GT242, GT262, and GT275 Lawn and Garden Tractors

TECHNICAL MANUAL

John Deere
Worldwide Commercial and
Consumer Equipment Division
TM1582 (15JUL97)
Replaces TM1582 (22DEC94)
and TM1515 (01SEPT92)

Litho in U.S.A

M85682

Model GT242

M85683

Model GT262

M85684

Model GT275

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
- General Diagnostic Information
- Specifications
- Electrical Wiring Harness Legend
- Component Location
- System Schematic
- Wiring Harness
- Troubleshooting Chart
- Theory of Operation
- 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. To help, there are postage paid post cards included at the back. If you find any errors or want to comment on the layout of the manual please fill out one of the cards and mail it back to us.

Safety

Specifications and Information

Engine (FV420V, FV540V)

Electrical

Gear Power Train

Hydrostatic Power Train

Steering

Brakes

Attachments

Miscellaneous

Deere & Co.
John Deere Worldwide Commercial and
Consumer Equipment Division
Horicon, WI

RECOGNIZE SAFETY INFORMATION

This is the safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

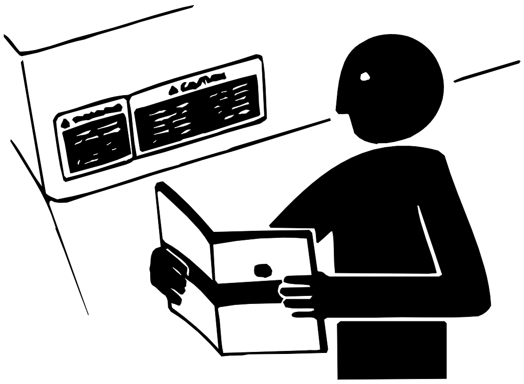
Follow recommended precautions and safe servicing practices.

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

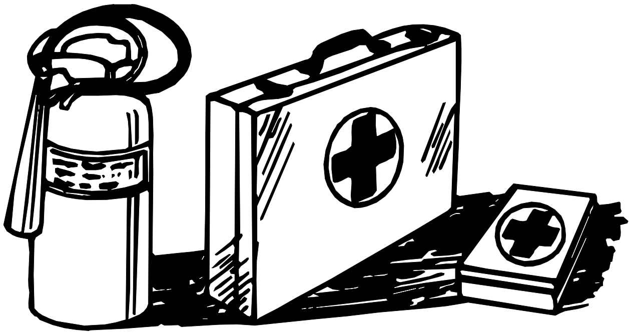
REPLACE SAFETY SIGNS



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

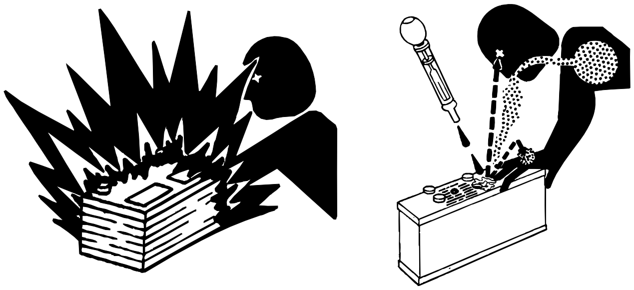
HANDLE FLUIDS SAFELY-AVOID FIRES

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.

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. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

- **If you spill acid on yourself:**

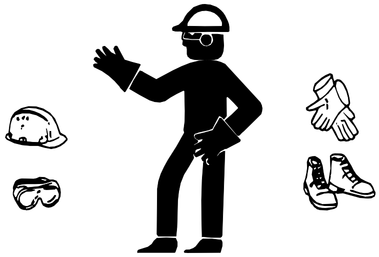
1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 10–15 minutes.
4. Get medical attention immediately.

- **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

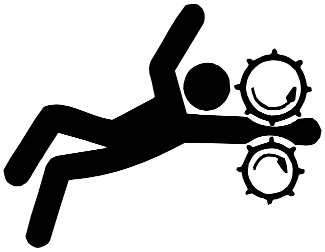


Wear close fitting clothing and safety equipment appropriate to the job.

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



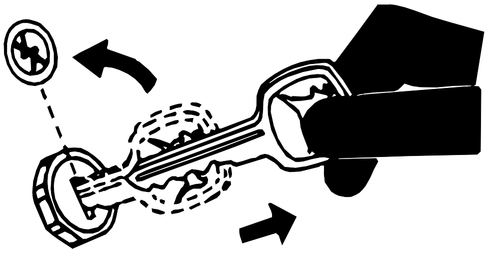
Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

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.

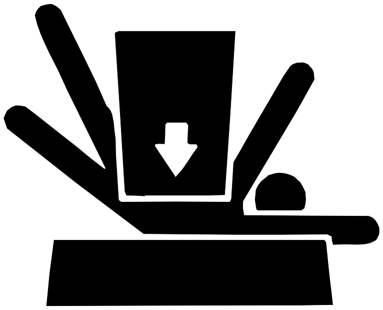
Park Machine Safely



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



If you must work on a lifted machine or attachment, securely support the machine or attachment.

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 injury or machine damage. Follow recommended procedure for removal and installation of components in the manual.

Work In Clean Area

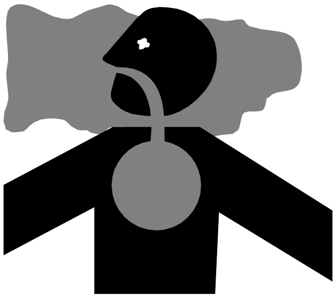
Before starting a job:

1. Clean work area and machine.
2. Make sure you have all 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

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, brake band and lining assemblies, clutch plates, 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

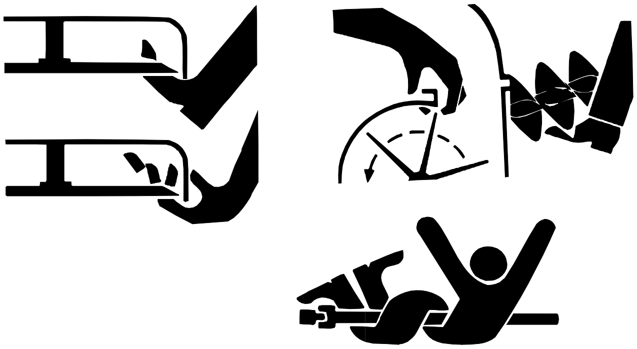
Explosive separation of a tire and rim parts can cause serious injury or death.

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.

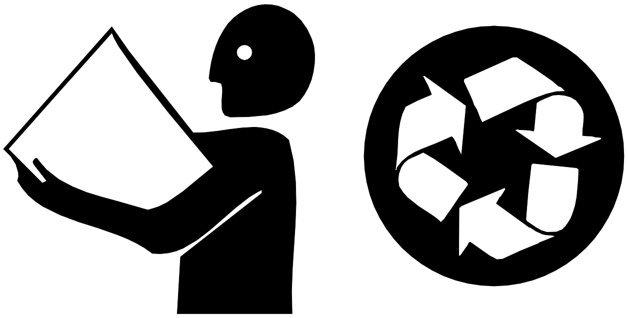
Check wheels for low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.

AVOID INJURY FROM ROTATING BLADES, AUGERS AND PTO SHAFTS



Keep hands and feet away while machine is running. Shut off power to service, lubricate or remove mower blades, augers or PTO shafts.

HANDLE CHEMICAL PRODUCTS SAFELY



Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment 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 used with John Deere equipment include such items as 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, or from your John Deere dealer.

LIVE WITH SAFETY

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

CONTENTS

GENERAL VEHICLE SPECIFICATIONS

Model:	**GT242**	**GT262**	**GT275**
ENGINE			
Make	John Deere “K” Series, Air Cooled	John Deere “K” Series, Air Cooled	John Deere “K” Series, Air Cooled
Manufacturer	Kawasaki	Kawasaki	Kawasaki
Type	Gasoline	Gasoline	Gasoline
Model	FC420V-ES10	FC540V-ES15	FV540V-KS00
Aspiration	Natural	Natural	Natural
Horsepower	10.4 kW (14 HP)	12.6 kW (17 HP)	12.6 kW (17 HP)
Cylinders	1	1	1
Displacement	423 cm^3 (25.8 cu. in.)	535cm^3 (32.6 cu. in.)	535 cm^3 (32.6 cu. in.)
Stroke/Cycle	4 Cycle	4 Cycle	4 Cycle
Bore	89 mm (3.500 in.)	89 mm (3.500 in.)	89 mm (3.500 in.)
Stroke	68 mm (2.58 in.)	86 mm (3.360 in.)	86 mm (3.360 in.)
Compression Ratio		8.3:1	8.3:1
Slow Idle	1550 ± 75 rpm	1550 ± 75 rpm	1550 ± 75 rpm
Fast Idle	3350 ± 50 rpm	3350 ± 50 rpm	3350 ± 50 rpm
Valves	Overhead	Overhead	Overhead
Lubrication	Pressurized	Pressurized	Pressurized
Oil Filter	Full Flow Filter	Full Flow Filter	Full Flow Filter
Cooling System	Air Cooled	Air Cooled	Air Cooled
Air Cleaner	Dual Stage Paper Air Filter and Foam Precleaner	Dual Stage Paper Air Filter and Foam Precleaner	Dual Stage Paper Air Filter and Foam Precleaner
Muffler	Horizontal Discharge Below Frame	Horizontal Discharge Below Frame	Horizontal Discharge Below Frame
Engine Oil Capacity (with filter)	1.5 L (3.2 pt.)	1.8 L (3.8 pt.)	1.8 L (3.8 pt.)

GENERAL VEHICLE SPECIFICATIONS (CONTINUED)

Model:	**GT242**	**GT262**	**GT275**
FUEL SYSTEM			
Fuel Tank Location	Rear	Rear	Rear
Fuel Tank Capacity	10.4 L (2.75 U.S. gal)	10.4 L (2.75 U.S. gal)	10.4 L (2.75 U.S. gal)
Fuel (min. octane)	Unleaded Gasoline, 87 Octane	Unleaded Gasoline, 87 Octane	Unleaded Gasoline, 87 Octane
Fuel Pump Location	On left hand side of engine	On left hand side of engine	On left hand side of engine
Type	Diaphragm Vacuum Pulse	Diaphragm Vacuum Pulse	Diaphragm Vacuum Pulse
Fuel Gauge	Translucent Fuel Tank	Translucent Fuel Tank	Translucent Fuel Tank
Fuel Delivery	Float Side Draft Carburetor	Float Side Draft Carburetor	Float Side Draft Carburetor
Fuel Shut-Off	Fuel Shutoff Solenoid	Fuel Shutoff Solenoid	Fuel Shutoff Solenoid
Fuel Filter	Replaceable, In-Line	Replaceable, In-Line	Replaceable, In-Line
ELECTRICAL			
Ignition	Electronic	Electronic	Electronic
Type of Starter	Solenoid Shift	Solenoid Shift	Solenoid Shift
Charging System	Flywheel Alternator	Flywheel Alternator	Flywheel Alternator
Charging Capacity	15 amp Regulated	15 amp Regulated	15 amp Regulated
Battery Type	BCI Group, U1	BCI Group, U1	BCI Group, U1
Battery Voltage	12 volt	12 volt	12 volt
Battery Reserve Capacity at 25 amp.	38 minutes	38 minutes	38 minutes
Battery Cold Cranking Amps at 0° F	295 amps	295 amps	295 amps
Headlights	Incandescent	Incandescent	Incandescent
Indicator Lights	Battery Charge	Engine Oil Pressure, Battery Charge	Engine Oil Pressure, Battery Charge
Ignition Interlock Switches	Neutral Start, Operator Presence	Neutral Start, Operator Presence	Neutral Start, Operator Presence

GENERAL VEHICLE SPECIFICATIONS (CONTINUED)

Model:	**GT242**	**GT262**	**GT275**
POWER TRAIN			
Drive Wheels	Rear	Rear	Rear
Transmission	Transaxle (Gear)	Transaxle (Gear)	Hydrostatic, Piston Type
Traction Drive	Transaxle - Clutch and Gear 6 Speeds Forward 1 Speed Reverse	Transaxle - Clutch and Gear 6 Speeds Forward 1 Speed Reverse	Hydrostatic - Twin Touch Foot Control
Transmission Drive	Belt	Belt	Belt
Transmission Filter	None	None	Replaceable Internal Cartridge
Fan Blade Size	None	None	7 in. Diameter
Lubricant Capacity	3.3 L (3.4 qt)	3.3 L (3.4 qt)	4.3 L (4.7 qt.)
Axle Type/Hub Wheels	Straight with Separate 5-Bolt Hubs	Straight with Separate 5-Bolt Hubs	Straight with Separate 5-Bolt Hubs
Travel Speeds			
Forward - Hydrostatic			0–11.2 kmh (0–7 mph)
Forward - Geared			
1st Gear	1.13 km/h (0.7 mph)	1.13 km/h (0.7 mph)	
2nd Gear	2.25 km/h (1.4 mph)	2.25 km/h (1.4 mph)	
3rd Gear	3.86 km/h (2.4 mph)	3.86 km/h (2.4 mph)	
4th Gear	5.31 kp/h (3.3 mph)	5.31 kp/h (3.3 mph)	
5th Gear	6.76 kp/h (4.2 mph)	6.76 kp/h (4.2 mph)	
6th Gear (Fast Idle)	10.62 kp/h (6.6 mph)	10.62 kp/h (6.6 mph)	
Reverse	4.3 km/h (2.7 mph)	4.3 km/h (2.7 mph)	0–6.4 km/h (0–4 mph)
Clutch	Left Pedal - V-Belt	Left Pedal - V-Belt	None
Clutch	Left Pedal - V-Belt	Left Pedal - V-Belt	None

GENERAL VEHICLE SPECIFICATIONS (CONTINUED)

Model:	**GT242**	**GT262**	**GT275**
STEERING			
Type	Sector and Pinion	Sector and Pinion	Sector and Pinion
BRAKES			
Location	Transmission	Transmission	Transmission
Type	Internal Wet Disk, Right Pedal w/Clutch Interlock	Internal Wet Disk, Right Pedal w/Clutch Interlock	Internal Wet Disk, Single Pedal
Parking Brake	Right Pedal with Clutch Interlock and Lock Lever	Right Pedal with Clutch Interlock and Lock Lever	Brake Pedal Lock Lever
IMPLEMENT LIFT			
Lift System	Manual with Depth Stop	Manual with Depth Stop	Manual with Depth Stop
Lift Assist Type	Fixed Spring	Fixed Spring	Fixed Spring
Lift Lever Location	Left-hand Side of Hood	Left-hand Side of Hood	Left-hand Side of Hood
Cutting Heights			
mm	25.4–101.6 mm (12.7 mm increments)	25.4–101.6 mm (12.7 mm increments)	25.4–101.6 mm (12.7 mm increments)
in.	1.0–4.0 in. (0.5 in. increments)	1.0–4.0 in. (0.5 in. increments)	1.0–4.0 in. (0.5 in. increments)
ATTACHMENTS			
Cutting Unit Drive	Belt	Belt	Belt

GENERAL VEHICLE SPECIFICATIONS (CONTINUED)

Model:	**GT242**	**GT262**	**GT275**
WEIGHTS AND DIMENSIONS			
Net Weight (less attachments and fuel)	257 kg (565 lbs)	284 kg (625 lbs)	284 kg (625 lbs)
Mower Deck Weight			
38-Inch Mower Deck	43 kg (95 lbs)	43 kg (95 lbs)	43 kg (95 lbs)
44-Inch Mower Deck	49 kg (108 lbs)	49 kg (108 lbs)	49 kg (108 lbs)
48-Inch Mower Deck	57 kg (125 lbs)	57 kg (125 lbs)	57 kg (125 lbs)
Wheel Base	1.21 m (47.750 in.)	1.21 m (47.750 in.)	1.21 m (47.750 in.)
Tread Width			
Front	0.74 cm (29 in.)	0.74 cm (29 in.)	0.74 cm (29 in.)
Rear	72.5 cm (28.50 in.)	72.5 cm (28.50 in.)	72.5 cm (28.50 in.)
Turning Radius			
Inside Rear Wheel	50.8 cm (20 in.)	50.8 cm (20 in.)	50.8 cm (20 in.)
Outside Front	203 cm (80 in.)	203 cm (80 in.)	203 cm (80 in.)
Overall Length	1.79 m (70.5 in.)	1.79 m (70.5 in.)	1.79 m (70.5 in.)
Overall Height	1.09 m (43 in.)	1.09 m (43 in.)	1.09 m (43 in.)
Overall Width (less attachments)	0.99 m (39 in.)	0.99 m (39 in.)	0.99 m (39 in.)
With 38-Inch Mower Deck	1.33 m (52.600 in.)	1.33 m (52.600 in.)	1.33 m (52.600 in.)
With 44-Inch Mower Deck	1.16 m (45.7 in.)	1.16 m (45.7 in.)	1.16 m (45.7 in.)
With 48-Inch Mower Deck	1.52 m (60 in.)	1.52 m (60 in.)	1.52 m (60 in.)
WHEELS AND TIRES			
Front	16 x 6.50-8, 2 or 4 ply, Turf *	16 x 6.50-8, 2 or 4 ply, Turf	16 x 6.50-8, 2 or 4 ply, Turf
Rear	23 x 10.50-12.00, Turf or Bar	23 x 10.50-12.00, Turf or Bar	23 x 10.50-12.00, Turf or Bar

* Engineering change since last edition of this manual.

TORQUE VALUES, NON-STANDARD FASTENERS

NOTE: Torques listed in this GROUP apply ONLY to "special" and/or NON-STANDARD fasteners. Unless otherwise specified, STANDARD fasteners should be torqued per "TORQUE VALUES, STANDARD METRIC FASTENER" on page 10 or "TORQUE VALUES, STANDARD INCH FASTENER" on page 12.

ENGINE

Cylinder Head and Valves	
Rocker Arm Cap Screw Torque	10 N•m (89 lb-in.)
Valve Adjustment Screw Jam Nut Torque	20 N•m (180 lb-in.)
Valve Cover Cap Screw Torque	6 N•m (53 lb-in.)
Cap Screw Torque in Sequence (Lubricated) at 7 N•m (62 lb-in.) Increments	
Initial Torque	32 N•m (288 lb-in.)
Final Torque.	52 N•m (456 lb-in.)
Spark Plug Torque	20 N•m (177 lb-in.)
Crankcase Cover	
Mounting Cap Screw Torque	26 N•m (230 lb-in.)
Piston Assembly	
Connecting Rod Cap Screw Torque	20 N•m (177 lb-in.)
Reciprocating Balancer	
Support Shaft Nut Torque	7 N•m (65 lb-in.)
Governor	
Governor Lever Nut Torque	7.8 N•m (69 lb-in.)
Engine Mounting Cap Screw Torque	16.7—22.6 N•m (148.0—200.0 lb-in.)
Blower Housing Cap Screw Torque	10 N•m (89 lb-in.)
Flywheel Screen To Cooling Fan Cap Screw Torque	6 N•m (53 lb-in.)
Cooling Fan To Flywheel Cap Screw Torque	10 N•m (89 lb-in.)
Cooling Fan Bracket To Flywheel Cap Screw Torque	12 N•m (102 lb-in.)
Flywheel Mounting Nut Torque	
FC420V	137 N•m (101 lb-ft)
FC540V	172 N•m (127 lb-ft)
Oil Drain Plug Torque	23 N•m (200 lb-in.)
Stator	
Cap Screw Torque	6 N•m (53 lb-in.)
Magneto Ignition Coil	
All Engines Prior To and Including: FC420V-DS10 (—FC420VB50633) FC540V-DS15 (—FC540VA00385)	
Cap Screw Torque	6 N•m (53 lb-in.)
Magneto Ignition Coil With Ignitor Module	
All Engines After and Including: FC420V-DS10 (FC420VB50633—) FC540V-DS15 (FC540VA00385—)	
Cap Screw Torque	6 N•m (53 lb-in.)
Starter	
Starter-To-Engine Mounting Cap Screw Torque	16 N•m (142 lb-in.)
Starter End Cover Cap Screw Torque	9 N•m (80 lb-in.)

