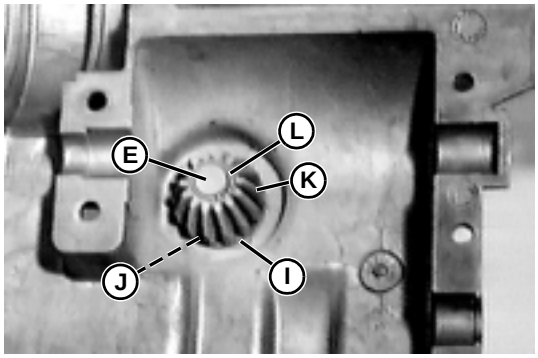
6. Replace both bearings by carefully pressing them from case bore without damaging bore.
7. Pack area between bearing with Multi-Purpose EP Grease.
8. Clean and inspect bore. If scratched or deformed, replace upper case half.

Assemble Input Shaft/Pinion Gear Assembly:

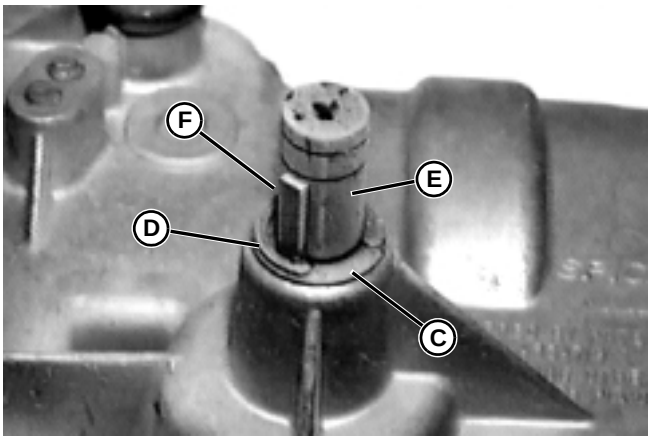


IMPORTANT: DO NOT scratch or deform upper case half bore when installing needle bearings.

1. Pack needle bearings (A and B) with Multi-Purpose EP Grease before installing.
2. Install lower needle bearing (B) with flat side of bearing (with lettering) toward inside of case. Press lower needle bearing in case bore with a maximum recess of **0.76 mm (0.030 in.)** (H) from case surface.
3. Install upper needle bearing (A) with flat side of bearing (with lettering) toward outside of case. Press lower needle bearing flush with surface of case bore. A maximum recess of **0.76 mm (0.030 in.)** from case surface is also acceptable.
4. Pack cavities (G and H) with Multi-Purpose EP grease before installing input shaft.



5. Install input shaft (E) (with keyway on outside of case), large washer (I), small washer (J), bevel pinion gear (K), and snap ring (L).

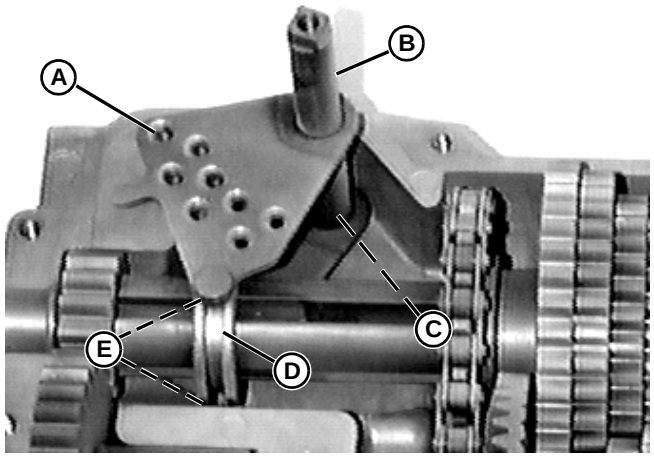


6. Turn upper case half over.
7. Install a shim washer (C) (from Shim Kit) of the proper thickness that allows enough clearance for E-ring (D) to be installed.
8. Turn upper case half over and measure air gap between snap ring (L) and bevel pinion gear (K):

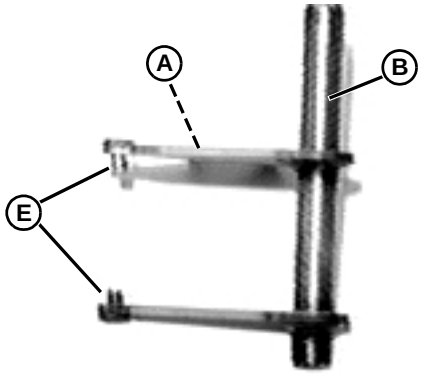
Clearance . . . . . .0.127 mm (0.005 in.) or less.

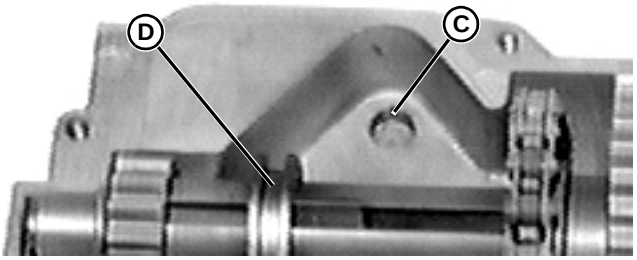
9. If clearance is excessive, shim thickness (C) needs to be changed.
10. Install woodruff key (F) in shaft keyway.

Shifter Disassembly:



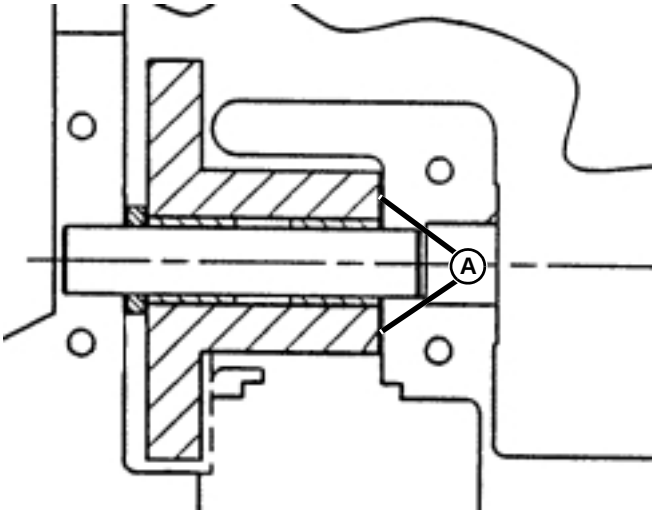
1. Lift shifter shaft (B) from lower case half mounting hole (C) and groove of shift collar (D).





2. Clean shifter assembly and inspect condition of detent holes (A), shift pins (E), shaft (B), lower case mounting hole (C), and shift collar (D).
3. Replace any worn or damaged parts of shifter assembly, rubber boot, detent balls, detent springs, or set screws.
4. If lower case mounting hole (C) is worn or damaged, replace the case half.
5. If shift collar (D) is worn or damaged, replace it when intermediate shaft assembly is disassembled.

Idler Gear Inspection:

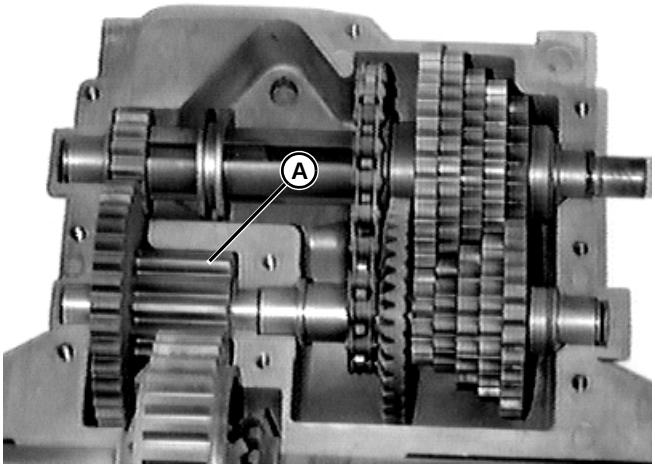


1. Visually check overall condition of assembly, including shaft and bushings, gears for wear, pitting, broken teeth, etc.
2. Use a feeler gauge to measure clearance (A) between end surface of combination gear and side surface of case half:

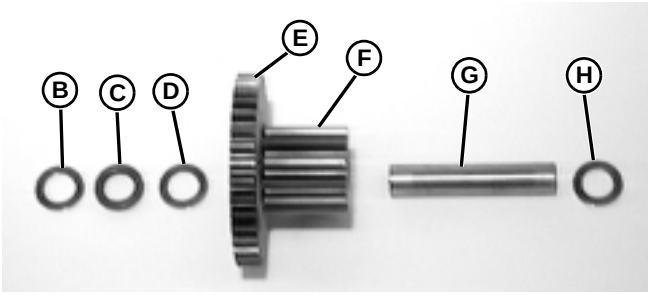
Clearance . . . . . 0.33—0.63 mm (0.013 —0.025 in.),

3. If clearance is excessive worn and/or damaged components need to be replaced.

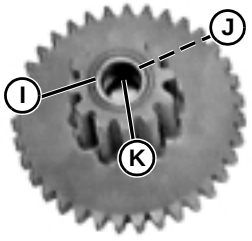
Idler Gear Disassembly:



1. Lift idler gear assembly (A) from lower case half.
2. Clean components and disassemble.

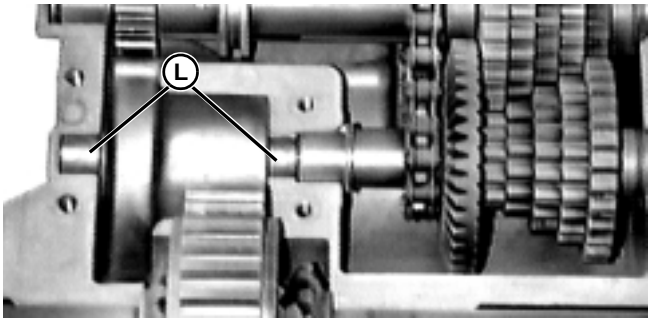


3. Separate and inspect idler components:
   - Washers (B and D) should be 0.632 x 1.00 x 0.026 in., not scored nor discolored (burnt).
   - Spacer (C) should be 0.630 x 1.00 x 0.169 in., not scored nor discolored (burnt).
   - Narrow combination gear (E) should have 35 good teeth and wide combination gear (F) should have 12 good teeth, not scored nor discolored (burnt).
   - Idler shaft (G) should be smooth and not scored, pitted, nor discolored (burnt).
   - Shim washer(s) (H) should be 0.632x1.00 and range in thickness from 0.010 to 0.082 in.



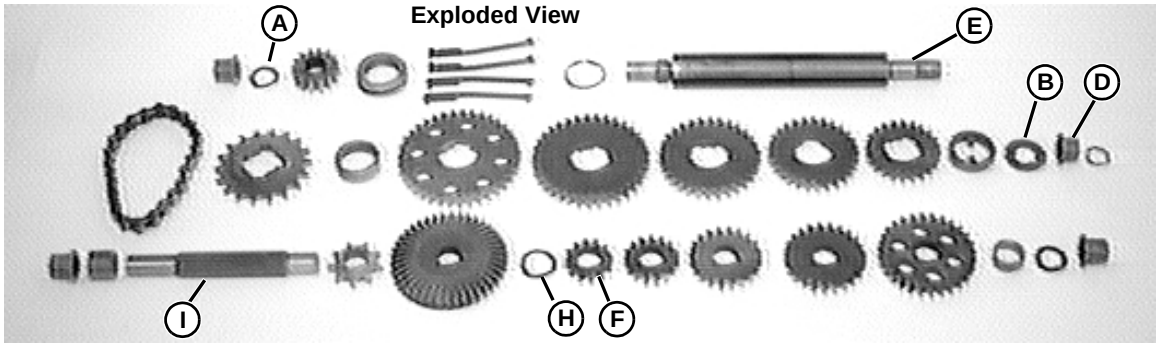
- Inside bearing (I) and outside bearing (K), (which are press fit), should not be scored nor discolored (burnt);

NOTE: Replacement gear and needle bearings and a new shaft are also recommended whenever new gear is ordered.

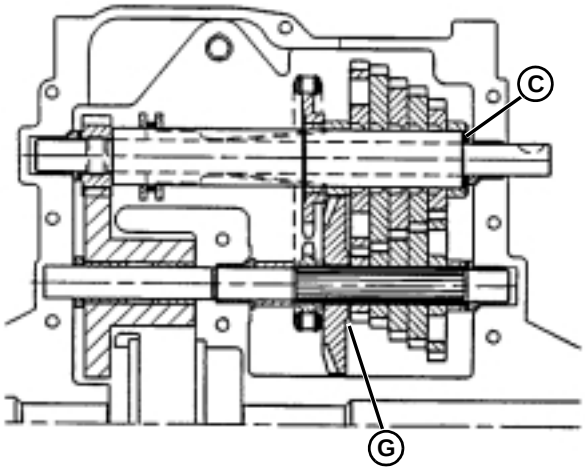


4. Inspect lower and upper case halves idler shaft bearing surfaces (L) for excessive scoring or wear. Replace case halves as necessary.

INTERMEDIATE SHAFT & DRIVE SHAFT REPAIR



Intermediate & Drive Shaft Inspection:



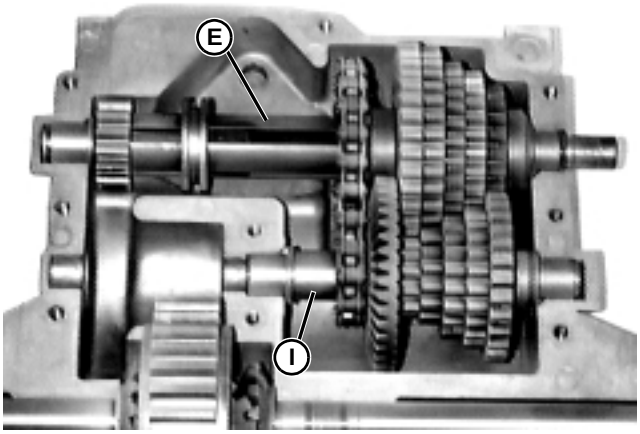
1. Inspect overall condition of intermediate shaft and drive shaft assemblies, including gears for wear, pitting, broken teeth, etc.
2. For the drive shaft assembly (I), use a feeler gauge to measure clearance (G) between side surface of small gear (F) and side surface of shim washer (H):
3. For the intermediate shaft assembly (E), use a feeler gauge to measure clearance (C) between end surface of flange bearing (D) and washer (B):

Clearance (G) . . . . . 0—0.20 mm (0—0.008 in.)

Clearance (C) . . . . . 0—0.25 mm (0—0.010 in.)

4. If either or both clearance measurements are in excess of specifications shim washers (A) or (H) need to be added or worn components need to be replaced.

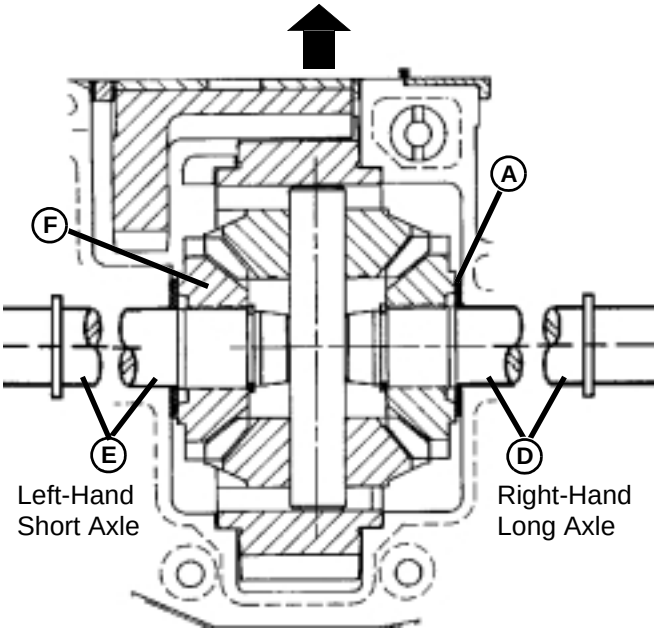
Intermediate & Drive Shaft Disassembly:



1. Lift both drive (I) and intermediate (E) shaft assemblies from transaxle case together.
2. Carefully remove drive shaft assembly components (bottom row of exploded view) from drive shaft (I). Be sure to remember each components orientation to its neighbor and to the drive shaft. Mark the same side of each component to aid reassembly.
3. Clean components individually once disassembled.
4. Inspect each component closely for wear, scoring, cracks, chips, and broken teeth or splines.
5. Repeat steps 2 through 4 for the intermediate shaft (E) and its components (top two rows of exploded view).
6. Replace components as necessary.

IMPORTANT: Remember gear sets are a matched set and both must be replaced, even if only one gear in the set is damaged.

Differential/Axle Shaft Inspection:

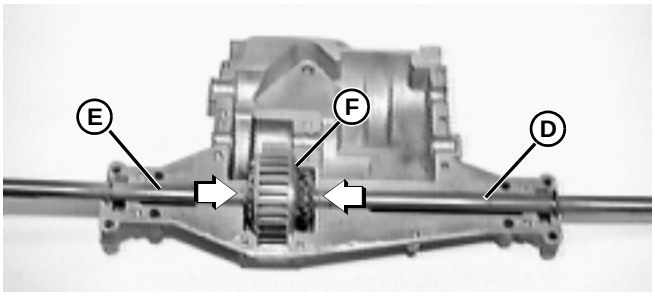


1. Visually check overall condition of assembly.
2. Use a feeler gauge to measure clearance (A) between side surface of shim washer and side surface of lower case:

Clearance . . . . . 0.18—0.38 mm (0.007—0.015 in.),

3. If clearance is excessive, worn or damaged components must be replaced.

Differential/Axle Shafts Disassembly:



1. Put inward pressure on both axles (D and E) as you lift differential assembly (F) from lower case.

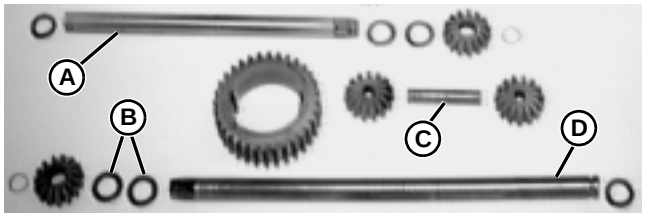
2. Carefully remove axle shaft assembly components from ring gear (G). Be sure to remember each components orientation to its neighbor and to the ring gear (G). Mark the same side of each component to aid reassembly.
3. Clean components individually once disassembled, be sure to remove all sealant material from upper and lower case halves.
4. Inspect each component (especially both upper and lower case halves) closely for wear, scoring, cracks, chips, or discoloration (burnt). Replace components as necessary.
5. Replace seals (I and F) **every time** transaxle housing has been separated.

TRANSAXLE ASSEMBLY

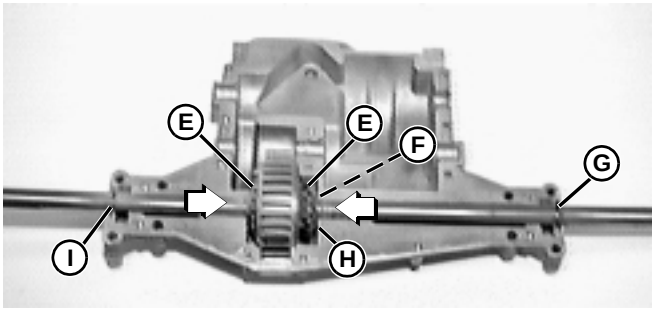
IMPORTANT: Maintain absolute cleanliness when working on transaxle. The close tolerances in this unit will not tolerate ANY dirt. Use only clean fresh multipurpose EP grease during assembly.

IMPORTANT: Coat all mating surfaces, except seal surfaces, with SAE 30 weight oil before assembly. Pay close attention to proper order and orientation of all components. Use a calliper to identify the correct shim, spacer, or washers are installed correctly.

Differential/Axle Shaft Assembly:

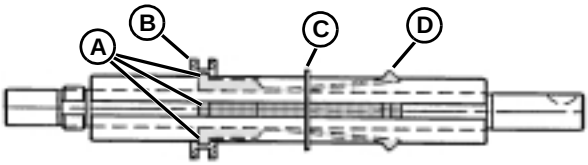


1. Assemble left-hand, short axle (A) as shown with splined, beveled gear facing the ring gear.
2. Assemble right-hand, long axle (D) as shown with splined, beveled gear facing the ring gear and shim washers (B) assembled in combination of thicknesses to obtain specified air gap (see Inspect Differential/Axle Shafts Assembly).
3. Assemble internal shaft (C) as shown with beveled gears facing each other.
4. Install internal shaft assembly in slots of ring gear and push beveled gears away from each other so they are ready to mesh with both axle beveled gears.

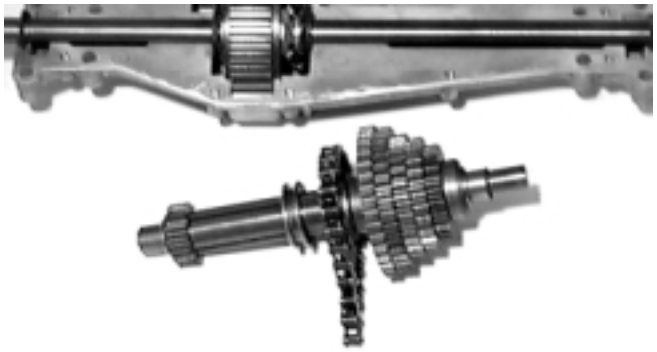


5. Install axle shafts so beveled gears (E) mesh with differential internal shaft beveled gears.
6. Keep inward pressure on both axles as you install differential assembly in lower case housing.
7. Measure air gap between shim washers (F) and side of housing (H). If air gap meets specification (see Inspect Differential/Axle Shafts Assembly), go to next step. If air gap does not meet specification, remove right axle shaft and add other shim washer combinations until air gap in within specification.
8. Carefully install new axle shaft seals (G and I) and seat them in their lower case housing grooves.

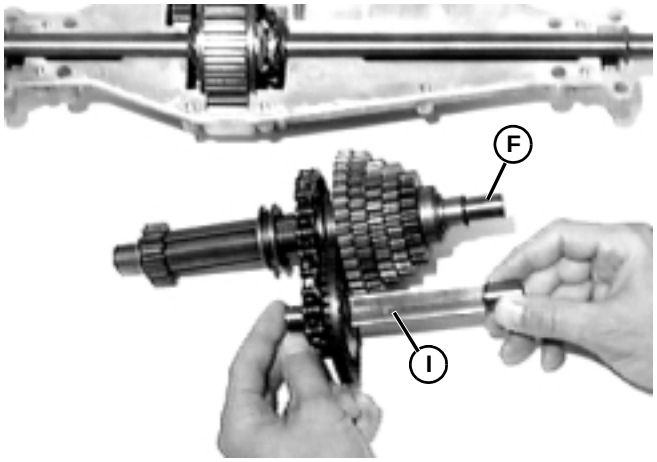
Assemble Drive/Intermediate Shaft Assemblies:



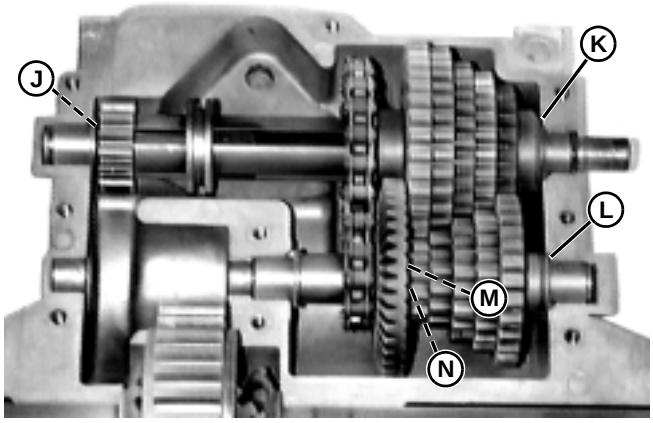
1. Install retaining ring (C) in intermediate shaft groove.
2. Install four keys in grooves of intermediate shaft and hold them so internal shift collar anchors (A) will seat in internal groove of collar (B) as it is installed on the shaft.
3. Slide shift collar and keys against retaining ring (C) and compress locking ramps/lugs (D) to clear retaining ring.



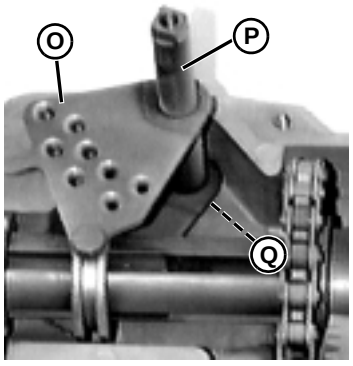
4. Install remaining intermediate shaft components in their proper order and orientation (reference top two rows of components in exploded view at the beginning of this section).



5. Install drive shaft components one at a time from left-to-right (reference bottom row of components in photo M42335 at the bottom of this page). Long flange of small sprocket (J) faces bevel drive gear.
6. Shim washer(s) (E) for intermediate shaft (F) are found in Shim Kit.
7. Shim washer(s) (H) for drive shaft (I) are found in Shim Kit.
8. Install new intermediate shaft seal (G) with open lip facing inside.

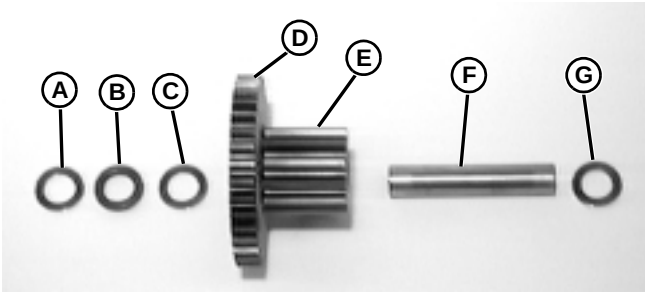


9. Measure air gaps (K and N)—(see Inspect Drive/ Intermediate Shaft Assemblies). Make any changes in shim washer (M) thicknesses from Shim Kit and shim washer (J) thicknesses from Shim Kit to obtain proper air gaps.
10. When proper air gap is obtained, gears should drag slightly against feeler gauge.



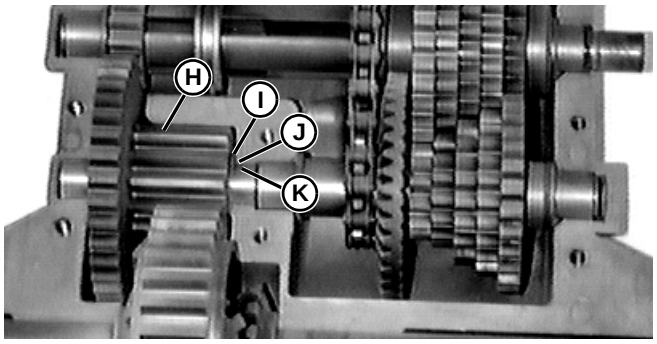
11. Apply Never-Seez® to top surface (O) of shifter plate and contact portions of shifter shaft (P) and (Q) with upper and lower case halves.
12. Install shifter fork assembly.

Assemble Idler Combination Gear Assembly:



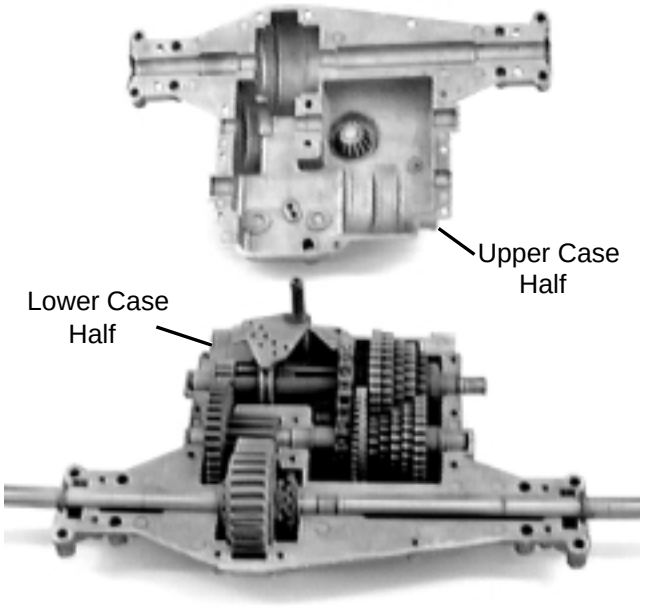
1. Install components on idler shaft in order shown:

- Washers (A and C) should be 0.632 x 1.00 x 0.026 in.,
- Spacer (B) should be 0.630 x 1.00 x 0.169 in.,
- Narrow combination gear (D) should have 35 good teeth and wide combination gear (E) should have 12 good teeth,
- Idler shaft (F) should be smooth, not scored, worn, or pitted,
- Shim washer(s) (G) are found in Shim Kit.

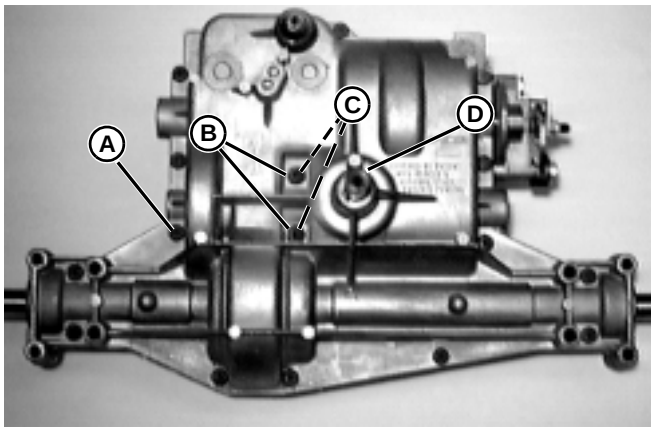


2. Install idler combination gear assembly (H) into lower case half.
3. Measure air gap (J) between shim washer (I) and face of case (K) (see Inspect Idler Combination Gear Assembly).
4. When proper air gap is obtained, assembly should drag slightly against feeler gauge.

Assembly Transaxle Housing Case Halves:

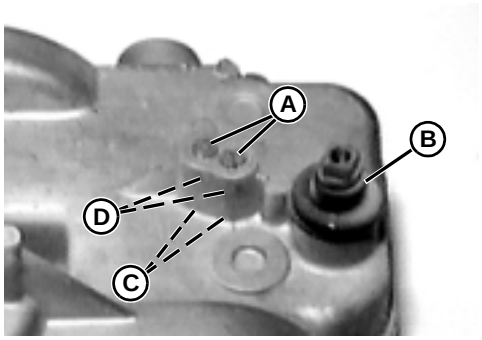


1. Pack upper case beveled pinion gear and lower case housing assembly with 638 g (1.406 lbs) of Multi-Purpose EP grease.
2. Apply Form-In-Place Gasket Silicone Sealant to lower case.
3. **BE SURE** sealant **DOES NOT** contact any gear, shaft, or bearing surfaces.



4. Align lower and upper case halves together, **be sure** shaft seals are seated correctly and you may have to turn input shaft (D) slightly to insure beveled pinon gear meshes with beveled drive gear.
5. Install 14 outside socket head screws (A) and two center socket head screws (B) with new rubber seals (C).
6. Tighten screws to **10 N•m (88 lb-in.)**.

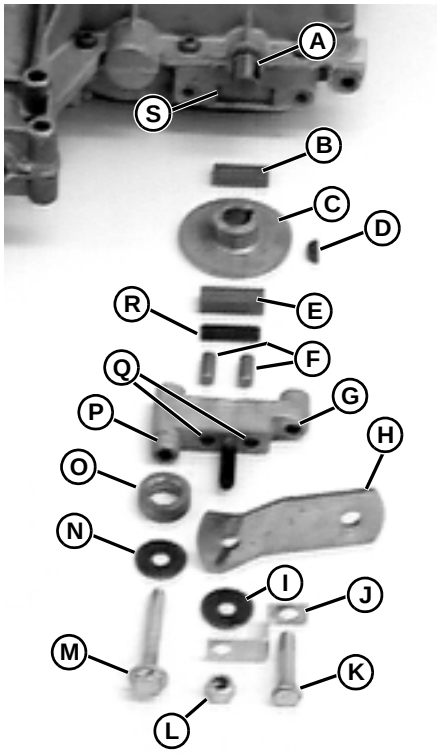
Install Shifter Detent Assembly:



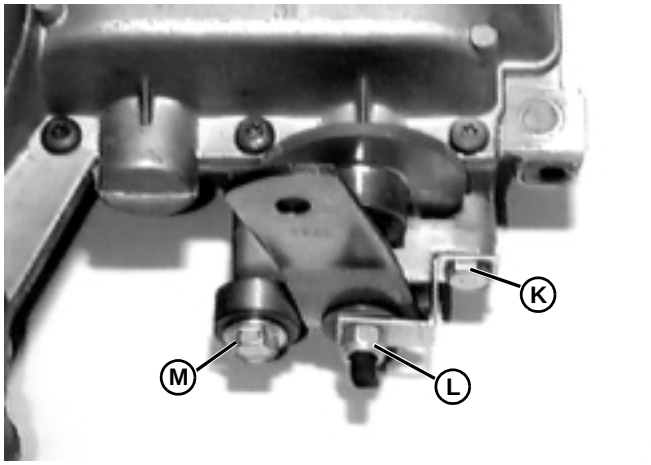
IMPORTANT: DO NOT drop or lose detent balls.

1. Install shifter shaft rubber boot (B).
2. Coat detent balls (C) and springs (D) with Never-Seez and install in case bores.
3. Install and tighten set screws (A) until they are flush with top of mounting hole surface.

Install Brake Assembly:

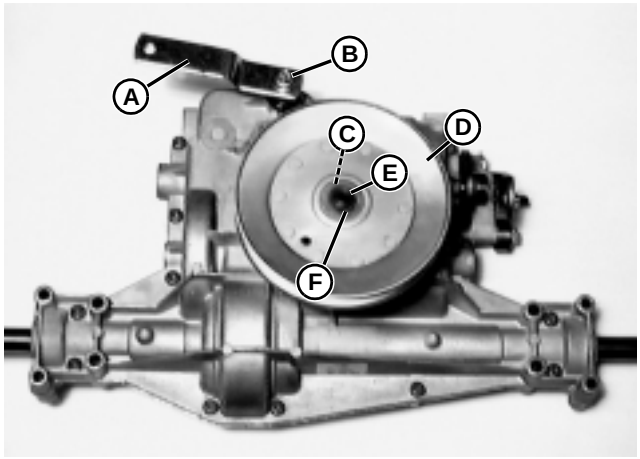


1. Install woodruff key (D) into shaft keyway (A).
2. Install thinner friction puck (B) in lower case puck recess (S).
3. Install brake disc (C) with hub outward.
4. Install spacer (O) over left lip (P) of mounting bracket.
5. Install long cap screw (M) and washer (N) in left mounting bracket hole.
6. Install brake lever (H), washer (I), bent bracket (J), and lock nut (L) on mounting bracket center stud.
7. Install short cap screw (K) in right mounting bracket hole (G).
8. Install dowel pins (F) inside two center mounting bracket holes (Q).
9. Install striker plate (R) and thick friction puck (E) in backside recess of mounting bracket.



1. Install complete brake assembly to transaxle.
2. Tighten cap screws (K and M) to **20 N•m (160 lb-in.)**.
3. Tighten lock nut (L) to specification until there is a **10 mm (0.39 in.)** clearance between thick friction puck and brake disc.

Install Drive Sheave and Shift Arm:



1. Install woodruff key (C) in input shaft (E).
2. Install drive sheave (D) and fasten with snap ring (F).
3. Install shift arm (A). Tighten cap screw (B) to **16 N•m (140 lb-in.)**.

NOTE: Be sure when installing that special square hole washer and shift arm are seated properly over square end of shifter shaft.

Install Transaxle:

See “TRANSAXLE REMOVAL & INSTALLATION” on page 23.

Page

HYDROSTATIC POWER TRAIN

NOTE: INSPECTION, DISASSEMBLY, AND REPAIR INSTRUCTIONS SHOWN IN THIS MANUAL ARE FOR OUT-OF-WARRANTY REPAIRS ONLY.

This transaxle is warranted for 2 years (residential-homeowner application) or 90 days (commercial application). Should an internal defect result in a transaxle failure within the warranty period, John Deere will replace the transaxle assembly.

NOTE: If internal hydro component parts are suspected (after performing all external checks and adjustments) CALL SABRE SERVICE DEPARTMENT FOR AUTHORIZATION TO REPLACE TRANSAXLE ASSEMBLY.

SPECIFICATIONS

Gear Teeth:	K–55	K–51
Spur Gear (drive shaft)	6 teeth	12 teeth
Differential Ring Gear	98 teeth	53 teeth
Differential Bevel Pinion Gears		
Cross shaft	10 teeth	10 teeth
Axle shafts)	16 teeth	16 teeth

Drive Belt:	K–55	K–51
Effective Length		
New	2485 mm (97.8 in.)	2400 mm (94.5 in.)
Top Width		
New	13.11 mm (0.52 in.)	12.7 mm (0.50 in.)
Minimum	10 mm (0.39 in.)	10 mm (0.39 in.)
Bottom Width		
New	7.93 mm (0.31 in.)	7.63 mm (0.30 in.)
Minimum	6 mm (0.24 in.)	6 mm (0.24 in.)
Depth		
New	9.46 mm (0.37 in.)	8.89 mm (0.35 in.)
Minimum	7 mm (0.28 in.)	7 mm (0.28 in.)

Lubrication:	K–55	K–51
Oil Type	10W30 Engine Oil, Class CD	Factory Sealed
Capacity	1.6 L (1.7 qt)	Factory Sealed

Gear Ratios:	K–55	K–51
Forward	25.3:1	28.2:1
Reverse	25.3:1	28.2:1

Ground Speeds:	K–55	K–51
Domestic—Forward	0–8.66 km/hr (0–5.38 mph)	0–8.5 kph (0–5.3 mph)
Reverse	0–4.24 km/hr (0–2.62 mph)	0–5.3 kph (0–3.3 mph)
Export—Forward	0–7.75 km/hr (0–4.82 mph)	0–8.5 kph (0–5.3 mph)
Reverse	0–3.80 km/hr (0–2.36 mph)	0–5.3 kph (0–3.3 mph)

Output Torque Rating:	K–55	K–51
Rated	196 N•m (145 lb-ft)	231 N•m (170.4 lb-ft)
Maximum	680 N•m (506 lb-ft)	805 N•m (594 lb-ft)

Brake Torque Rating:	K–55	K–51
Maximum	196 N•m (145 lb-ft) at 245 N (55 lbs) Brake Arm Force	

Rear Axle Loading:	K–55	K–51
Maximum	240 kgs (528 lbs)	240 kgs (528 lbs)

REPAIR SPECIFICATIONS

Transaxle Components Wear Tolerances:	K–55	K–51
Pump (Input) Shaft		
Wear Limit	Visual Check	N/A
Motor (Drive) Shaft		
Wear Limit	Visual Check	N/A
Axle Shaft Thrust Washers		
Wear Limit	Visual Check	N/A
Pump Plate		
Wear Limit	Visual Check	N/A
Motor Plate		
Wear Limit	Visual Check	N/A
Pump Swashplate Upper Case		
Thrust Bushings Minimum	1.3 mm (0.051 in.)	N/A
Pump Swashplate Bushing		
Wear Limit	Visual Check	N/A
Pump Swashplate-To- Shifter Blocks		
Maximum	0.15 mm (0.0059 in.)	N/A
Axle Shaft-To-Upper Case Bushing		
Maximum	0.5 mm (0.02 in.)	N/A
Differential Cross-Shaft-To-Bevel		
Pinion Gears Maximum	0.5 mm (0.02 in.)	N/A

Brake Components Wear Tolerances:	K–55	K–51
Brake Disc (Minimum)	2.5 mm (0.1 in.)	N/A
Brake Puck (Minimum)	8 mm (0.32 in.)	N/A
Brake Lever		
Minimum	25 mm (1 in.)	N/A
Degrees Forward from Vertical	30°	20°
Travel Maximum	30°	30°

TORQUE SPECIFICATIONS	K–55	K–51
Brake Lever Bracket Cap Screws	55 N•m (40 lb-ft.)	55 N•m (40 lb-ft.)
Case Cap Screws		
New Case	30 N•m (264 lb-in.)	30 N•m (264 lb-in.)
Used Case	27 N•m (243 lb-in.)	27 N•m (243 lb-in.)
Center Block Cap Screws	55 N•m (40 lb-ft.)	N/A
Drain Plug	19 N•m (168 lb-in.)	N/A
Pump Port Connector	24 N•m (217 lb-in.)	N/A
Pump Port Connector Pipe Plug	8 N•m (72 lb-in.)	N/A
Pump Port Plug	24 N•m (217 lb-in.)	N/A
Reservoir Cover Cap Screws	29 N•m (260 lb-in.)	N/A

OTHER MATERIALS

Transaxle Housing Case Half Sealant:	K–55	K–51
	Form-In-Place Silicone Gasket Sealant	N/A

Pump Connector Pipe Plug Sealant:	K–55	K–51
. . . . .	Pipe Sealant With Teflon®	N/A
. . . . .	Approved Teflon® Sealant Tape	N/A

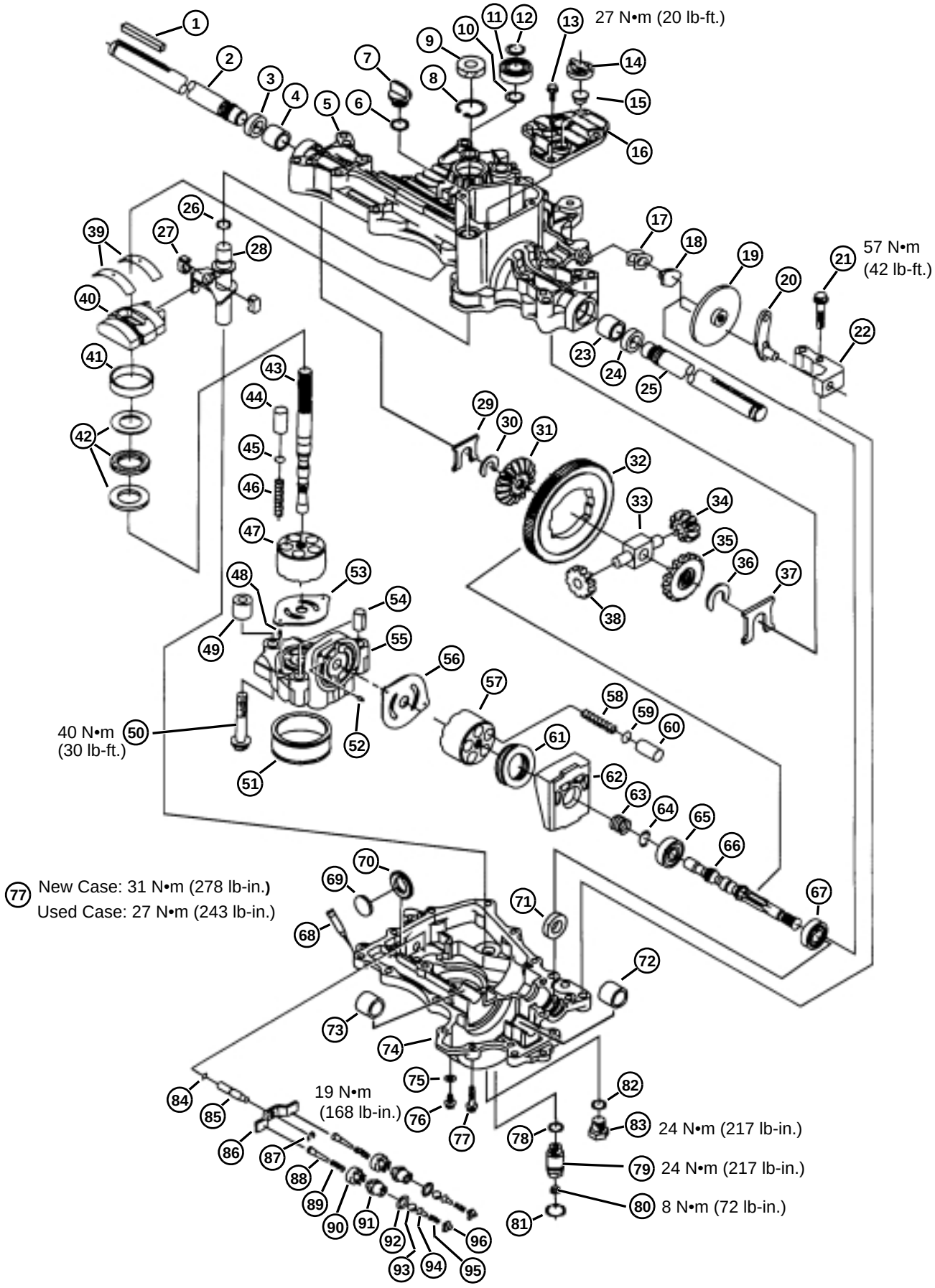
Lubrication:	K–55	K–51
Type	10-W-30 Class-CD	Factory Sealed

COMPONENT LOCATION

COMPONENT LOCATION—K55

1. Axle Shaft/Wheel Key (2 used)
2. Left Axle Shaft
3. Left Axle Shaft Seal
4. Left Axle Shaft Bushing
5. Upper Case Housing
6. O-Ring
7. Fill Cap
8. Snap Ring
9. Input Shaft Seal
10. Snap Ring
11. Ball Bearing
12. Snap Ring
13. Cap Screw (M8x20) (4 used)
14. Vent Valve Cap
15. Vent Valve
16. Reservoir Cover
17. Brake Friction Puck Shims
18. Brake Friction Puck
19. Brake Disc (splined)
20. Brake Lever
21. Cap Screw (M10x45) (2 used)
22. Brake Lever Mounting Bracket
23. Right Axle Shaft Bushing
24. Right Axle Shaft Seal
25. Right Axle Shaft
26. Shifter Shaft O-Ring
27. Shift Block (2 used)
28. Shifter Shaft
29. Left Axle Shaft Thrust Washer
30. Left Axle Shaft C-Ring Retainer
31. Left Axle Shaft Differential Bevel Pinion Gear (16 teeth)
32. Differential Ring Gear (98 teeth)
33. Differential Cross Shaft Block
34. Differential Cross Shaft Bevel Gear (10 teeth)
35. Right Axle Shaft Differential Bevel Pinion Gear (16 teeth)
36. Right Axle Shaft C-Ring Retainer
37. Right Axle Shaft Thrust Washer
38. Differential Cross Shaft Bevel Gear (10 teeth)
39. Pump Swashplate Upper Case Thrust Bushing (2 used)
40. Pump Swashplate
41. Pump Swashplate Bushing
42. Pump Swashplate Bearing
43. Pump Input Shaft
44. Pump Piston (5 used)
45. Pump Piston Washer (5 used)
46. Pump Piston Spring (5 used)
47. Pump Cylinder Block
48. Pump Plate Dowel Pin (2 used)
49. Spacer (M10x20x20)
50. Cap Screw (M10x60) (3 used)
51. Pump Filter
52. Motor Plate Dowel Pin (2 used)
53. Pump Plate
54. Rolled Pins (M12x22) (2 used)
55. Pump and Motor Center Block
56. Motor Plate
57. Motor Cylinder Block
58. Motor Piston Spring (5 used)
59. Motor Piston Washer (5 used)
60. Motor Piston (5 used)
61. Motor Swashplate Bearing
62. Motor Fixed Swashplate Housing
63. Spring
64. Snap Ring
65. Ball Bearing
66. Motor Output Shaft (6 teeth)
67. Ball Bearing
68. Silicone Sealant
69. Debris Magnet
70. Magnet Seal
71. Motor Output Shaft Seal
72. RH Axle Bushing
73. LH Axle Bushing
74. Lower Case Housing
75. O-Ring
76. Drain Plug
77. Cap Screw (Self-Tapping) (M8x30) (17 used)
78. O-Ring
79. Bleed Port Connector
80. Pipe Plug
81. O-Ring
82. O-Ring
83. Pump Port Plug
84. O-Ring
85. Transport Bypass Valve Actuating Pin
86. Transport Bypass Valve Actuating Bracket
87. E-Ring
88. Transport Bypass Valve Push Pin (2 used)
89. Transport Bypass Valve Spring (2 used)
90. Transport Bypass Valve Push Pin Guide (2 used)
91. Transport Bypass Valve Body (2 used)
92. O-Ring (2 used)
93. Ball (2 used)
94. Ball Holder (2 used)
95. Spring (2 used)
96. Spring Holder (2 used)

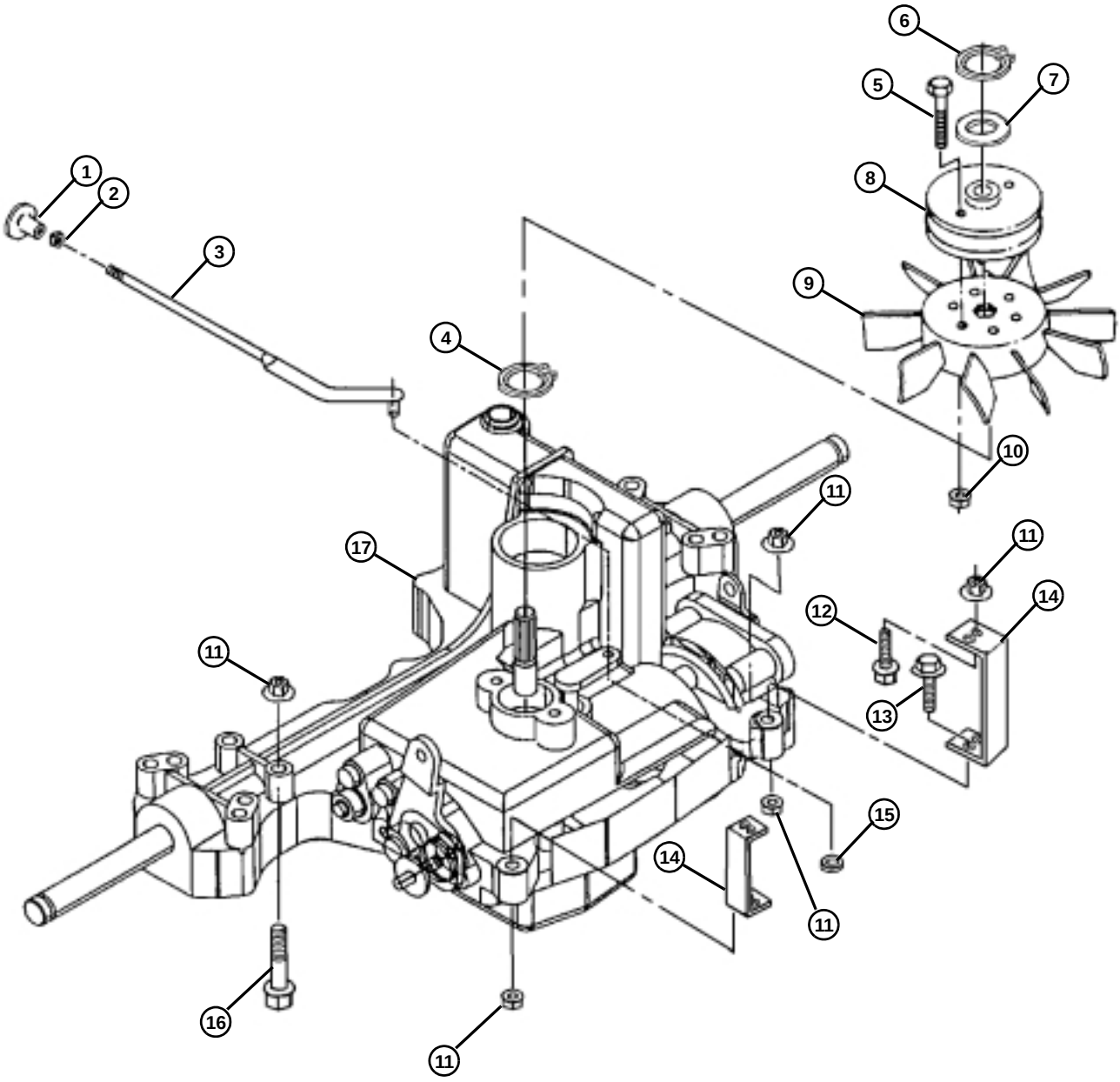
COMPONENT LOCATION—K55



COMPONENT LOCATION—K51

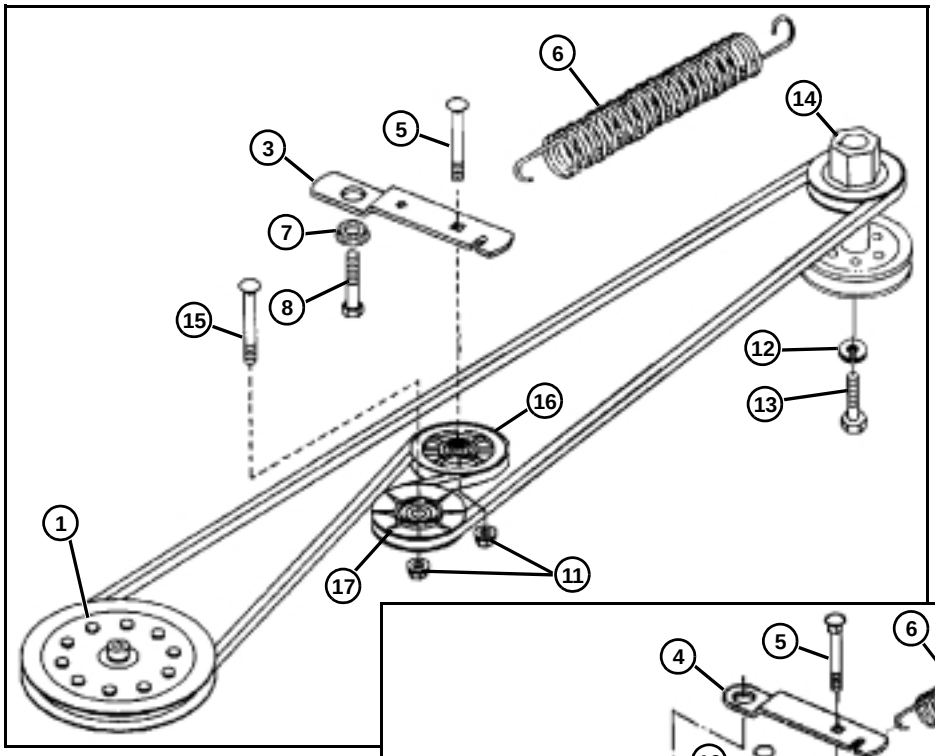
1. Knob
2. 1/4X20 Hex Jam Nut
3. Rod
4. E-Ring
5. M6X30 Bolt
6. Snap Ring
7. Spacer
8. Sheave
9. Fan
10. Flnage Lock Nut
11. Lock Nut
12. Screw
13. Screw
14. Strap
15. Push Nut
16. Screw (R.H. Side)
    Screw (L.H. Side Not Shown)
17. Transmission Assembly

COMPONENT LOCATION—K51

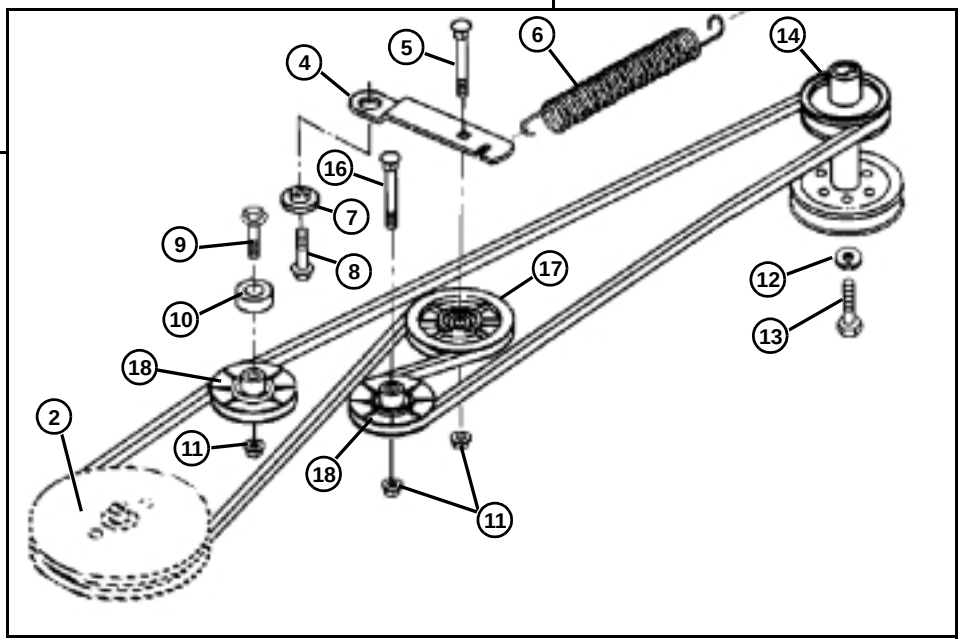


New Case: 27.4-31.4 N•m (20-23 lb-ft.)
Used Case: 22.5-27.4 N•m (16-20 lb-ft.)