POWER TRAIN, GEAR

Differential Assembly	
Housing Bolts	51 N•m (38 lb-ft)
Replaced Transaxle Cases	
Force necessary to torque the six (6) bolts in the area of the reduction shaft and a seventh (7th) at the opposite end of the housing.	
New Case	29 N•m (22 lb-ft)
Used Case	24 N•m (216 lb-ft)
Brake Assembly	
Transaxle Cap Screws	
New Case	29 N•m (22 lb-ft)
Used Case	24 N•m (216 lb-ft)
Oil Drain Plugs	
Torque Specifications	39 N•m (29 lb-ft)
Retainer Cap Screws	
New Case	29 N•m (22 lb-ft)
Used Case	24 N•m (216 lb-ft)

POWER TRAIN, HYDROSTATIC

Transmission	
New Case	29 N•m (22 lb-ft)
Rear Transmission-to-Frame Mounting Nut Torque	54 N•m (40 lb-ft)
Front Transmission-to-Frame Mounting Nut Torque	27 N•m (20 lb-ft)
Center Case Cap Screw Torque	54 N•m (40 lb-ft)
Relief Valve Plug Torque	22 N•m (195 lb-in.)
Pump Body Cap Screw Torque	23 N•m (204 lb-in.)
Drain Plug Cap Screw Torque	15 N•m (133 lb-in.)
Housing Cap Screw Torque	23 N•m (204 lb-in.)

OTHER

Electrical

Electric PTO Cap Screw Torque	
GT242	75 N•m (55 lb-ft)
GT262	75 N•m (55 lb-ft)
GT275	56 N•m (45 lb-ft)

Steering

Drag Link Nut Torque	30 N•m (22 lb-ft)

OTHER (Continued)

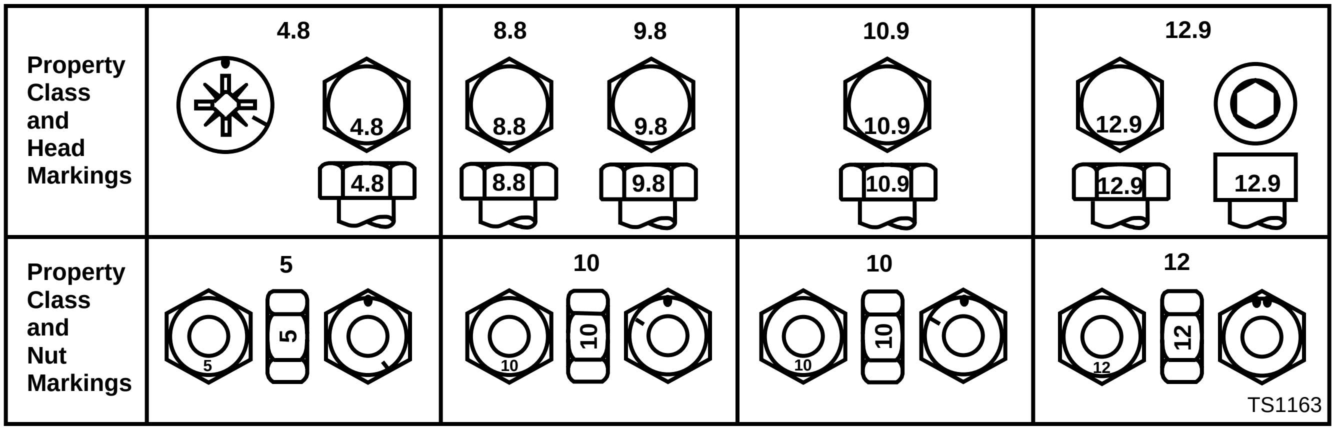
Attachments

- 38-Inch Mower Deck
  - Spindle
    - Mounting Nut Torque . . . . 26 N•m (230 lb-in.)
    - Sheave Nut Torque . . . . 140 N•m (103 lb-ft)
  - Blade
    - Blade Cap Screw Torque. . . . . 68 N•m (55 lb-ft)
- 44-Inch Rear Discharge Mower Deck
  - Spindle
    - Mounting Nut Torque . . . . 26 N•m (230 lb-in.)
    - Sheave Nut Torque . . . . 163 N•m (120 lb-ft)
  - Blade
    - Blade Cap Screw Torque. . . . . 68 N•m (50 lb-ft)
- 48-Inch Mower Deck
  - Gauge Wheels
    - Roller Shaft Nut Torque . . . . 30 N•m (22 lb-ft)
  - Idlers and Sheaves
    - Jack Sheave Nut Torque . . . . 136 N•m (100 lb-ft)
    - Tensioning Idler Sheave Nut Torque . . . . 27 N•m (20 lb-ft)
  - Spindle
    - Mounting Nut Torque . . . . 26 N•m (230 lb-in.)
    - Sheave Nut Torque . . . . 163 N•m (120 lb-ft)
  - Blade
    - Blade Cap Screw Torque. . . . . 68 N•m (50 lb-ft)

Miscellaneous

- Pivot Anchor Cap Screw Torque. . . . . 25 N•m (228 lb-in.)
- Tie Rod Lock Nut Torque . . . . 23 N•m (200 lb-in.)
- Drag Link Lock Nut Torque. . . . . 37 N•m (27 lb-ft)
- Rear Wheel Cap Screw Torque . . . . 88 N•m (65 lb-ft)

METRIC FASTENER TORQUE VALUES



	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]	
SIZE	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	225	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	2200	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

DO NOT use these hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a ±10% variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

Fasteners should be replaced with the same class. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

When bolt and nut combination fasteners are used, torque values should be applied to the **NUT** instead of the bolt head.

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

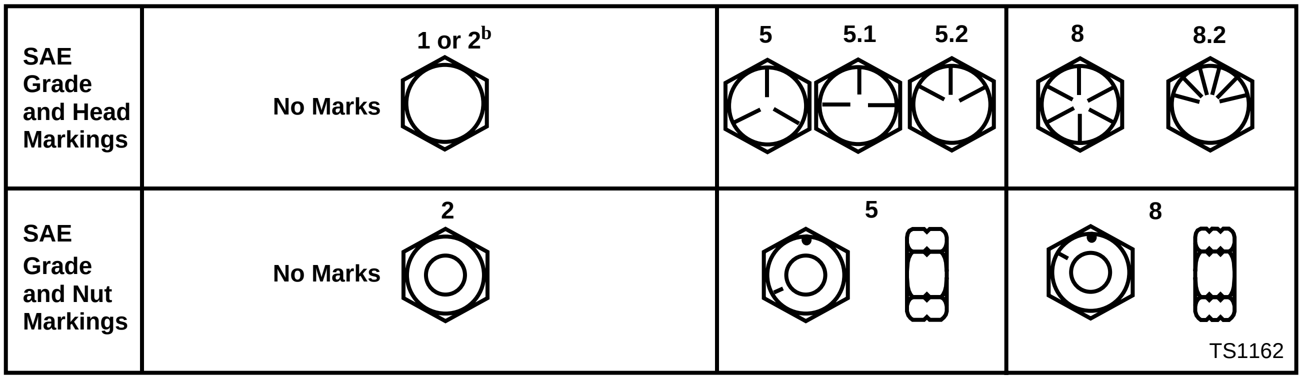
[a] *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated (yellow dichromate - Specification JDS117) without any lubrication.*

Reference: JDS—G200.

METRIC FASTENER TORQUE VALUE – GRADE 7

Size	Steel or Gray Iron Torque		Aluminum Torque	
	N•m	lb-ft	N•m	lb-ft
M6	11	8	8	6
M8	24	18	19	14
M10	52	38	41	30
M12	88	65	70	52
M14	138	102	111	82
M16	224	165	179	132

INCH FASTENER TORQUE VALUES



	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]	
SIZE	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	215	160	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	470	300	510	375	470	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a ±10% variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

Fasteners should be replaced with the same grade. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

When bolt and nut combination fasteners are used, torque values should be applied to the **NUT** instead of 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 (yellow dichromate - Specification JDS117) without any lubrication.*

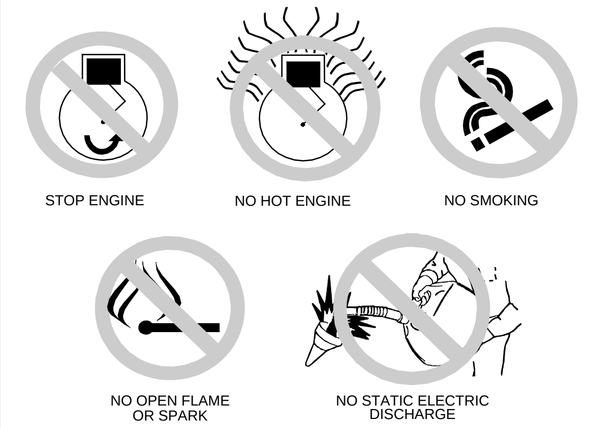
[b] *"Grade 2" applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. "Grade 1" applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length.*

Reference: JDS—G200.

GASOLINE SPECIFICATIONS

4–CYCLE ENGINES – NORTH AMERICA

CAUTION



Gasoline is HIGHLY FLAMMABLE, handle it with care.

DO NOT refuel machine while:

- **indoors, always fill gas tank outdoors;**
- **machine is near an open flame or sparks;**
- **engine is running, STOP engine;**
- **engine is hot, allow it to cool sufficiently first;**
- **smoking.**

Help prevent fires:

- **fill gas tank to bottom of filler neck only;**
- **be sure fill cap is tight after fueling;**
- **clean up any gas spills IMMEDIATELY;**
- **keep machine clean and in good repair—free of excess grease, oil, debris, and faulty or damaged parts;**
- **any storage of machines with gas left in tank should be in an area that is well ventilated to prevent possible igniting of fumes by an open flame or spark, this includes any appliance with a pilot light.**

To prevent fire or explosion caused by STATIC ELECTRIC DISCHARGE during fueling:

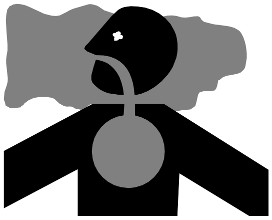
- **ONLY use a clean, approved POLYETHYLENE PLASTIC fuel container and funnel WITHOUT any metal screen or filter.**

To avoid engine damage:

- DO NOT mix oil with gasoline;
- **ONLY use clean, fresh unleaded gasoline with an octane rating (anti-knock index) of 87 or higher**;
- fill gas tank at the end of each day's operation to help prevent condensation from forming inside a partially filled tank;
- keep up with specified service intervals.

Use of alternative oxygenated, gasohol blended, unleaded gasoline is acceptable as long as:

- the ethyl or grain alcohol blends DO NOT exceed 10% by volume or
- methyl tertiary butyl ether (MTBE) blends DO NOT exceed 15% by volume.



IMPORTANT: DO NOT use METHANOL gasolines because METHANOL is harmful to the environment and to your health.

WARNING

<u>California Proposition 65 Warning:</u> Gasoline engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

GASOLINE STORAGE

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

Keep gasoline stored in a safe, protected area. Storage of gasoline in a clean, properly marked **("UNLEADED GASOLINE") POLYETHYLENE PLASTIC container WITHOUT** any metal screen or filter is recommended. **DO NOT** use de-icers to attempt to remove water from gasoline or depend on fuel filters to remove water from gasoline. Use a water separator installed in the storage tank outlet. **BE SURE** to properly discard unstable or contaminated gasoline. When storing unit or gasoline, it is recommended that you add **John Deere Gasoline Conditioner and Stabilizer (TY15977)** or an equivalent to the gasoline. **BE SURE** to follow directions on container and to properly discard empty container.

ENGINE OIL SPECIFICATIONS

4–CYCLE GASOLINE ENGINE OIL – NORTH AMERICA

Use the appropriate oil viscosity based on the expected air temperature range during the period between recommended oil changes. Operating outside of these recommended oil air temperature ranges may cause premature engine failure.

The following John Deere oils are **PREFERRED**:

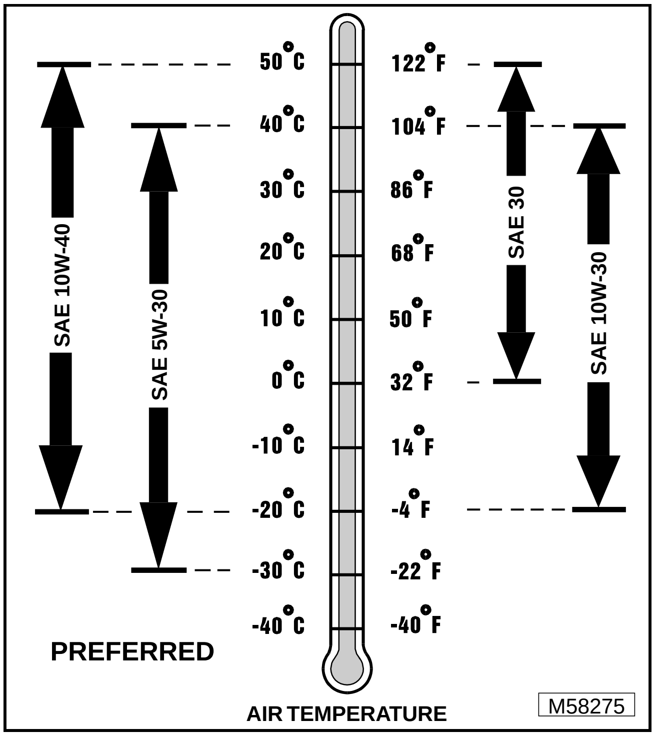
- **PLUS–4®—SAE 10W-40**;
- **TORQ–GARD SUPREME®—SAE 5W-30**.

The following John Deere oils are **also recommended**, based on their specified temperature range:

- **TURF–GARD®—SAE 10W-30;**
- **PLUS–4®—SAE 10W-30;**
- **TORQ–GARD SUPREME®—SAE 30.**

Other oils may be used if above John Deere oils are not available, provided they meet one of the following specifications:

- SAE 10W-40—API Service Classification SG or higher;
- SAE 5W-30—API Service Classification SG or higher;
- SAE 10W-30—API Service Classification SG or higher;
- SAE 30—API Service Classification SC or higher.



BREAK–IN 4-CYCLE GASOLINE ENGINE OIL – NORTH AMERICA

IMPORTANT: ONLY use a quality break-in oil in rebuilt or remanufactured engines for the first 5 hours (maximum) of operation. DO NOT use oils with heavier viscosity weights than SAE 5W-30 or oils meeting specifications API SG or SH, these oils will not allow rebuilt or remanufactured engines to break-in properly.

The following John Deere oil is **PREFERRED**:

- **BREAK–IN ENGINE OIL**.

John Deere BREAK–IN ENGINE OIL is formulated with special additives for aluminum and cast iron type engines to allow the power cylinder components (pistons, rings, and liners as well) to “wear-in” while protecting other engine components, valve train and gears, from abnormal wear. Engine rebuild instructions should be followed closely to determine if special requirements are necessary.

John Deere BREAK–IN ENGINE OIL is also recommended for non-John Deere engines, both aluminum and cast iron types.

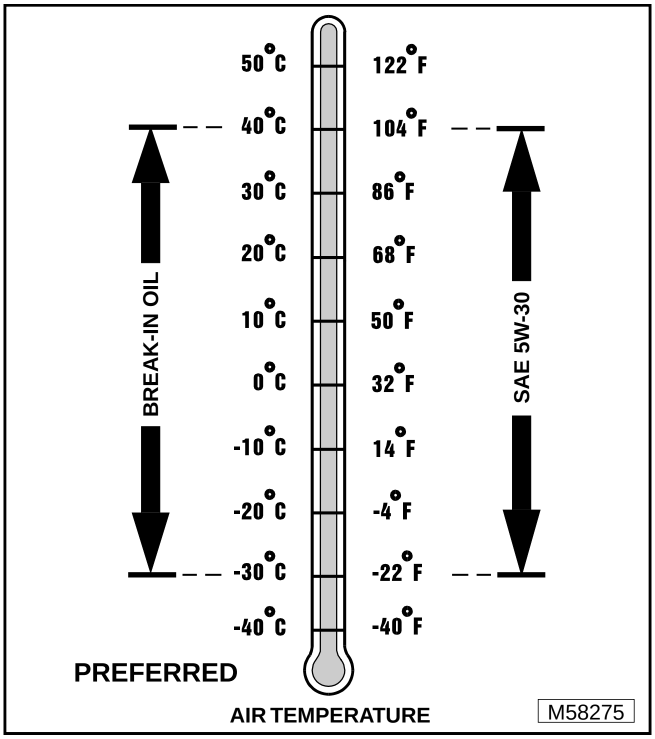
The following John Deere oil is **also recommended** as a break-in engine oil:

- **TORQ–GARD SUPREME®—SAE 5W-30.**

If the above recommended John Deere oils are not available, use a break-in engine oil meeting the following specification during the first 5 hours (maximum) of operation:

- SAE 5W-30—API Service Classification SE or higher.

IMPORTANT: After the break-in period, use the John Deere oil that is recommended or its equivalent for this engine.



HYDROSTATIC TRANSMISSION AND HYDRAULIC OIL

Use the appropriate oil viscosity based on these air temperature ranges. Operating outside of these recommended oil air temperature ranges may cause premature hydrostatic transmission or hydraulic system failures.

IMPORTANT: Mixing of LOW VISCOSITY HY–GARD® and HY–GARD® oils is permitted. DO NOT mix any other oils in this transmission. DO NOT use engine oil or “Type F” (Red) Automatic Transmission Fluid in this transmission. DO NOT use BIO–HY–GARD® in this transmission.

The following John Deere transmission and hydraulic oil is **PREFERRED**:

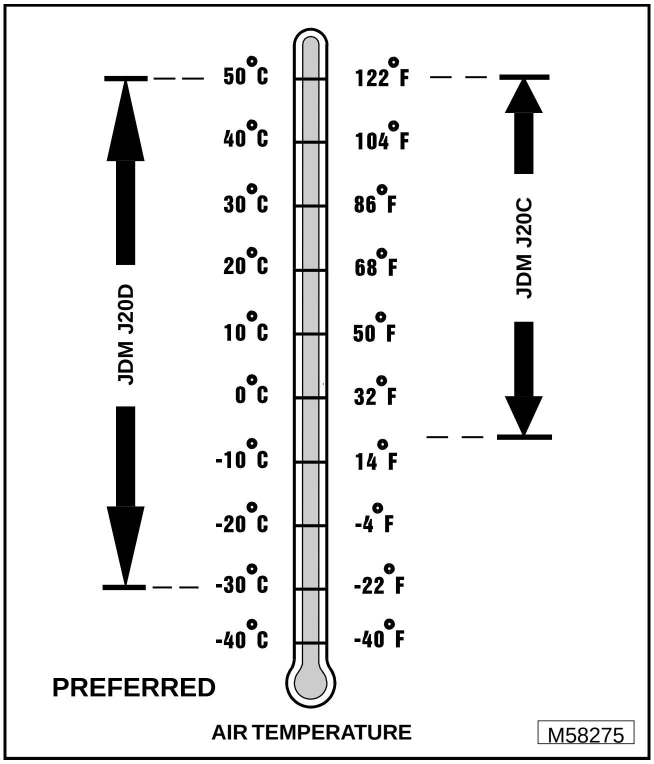
- **LOW VISCOSITY HY–GARD®—JDM J20D**.

The following John Deere oil is **also recommended** if above preferred oil is not available:

- **HY–GARD®—JDM J20C.**

Other oils may be used if above recommended John Deere oils are not available, provided they meet one of the following specifications:

- John Deere Standard JDM J20D;
- John Deere Standard JDM J20C.



ANTI-CORROSION GREASE SPECIFICATIONS

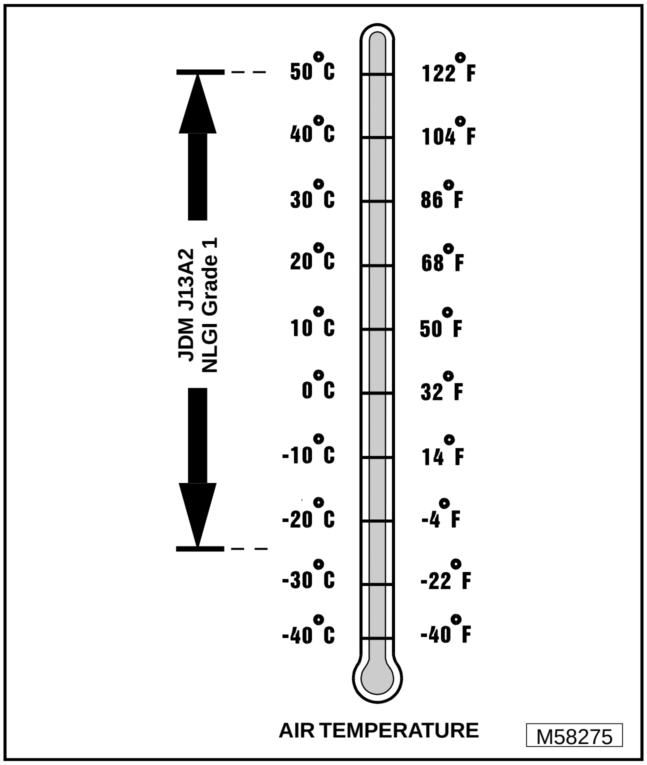
This anti-corrosion grease is formulated to provide the best protection against absorbing moisture, which is one of the major causes of corrosion. This grease is also superior in its resistance to separation and migration.

The following anti-corrosion grease is **PREFERRED**:

- **DuBois MPG-2® Multi-Purpose Polymer Grease—M79292.**

Other greases may be used if they meet or exceed the following specifications:

- John Deere Standard JDM J13A2, NLGI Grade 1.



GENERAL APPLICATION GREASE SPECIFICATIONS

GREASE – NORTH AMERICA

Use the following grease based on the air temperature range. Operating outside of the recommended grease air temperature range may cause premature failures.

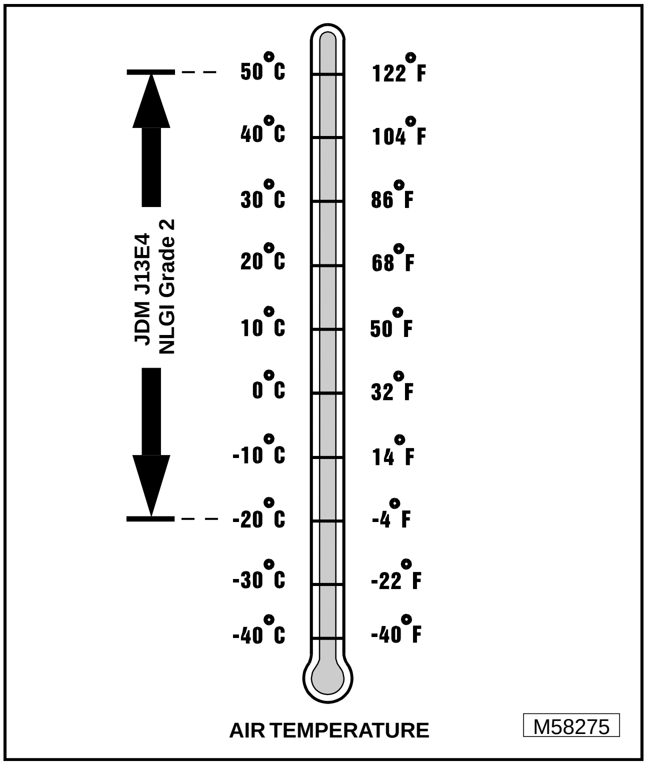
IMPORTANT: ONLY use a quality grease in this application. DO NOT mix any other greases in this application. DO NOT use any BIO–GREASE in this application.

The following John Deere grease is **PREFERRED**:

- **NON-CLAY HIGH-TEMPERATURE EP GREASE®—JDM J13E4, NLGI Grade 2.**

Other greases may be used if above preferred John Deere grease is not available, provided they meet the following specification:

- John Deere Standard JDM J13E4, NLGI Grade 2.



ALTERNATIVE LUBRICANTS

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

IMPORTANT: Use of alternative lubricants could cause reduced life of the component.

If alternative lubricants are to be used, it is recommended that the factory fill be thoroughly removed before switching to any alternative lubricant.

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 manual.

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

Avoid mixing different brands, grades, or types of oil. Oil manufacturers blend additives 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.

LUBRICANT STORAGE

All machines operate at top efficiency only when clean lubricants are used. Use clean storage containers to handle all lubricants. Store them in an area protected from dust, moisture, and other contamination. Store drums on their sides. Make sure all containers are properly marked as to their contents. Dispose of all old, used containers and their contents properly.

MIXING OF LUBRICANTS

In general, avoid mixing different brands or types of lubricants. Manufacturers blend additives in their lubricants to meet certain specifications and performance requirements. Mixing different lubricants can interfere with the proper functioning of these additives and lubricant properties which will downgrade their intended specified performance.

OIL FILTERS

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

The following John Deere oil filters are PREFERRED:

- AUTOMOTIVE AND LIGHT TRUCK ENGINE OIL FILTERS.

Most John Deere filters contain pressure relief and anti-drainback valves for better engine protection.

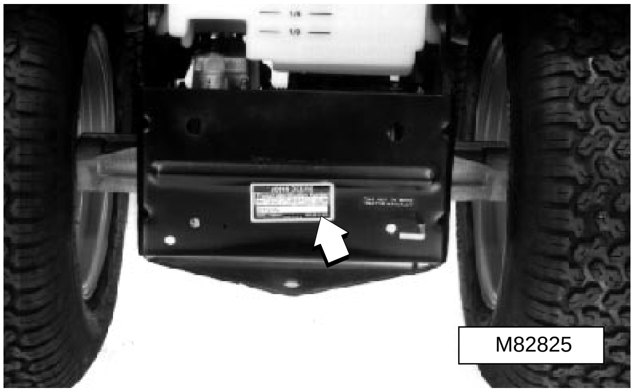
Other oil filters may be used if above recommended John Deere oil filters are not available, provided they meet the following specification:

- ASTB Tested In Accordance With SAE J806.

SERIAL NUMBER LOCATION

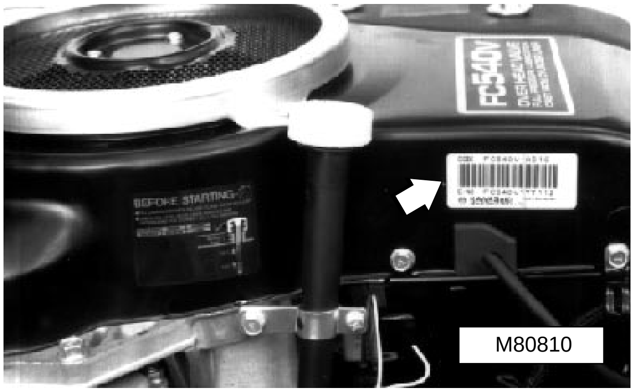
When ordering parts or submitting a warranty claim, it is IMPORTANT that the machine product identification number and component serial numbers are included. The location of the machine identification number and component serial numbers are shown.

MACHINE IDENTIFICATION NUMBER



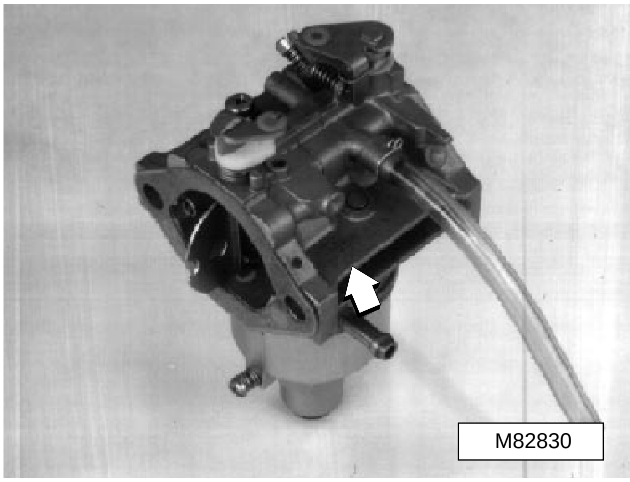
M82825

ENGINE SERIAL NUMBER



M80810

CARBURETOR SERIAL NUMBER

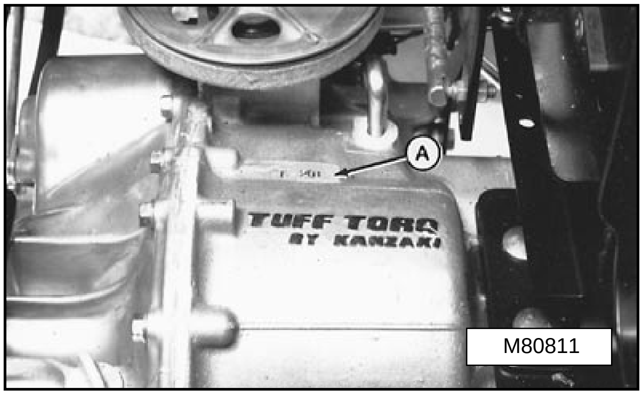


M82830

GEAR TRANSAXLE SERIAL NUMBER LOCATION

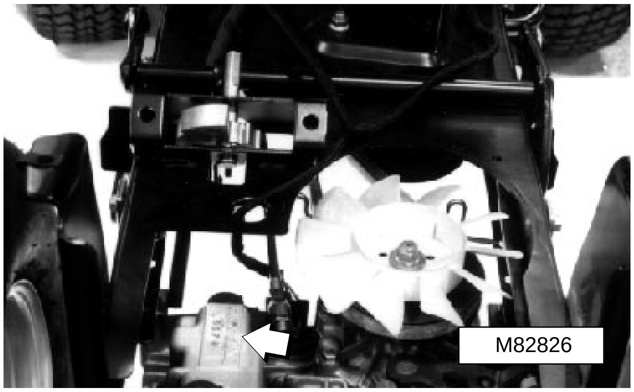
NOTE: Fuel tank removed for clarity. Serial number can be seen by looking over right-hand rear corner of frame.

The transaxle serial number (A) is stamped on top of case.



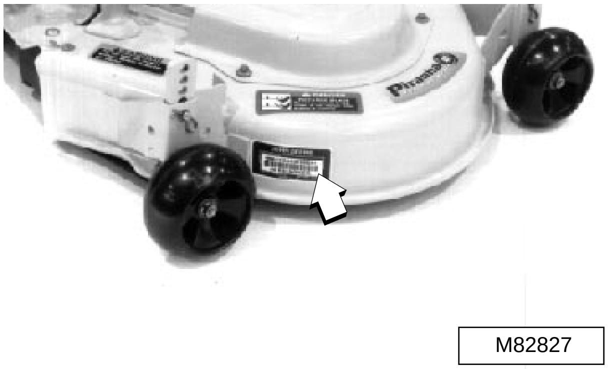
M80811

HYDROSTATIC TRANSMISSION SERIAL NUMBER



MOWER DECK SERIAL NUMBER LOCATION

38 and 48-Inch Mower Decks



44-Inch Rear Discharge Mower Deck

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CONTENTS

Page

CONTENTS CONTINUED

REPAIR

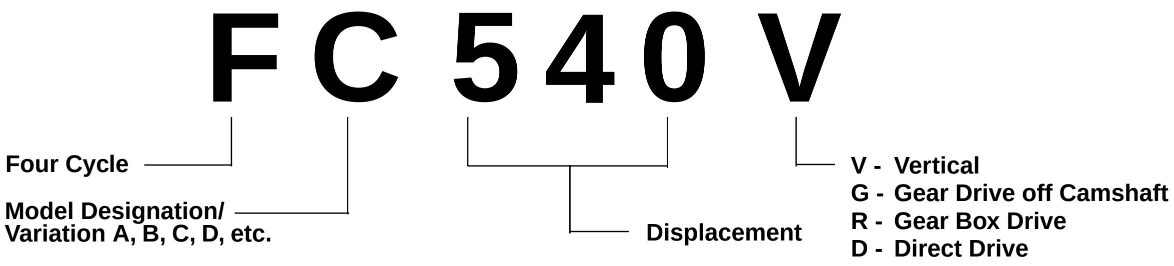
Page

CONTENTS CONTINUED

SPECIFICATIONS

ENGINE DESIGNATION

NOTE: GT242 tractor uses engine model number FC420V, GT262 and GT275 tractors use engine model number FC540V.



TEST AND ADJUSTMENT SPECIFICATIONS

SLOW Idle	
Carburetor SLOW Idle Stop Screw Setting	1450 ±75 rpm
Throttle Control Arm	
SLOW Idle Stop Screw Setting	1550 ±75 rpm
FAST Idle	3350 ±100 rpm
Cylinder Compression Pressure (Minimum)	483 kPa (71 psi)
Valve Clearance (Cold)	0.15 mm (0.006 in.)
Jam Nut Torque	20 N•m (180 lb-in.)
Valve Cover Cap Screw Torque	6 N•m (53 lb-in.)
Exhaust Valve ACR Movement (Minimum)	0.25 mm (0.010 in.)
Crankcase Vacuum (Minimum)	25 cm (1.0 in.) of water movement
Engine Oil Pressure (Minimum)	
FAST Idle (3350 ±100 rpm)	240 kPa (35 psi)
SLOW Idle (1550 ±75 rpm)	20.68 kPa (3 psi)
Fuel Pump Pressure (Minimum)	6.12 kPa (0.90 psi)
Fuel Pump Flow (Minimum)	
FC420V	55 mL/15 seconds (1.8 oz/15 seconds)
FC540V	65 mL/15 seconds (2.2 oz/15 seconds)
Crankshaft End Play	0.09—0.22 mm (0.004—0.009 in.)
Spark Plug Gap	0.76 mm (0.030 in.)
Spark Plug Torque	20 N•m (177 lb-in.)

REPAIR SPECIFICATIONS

Rock Arm Assembly	
Shaft O.D. (Minimum)	12.94 mm (0.509 in.)
Bearing I.D. (Maximum)	13.07 mm (0.515 in.)
Push Rod Bend (Maximum)	0.30 mm (0.012 in.)

REPAIR SPECIFICATIONS (Continued)

Cylinder Head and Valves	
Rocker Arm Cap Screw Torque	10 N•m (89 lb-in.)
Valve Adjustment Screw Jam Nut Torque	20 N•m (180 lb-in.)
Valve Cover Cap Screw Torque	6 N•m (53 lb-in.)
Cap Screw Torque in Sequence (Lubricated) at 7 N•m (62 lb-in.) Increments	
Initial Torque	32 N•m (288 lb-in.)
Final Torque	52 N•m (456 lb-in.)
Spark Plug Torque	20 N•m (177 lb-in.)
Cylinder Head Distortion (Maximum)	0.05 mm (0.002 in.)
Valve Guide I.D. (Maximum)	
FC420V	7.015 mm (0.2762 in.)
FC540V	7.07 mm (0.2780 in.)
Valve Seating Surface	1.10—1.46 mm (0.043—0.057 in.)
Valve Spring Free Length (Minimum)	
Early Model	37.50 mm (1.476 in.)
Late Model	35.50 mm (1.398 in.)
Valve Margin (Minimum)	0.60 mm (0.024 in.)
Valve Stem Bend (Maximum)	0.03 mm (0.001 in.)
Valve Guide Installation Depth	
FC420V	12 ±0.1 mm (0.472 ±0.004 in.)
FC540V	9.5 ±0.1 mm (0.370 ±0.004 in.)
Finished Valve Guide I.D. (Reamed)	7.00—7.02 mm (0.275—0.276 in.)
Valve Seat and Face Angle	45°
Valve Narrow Angle	30°
Breather Air Gap	1—2 mm (0.040—0.080 in.)
Crankcase Cover	
Oil Capacity (w/Filter) FC420V	1.6 L (3.4 U.S. pt)
Oil Capacity (w/Filter) FC540V	1.9 L (4.0 U.S. pt)
Mounting Cap Screw Torque	26 N•m (230 lb-in.)
Piston Assembly	
Piston Ring Groove Side Clearance (Maximum)	
Top Ring	0.17 mm (0.007 in.)
Second Ring	0.15 mm (0.006 in.)
Oil Ring	0.20 mm (0.008 in.)
Pin O.D. (Minimum)	
Early Model	21.98 mm (0.865 in.)
Late Model	18.975 mm (0.747 in.)
Pin Bore I.D. (Maximum)	
Early Model	22.04 mm (0.868 in.)
Late Model	19.042 mm (0.7497 in.)
Piston O.D.	
Standard Piston	88.830—88.864 mm (3.4885—3.4984 in.)
Oversize Piston 0.50 mm (0.020 in.)	89.330—89.364 mm (3.517—3.518 in.)
Cylinder Bore I.D.	
Standard Size Bore	
Standard	88.980—89.000 mm (3.5031—3.5039 in.)
Wear Limit (Maximum)	89.076 mm (3.5069 in.)
Oversize Bore—0.50 mm (0.020 in.)	
Standard	89.480—89.500 mm (3.5228—3.5236 in.)
Wear Limit (Maximum)	89.576 mm (3.5266 in.)

REPAIR SPECIFICATIONS (Continued)

- Piston Assembly (Continued)
  - Piston-To-Cylinder Bore Clearance . . . . 0.110—0.151 mm (0.0043—0.0059 in.)
  - Connecting Rod
    - Connecting Rod Cap Screw Torque . . . . 20 N•m (177 lb-in.)
    - Crankshaft Bearing I.D. (Maximum)
      - Standard . . . . 41.07 mm (1.617 in.)
      - Undersized . . . . 40.56 mm (1.597 in.)
    - Piston Pin Bearing I.D. (Maximum)
      - Early Models . . . . 22.06 mm (0.869 in.)
      - Late Models . . . . 19.051 mm (0.750 in.)
  - Piston Rings
    - Ring Thickness—Top and Second Rings (Minimum) . . . . 1.94 mm (0.076 in.)
    - Ring End Gap (Minimum) . . . . 0.18 mm (0.007 in.)
    - Ring End Gap (Maximum)
      - Compression Rings—Top and Second
        - Early Model . . . . 0.90 mm (0.035 in.)
        - Late Model . . . . 1.50 mm (0.059 in.)
      - Oil Ring Side Rails . . . . 1.30 mm (0.051 in.)
- Camshaft
  - Axial Play
    - FC540V (Serial Number - 014454 Only) . . . . . 0.07—0.19 mm (0.0028—0.0075 in.)
  - End Journal O.D.—Cylinder Block (Minimum)
    - FC420V . . . . 19.912 mm (0.7839 in.)
    - FC540V . . . . 20.912 mm (0.8233 in.)
  - End Journal O.D.—Crankcase Cover (Minimum)
    - FC420V . . . . 20.912 mm (0.8233 in.)
    - FC540V . . . . 20.912 mm (0.8233 in.)
  - Lobe Height (Minimum)
    - FC420V . . . . 36.75 mm (1.447 in.)
    - FC540V . . . . 37.10 mm (1.461 in.)
  - Bearing I.D.—Cylinder Block (Maximum)
    - FC420V . . . . 20.076 mm (0.7904 in.)
    - FC540V . . . . 21.076 mm (0.8298 in.)
  - Bearing I.D.—Crankcase Cover (Maximum)
    - FC420V . . . . 21.076 mm (0.8298 in.)
    - FC540V . . . . 21.076 mm (0.8298 in.)
  - ACR Tappet Lift (Minimum) . . . . 0.6 mm (0.024 in.)
  - ACR Disengagement . . . . 600–900 rpm
- Reciprocating Balancer
  - Support Shaft Nut Torque . . . . 7 N•m (65 lb-in.)
  - Link Rod
    - Journal O.D.—On Crankshaft (Minimum)
      - FC420V . . . . 53.950 mm (2.1240 in.)
      - FC540V . . . . 57.941 mm (2.2811 in.)
    - Wrist Pin Bearing I.D. (Maximum) . . . . 12.601 mm (0.4961 in.)
    - Collar Bearing I.D. (Maximum)
      - FC420V . . . . 54.121 mm (2.1307 in.)
      - FC540V . . . . 58.153 mm (2.2895 in.)
    - Bearing Installation Depth Below Surface (Both Ends) . . . . 1.0 mm (0.0394 in.)
  - Balance Weight
    - Bearing I.D. (Maximum) . . . . 26.097 mm (1.0274 in.)
    - Bearing Installation Depth (Below Surface) . . . . 0.50 mm (0.0197 in.)
  - Support Shaft
    - Shaft O.D. (Minimum) . . . . 25.927 mm (1.0208 in.)