TRACTION DRIVE SYSTEM COMPONENT LOCATION



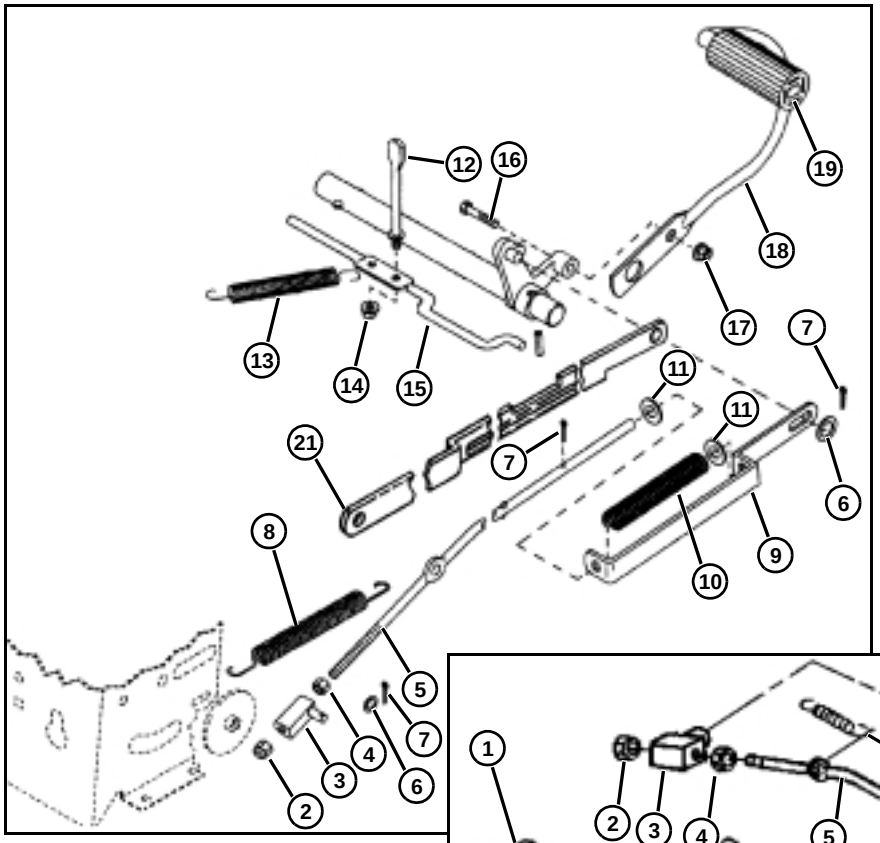
K–55 TRANSAXLE



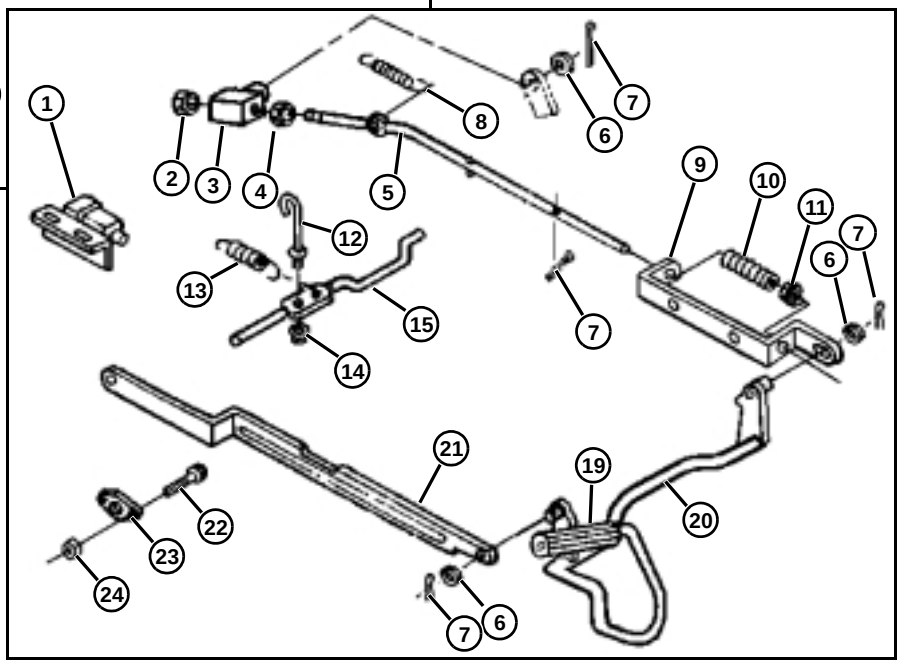
K–51 TRANSAXLE

1. Transaxle Drive Sheave (K55)
2. Transaxle Drive Sheave (K51)
3. Arm (K55)
4. Arm (K51)
5. Bolt M8 x 45
6. Spring
7. Bushing
8. Cap Screw
9. Bolt (K51)
10. Spacer (K51)
11. Flange Nut M8
12. Lock Washer
13. Cap Screw
14. Sheave, Engine
15. Bolt M8 x 45
16. Idler
17. Idler
18. Idler (K51)

PEDAL LINKAGE ASSEMBLY COMPONENT LOCATION



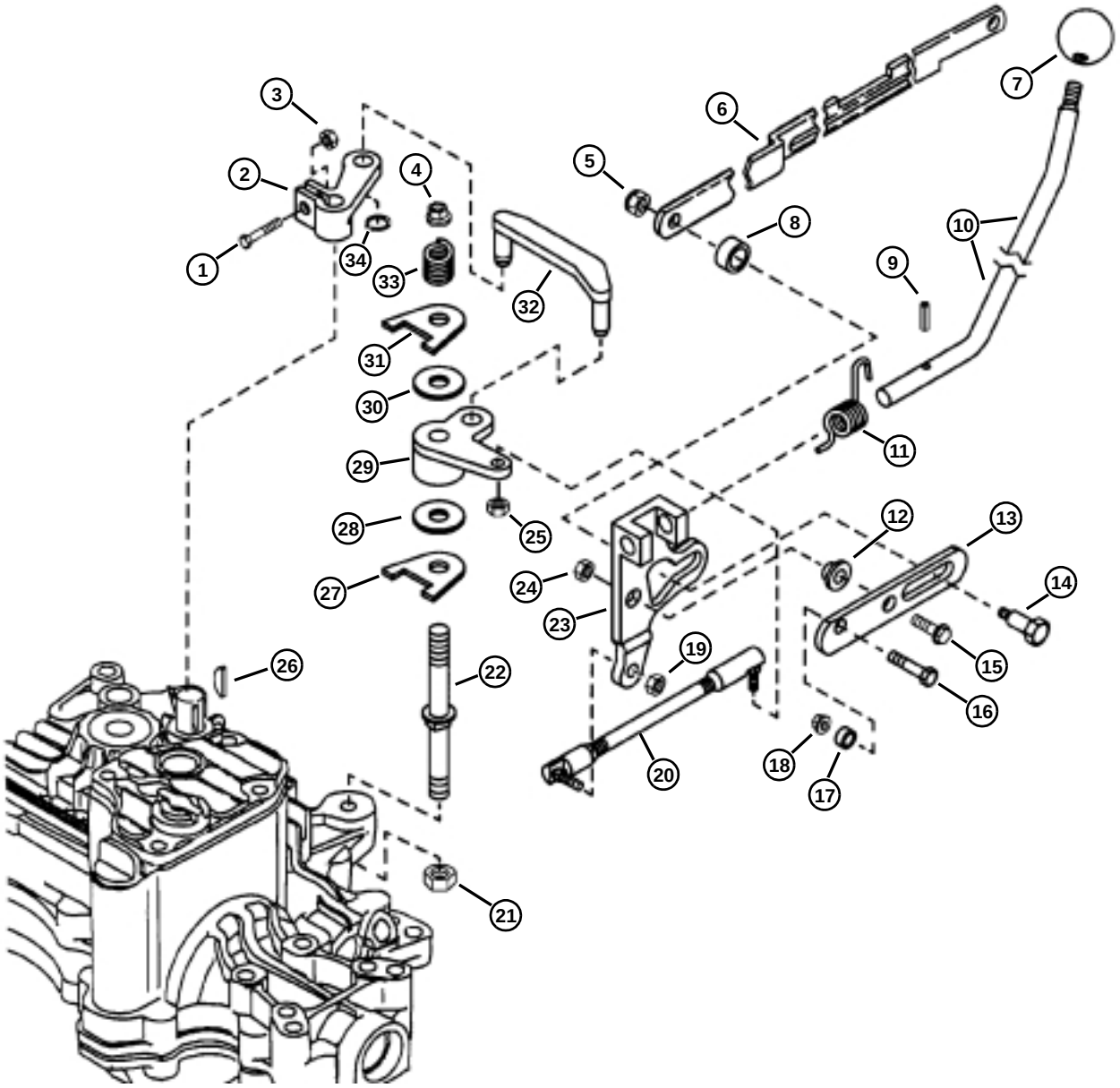
K–55 TRANSAXLE



K–51 TRANSAXLE

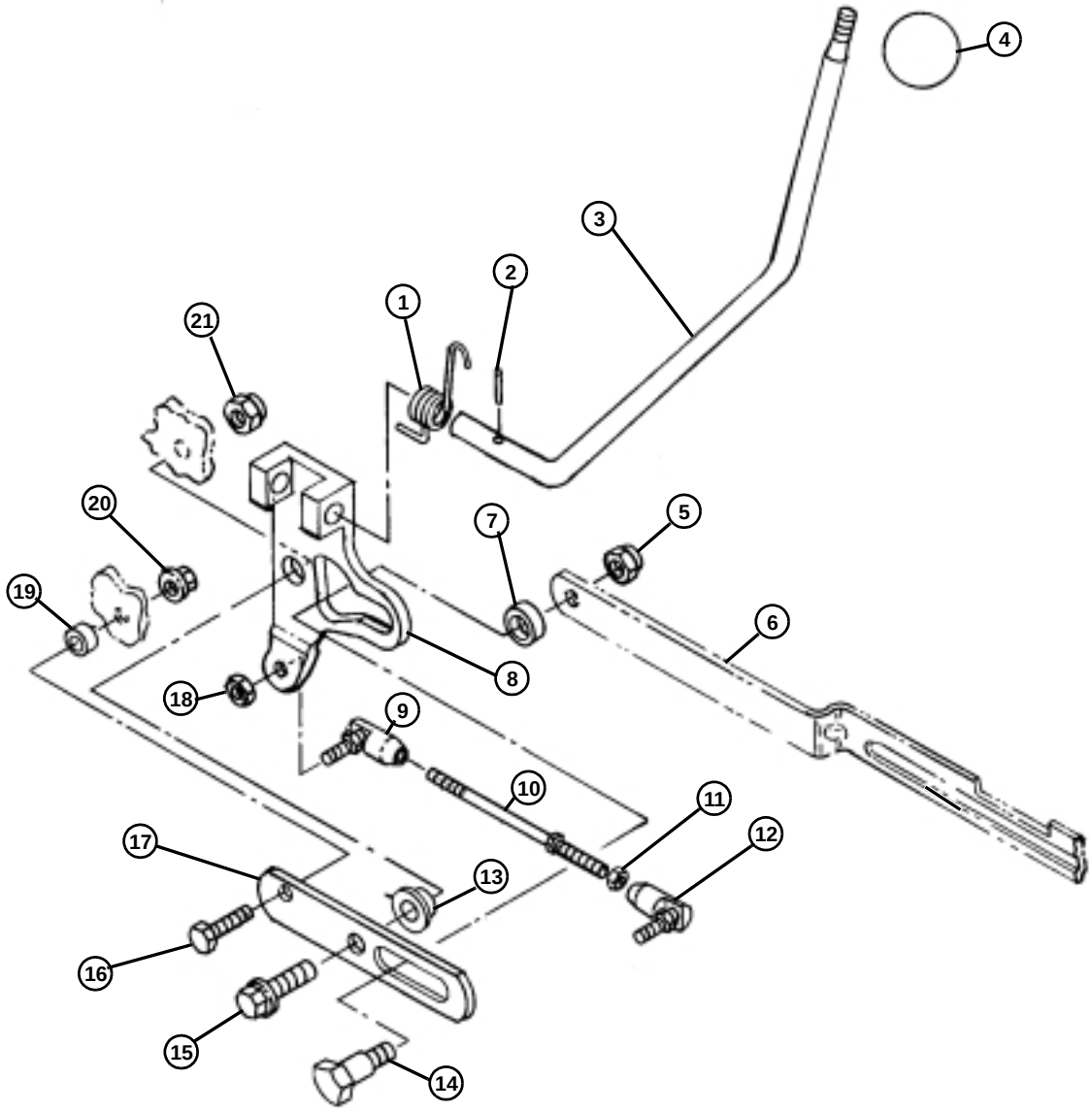
1. Neutral Switch
2. Lock Nut, 9.525mm
3. Pivot
4. Nut, 3/8 in.
5. Rod
6. Washer
7. Cotter Pin
8. Brake Rod Return Spring
9. Brake Spring Strap
10. Brake Compression Spring
11. Washer
12. Park Brake Lever
13. Extension Spring
14. Flange Nut
15. Rod, Parking Brake
16. Cap Screw, M8x35 (K55)
17. Lock Nut M8 (K55)
18. Brake Pedal (K55)
19. Pad
20. Shaft, Brake (K51)
21. Strap, Return to Neutral
22. Screw, M8x20 (K51)
23. Bracket (K51)
24. Lock Nut, M8 (K51)

SHIFT LINKAGE COMPONENT LOCATION—K–55 TRANSAXLE



1. Cap Screw (M6x20)
2. Shift Arm
3. Lock Nut (M6)
4. Lock Nut (M10)
5. Flange Nut (M8)
6. Return-To-Neutral Strap
7. Shift Knob
8. Neutral Return Bushing
9. Rolled Pin (M4x20)
10. Shift Lever
11. Shift Lever Neutral Return Spring
12. Spacer
13. Support Strap
14. Shoulder Bolt
15. Cap Screw (M10x25)
16. Cap Screw (M8x25)
17. Spacer
18. Flange Nut (M8)
19. Lock Nut (5/16-24 UNF 3B)
20. Shift Link Ball Joint Assembly
21. Flange Nut (M8)
22. Mounting Stud (M10x76.5-Top/ M8x40-Bottom)
23. Shift/Return-To-Neutral Bracket
24. Flange Nut (M8)
25. Lock Nut (5/16-24 UNF 3B)
26. Woodruff Key (5/32x5/8 in.)
27. Anchored Washer
28. Friction Disc
29. Bellcrank
30. Friction Disc
31. Anchored Washer
32. Shift Link
33. Tensioning Spring
34. Snap Ring

SHIFT LINKAGE COMPONENT LOCATION—K–51 TRANSAXLE



1. Torsion Spring
2. Spring Pin (4 x 20 mm)
3. Gearshift Lever
4. Knob
5. Lock Nut
6. Strap
7. Roller
8. Bracket
9. Ball Joint
10. Stud, Adjusting
11. Nut, (5/16”)
12. Ball Joint
13. Bushing
14. Shoulder Bolt
15. Screw M10 x x25
16. Screw M8 x 25
17. Support
18. Lock Nut (5/16-24 UNF 3B)
19. Spacer
20. Flange Nut, M8
21. Flange Nut, M10

THEORY OF OPERATION

In this group the Sabre hydrostatic power train is separated into the following systems:

- Traction Drive Belt System
- Transaxle and Shift Linkage System
- Brake/Neutral Return Pedal System
- Transport (Free-Wheeling) System

TRACTION DRIVE BELT SYSTEM OPERATION

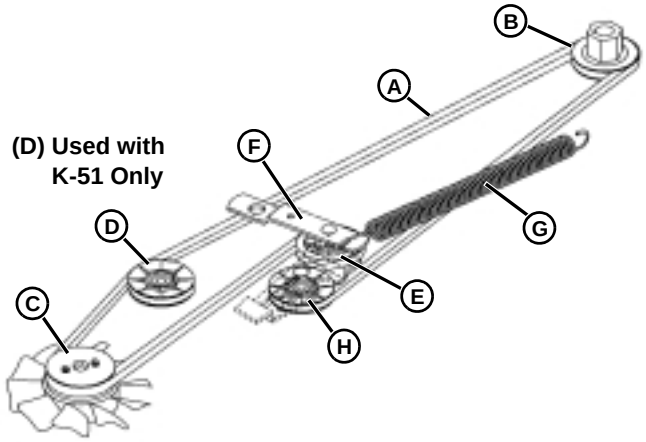
Function:

The traction drive belt transfers power from the engine to the input pulley of the hydrostatic transaxle.

Major Components:

- Foot pedal and brake linkage
- Engine drive sheave
- Traction drive belt
- Tensioning idler assembly
- Tensioning spring
- Adjusting idler assembly
- Transaxle drive sheave

Theory of Operation:



The traction drive belt (A) is driven by the upper pulley of the engine drive sheave (B). The traction belt then transmits engine power to the input pulley of the hydrostatic transaxle (C). On the K-51 transaxle only, an additional idler pulley (D) is used between the engine sheave and the transaxle. The traction drive belt is tensioned by the tension idler (E), which is mounted on a spring loaded bracket (F). The tension spring (G) runs forward and hooks to the frame. When the traction drive belt stretches beyond the range of the spring loaded tension idler, an adjustable idler (H) can be moved in slots on the frame, allowing the tension idler to move back into range.

TRANSAXLE AND SHIFT LINKAGE SYSTEM OPERATION

Function:

The function of the transaxle is to transfer power from the traction drive belt system (driven by the engine), to the rear wheels, and allow the operator to select ground speed and direction.

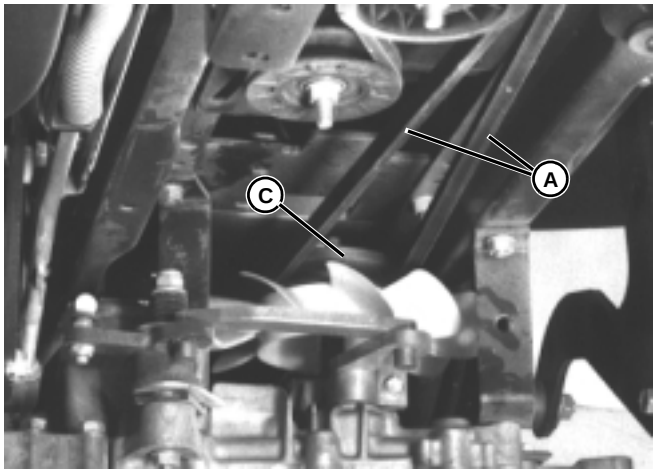
The drive belt turns the transaxle input pulley, and drives the transaxle's hydrostatic pump. When the hydrostatic drive is in neutral, no pressure is built up in the pump. When the operator pushes the hydrostatic drive lever forward, the shift linkage tilts the swash plate, inside the transaxle, off center, and the pump pistons build pressure which drives the hydrostatic motor. The motor drives the rear axle and wheels through the differential assembly.

The transaxle provides infinite ground speed selections up to 5 mph in forward and up to 2.6 mph in reverse.

Major Components:

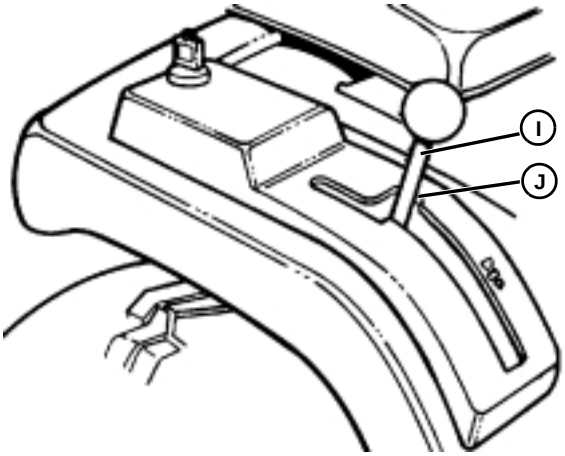
- Transaxle input pulley and fan
- Pump (input) shaft and cylinder block assembly
- Shift linkage and pump swashplate assembly
- Center block assembly
- Motor cylinder block assembly and drive shaft
- Differential assembly and axle shafts
- Wheels and tires.

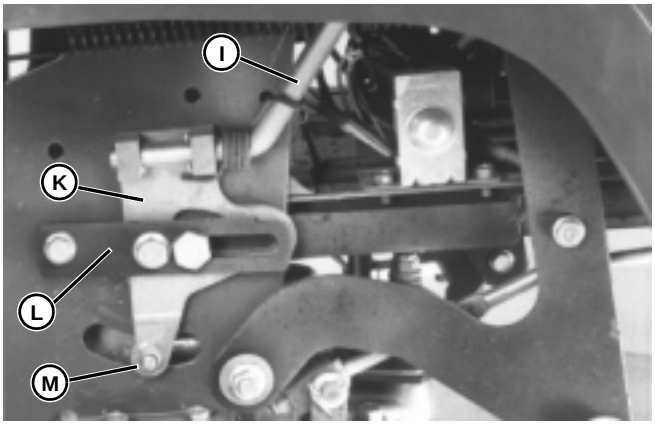
Theory of Operation:



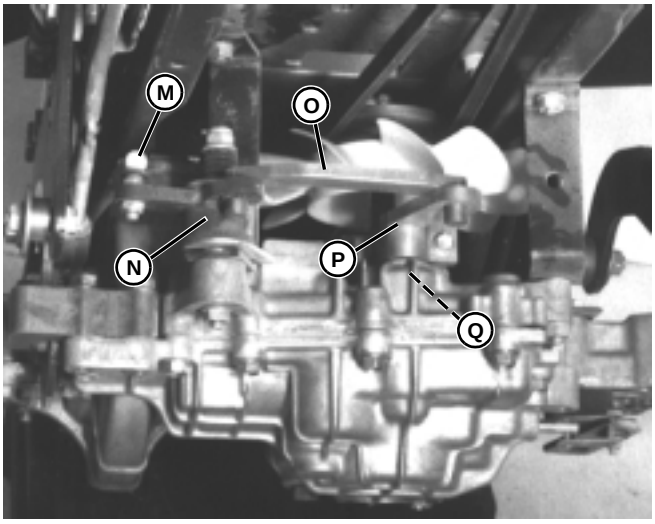
Neutral:

When the engine is running, the traction drive belt (A) turns the transaxle input pulley (C), cooling fan, and input shaft. The input shaft turns the hydrostatic pump input shaft and pump body, inside the transaxle.

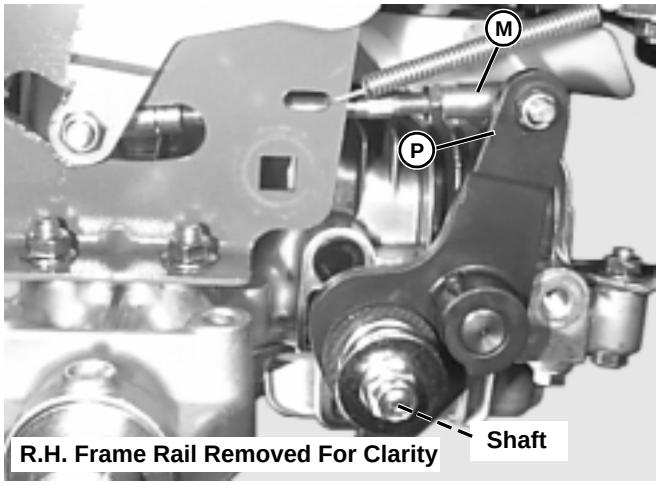




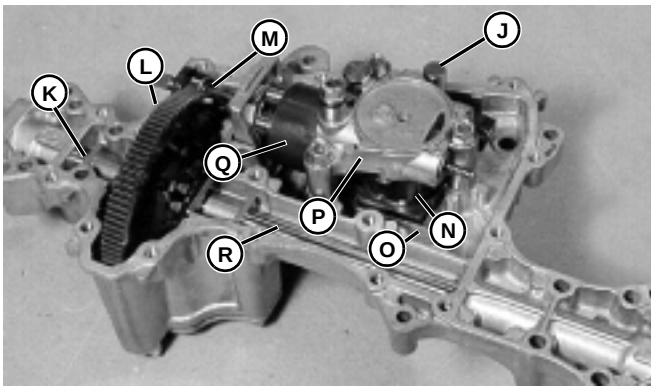
When the hydrostatic drive lever (I), is in the neutral position (J), the shift bracket (K) is centered in it's mounting bracket (L), and the turnbuckle link (M) is centered in the slot on the right side frame.



On the K-55 transaxle, the turnbuckle link (M) moves the bellcrank (N), link strap (O), and transaxle shift lever (P). The shift lever turns the transaxle shifter shaft.



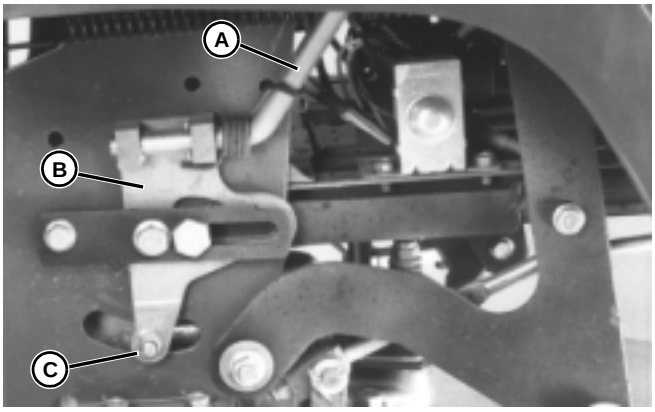
On the K-51 transaxle, the turnbuckle link (M) moves the transaxle shift lever (P). The shift lever turns the transaxle shifter shaft.



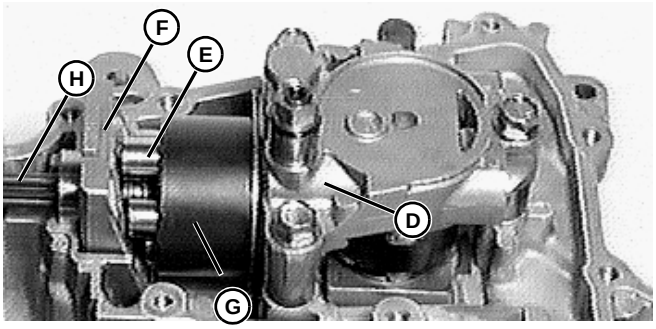
K55

When in neutral, the shift linkage holds the shifter shaft (J) and the variable-angle pump swashplate (O) in the neutral position. While in neutral (level) position, the pump cylinder block (N) rotates with the pump (input) shaft but does not pump any oil into the motor half of the center block (P) because the pump pistons are not moving up and down as they rotate. Therefore, the motor cylinder block (Q) does not turn nor do the motor (output) shaft (M), differential assembly (L), or drive axles (K and R).

Forward:



When the shift lever (A) is moved into forward position, the shift bracket (B) pivots, pulling the turnbuckle link (C) rearward. The transmission linkage turns the shifter shaft, and through it, the variable-angle pump swashplate into forward position.



K55

With the pump swashplate angled in forward position, the pump cylinder block pistons are pumping oil through one side of the center block (D) into the pistons (E) of the motor, forcing the pistons out against the fixed-angle swashplate (F) and causing the motor cylinder (G), motor (output) shaft (H), differential assembly, and drive axles to turn in the forward direction.

Reverse:

When the shift lever (A) is moved into reverse position, the shift bracket (B) pivots in the opposite direction, pushing the turnbuckle link (C) foreward. The transmission linkage turns the shifter shaft, and through it, the variable-angle pump swashplate into reverse position.

With the pump swashplate angled in the opposite direction from the forward position, the pump cylinder block pistons are pumping oil through the other side of the center block (D) into the pistons (E) of the motor, forcing the pistons out (on the opposite side) against the fixed-angle swashplate (F) and causing the motor cylinder (G), motor (output) shaft (H), differential assembly, and drive axles to turn in the reverse direction.

BRAKE/NEUTRAL RETURN PEDAL COMPONENT LOCATION & OPERATION

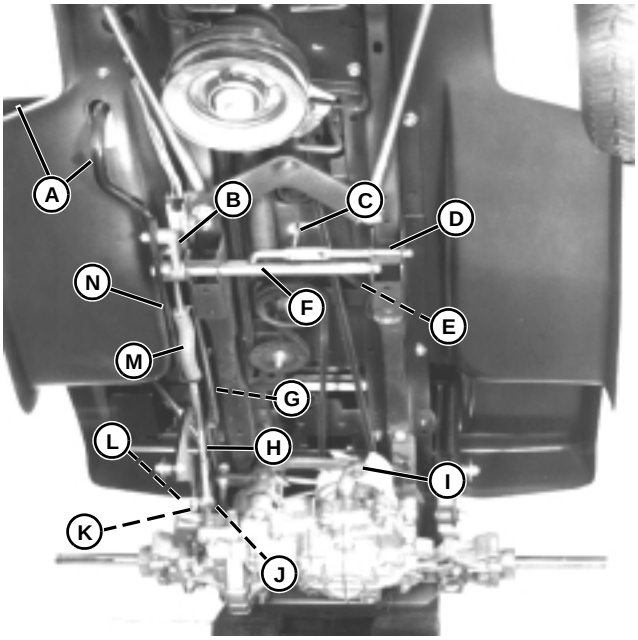
Function:

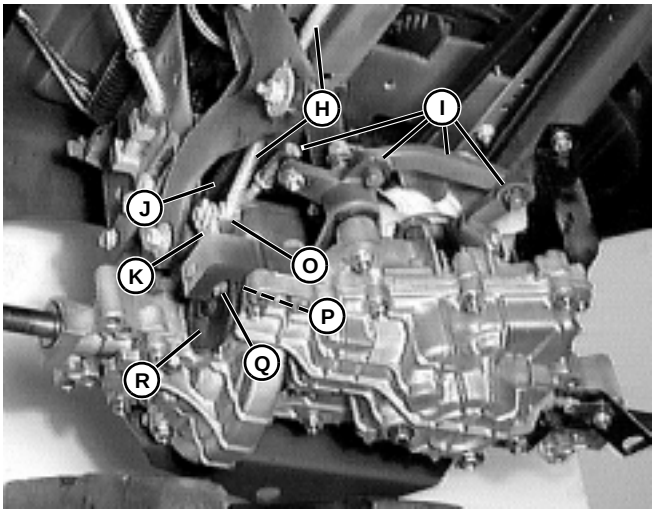
The brake system allows the operator to slow down or stop the tractor, return the shift linkage to neutral, and lock the brake into park.

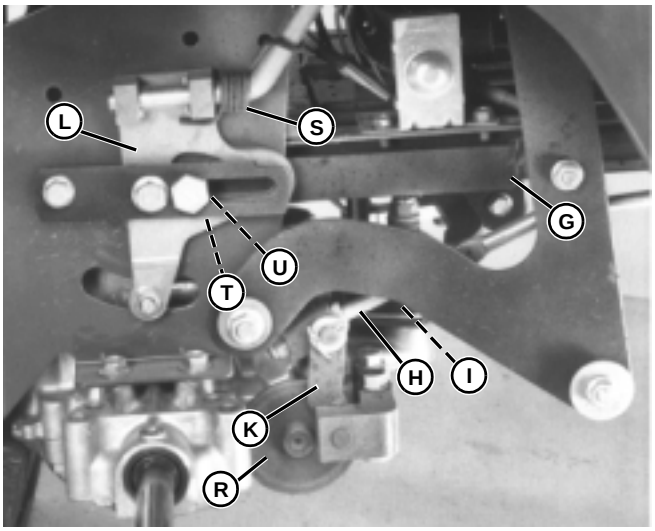
Major Components:

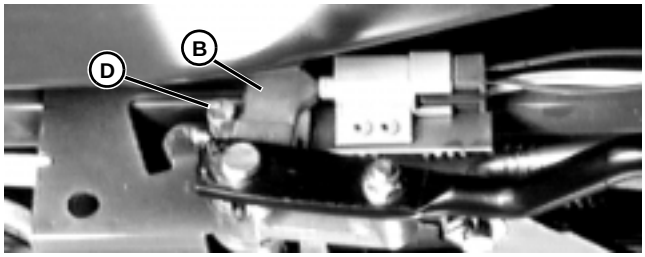
- Foot pedal
- Frame cross rod and bellcrank
- Brake rod, compress spring, and strap
- Brake rod return spring
- Brake rod adjustment coupler
- Transaxle brake assembly and return spring
- Shift linkage
- Shift/return-to-neutral bracket
- Shift bracket return-to-neutral strap and bushing
- Shift bracket support strap
- Park locking rod
- Park locking lever
- Park locking spring

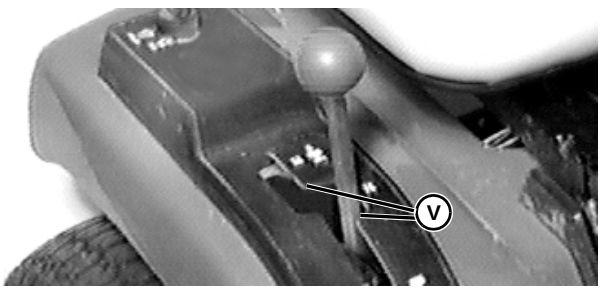
Theory of Operation — K55









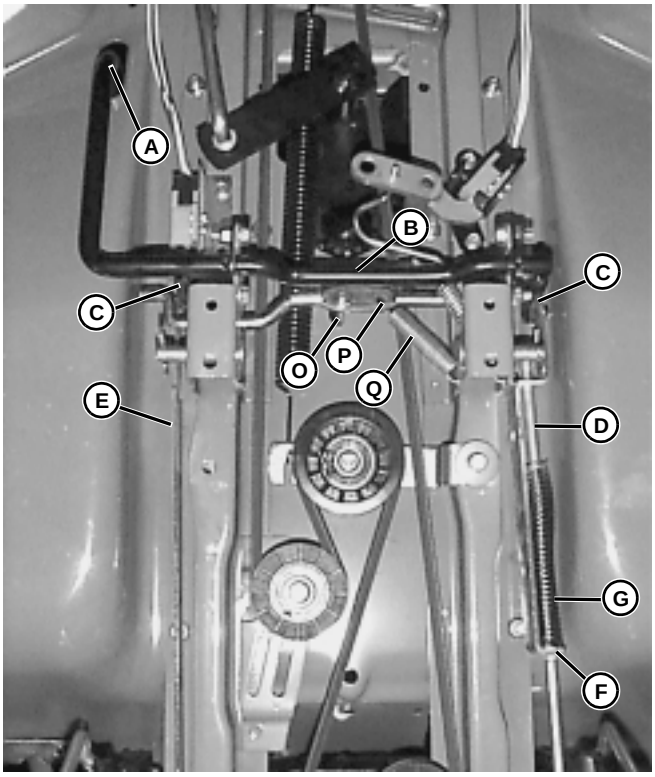


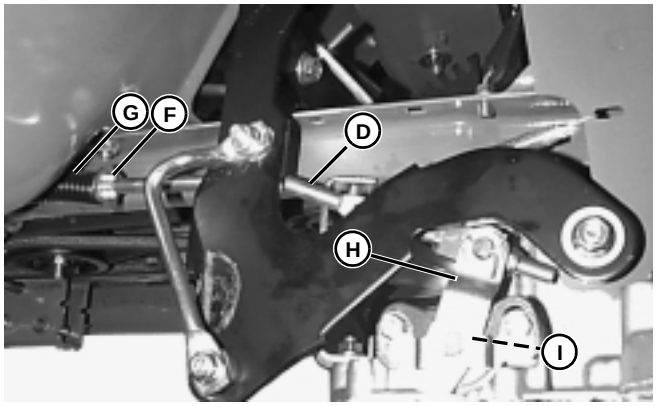
When the brake pedal (A) is depressed, the bellcrank (B) and frame rod (F) rotate forward. This motion causes the brake rod (H) and neutral return strap (G), connected at the same point on the bellcrank, to move forward at the same time. As the brake pedal is depressed further, spring strap (N) compresses the compression spring (M). As the spring is compressed, the brake lever (K) rotates forward forcing its friction surface (Q) against the brake disc (R). Continued force pushes the disc against the shimmed friction puck (P), captured in the housing. As the brake pedal is depressed further, more-and-more force is applied until the disc stops turning. This works in conjunction with the neutral return linkage, stopping the tractor.

As this is happening, the neutral return strap (G) is pulled forward, forcing the cam roller (U) to roll up one of the ramp contours of shifter bracket (L). This action moves the shifter bracket (L) and lever (D) back towards the neutral position. At the same time, this returns the shift linkage (I) into neutral position and the internal, variable pump swashplate into its level (non-pumping) position. This works in conjunction with the brake linkage, stopping the tractor. As-soon-as the shift lever reaches either of the radii of the neutral slot (V), the return spring (S) snaps the shift lever back into neutral position.

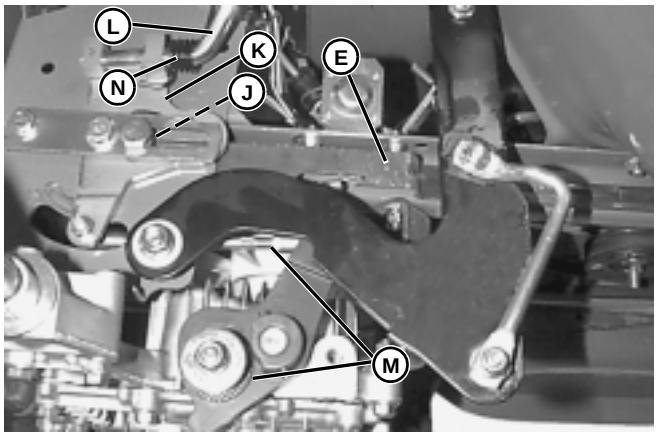
When the brake pedal is fully depressed, the brake can be locked into park position with the park lever (C) and locking rod (D). The locking spring (E) holds the locking rod in place until the operator eases up on the pedal and the force of compression spring (M) locks the bellcrank (B) against the locking rod (D). To release the park brake, the operator must again depress the brake pedal fully and pull the park lever (C) and locking rod (D) into the disengaged position. The brake rod neutral spring (J), maintains just enough air gap between the brake lever friction surface (Q), friction puck (P), and the brake disc (R) when the brake linkage is disengaged.

Theory of Operation — K51





L.H. Side



R.H. Side

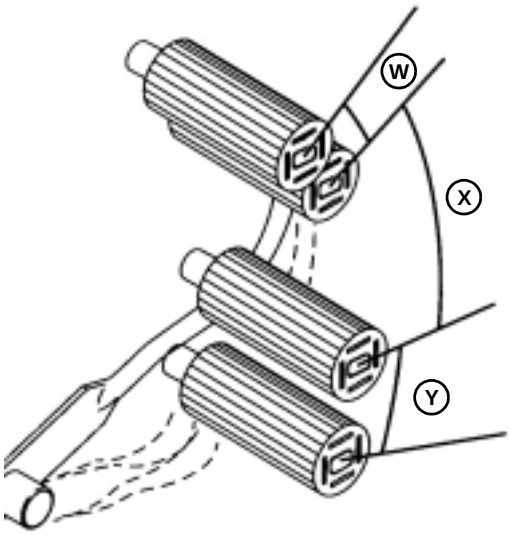
When the brake pedal (A) is depressed, the frame rod (B) and frame rod arms (C) rotate forward. This motion causes the brake rod (D) and neutral return strap (E), to move forward at the same time. As the brake pedal is depressed further, spring strap (F) compresses the compression spring (G). The compression spring pulls the brake rod (D) forward.

On the left hand side of the tractor, the brake lever (H) rotates forward forcing (by means of a cam) the brake shaft (I) into the transmission where it is pushed against the internal brake disk. As the brake pedal is depressed further, more-and-more force is applied until the disc stops turning. This works in conjunction with the neutral return linkage, stopping the tractor.

On the right hand side of the tractor, the neutral return strap (E) is pulled forward, forcing the cam roller (J) to roll up one of the ramp contours of shifter bracket (K). This action moves the shifter bracket and shifter lever (L) back towards the neutral position. At the same time, this returns the shift linkage (M) into neutral position and the internal, variable pump swashplate into its level (non-pumping) position. This works in conjunction with the brake linkage, stopping the tractor. As-soon-as the shift lever reaches either of the radii of the neutral slot, the return spring (N) snaps the shift lever back into neutral position.

When the brake pedal is fully depressed, the brake can be locked into park position with the park lever (O) and locking rod (P). The locking spring (Q) holds the locking rod in place until the operator eases up on the pedal and the force of compression spring (G) locks the frame rod arm (C) against the locking rod (D). To release the park brake, the operator must again depress the brake pedal fully and pull the park lever and locking rod (P) into the disengaged position.

Brake Pedal Travel



NOTE: Brake pedal has approximately 127 mm (5 in.) of travel.

1. The first segment of travel (W) is taking-up freeplay in the brake and return-to-neutral linkages.
2. The next segment of travel (X) is returning the shift linkage to neutral and engaging the brake.

IMPORTANT: Full brake engagement (drive wheels stop turning) must not occur until shift linkage has returned to neutral completely. If this is not the case, see Tests and Adjustments procedures later in this section.

3. The last segment of travel (Y) is locking and unlocking the brake linkage into park.

TRANSPORT (FREE-WHEEL) SYSTEM OPERATION—K55

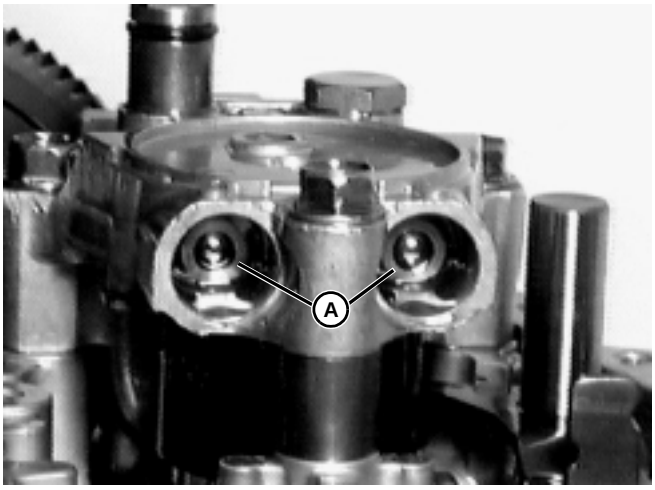
Function:

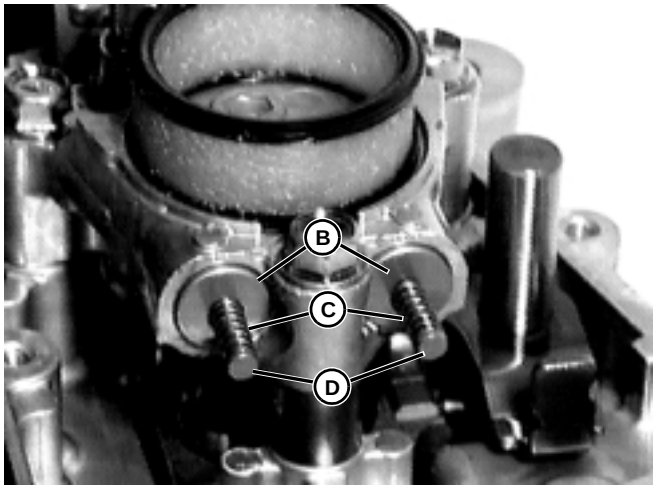
The transport (free-wheel) system allows the operator to push the tractor while the engine is off, transmission in or out of either forward or reverse, and the brake released.

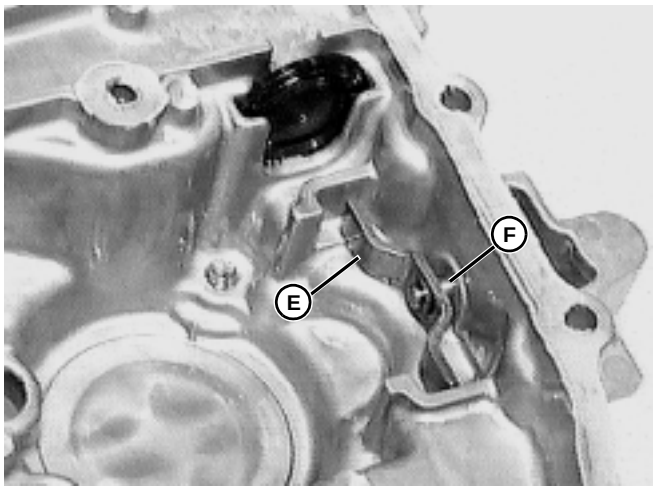
Major Components:

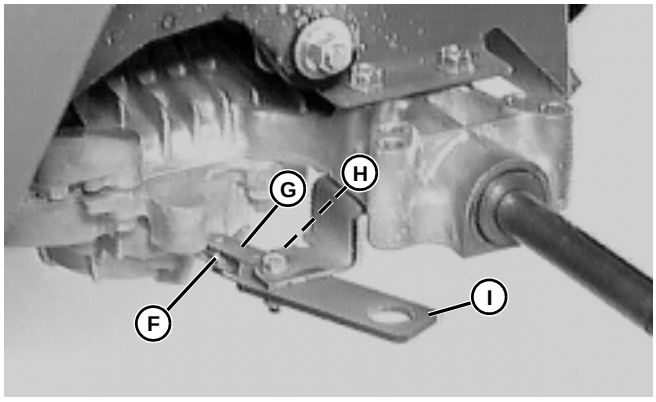
- Internal center block relief valve assembly
- Internal actuating assembly
- External over-center actuating lever assembly

Theory of Operation:









A pair of bypass relief valves (A), located inside the center block of the transaxle, allow for oil to flow freely without the pump being turned by the engine and traction drive system.

When the actuating lever (I) is moved into its over-center locked position (H), the single chain link assembly (G) pushes the actuating pin (F) and bracket (E) against both valve pins (D). As the pins move inside their guides (B), the return springs (C) become compressed and the check balls of the relief valves (A)

are unseated; allowing oil to flow freely. This allows the operator to push the tractor with the engine off and the brake released.

TRANSPORT (FREE-WHEEL) SYSTEM OPERATION—K51

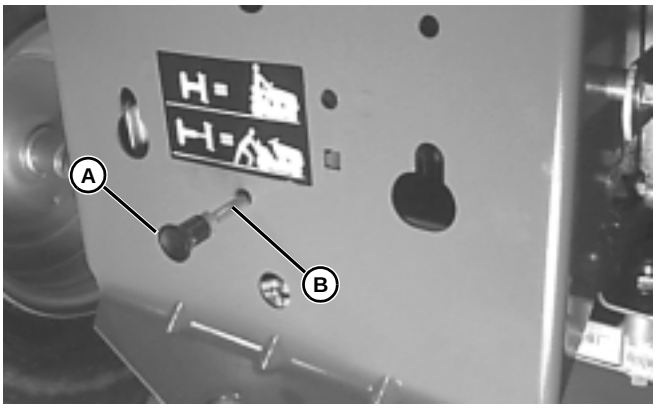
Function:

The transport (free-wheel) system allows the operator to push the tractor while the engine is off, transmission in or out of either forward or reverse, and the brake released.

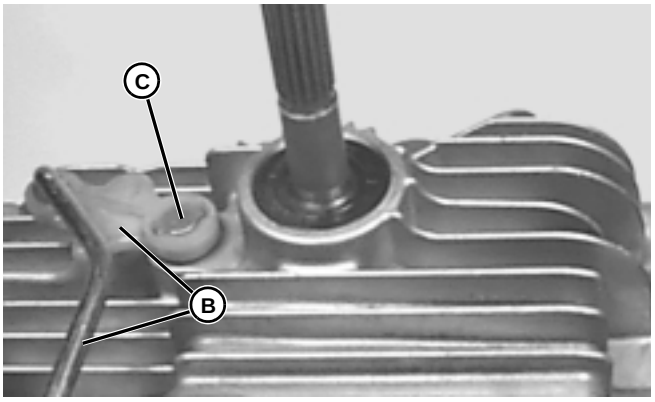
Major Components:

- External over-center actuating lever assembly

Theory of Operation:



When the actuating rod (A) is pulled out to its locked position, the linkage assembly (B) rotates the actuating shaft (C) 35°.



When the actuating shaft (D) rotates 35° the operator is allowed to push the tractor with the engine off and the brake released.

TROUBLESHOOTING

Problem or Symptom / Check or Solution	Belt jumping off or slapping	Lack of drive in one wheel or both	Loses power under load, belt slips, or erratic drive	Jerky or aggressive engagement	Cannot get full forward or reverse speed	Input shaft /pulley will not turn	Returns to neutral during operation or under load	Shifts hard	Noisy operation	Leaking lubricant	Brakes will not stop tractor	Park brake will not hold	Transaxle overheats	Transport mode pushes hard	Creeps in neutral
Belt sheaves and idlers loose, out of adjustment, worn, or damaged—tighten, replace, or adjust properly	●	●	●	●	●	●			●						
Belt worn, frayed, glazed, or stretched—replace belt	●	●	●	●					●						
Tensioning spring weak or broken—replace as necessary	●	●	●						●						
Accumulation of grass and other debris in cooling fins or around moving parts of transmission		●	●			●			●		●	●	●	●	●
Brake pedal linkage out of adjustment—adjust properly		●	●	●		●	●	●			●	●	●	●	●
Brake system components worn, bent, or broken—replace and adjust properly		●		●		●	●	●			●	●	●	●	●
Oil on brake disk and/or shoes (K55 Only)											●	●	●		●
Shift lever linkage bent, worn, out of adjustment, or broken—replace or adjust properly		●	●	●		●	●	●					●		●
Neutral return linkage worn, bent, or broken—replace as necessary		●				●		●						●	●

Problem or Symptom / Check or Solution	Belt jumping off or slapping	Lack of drive in one wheel or both	Loses power under load, belt slips, or erratic drive	Jerky or aggressive engagement	Cannot get full forward or reverse speed	Input shaft /pulley will not turn	Returns to neutral during operation or under load	Shifts hard	Noisy operation	Leaking lubricant	Brakes will not stop tractor	Park brake will not hold	Transaxle overheats	Transport mode pushes hard	Creeps in neutral
Input sheave, input shaft, and axle keys or keyways loose, worn, or damaged—replace as necessary (K55 Only)	●	●	●	●		●	●	●							
Internal transaxle components worn, stripped, or broken—replace as necessary (K55 Only)		●	●	●		●	●	●	●				●		
Internal hydro pump and/or motor cylinder block and valve plate mating surfaces worn or scored—replace as necessary (K55 Only)		●	●	●	●	●		●	●				●		
Transaxle case and mountings loose, worn, or broken—replace halves or mountings (K55 Only)	●	●		●				●	●					●	
Fan and/or pulley loose or damaged—tighten or replace	●								●				●		
Hydrostatic oil filter plugged (K55 Only)		●	●		●				●				●		
Incorrect type or volume of lubricant used—replace with correct type and volume. (K55 Only) Note: Initial leakage may be result of excessive factory rust preventive. Clean case and verify source of leak		●	●	●			●		●	●			●		●

Problem or Symptom / Check or Solution	Belt jumping off or slapping	Lack of drive in one wheel or both	Loses power under load, belt slips, or erratic drive	Jerky or aggressive engagement	Cannot get full forward or reverse speed	Input shaft /pulley will not turn	Returns to neutral during operation or under load	Shifts hard	Noisy operation	Leaking lubricant	Brakes will not stop tractor	Park brake will not hold	Transaxle overheats	Transport mode pushes hard	Creeps in neutral
Bleed procedure overlooked or improperly done—repeat procedure correctly		●	●	●	●				●						
Wheels and axle keys, key ways, or snap rings worn—replace as necessary		●	●		●				●						
Motor drive shaft or axle seals worn or damaged—replace seals (K55 Only)									●	●					
Transaxle case halves cap screws loose or stripped—tighten to 27 N•m (20 lb-ft.) or replace screws								●	●	●					
Poor application of transaxle case halves sealant—replace sealant properly (K55 Only)										●					
Incorrect type sealant—replace with proper sealant (K55 Only)										●					
Drain Plug not tight or bad seal. Replace seal and Torque to15 N•m (11lb-ft.) (K55 Only)										●					
Transport (free-wheeling) valves and linkage out of adjustment or damaged—readjust or replace as necessary		●	●		●				●				●	●	
Engine performance problems—see Engine Section		●	●												

DIAGNOSIS

Test Conditions:

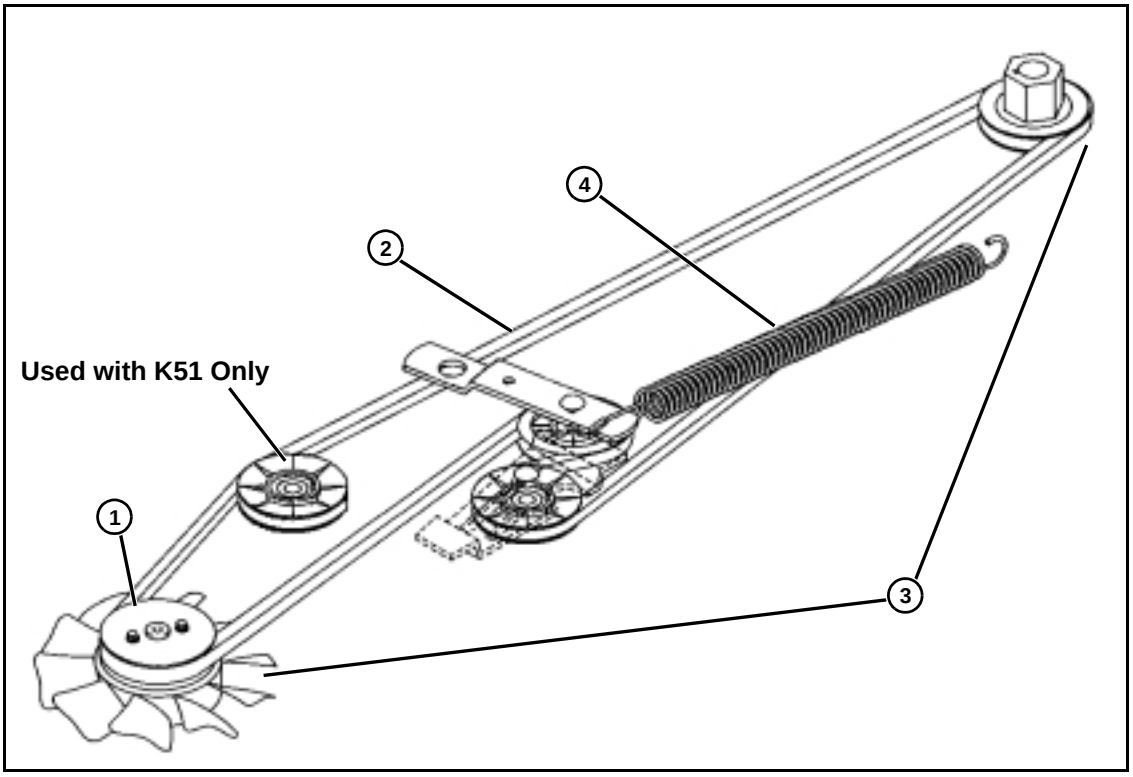
• Tractor on level surface.	• Front wheels blocked.
• Engine OFF.	• Rear wheels raised off surface with axle housings on jack stands.

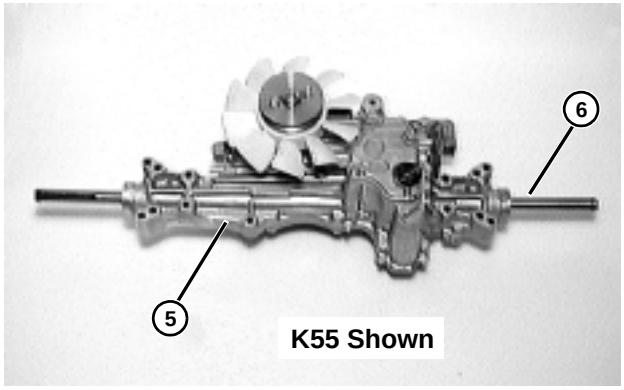
Test/Check Point	Normal	If Not Normal
1. Fan	Fan in good condition and tight.	Tighten fan. Repair or replace as needed.
2. Drive belt	Belt in good condition, not glazed, split, unraveled, or stretched.	Replace drive belt as needed.
3. Tensioning spring	Tensioning spring installed and not damaged.	Install spring. Repair or replace as needed.
4. Sheaves and idlers, belt traction drive system.	Drive sheaves and idlers in good condition and adjusted properly.	Adjust idler assembly. Repair or replace as needed.
	Belt not slipping, squealing, or vibrating excessively.	Check belt condition, check adjustment and condition of idlers and guides. Adjust, repair or replace components as needed.
5. Hydro housing exterior	No cracks, leaks, or loose hardware.	Tighten hardware. Check warranty. Repair or replace transaxle housing. Replace any damaged components.
6. Axles	Axles straight.	Repair or replace as needed.
7. Wheels and tires.	Air pressure equal in driving tires.	Adjust air pressure.
	Driving tires have same circumference.	Match tires for same circumference.
	Wheels not bent or out of round.	Repair or replace wheels as necessary.
8. Axles, wheels, and tires.	Axles, wheels, and tires in good shape and functioning properly.	Check axles and wheel for straitness, check condition of keys and keyways, washers, and snap rings. Check tires for tread wear and proper inflation. Repair or replace components as needed.

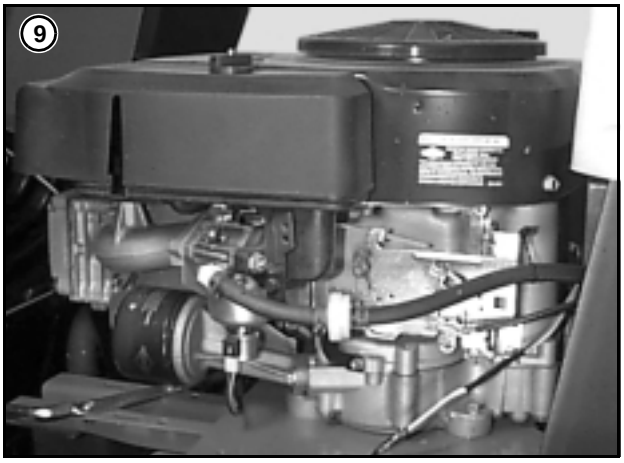
Test Conditions:

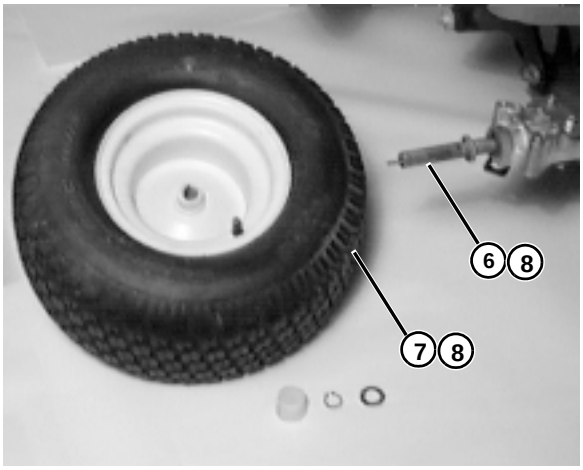
• Engine ON.	• Rear wheels raised off surface with axle housings on jack stands.

9. Engine performance.	Engine running smoothly throughout throttle range. See “TRACTION DRIVE SYSTEM” on page 30.	Adjust, tune, or repair engine.









DIAGNOSIS—K55

Test Conditions:

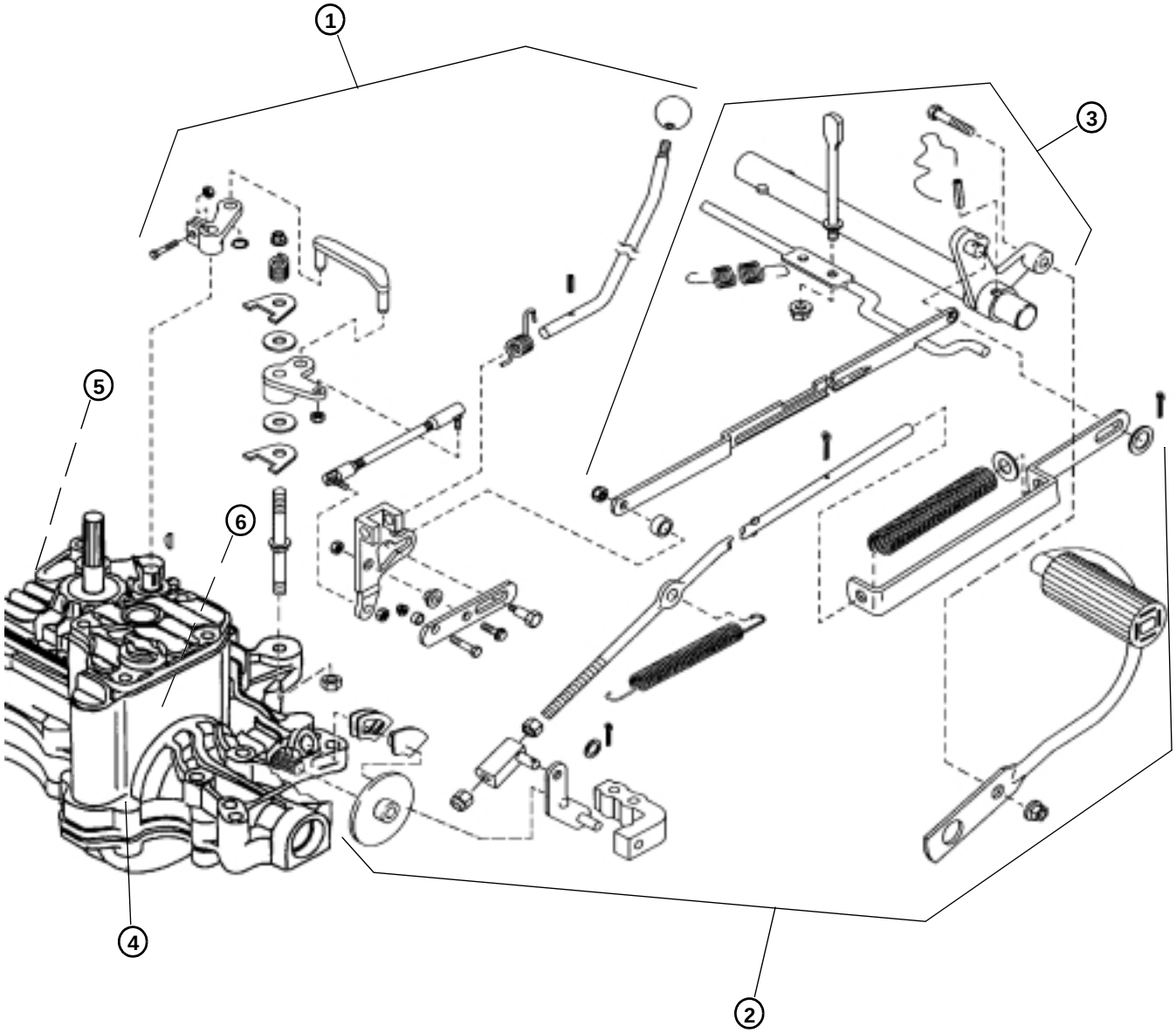
• Tractor operated in test area.	• Tests run at engine slow idle and fast idle.
• Engine at operating temperature.	• Hydro run through full range of speeds in both directions.

Test/Check Point	Normal	If Not Normal
1. Shift linkage	Shift linkage adjusted properly and working smoothly.	Repair or replace as needed.
2. Brake linkage and assembly	Brake and brake linkage adjusted properly and working smoothly.	Adjust as needed. See “BRAKE SPRING ADJUSTMENT—K55” on page 33. Repair or replace as needed.
	Brake components not worn or damaged.	Repair or replace as needed.
3. Neutral return linkage	Neutral return linkage adjusted properly and working smoothly.	Adjust as needed. Repair or replace as needed.

Test Conditions:

• Tractor on level surface.	• Front wheels blocked.
• Engine OFF.	• Rear wheels raised off surface with axle housings on jack stands.

Test/Check Point	Normal	If Not Normal
4. Hydro housing exterior	No cracks, leaks, or loose hardware.	Tighten hardware. Repair or replace transaxle housing. Replace any damaged components.
5. Transport (free wheeling) valve and linkage	Transport linkage engaging and disengaging properly.	Adjust. Repair or replace as needed.
6. Internal hydro components	No worn, scored or scratched components.	Repair or replace as needed. See “TRANSAXLE REMOVAL AND INSTALLATION—K55” on page 41.
	Correct type and quality of oil. Oil not dirty or burnt.	Fill to proper level. Replace with correct or unburned oil.
	Retaining snap rings in good shape and seated correctly.	Repair or replace as needed.



DIAGNOSIS —K51

Test Conditions:

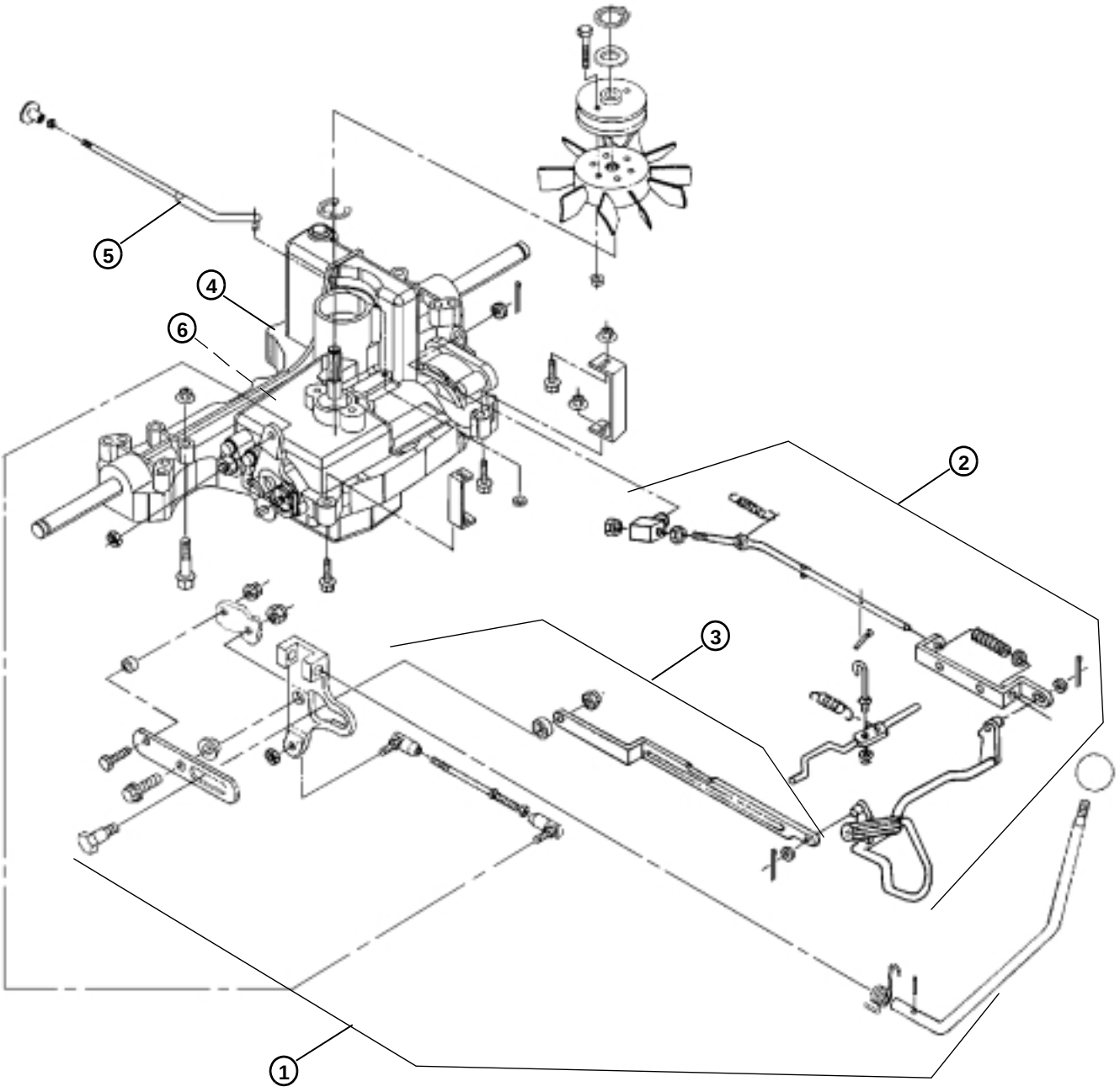
• Tractor operated in test area.	• Tests run at engine slow idle and fast idle.
• Engine at operating temperature.	• Hydro run through full range of speeds in both directions.

Test/Check Point	Normal	If Not Normal
1. Shift linkage	Shift linkage adjusted properly and working smoothly.	Repair or replace as needed.
2. Brake linkage and assembly	Brake and brake linkage adjusted properly and working smoothly.	Adjust as needed. See “BRAKE SPRING ADJUSTMENT—K51” on page 34. Repair or replace as needed.
	Brake components not worn or damaged.	Repair or replace as needed.
3. Neutral return linkage	Neutral return linkage adjusted properly and working smoothly.	Adjust as needed. Repair or replace as needed.

Test Conditions:

• Tractor on level surface.	• Front wheels blocked.
• Engine OFF.	• Rear wheels raised off surface with axle housings on jack stands.

Test/Check Point	Normal	If Not Normal
4. Hydro housing exterior	No cracks, leaks, or loose hardware.	Tighten hardware. Repair or replace transaxle housing. Replace any damaged components.
5. Transport (free wheeling) valve and linkage	Transport linkage engaging and disengaging properly.	Repair or replace linkage as needed.
6. Internal hydro components	***NOTE: If internal hydro component parts are suspected (after performing <u>all</u> external checks and adjustments) CALL SABRE SERVICE DEPARTMENT FOR AUTHORIZATION TO REPLACE TRANSAXLE ASSEMBLY.***	



TESTS AND ADJUSTMENTS

TRACTION DRIVE SYSTEM

Reason:

To ensure shift, neutral return, and brake linkages and belt drive system maintain traction in lower 1/3 of forward speed range up a 17° slope. To ensure that transport (free-wheeling) valve assembly and linkage allow tractor to be pushed when engaged and to drive tractor when disengaged. Also, to ensure tractor returns to neutral, engages the brake, stops tractor within specification, and holds tractor stationary in PARK position on a 17° slope or less.

Procedure:

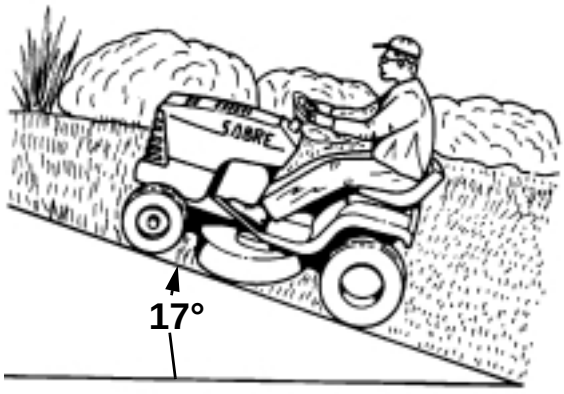
NOTE: This is a six part test and adjustment procedure:

- Test drive on 17° slope,
- Drive belt adjustment,
- Transport valve linkage adjustment
- Shift linkage adjustments,
- Brake rod adjustment,
- Repeat test drive on 17° slope.

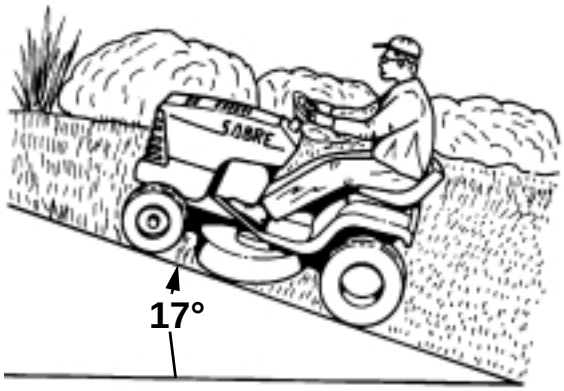
Test Drive—

CAUTION

DO NOT engage shift lever too aggressively or tractor may tip over backwards. while performing the test drive on a 17° slope.

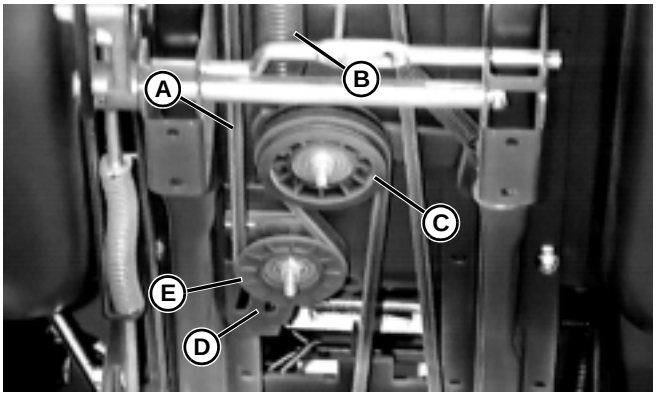


1. Test drive tractor to see if traction drive system pulls tractor up a 17° slope in lower 1/3 of forward range.
2. Look for a steady pull up the slope.
3. If test fails in any of the lower 1/3 range, the belt tension must be adjusted.

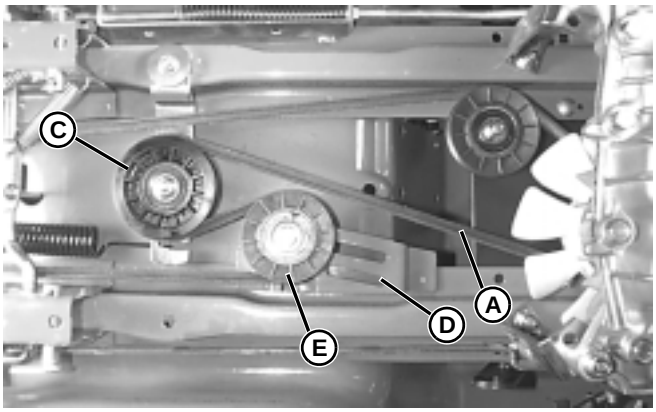


4. Drive or push tractor onto a 17° slope, depress the brake pedal and lock it in PARK position.
5. Shift lever and linkage must return-to-neutral, park brake must hold tractor stationary on slope, and tractor must not creep downward once park brake is locked into position.
6. Drive tractor on dry pavement in a safe, open, and level area at fast idle in full forward position. Apply a “panic stop” force (no more than 50 pounds of force)—tractor **must stop** within **0.9—1.5 M (3—5 ft)** and both wheels should **“lock-up”**, leaving skid marks on pavement.
7. Repeat Steps 4—6 for reverse.
8. If any test fails, the brake linkage and return-to-neutral linkage must be adjusted or components replaced.

DRIVE BELT ADJUSTMENT



K55



K55

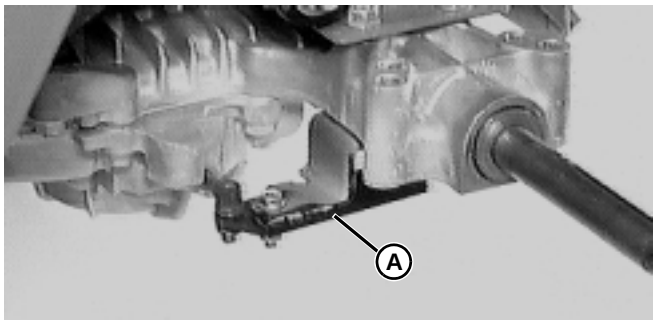
1. Lock park brake.

> **⚠ CAUTION**
>
> **Tensioning spring (B) is under high tension. Wear gloves and use a firm grip when stretching spring.**

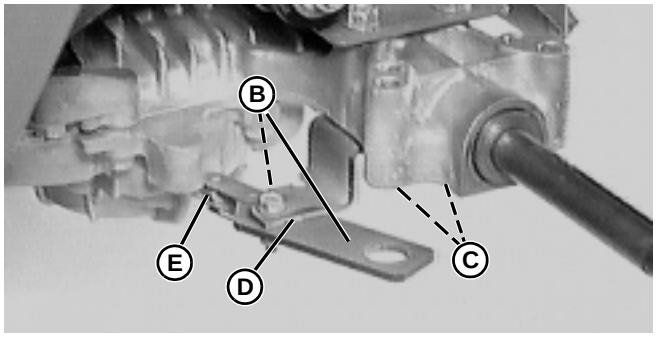
2. Carefully pull larger tensioning idler (C) rearward until belt (A) can be removed from adjustable idler (E), then slowly release tensioning idler.
3. Loosen and move adjustable idler (E) rearward in slots (D) in increments of **10 mm (0.39 in.)**.
4. Tighten adjustable idler (E) and carefully install belt in larger tensioning idler (C).
5. Repeat procedure until belt tension is sufficient to overcome any slippage.
6. If adjustable idler is adjusted to rear end of slot (D) and belt tension is not sufficient to overcome any slippage, replace belt.

NOTE: If a new belt is required, adjustable idler (E) should be reset at front end of slot (D).

TRANSPORT (FREE-WHEEL) VALVE ADJUSTMENT—K55



1. Replace lever assembly (A) components as needed.

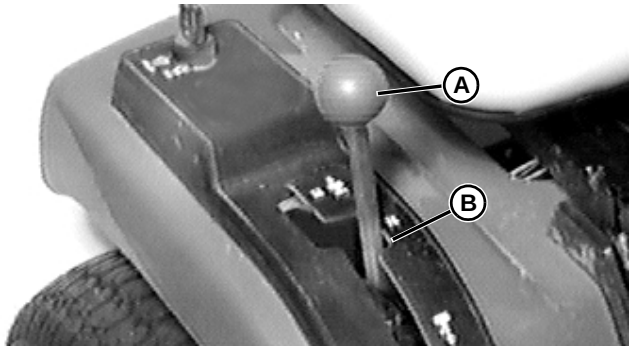


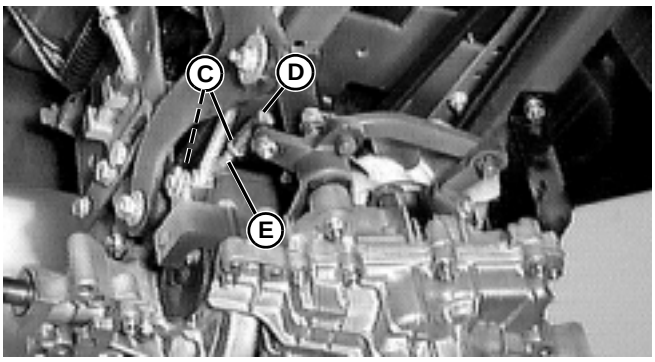
2. Slowly engage lever (A) into over-center position (B).
3. Watch closely that actuating pin (E) moves inward all-the-way and, as lever snaps into over-center position, does not move outward at all.
4. If actuating pin (E) does move outward, loosen mounting nuts (C).
5. Push and hold edge of mounting bracket (D) inward until actuating pin (E) bottoms out (internally). Hold edge of bracket (D) stationary while axle mounting nuts (C) are tightened to **15 N•m (132 lb-in.)**

Test Transport Valve Operation:

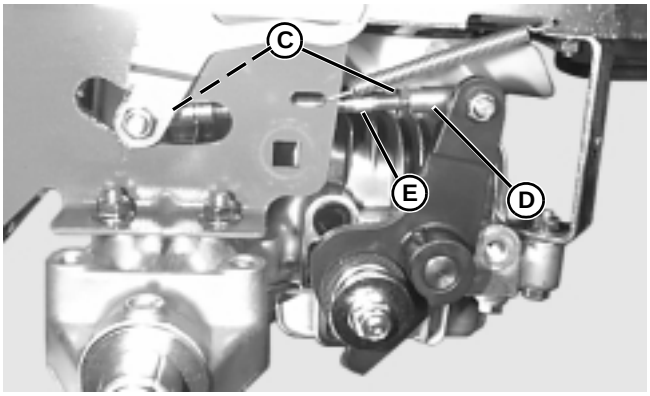
1. With engine off and shift lever in any position, put transport valve lever (A) in over-center position (B) and push tractor forward at least 3.05 M (10 ft)—tractor should push easily the entire distance.
2. Push tractor backward the same distance—tractor should push easily the entire distance.
3. If tractor pushes hard, repeat adjustment procedure above—be sure actuating pin (E) does not move outward once over-center position (B) is achieved and mounting nuts (C) are tightened.
4. Repeat test Steps 1 and 2.
5. If tractor still pushes hard, internal component are not assembled properly or are damaged. Remove transaxle and make necessary inspection and repairs (see Repair Group later in this section).

SHIFT LINKAGE ADJUSTMENT

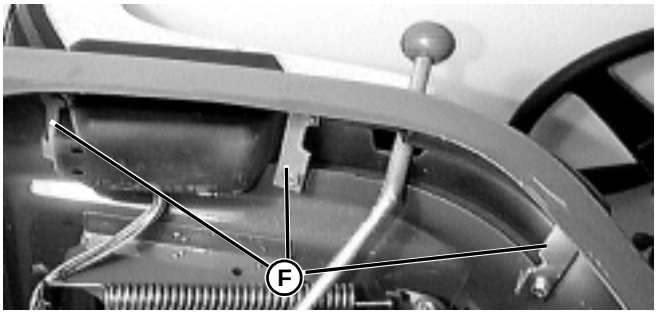




K55

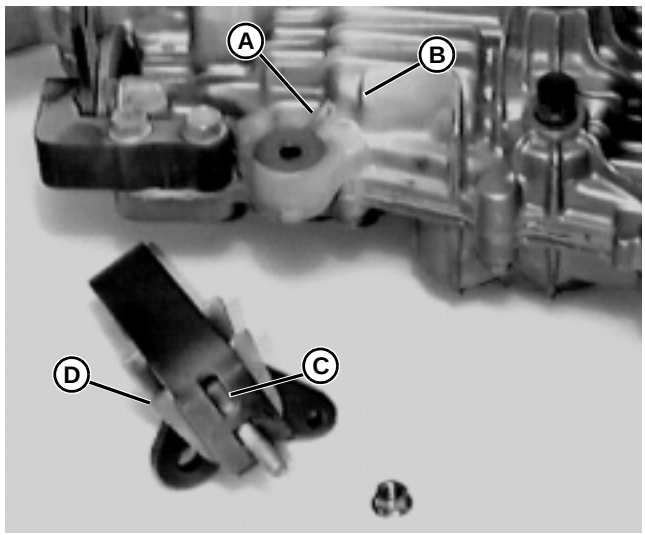


K51

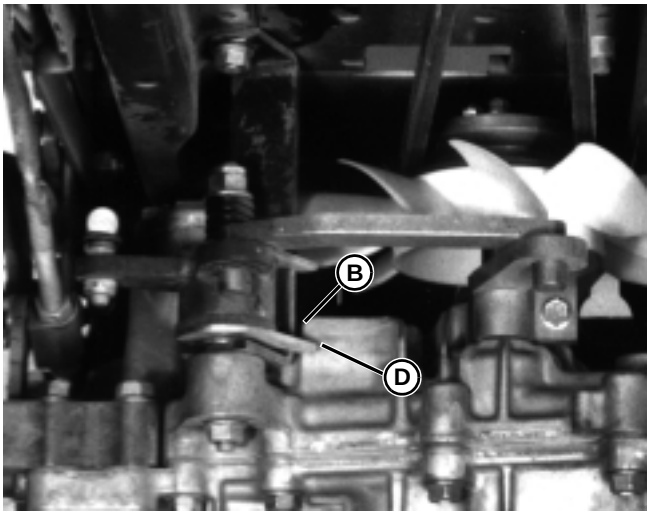


1. Safely raise rear of tractor off the surface and block the front wheels. Remove rear wheels to gain access to transaxle shift linkage and to safely check for creep in transaxle (axles turning while shift linkage is in neutral position without brake engaged).
2. Check that all shift linkage hardware is in good condition and tight. Replace components as necessary.
3. With park brake unlocked, cycle shift lever (A) into full forward and step on brake pedal to return shift lever into neutral position (B). DO NOT move shift lever by hand.
4. Run engine at fast idle and check that transaxle does not creep while shift lever is in this position.
5. If transaxle creeps, loosen front and rear jam nuts (C) of turnbuckle assembly (D).
6. Use flats (E) to turn threaded link (use 1/4 turn increments) clockwise to shorten turnbuckle length or counterclockwise to extend turnbuckle length.
7. Adjust turnbuckle length until creep stops. Hold flats (E) stationary and tighten jam nuts (C).
8. Only as a last resort, if prior adjustment fails to stop creep motion with few threads of link left, would you adjust shift quadrant forward or rearward.
9. Loosen shift quadrant three mounting brackets (F).
10. With engine at fast idle, move quadrant forward or rearward until creep motion stops with shift lever in return-to-neutral position (via brake pedal).
11. Holding quadrant in place, turn engine off and tighten three mounting brackets (F).
12. With engine running at fast idle, re-cycle shift lever and return-to-neutral linkage several times to ensure adjustment eliminates creep.

BELLCRANK SPRING TENSION ADJUSTMENT



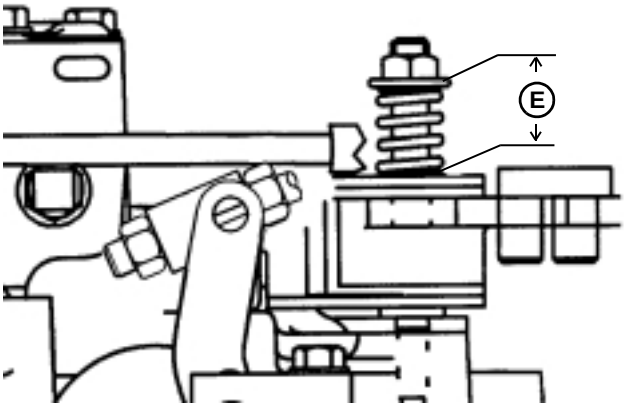
K55



K55

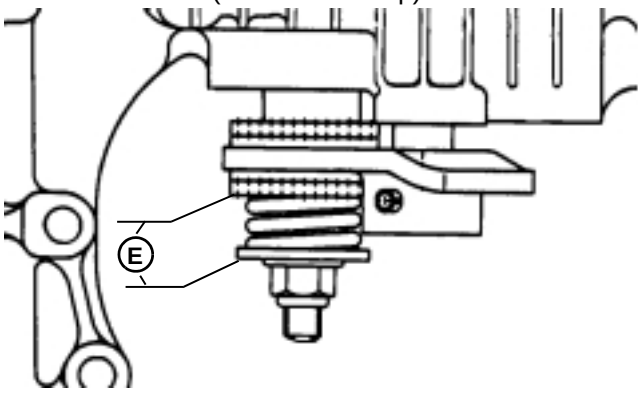
1. Make sure bellcrank assembly and transaxle right, front mounting bracket are oriented properly. Slot (C) should be aligned with transaxle housing rib (A) so that ear (D) of lower anchor washer **is not** wedged behind housing vertical rib (B).

(Shown from R.H. Side)



K55

(Shown from Top)



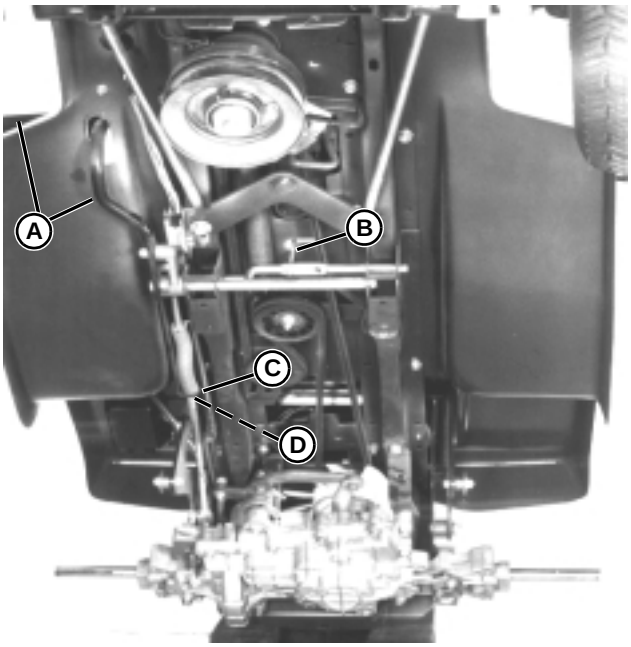
K51

2. Check shift linkage bellcrank spring tension by measuring spring length distance (E) between flanged nut and top anchor washer and adjust to specification. This will ensure shift lever will remain stationary wherever operator lets go of lever anywhere in shift quadrant. This adjustment may vary from one operator's preference to the next.

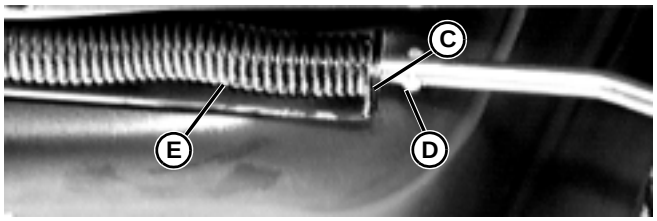
Specification:

Bellcrank spring length (maximum) — K55
production spring. . . . . 15±1 mm (0.59±0.04 in.)
service spring. . . . . 21±1 mm (0.83±0.04 in.)
Bellcrank spring length (maximum) — K51
production spring. . . . . 20±1 mm (0.78±0.04 in.)

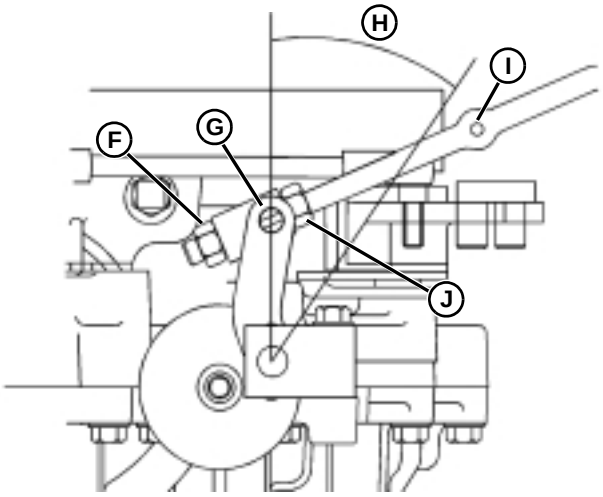
BRAKE SPRING ADJUSTMENT— K55



1. Unlock park brake lever (B) and release brake pedal (A).



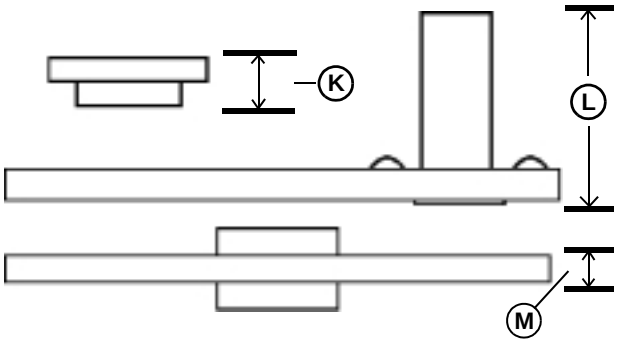
(Shown from R.H. Side)



2. Measure distance between centers of brake lever hole (G) and brake rod hole (I), distance should be **85 mm (3.35 in.)**.
3. If not, gradually adjust jam nuts (F and J) until specified measurement is obtained.
4. Depress pedal (A) and lock park brake (B).
5. Measure distance between end of compression spring bracket (C) and front edge of brake rod stop tabs (D), gap should have a **minimum distance of 2 mm (0.08 in.).**
6. Check brake rod compression spring (E), it should **not be** completely compressed, as shown, when park brake is locked. A slight air gap should be visible between the coils when proper adjustment is reached.
7. Recycle park brake a few times and remeasure distances each time until specified measurements are obtained.
8. Brake lever travel (H) should **not exceed 30°**, if it does measure brake components individually.

Specifications:

Brake lever hole-to-brake rod hole . . . . . 85 mm (3.35 in.)
Spring bracket-to-stop tabs (minimum). . . . . 2 mm (0.08 in.)
Brake lever travel (maximum). . . . . 30°



Specifications:

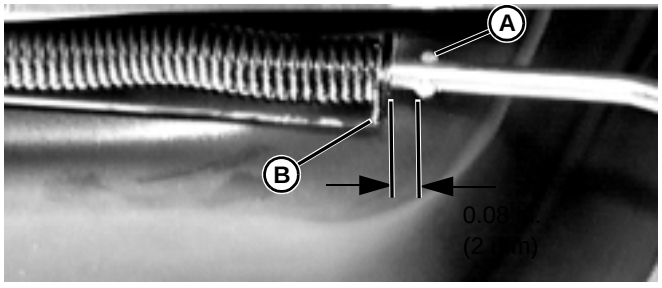
Brake Components Wear Tolerances—
(K) brake puck (minimum) . . . . . 8 mm (0.3 in.)
(L) brake lever (minimum) . . . . . 25 mm (1.0 in.)
(M) brake disc (minimum) . . . . . 2.5 mm (.098 in.)

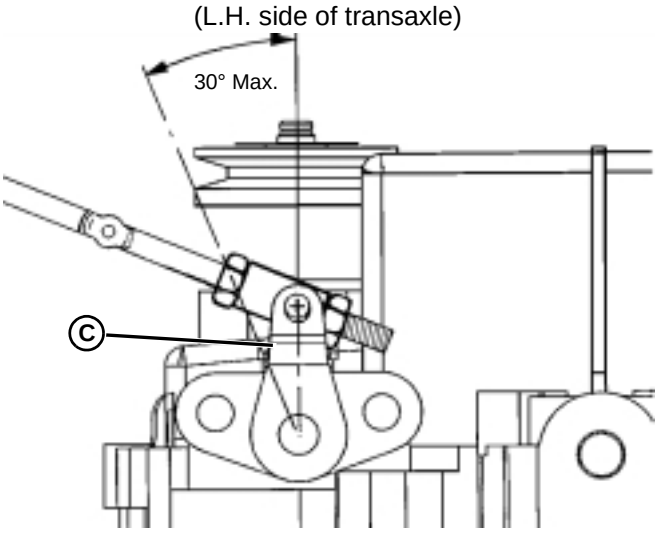
9. Replace components as necessary.
10. Install rear wheels, and lower tractor to surface.

BRAKE SPRING ADJUSTMENT—K51

Brake Spring Adjustment:

1. Unlock park brake and release brake pedal.
2. Measure distance from inside of brake rod stop tabs (A) to outside of compression spring bracket (B) (located below foot tread area on L.H. side of transmission). Distance should be **0.08 – 0.40 in. (2 – 10 mm)**.





If distance is less than or equal to **0.08 in. (2 mm)**:

1. Gradually adjust jam nuts until specified measurement is obtained.
2. Depress pedal and park brake.
3. Measure the distance from inside of brake rod stop tabs (A) to outside of compression spring bracket (B). Gap should have a minimum distance of **0.08 in. (2 mm)**.
4. Check brake rod compression spring. It should not be completely compressed when park brake is locked. A slight air gap should be visible between the coils when proper adjustment is reached.
5. Recycle park brake a few times and remeasure distances each time until specified measurements are obtained.
6. Brake lever (C) travel **should not exceed 30°**. If it does, measure brake components individually.

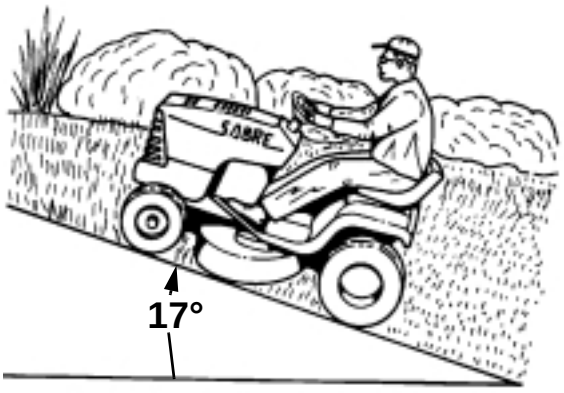
Specifications:

Spring bracket to stop tabs
(minimum) . . . . . 0.08 in. (2 mm)
(maximum). . . . . 0.40 in. (10 mm)
Brake lever travel (maximum). . . . . 30°

Repeat Test Drive—

> **⚠ CAUTION**
>
> **DO NOT engage clutch/brake pedal too aggressively or tractor may tip over backwards. It is recommended that you hang the mower deck from the tractor before performing the test drive on a 17° slope.**

1. Attach mower deck to tractor—this will help stabilize the tractor.



2. Carefully test drive tractor to see if traction drive system pulls tractor steadily up a 17° slope in lower 1/3 of forward range.
3. Look for a steady pull in all three lower gears up the slope. If tractor fails traction test, inspect traction drive belt:
   - if belt is excessively worn, stretched, glazed, or unraveling—replace it (see Inspect, Remove, and Install Traction Drive Belt in the Repair Section),
   - if belt is not excessively worn, make finite adjustments above or below specification to gain proper response in traction drive system. Remember: to lengthen clutch spring causes increased traction and aggressiveness; to shorten clutch spring causes decreased traction and aggressiveness.
4. Drive tractor onto a 17° slope and lock clutch/brake pedal in park position. Check that park brake holds tractor stationary on slope and that tractor does not creep downward once park brake is set.
5. If tractor fails park brake test, inspect brake assembly components and replace as necessary.
6. Return to work area and finish installing mower.

Results:

- Test drive tractor to ensure full forward and reverse speeds are obtained and that transaxle does not creep in neutral position.
- If adjustments are not satisfactory, repeat procedure until proper results are obtained.
- If adjustments are still not satisfactory, internal transaxle repair is needed.

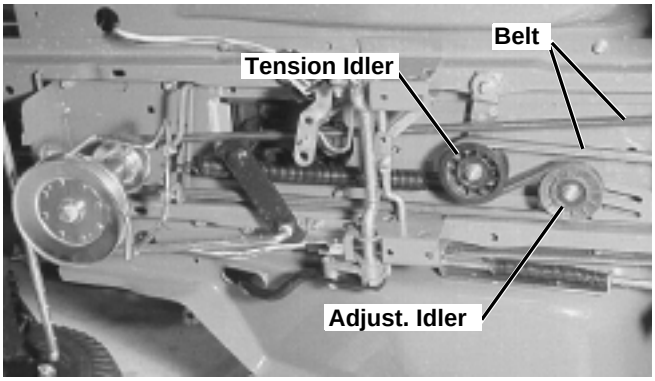
REPAIR

TRACTION DRIVE BELT REMOVAL—K55

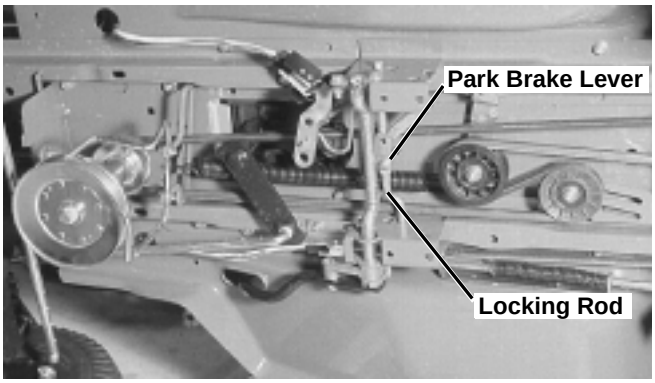
1. Park tractor on level surface and remove battery.
2. Disconnect spark plug.
3. Remove mower deck.
4. Safely raise and block tractor to gain easy access to underside of frame.

CAUTION

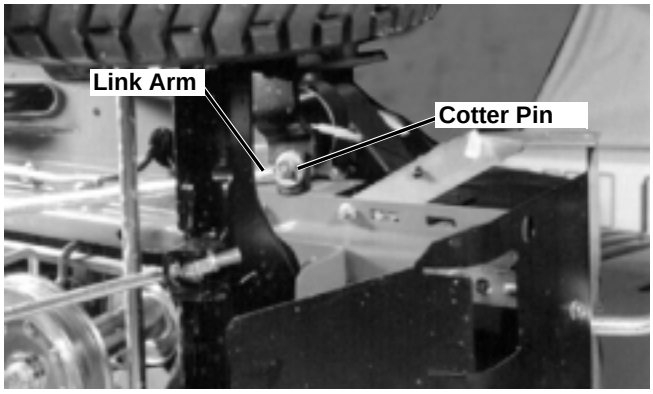
Tensioning spring is under high tension. Wear gloves and use a firm grip when stretching spring.