REPAIR SPECIFICATIONS (Continued)

Crankshaft	
Total Indicated Runout (TIR)	0.05 mm (0.002 in.)
Main Bearing Journal O.D.—Crankcase Cover Side (Minimum)	
FC420V	34.919 mm (1.3747 in.)
FC540V	37.904 mm (1.4923 in.)
Main Bearing Journal O.D.—Cylinder Block Side (Minimum)	
Both Engines	34.945 mm (1.3757 in.)
Connecting Rod Journal O.D. (Minimum)	
Standard	40.928 mm (1.6113 in.)
Undersized	40.47—40.48 mm (1.5932—1.5937 in.)
Crankcase Cover Crankshaft Bearing I.D. (Maximum)	
FC420V	35.069 mm (1.3807 in.)
FC540V	38.056 mm (1.4983 in.)
Oil Seal Installation Depth	
Both Sides/Both Engines	flush with surface
Oil Filter Manifold Cap Screw Torque	17 N•m (150 lb-in.)
Oil Pump	
Rotor Shaft O.D. (Minimum)	
FC420V (Large O.D.)	12.627 mm (0.4971 in.)
FC420V (Small O.D.)	7.935 mm (0.3125 in.)
FC540V	12.627 mm (0.4971 in.)
Rotor Shaft Bearing I.D. (Maximum)	
Both Engines (Oil Pump Cover)	12.76 mm (0.5024 in.)
FC420V (Crankcase Cover)	8.07 mm (0.3177 in.)
FC540V (Crankcase Cover)	12.76 mm (0.5023 in.)
Outer Rotor	
FC420V	
Minimum Thickness	11.92 mm (0.4692 in.)
Minimum O.D..	28.95 mm (1.1397 in.)
FC540V	
Minimum Thickness	9.92 mm (0.3905 in.)
Minimum O.D..	40.47 mm (1.5933 in.)
Outer Rotor Bearing Housing	
FC420V	
Maximum Depth	12.14 mm (0.4779 in.)
Maximum I.D.	29.20 mm (1.1496 in.)
FC540V	
Maximum Depth	10.17 mm (0.4003 in.)
Maximum I.D.	40.77 mm (1.6051 in.)
Relief Valve Spring Free Length (Minimum)	19.00 mm (0.7480 in.)
Governor	
Governor Mounting Shaft Height	32.2—32.8 mm (1.267—1.291 in.)
Governor Lever Nut Torque	7.8 N•m (69 lb-in.)
Engine Mounting Cap Screw Torque	16.7—22.6 N•m (148.0—200.0 lb-in.)
Blower Housing Cap Screw Torque	10 N•m (89 lb-in.)
Blower Housing To Flywheel Screen Gap (Minimum)	1.5 mm (0.059 in.)
Flywheel Screen To Cooling Fan Cap Screw Torque	6 N•m (53 lb-in.)
Cooling Fan To Flywheel Cap Screw Torque	10 N•m (89 lb-in.)
Cooling Fan Bracket To Flywheel Cap Screw Torque	12 N•m (102 lb-in.)
Flywheel Mounting Nut Torque	
FC420V	137 N•m (101 lb-ft)
FC540V	172 N•m (127 lb-ft)
Oil Drain Plug Torque	23 N•m (200 lb-in.)

REPAIR SPECIFICATIONS (Continued)

Stator	
Cap Screw Torque	6 N•m (53 lb-in.)
Ignitor Module	
All Engines Prior To:	
FC420V-DS10 (FC420VB50633—)	
FC540V-DS15 (FC540VA00385—)	
No Specifications	replace with known good ignitor module
Magneto Ignition Coil	
All Engines Prior To and Including:	
FC420V-DS10 (—FC420VB50633)	
FC540V-DS15 (—FC540VA00385)	
Resistance Between Primary Lead and Core	0.48—0.72 ohms
Resistance Between Plug Cap and Core	10.9—16.3 K ohms
Air Gap	0.30 mm (0.012 in.)
Cap Screw Torque	6 N•m (53 lb-in.)
Magneto Ignition Coil With Ignitor Module	
All Engines After and Including:	
FC420V-DS10 (FC420VB50633—)	
FC540V-DS15 (FC540VA00385—)	
Resistance Between Primary Lead and Core	0.48—0.72 ohms
Resistance Between Plug Cap and Core	
With Standard Plug	8.7—13.1 K ohms ±10%
With Resistor Plug	18.0—19.0 K ohms ±10%
Air Gap	0.30 mm (0.012 in.)
Cap Screw Torque	6 N•m (53 lb-in.)
Starter	
Maximum Amperage (No Load)	50 amps at 6000 rpm
Minimum Starter Brush Length	
FC420V	6 mm (0.240 in.)
FC540V	10.5 mm (0.413 in.)
Starter-To-Engine Mounting Cap Screw Torque	16 N•m (142 lb-in.)
Starter End Cover Cap Screw Torque	9 N•m (80 lb-in.)

SPECIAL OR ESSENTIAL TOOLS

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

JT07270 Digital Pulse Tachometer
Used to check SLOW and FAST idle speeds and starter performance.

JDM59 Compression Gauge
Used to check engine compression.

JT05697 Manometer Kit
Contains #5 plug and the following:

- Barb Fitting
  Used to connect U-tube manometer to engine for Crankcase Vacuum Test.
- Line
  Used to connect U-tube manometer to engine for Crankcase Vacuum Test.
- U-Tube Manometer
  Used to check crankcase vacuum.

JT03503 Crankcase Vacuum Gauge Test Kit
Used to check crankcase vacuum.

JT03338 90° Elbow Fitting
Used to connect pressure gauge to engine when performing Engine Oil Pressure Test.

JT03344 Pressure Gauge Assembly
Used to read engine oil pressure when performing Engine Oil Pressure Test.

JT03017 Hose Assembly
Used to connect pressure gauge to engine when performing Engine Oil Pressure Test.

JDG356 Pressure Gauge
Used to check fuel pump performance.

D-05351ST Spark Tester
Used to check overall condition of ignition system.

JDM70 Valve Spring Compressor
Used to remove and install valve springs.

JDG504 Valve Guide Driver Tool
Used to replace valve guide bushings.

JT05791 Digital Analog Multimeter and JT02153 Current Clamp-on Tester
Used to check starter performance and condition of ignition system components.

D-05351ST Spark Tester
Used to visually check for spark.

OTHER MATERIALS

Number	Name	Use
M79292	MPG-2® Multipurpose Polymer Grease	Apply to engine crankshaft.
	SCOTCH-BRITE® Abrasive Sheets/Pads	Clean cylinder head.
	Valve Guide Cleaner	Clean valve guides.
	Stanisol (or Kerosene)	Finish ream valve guides.
	Prussian Blue Compound	Check valve seat contact.
	Lithium Base Grease	Pack oil seals.
	Zinc Oxide/Wood Alcohol	Check block for cracks.
	Mineral Spirits	Clean armature.
T43512	John Deere Thread Lock and Sealer (Medium Strength)	Retains cap screws.
TY9375/TY9480/592	Pipe Sealant with TEFLON®	Apply to threads of oil pressure switch.

SERVICE PARTS KITS

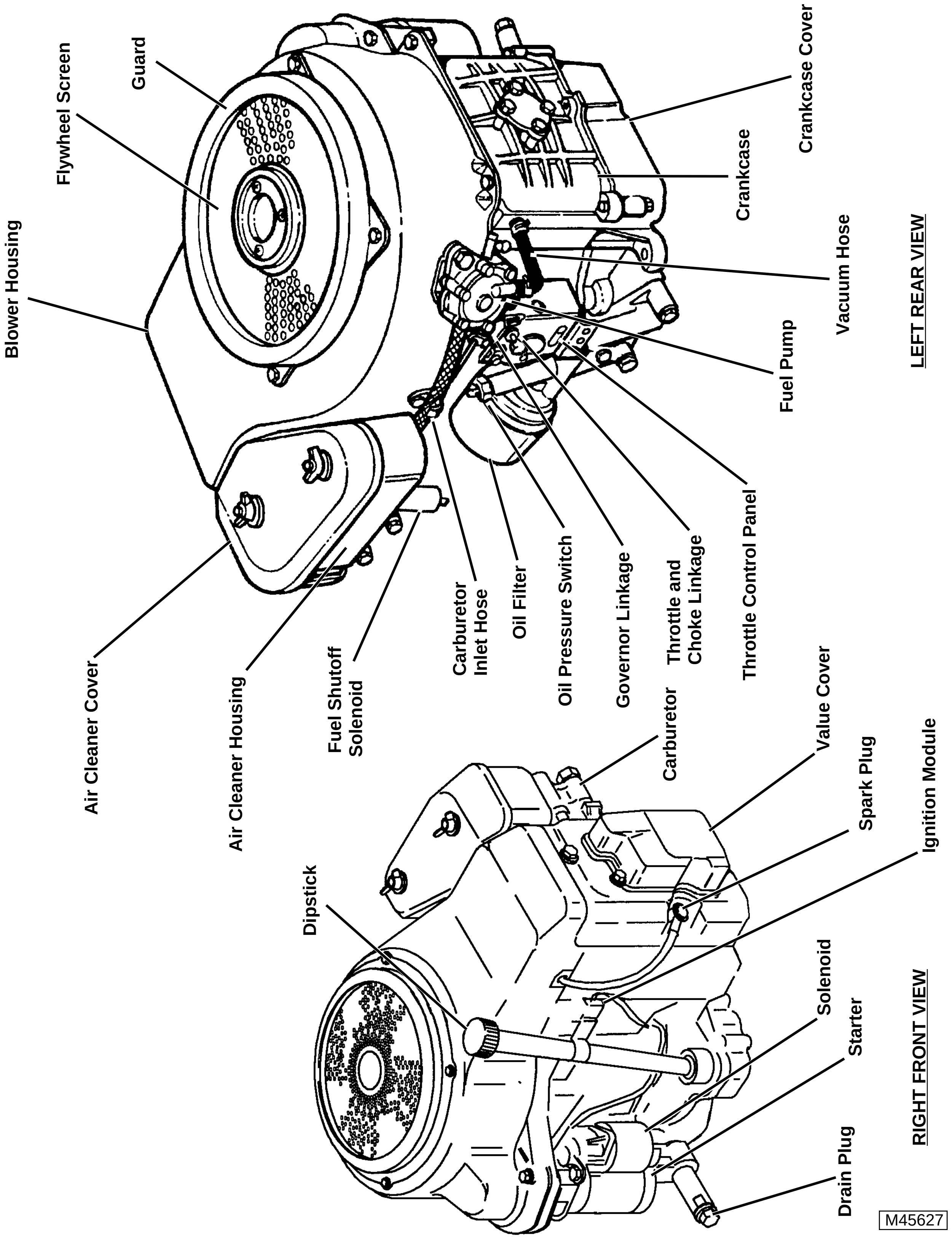
The following kits are available through your parts catalog:

- Fuel Pump Gasket Kit
- Carburetor
- Gasket Kit
- Vent Kit
- Jet Kit
- Choke Shaft Kit
- Throttle Shaft Kit
- Breather Valve Kit
- Air Cleaner Assembly
- Blower Housing Engine Cover Kit
- Flywheel Screen and Spacer Kit
- Dipstick Tube Kit
- Rocker Arm and Shaft Kit
- Intake Valve Kit
- Exhaust Valve Kit
- Camshaft and Tappet Kit
- Camshaft Axial Play Shim Kit
- Piston Ring Kit
- Oversized Piston
- Oversized Piston Ring Kit
- Undersized Connecting Rod
- Crankshaft End Play Shim Kit
- Cylinder Block
- Overhaul Gasket Kit
- Short Block Kit
- Oil Pump Kit
- Governor and Shaft Kit

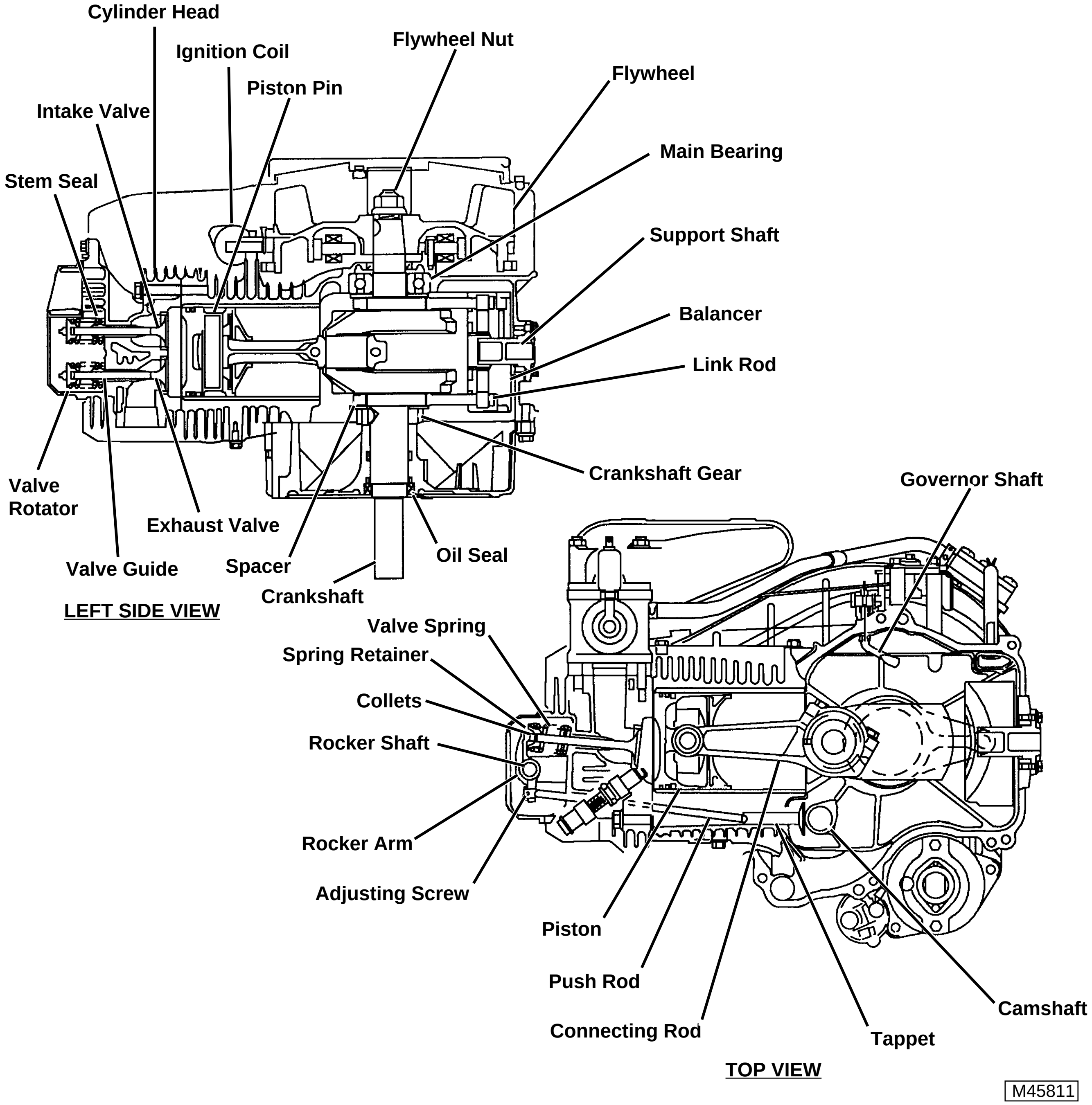
MPG-2® is a registered trademark of DuBois USA.
SCOTCH-BRITE® is a registered trademark of the 3M Co.
TEFLON® is a registered trademark of the DuPont Co.

COMPONENT LOCATION

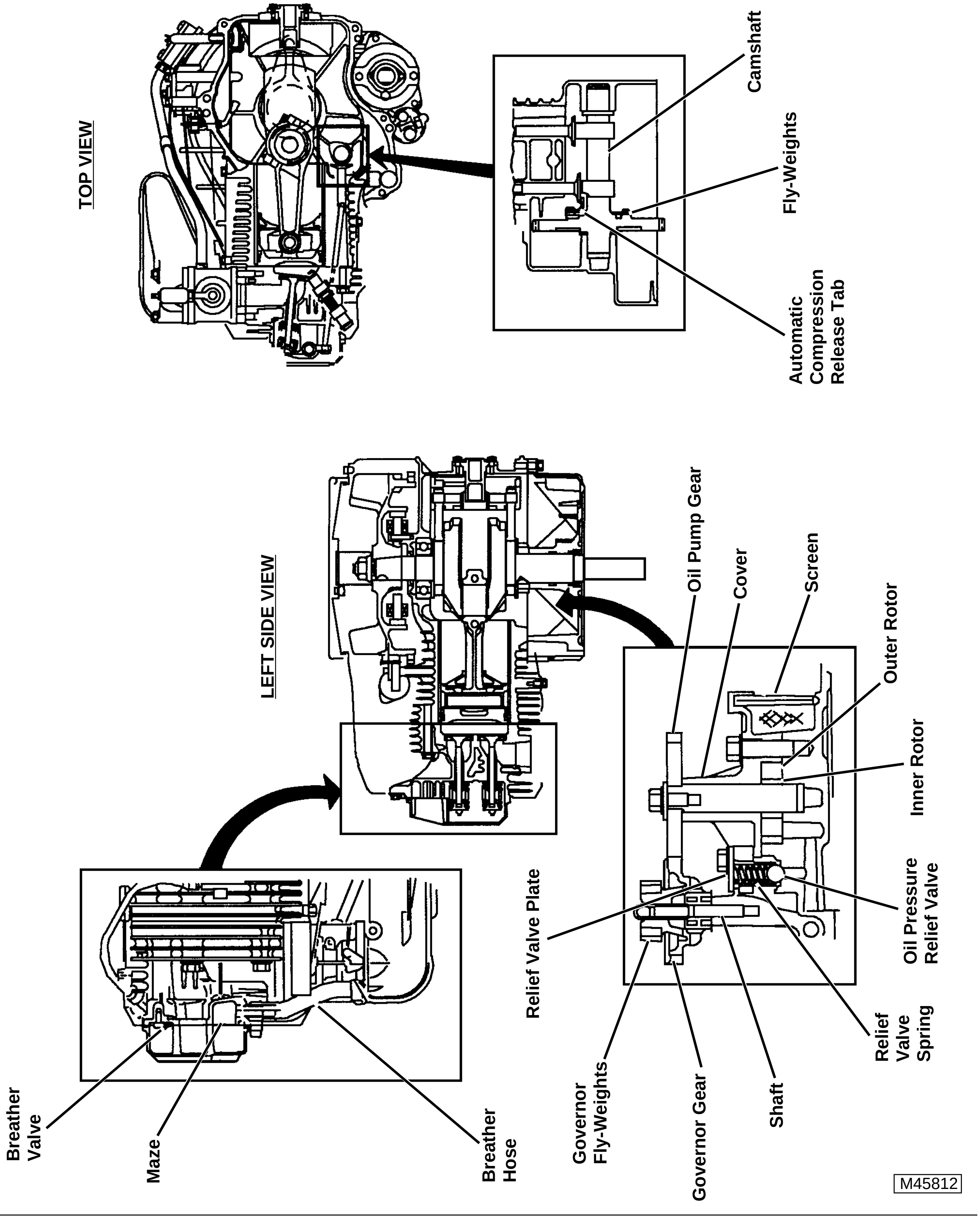
EXTERNAL ENGINE COMPONENTS



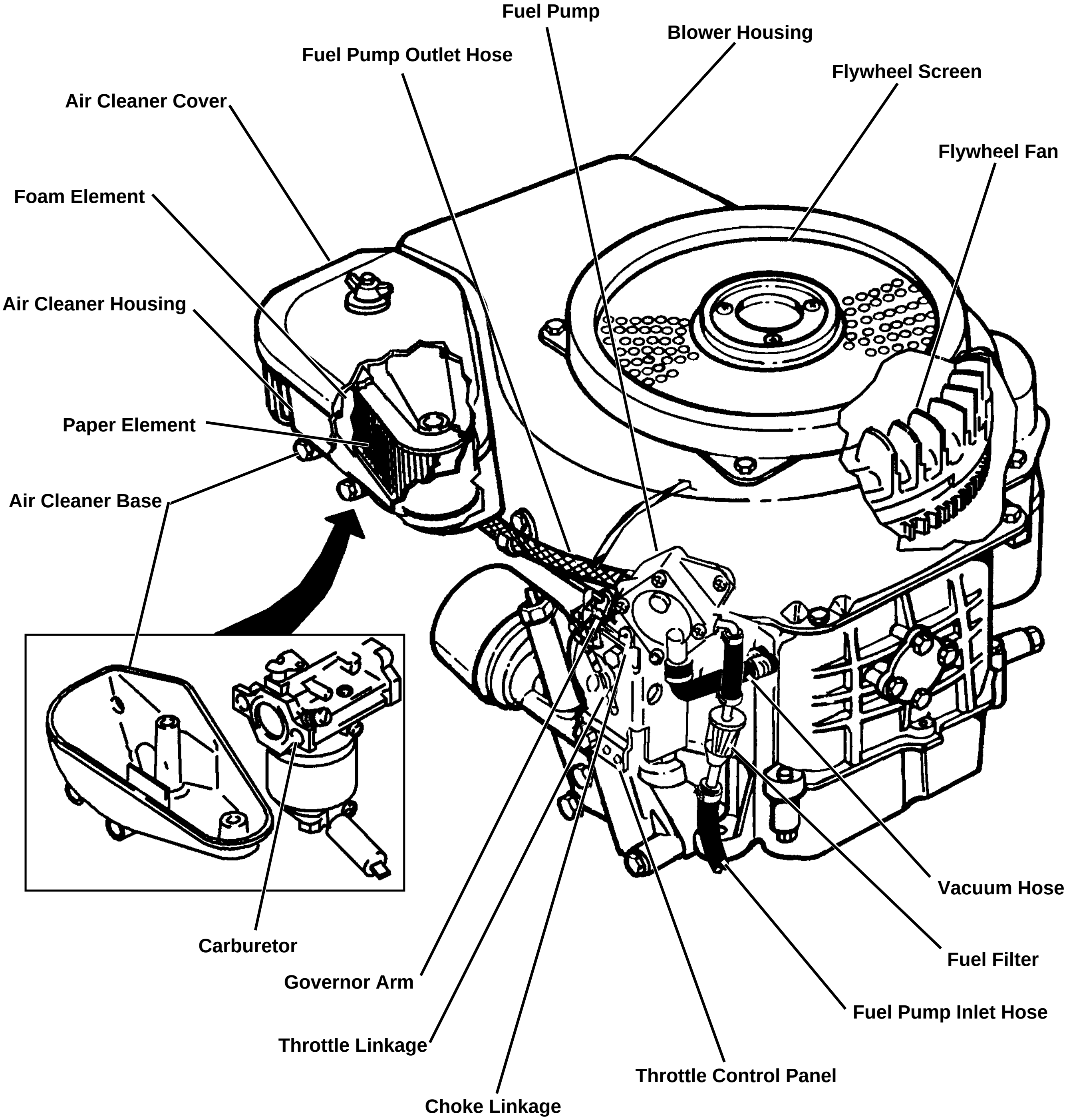
INTERNAL ENGINE COMPONENTS



OIL PUMP BREATHER AND COMPRESSION RELEASE COMPONENTS



FUEL AND AIR SYSTEM COMPONENTS



LEFT REAR VIEW

M45665

THEORY OF OPERATION

LUBRICATION SYSTEM OPERATION

Function:

To provide pressurized oil to lubricate internal engine components.