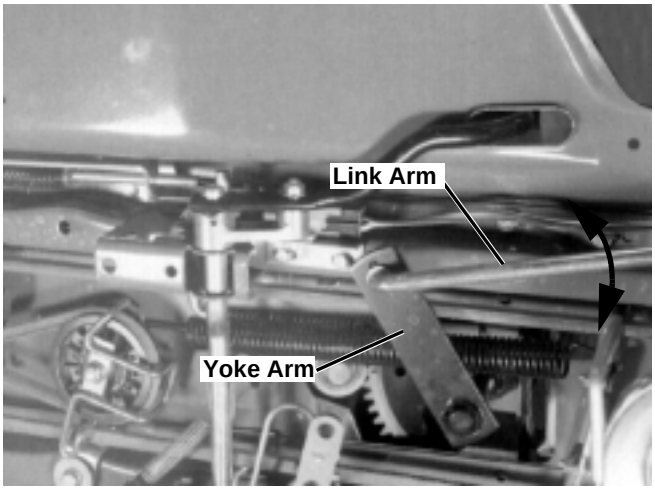
5. Pull tensioning idler rearward until belt can be removed from adjustable idler. Release tensioning idler and remove belt from tensioning idler, and transaxle drive sheave (Not Shown).

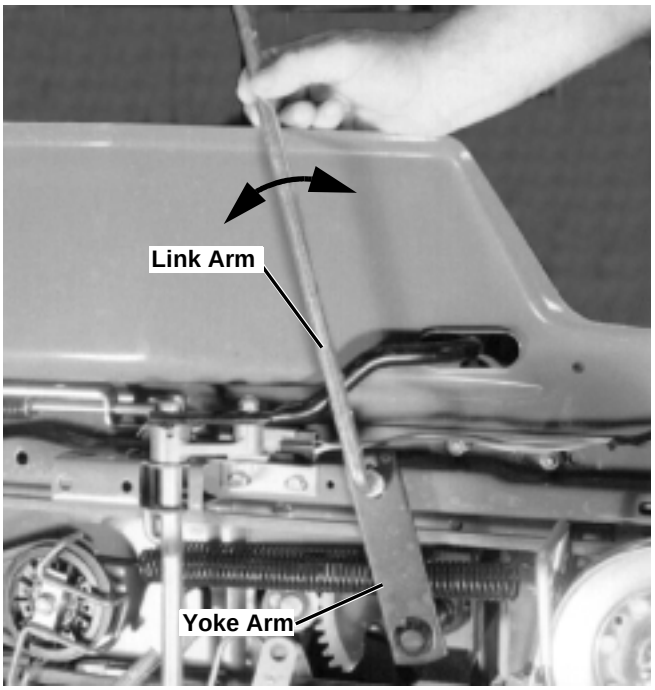


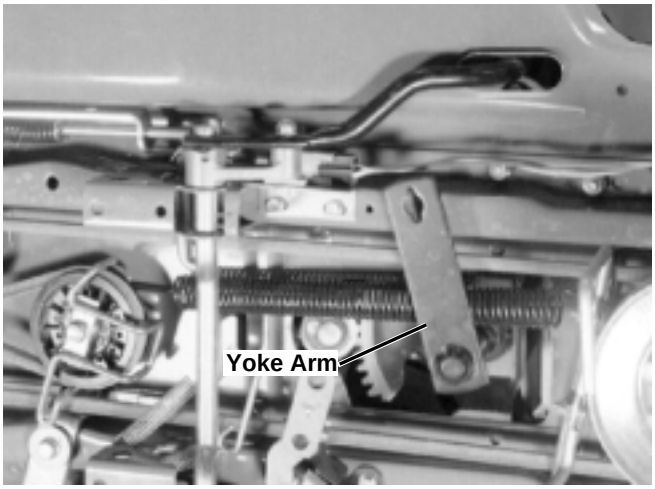
6. Remove park brake lever from locking rod.



7. Remove cotter pin and washer from end of steering link arm.







8. Remove link arm from steering yoke by rotating link arm until parallel with steering yoke arm.

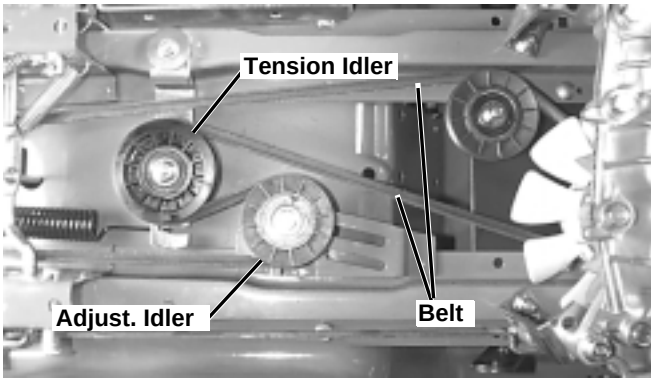
9. Remove belt from engine drive sheave and remove belt from tractor.

TRACTION DRIVE BELT REMOVAL—K51

1. Park tractor on level surface and remove battery.
2. Disconnect spark plug.
3. Remove mower deck.
4. Safely raise and block tractor to gain easy access to underside of frame.

⚠ CAUTION

Tensioning spring is under high tension. Wear gloves and use a firm grip when stretching spring.



5. Pull tensioning idler rearward until belt can be removed from adjustable idler. Release tensioning idler and remove belt from tensioning idler, and transaxle drive sheave.

TRACTION DRIVE BELT INSPECTION

1. Inspect drive belt.

K55:

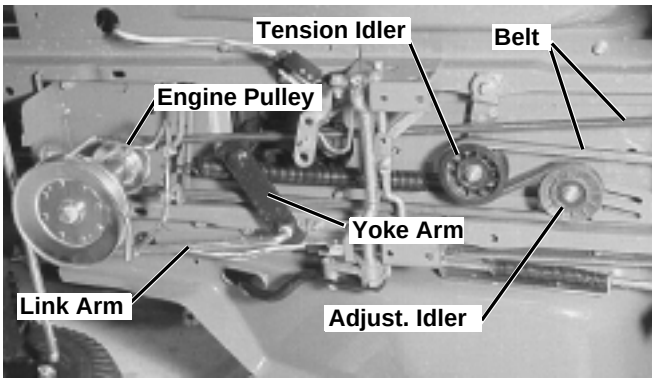
Effective Length—
New . . . . . 2485 mm (97.8 in.)
Top Width—
New . . . . . .13.11 mm (0.52 in.)
Minimum . . . . . 10 mm (0.39 in.)
Depth—
New . . . . . 9.46 mm (0.37 in.)
Minimum . . . . . 7 mm (0.28 in.)

K51:

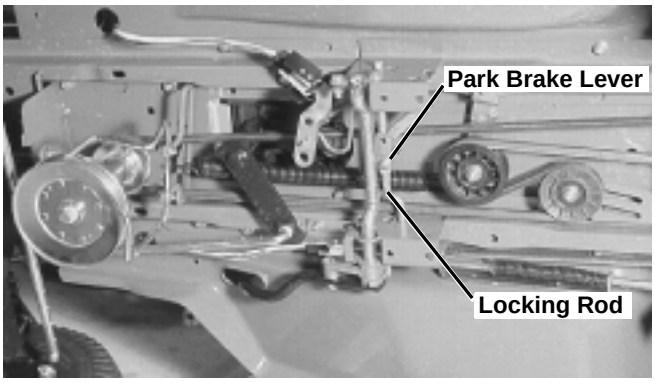
Effective Length—
New . . . . . 2400 mm (94.5 in.)
Top Width—
New . . . . . 12.7 mm (0.50 in.)
Minimum . . . . . 10 mm (0.39 in.)
Depth—
New . . . . . 8.89 mm (0.35 in.)
Minimum . . . . . 7 mm (0.28 in.)

2. Replace belt as necessary.

TRACTION DRIVE BELT INSTALLATION – K55

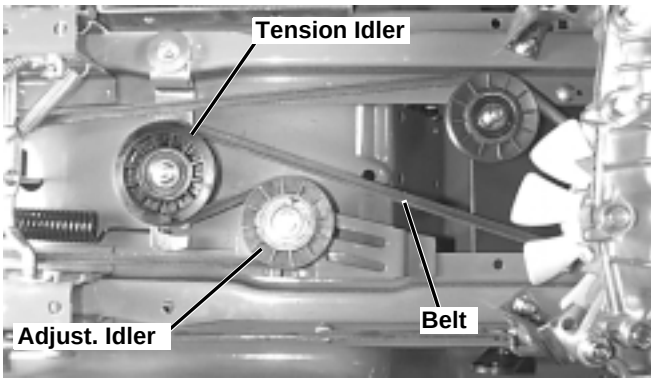


1. Thread belt around belt guide on engine drive pulley assembly. Install on smaller drive pulley, nearest engine.
2. Place belt over pulley on input shaft of gear box.
3. Place belt over idler pulley.
4. Extend tension pulley and slip belt over pulley.
5. Replace steering link arm in steering yoke. Place other end in tie rod and secure with washer and new cotter pin.

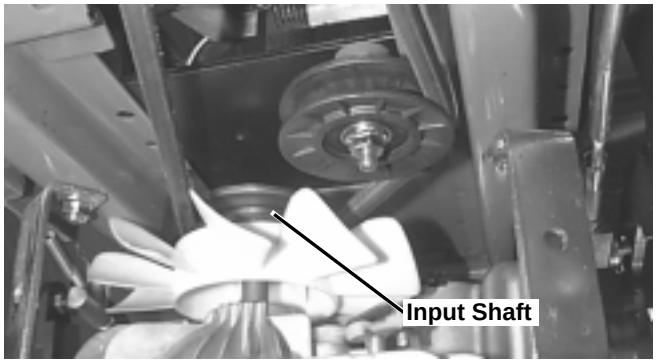


6. Reassemble brake lock.
7. Check belt tension. See “DRIVE BELT ADJUSTMENT” on page 31.
8. Remove blocking and return tractor to level.
9. Hook up battery and spark plug.

TRACTION DRIVE BELT INSTALLATION—K51



1. Thread belt around belt guide on engine drive pulley assembly.



2. Place belt over pulley on input shaft of gear box.
3. Place belt over adjustable idler pulley.
4. Extend tension pulley and slip belt over pulley.
5. Check belt tension. See “DRIVE BELT ADJUSTMENT” on page 31.
6. Remove blocking and return tractor to level.
7. Hook up battery and spark plug.
8.

TRACTION DRIVE BELT TENSIONING SYSTEM REMOVAL/ INSPECTION/INSTALLATION—K55

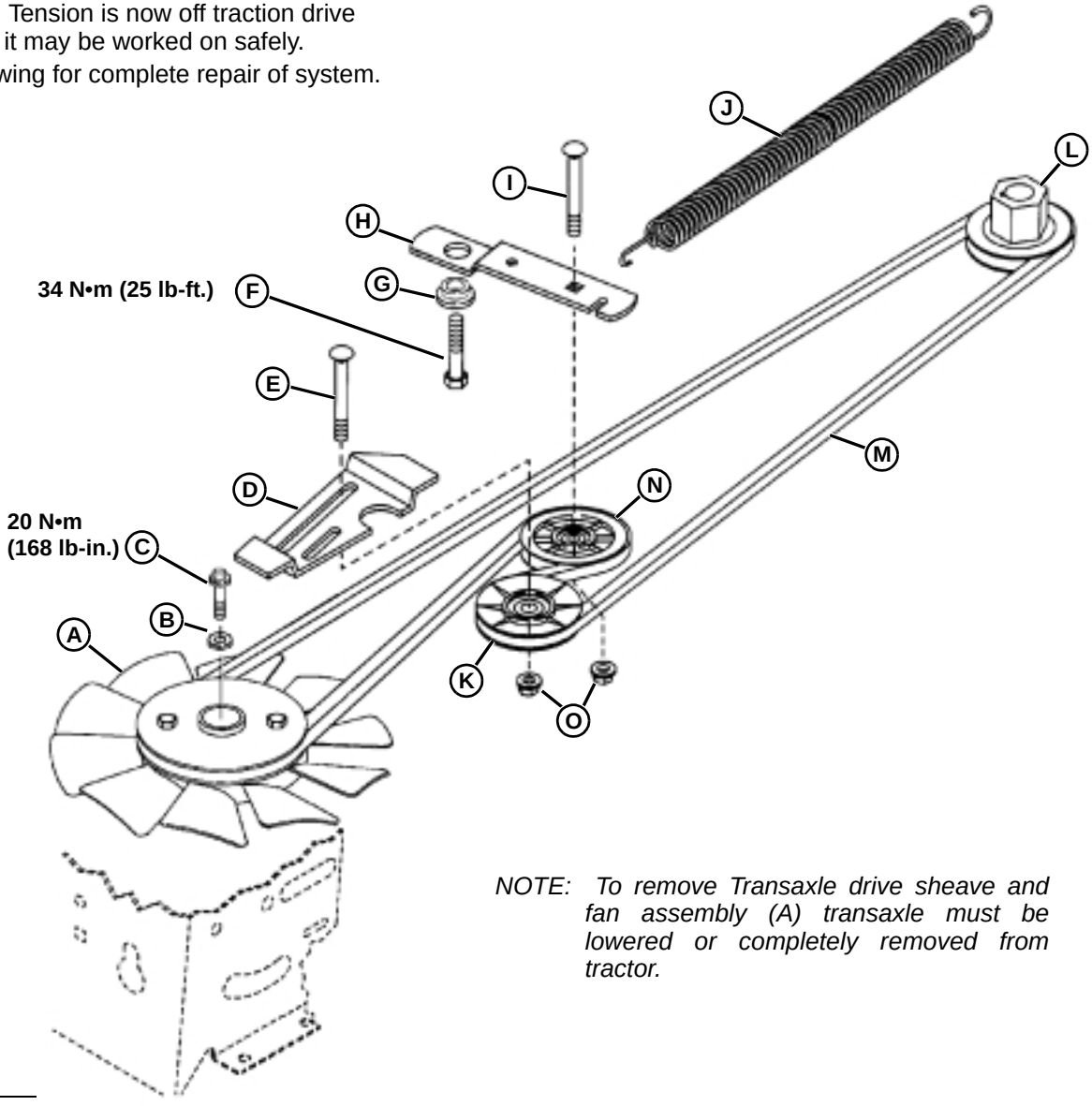
1. Remove mower deck.

CAUTION

Bellcrank tensioning spring is under high tension. Wear safety glasses and gloves when removing or installing spring from frame.

2. Remove Traction Drive Belt (See "TRACTION DRIVE BELT REMOVAL—K55" on page 36)
3. Thread one end of a three foot long piece of starter rope under the front hook of bellcrank tension spring (J). Pull rope half way through spring until ends meet, and wrap ends around a bar several times to make a temporary handle. Pull handle until spring hook is free from frame, and release tension from spring. Tension is now off traction drive system and it may be worked on safely.
4. Use this drawing for complete repair of system.

A. Transaxle drive sheave
B. Washer
C. Cap screw (M6x25)
D. Adjustable idler weldment bracket
E. Carriage bolt (M8x35)
F. Cap screw (M8x20)
G. Bushing
H. Bellcrank
I. Carriage bolt (M8x45)
J. Tensioning spring
K. Adjustable idler
L. Crankshaft drive sheave
M. Drive belt
N. Bellcrank idler
O. Flange nuts (M8)



NOTE: To remove Transaxle drive sheave and fan assembly (A) transaxle must be lowered or completely removed from tractor.

POWER TRAIN LINKAGE SYSTEM REMOVAL/INSTALLATION—K55

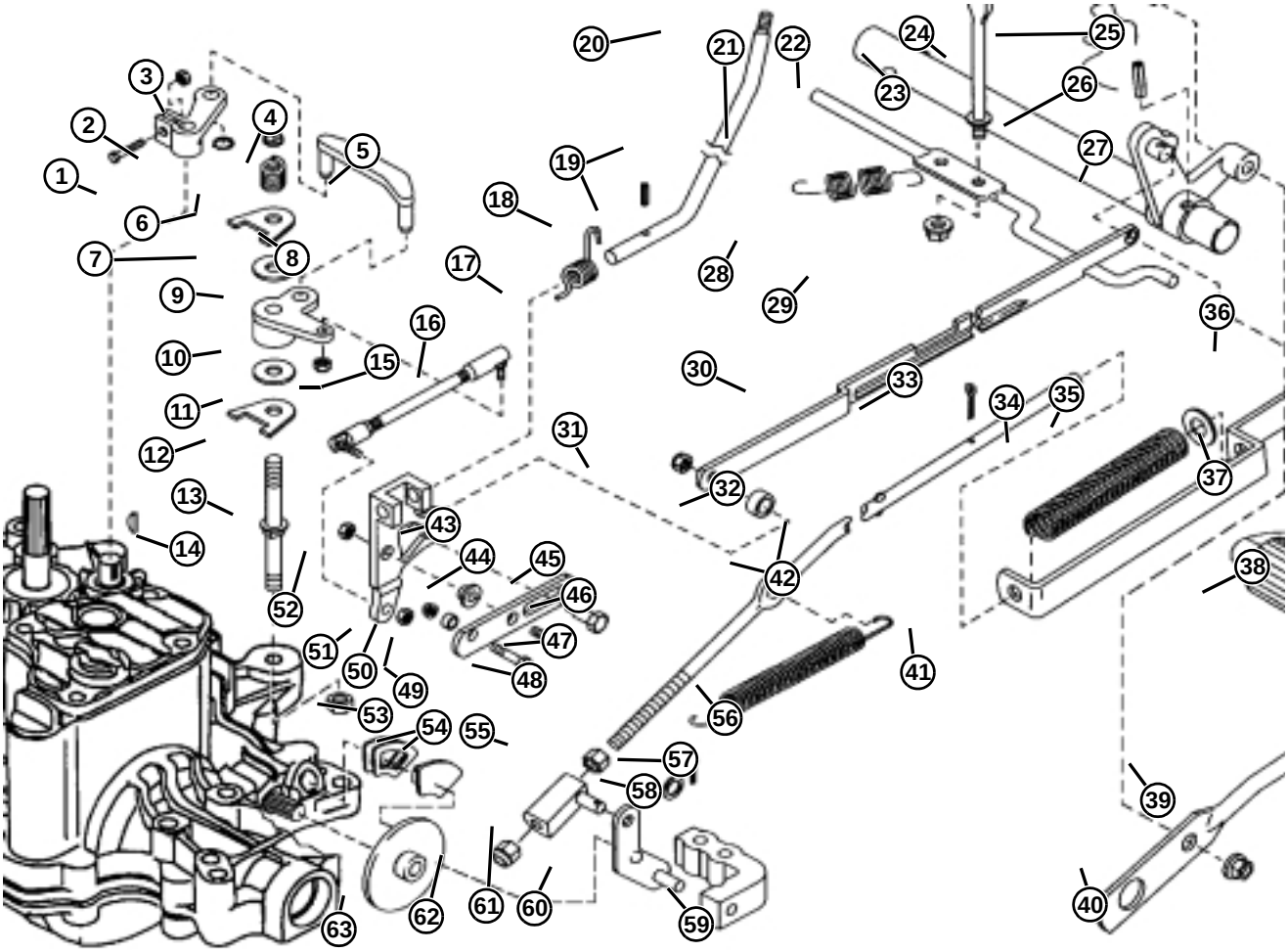
1. Remove mower deck.

CAUTION

Bellcrank tensioning spring is under high tension. Wear safety glasses and gloves when removing or installing spring from frame.

2. Use procedure on previous page to remove bellcrank spring from frame.
3. Use this drawing for complete repair of system.
4. See TESTS AND ADJUSTMENTS section to adjust drive belt tension, shift linkage, bellcrank spring, and brake spring, after installing transaxle.
5. Install mower deck.

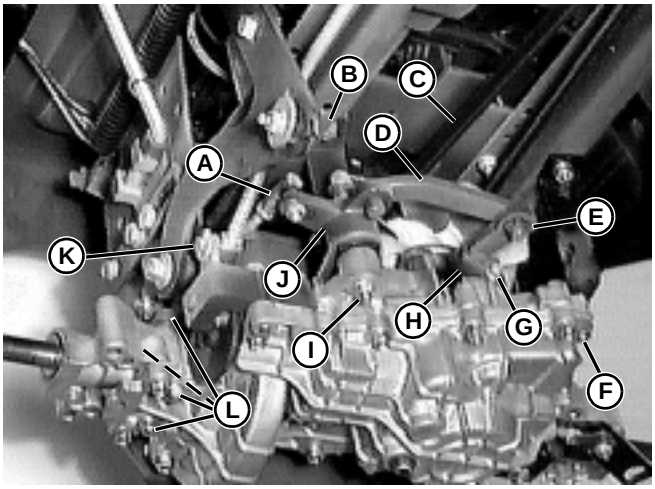
1-Cap Screw (M6x20)
2-Shift aRm
3-Lock Nut (M6)
4-Lock Nut (M10)
5-Shift Link
6-Snap Ring
7-Anchor waSher
8-Spring
9-Friction Disc
10-Bellcrank
11-Friction Disc
12-Anchor Washer
13-Stud (M10x76.5/M8x40)
14-Woodruff Key (5/32x5/8 in.)
15-Lock Nut (5/16 in.)
16-Turnbuckle
17-Return Spring
18-Rolled Pin (M4x20)
19-Shift Lever
20-Shift Knob
21-Park brAke Rod
22-Brake Cross-Shaft
23-Park Brake Lever
24-Safety Wire
25-Cap Screw (M8x35)
26-Rolled Pin (M4x20)
27-Brake Bellcrank
28-Spring
29-Flange Nut (M6)
30-Neutral reTurn Strap
31-Flange Nut (M10)
32-Bushing
33-Cotter Pin (M3.2x20)
34-Compression Spring
35-Washer
36-Cotter Pin (M3.2x20)
37-Washer
38-Brake Pedal Pad
39-Brake Pedal
40-Lock Nut (M8)
41-Comp. Spring Strap
42-Brake Rod
43-Shift Bracket
44-Bushing
45-Support Strap
46-Shoulder Bolt
47-Cap Screw (M10x25)
48-Cap Screw (M8x25)
49-Spacer
50-Flange Nut (M8)
51-Lock Nut
52-Flange Nut (M10)
53-Flange Nut
54-Friction Puck and Shims
55-Nut
56-Return Spring
57-Cotter Pin (M3.2x20)
58-Washer
59-Brake Lever Bracket
60-Brake lever
61-Brake Adapter
62-Lock Nut
63-Brake Disc

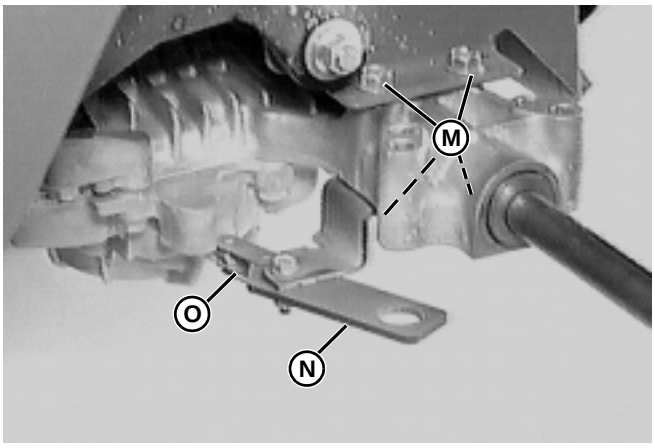


TRANSAXLE REMOVAL AND INSTALLATION—K55

Removal—

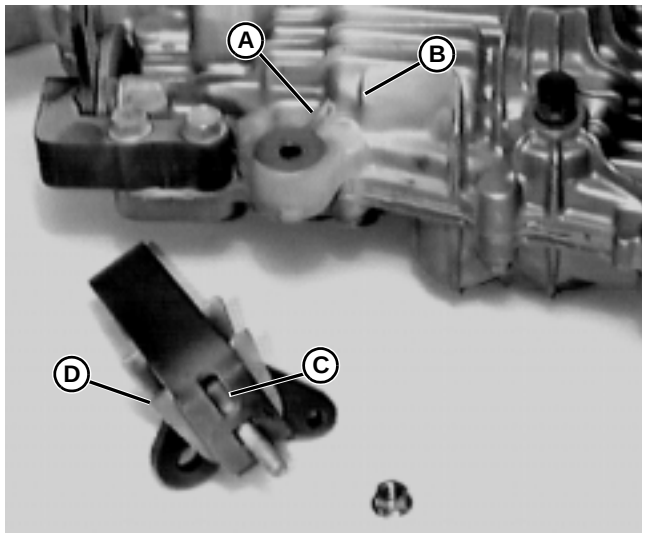
1. Safely raise and block rear of tractor off surface.
2. Safely support bottom of transaxle or have a helper hold transaxle in place when you remove final hardware (Steps 13—14).
3. Remove drive wheels, inspect key and keyways, washers, and snap rings. Replace as necessary.

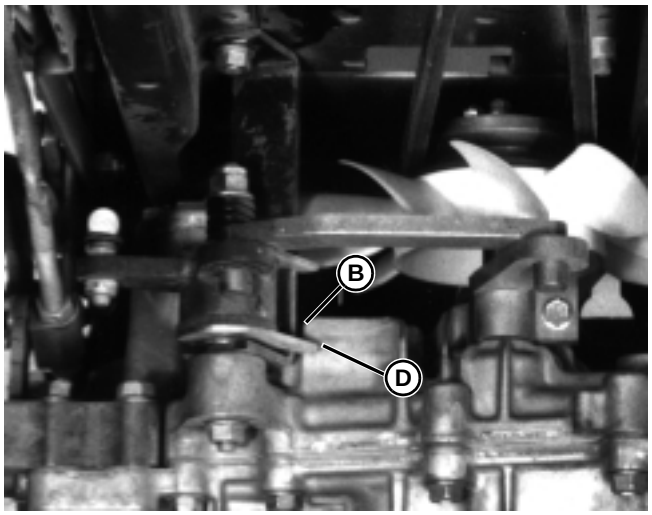




4. Remove traction drive belt (C) from drive sheave.
5. Disconnect shift linkage turnbuckle (A) from bellcrank assembly (J).
6. Remove cotter pin and washer (K) to disconnect brake rod from brake lever.
7. Remove chain link (O) from left-side transport valve assembly.
8. Remove left-front mounting bracket lower cap screw and flange nut (F).
9. Remove flange nut (B) from right-front mounting bracket.
10. Remove two right-side mounting cap screws and flange nuts (L).
11. Pull transport lever (N) into over-center position to remove two left-hand mounting cap screws and flange nuts (M).
12. Remove transaxle to workbench.
13. Remove snap ring (E) to remove shift link (D).
14. Remove cap screw and lock nut (G) to remove shift arm (H). Inspect woodruff key and keyways of shift arm and pump variable swashplate shifter shaft.
15. Remove flange nut (I) slowly to remove bellcrank assembly (J).
16. Drain oil from transaxle.

Installation—





17. Make sure bellcrank assembly and transaxle right, front mounting bracket are oriented properly. Slot (C) should be aligned with transaxle housing rib (A) so that ear (D) of lower anchor washer **is not** wedged behind housing vertical rib (B).
18. Install transaxle in reverse order of removal.
19. Tighten mounting hardware to specifications.

20. Install traction drive belt.

Specification:

Flange nut to right-front mounting bracket . . . . . 15 N•m (11 lb-ft.)
Cap screw and nut to left-front mounting bracket . . . . . 15 N•m (11 lb-ft.)
Cap screws and nuts to frame . . . . . 30 N•m (22 lb-ft.)
Shift arm cap screw and lock nut . . . . . 10 N•m (84 lb-in.)
Turnbuckle lock nut . . . . . 15 N•m (11 lb-ft.)

Adjust Entire Traction Drive System—

See Tests and Adjustments group earlier in this section.

TRANSAXLE DISASSEMBLY—K55

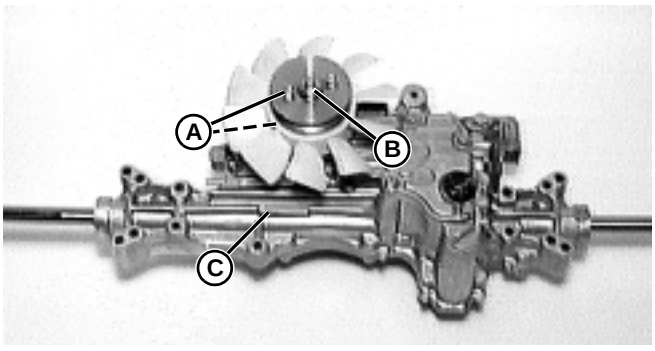
NOTE: INSPECTION, DISASSEMBLY, AND REPAIR INSTRUCTIONS SHOWN IN THIS MANUAL ARE FOR OUT-OF-WARRANTY REPAIRS ONLY.

This transaxle is warranted for 2 years (residential-homeowner application) or 90 days (commercial application). Should an internal defect result in a transaxle failure within the warranty period, the transaxle will be replaced as a complete assembly.

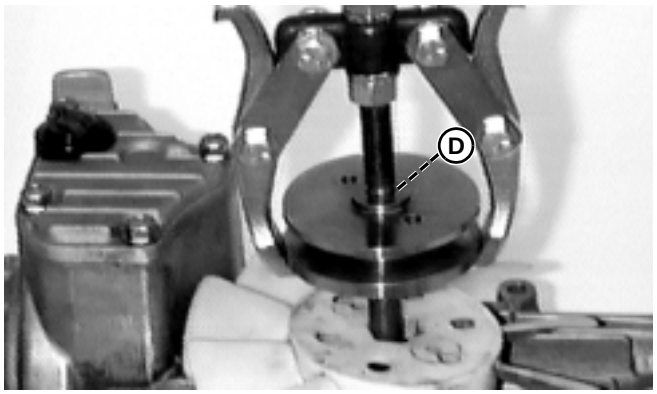
NOTE: If internal hydro component parts are suspected (after performing <u>all</u> external checks and adjustments) CALL SABRE SERVICE DEPARTMENT FOR AUTHORIZATION TO REPLACE TRANSAXLE ASSEMBLY.

IMPORTANT: PAY CLOSE ATTENTION to the ORDER and ORIENTATION of ALL COMPONENTS to their neighboring components. Mark them, if necessary. This will help greatly when its assembly time.

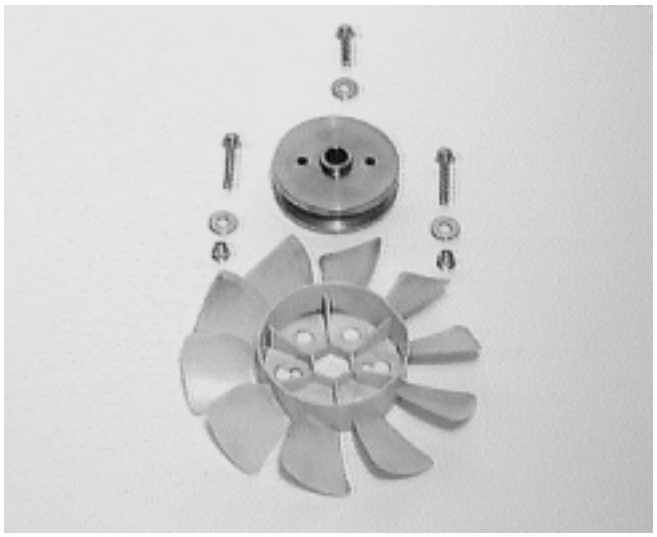
Remove Drive Sheave and Fan—



1. Thoroughly clean transaxle with approved solvent for aluminum castings and dry with compressed air.
2. Remove fan cap screws and flange nuts (A).
3. Remove cap screw and washer (B).
4. Reference transaxle serial number (C) whenever necessary.



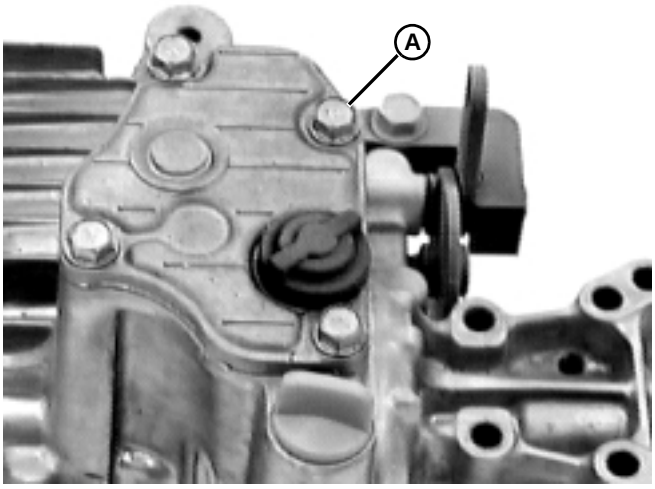
5. Install an 19m8334 (M6x1.0x30) socket head cap screw (D) from stock into end of pump (input) shaft—finger tight only.
6. Put puller on special screw and pull drive sheave from pump shaft.



7. Inspect drive sheave for damage, replace as necessary.
8. Remove fan and inspect for damage, replace as necessary.

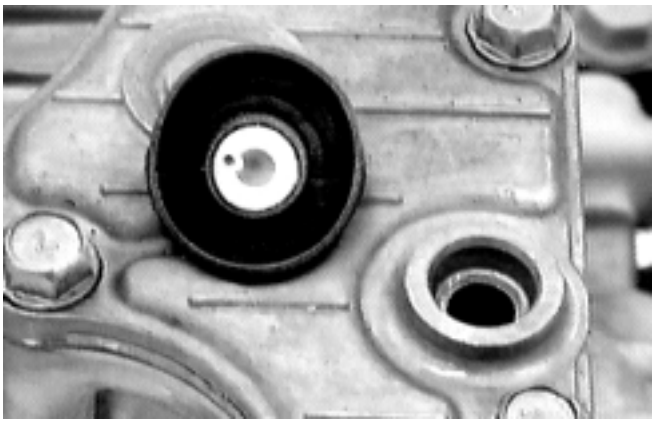
Remove Reservoir Cover—

NOTE: If there is no damage to cover or upper case housing, you need not remove cover because there are no components inside the reservoir.



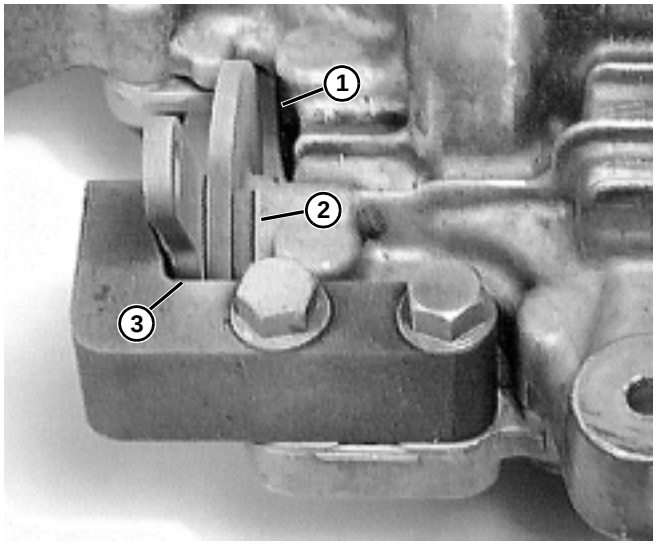
1. Remove four cap screws (A) to remove reservoir cover.
2. Inspect cover for cracks or holes, replace as necessary.
3. If cover is in good condition and to be reused, clean off all gasket residue and wipe clean, then set cover and four cap screws aside for final assembly.

Remove Breather Valve Assembly—

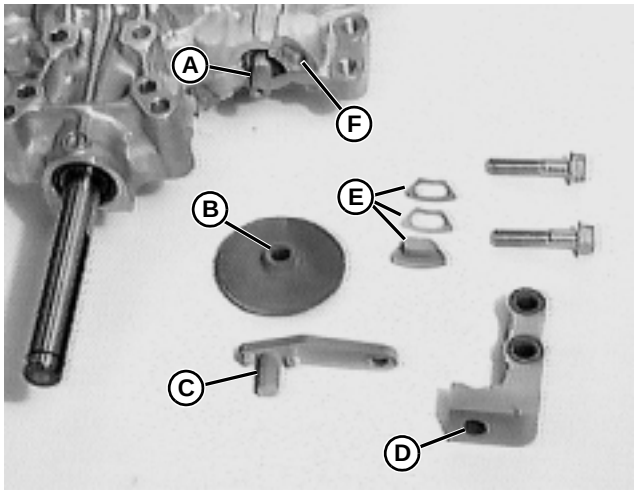


1. Pull breather valve assembly from reservoir cover.
2. Inspect condition of breather valve assembly, replace as necessary.

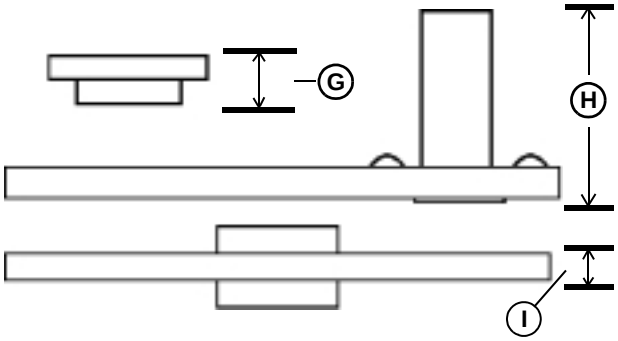
Remove Brake Assembly—



1. First, inspect brake assembly for wear or damage:
   - check for brake disc contact points at case points (1 and 2),
   - check for brake lever contact point at mounting bracket edge (3). If contact is detected, replace lever, disc, and friction puck **as a set**.



2. Remove two cap screws to remove brake assembly.
3. Inspect intermediate shaft brake splines (A) and brake disc splines (B) for chips, rust, and broken teeth. Replace as necessary.
4. Inspect mating surfaces of brake lever shaft (C) and mounting hole (D) for scoring, pitting, and wear. Replace as necessary.
5. Inspect mating surfaces of case recess (F) and friction puck and shims (E) for rust. Clean or replace as necessary.



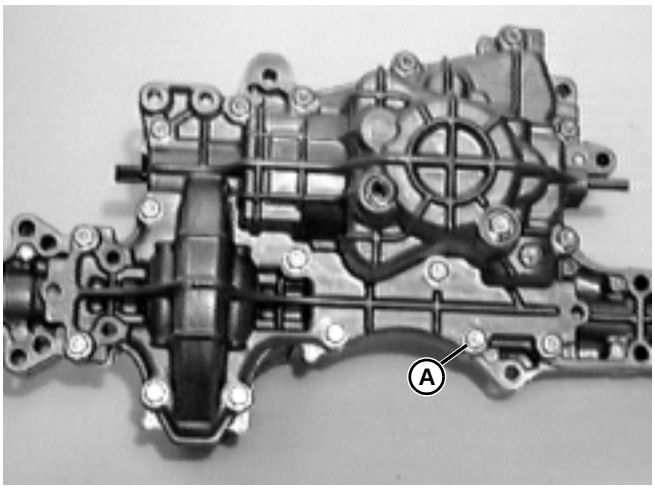
6. Measure brake components individually.
7. Replace components as necessary and **as a set only**. Set brake assembly components aside for final assembly.

Specifications:

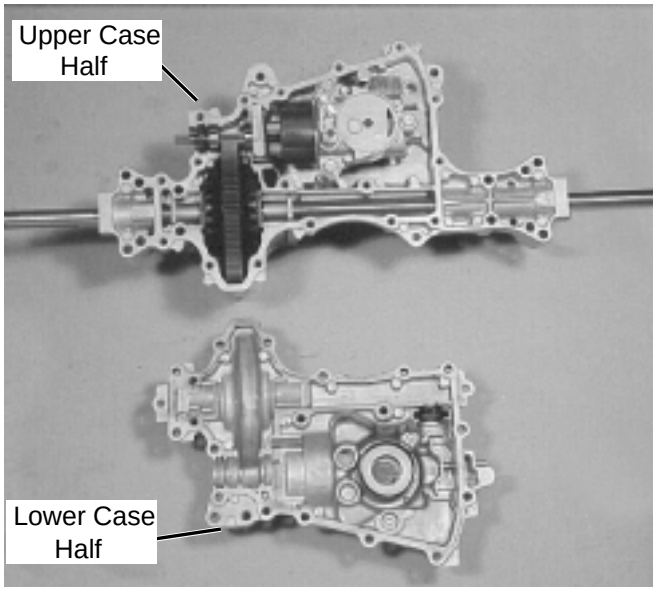
Brake Components Wear Tolerances—

(G) brake puck (minimum) . . . . . 8 mm (0.3 in.)
(H) brake lever (minimum). . . . . 25 mm (1.0 in.)
(I) brake disc (minimum) . . . . . 2.5 mm (.098 in.)

Separate Transaxle Housing Case Halves—

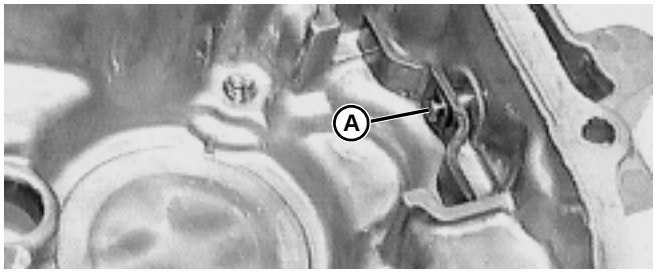


1. Remove seventeen transaxle housing cap screws (B).

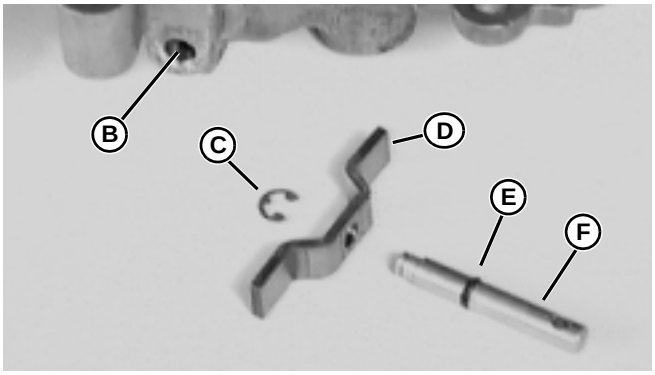


2. Carefully separate transaxle housing into upper and lower case halves.
3. Remove any gasket residue from both case halves.
4. Inspect overall condition of components without removing any of them. Visually target worn or damaged parts for replacement.
5. Remove any remaining oil without removing any components.

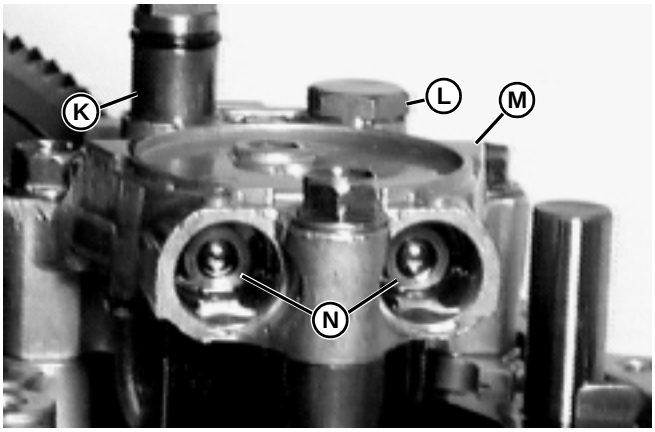
Disassemble Transport (Free-Wheeling) Assembly–



NOTE: Inspect transport actuating bracket and pin assembly (A) for wear or leakage to outside. If assembly is in good condition, just set lower case half aside for final assembly.

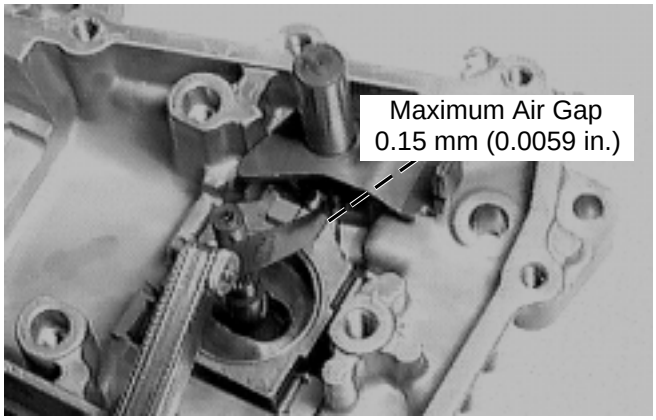


1. If wear or leakage is detected, remove e-ring (C), actuating bracket (D), and pin (F).
2. Remove and discard o-ring (E). Replace it with new o-ring every time assembly is removed or leaking.
3. Inspect pin (F) and lower case bore (B) for pitting, scoring, or rust. Replace as necessary.
4. Inspect e-ring (C) and bracket (D) for wear or deformity. Replace as necessary.
5. Remove and discard filter (G). Replace it with a new filter every time case halves are separated.
6. Remove and inspect push pins (J), springs (I), and push pin guides (H). Replace as necessary.

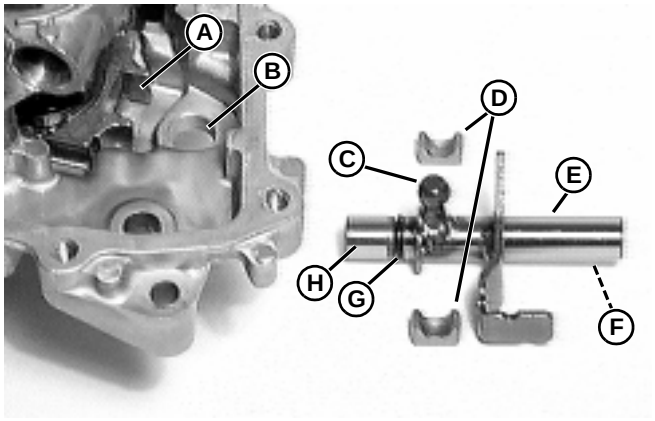


7. Inspect transport bypass relief valve body and balls (N) for pitting, scoring, discoloration, or damage.
8. If any detected, install brake disc on motor drive shaft splines and hold shop cloth over valve bores to catch valve bodies.
9. Turn brake disc clockwise to force one of valve assemblies (N) from center block (M), then turn brake disc counterclockwise to force other valve assembly from center block.
10. If valve assemblies do not dislodge, remove plug (L) and bleed port connector (K) and try using compressed air to dislodge valve assemblies.
11. If valve assemblies still remain lodged, depress check balls with extractor tool(s) to grab onto valve body and pull them from center block and discard valve bodies.
12. Check bores, if damaged—replace center block.

Disassemble Shifter Shaft Assembly—

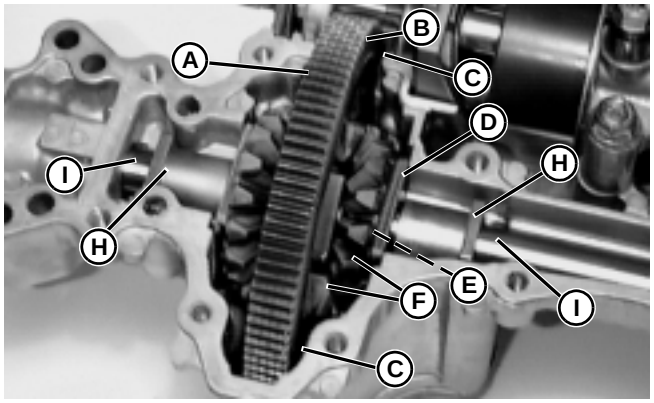


(Pump, motor, and center block removed for clarity)



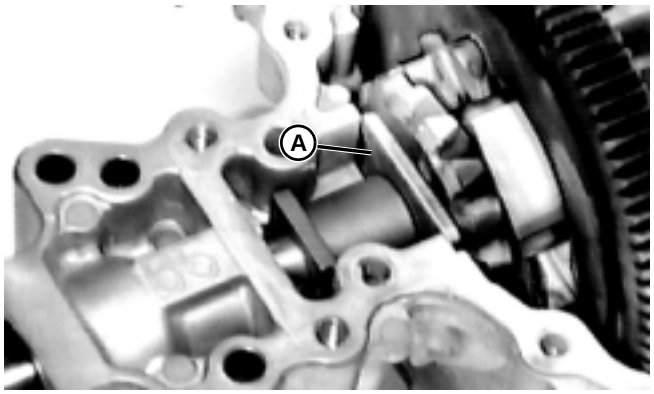
1. First, measure air gap between edge of swashplate slot (A) and shift blocks (D). If out-of-specification, replace shift blocks.
2. Lift shifter shaft assembly (E) and shift blocks (D) from upper case half mounting hole (B) and slot of swashplate (A).
3. Inspect mating surfaces of case hole (B) and end of shaft (H) for scoring or pitting. Replace as necessary.
4. Remove and discard o-ring (G). Replace o-ring every time shifter shaft is removed.
5. Inspect mating surfaces of shifter shaft ball joint (C) and shift blocks (D) for scoring or pitting. Replace as necessary.
6. Inspect shifter shaft keyway (E) for chips or wear. Replace shifter shaft as necessary.

Inspect Differential Axle Assembly—



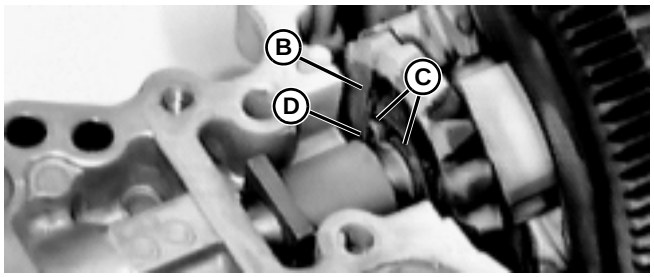
1. Visually inspect assembly:
   - ring gear teeth (A) are all in good condition;
   - sides of ring gear (B) are not contacting walls of case half (C);
   - thrust plates (D) are holding assembly in proper alignment;
   - axle shafts and bevel gear splines (E) instantly and smoothly turn differential bevel gears;
   - bevel gears (F) are all in good condition;
   - axle shaft bushings (H) are both in good condition;
   - axle shafts (I) are both in good condition;
   - area is free of metal chips or shavings.

Disassemble Differential Axle Assembly—



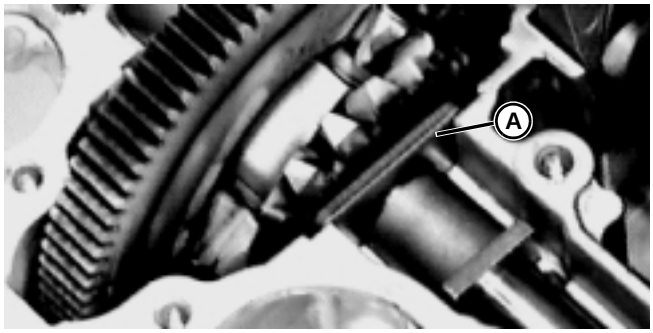
Short Axle Side

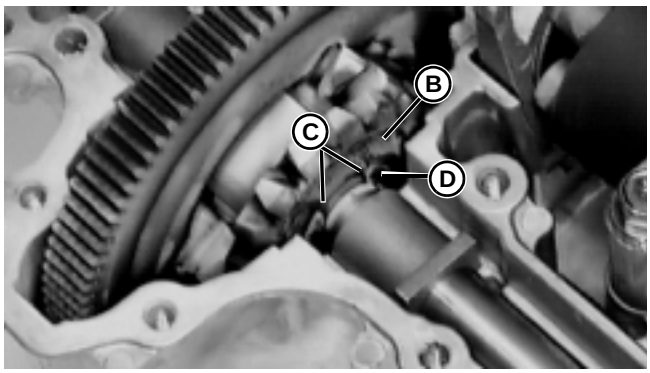
1. Remove short axle side thrust washer (A).



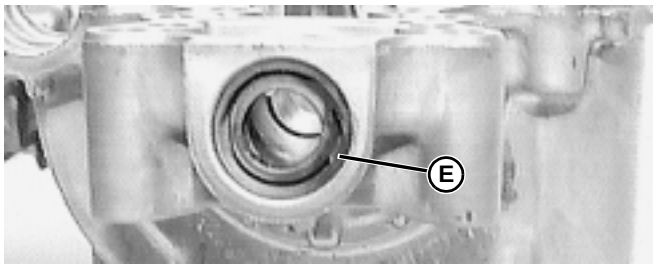
Short Axle Side

2. Turn c-ring (D) in its groove so gap (C) faces down to keep c-ring from falling down inside case.
3. Carefully slide short axle outward slightly while holding axle bevel gear (B) stationary, just enough to expose c-ring (D).
4. Carefully lift c-ring (D) from axle. **DO NOT** remove axle, this will hold bevel gear (B) in place while long axle side is disassembled.

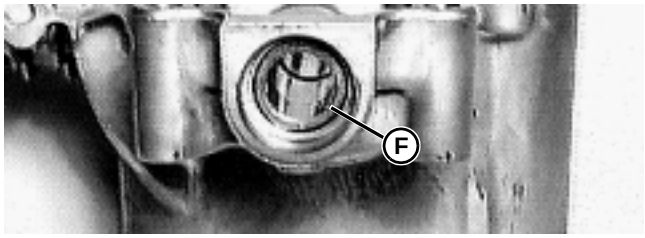


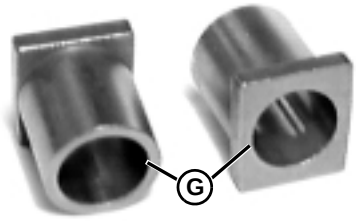


5. Repeat Steps 1—4 for long axle side.
6. Grab entire differential gear assembly by both axle bevel gears (B) and slide each axle clear to remove gear assembly.
7. Remove both axles and axle bushings.

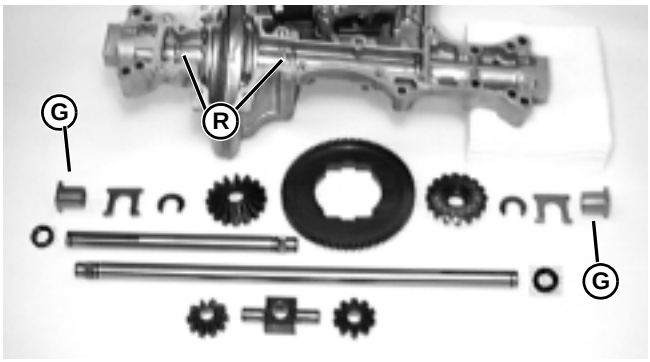


8. Remove and discard axle seals (E) from both sides. Replace with new seals every time axles are removed.





9. Inspect upper case half outer left and right axle bushings for scoring, pitting, wear, or discoloration.
10. Measure inside diameter of bushings (F) and K-55 inner left and right axle bushings (G).
11. If bushings exceed specification, replace upper case half (outer bushings are not serviced) and both inner axle bushings (G), replace as a set only.



12. Inspect thrust washers (H), c-rings (I), and bevel gear (J) recess surfaces (N) for scoring, pitting, or wear.
13. Inspect axle bevel gears (J) for wear, scoring, pitting, chipped or broken teeth, and worn, chipped, or broken splines. Gears should have 16 teeth.
14. Inspect differential ring gear (L) for wear, scoring, pitting, chipped or broken teeth, and cross-shaft notch wear. Ring gear should have 98 teeth.
15. Inspect differential cross-shaft (Q) and bevel gears (P) for wear, scoring, pitting, discoloration, and chipped or broken teeth. Gears should have 10 teeth. Measure inside diameter of gears and outside diameter of cross-shaft.
16. Inspect axle shafts for scoring, pitting, discoloration, damaged c-ring and snap ring grooves, damaged keyways, and chipped or broken splines. Measure axles outside diameters.
17. Replace components as necessary.

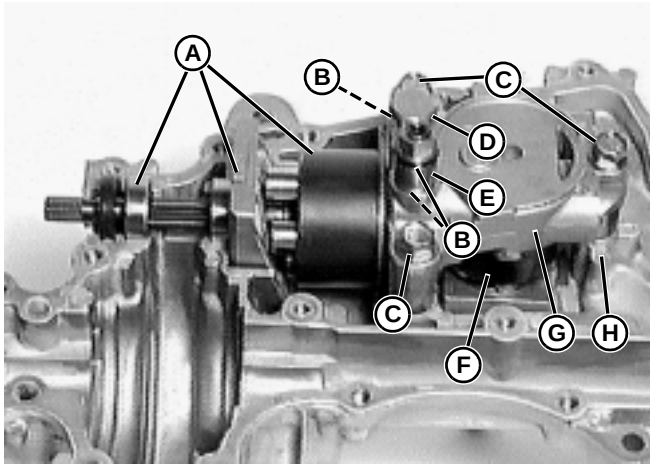
IMPORTANT: Axle shaft seals (O) must be replaced every time axles are remove. Protect new seals by wrapping tape over splines and c-ring grooves of axle shafts before assembly.

18. Inspect upper case journals (K) and bushings seat grooves (R) for excessive wear, scoring, pitting, or discoloration. Replace as necessary.

Specifications:

Bushing ID (maximum) . . . . . 19.2 mm (0.76 in.)
Bevel gears ID (maximum) . . . . .15.11 mm (0.60 in.)
Cross-shaft OD (minimum) . . . 14.96 mm (0.589 in.)
Axles OD (minimum) . . . . . 19 mm (0.748 in.)

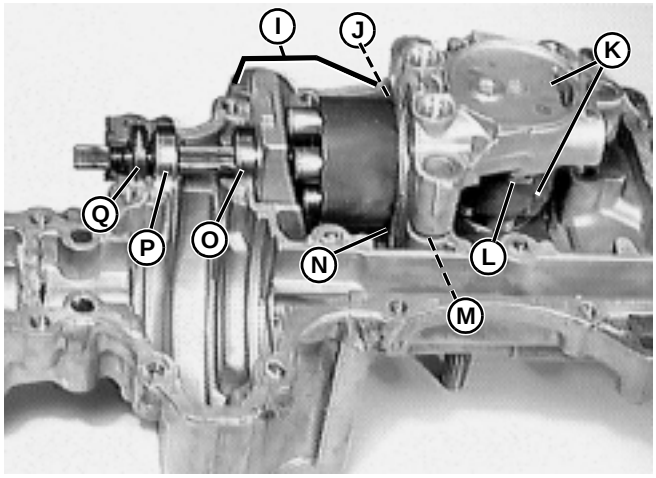
Disassemble Pump, Motor, and Center Block Assembly—



IMPORTANT: READ THIS PROCEDURE COMPLETELY BEFORE PROCEEDING. Pump, motor, and center block assembly is under CONSIDERABLE PRESSURE. Do not allow assembly to FLY APART or damage may occur to many finely-polished, machined components. PAY CLOSE ATTENTION to the ORDER and ORIENTATION of ALL COMPONENTS to their neighboring components. Mark them, if necessary. This will be of great help during re-assembly.

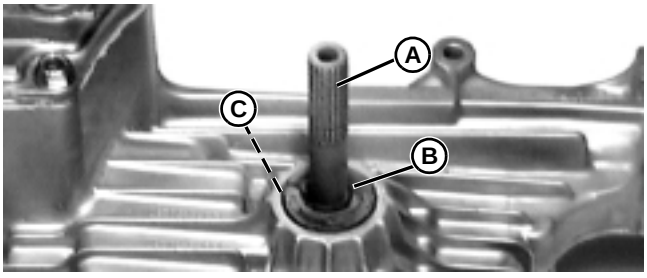
1. Visually check overall condition of assembly, without removing any components. Look for scoring, pitting, discoloration, worn or broken teeth or splines, or other detectable damage.
2. Remove port plug (D) and connector (E). Remove and discard three o-rings (B. Replace o-rings every time port plug and connector are remove.

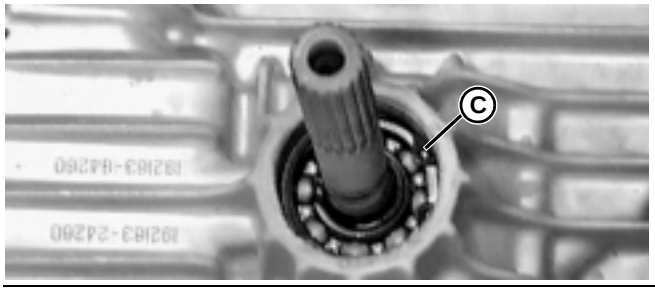
3. Hold downward on entire pump (F), motor (A), and center block (G) assembly with one hand as you gradually loosen three cap screws (C) with the other.
4. Keeping downward pressure steady, slowly remove three cap screws (C) and spacer (H).



5. Without losing any pressure; reposition both hands, one over the motor portion (I) and one over pump and center block portion (K).
6. Now compress both portions together a little more to allow you to walk rolled pins (M) and entire assembly from upper case. Maintain pressure so you do not scratch mating surfaces of motor cylinder block (J) and finished-brass motor plate (N) and pump cylinder block and its plate (L). Also, do not scratch bearing races (O and P) on case grooves while walking assembly from upper case.
7. Carefully move and separate motor, pump, and center block assembly to workbench.

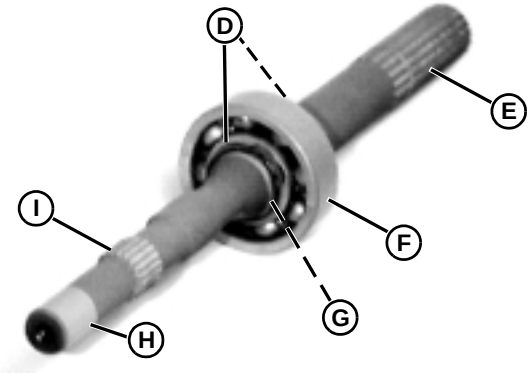
Remove Pump Input Shaft Assembly—





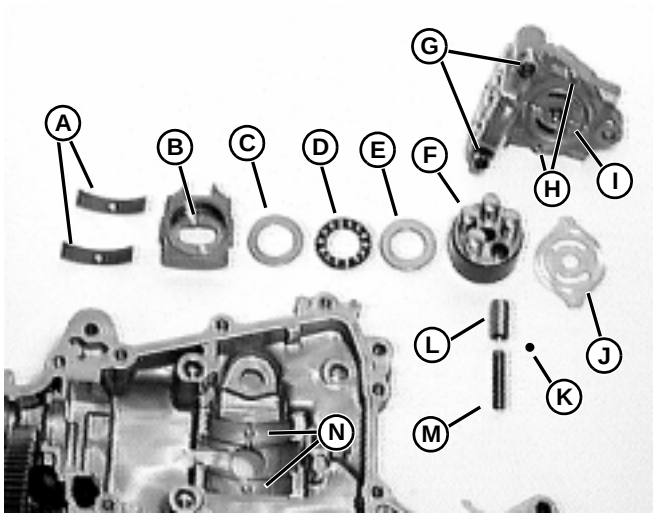
IMPORTANT: Carefully remove components so case bore is not damaged.

1. Remove and discard shaft seal (B).
2. Remove snap ring (C) and pump shaft assembly (A).



3. Inspect ball bearing (F) for scoring, pitting, discoloration, and other wear.
4. If damaged, remove two snap rings (D) to remove and replace bearing.
5. Inspect splines (E and I) for chipped or broken teeth and machined surfaces (G and H) for scoring, pitting, discoloration, and other wear. Replace shaft as necessary and assemble in reverse order.

Disassemble and Inspect Pump and Swashplate—



IMPORTANT: PAY CLOSE ATTENTION to the ORDER and ORIENTATION of ALL COMPONENTS to their neighboring components. Mark them, if necessary. This will help greatly during assembly.

1. Carefully separate pump and swashplate components.

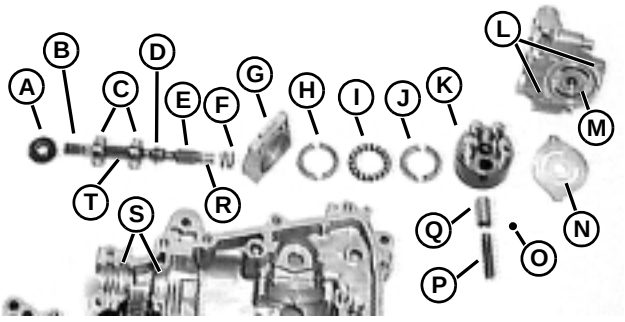
2. Clean and inspect components individually once disassembled:
   • thrust bushings (A) should not be scored, pitted, or worn badly—measure thickness:

Thrust bushings thickness
Minimum . . . . . 1.3 mm (0.050 in.);

• swashplate (B) machine surfaces of ramps and bearing recess and bushing should not scored, pitted, discolored, or worn badly;
• swashplate roller bearing (C, D, and E) should not be scored, pitted, discolored, missing any rollers, or roller retainer broken;
• pump cylinder block (F), pistons (L), washers (K), and springs (M) must have free movement and should not be scored, pitted, discolored, distorted, or worn;
• bronze pump plate (J) and mating surface of cylinder block (F) should not be grooved, discolored, or worn thin around ports;
• center block machined surface (I) should not scored, pitted, or discolored;
• center block rolled pins (G) and dowel pins (H) should be in good condition, not missing or sheared off;
• upper case ramps and centering pins (N) should be in good condition.

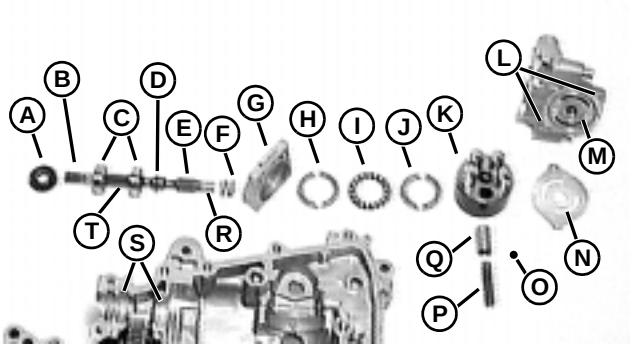
IMPORTANT: If thrust bushings and swashplate ramps are damaged, they must be replaced as a set. If swashplate recess machined surface or bushing are damaged, replace with new swashplate (bushing is not serviced separately). If bronze pump plate or center block are damaged, they both must be replaced. If any component of pump cylinder block is damaged, a complete new pump cylinder block must be ordered.

Disassemble and Inspect Motor and Drive Shaft—



IMPORTANT: Pay CLOSE attention to the ORDER and ORIENTATION of ALL COMPONENTS to their neighboring components. Mark them, if necessary. This will be a great help during re-assembly.

1. Carefully separate motor and drive shaft components.
2. Clean and inspect components individually once disassembled:
   • drive shaft seal (A) must be replaced every time drive shaft is removed or case halves separated;
   • drive shaft splines (B and E) should be in good condition, not chipped, broken, or worn;
   • drive shaft ball bearings (C) should not be scored, pitted, loose, or discolored;
   • drive shaft snap ring (D) should be in good condition as should its groove;
   • drive shaft machined surface (R) should not be scored, pitted, or worn;
   • drive shaft spur gears (T) should have 6 teeth, not be scored, pitted, discolored, chipped or broken, nor worn thin;
   • drive shaft-to-cylinder block spring (F) should be in good condition, not weak, broken, nor distorted;



   • motor fixed swashplate (G) should be in good condition, bearing recess machined surface should not be scored, pitted, discolored, nor worn badly;
   • motor fixed swashplate ball bearing and thrust washers (H, I, and J) should not be scored, pitted, discolored, missing any balls, or ball retainer broken;
   • motor cylinder block (K), pistons (Q), washers (O), and springs (P) must have free movement and should not be scored, pitted, discolored, distorted, or worn;
   • bronze motor plate (N) and mating surface of cylinder block (K) should not be grooved, discolored, or worn thin around ports;
   • center block machined surface (M) should not scored, pitted, or discolored;
   • center block dowel pins (L) should be in good condition, not missing or sheared off;
   • upper case drive shaft ball bearing grooves (S) should be in good condition, not scored, pitted, or discolored.

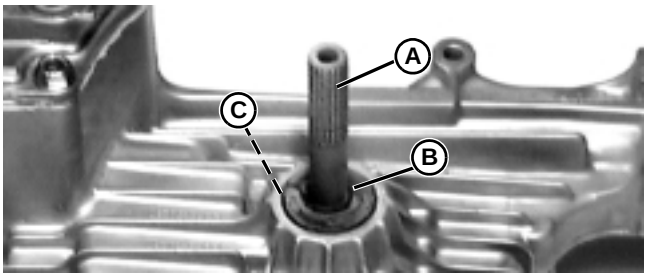
IMPORTANT: If fixed swashplate bearing components are damaged, they must be replaced as a set. If bronze motor plate or center

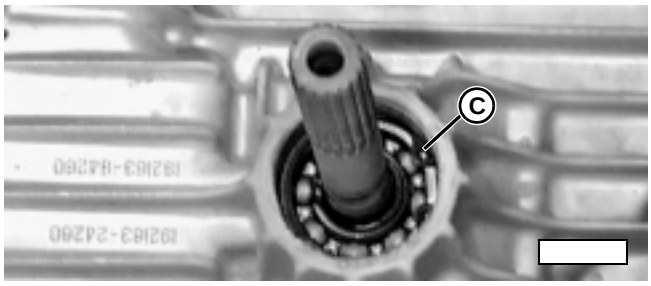
block are damaged, they both must be replaced. If any component of motor cylinder block is damaged, a complete new motor cylinder block must be ordered. If upper or lower case halves show wear or damage, they need not be ordered as a set unless wear or damage is severe enough.

TRANSAXLE ASSEMBLY—K55

IMPORTANT: Coat all components lightly with fresh oil before assembly, especially any mating surfaces between components.

Assemble and Install Pump Shaft Assembly—



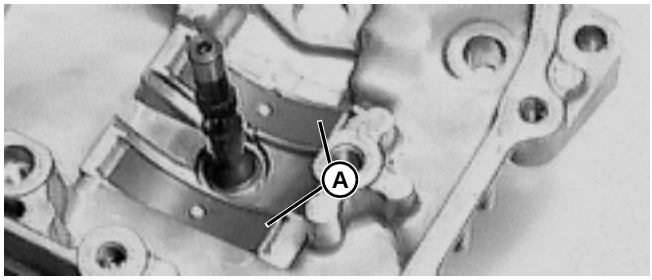


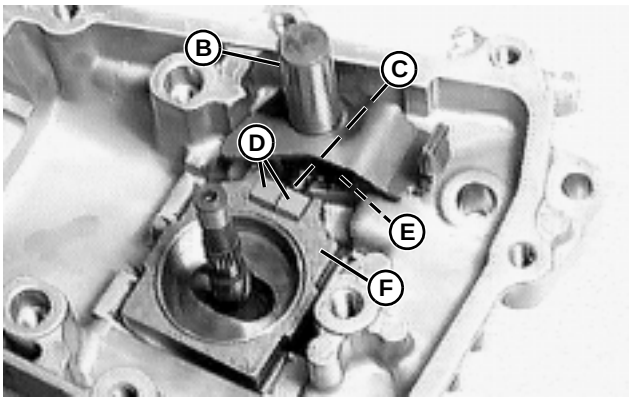
IMPORTANT: Carefully install pump shaft assembly so case bore is not damaged.

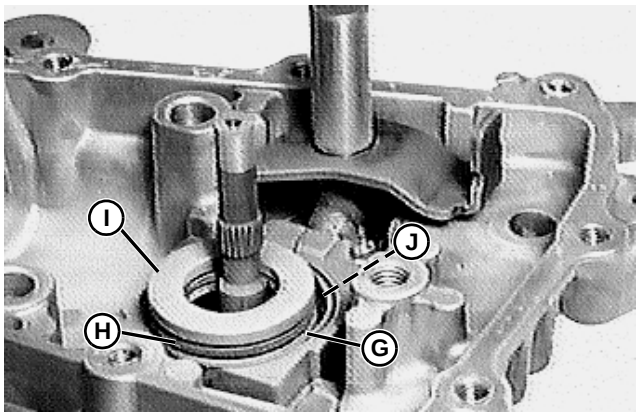
1. Assemble pump (input) shaft and carefully install it into upper case with snap ring (C).
2. Wrap tape around shaft splines (A) to protect seal.
3. Apply grease to lip surfaces of seal (B) before installing it flush with case lip.

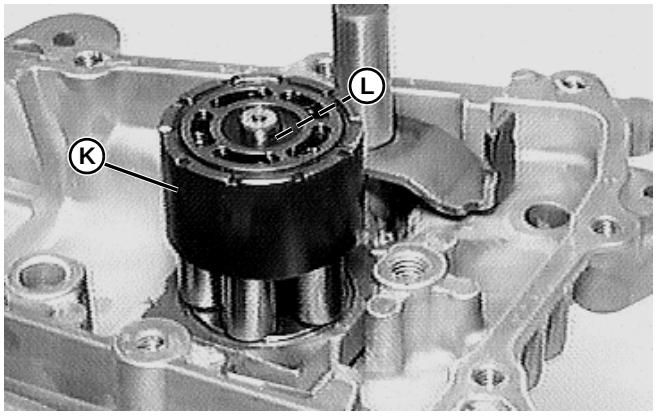
Install Pump, Swashplate, and Shifter Shaft Assemblies—

IMPORTANT: READ THESE NEXT FOUR PROCEDURES COMPLETELY BEFORE PROCEEDING.









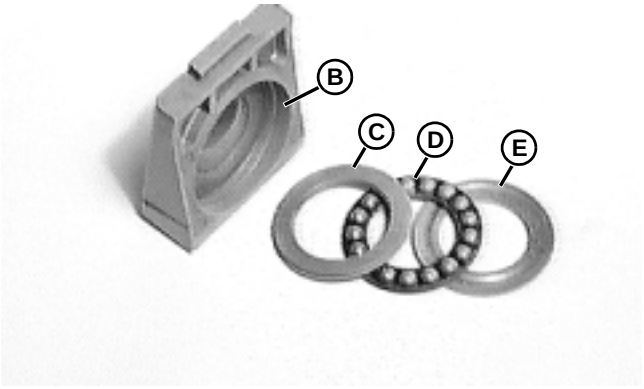
1. Install swashplate thrust plates (A).
2. Install new o-ring (E) on shifter shaft.
3. Install swashplate (F), shift blocks (D) (apply grease to help hold blocks in place), ball joint (C), and shifter shaft (B) together.

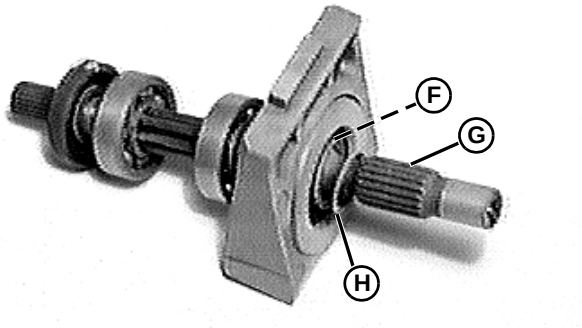
4. Install thin bearing thrust washer (G) first, ball bearing (H), and thick bearing thrust washer (I) on top (mates with pump pistons) into swashplate (J).

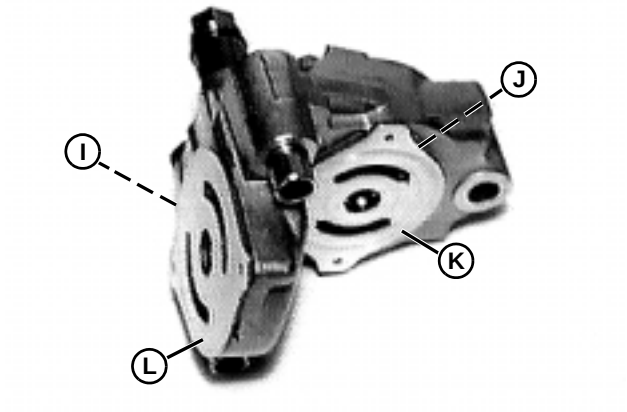
IMPORTANT: Hold fingers tightly between all five pistons so pistons don't drop out of cylinder block during assembly and spline alignment.

5. Install pump cylinder block assembly (K) over pump shaft, twisting left or right until splines of cylinder block align with shaft splines (L), and on top of swashplate bearing assembly.
6. Push on pump cylinder block a few times to ensure assembly is properly installed and has smooth movement and good spring tension.

Install Motor and Drive Shaft Assembly—

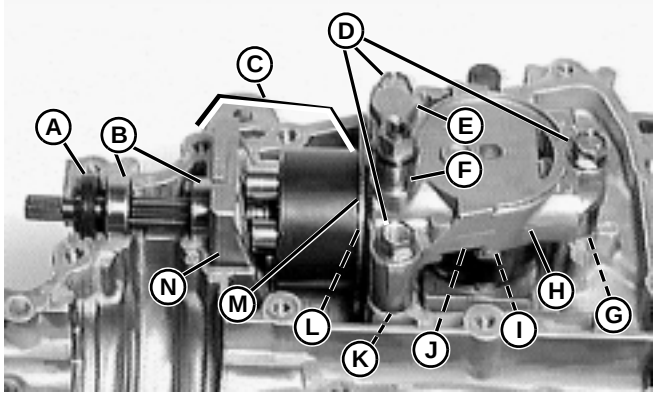






1. Assemble motor drive shaft.
2. Wrap tape over brake disc splines (A) before installing new seal with open lip to inside. Remove tape once seal is installed.
3. Install narrow thrust washer (C) into fixed swashplate recess (B) first, then ball bearing (D), and wide thrust washer (E) last (mates with motor pistons).
4. Install motor drive shaft assembly with longer cylinder block splines (G), spring (H), and snap ring (F) through fixed swashplate hole as shown.
5. Coat motor (I) and pump (J) machined surfaces of center block and backside of bronze motor (L) and pump (K) plates with grease to hold bronze plates in place.
6. Install motor (L) and pump (K) plates with bronze side facing away from center block.

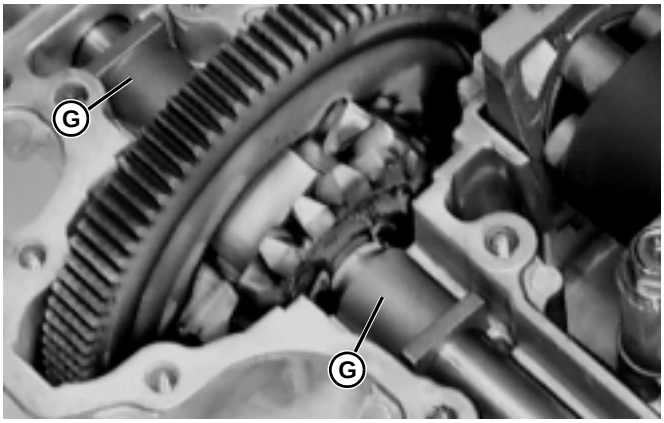
Install Pump, Motor, and Center Block Assembly—



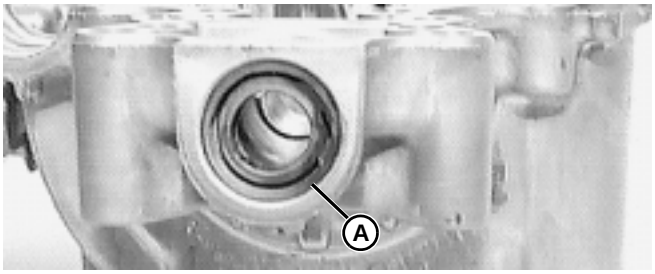
IMPORTANT: DO NOT scratch surface of bronze plate (M) with machined surface of cylinder block or with end of drive shaft (L).

1. Assemble motor cylinder block and drive shaft assembly (C) to center block.
2. Watch to see that end of pump shaft (J) is aligned with bronze plate center hole (I) as you execute Step 3.
3. At a slight angle, align seal (A), ball bearings (B), and fixed swashplate body (N) (with thick portion down) with upper case grooves and, at the same time, align two center block rolled pins (K) with case mounting holes as you squeeze center block and motor assemblies together.
4. Once rolled pins (K) are started, install center two cap screws (D) into rolled pin holes and turn finger tight only.
5. Install spacer (G) and right (third) cap screw (D) and turn finger tight.
6. Check assembly closely to ensure everything is aligned properly then tighten three caps screws to **55 N•m (40 lb-ft.)**.

Install Differential Axle Assembly—

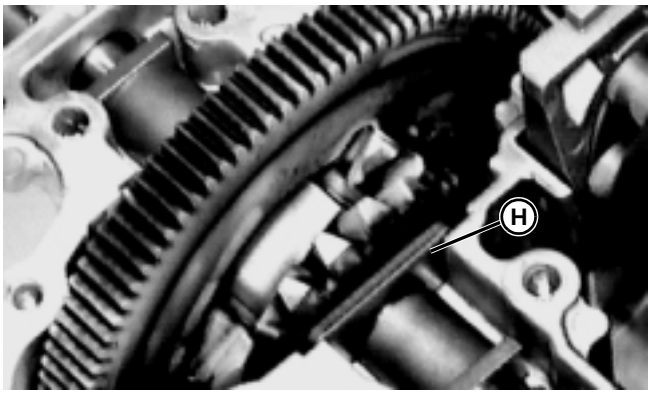


7. Wrap tape around short (B) and long (E) axle shaft splines and c-ring grooves to protect new seals.
8. Install axle shafts tin lower transmission case.Install inner bushings (G) and slide axle shafts flush with inside edge of bushings.

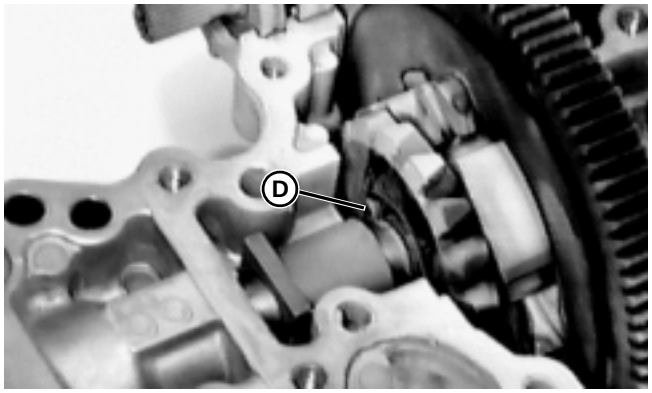


1. Apply grease to new axle seals (A) and install them, open side of seals to inside, over axle, taking care not to damage lip faces, so they are flush with outside case lip.

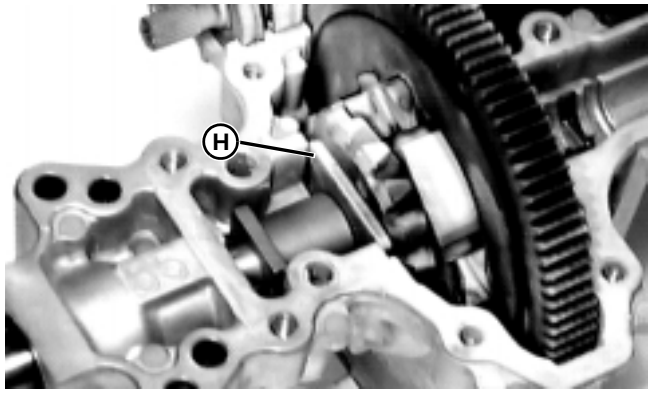
2. Assemble and hold differential cross-shaft, bevel gears, and ring gear assembly (F) together as you align it with motor drive shaft spur gears (C) and axle shafts (B and E).
3. Slide axle shafts into their bevel gears and retain them with c-ring (D).



4. Install thrust washer (H).

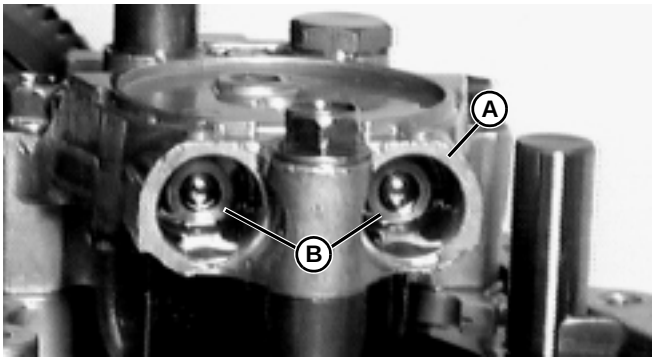


5. Repeat C-ring (D) procedures for short axle side.



6. Repeat thrust washer procedures for short axle side.

Install Filter, Magnet, and Transport (Free-Wheeling) Assembly—

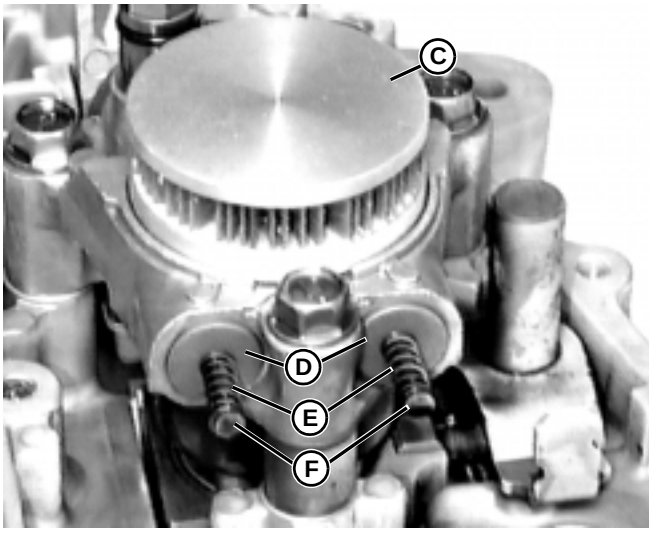


1. Carefully install new relief valve assemblies (B) to specification into center block bores (A).

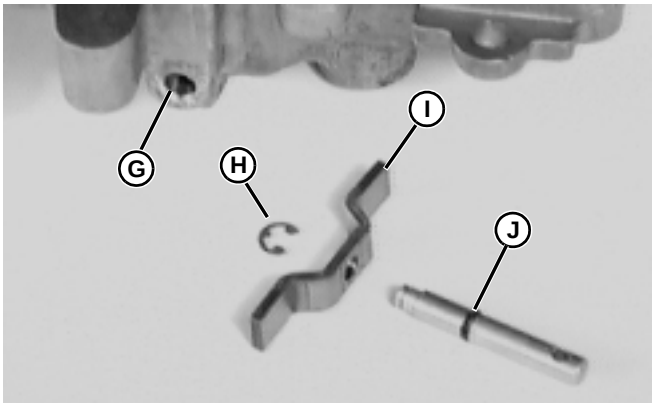
Specification:

Transport relief valve assemblies

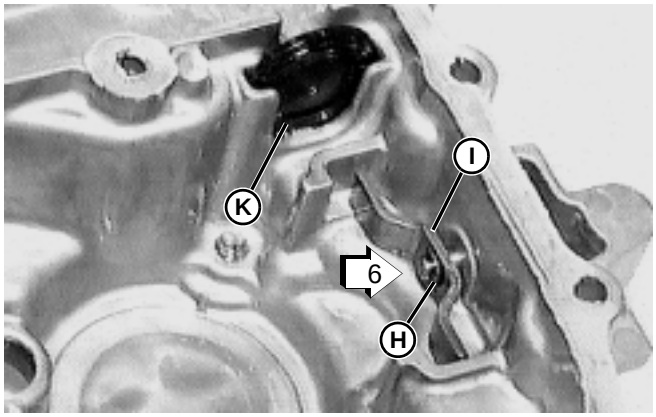
. . . . . approximately 13 mm (0.51 in.)



2. Install new filter (C).
3. Install bypass valve push pin guides (D), springs (E), and push pins (F).

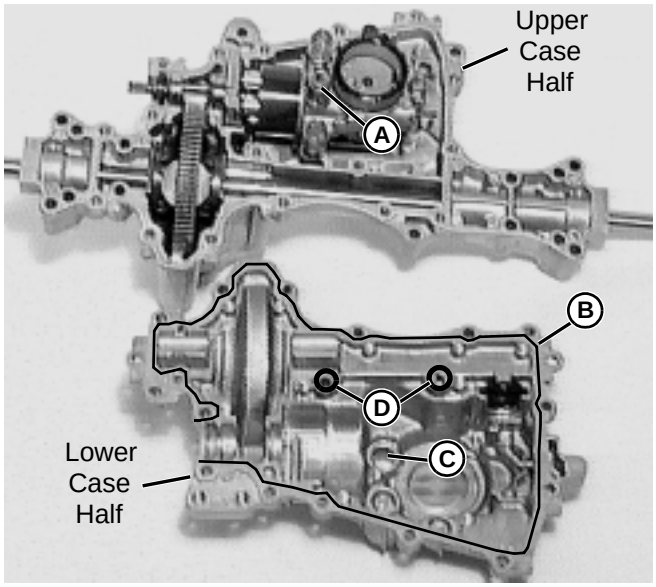


4. Install new o-ring (J) on actuating pin and install in lower case half bore (G).



5. Fasten actuating bracket (I) with e-ring (H).
6. Be sure assembly is pushed all-the-way out before assembling transaxle case halves.
7. Install clean or new magnet assembly (K).

Assemble Transaxle Case Halves—

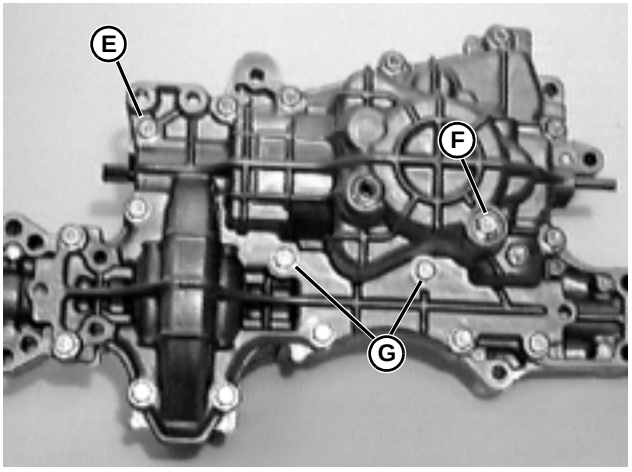


IMPORTANT: Make sure ALL mating surfaces of transaxle case halves are free off all oil, clean and dry before application of Gasket Material.

1. Apply a solid bead (B) of Form-In-Place Silicone Gasket Sealant around lower case half. Be sure to stay to the inside of the mounting holes.
2. Be sure to apply a solid bead around two inner holes (D).

IMPORTANT: When assembling case halves make sure that bypass push pins are fully seated in bore and that actuating bracket and rod are fully withdrawn. Failure to do so will result in broken push pins.

3. Align hole (C) with bleed port stack (A) and firmly push lower case half onto upper case half.
4. Align all 17 case halves holes.



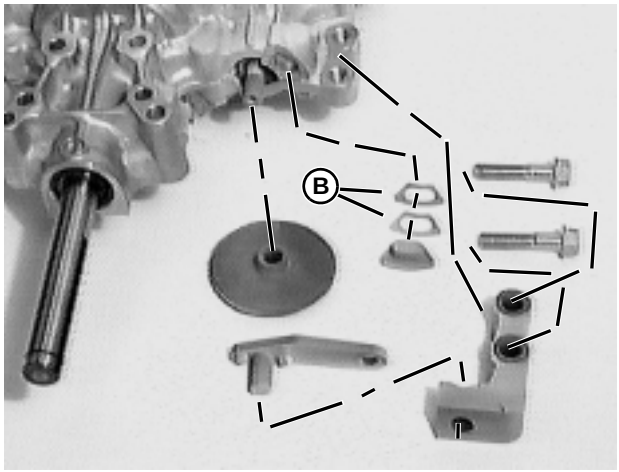
5. Install 17 cap screws (E) finger tight initially and then tighten from center-to-outside in a crossing pattern, beginning with two cap screws (G). Tighten 17 cap screws to specifications.

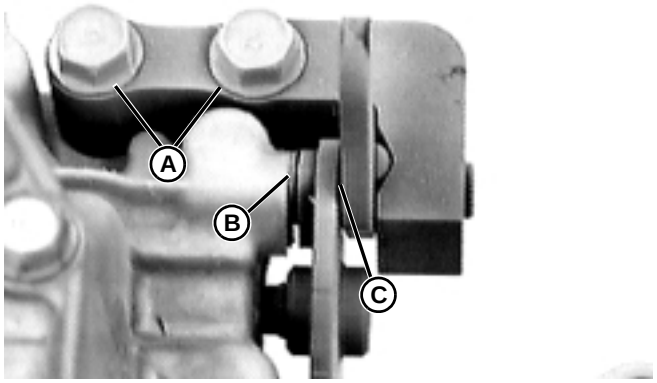
Specifications:

New upper case . . . . . 30 N•m (22 lb-ft.)
Used upper case . . . . . 27 N•m (20 lb-ft.)

6. Install new o-ring on drain plug (F) and tighten it to **24 N•m (17 lb-ft.)**.

Install Brake Assembly—

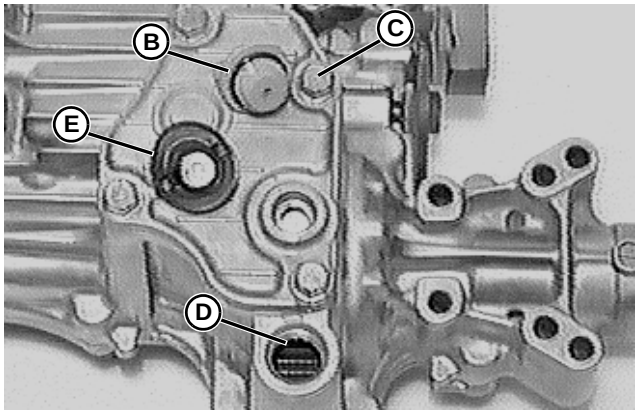




1. Install brake components to transaxle and, using friction puck shims (B), adjust air gap (C) between brake lever and brake disc to **0.8—1.3 mm (0.030—0.050 in.)**.
2. Tighten cap screws (A) to **55 N•m (40 lb-ft.)**.

Install Reservoir Cover and Breather Valve Assembly and Fill Reservoir—

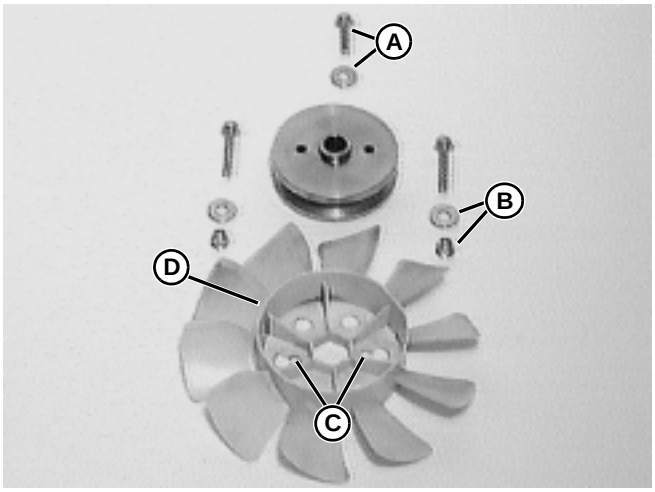
1. If reservoir cover was removed or replaced, apply a solid bead (A) of Form-In-Place Silicone Gasket Sealant around the cover, staying to inside of holes.



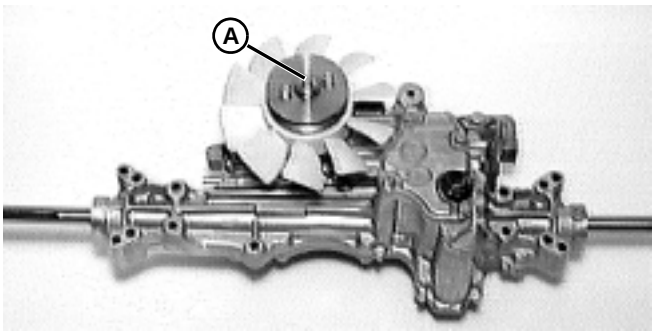
2. Install cover to reservoir and fasten with 4 cap screws (C). Tighten cap screws to specification.
3. Fill reservoir with 1.6 L (1.7 U.S. qt) of 10W30, Class-CD engine oil. Oil should reach bottom of fill hole (D).

4. Install breather valve assembly (E) and fill cap (B). Tighten cap screws to **24 N•m (17 lb-ft.)**

Install Fan and Drive Sheave—

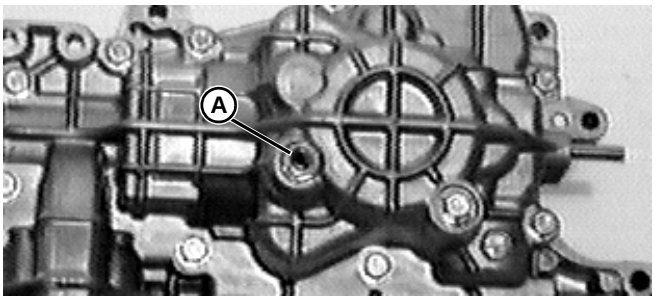


1. Assemble fan to transaxle drive sheave using two fan holes (C). Two washers and nuts (B) go under fan. Bottom fan lip (D) goes towards transaxle.



2. Install sheave/fan assembly to pump input shaft with cap screw and washer (A). Tighten cap screw to specification **20 N•m (168 lb-in.)**

Quick Transaxle Bleed Procedure:



1. Turn transaxle over.
2. Remove recess plug (A) from bleed port stack.
3. While you pour new oil into hole, have a helper hold transaxle off bench and turn brake disc to rotate motor shaft and bleed internal pump, motor, and center block assembly.
4. Stop pouring oil when oil reaches bottom of hole. Apply Pipe Sealant with Teflon® or Teflon® tape to pipe plug. **DO NOT** allow any tape to enter internal portion of bleed port stack. Tighten plug to **8 N•m (72 lb-in.)**.

TRANSAXLE INSTALLATION—K55

See “TRANSAXLE REMOVAL AND INSTALLATION—K55” on page 41

TRANSAXLE BLEED PROCEDURE—K55

1. With vehicle parked on a flat level surface, preferably outside and away from all obstructions, check transmission oil. Top of if required.
2. Safely raise and block frame so that rear wheels are a minimum of **51 mm (2 in.)** off the surface. Chock front wheels.

⚠ CAUTION

Vehicle must be blocked and chocked in such a fashion that it will not move when engine is running. DO NOT park vehicle facing wall. Operator should be in seat during this procedure to prevent inadvertent run always if vehicle should come off blocks.

3. Run engine at **SLOW** idle.
4. **CAREFULLY** engage and disengage transport (free-wheel) lever while helper pushes shift lever into forward, neutral, and reverse. Repeat several times.
5. When drive wheels start to turn, shift to neutral and be sure transport lever is disengaged.

IMPORTANT: TURN OFF ENGINE.

6. Safely lower tractor to surface.
7. Recheck and top-off oil level.
8. Sit in seat, shift into forward, and, if necessary, have helper push tractor until transaxle drives tractor under its own power.
9. Move throttle lever to fast idle and alternate shift lever between forward and reverse several times until transaxle is responsive and obtains full forward speed of 8 km/hr (5 mph) and reverse speed of 4.2 km/hr (2.6 mph).
10. Recheck and top-off oil level.

Test and Adjust Entire Traction Drive System

See See “TESTS AND ADJUSTMENTS” on page 30 for relevant procedures.

TRACTION DRIVE BELT TENSIONING SYSTEM REMOVAL/ INSPECTION/INSTALLATION—K51

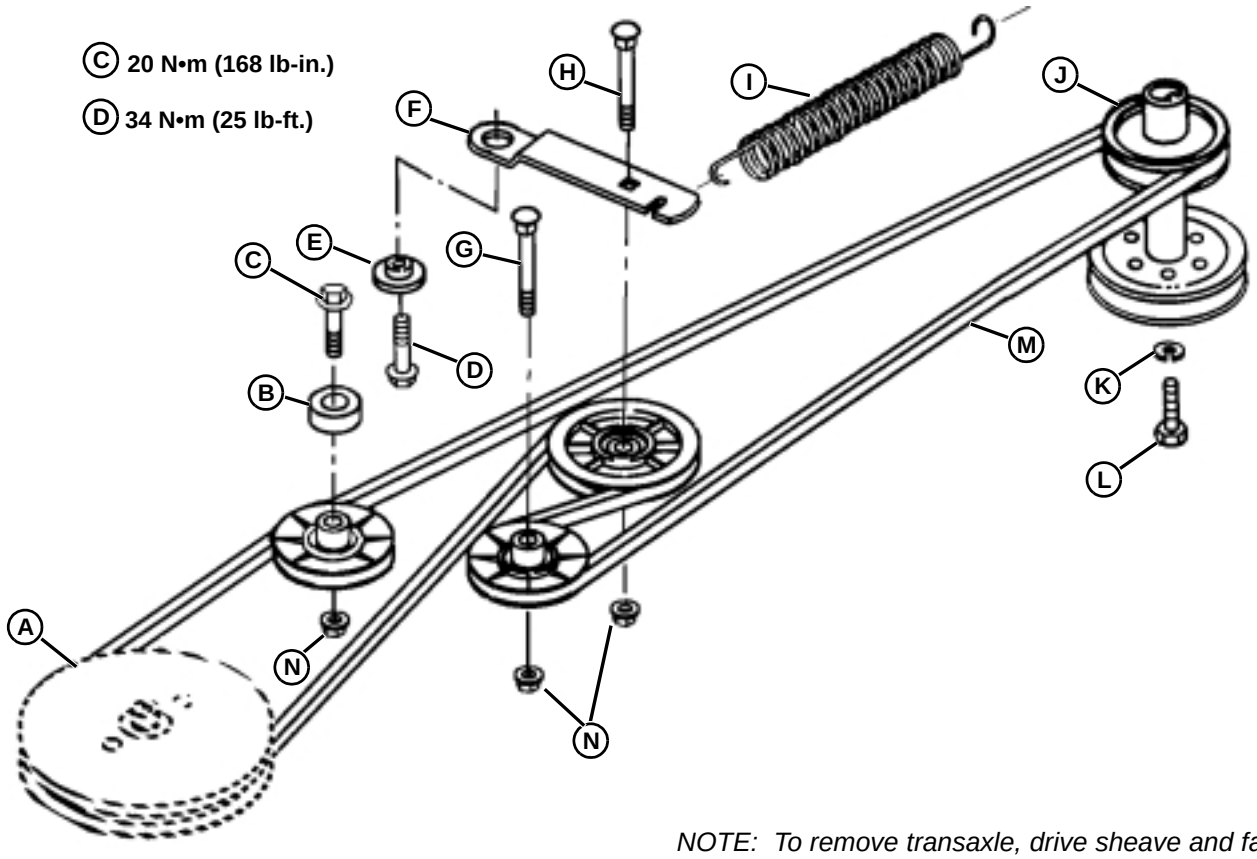
1. Remove mower deck.

CAUTION

Bellcrank tensioning spring is under high tension. Wear safety glasses and gloves when removing or installing spring from frame.