Theory of Operation:

A positive displacement gerotor pump is used to pressurize the lubrication system. The oil pump is driven directly off the crankshaft gear. The lubrication system is protected by an oil pressure relief valve, low oil pressure switch, and an oil filter with bypass.

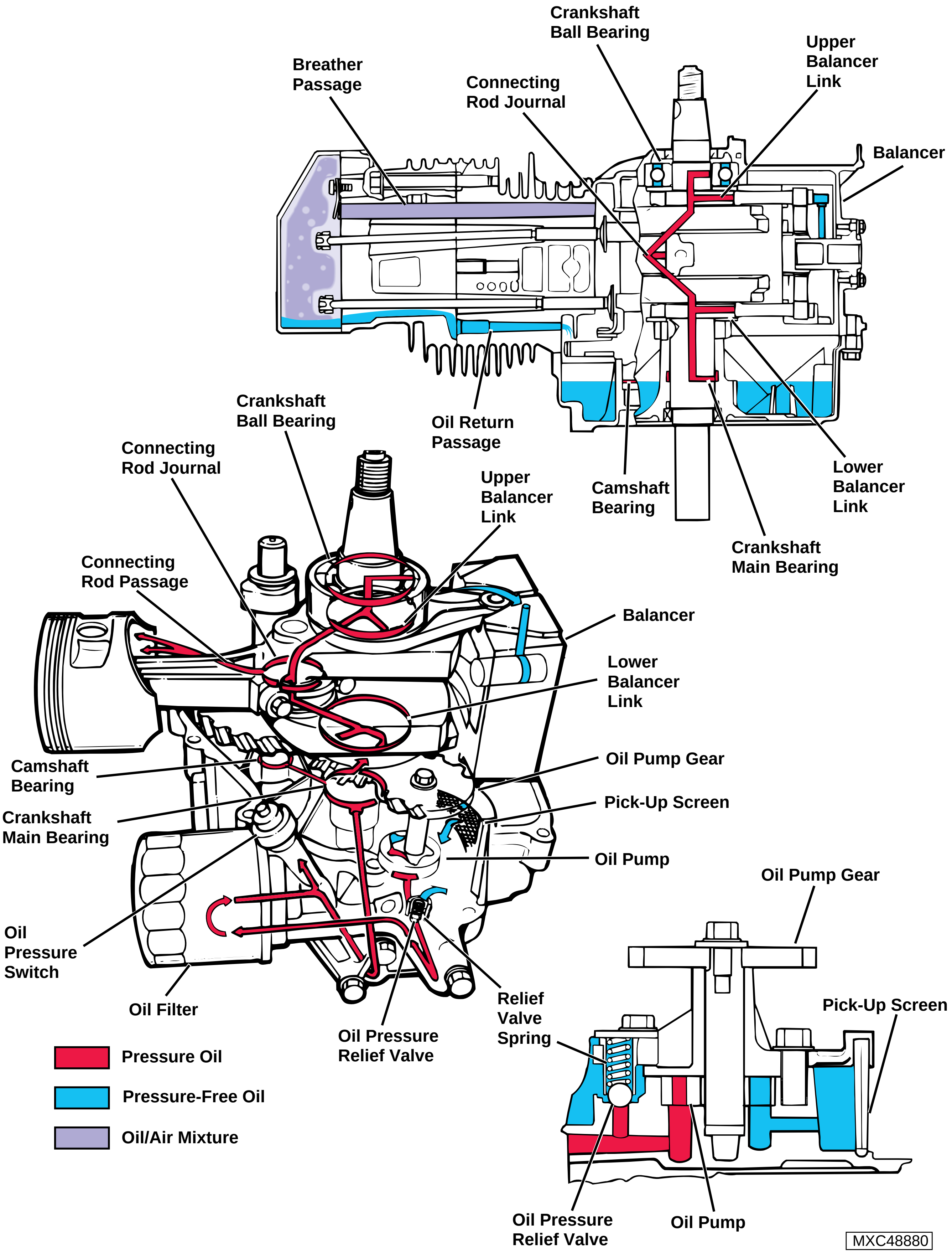
The oil pump draws oil from the sump through the pick-up screen. Pressure oil from the pump flows through the pump outlet passage past the oil pressure relief valve. The oil pressure relief valve limits the oil pressure to approximately 296 kPa (43 psi) and protects the oil pump from damage if an oil passage becomes blocked. If oil pressure exceeds 296 kPa (43 psi), the relief valve opens allowing oil to return to sump. Relief valve is not adjustable.

Pressure oil from the relief valve flows to the oil filter. The filter contains a bypass valve which opens if the element becomes plugged to ensure engine lubrication.

An oil pressure switch mounted in the oil filter manifold turns on a warning light if oil pressure is below 28 kPa (4 psi). Filtered pressure oil flows through a passage in the oil sump to the crankshaft main bearing (PTO side) and then to the camshaft bearing. Drilled passages in the crankshaft distribute oil from the main bearings to the lower balancer link, connecting rod journal, upper balancer link, and crankshaft ball bearing (flywheel side). A drilled passage in the connecting rods allow oil from the connecting rod journal to lubricate the piston and cylinder walls.

Pressure-free oil flowing out of the crankshaft ball bearing or upper balancer link also lubricates the balancer. A drilled passage in the top of the balancer allows oil to flow to the support shaft and balancer bushing.

The rocker arms, valves, and pushrods are lubricated by an oil/air mixture and carried to the rocker arm cover through the breather passage. The breather passage is located directly above the upper pushrod. The oil from the oil/air mixture is separated from the air through the breather maze and flows to the bottom of the cylinder head. This oil drains back to the sump through an oil return passage located in the bottom of the cylinder block directly under the lower pushrod.


Crankshaft Ball Bearing
Breather Passage
Connecting Rod Journal
Upper Balancer Link
Balancer
Oil Return Passage
Camshaft Bearing
Lower Balancer Link
Crankshaft Main Bearing
Crankshaft Ball Bearing
Connecting Rod Journal
Upper Balancer Link
Connecting Rod Passage
Balancer
Lower Balancer Link
Camshaft Bearing
Oil Pump Gear
Crankshaft Main Bearing
Pick-Up Screen
Oil Pump
Oil Pump Gear
Oil Pressure Switch
Oil Filter
Relief Valve Spring
Pick-Up Screen
Oil Pressure Relief Valve
🟥 Pressure Oil
🟦 Pressure-Free Oil
🟪 Oil/Air Mixture
Oil Pressure Relief Valve
Oil Pump
MXC48880

COOLING SYSTEM OPERATION

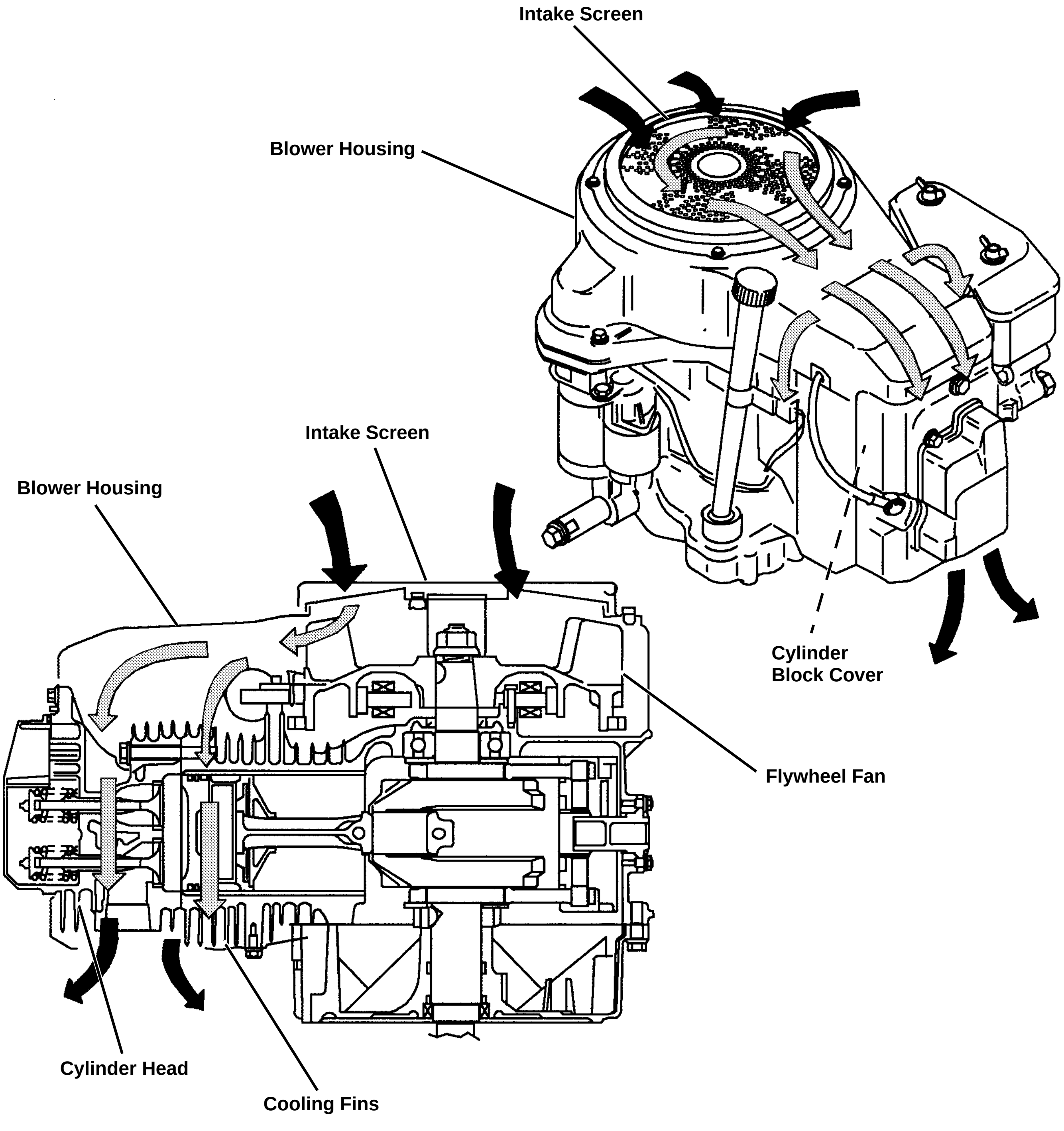
Function:

Remove heat from engine.

Theory of Operation:

The engine is air-cooled with air flow provided by a fan that is part of the flywheel. During operation, the fan draws air in through the intake screen. The intake screen rotates and cuts debris into small pieces to help prevent the cooling fins from plugging. The blower housing and cylinder block cover direct the air flow past the cooling fins of the cylinder block and head. Most of the cooling air flows directly over the valve area. This increased cooling capacity in the valve area helps to minimize valve sticking and seat wear due to overheating. The cooling fins are cast into the engine block and cylinder head to increase their surface area to allow more of the heat generated by the engine to be transferred to the cooling air.

It is important that the intake screen remains free of debris for proper air flow. The engine covers should not be removed or altered, as cooling capacity will be reduced. Cylinder block and head cooling fins must remain clean to properly dissipate heat. Debris build-up on the intake screen or fins will affect the volume of air to the carburetor.


Intake Screen
Blower Housing
Intake Screen
Blower Housing
Cylinder Block Cover
Flywheel Fan
Cylinder Head
Cooling Fins

M45628

TROUBLESHOOTING

ENGINE AND FUEL SYSTEM TROUBLESHOOTING CHART

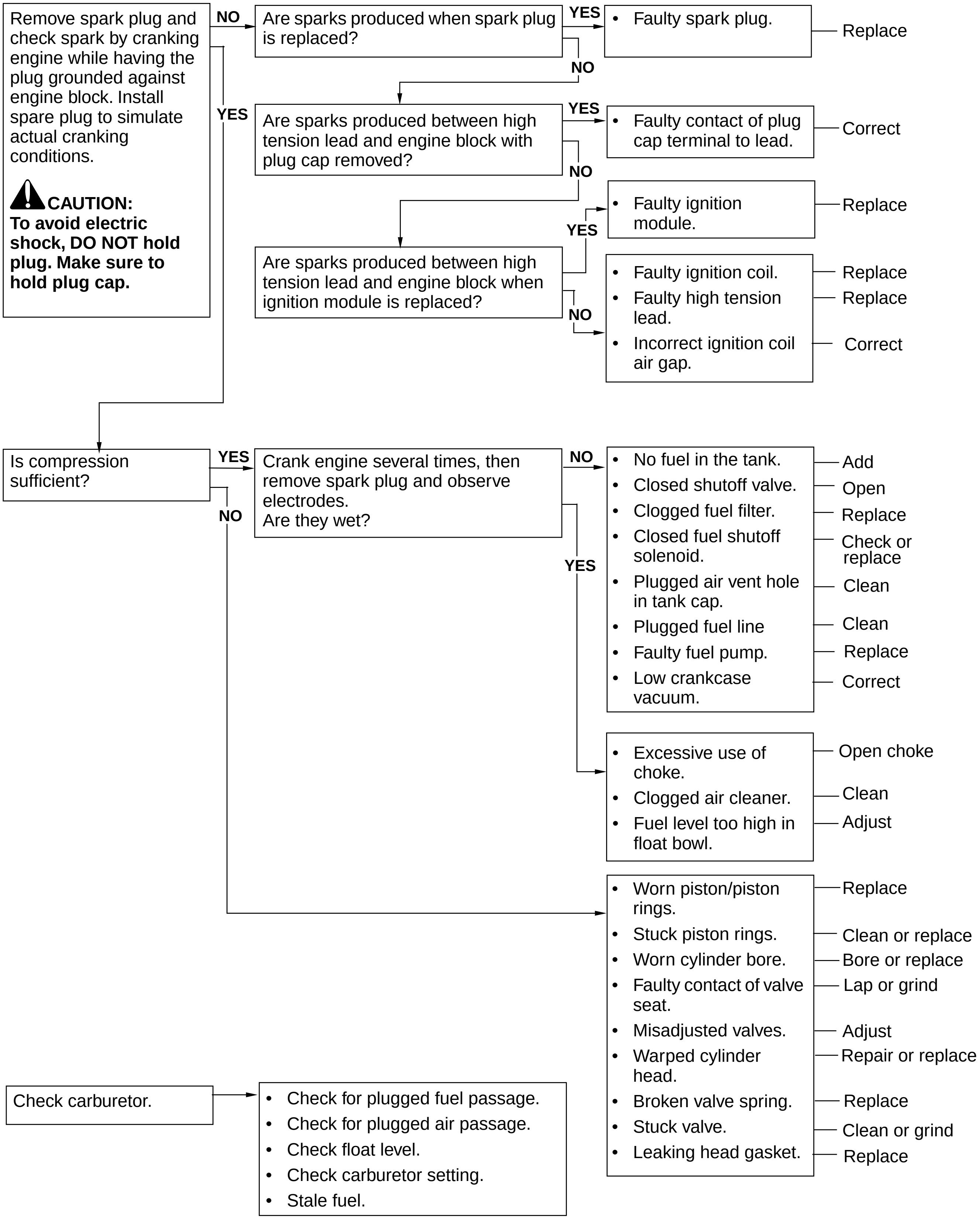
PROBLEM OR SYMPTOM / CHECK OR SOLUTION	Engine cranks but will not start or starts hard	Engine will not stay running, runs rough, or irratically	Engine dies frequently	Engine backfires (afterbang)	Engine surges, or has uneven or uncontrolled rpm	Engine has low power	Engine has no spark	Engine will not crank	Lack of fuel in carburetor	Engine floods	Exhaust smoke black or uses too much fuel	Exhaust smoke blue or has excessive oil consumption	Engine has low oil pressure	Fuel in oil	Engine overheats	Excessive engine noise or vibration
Spark plug fouled, defective, or gap not correct. Incorrect spark plug	●	●				●	●			●	●			●	●	
Defective ignition components	●	●	●	●	●	●	●			●	●			●		
Starter worn. Cranking rpm too slow	●							●								
Fuel filter or line restricted. Fuel pump weak, restricted, or leaking. Fuel stale, contains water, or wrong type	●	●	●	●	●	●			●		●	●				
Fuel pump not operating	●	●							●							
Air filter element(s) plugged, oil soaked, or restricted	●	●			●	●				●	●			●		
Choke, throttle, or governor linkage misadjusted. Carburetor misadjusted	●	●	●	●	●	●			●	●	●			●		
Carburetor worn, contaminated with debris or varnish. Passages plugged. Wrong jets	●	●	●	●	●	●			●					●		
Carburetor, intake & exhaust manifold, or cylinder head gaskets leaking or damaged	●	●		●	●	●										●
Low compression from worn piston, rings, cylinder, valves or warped head	●	●				●						●		●		●