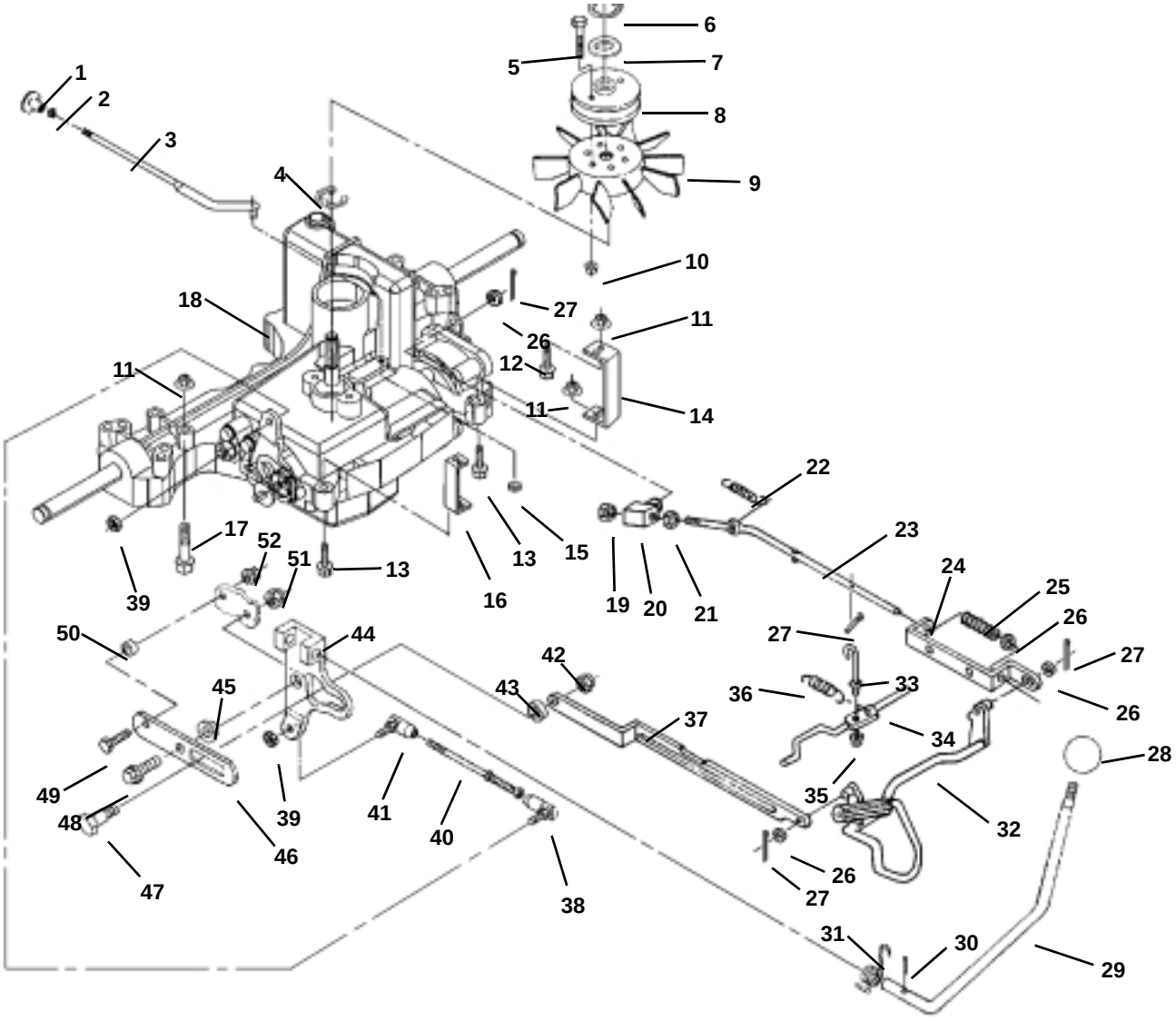
2. Remove Traction Drive Belt (See “TRACTION DRIVE BELT REMOVAL—K51” on page 37)
3. Thread one end of a three foot long piece of starter rope under the front hook of bellcrank tension spring (J). Pull rope half way through spring until ends meet, and wrap ends around a bar several times to make a temporary handle. Pull handle until spring hook is free from frame, and release tension from spring. Tension is now off traction drive system and it may be worked on safely.
4. Use this drawing for complete repair of system.

A. Transaxle Drive Sheave
B. Spacer
C. Cap Screw
D. Cap Screw (M8x20)
E. Bushing
F. Bellcrank
G. Bolt (M8x45)
H. Bolt (M8x45)
I. Tensioning Spring
J. Engine Pulley
K. Lock Washer
L. Cap Screw
M. Drive Belt
N. Flange Nuts (M8)



NOTE: To remove transaxle, drive sheave and fan assembly (A) transaxle must be lowered or completely removed from tractor.

POWER TRAIN LINKAGE SYSTEM REMOVAL/INSTALLATION—K51

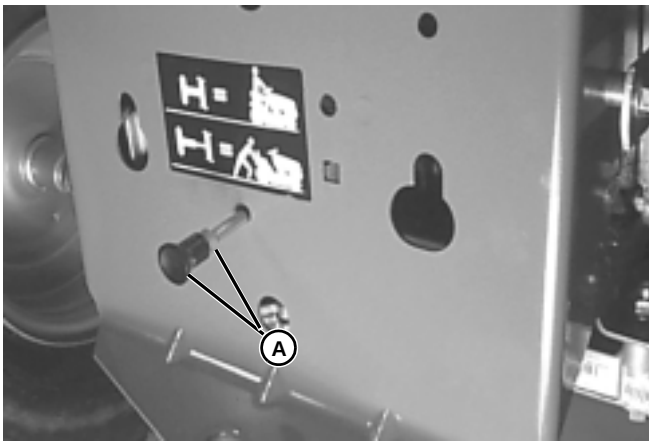


1	M127365	Knob	1	27	11H278	Cotter Pin	4
2		1/4” x 20 Hex Jam Nut	1	28	M125566	Knob	1
3	M127363	Rod	1	29	M125565	Gearshift Lever	1
4	F2863R	E- Ring	1	30	34M7130	Spring Pin, 4 x 20 MM	1
5	19M7874	Bolt, M6 x 30	2	31	M118187	Torsion Spring, R.H.	1
6	M43940	Snap Ring	1	32	AM123439	Shaft	1
7	M127620	Spacer	2	33	M117846	Park Brake Lever	1
8	M127358	Sheave	1	34	M119108	Rod, Parking Brake	1
9	M127359	Fan	1	35	14M7303	Flange Nut, M6	1
10	14M7397	Flange Lock Nut	2	36	M115744	Extension Spring	1
11	14M7298	Lock Nut	8	37	M118512	Strap	1
12	19M7865	Screw	2	38	AT12383	Ball Joint	1
13	19M7798	Screw	2	39	M83389	Lock Nut, 7.952 MM	2
14	M127360	Strap	1	40	M127357	Stud, Adjusting	1
15	M127364	Push Nut	1	41	AM38782	Ball Joint	1
16	M127360	Strap	1	42	T11234	Lock Nut	2
17	19M7803	Screw (R.H. Side)	2	43	M119205	Roller	1
	19M7801	Screw (L.H. Side)	2	44	M118696	Bracket	1
18	AM123230	Transmission Assembly	1	45	M93897	Bushing	1
19	M68954	Lock Nut, 9.525 MM	1	46	M120142	Support	1
20	M117048	Pivot	1	47	M118308	Bolt, 9.525 x 35.60 MM	1
21	14H774	Nut, 3/8”	1	48	19M7785	Scrw, M10 x 25	1
22	M120404	Spring	1	49	19M7867	Screw, M8 x 25	1
23	M115388	Rod	1	50	M111180	Spacer	1
24	M120007	Strap, Comp. Spring	1	51	14M7296	Flange Nut, M10	1
25	M78462	Compression Spring	1	52	14M7298	Flange Nut, M8	1
26	24H1305	Washer, 13/32” x 13/16”	1				

TRANSAXLE REMOVAL AND INSTALLATION—K51

Removal—

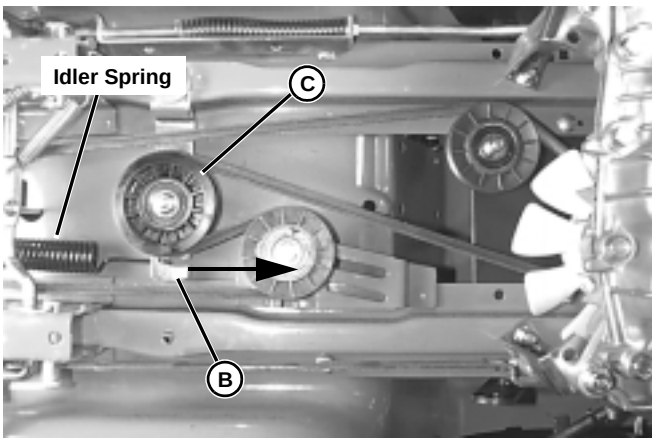
1. Safely raise and block rear of tractor off surface.
2. Safely support bottom of transaxle or have a helper hold transaxle in place while you remove final hardware. (See step 12.)
3. Remove mower deck.



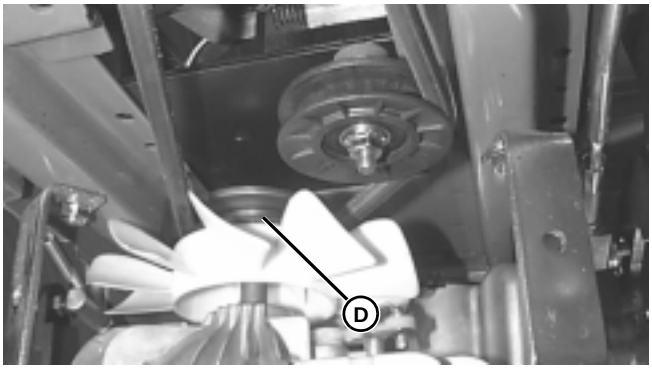
4. Unscrew and remove free wheeling knob (A) and nut. Push free wheeling rod in.

CAUTION

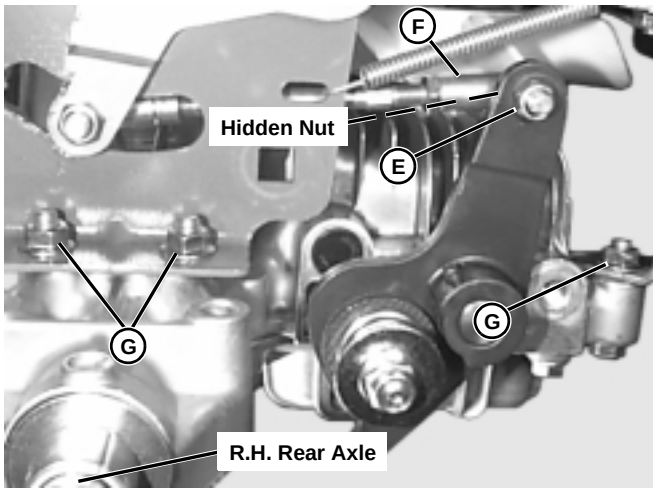
Large idler spring is under high tension. Wear safety glasses and gloves when removing drive belt.



5. Pull idler arm (B) towards transaxle and remove drive belt from idler pulley (C).

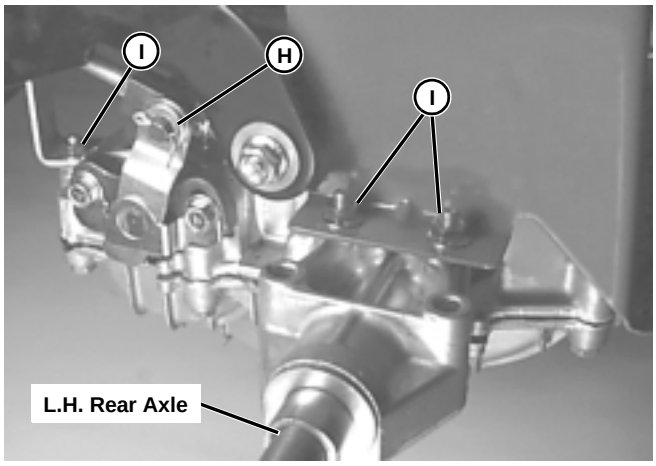


6. Remove drive belt from drive sheave and fan (D).
7. Remove drive wheels, inspect keys and keyways, washers, and snap rings. Replace as necessary during assembly.



NOTE: R.H. frame rail removed for clarity.

8. It is necessary to hold nut (hidden) on opposite side with a 10 mm wrench while removing nut (E). Remove lock nut (E) from clutch linkage turnbuckle (F).
9. Loosen, but do not remove, three flange nuts (G) and cap screws securing transaxle to R.H. side of frame.



10. Remove cotter pin (H) and washers from brake linkage on L.H. side of transaxle. Remove brake rod from brake lever.
11. Loosen, but do not remove, three flange nuts (I) and cap screws securing transaxle to L.H. side of frame.
12. Being careful to not catch free wheeling rod on frame, remove six flange nuts (G) and (I) and cap screws holding transaxle to tractor frame.
13. Remove transaxle to workbench.

Installation—

1. Being careful to insert free wheeling rod into frame hole, set transaxle into frame.
2. Insert six cap screws through transaxle and frame holes, and loosely place flange nuts on cap screws. Tighten cap screws to specification.

Specifications:

Cap screw and flange nut to mounting brackets and frame. . 30 N•m (22 lb-ft.)
Turnbuckle lock nut . . . . . 15 N•m (11 lb-ft.)

3. Install brake linkage into transaxle brake lever using washers and new cotter pin.
4. Install shift linkage turnbuckle into transaxle shift lever.
5. Holding rear washer with a 10 mm wrench, install lock nut onto shift linkage turnbuckle. Tighten lock nut to specification.
6. Install drive belt over transaxle drive sheave and fan.

CAUTION

Large idler spring is under high tension. Wear safety glasses and gloves when removing drive belt.

7. Pull idler arm towards transaxle and install drive belt onto idler pulley.
8. Install mower deck.

TRANSAXLE EXTERNAL COMPONENTS REMOVAL—K51

NOTE: INSPECTION AND REPAIR INSTRUCTIONS SHOWN IN THIS MANUAL ARE FOR OUT-OF-WARRANTY REPAIRS ONLY.

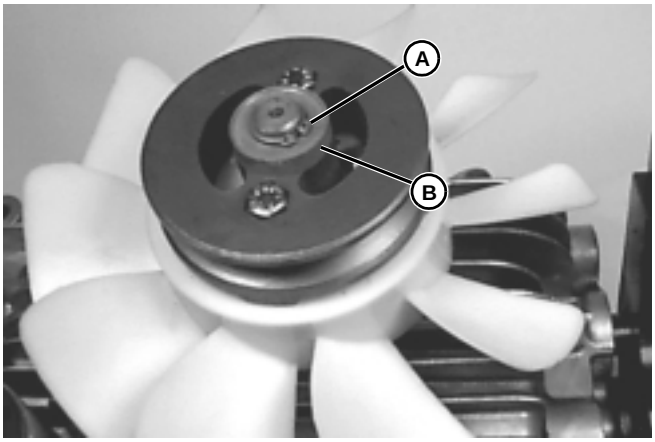
This transaxle is warranted for 2 years (residential-homeowner application) or 90 days (commercial application). Should an internal defect result in a transaxle failure within the warranty period, the transaxle will be replaced as a complete assembly.

NOTE: If internal hydro component parts are suspected (after performing <u>all</u> external checks and adjustments) CALL SABRE SERVICE DEPARTMENT FOR AUTHORIZATION TO REPLACE TRANSAXLE ASSEMBLY.

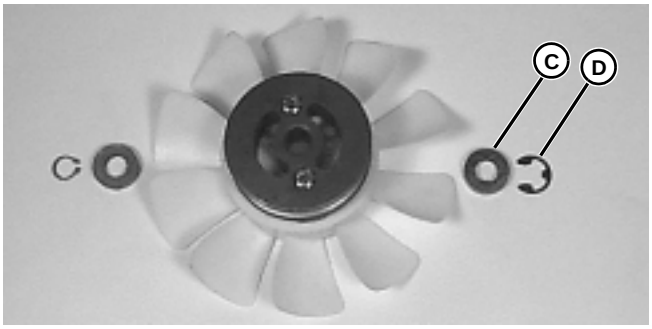
IMPORTANT: PAY CLOSE ATTENTION to the ORDER and ORIENTATION of ALL components to their neighboring components. Mark them, if necessary. This will be of great help during reassembly.

Remove Drive Sheave and Fan—

1. Thoroughly clean transaxle with approved solvent for aluminum castings and dry with compressed air.

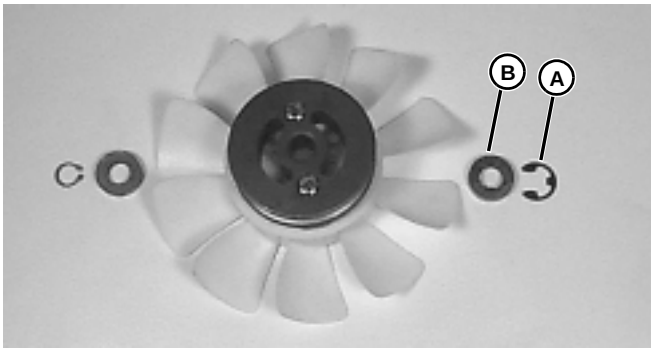


2. Remove c-clip (A) and upper fan retainer (B).
3. Remove drive sheave and fan assembly.

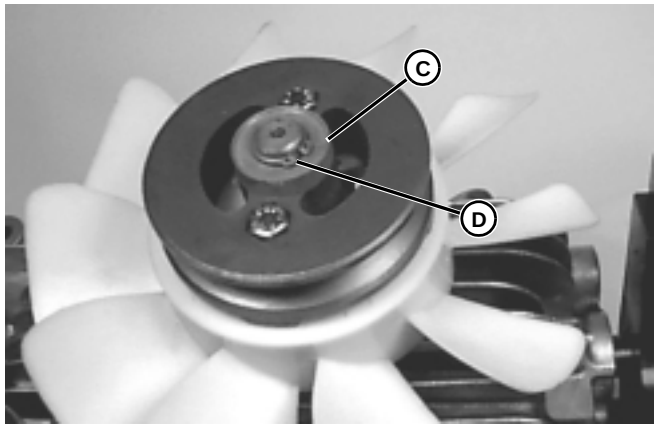


4. Remove fan lower retainer (C) and e-ring (D).

Install Drive Sheave and Fan—



1. Install e-ring (A) in groove on input shaft, and fan lower retainer (B) with flat side towards fan.



2. Install drive sheave and fan, fan retainer (C) with flat side towards fan, and c-clip (D).

TRANSAXLE INSTALLATION—K51

1. Install transaxle. See “TRANSAXLE REMOVAL AND INSTALLATION—K51” on page 58.
2. Test and adjust entire traction drive system. See “TESTS AND ADJUSTMENTS” on page 30 for relevant procedures.

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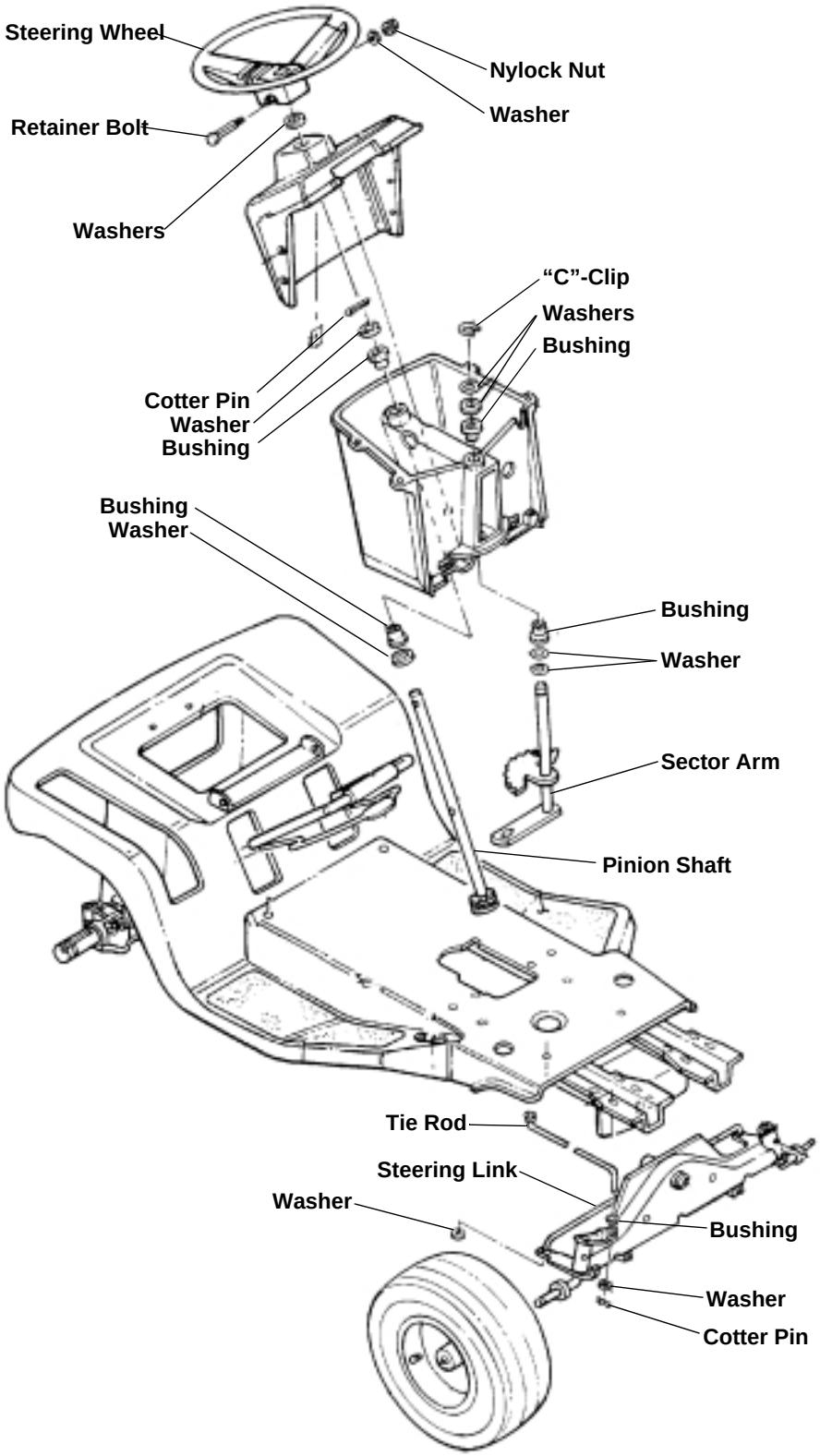
STEERING

COMPONENT LOCATION

STEERING



SERVICE EQUIPMENT AND TOOLS

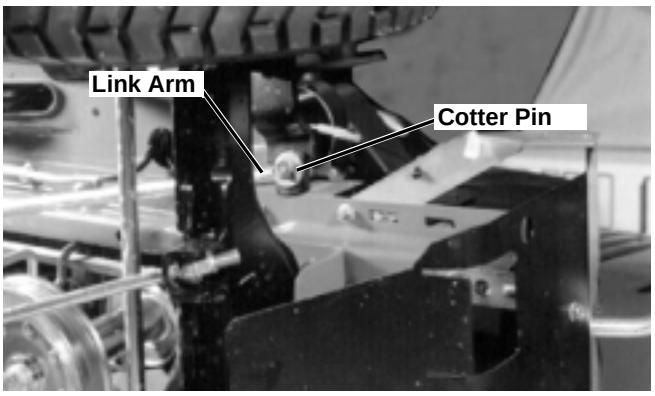
NOTE: Order tools from your SERVICE-GARD Catalog.
Some tools may be available from a local supplier.

Name	Use
Inside Puller and Slide Hammer	Remove steering bushings.

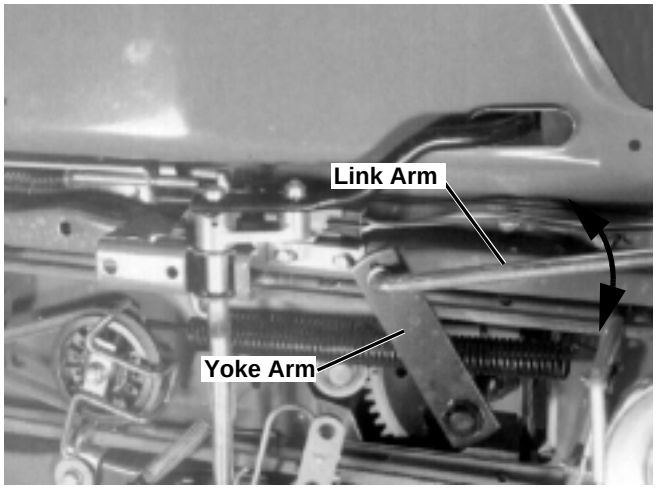
REPAIR

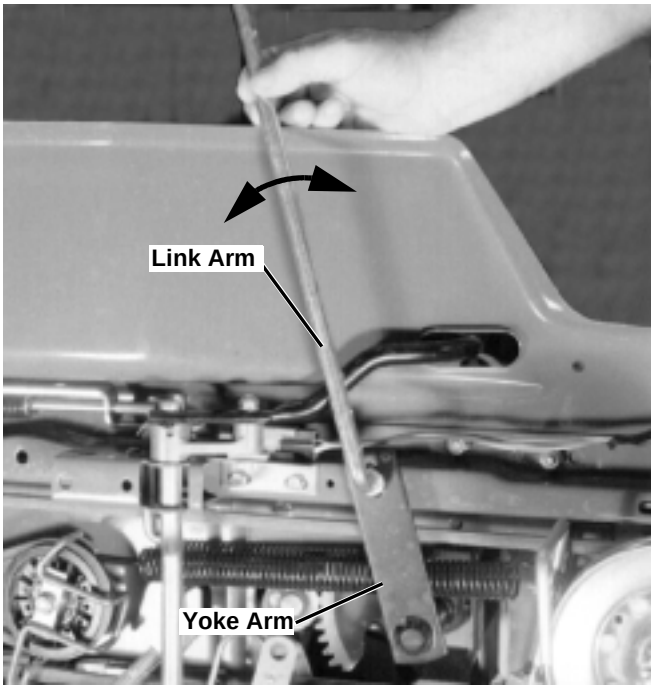
STEERING GEAR REMOVAL

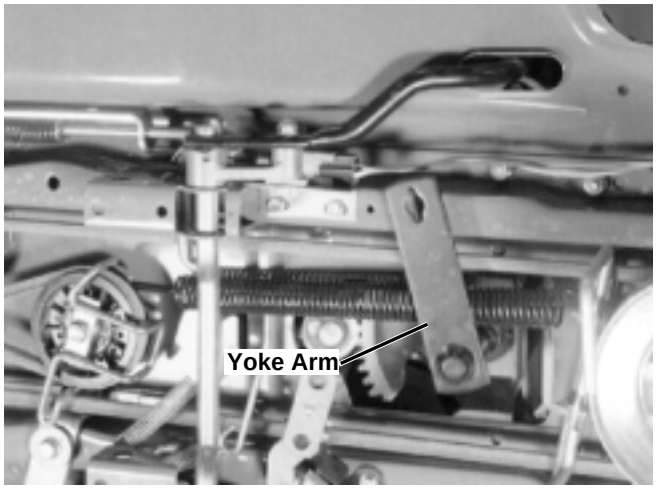
1. Remove battery and safely raise front of tractor.
2. Remove fuel tank and dash panel. See “FUEL TANK AND DASH PANEL REMOVE AND INSTALL” on page 5 in MISCELLANEOUS Section.



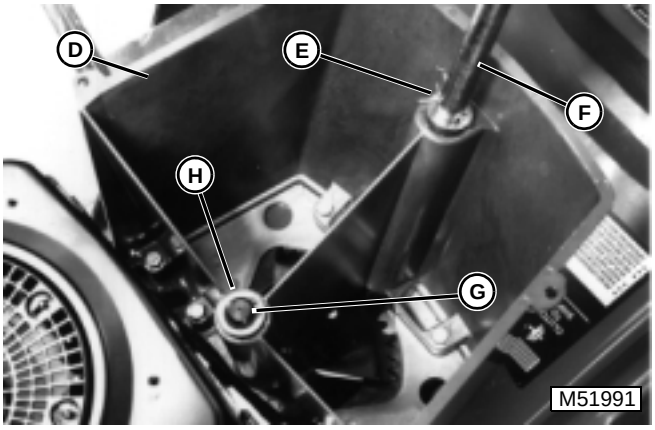
3. Remove cotter pin and washer from end of steering tie rod.





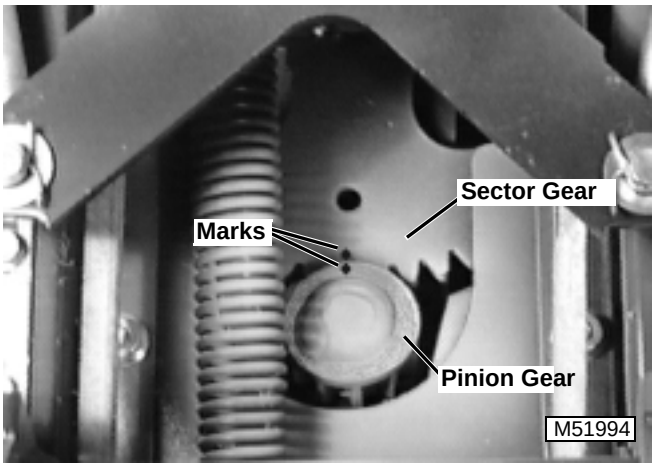


4. Remove tie rod from steering yoke by rotating tie rod until parallel with steering yoke arm.



NOTE: Write down location and number of washers on pinion and sector gear shafts. If a new shaft is installed, number and placement of washers may need adjustment.

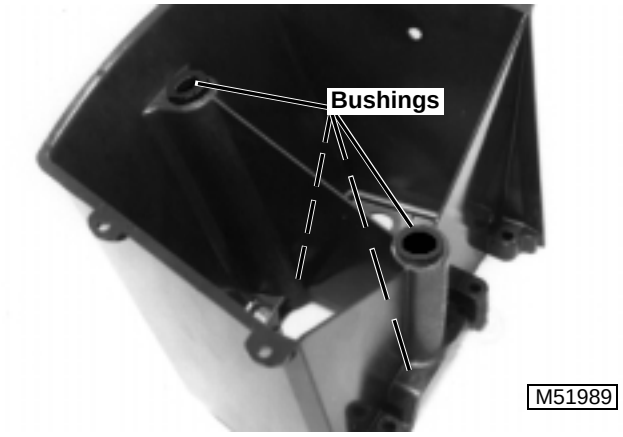
5. Remove cotter pin and washer(s) (E) from steering pinion shaft (F).
6. Remove pinion gear shaft from bottom of tractor.
7. Inspect shaft and pinion gear assembly, replace as necessary.



NOTE: Steering pinion gear can not be removed from the steering shaft. There may be 0—3 washers installed above pinion gear. These washers are not interchangeable with other washers on the shaft. They are needed to ensure proper pinion gear to sector gear backlash engagement for proper steering response.

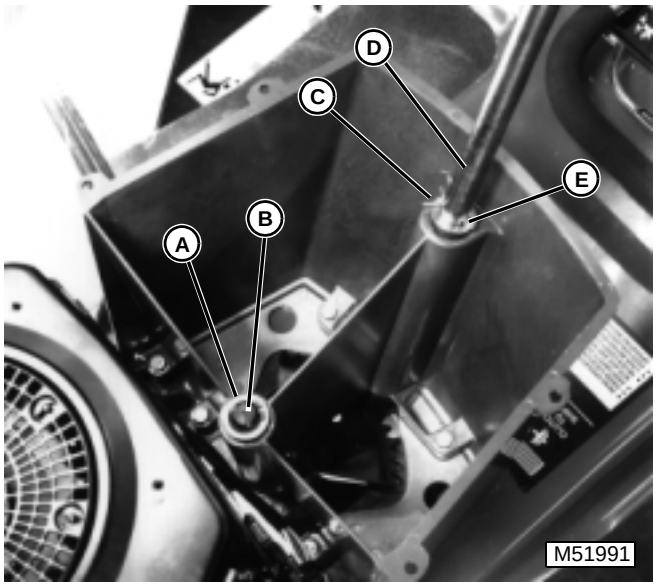
8. Remove pedestal (D) and sector gear shaft (G) as an assembly
9. Remove snap ring and washer(s) (H).
10. Remove sector gear shaft (G).
11. Replace worn or damaged parts as necessary.
12. Adjust steering backlash (see Adjust Steering Backlash later in this section).
13. Install assembly in reverse order, making sure pinion gear and sector gear alignment marks are aligned as steering pinion shaft (F) is installed.

REPLACE PEDESTAL BUSHINGS

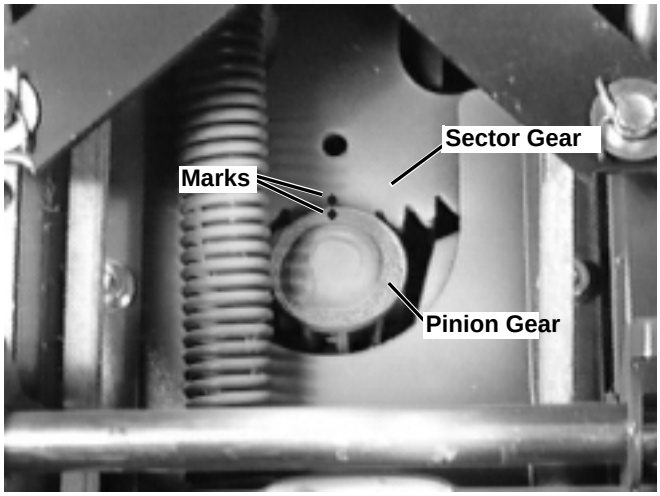


1. Inspect four bushings installed in steering sleeves of pedestal. If worn or damaged, replace them individually or as a set.
2. Clamp pedestal to stationary bench.
3. Use a slide hammer puller set up with inside jaws to remove four bushings.
4. Install new bushings using a rubber hammer.

ADJUST STEERING BACKLASH



1. Install shaft (B) with four bottom washers in pedestal.
2. Install washers and snap ring (A) on shaft (B).
3. Install pedestal on tractor.



4. Align marks on sector gear and pinion gear as steering pinion shaft (D) is installed from the bottom of the tractor.
5. Install washers (E) and cotter pin (C).
6. Install and fasten tie rods (Long leg of tie rod is installed in axle spindle).
7. Install steering wheel on top of steering shaft (D) and fasten with mounting hardware.
8. Turn steering left-to-right several times to test steering response and feel.
9. Repeat adjustment procedure until minimum backlash without binding is achieved.

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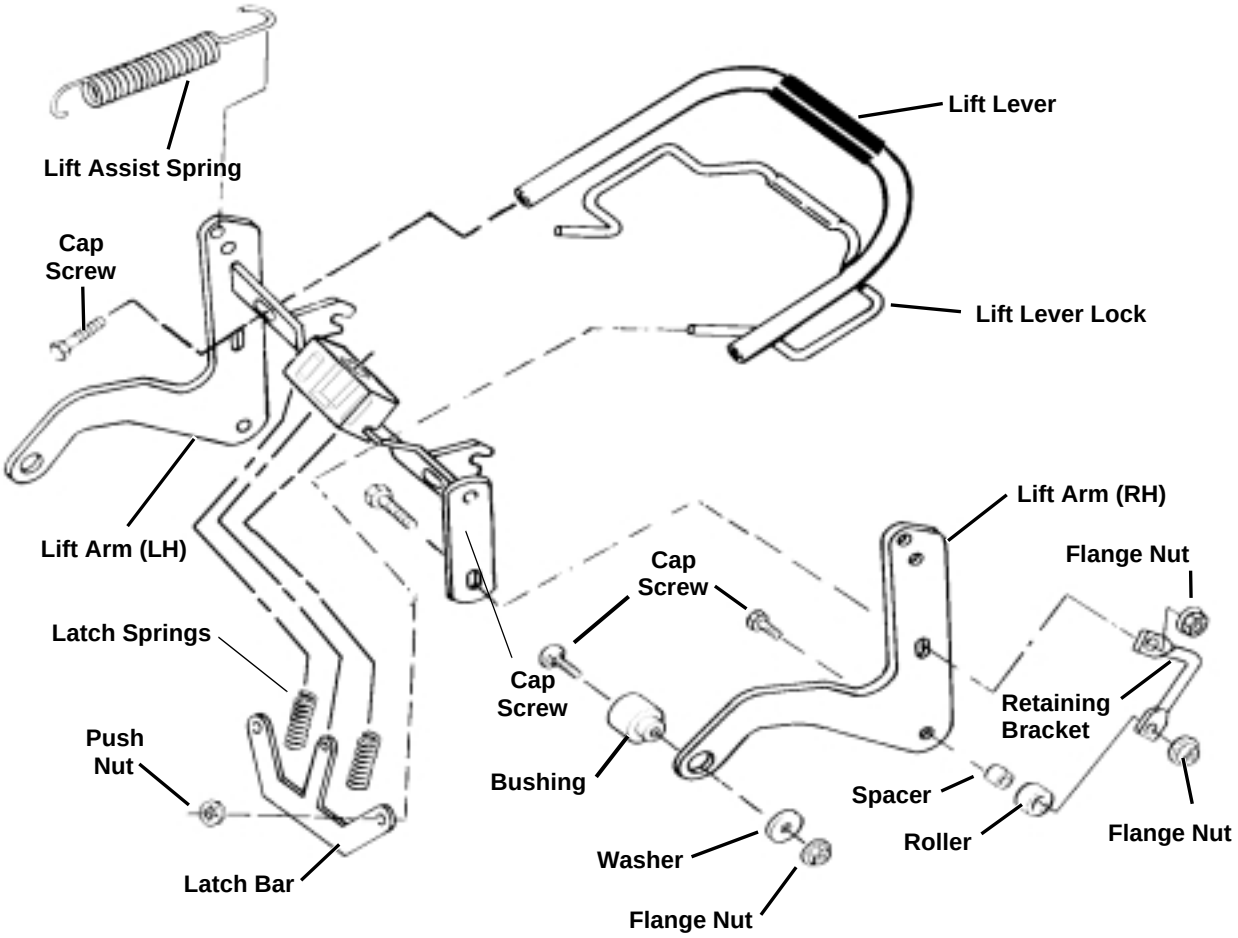
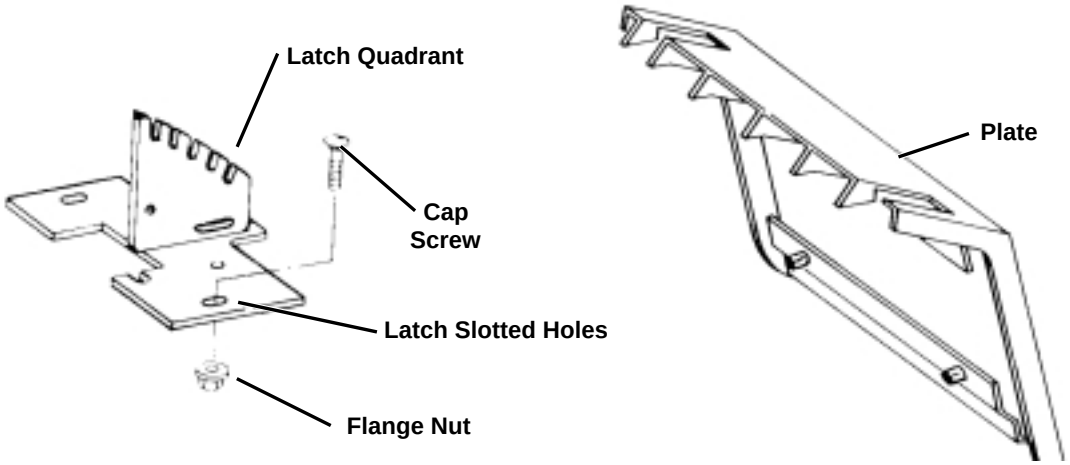
ATTACHMENTS

COMPONENT LOCATION

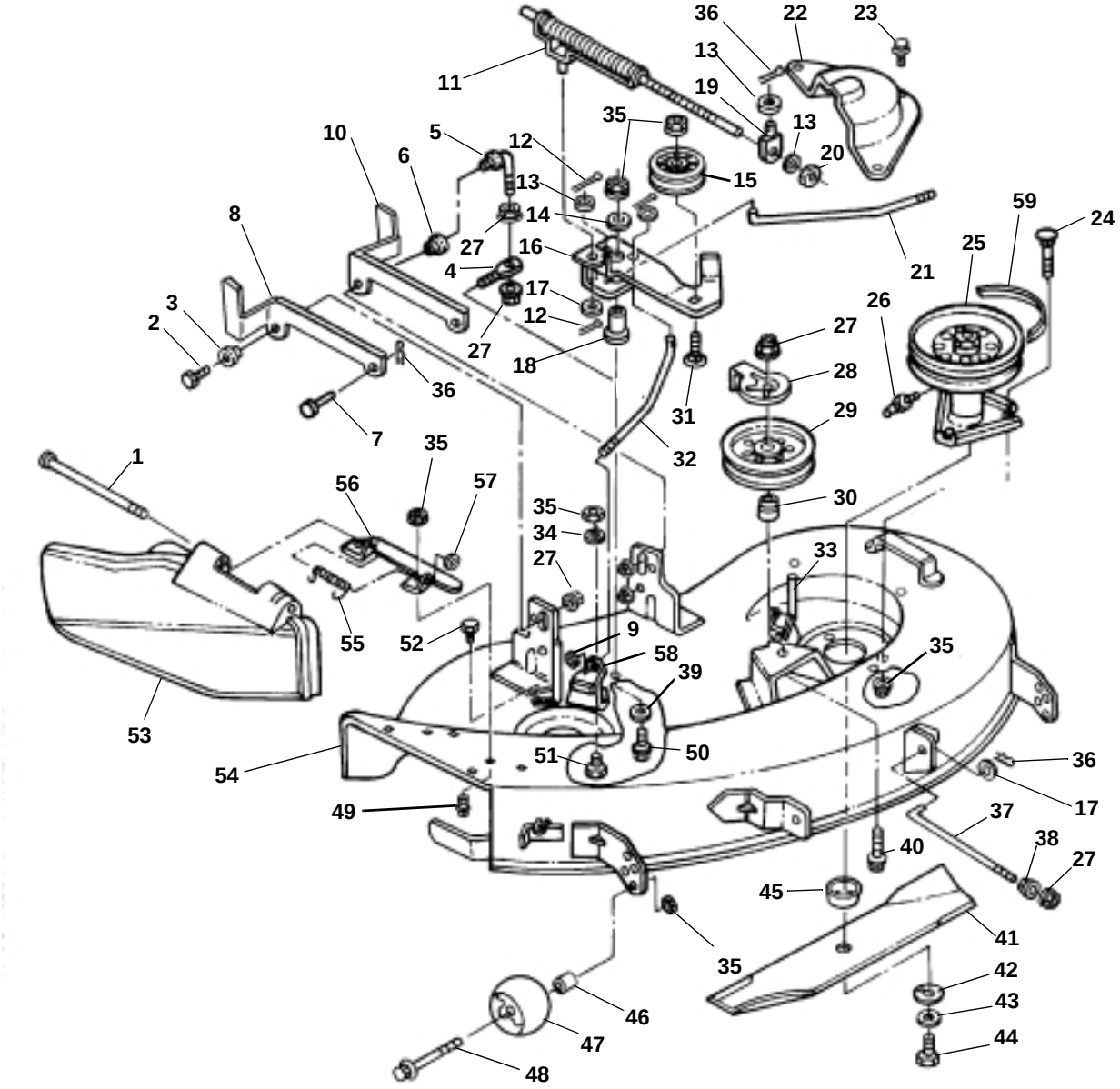
LIFT LINKAGE





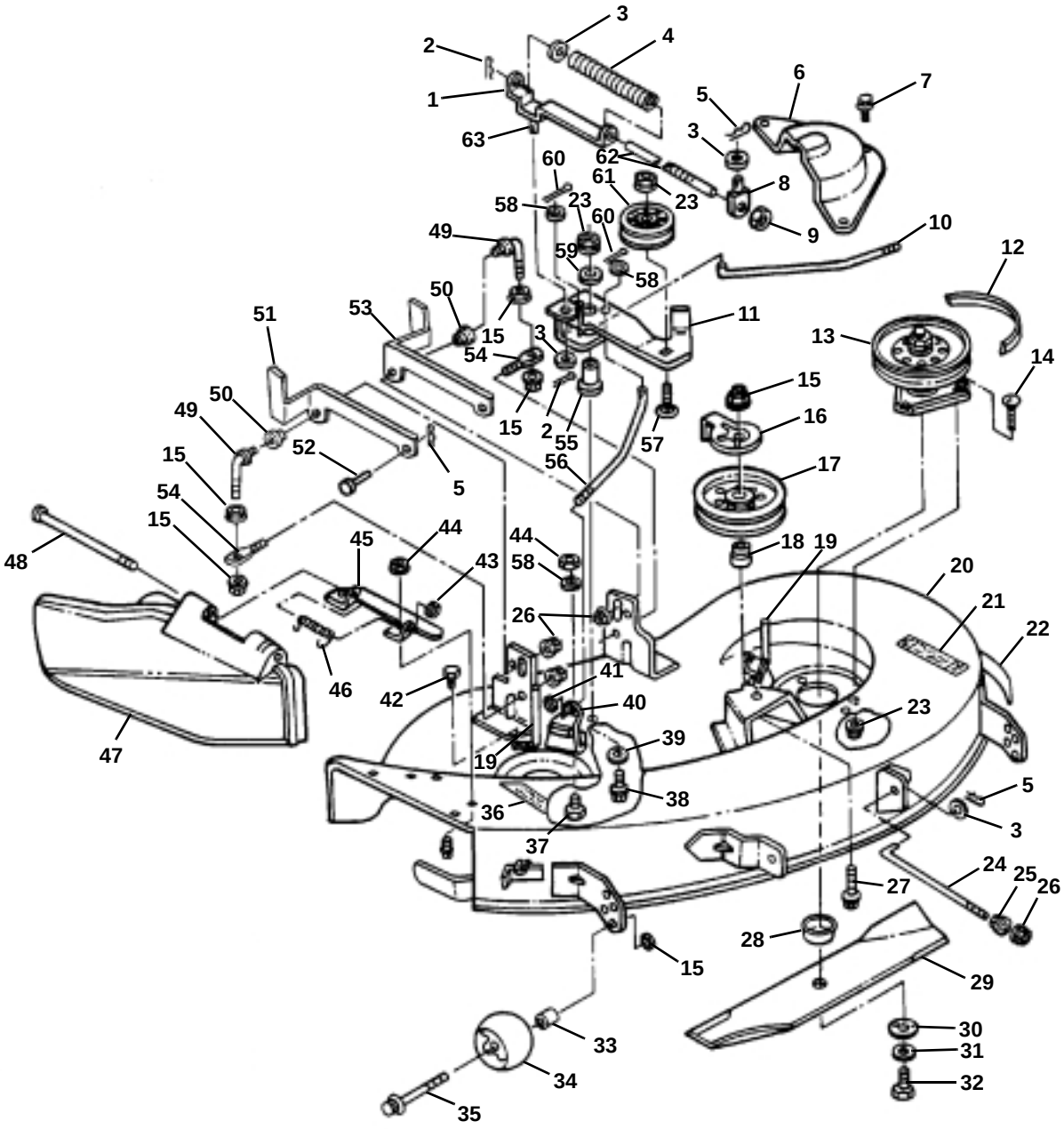
1. Remove battery and mower deck.
2. Check for worn or damaged components.
3. Adjust latch quadrant using slotted holes, if necessary, for smooth engagement with latch.
4. Install and adjust mower deck.
5. Install battery.