ENGINE AND FUEL SYSTEM TROUBLESHOOTING CHART, continued

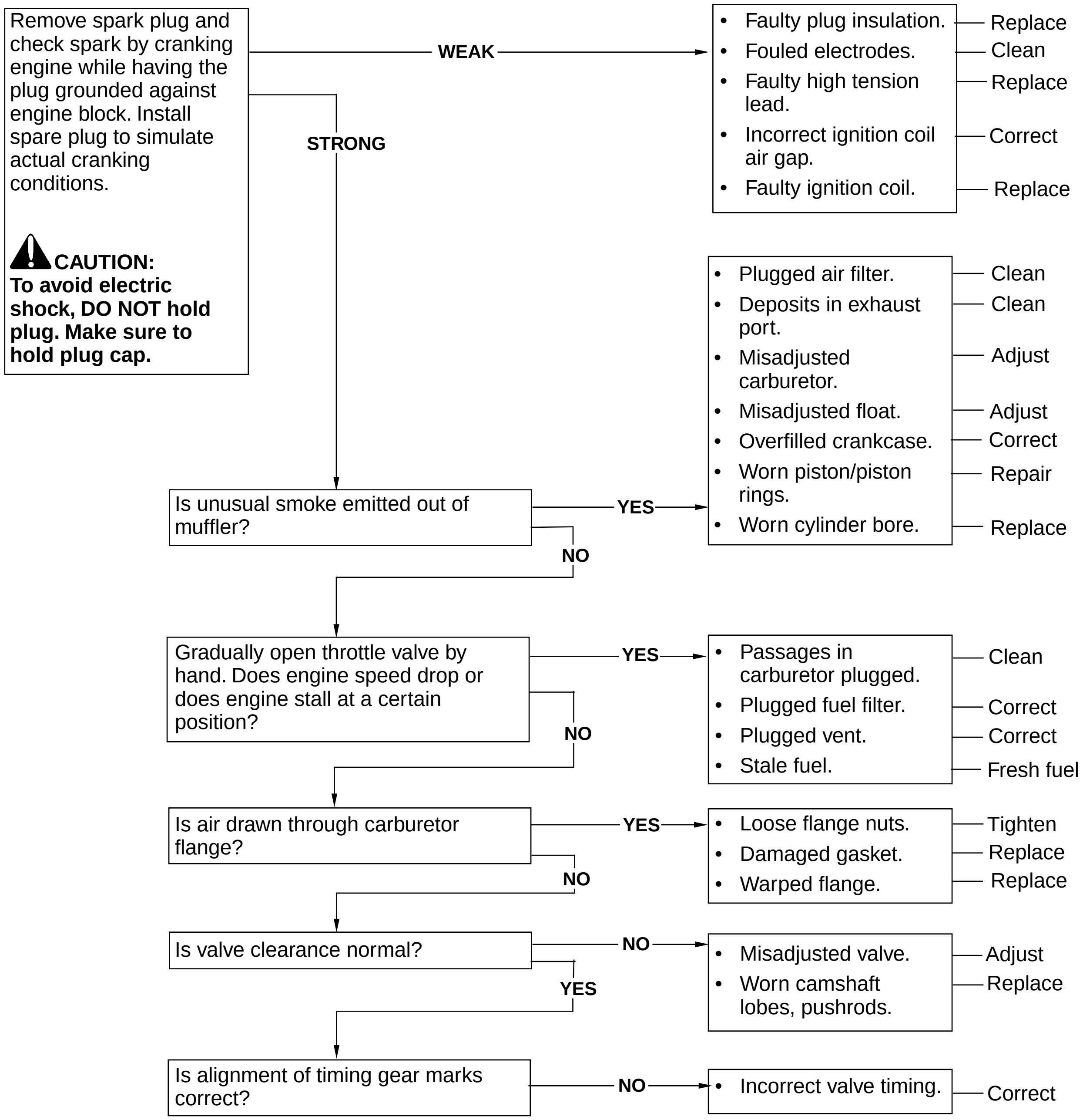
PROBLEM OR SYMPTOM / CHECK OR SOLUTION	Engine cranks but will not start or starts hard	Engine will not stay running, runs rough, or irratically	Engine dies frequently	Engine backfires (afterbang)	Engine surges, or has uneven or uncontrolled rpm	Engine has low power	Engine has no spark	Engine will not crank	Lack of fuel in carburetor	Engine floods	Exhaust smoke black or uses too much fuel	Exhaust smoke blue or has excessive oil consumption	Engine has low oil pressure	Fuel in oil	Engine overheats	Excessive engine noise or vibration
Valve clearance incorrect. Burned or warped valves and seats. Defective springs. Defective ACR.	●	●		●		●										●
Engine oil viscosity or level incorrect. Engine oil filter restricted												●	●		●	●
Engine gaskets or seals leaking	●	●		●	●	●						●	●			
Crankcase breather restricted, reed valve damaged, clearance incorrect, or drain hole plugged		●			●	●						●				
Valve guides or seals worn or leaking. Valve stems worn						●						●				
Worn, stuck, or broken piston rings. Cylinder bore worn. Check compression and vacuum	●	●				●						●				
Connecting rod or crankshaft bearings worn. Internal wear limits out of specification						●							●		●	●
Battery cables corroded or loose, or battery weak		●	●				●	●								
Clogged cooling fins or air intake screen															●	

ENGINE TROUBLESHOOTING GUIDE

Engine Hard To Start or Will Not Start



Engine Malfunctions at Low Speed



Engine Runs Erratically

Problem in fuel system (lack of fuel).

Dust or water in fuel line or fuel filter.	Clean
Air or vapor lock in fuel line.	Remove
Plugged air vent in fuel tank cap.	Clean
Plugged air/fuel passages in carburetor.	Clean
Too little opening of carburetor pilot air-screw.	Correct
Stale fuel.	Fresh fuel

Problem in governor system.

Incorrect governor linkage adjustment.	Correct
Faulty governor spring.	Replace
Governor gear assembly malfunction.	Check

Engine knocks.

Stale fuel.	Fresh fuel
Excessive carbon deposit in engine.	Clean
Excessive engine load.	Adjust
Engine overheating.	See **Has Low Power**

Oil Consumption Is Excessive

Is compression sufficient?

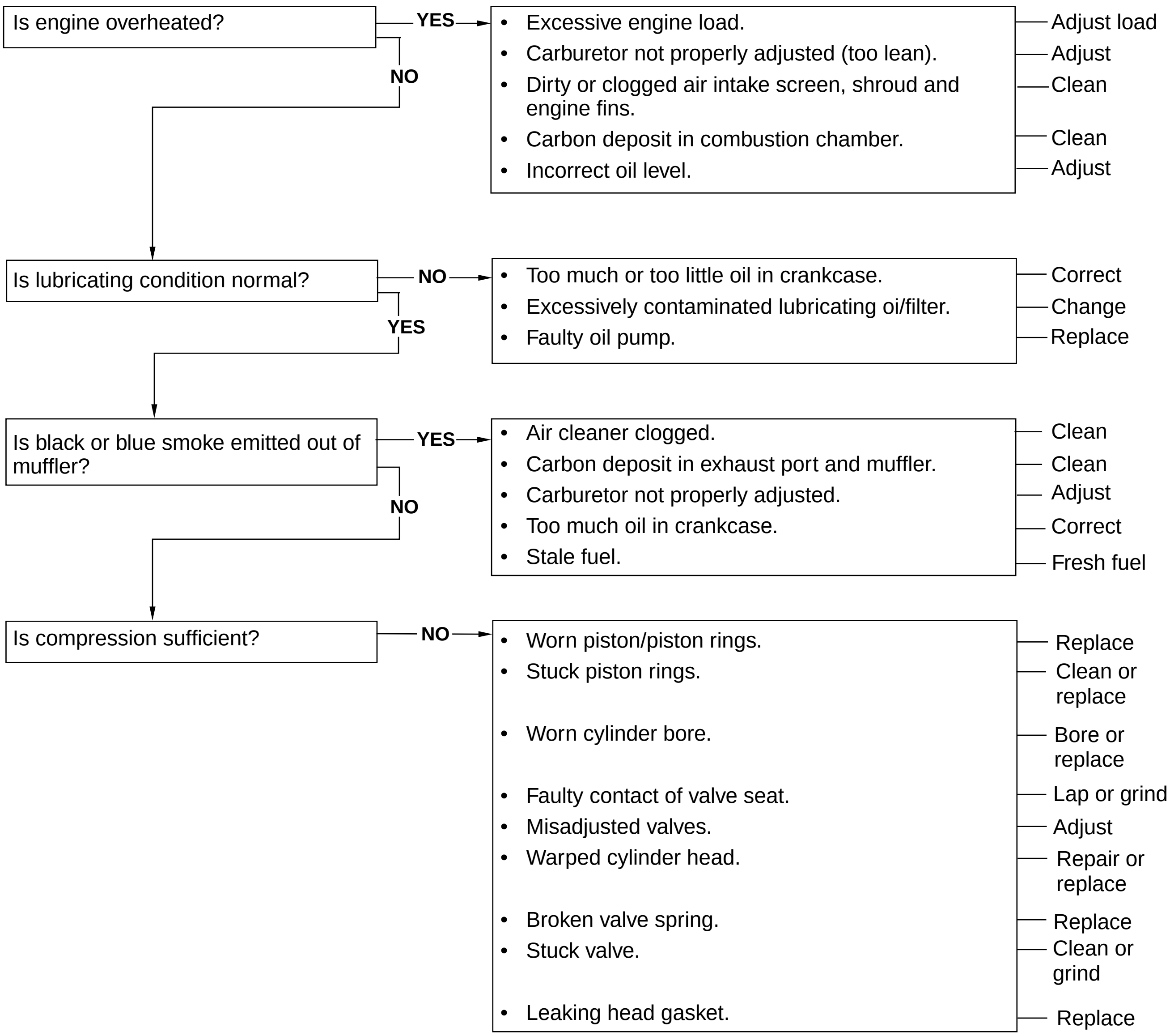
YES

Plugged oil ring groove.	Clean
High oil level.	Adjust
Worn valve stems and valve guides.	Replace
Oil leakage along governor shaft.	Replace
Oil seals leaking.	Replace
Head gasket leaking.	Replace
Drain plug leaking.	Retighten or replace
Breather valve clogged.	Clean
Drain-back hole in tappet chamber plugged.	Clean
Incorrect oil viscosity.	Change

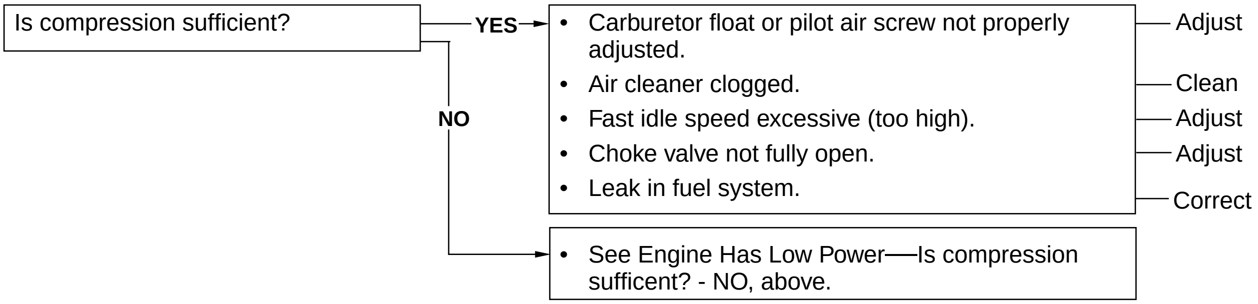
NO

Worn piston/piston rings.	Replace
Stuck piston rings.	Clean or replace
Worn cylinder bore.	Bore or replace
Faulty contact of valve seat.	Lap or grind
Misadjusted valves.	Adjust
Warped cylinder head.	Repair or replace
Broken valve spring.	Replace
Stuck valve.	Clean or grind
Leaking head gasket.	Replace

Engine Has Low Power



Fuel Consumption Is Excessive



STARTER MOTOR TROUBLESHOOTING GUIDE

1. Disconnect spark plug cap, and ground the cap terminal.
2. Turn key switch to “START” position and check condition.

CAUTION

Engine may be cranked in this test. DO NOT touch any rotating parts of engine and equipment during test.

IMPORTANT: If starter does not stop when key switch is in off position, disconnect negative (-) lead from battery as soon as possible.

Starter Does Not Rotate

Click sound from solenoid (switch)?	NO	• Faulty battery.	Charge or replace
		• Faulty leads or connection.	Repair or replace
		• Melted fuse.	Replace
		• Faulty key switch.	Repair or replace
		• Faulty solenoid (switch).	Replace
	YES	• Weak battery.	Charge or replace
		• Faulty leads or connection. (Solenoid to motor)	Repair or replace
		• Faulty solenoid (switch). (Main terminal in solenoid)	Replace
		• Faulty starter motor.	Repair or replace

Starter Rotates Slowly

Is battery charged?	NO	• Weak battery.	Charge or replace
	YES	• Faulty leads or connection. (Solenoid to motor)	Repair or replace
		• Faulty solenoid (switch). (Main terminal in solenoid)	Replace
		• Faulty starter motor.	Repair or replace
		• Faulty engine.	Repair or replace

Starter Rotates But Can Not Crank Engine

Does pinion mesh with ring gear?	NO	• Worn pinion or ring gear.	Replace
		• Incorrect starter alignment.	Correct
	YES	• Faulty bendix.	Replace

Starter Does Not Stop With Key Switch In RUN or OFF Position

Can stop starter with key switch in RUN or OFF position.	NO	• Faulty key switch.	Repair or replace
		• Faulty solenoid (switch).	Replace
	YES	• Faulty pinion or ring gear	Repair or replace
		• Incorrect starter alignment.	Correct
		• Faulty pinion return mechanism.	Repair or replace

TESTS AND ADJUSTMENTS

THROTTLE CABLE TEST AND ADJUSTMENT

Reason:

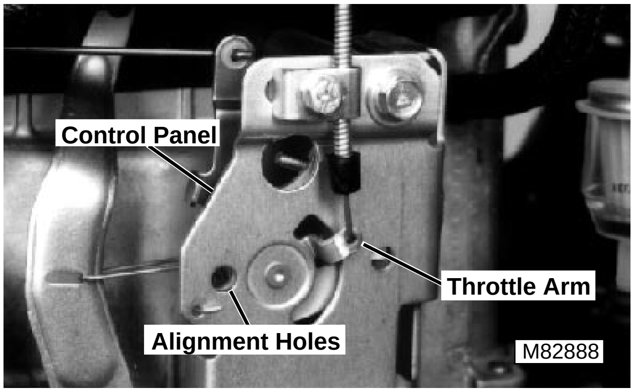
To make sure the throttle control lever obtains the full range of motion from SLOW idle, to FAST idle, and into FULL CHOKE position at the throttle control panel.

Equipment:

- 6 mm (15/64 in.) Drill Bit or
- 6 x 30 mm Flat Head Pin (45M7036)

Test Procedure:

1. Move throttle control lever from SLOW idle to FAST idle position. A solid “detent” should be felt to assure that the control lever is in the FAST idle position.



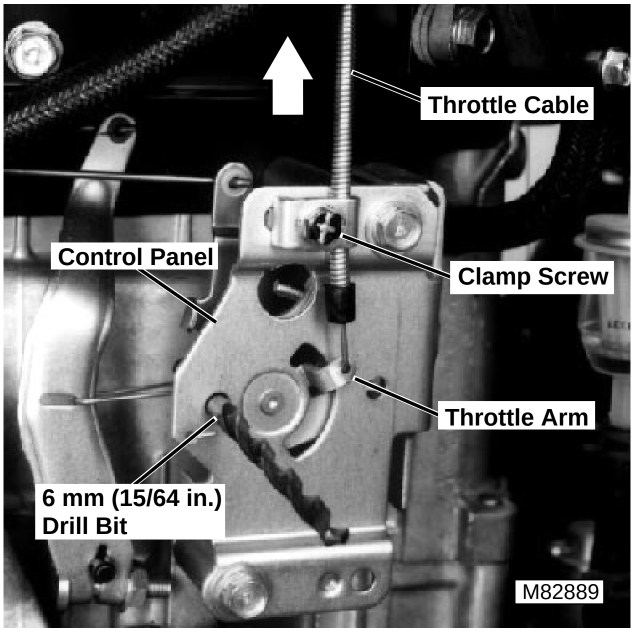
2. Check alignment holes in control panel and throttle arm. They MUST be in visual alignment.
3. Move throttle control lever into CHOKE position, then back into FAST idle position. Again, holes in control panel and throttle arm MUST be aligned.

Results:

- If holes align in FAST idle position, throttle cable is adjusted properly. Test and adjust choke plate. (See CHOKE PLATE TEST AND ADJUSTMENT.
- If holes DO NOT align in FAST idle position, perform following Adjustment Procedure.

Adjustment Procedure:

1. Move throttle control lever to FAST idle position.



2. Loosen clamp screw.
3. Align hole in throttle arm with hole in control panel. Insert a 6 mm (15/64 in.) drill bit or 6 x 30 mm flat head pin (45M7036) through holes to keep throttle arm from moving. Be sure drill bit or flat head pin is perpendicular to the control panel.
4. Pull throttle cable up (arrow) and tighten screw.
5. Remove drill bit.
6. Repeat test procedure.
7. Move throttle control lever through full range several times to be sure linkage is not binding.

CHOKE PLATE TEST AND ADJUSTMENT

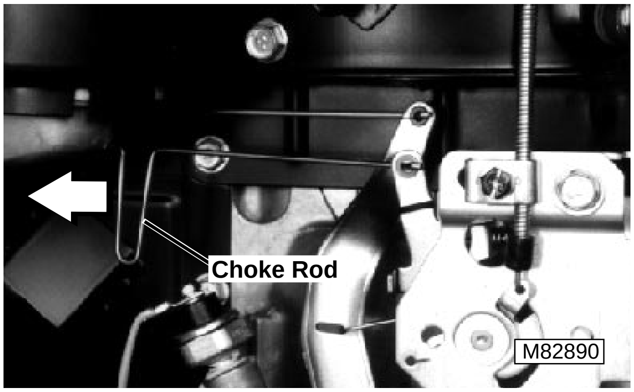
Reason:

To make sure that the choke plate is fully closed when the throttle control lever is in the FULL CHOKE position and completely opens choke plate at FAST idle position.

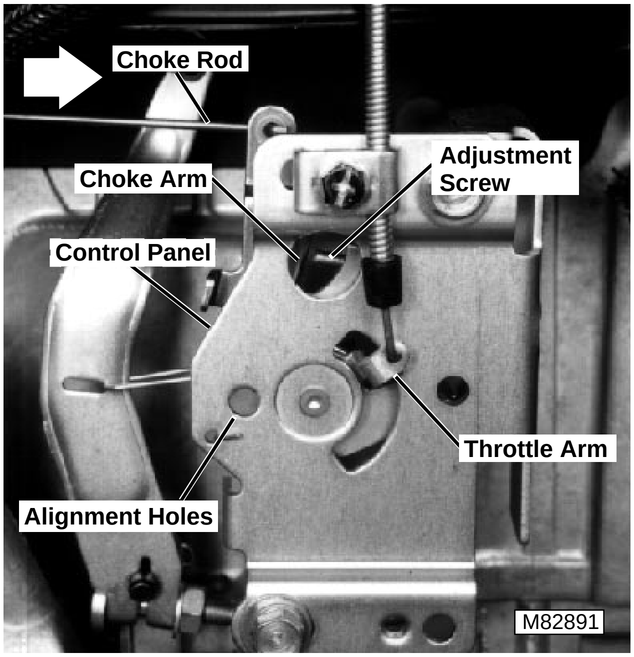
Test Procedure:

IMPORTANT: Test and adjust throttle cable before adjusting choke, to ensure accurate choke adjustment.

1. Check and adjust throttle cable.
2. Move throttle control lever to full CHOKE position.



3. Try to move choke rod toward carburetor (arrow). Choke rod should NOT move. If choke rod moves **forward**, the choke plate is not fully closed.
4. Move throttle control lever to FAST idle position.



5. Check holes in control panel and throttle arm. They MUST be in visual alignment. Check for gap between adjustment screw and choke arm.
6. Try to move choke rod toward control panel (arrow). Choke rod should NOT move. If choke rod moves **rearward**, the choke plate is not fully open.

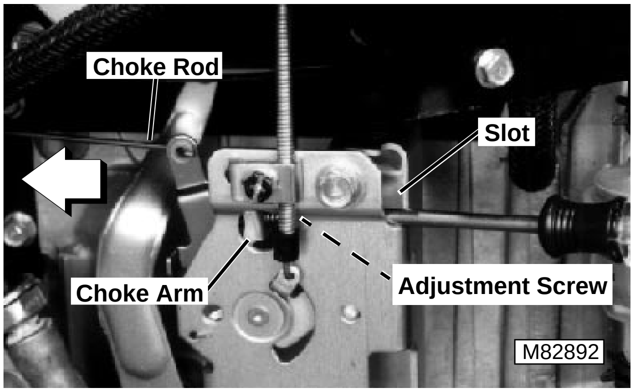
Results:

- If choke rod DOES NOT move in either direction with the throttle control lever in the specific positions, choke operation is properly adjusted.
- If choke rod DOES move in either direction with throttle control lever in the specific positions, perform following Adjustment Procedure.