38 INCH DECK (– 1996)



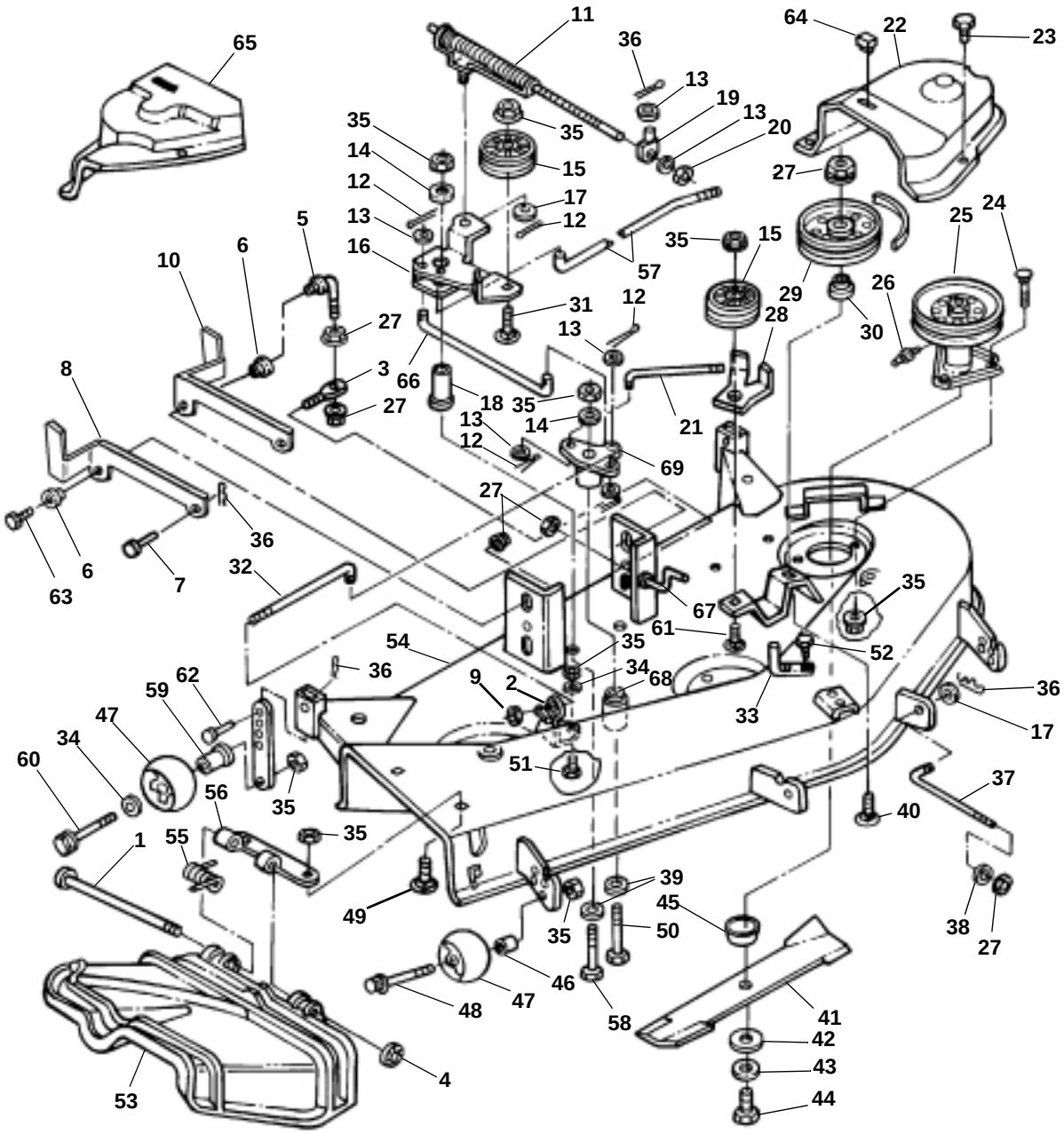
1. Pin
2. Bolt
3. Bushing
4. Eyebolt
5. Rod, Adjusting
6. Flange Bushing
7. Draft Arm Pin
8. Bracket, RH Draft
9. Lock Nut, M6
10. Bracket, LH Draft
11. Tension Arm, PTO
12. Cotter Pin
13. Washer
14. Washer
15. Sheave, Flat Idler
16. Arm, Idler
17. Washer
18. Bushing
19. End, PTO Rod
20. Nut, M10
21. Rod, LH Brake
22. Shield
23. Screw, M6X12
24. Bolt, M6X16
25. Spindle Assembly
26. Zerk
27. Flange Nut, M10
28. Guide
29. Idler
30. Spacer
31. Carriage Bolt, M8X35
32. Rod, RH Brake
33. Belt Guide
34. Washer
35. Lock Nut, M8
36. Spring Locking Pin
37. Rod, Front Draft
38. Ball, Leveling
39. Washer
40. Capscrew
41. Blade
42. Washer
43. Washer
44. Bolt
45. Deflector
46. Spacer
47. Wheel
48. Screw, M10X70
49. Bolt
50. Cap Screw, M8X80
51. Cap Screw, M8X20
52. Bolt, M8X12
53. Chute
54. Mower Deck
55. Torsion Spring
56. Hinge
57. Nut, Push On
58. Pad, Brake
59. Belt

38 INCH DECK (1997 –)



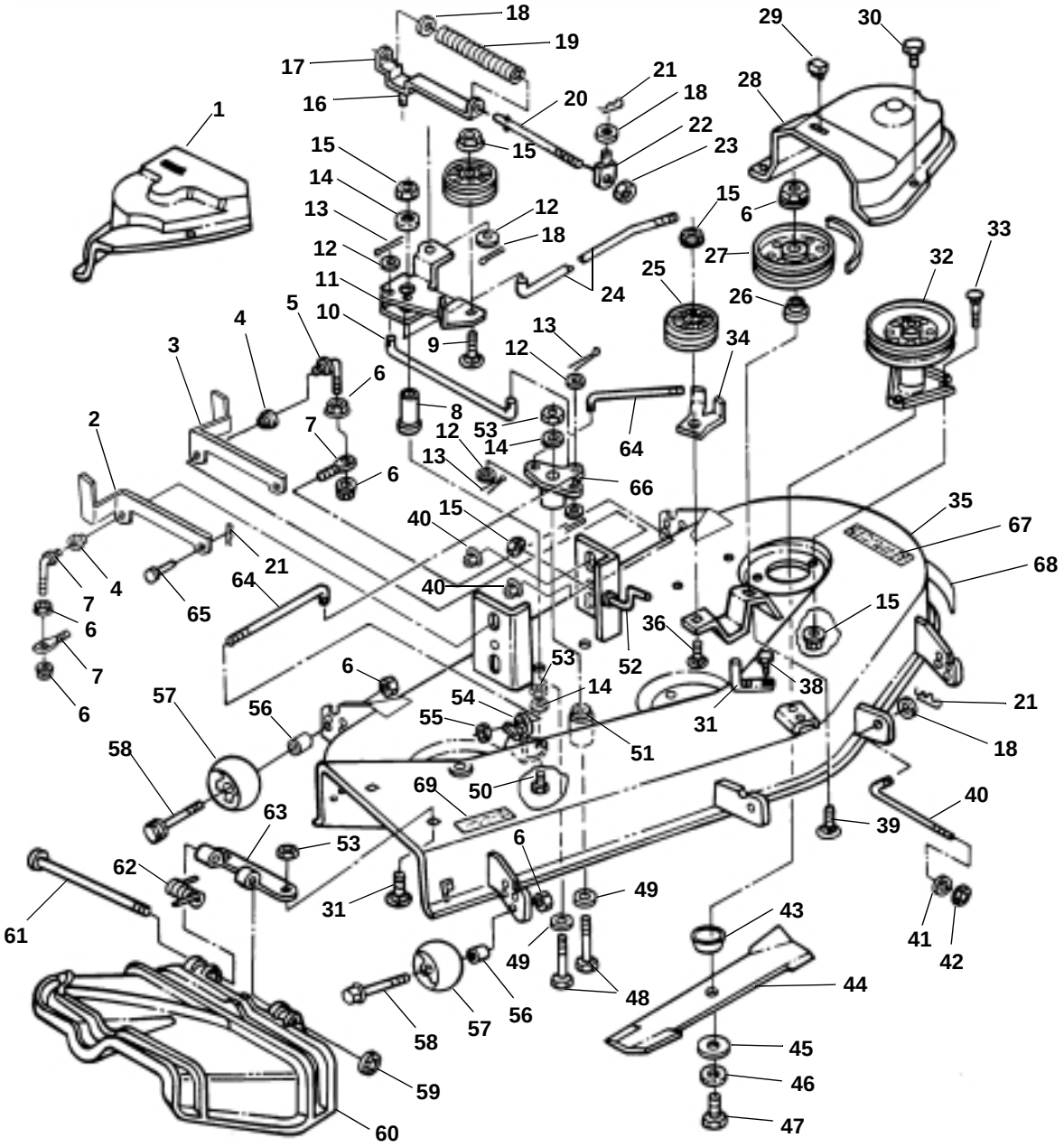
1. Strap, PTO Spring
2. Cotter Pin
3. Washer
4. Compression Spring
5. Spring Locking Pin
6. Shield
7. Screw, M6 x 12
8. End, PTO Rod
9. Nut
10. Rod, LH Brake
11. Arm, Idler
12. Belt
13. Spindle Assembly
14. Bolt, M8x16
15. Flange Nut, M10
16. Guide
17. Idler
18. Spacer
19. Guide, Belt
20. Mower Deck
21. Label, Danger
22. Label, Mulcher
23. Flange Nut, M8
24. Rod, Front Draft
25. Ball, Leveling
26. Lock Nut, M10
27. Screw, M10 x 50
28. Deflector
29. Blade
30. Washer
31. Washer
32. Bolt
33. Spacer
34. Wheel, Gage
35. Screw, M10x70
36. Label, Danger
37. Screw, M8x20
38. Cap Screw, M8x80
39. Washer, 21/64”x 1-15/32”x7/64”
40. Pad, Brake (W/Spring)
41. Lock Nut, M6
42. Screw, M8x12 Self-Tapping
43. Nut, Push On
44. Lock Nut, M8
45. Hinge
46. Torsion Spring
47. Chute
48. Pin, 8x226 MM
49. Rod, Adjusting
50. Bushing
51. Bracket, RH Draft
52. Pin
53. Bracket, LH Draft
54. Eyebolt
55. Bushing
56. Rod, RH Brake
57. Carriage Bolt, M8x35
58. Washer, 6.4x12x1.600 MM
59. Washer, 8.4x24x2 MM
60. Cotter Pin, 2.5x20 MM
61. Sheave, Flat Idler
62. Rod
63. Pin, 10x22 MM

46 INCH DECK (– 1996)



1. Pin
2. Pad, Brake (W/Spring)
3. Eyebolt
4. Nut, Push On
5. Rod, Adjusting
6. Bushing
7. Pin
8. Bracket, RH Draft
9. Lock Nut, M6
10. Bracket, LH Draft
11. Tension Arm
12. Cotter Pin
13. Washer
14. Washer
15. Pulley
16. Arm, Idler
17. Washer
18. Bushing, Idler Pivot
19. End, PTO Rod
20. Nut, M10
21. Brake Rod
22. Shield, LH Belt
23. Screw, M6x12
24. Carriage Bolt, M8x16
25. Spindle Assembly
26. Zerk
27. Flange Nut, M10
28. Guide, LH Belt
29. Flat Idler
30. Spacer
31. Carriage Bolt, M8x35
32. Brake Rod
33. Guide, Belt
34. Washer
35. Flange Nut, M8
36. Spring Locking Pin
37. Rod, Front Draft
38. Ball, Leveling
39. Washer
40. Bolt, M10x45
41. Blade
42. Washer
43. Washer
44. Bolt
45. Deflector
46. Spacer
47. Wheel, Gage
48. Screw, M10x70
49. Bolt
50. Capscrew
51. Screw, M8x20
52. Screw, M8x12
53. Chute
54. Mower Deck
55. Torsion Spring
56. Hinge
57. Rod, LH Brake
58. Capscrew
59. Bushing
60. Capscrew, M8x80
61. Carriage Bolt, M8x40
62. Pin
63. Capscrew, M10x35
64. Bumper
65. Shield, RH Belt
66. Rod
67. Guide, Belt
68. Bushing, Bell Crank
69. Bell Crank

46 INCH DECK (1997 –)



1. Shield, RH Belt
2. Bracket, RH Rear Draft
3. Bracket, LH Rear Draft
4. Bushing
5. Rod, Adjusting
6. Flange Nut, M10
7. Eyebolt
8. Bushing, Idler Pivot
9. Bolt, Carriage M8 x 35
10. Rod
11. Arm, Idler
12. Washer, 6.4x12x1.6
13. Cotter Pin
14. Washer, 8.4x24x2
15. Flange Nut, M8
16. Pin
17. Strap, PTO Spring
18. Washer, 13/32”x 13/16”x0.065”
19. Compression Spring
20. Rod, PTO Spring
21. Spring Locking Pin
22. End, PTO Rod (Blade Drive Arm)
23. Nut, M10
24. Rod, LH Brake
25. Pulley
26. Spacer
27. Pulley, 5” Flat Idler
28. Shield, LH Belt
29. Bumper
30. Screw, M6x12
31. Guide, Belt
32. Spindle
33. Bolt, Carriage M8x16
34. Guide, LH Belt
35. Mower Deck 1.17M
36. Bolt, Carriage M8x40
37. Guide, Belt
38. Screw, M8x12
39. Bolt, Carraige M10x45
40. Rod, Front Draft
41. Ball, Leveling
42. Lock Nut, M10
43. Deflector
44. Blade
45. Washer
46. Washer
47. Bolt
48. Cap Screw, M8x80
49. Washer, 11/32”x 1 3/8”x0.134
50. Screw, M8x20
51. Bushing, Bellcrank
52. Guide, Belt
53. Lock Nut, M8
54. Pad, Brake (W/Spring)
55. Lock Nut, M6
56. Spacer
57. Gage Wheel
58. Screw, M10x70
59. Nut, 7.925 Push On
60. Chute
61. Pin, 8x226 MM
62. Torsion Spring
63. Hinge
64. Rod, Brake
65. Pin
66. Bellcrank
67. Label, Danger
68. Label, Mulcher
69. Label, Danger

TESTS AND ADJUSTMENTS

BEFORE PERFORMING ANY SERVICE OR ADJUSTMENTS:

1. Depress clutch/brake pedal fully and set parking brake.
2. Place gearshift lever in neutral (N) position.
3. Place PTO lever in “DISENGAGED” position.
4. Turn ignition key “OFF” and remove key.
5. Make sure the blades and all moving parts have completely stopped.
6. Disconnect spark plug wire from spark plug and place wire where it cannot come in contact with plug.

SPINDLE BRAKE ADJUSTMENT

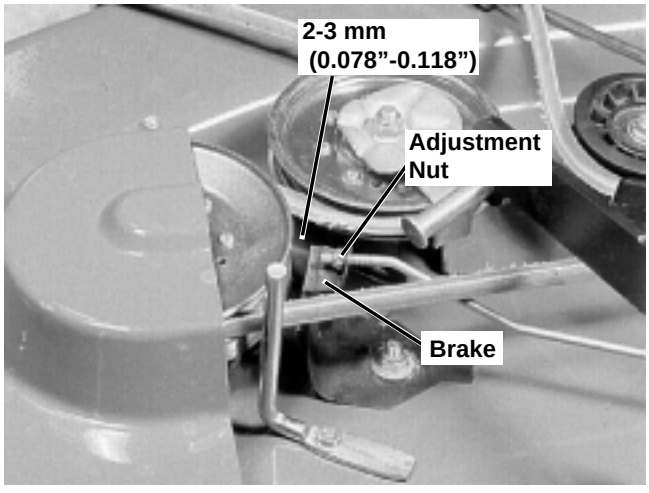
CAUTION

Spindle brake engagement must be checked and corrected every time the belt tension is adjusted.

Belt tension should be adjusted, if required, before brakes are adjusted.

1. Park mower on a hard, smooth surface. Stop engine, remove key, wait for moving parts to stop and remove wire from spark plug to prevent accidental starting.
2. Place cutting unit in lowest setting.
3. Engage mow lever.
4. Remove belt guard if necessary.

IMPORTANT: There are two (2) spindle brakes on the 38 inch deck and three (3) spindle brakes on the 46” deck. All Brakes must be adjusted.



5. Measure distance from brake surface to pulley braking surface.

Specifications:
Brake to Pulley
Distance ..... 2–3 mm (0.08–0.12 in.)

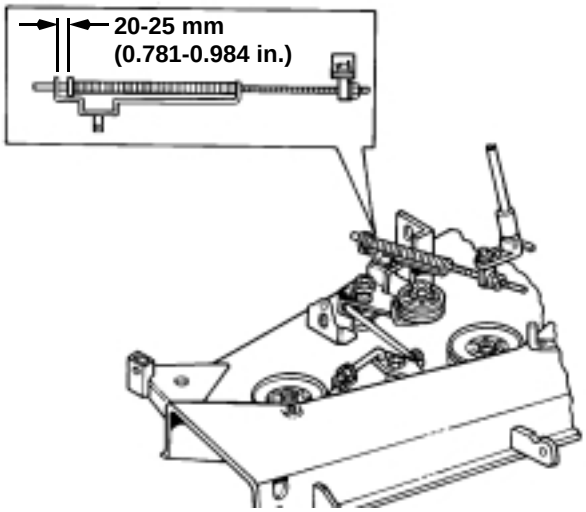
6. If not to specification adjust nut on end of brake rod to set brake at proper distance from pulley.
7. Reinstall belt covers if removed.
8. Connect spark plug.

MOWER BELT TENSION ADJUSTMENT

CAUTION

Spindle brake adjustment must be checked every time the belt tension is adjusted. Perform brake adjustment after belt tension adjustment.

1. Park mower on a hard, smooth surface. Stop engine, remove key, wait for moving parts to stop and remove wire from spark plug to prevent accidental starting.
2. Place cutting unit in lowest setting.
3. Engage mow lever.

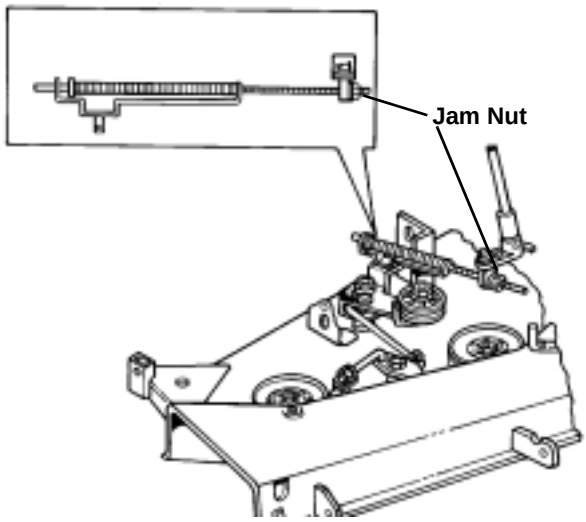


4. Measure distance from bracket to washer on tension rod.

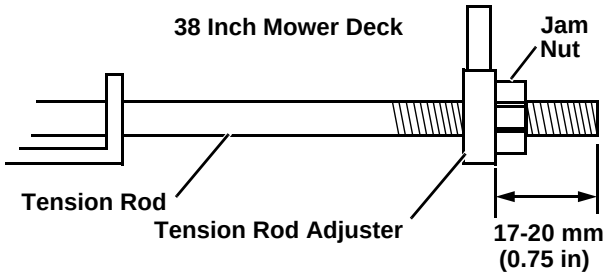
Specifications:
Bracket to Washer
Distance . . . . . 20—25 mm (0.78—0.98 in.)

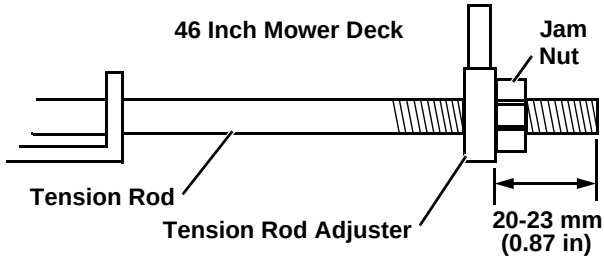
5. If adjustment is required:
   - Disengage Mow lever.
   - Remove spring pin clip and washer from tension rod and remove rod from blade drive lever.

IMPORTANT: Do not attempt to loosen jam nut on tension rod without using a suitable wrench to support fitting.



- Loosen jam nut.
- Turn fitting on tension rod in proper direction to lengthen or shorten effective rod length.





- Tighten jam nut to **27 N•m (20 lb-ft.)**
- Assemble tension rod to tractor blade drive arm.
- Recheck dimension from bracket to washer. Readjust if necessary.

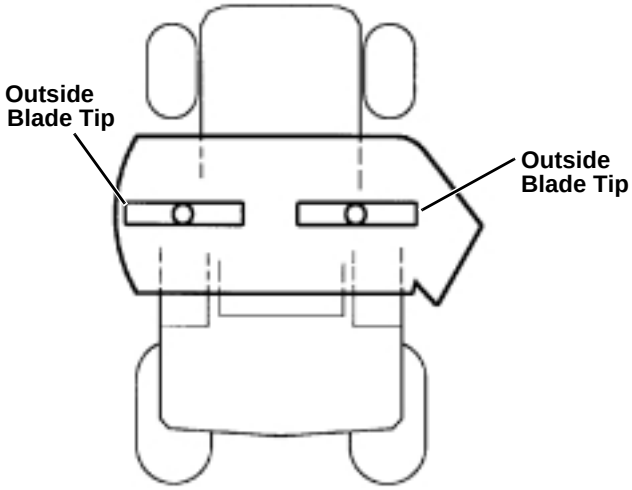
6. Check brake clearance. See “SPINDLE BRAKE ADJUSTMENT” on page 8.
7. Reconnect spark plug.

DECK LEVELING (SIDE-TO-SIDE)

1. Park tractor on a hard, level surface.
2. Stop engine and remove key. Disengage blade drive.
3. Check tire pressure. (**14 PSI** – Front Tire; **10 PSI** – Rear Tire)
4. Adjust cutting height to middle position.

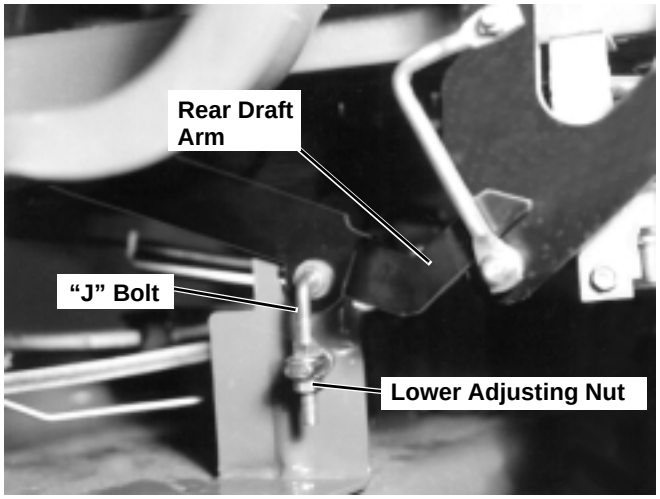
⚠ CAUTION

Blades are sharp and could cause personal injury. Wear gloves or wrap blades with shop cloths to remove and install blades. DO NOT hold blade with bare hand. Use a block of wood wedged between deck and blade to keep spindle from turning.



5. Turn left blade by hand parallel to mower axle. Hold left blade with glove and turn right blade parallel to axle.
6. Measure height from level surface to outside blade tip on left and right blades. (See Fig. 43) Difference between measurements should not exceed **1/4 in. (6 mm)**.
7. Turn blades 180° and measure again to ensure blades are not bent.

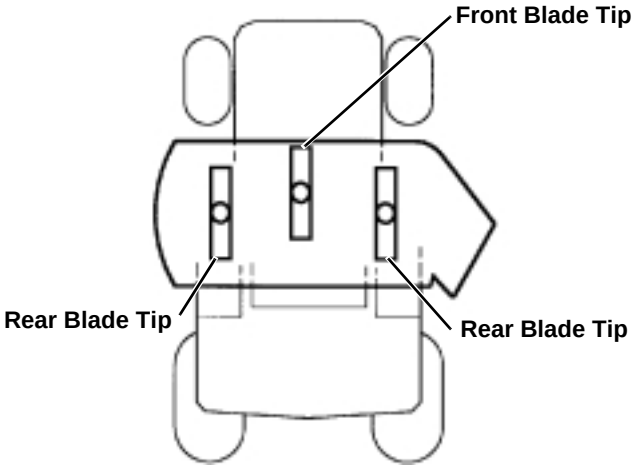
NOTE: Adjusting “J” bolt on left-hand rear side of rear draft arm, shown below.



NOTE: Adjusting "J" bolts are on both left and right hand sides of rear draft arms. For minor side-to-side adjustments, do not alter factory preset of right hand side adjusting "J" bolt. Reset left hand side adjusting "J" bolt to obtain proper side-to-side adjustment. A deck leveling gauge (P/N TY15272) may be obtained through your local Sabre Service Center at nominal cost to aid in deck adjustment.

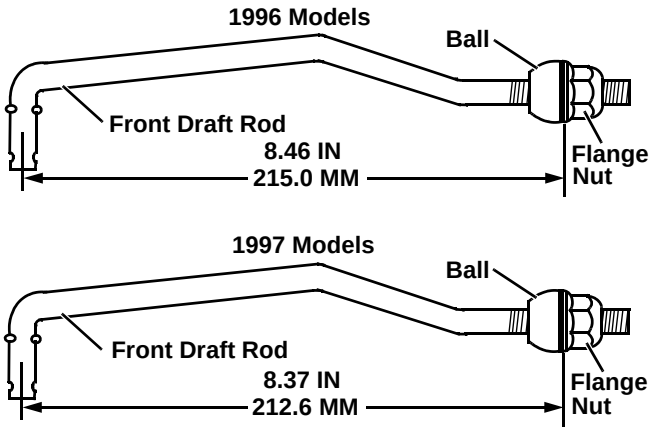
8. Using a 15 mm wrench, loosen top clamping nut on left hand side adjusting "J" bolt facing inside of mower approximately 1 turn. (See Fig. 44)
9. Loosen upper adjusting nut on adjusting "J" bolt.
10. Turn lower adjusting nut towards rear to raise left side of deck.
11. Turn nut towards front to lower left side of deck.
12. Tighten upper nut after adjustment.
13. Tighten clamping nut on adjusting "J" bolt.

DECK LEVELING (FRONT-TO-REAR)

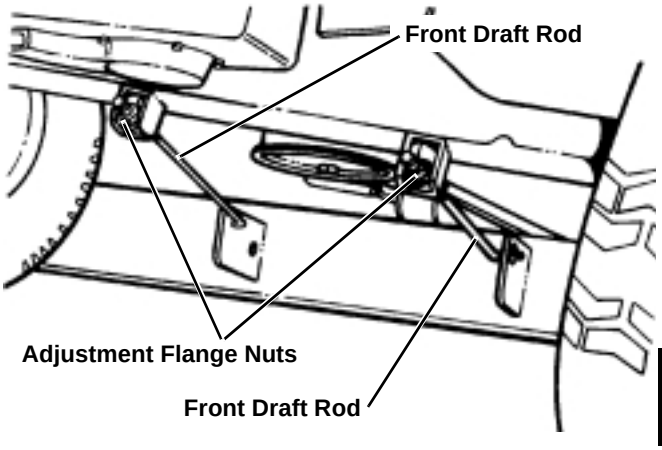


1. Turn blades to point front to rear.
2. Measure height from level surface to front and rear blade tips. Turn blades 180° and measure again to ensure blades are not bent.

• Height of rear blade tip should be **1/8 to 3/8 in. (3-10 mm)** higher than front blade tip.



IMPORTANT: Make sure each front draft rod is equally tensioned. The installed rods should exhibit identical amounts of movement between left and right rods. If one rod moves more freely than the other, then the adjustment flange nut should be tightened until the movement of the assembly matches that of the other side.



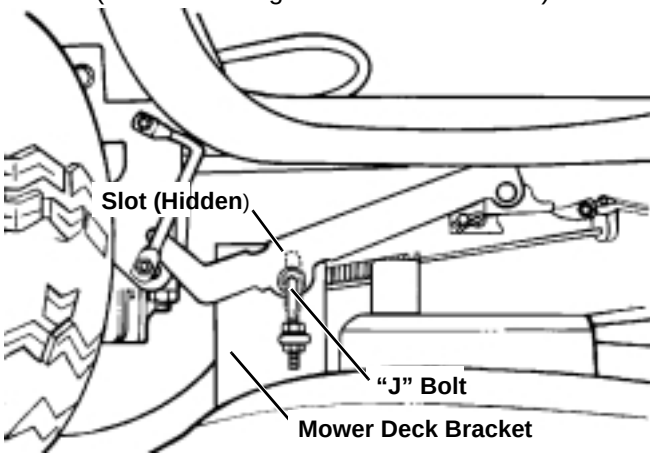
3. Turn adjustment flange nuts on front draft rods equally until adjustment is correct. Turning nut clockwise will raise the front of the mower. Turning flange nut counterclockwise will lower the front of the mower.

READJUSTING SUSPENSION TO OBTAIN 1– 4 INCH CUT HEIGHT

*NOTE: Normal settling of the deck suspension after years of use may cause cut height range to shift downward. This may be readjusted by resetting the right hand adjusting "J" bolt adjuster. Adjustments are easier to make in the lowest cutting position, while the **4.25 in. (110 mm)** dimension should be measured in the highest cutting position.*

- Loosen right hand side adjusting "J" bolt and move bolt downward in slot on right hand side of mower deck bracket so the right hand rear blade tip is about **4.25 in. (110 mm)** from ground in the highest deck setting. Retighten right hand adjusting "J" bolt nuts securely in slot.
- Repeat sequences described for minor adjustments detailed in DECK LEVELING (SIDE-TO-SIDE) and DECK LEVELING (FRONT-TO-BACK) sections.

(Shown from right hand side of tractor)



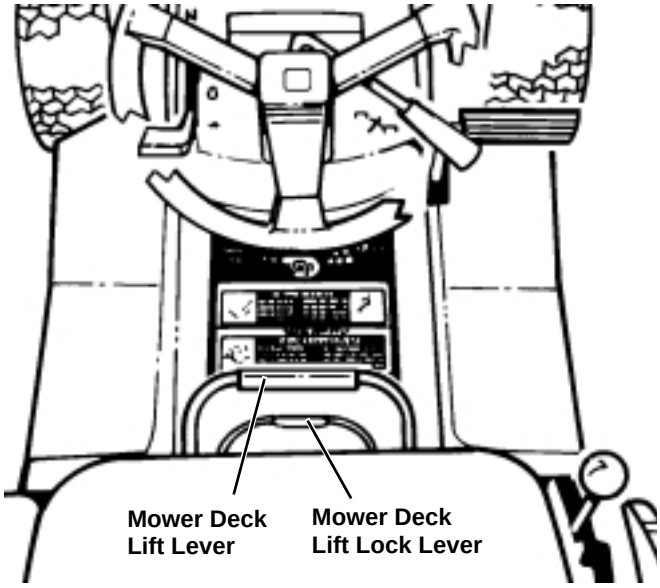
REPAIR

MOWER DECK REMOVAL

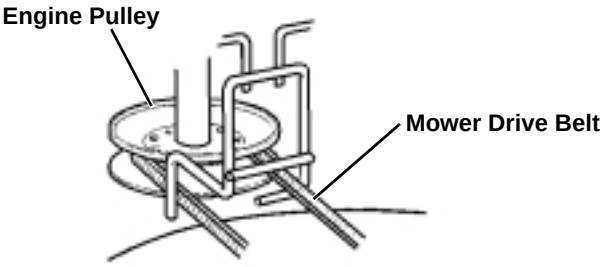
1. Stop engine, engage park brake, disengage blade drive.
2. Place 2 in. (5cm) blocks under edges of mower deck.

CAUTION

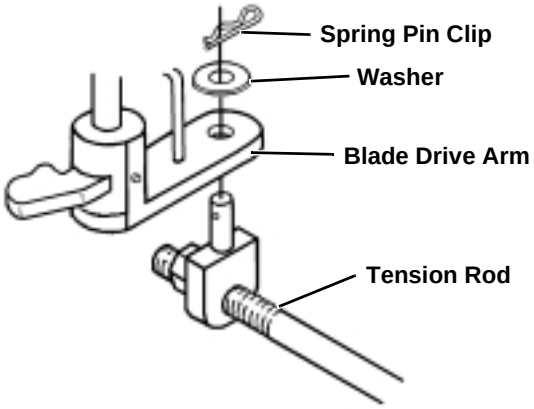
Mower lift lever is under high tension. When mower deck is removed, always grasp lift lever securely before releasing lift lock lever. Do not place hands between lift lever and frame while adjusting.



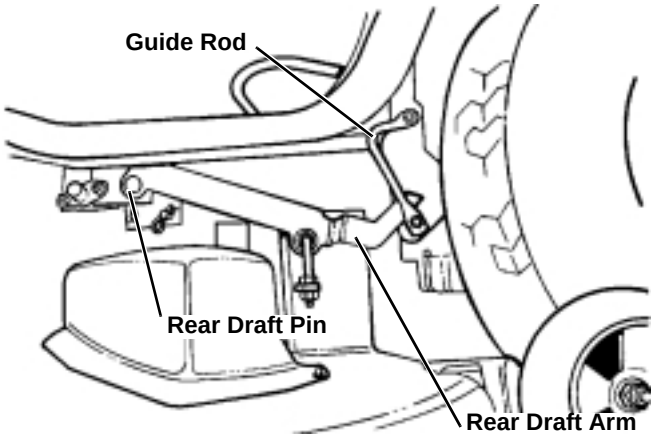
3. Lower mower deck lift lever to lowest position, bringing deck down onto blocks.



4. Remove mower deck drive belt from tractor engine pulley.



5. Remove spring pin clip and washer holding tension rod to blade drive arm.
6. Remove spring pin clips and washers from two mower draft rods at front of deck.

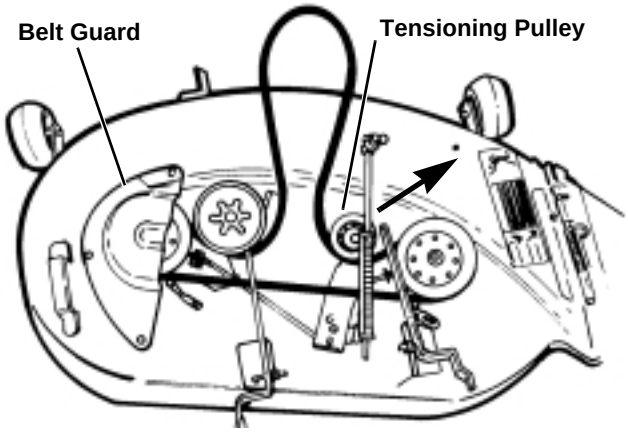


7. Remove two spring pin clips from two rear draft pins holding rear draft arms to mower frame.
8. Remove rear draft pins from draft arms.
9. Raise mower deck lift lever to highest position. Remove blocks from under deck.
10. Pull deck out from under side of mower, being careful to not catch rear draft arms on frame.
11. If mower is to be driven with deck removed, remove two draft rods from under mower to prevent damage.

REPLACING MOWER DECK BELT

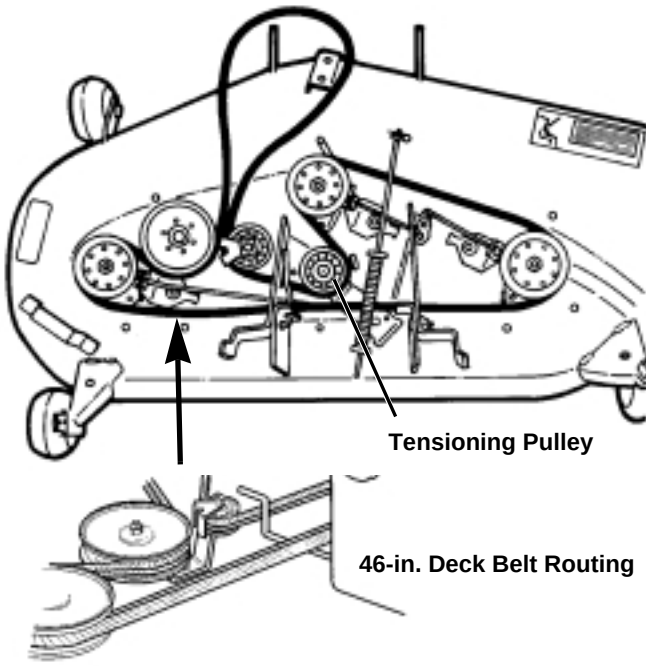
1. Remove mower deck from tractor. See “MOWER DECK REMOVAL” on page 11.

38-INCH MOWER:



2. Remove three cap screws and belt guard.
3. Remove belt from the mower deck spindles and idlers.
4. Installation of belt is in reverse order of removal. Use diagram above for belt routing. Be sure belt is not twisted.
5. Inspect spindle brake pads for wear.
6. Reinstall belt guard and tighten cap screws securely.
7. Install mower deck on tractor. See “MOWER DECK INSTALLATION” on page 13.
8. Adjust mower deck belt tension. See “MOWER BELT TENSION ADJUSTMENT” on page 8.
9. Adjust spindle brake. See “SPINDLE BRAKE ADJUSTMENT” on page 8.

46-INCH MOWER:



1. Remove six cap screws holding left and right belt guards.
2. Remove mower drive belt from deck pulleys and idlers, and remove belt from mower deck.
3. Installation of belt is in reverse order of removal. Use diagram above for belt routing. Be sure belt is not twisted.

CAUTION

Do not operate tractor without belt guard(s) installed.

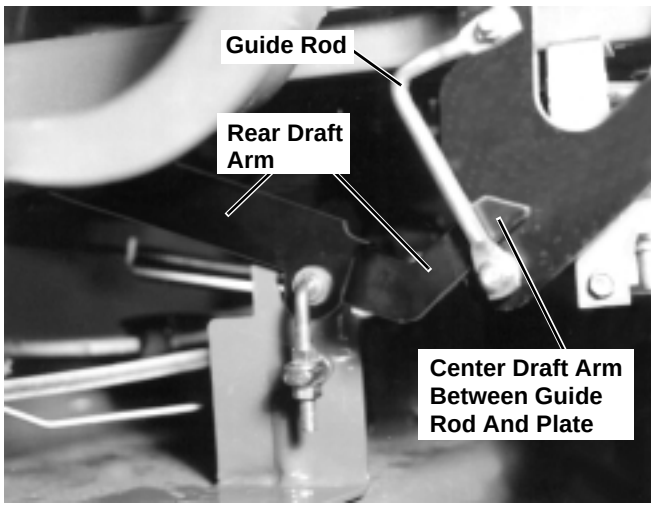
4. Reinstall belt guards and tighten screws securely.
5. Install mower deck on tractor. See “MOWER DECK INSTALLATION” on page 13.
6. Adjust mower deck belt tension. See “MOWER BELT TENSION ADJUSTMENT” on page 8.
7. Adjust spindle brake. See “SPINDLE BRAKE ADJUSTMENT” on page 8.

MOWER DECK INSTALLATION

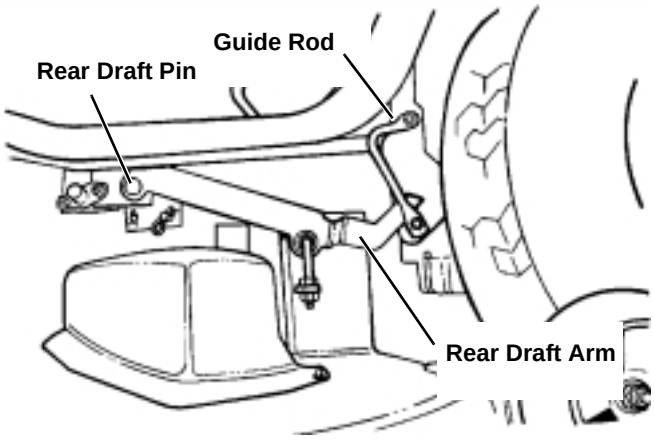
CAUTION

Mower lift lever is under high tension. When mower deck is removed, always grasp lift lever securely before releasing lift lock lever. Do not place hands between lift lever and frame while adjusting.

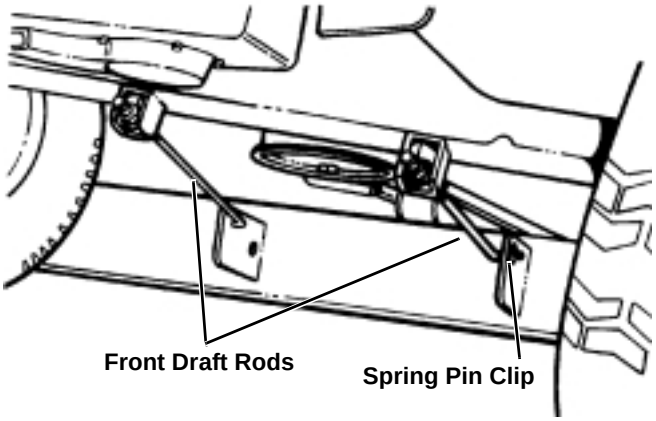
1. Raise the mower deck lift lever to its highest point by pressing the lift lever lock and raising the lever up.
2. Slide deck under mower from side, being careful not to catch rear draft brackets on frame.
3. Place deck on 2 in. (5cm) blocks under edges of mower deck.



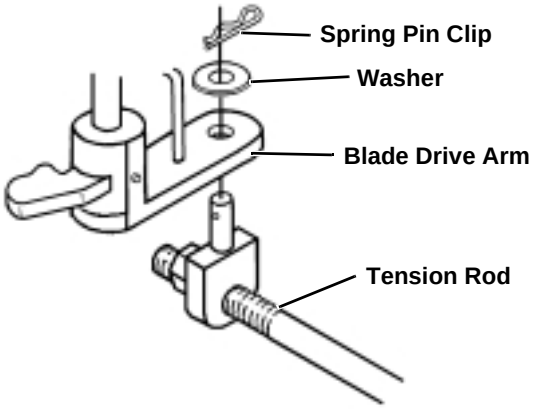
4. Lower deck lift lever to lowest position, while centering rear draft arms between guide rods and plate on both sides of tractor.



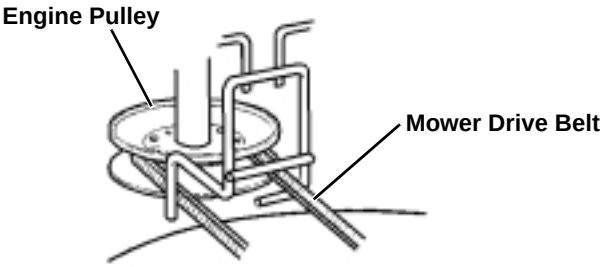
5. Raise front of draft arms to align holes in end of draft arms with holes in mower frame. Install draft pins through rear draft arms and mower frame. Secure with spring pin clips.



6. Attach draft rods to front of deck with washers and spring pin clips.



7. Attach mower deck spring tension rod to blade drive arm with washer and spring pin clips.



8. Install mower drive belt on engine pulley.
9. Remove blocks from under mower.
10. Check mower deck belt tension. See “MOWER BELT TENSION ADJUSTMENT” on page 8.

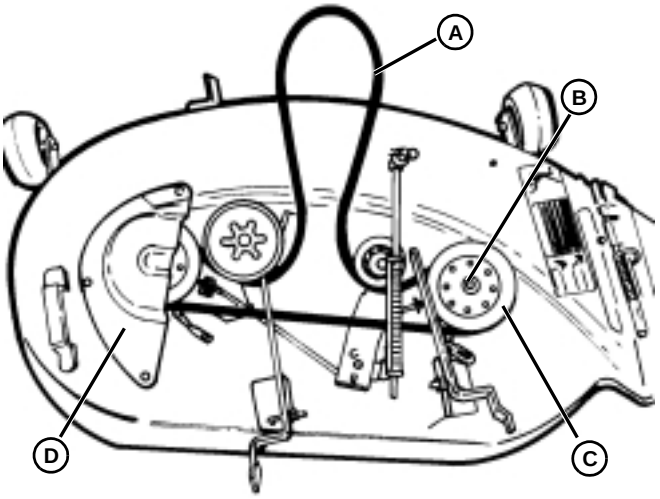
MOWER SPINDLE ASSEMBLY

REMOVAL

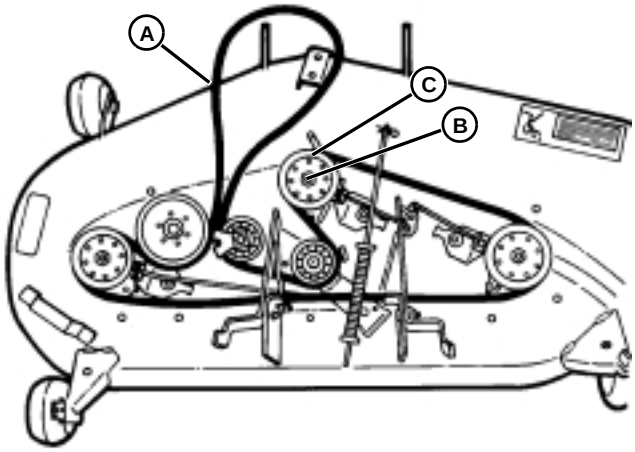
NOTE: Spindles are not serviceable. The spindle, complete with pulley, must be replaced as an assembly if any parts are needed.

1. Remove deck unit from machine. See “MOWER DECK REMOVAL” on page 11

38-INCH MOWER:



46-INCH MOWER:

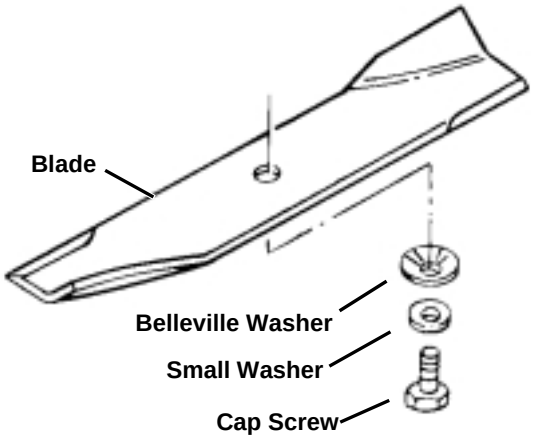


2. Remove shield(s) (D) and belt (A).

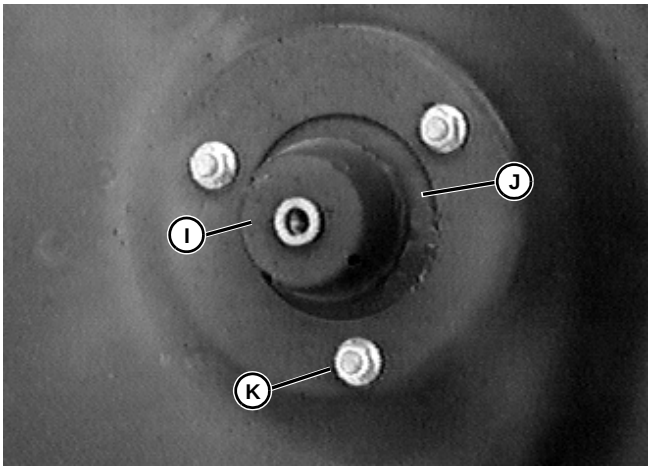
IMPORTANT: DO NOT remove nuts (B) or sheaves (C) from spindles.

⚠ CAUTION

Blades are sharp and could cause personal injury. Wear gloves or wrap blades with shop cloths to remove and install blades. DO NOT hold blade with bare hand. Use a block of wood wedged between deck and blade to keep spindle from turning.



3. Remove cap screw, small washer, and belleville washer to remove blade(s).

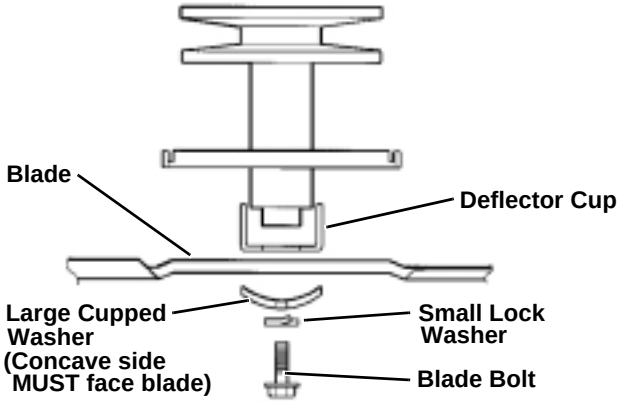


4. Remove spindle bearing guard(s) (I) and mounting hardware (K) to remove spindle assembly (J).

INSTALLATION

NOTE: Spindles are not serviceable. The spindle, complete with pulley, must be replaced as an assembly if any parts are needed.

IMPORTANT: DO NOT add grease to spindle grease fitting. Grease fittings are for manufacturers use only. Adding grease may damage spindle seals.



IMPORTANT: Blade bolt is Grade 8 heat treated

1. Install each spindle assembly in reverse order. Tighten mounting hardware to specification.
2. Install spindle bearing guard(s) and blade(s) to specification.

Specifications:
Spindle Assembly Nuts . . . . . 27 N•m (20 lb-ft.)
Blade Cap Screw . . . . . .46-65 N•m (34-48 lb-ft)

3. Install mower belt. See “REPLACING MOWER DECK BELT” on page 12.
4. Install shield(s) (D), as shown.
5. Install deck. See “MOWER DECK INSTALLATION” on page 13.
6. Adjust mower belt tension. See “MOWER BELT TENSION ADJUSTMENT” on page 8.
7. Adjust spindle brakes. See “SPINDLE BRAKE ADJUSTMENT” on page 8.

GAGE WHEEL ADJUSTMENT

This unit has been equipped with gage wheels to minimize scalping by the mower deck when mowing uneven terrain. To achieve best results follow these guidelines:

1. Set gage wheels so they ride about **1/4 inch (6 mm)** higher than the desired cutting height.
2. All mowers: Make sure that all gage wheel mounting bolts are securely tightened after adjustment to prevent losing wheel parts while mowing.

NOTE: 46 Inch Mower Deck: Be sure that front and rear gauge wheels ride in the same hole sets front-to-back and side-to-side to provide optimum performance.

3. Do not run the gage wheels on the ground continuously while mowing or transporting. Doing this will result in accelerated wear of gage wheel components and may lead to early failure. The gage wheels are designed to handle occasional ground contact in uneven terrain situations to prevent scalping.

CONTENTS

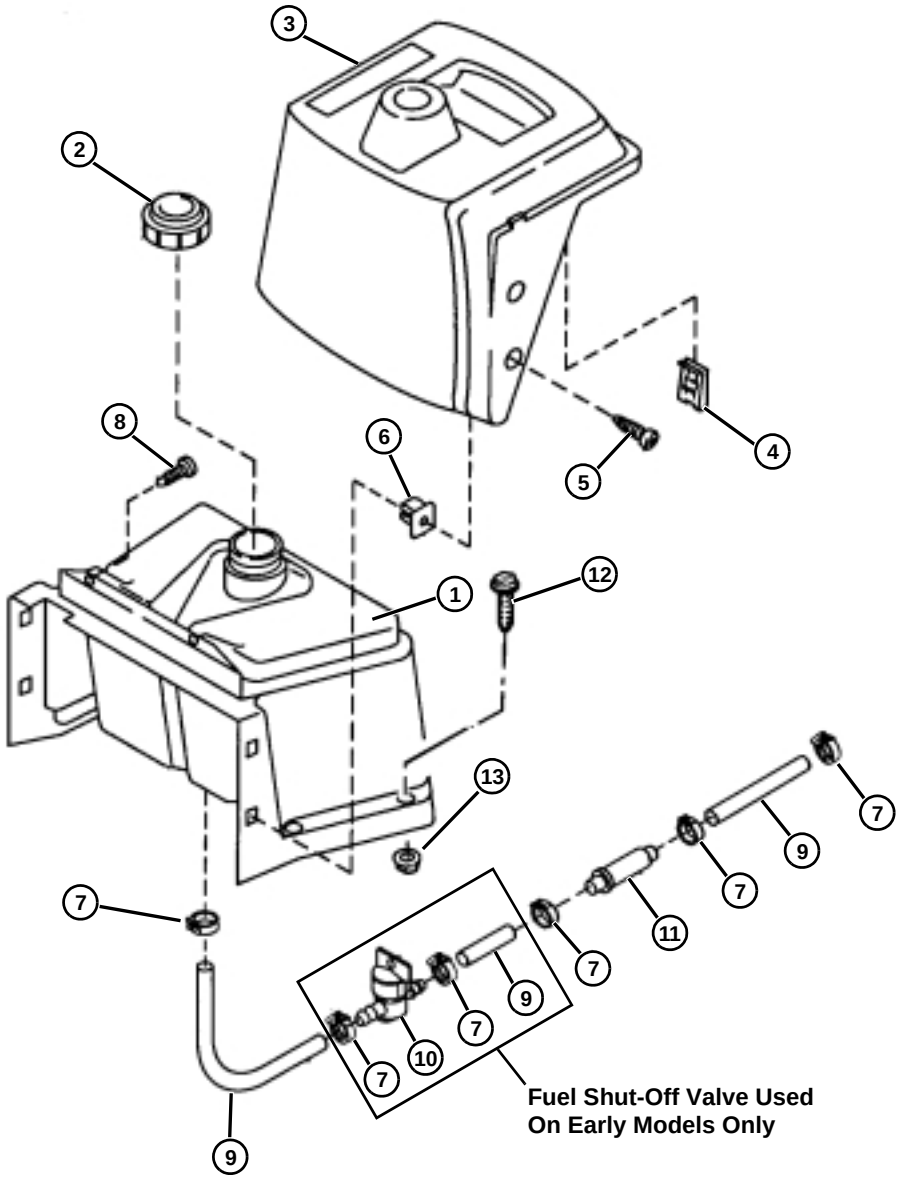
Page

MISCELLANEOUS

M

COMPONENT LOCATION

FUEL TANK AND DASH PANEL



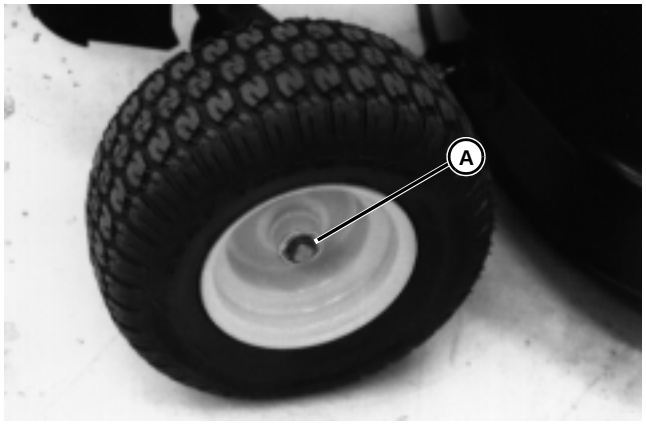
1. Fuel Tank
2. Filler Cap
3. Dash Panel
4. Clip Nut (2 used)
5. Screw (6 used)
6. Fastener Grommet (4 used)
7. Hose Clamps (6 used)
8. Screw
9. Fuel Delivery Hose (Typical)
10. Fuel Shut-Off Valve
11. Fuel Filter
12. Flange Screw
13. Nylock Nut

M

REPAIR

FRONT WHEELS REMOVAL & INSTALLATION

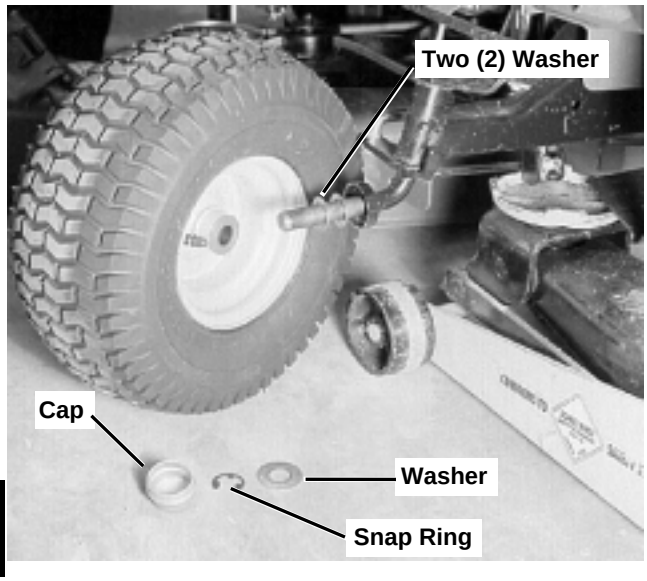
1. Safely lift and support tractor.
2. Remove plastic cap.



3. Remove snap ring (A) and wheel.
4. Clean axle, washers, and bearings of old grease.
5. Inspect bearings for excessive wear. Replace if necessary.

NOTE: Front wheels are installed with valves to the inside.

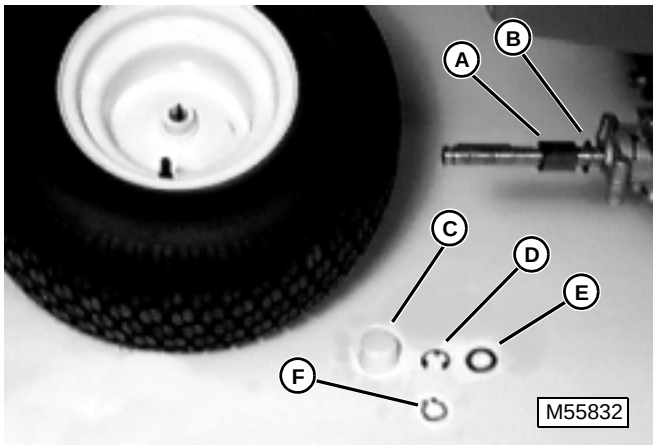
6. Grease spindles with specified grease.



7. Install two washers on axle.
8. Install wheel on axle.
9. Place large washer on axle and install snap ring.
10. Install plastic cap.

REAR WHEELS REMOVAL & INSTALLATION

1. Safely lift and support tractor.



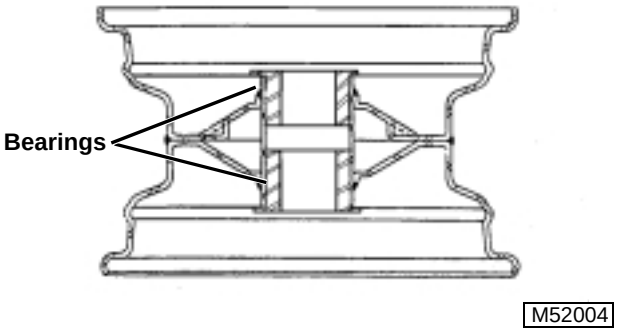
2. Remove plastic cap (C), E-ring (D) (gear) or snap ring (F) (hydro), and outer washer (E).
3. Remove wheel.