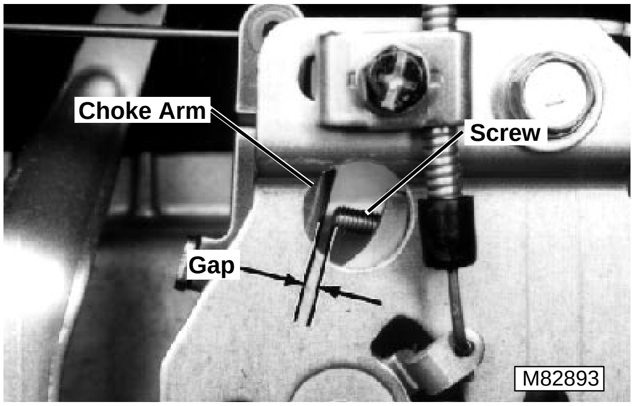
Adjustment Procedure:

If choke plate is not closed when the throttle control is in full choke position;

1. Move throttle control lever to full CHOKE position.



2. Push and hold choke rod forward (arrow) to close choke plate.
3. Insert a screwdriver through slot in control panel. Turn adjustment screw (on backside of control panel) clockwise until it is tight against choke arm.
4. Move throttle control lever to FAST idle position.



NOTE: Amount of gap may vary from approximately ***0.25—3.0 mm (0.01—0.12 in.)***.

5. Check for gap between screw and choke arm. Amount of gap should be approximately **0.25—3.0 mm (0.01—0.12 in.)**.
6. Repeat Test Procedure.

GOVERNOR ADJUSTMENT

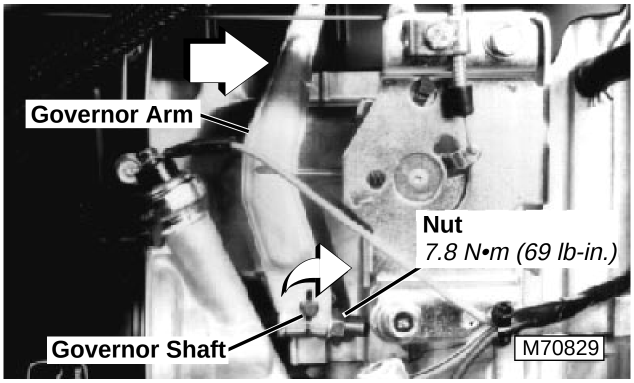
Reason:

To make sure the governor responds correctly at slow and fast idle.

Procedure:

NOTE: Adjust throttle cable and choke plate before adjusting governor linkage.

1. Adjust throttle cable and choke plate. (See THROTTLE CABLE and CHOKE PLATE TEST AND ADJUSTMENT.)
2. Move throttle lever to FAST idle position.



3. Loosen nut.
4. Hold governor arm in the full clockwise position (toward control panel). Turn the governor shaft clockwise to the end of its travel. Hold governor shaft and tighten nut to specifications.
5. Move throttle lever through full range to be sure linkage is not binding.

FAST IDLE SPEED ADJUSTMENT

Reason:

To set engine FAST idle speed.

Equipment:

- 6 mm (15/64 in.) Drill Bit or 6 x 30 mm Flat Head Pin (45M7036)
- JT07270 Digital Pulse Tachometer

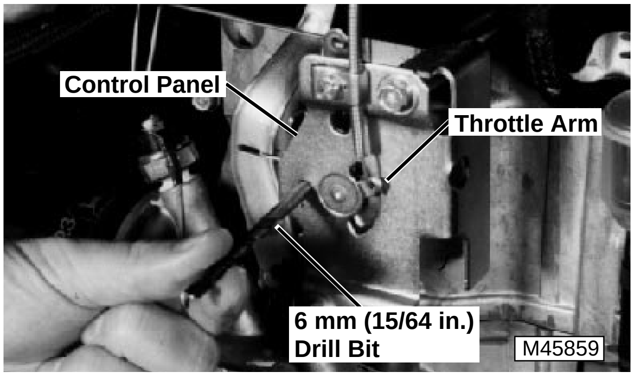
Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Raise engine hood.
4. Start and run engine at MEDIUM idle for 5 minutes to warm engine to normal operating temperature.

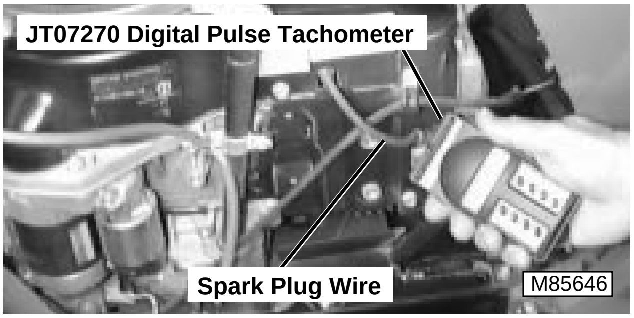
⚠ CAUTION

Engine will be HOT. Be careful not to burn hands.

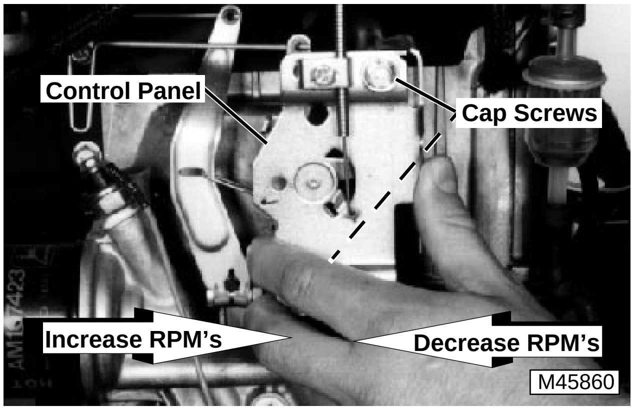
5. Move throttle control lever to FAST idle position.



6. Align hole in throttle arm with hole in throttle control panel. Insert a 6.0 mm (15/64 in.) drill bit or 6 x 30 mm flat head pin (45M7036) through holes to keep throttle arm from moving. Be sure bit or flat head pin are perpendicular to the throttle control panel.



7. Use a JT07270 Digital Pulse Tachometer at spark plug wire to set engine FAST idle speed at **3350 ± 100 rpm**.



Results:

- If FAST idle speed DOES NOT meet specifications:
  - Loosen throttle control panel cap screws.
  - Move throttle control panel rearward to increase rpm or forward to decrease rpm.
  - Hold throttle control panel motionless once specified rpm is found and tighten cap screws.
  - Check that hole in throttle arm aligns with hole in throttle control panel (see Step 6)—readjust throttle cable if holes are not in alignment.

SLOW IDLE SPEED ADJUSTMENT NON CARB/EPA ENGINES

NOTE: For engines WITHOUT California Air Resources Board/Environmental Protection Agency (CARB/EPA) Emissions Carburetors.

ALL ENGINES PRIOR TO AND INCLUDING:

FC420V—ES10 . . . .(—FC420VB78803)

FC540V—JS00 . . . . (—FC540VA17947)

Reason:

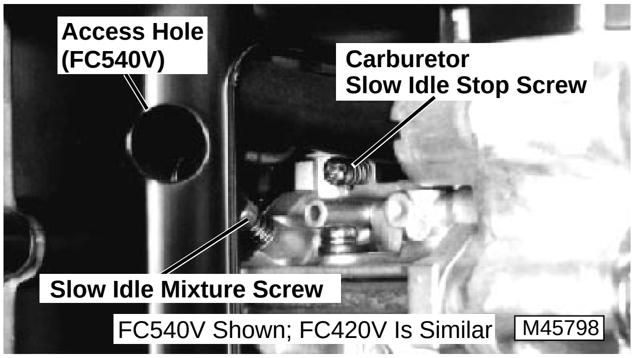
To set engine SLOW idle mixture and rpm.

Equipment:

- JT07270 Digital Pulse Tachometer

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Remove engine hood. (See procedure in MISCELLANOUS section.)

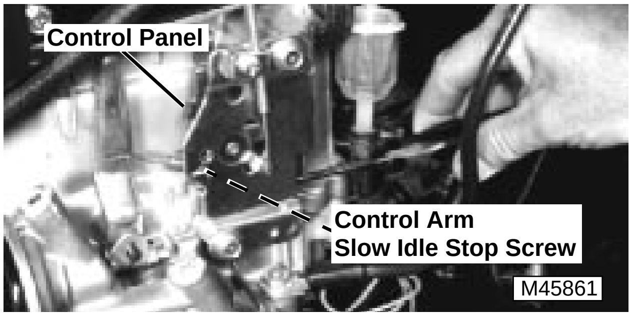


FC540V Shown; FC420V Is Similar

IMPORTANT: Forcing the slow idle mixture screw tight will damage the needle and seat.

NOTE: For access to SLOW idle mixture screw, insert screwdriver through hole in front shroud.

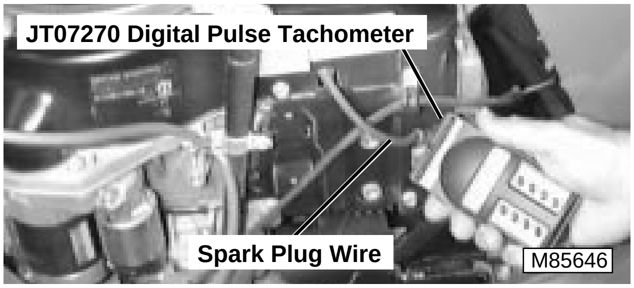
4. Turn SLOW idle mixture screw clockwise until lightly seated, then turn counterclockwise **1-3/8 turns (FC420V) or 1-1/2 turns (FC540V)**.



5. Put throttle lever in SLOW idle position and turn throttle control arm SLOW idle stop screw counterclockwise until it clears the throttle control panel by one full turn.
6. Start and run engine at MEDIUM idle for five minutes to warm engine to normal operating temperature.
7. Move throttle control lever to SLOW idle position.

⚠ CAUTION

Engine will be HOT. Be careful not to burn hands.



8. Use a JT07270 Digital Pulse Tachometer at the spark plug wire to check engine rpm.
9. Adjust carburetor SLOW idle stop screw until SLOW idle speed is **1400 rpm,** removing any governor action.
10. Turn SLOW idle mixture screw clockwise until engine speed drops, note position.
11. Turn SLOW idle mixture screw counterclockwise until engine speed increases and drops again, note position.
12. Turn SLOW idle mixture screw to midway between drop points, then turn screw counterclockwise an additional **1/4 turn (FC420V)** or **1/8 turn (FC540V)**.
13. Readjust carburetor SLOW idle stop screw to set carburetor SLOW idle speed at **1450 ± 75 rpm**.
14. Adjust throttle control arm SLOW idle stop screw to set the throttle SLOW idle speed at **1550 ± 75 rpm** (**100 rpm** above carburetor SLOW idle setting).

SLOW IDLE SPEED ADJUSTMENT CARB/EPA ENGINES

NOTE: For engines with California Air Resources Board/Environmental Protection Agency (CARB/EPA) Emissions Carburetors.

ALL ENGINES AFTER AND INCLUDING:

FC420V—ES10 . . . .(FC420VB78804—)

FC540V—JS00 . . . .(FC540VA17948—)

ATTENTION!

DO NOT attempt to adjust the carburetor unless you are a factory trained technician with authorization to service CARB/EPA Certified Emissions Carburetors.

Reason:

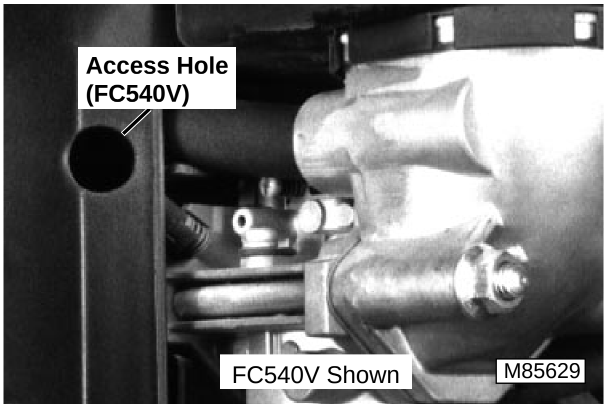
To set engine SLOW idle mixture and rpm. This ensures the engine meets the CARB/EPA emission requirements.

Equipment:

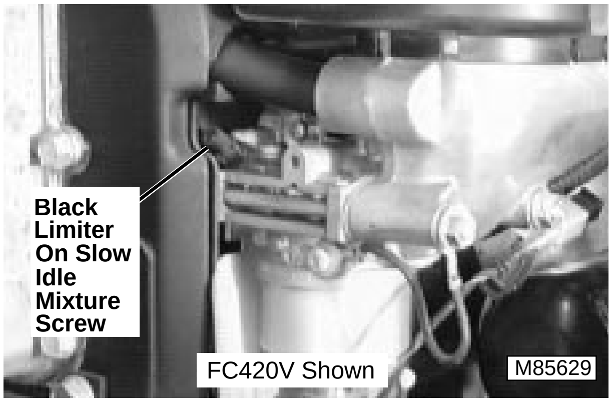
- JT07270 Digital Pulse Tachometer

Procedure:

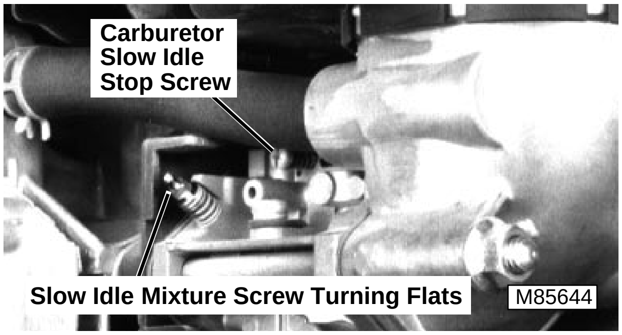
1. Park machine on level surface.
2. Turn key switch OFF.
3. Remove engine hood. (See procedure in MISCELLANEOUS section.)



NOTE: On FC540V engines, SLOW idle mixture screw is accessed through front shroud hole. To remove and install black limiter on SLOW idle mixture screw, first remove front shroud.



4. Use screwdriver to carefully remove black limiter from SLOW idle mixture screw.



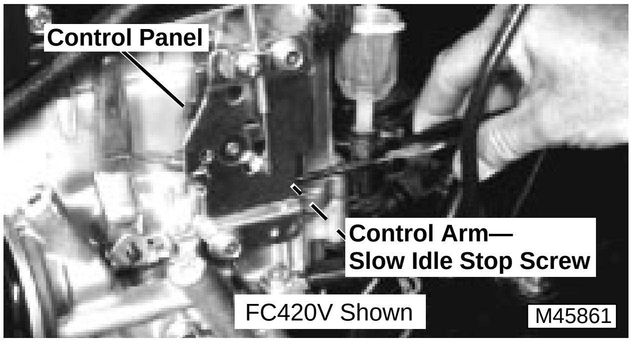
IMPORTANT: Forcing the slow idle mixture screw tight will damage the needle and seat.

5. Turn flats of SLOW idle mixture screw clockwise until lightly seated, then turn counterclockwise to following specifications:

Specifications:

FC420V . . . . 1 7/16 Turns

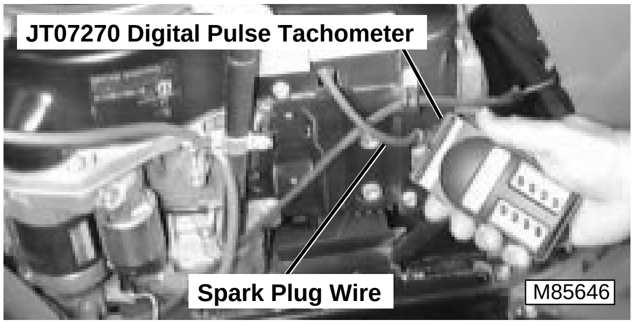
FC540V . . . . 1 5/8 Turns



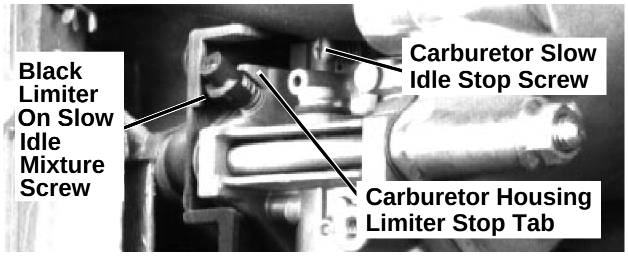
6. Put throttle lever in SLOW idle position and turn throttle control arm SLOW idle stop screw counterclockwise until it clears the throttle control panel by two turns.
7. Start and run engine at MEDIUM idle for five minutes to warm engine to normal operating temperature.
8. Move throttle control lever to SLOW idle position.

⚠ CAUTION

Engine will be HOT. Be careful not to burn hands.



9. Use a JT07270 Digital Pulse Tachometer at the spark plug wire to check engine rpm.
10. Adjust carburetor SLOW idle stop screw until SLOW idle speed is **1400 rpm,** removing any governor action.
11. Turn SLOW idle mixture screw clockwise until engine speed drops, note position.
12. Turn SLOW idle mixture screw counterclockwise until engine speed increases and drops again, note position.
13. Turn SLOW idle mixture screw to midway between drop points.



14. Without moving screw, carefully install black limiter on SLOW idle mixture screw so stops are centered on carburetor housing limiter stop tab. Now SLOW idle mixture screw can be fine tuned ONLY to limits allowed by black limiter cap.
15. Adjust carburetor SLOW idle stop screw to set carburetor SLOW idle speed at **1450 ± 75 rpm**.
16. Turn throttle control arm SLOW idle stop screw to set the SLOW idle speed at **1550 ± 75 rpm,** (**100 rpm** above carburetor SLOW idle speed).
17. Install front engine shroud (FC540V only).

CYLINDER COMPRESSION PRESSURE TEST

Reason:

To determine if the ACR mechanism is functioning properly.

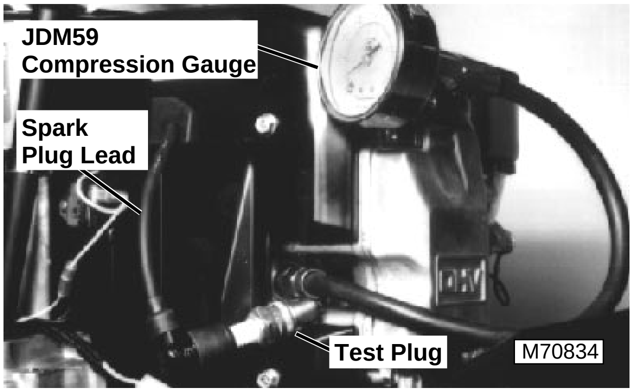
NOTE: A compression test on engines with ACR will not provide a good indication of the condition of the pistons, rings, cylinder walls, head gasket, and valves because the ACR mechanism is releasing compression pressure automatically.

Test Equipment:

- JDM59 Compression Gauge
- JDM-74A-5 Ignition Test Plug

Procedure:

1. Park machine on level surface and turn key switch OFF.
2. Raise or remove (optional) engine hood.



IMPORTANT: Spark Plug wire must be grounded or electronic ignition could be damaged.

3. Remove spark plug and ground spark plug lead to engine using JDM-74A-5 Ignition Test Plug.
4. Install JDM59 Compression Gauge.
5. Move throttle control lever to FAST idle position—throttle and choke plates must be fully open to obtain an accurate reading.

IMPORTANT: DO NOT overheat starting motor during test. Starter duty cycle is 5 seconds ON, 10 seconds OFF. Battery must be at a full state of charge—charge battery first, if necessary.

6. Crank engine until gauge needle settles out at its highest position.
7. Record pressure reading. **Minimum compression should be 483 kPa (71 psi)**.

Results:

- If compression is **above** 690 kPa (100 psi), the ACR is malfunctioning.
- If compression is **below** minimum specification, perform valve clearance test and adjustment and repeat test. (See VALVE CLEARANCE TEST AND ADJUSTMENT.)

NOTE: Compression readings slightly below minimum specification are not a problem; however, compression readings 69 kPa (10 psi) or more below minimum specification may cause hard starting—especially at colder air temperatures.