NOTE: Rear wheels are installed with valves to the outside.

4. Apply grease to axle shaft and key.
5. Install wheel on axle.
6. Install outer washer (E), E-ring (D) or snap ring (F), and plastic cap (C).

FRONT WHEEL BEARING REPAIR

1. Remove bearings (A) using slide hammer puller.

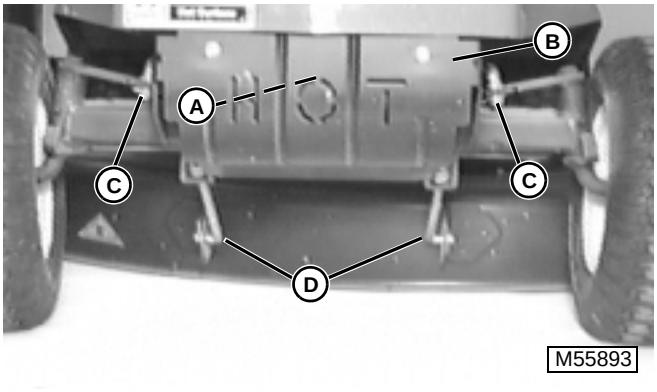


2. Install new bearings using suitable driver on outside race of bearing.

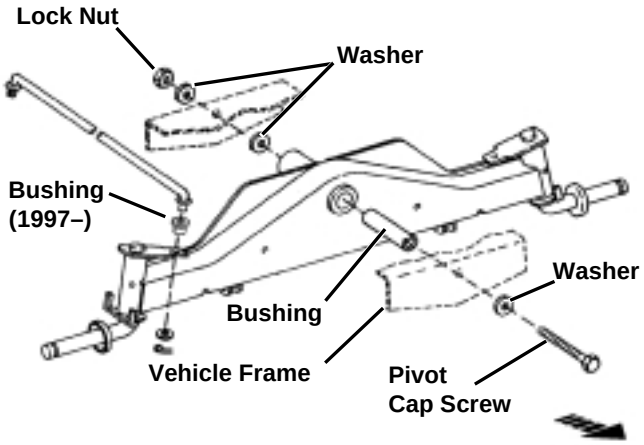
M

FRONT AXLE REMOVAL

1. Safely support front of tractor.
2. Remove front wheels. See “FRONT WHEELS REMOVAL & INSTALLATION” on page 4.



3. Disconnect draft arms (D) from axle.
4. Remove tie rods (C) at spindle arms.
5. Remove muffler shield(s) and muffler (B).



6. Remove pivot cap screw (A).
7. Remove axle and replace parts as necessary.

FRONT AXLE INSTALLATION

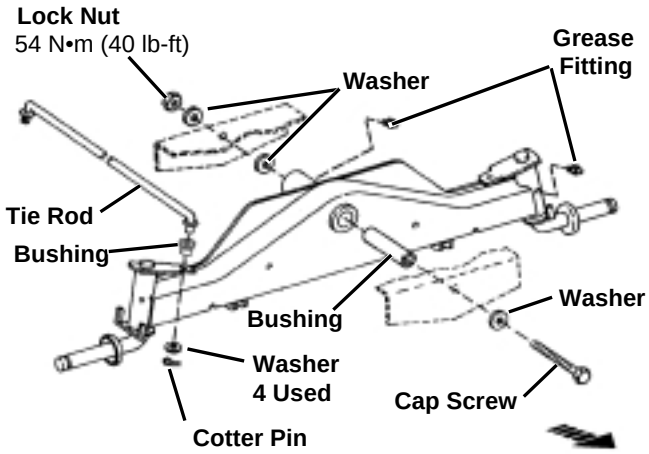
1. Grease and install axle. Tighten pivot cap screw to **54 N•m (40 lb-ft)**
2. Install muffler. Tighten pivot cap screw to **19—30 N•m (168—265 lb-in.)**
3. Install muffler shield(s).
4. Connect tie rods to axle (long leg in axle spindle).
5. Connect draft arms to axle.

FRONT AXLE REPAIR

1. Remove axle. See “FRONT AXLE REMOVAL” on page 5.
2. Remove bushing (I), you may need to use a driver and hammer or an hydraulic press.

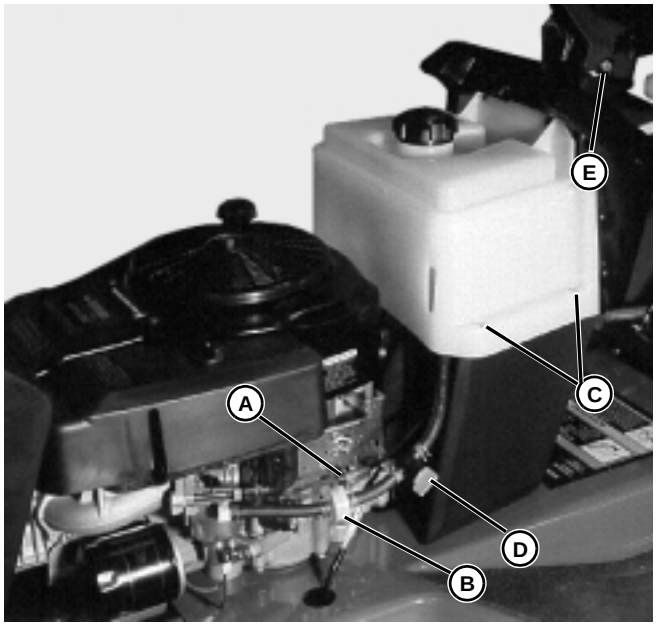
NOTE: If new axle is being installed, original bushing can be used if in good condition.

3. Grease axle pivot ID and bushing OD and install. Tighten lock nut (B) to specification.
4. Grease spindle shafts (Q) before installing rims.



FUEL TANK AND DASH PANEL REMOVE AND INSTALL

1. Disconnect battery ground (—) cable.

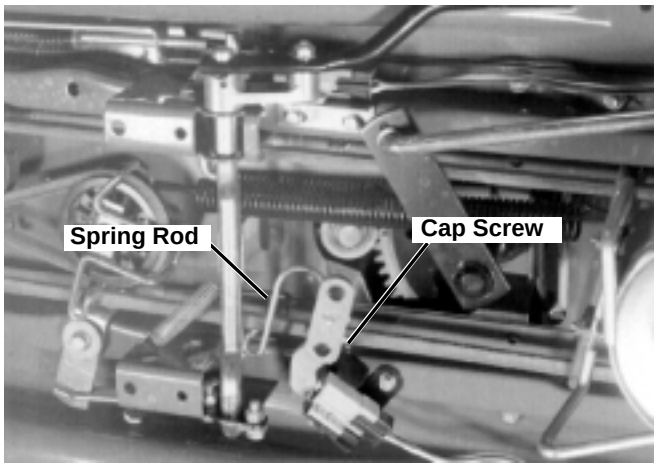


M

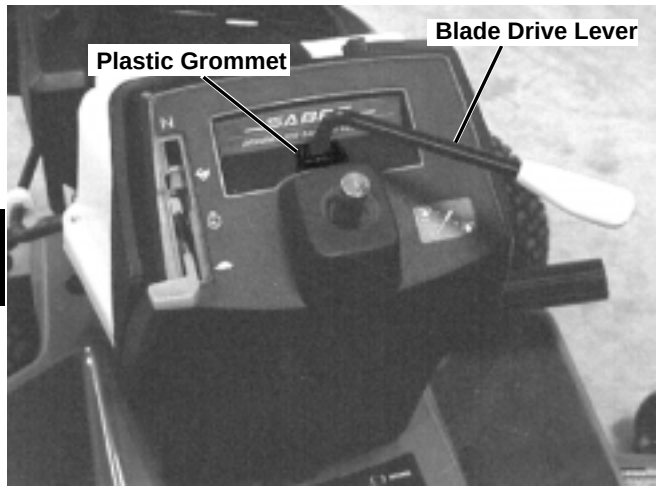
CAUTION

Gasoline is explosive. Do not expose to flame or spark. Serious injury can result. Catch or wipe up any spilled fuel immediately.

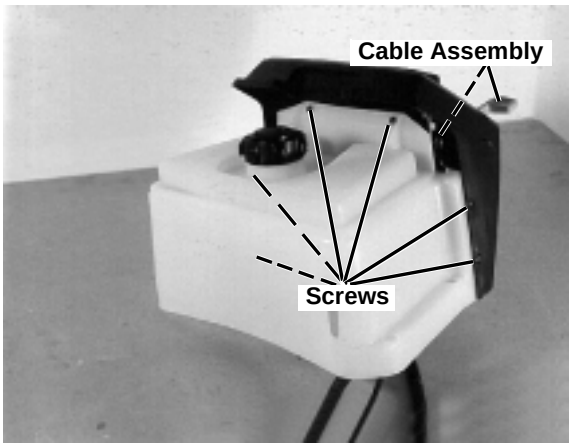
2. Turn fuel shut-off valve (D) (early models only), to CLOSED position, or clamp fuel line closed between filter and tank.
3. Disconnect fuel line at filter (B) side of fuel shut-off valve.
4. Remove fill cap and drain any fuel into an approved container.
5. Disconnect throttle cable (A) at throttle plate.
6. Remove mounting screws on right and left side of gas tank (C).
7. Remove screw (E) securing steering wheel to column and remove steering wheel and washer(s).
8. Disconnect mower deck blade drive lever.



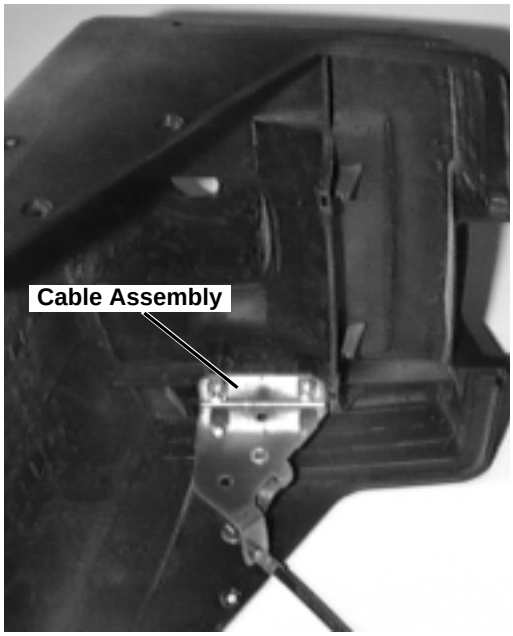
9. Remove spring rod from switch cam.
10. Remove socket head cap screw securing switch cam to rod.



11. Remove mower deck blade drive lever through dash, retain plastic grommet.
12. Remove fuel tank/dash panel assembly to workbench.

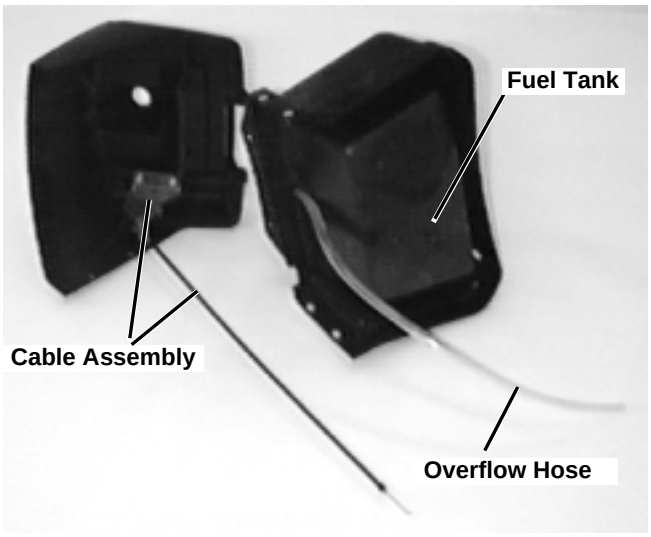


13. Remove lever from throttle cable assembly (G) only if dash panel or throttle cable assembly are to be replaced.
14. Remove six screws to separate tank from dash panel and cable assembly.
15. Remove overflow tube and fuel line, replace as necessary.

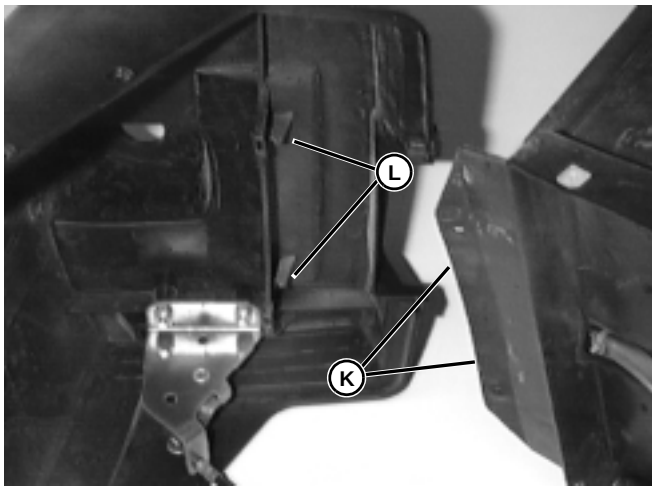


16. Remove and replace throttle cable assembly as necessary.
17. Properly dispose of fuel tank and/or dash panel as necessary.

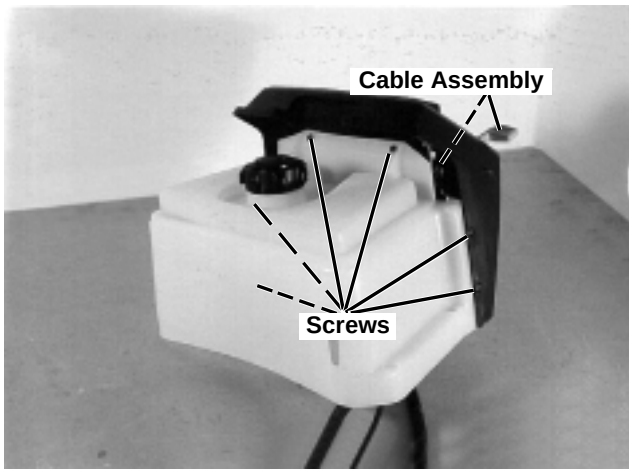
M



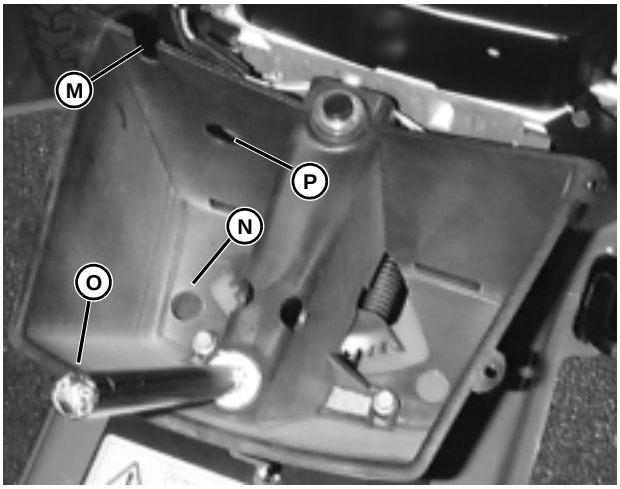
18. Install overflow tube and fuel line to fuel tank spigots.



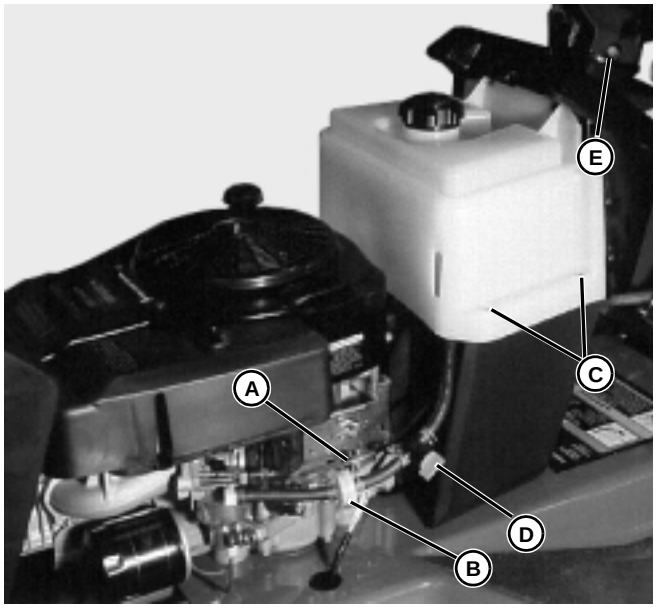
19. Install fuel tank lip (K) in console notches (L) while aligning six mounting holes.



20. Fasten fuel tank to dash panel with six screws.
21. Install lever on end of throttle cable assembly.

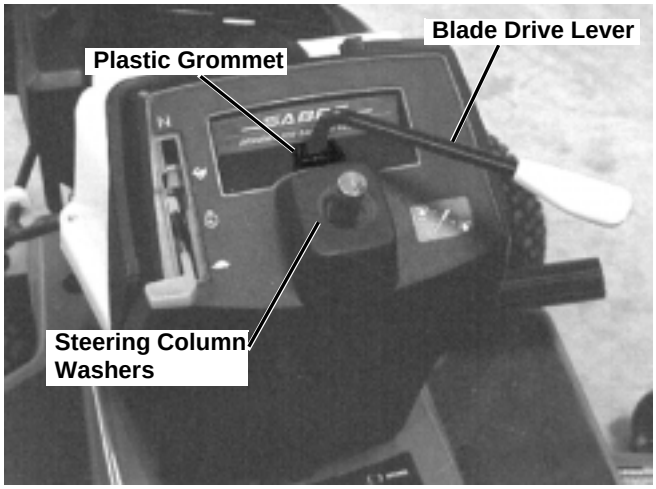


22. Align fuel hose with slot (M), overflow tube with frame hole (N), throttle cable with hole (P), and dash panel steering shaft hole with steering shaft (O) as you install fuel tank/dash panel assembly onto steering pedestal.



23. Secure gas tank to pedestal with four (4) flanged screws (C).
24. Attach throttle cable (A) to carburetor.
25. Connect fuel line to fuel shutoff valve (B) (earlly models only), or to fuel filter (late models).

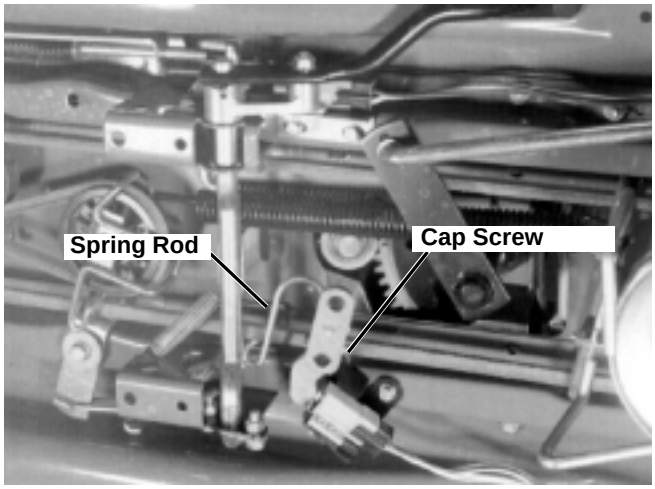
M



26. Place blade drive lever into hole in dash and frame.
27. Insert plastic grommet

NOTE: Apply anti-seize lubricant to steering shaft before installing steering wheel.

28. Install washer(s) exactly as removed earlier onto steering shaft.
29. Install steering wheel and fasten with cap screw and lock nut.



30. Assemble spacer, switch cam, spring rod on tension lever end. Line up holes in shaft and cam and Secure with cap screw and nylock nut
31. Add fuel to tank and turn fuel shutoff valve (early models only) to ON position.
32. Check for and fix any leaks from fuel system.

M

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Service Information Bulletin

No. 96-001

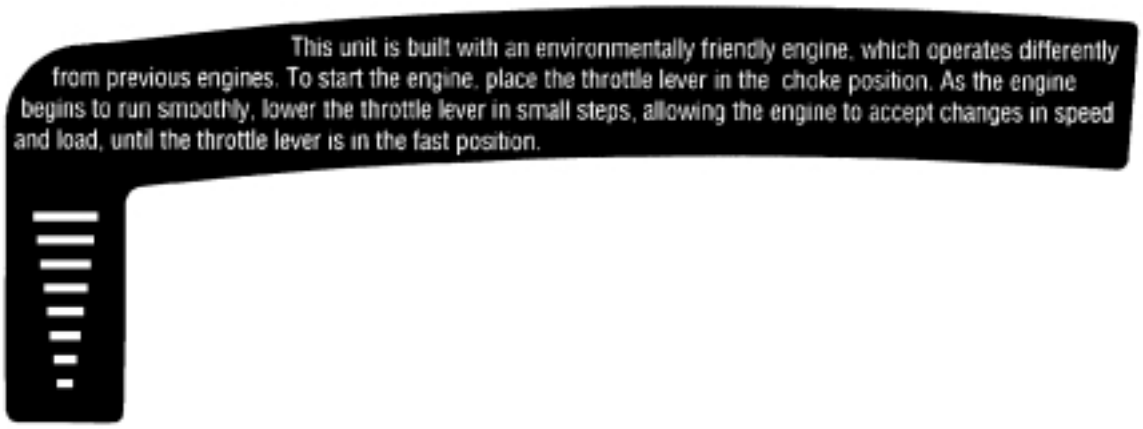
May 1, 1996

SUBJECT: ENGINE SURGING WHEN COLD

AFFECTS: SABRE Lawn Tractors

ENGINES ON SABRE LAWN TRACTORS ARE ENVIRONMENTALLY FRIENDLY!

All Briggs & Stratton engines used on the SABRE lawn tractors are California Air Resources Board (C.A.R.B.) approved. In order to meet the established emissions standards, the carburetors on these C.A.R.B. approved engines, are calibrated leaner than those engines which do not pass the C.A.R.B. standard. The result, for the consumer, is an ENVIRONMENTALLY FRIENDLY ENGINE which requires a longer warm-up period during which the choke should be opened slowly, in small steps, during the warm-up phase. **Engines which are not allowed to warm-up properly may experience surging when the blade drive lever is engaged and the engine is put under load.** To help the consumer understand and become aware of this warm-up procedure, SABRE has implemented a removable decal on the console of all SABRE lawn tractors. A sample of this decal is below:



Whenever possible, the consumer should be given instruction, by the dealer or retailer, of the proper starting and warm-up procedure for these ENVIRONMENTALLY FRIENDLY, C.A.R.B. approved engines.

The following statement also appears in the Briggs & Stratton Engine Owner's Manuals ("Starting" section) which are packaged with all SABRE lawn tractors:

Choke operation/engine warm-up

This engine is designed for maximum performance and life if operated with the choke fully open (in RUN) and throttle fully open (in FAST). To open the choke fully requires an engine warm-up period of several seconds to several minutes, depending on temperature.
After starting engine, first open the choke (toward RUN) until the engine just begins to run smoothly. Then open the choke in small steps, allowing the engine to accept changes in speed and load, until the choke is fully open (in RUN).

During engine warm-up, the equipment can be operated.

Peery Gibson

Product Service Manager

S

Service Information Bulletin

No. 96-002

May 13, 1996

SUBJECT: MULCHING BLADES CONTACTING EACH OTHER

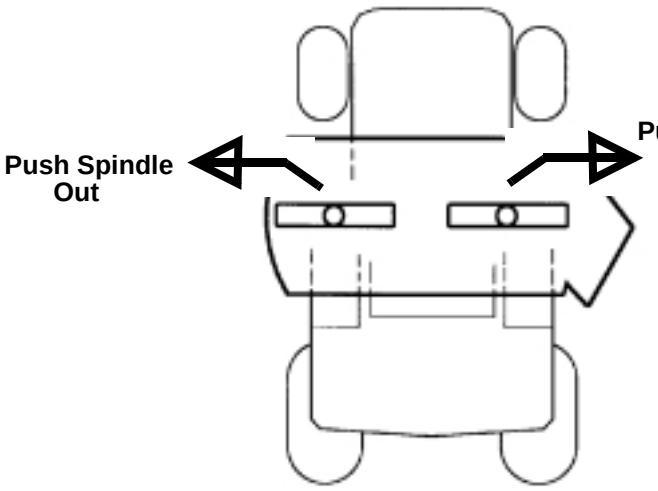
AFFECTS: SABRE Lawn Tractors with BM 18617 (38”) and BM 18618 (46”) Mulch Kits installed.

There have been a few reports of the mulching blades contacting each other following installation of the mulch kit.

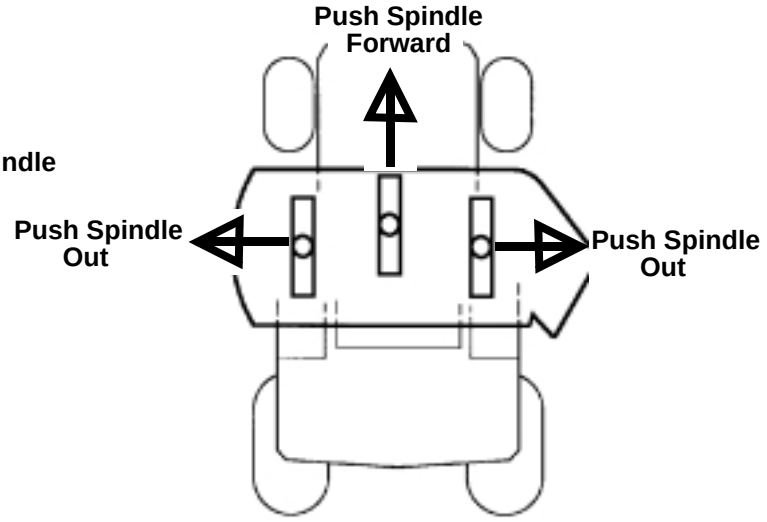
This can be remedied by loosening the spindle mounting bolts and pushing each spindle to the outside (refer to illustrations below), and then re-tightening the mounting bolts. On the 46” mower deck, also loosen the center spindle mounting bolts, push it forward and retighten the mounting bolts.

Service Note: TORQUE SPINDLE MOUNTING NUTS TO 16 ft.lbs. (22 Nm)

38” DECK



46” DECK



CAUTION!

DO NOT hold blade with bare hand.
Blades are sharp and could cause personal injury.
Wear gloves or wrap blades with cloths
to prevent being cut by blade.
When removing or installing blades,
use a block of wood wedged between deck and blade
to keep spindle from turning.

S

Peery Gibson
Product Service Manager

Service Information Bulletin

No. 96-003

May 14, 1996

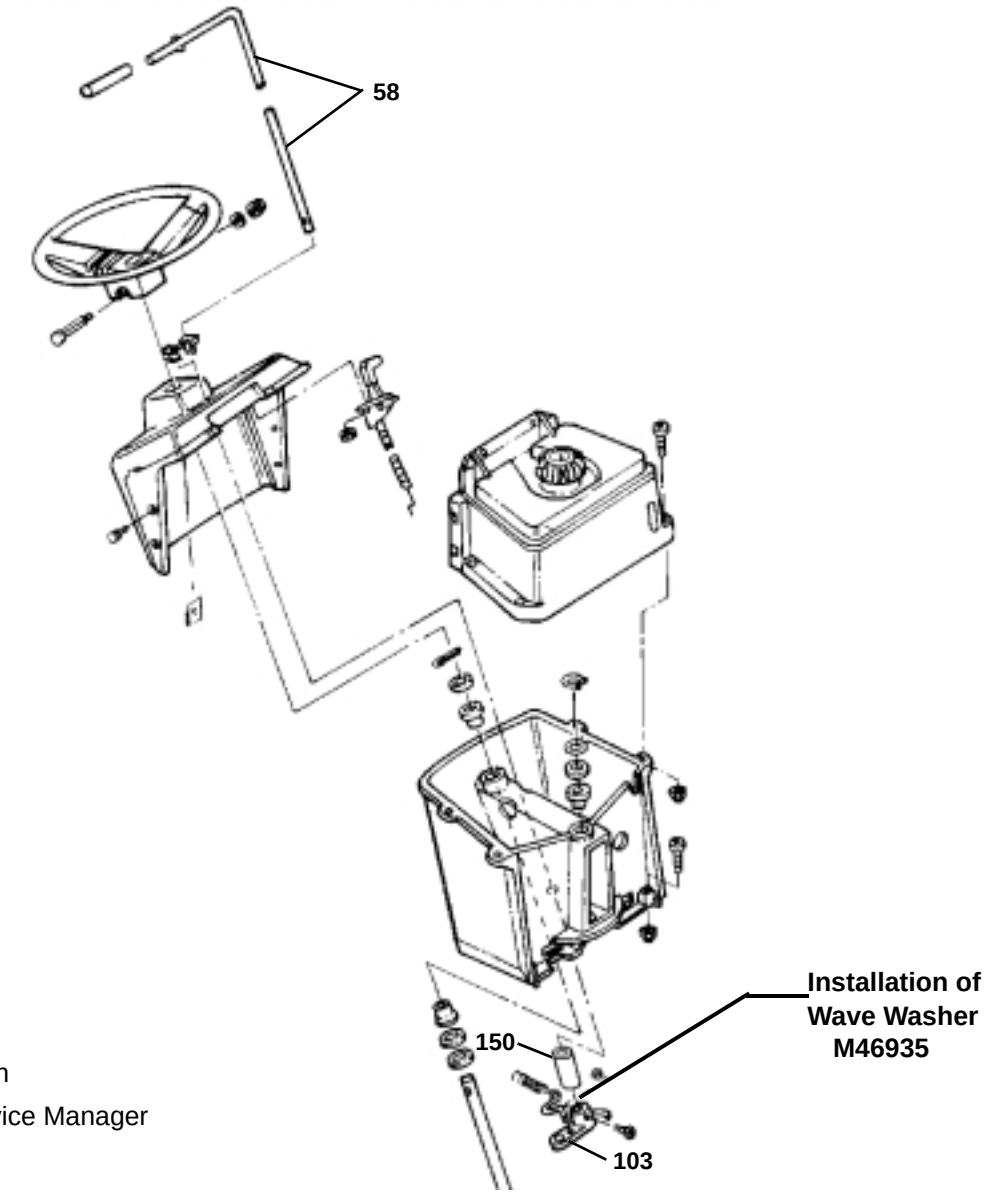
SUBJECT: CHATTERING NOISE FROM UNDER THE FRAME

AFFECTS: SABRE Lawn Tractors

The mower drive lever (key # 58 below) uses a loose fitting, long spacer (key # 150) that fits around the lever shaft between the frame and the pivot arm (key # 103) under the frame, Due to the proximity of the transaxle drive belt to the bushing, the vibration of the drive belt, can cause the belt to contact the bushing resulting in a chattering noise.

Although this chattering noise produces no functional problems, it can be eliminated by the installation of wave washer (M46935) between the pivot arm (M122986) and the spacer (M123249). The addition of this wave washer keeps the spacer from sliding up or down on the mower engagement shaft resulting in a tighter fit between the pivot arm and the spacer.

Refer to the illustration below for the location of the wave washer.



Peery Gibson

Product Service Manager

S

Service Information Bulletin

No. 96-008

October 15, 1996

SUBJECT: MOWER DRIVE BELT SMOKING WHEN PTO (BLADE DRIVE) LEVER IS DISENGAGED - MAY BE ACCOMPANIED BY A "SQUELING" NOISE (ADDENDUM TO SIB 96-004, MAY 14, 1996)

AFFECTS: SABRE Lawn Tractors

Complaint or Symptom:

1) Mower drive belt smokes when PTO (blade drive) lever is dis-engaged.
2) May be accompanied by a "squealing" noise at higher engine speeds.

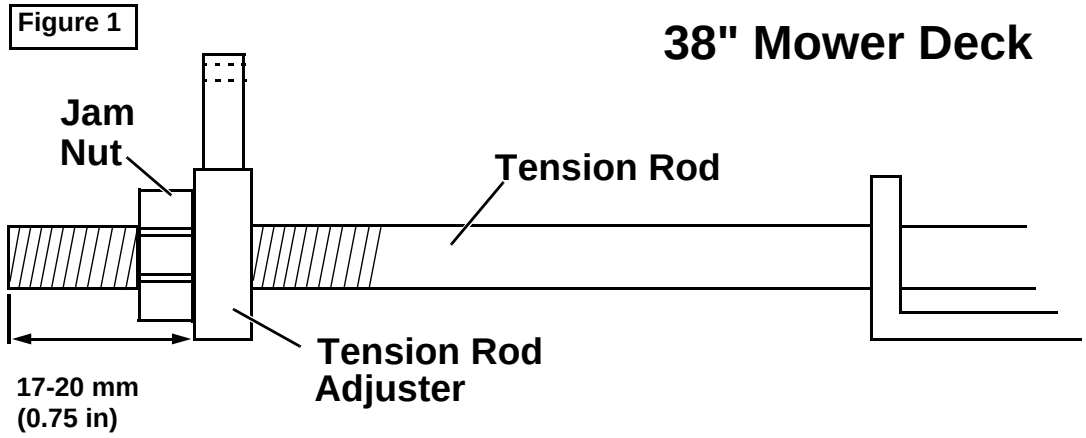
Situation: Several items can contribute to this problem:
- Deck idler arm tension rod not adjusted properly (set too tight)
- Spindle brake pad clearance too wide
- Bent or deformed engine sheave belt guide or bracket (46-inch deck only)
- Belt keepers or guides not oriented properly
- Belt not routed properly
- Deck improperly leveled

Solution:
- Check tension rod setting per Fig. 1 & 2. Readjust to correct preset dimensions.
- Check and adjust all spindle brake clearances. Clearance should be 2-3mm (0.078"-0.118") with the PTO (blade drive) lever in the engaged position.
- Check for bent or deformed engine sheave belt guide and/or bracket (46-inch only). See Fig. 3.
- Check and readjust belt guides on mower deck. See Fig. 4 & 5.
- Ensure deck belt is routed properly around all pulleys, sheaves and guides. See Figure 4 & 5.
- Check deck leveling. Deck should be level side-to-side (within 1/4") and be 1/8"-3/8" lower in the front than in the rear. NOTE: Deck leveling measurements should be made at blade tips, not from the surface of the deck shell. Use John Deere Deck Leveling Gauge P/N TY15272 as an aid in leveling deck.

Additional Information:
- Anytime the tension rod is adjusted, it is important that the spindle brake clearances be checked to ensure proper clearances in the engaged position and proper contact of the pad to the spindle in the disengaged position.
- Incorrect spindle brake pad adjustments can result in the brake pad pulling away too far from the spindle, not allowing the idler arm to return completely to the "at rest" position when the PTO (blade drive) lever is pulled back. The mower drive belt continues to rotate and not release fully from the engine sheave even though the PTO lever has been disengaged.
- A bent or deformed engine sheave belt guide or ground drive keeper can prevent the belt from "blossoming" off the sheave and releasing fully when the PTO lever is disengaged. Fig.3 shows the correct clearances for the 46-inch deck. If the clearances cannot be obtained without deforming the welded ground drive keeper bracket, remove the belt guide and re-install it on the front side of the bracket. This should achieve the specified clearances to ensure the mower drive belt "blossoms" properly off of the engine sheave.
- Mower deck leveling should be checked anytime belt problems occur. All measurements should be made from blade tips. There should be no more than **1/4" difference** in the **side-to-side** measurements. Use J-bolt on left side of deck to make side-to-side adjustments. The **front** of the deck should be **1/8"-3/8" lower** than the rear of the deck. Adjust front draft rods equally to make front-to-rear (rake) adjustments.

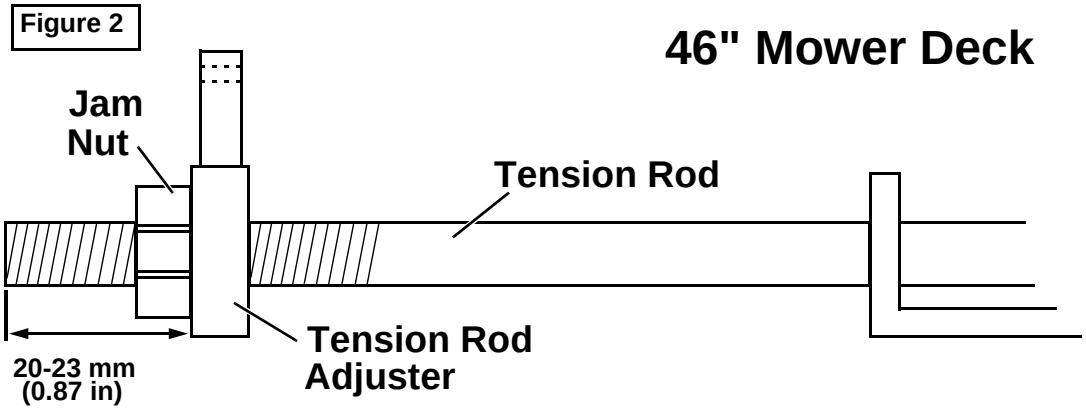
The preset tension rod measurements for the 38-inch deck should be 17-20 mm (0.75 [3/4] in.). Measurement should be taken from face of tension rod adjuster to end of threaded tension rod (see Figure 1).

Figure 1



The preset tension rod measurement for the 46-inch deck should be 20-23 mm (0.87 [7/8] in.). Measurement should be taken from face of tension rod adjuster to end of threaded tension rod (see Figure 2).

Figure 2



SERVICE NOTE:

Whenever the tension rod is adjusted,
always check spindle brake pad to pulley clearance and re-adjust, if necessary.
IMPROPER BRAKE PAD CLEARANCE MAY WILL RESULT IN:
1) THE BRAKE PAD (IF ADJUSTED TOO CLOSE TO THE PULLEY) RUBBING THE PULLEY DURING MOWER OPERATION
2) THE BLADES NOT STOPPING IN THE REQUIRED TIME (IF PADS ARE ADJUSTED TOO FAR FROM PULLEY).
3) THE TENSION ROD NOT RELEASING FULLY WHEN THE PTO (BLADE DRIVE) LEVER IS MOVED TO THE DISENGAGED POSITION
The brake pad clearance with PTO (blade drive) lever engaged should be 2-3 mm (0.078 - 0.118.).
Refer to SABRE Technical Manual (M126434) for adjustment procedures.

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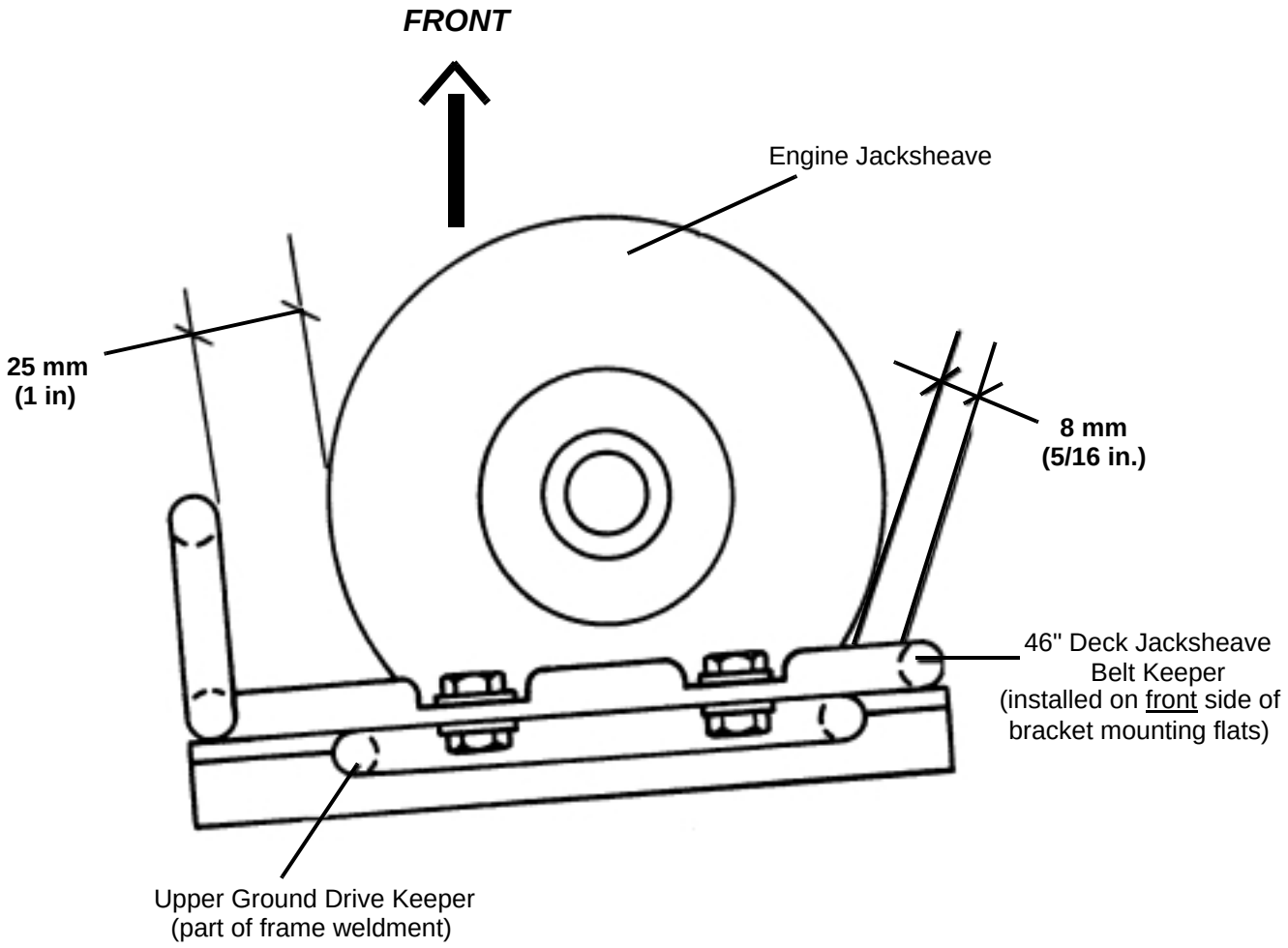
46 INCH DECK ONLY - If the proper clearances shown below cannot be obtained without deforming the upper ground drive keeper (part of frame weldment), remove and re-install the jacksheave belt keeper on the front side of the bracket mounting flats (See Figure 3 below).

Figure 3



TOP VIEW OF 46" ENGINE JACKSHEAVE AND BELT KEEPER

The following illustrations show the correct belt routing and belt keeper (guide) orientation for the 38 and 46 inch mower decks. Improperly oriented belt keepers can result in thrown belts, premature belt wear or breakage.

Engine Sheave Belt Routing - both decks

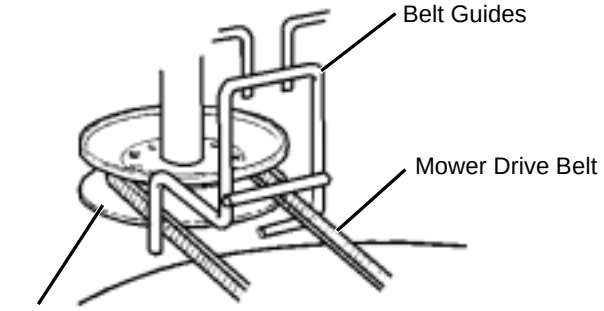


Figure 4

38-Inch Mower Deck

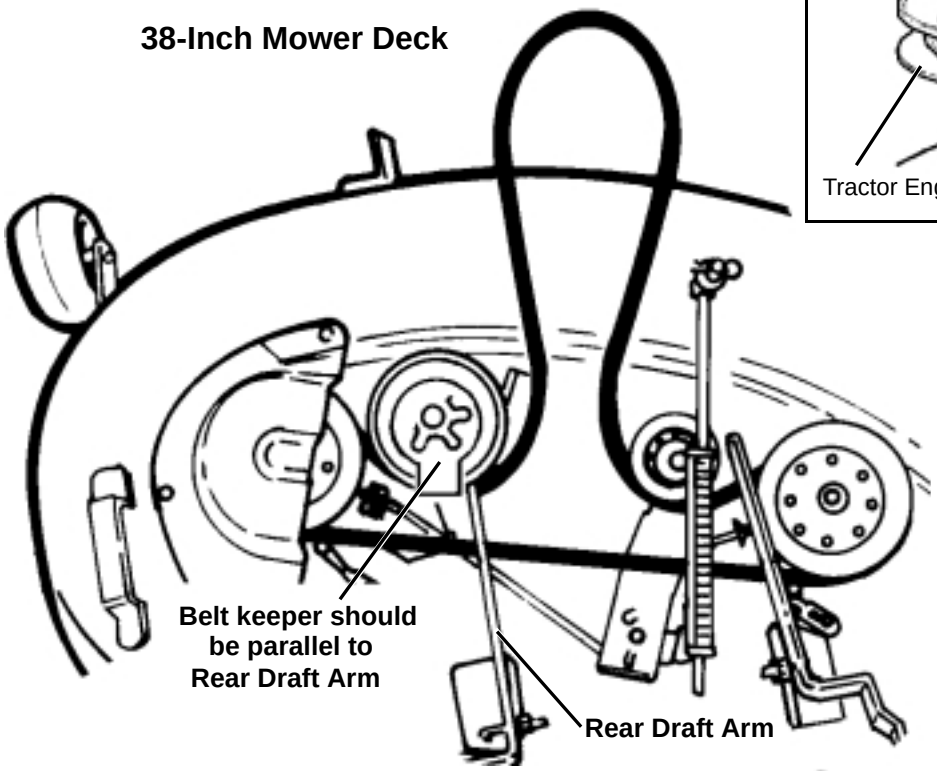
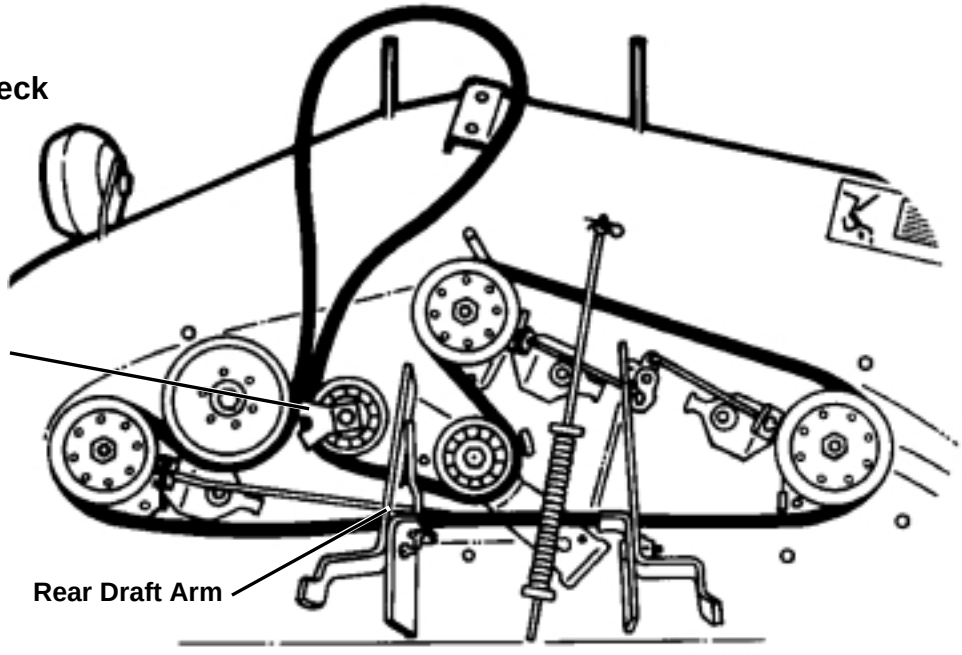


Figure 5

46-Inch Mower Deck



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Service Information Bulletin

No. 96-009

October 15, 1996

SUBJECT: MOWER BELT SMOKING COMES OFF

AFFECTS: MODELS1338 GEAR & 1538 HYDRO
SABRE Lawn Tractors with 38-inch (96 cm) Mower Deck

Complaint or Symptom:

Mower deck belt comes off during mowing or when PTO (blade drive) lever is engaged.

Situation:

- Too much clearance between idler arm pulley and belt guide (part of idler arm) results in belt coming off of idler arm pulley.

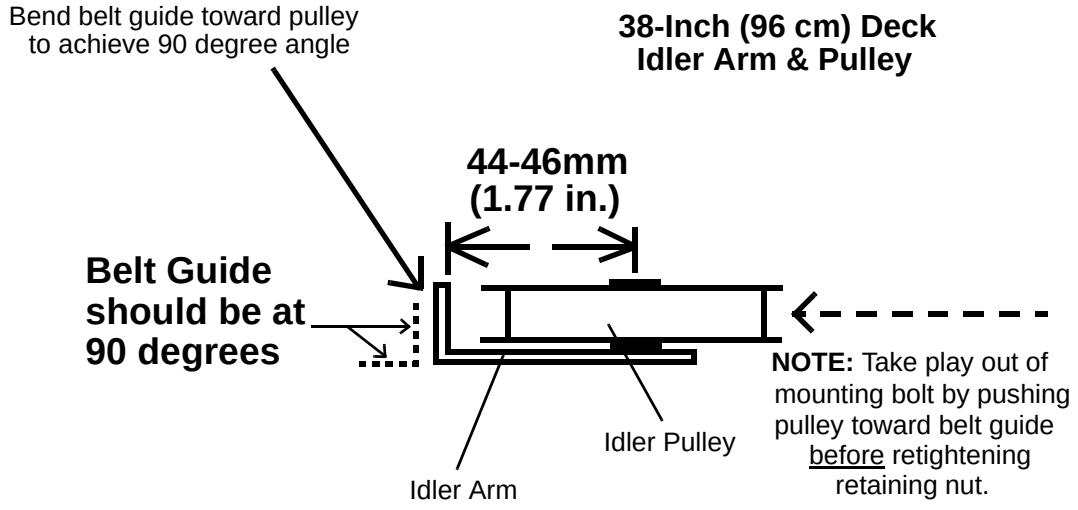
Solution:

- Remove idler arm and bend belt guide closer to idler pulley. See Fig. 1.
- When re-installing idler pulley, remove play from mounting bolt by pushing pulley toward the belt guide before tightening retaining nut.

Additional Information:

- Belt guide should be at a 90 degree angle to the idler arm. If the belt guide is too far away from idler pulley, the mower deck belt will ride off the pulley and past the belt guide, resulting in a thrown belt.
- If the mower deck belt has been thrown off repeatedly, it should be replaced.

Figure 1



Peery Gibson

Product Service Manager

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Service Information Bulletin

No. 96-010

October 31, 1996

SUBJECT: ENGINE SURGING

AFFECTS: 1538 Hydro, 1546 Gear, 1646 Hydro SABRE Lawn Tractors

Complaint or Symptom:
Engine runs lean and surges (or hunts) after warm-up during first few hours of running.

Situation:
-Engine surging (or hunting) and lean engine operation during the first few hours of operation may be due to the paper air filter element having been saturated with oil from the crankcase breather vent tube during the assembly process.
-Remove paper air filter element from engine and examine for oil wicking or saturation. Examine filter from the inside surface. Paper element may not show evidence of oil wicking if examined only from the outside.

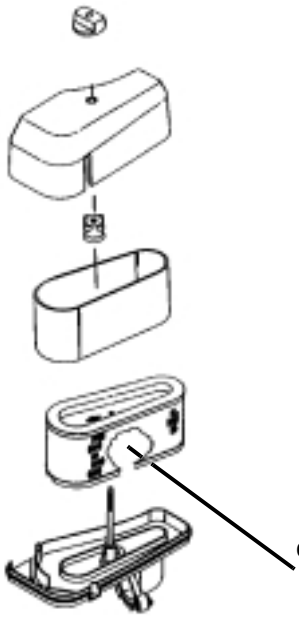
Solution:
- Replace paper air filter element and file warranty through SABRE only if this condition is found in the first few hours of operation*.

Additional Information:
- Part numbers for the paper air filter elements are listed below:

	Briggs & Stratton	John Deere
15hp	493909	LG 493909
16hp	493909	LG 493909

- Use Job Code RW02 on Warranty Claim. A time of 0.1 hr. will be allowed for this repair only if performed within the first few hours of operation.

***NOTE: Routine yearly maintenance and replacement of this air filter element is not covered under warranty and is the responsibility of the lawn tractor owner.**



Peery Gibson
Product Service Manager

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