If you have some reason to suspect bad rings, valves, or other internal engine components you should perform a cylinder leakdown test to better determine the state of their condition.

VALVE CLEARANCE TEST AND ADJUSTMENT

Reason:

To obtain the proper valve clearance that is critical for the valves to seat properly and for the automatic compression release to function properly.

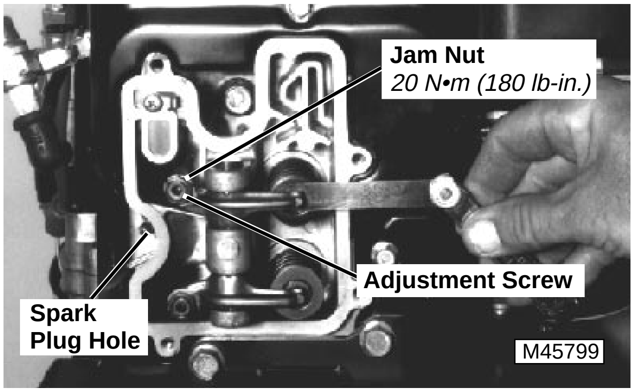
Equipment:

- Feeler Gauge (blade-type)

Procedure:

IMPORTANT: Perform valve clearance measurement or adjustment when engine is cold [15–30°C (60–85°F)]. Proper valve clearance is essential for the compression release system to function properly.

1. Park machine on level surface.
2. Turn key switch OFF. Allow engine to cool.
3. Move transaxle shift lever or forward/reverse pedals to NEUTRAL position.
4. Engage park brake.
5. Remove engine hood. (See ENGINE HOOD—Remove/Installation procedure in MISCELLANEOUS section.)
6. Remove and ground spark plug wire. Remove spark plug.
7. Remove valve cover.



8. Turn crankshaft until piston, visible in spark plug hole, is at Top Dead Center (TDC) of the compression stroke (both intake and exhaust valves will be closed).
9. Use a blade-type feeler gauge to measure valve clearance. Valve clearance should be **0.15 mm (0.006 in.)**.

Specifications:

Valve Clearance (cold). . . . . 0.15 mm (0.006 in.)
Jam Nut Torque . . . . 20 N•m (180 lb-in.)
Valve Cover
Cap Screw Torque . . . . 6.0 N•m (53.0 lb-in.)
Spark Plug Torque . . . . 20 N•m (177 lb-in.)

Results:

If valve clearance does not meet specifications, loosen the jam nut. Turn adjustment screw to adjust valve clearance to specifications. Hold screw and tighten nut to specifications. Check clearance again.

NOTE: BEFORE installing spark plug and valve cover, perform AUTOMATIC COMPRESSION RELEASE (ACR) TEST.

AUTOMATIC COMPRESSION RELEASE (ACR) TEST

Reason:

To determine if the ACR is opening the exhaust valve.

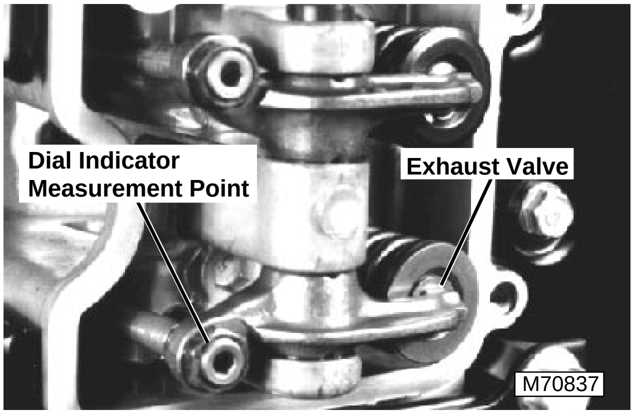
Test Equipment:

- Dial Indicator

Procedure:

IMPORTANT: Perform ACR movement measurement when engine is cold [15–30°C (60–85°F)]. Proper ACR movement is essential for the compression release system to operate correctly.

1. Immediately after adjusting valves, while rocker arm cover and spark plug are removed, rotate crankshaft slowly to observe ACR operation.



2. The exhaust valve must open (depress) briefly just after the intake valve closes.
3. Use a dial indicator to measure exhaust valve ACR movement. Minimum exhaust valve ACR movement should be **0.25 mm (0.010 in.)**.

Results:

- If the exhaust valve does not open or depress properly, the ACR tab is faulty.

CRANKCASE VACUUM TEST

NOTE: This test can be performed using either of the following test kit procedures.

Reason:

To measure the amount of crankcase vacuum to ensure the crankcase is not pressurized. Pressure build-up in the crankcase causes oil leakage by forcing oil past the seals and gaskets and through the breather into the carburetor.

Test Equipment:

- JT05697 Manometer kit

or

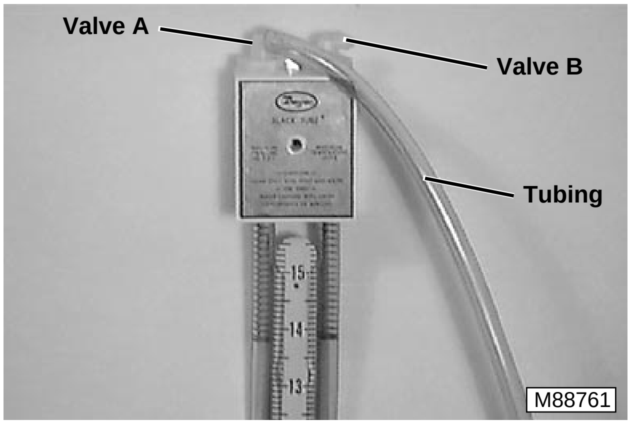
- JT-3503 Crankcase Vacuum Gauge Test Kit

U-Tube Manometer Test Procedure:

IMPORTANT: DO NOT attach manometer to engine until indicated in procedure. Connecting manometer before starting the engine will cause water in the manometer to be drawn into the crankcase.

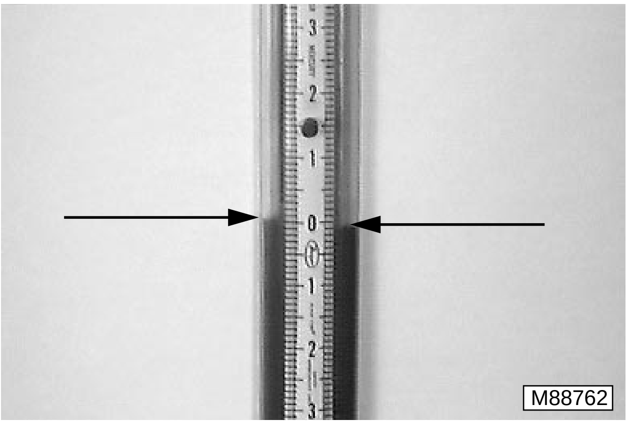
1. Park machine on level surface and raise engine hood.
2. Remove dipstick and inspect filler cap, O-ring, and dipstick tube for cracks or thread damage that may cause leakage. Replace parts as necessary.
3. Install dipstick. Remember that the engine will have to be warm before test is performed, and that test must be run at fast idle.
4. Attach manometer magnets to nearby metal surface so manometer is upright and tubing reaches engine dipstick.

IMPORTANT: DO NOT use more than 3 ft. of manometer tubing or readings will be inaccurate.



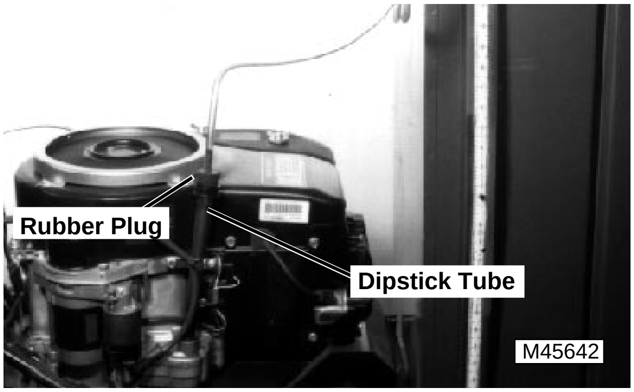
5. Open valves (A) and (B) on manometer and connect tubing to valve (A).
6. Install appropriate size plug with barbed fitting in dipstick tube.

IMPORTANT: On 17 HP Kawasaki engines, #5 rubber plug in test kit must be cut in half for proper seal in dipstick opening or false reading will be obtained.



7. Set manometer to zero by sliding ruled scale so “0” mark is at point where water level is even on both sides of U-tube.
8. Start engine, move throttle to fast idle and allow engine to reach operating temperature.

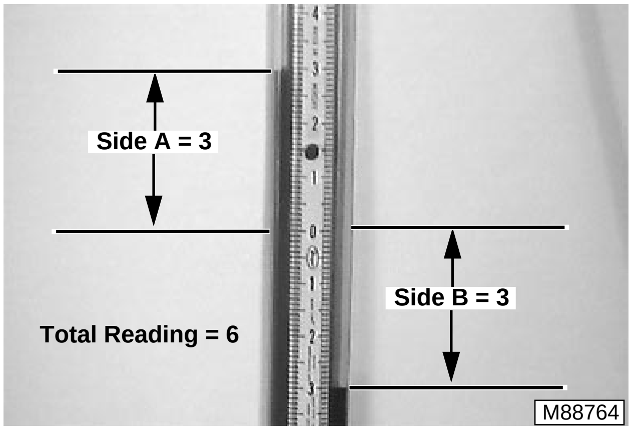
IMPORTANT: Engine MUST BE at operating temperature for accurate readings.



9. Quickly remove dipstick and insert rubber plug in dipstick opening.

⚠ CAUTION

Keep hands away from moving parts and hot engine surfaces.

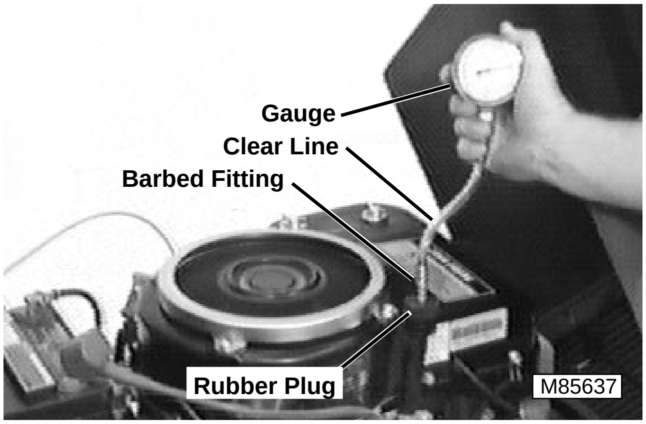


10. Record vacuum reading on manometer but **DO NOT TURN ENGINE OFF!** Reading is calculated by adding (A) and (B) water movement from "0" mark. **Manometer should indicate a minimum vacuum of 25 mm (1.0 in.) of water movement.**

NOTE: Negative pressure vacuum is recorded when water level is higher on side with tubing connected to engine, side (A). Positive pressure is recorded when water level is higher on atmospheric (open-to-air) side (B). Positive pressure is NOT WANTED as it indicates a pressurized crankcase causing oil leakage.

11. **WITH ENGINE RUNNING**, repeat test at least three times for accuracy. To repeat test, remove the manometer tubing only from top of manometer at valve (A). **DO NOT** remove tubing from engine. Reset manometer to zero and reattach tubing to valve (A). Record vacuum reading each time.
12. After testing, remove tubing from manometer at valve (A) **BEFORE** stopping engine.
13. Move throttle lever to SLOW idle, stop engine, and remove plug from dipstick opening. Install dipstick.

Crankcase Vacuum Gauge Test Procedure:



1. Complete Steps 1–2 in U-Tube Manometer test procedure.
2. Install appropriate size plug in dipstick tube. (Some engines will require that #5 plug be cut in half horizontally to get a tight seal.)

IMPORTANT: DO NOT make connection between test gauge and rubber plug BEFORE engine is running at FAST idle or gauge damage may result.

After test reading is made, DO disconnect test gauge WHILE engine is running at FAST idle to prevent damage to gauge.

3. Hold finger over rubber plug hole to keep oil from spraying out. Start engine and run at FAST idle.
4. Connect gauge, clear line, and barbed fitting to rubber plug.
5. Record crankcase vacuum reading. Gauge should show a **minimum vacuum of 25 mm (1.0 in.) of water movement**.
6. Disconnect barbed fitting, clear line, and gauge from rubber plug while engine is running at FAST idle. Hold finger over rubber plug hole to keep oil from spraying out.
7. Move throttle to SLOW idle and turn engine OFF.
8. Remove rubber plug and install dipstick.

Results:

- Cranckcase reading should show a minimum vacuum of **25 mm (1 in.)** of water movement. Check the following if reading is less than minimum specification.
  - Breather reed valve clearance and condition.
  - Breather port for obstruction.
  - Seals and gaskets for leakage, including valve cover gasket.
  - Rings, piston, and cylinder bore for wear or damage.

ENGINE OIL PRESSURE TEST

Reason:

To verify if the engine has enough oil pressure to lubricate internal components.

Test Equipment:

- JT03344 Pressure Gauge Assembly
- JT03017 Hose Assembly
- JT03338 90° Elbow Fitting

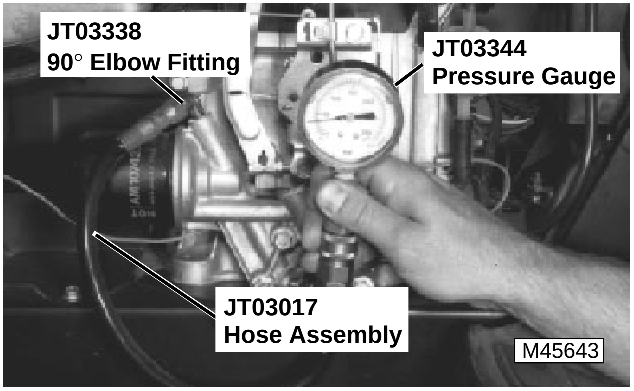
Procedure:

1. Park machine on level surface.
2. Turn key switch OFF. Allow engine to cool.
3. Move transaxle shift lever or forward/reverse pedals to NEUTRAL position.
4. Engage park brake.
5. Raise engine hood.

CAUTION

Engine components are HOT. Be careful not to touch while making adjustments.

6. Check engine oil level, bring level to full mark.
7. Disconnect oil pressure switch wiring lead and remove oil pressure switch.



8. Install JT03338 90° Elbow Fitting, JT03017 Hose Assembly and JT03344 Pressure Gauge Assembly.
9. Monitor oil pressure while cranking engine. If no or very low oil pressure is present, discontinue cranking engine. Determine and correct cause before running engine.

IMPORTANT: If pressure reading is below 69 kPa (10 psi) at FAST idle, STOP ENGINE IMMEDIATELY and determine cause.

10. Start and run engine at MEDIUM idle for five minutes to heat engine oil to normal operating temperature.
11. Run engine at FAST idle (3350 ± 100 rpm), then record oil pressure reading. Oil pressure should read a **minimum of 240 kPa (35 psi).**
12. Run engine at SLOW idle (1550 ± 75 rpm), then record oil pressure reading. Oil pressure should be a **minimum of 20.68 kPa (3 psi)**.

NOTE: Normal over-relief oil pressure is approximately 411 kPa (60 psi). Minimum oil pressure specification at FAST or SLOW idle indicates engine wear.

Results:

- If oil pressure is BELOW specifications, inspect or replace the following:
  - Oil pressure relief valve for broken or worn spring.
  - Oil pressure relief valve for stuck or damaged valve.
  - Worn or damaged oil pump.
  - Oil filter plugged.
  - Oil pump suction screen or oil passages plugged.
  - Excessive wear of connecting rod and main bearing journals.

FUEL PUMP TESTS

Reason:

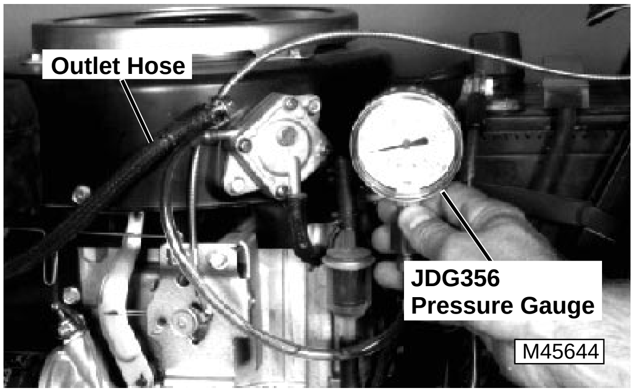
To check condition of fuel pump and determine fuel pressure and flow.

Test Equipment:

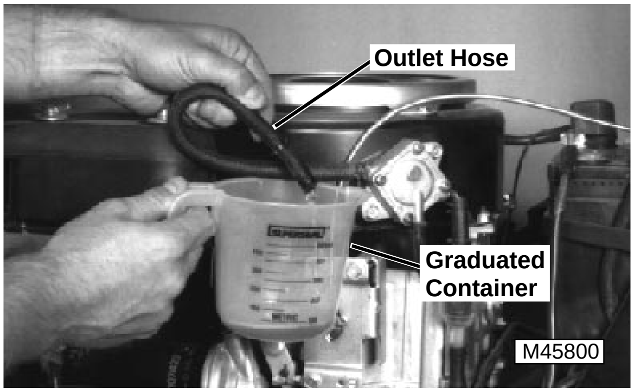
- JDG356 Pressure Gauge
- Graduated Container

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Move transaxle shift lever or forward/reverse pedals to NEUTRAL position.
4. Engage park brake.
5. Raise engine hood.
6. Make sure fuel tank is at least 1/4 full with fresh fuel.
7. Start engine and run at SLOW idle (1550 ± 75 rpm) for one minute to fill carburetor with fuel.
8. Stop the engine.



9. Disconnect and plug fuel pump outlet hose.
10. Connect JDG356 Pressure Gauge hose to fuel pump outlet.
11. Start and run engine at FAST idle (3350 ±100 rpm) for 15 seconds. Minimum pressure should be **6.12 kPa (0.90 psi)**.
12. Stop engine.
13. Remove pressure gauge and connect fuel pump outlet hose to fuel pump.



14. Disconnect fuel pump outlet hose from carburetor and place it in graduated container.
15. Start and run engine at FAST idle (3350 ±100 rpm) for 15 seconds, then stop engine and record container measurement. Minimum flow should be **55 mL/15 seconds (1.8 oz./15 seconds)** for FC420V or **65 mL/15 seconds (2.2 oz./15 seconds)** for FC540V.

Results:

- If fuel pressure and/or flow does not meet specifications, check the following:
  - Fuel lines, filter, shut-off valve, and fuel tank cap for restrictions.
  - Clean and inspect fuel pump.

SPARK TEST

Reason:

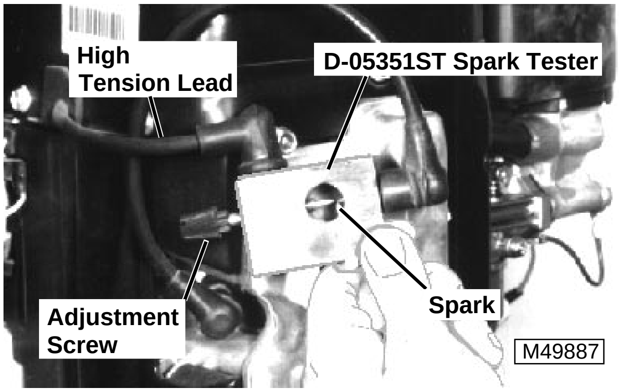
Check overall condition of ignition system.

Test Equipment:

- D-05351ST Spark Tester

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Move transaxle shift lever or forward/reverse pedals to NEUTRAL position.
4. Engage park brake.
5. Disengage PTO.
6. Raise engine hood.



7. Disconnect high tension lead from spark plug.
8. Connect D-05351ST Spark Tester to spark plug.
9. Connect high tension lead to Spark Tester.

IMPORTANT: Do not adjust Spark Tester gap beyond 5.0 mm (0.200 in.) (5 turns), as damage to ignition components could occur.

10. Adjust spark tester gap to **4.2 mm (0.166 in.) (4 turns)** with adjustment screw.
11. Move key switch to RUN position.
12. Spin engine with starter and watch spark at Spark Tester. If engine will start, watch spark with engine running. A steady, strong, blue spark should be observed.

Results:

- If spark is weak, or no spark is present, install a new spark plug and repeat test.
- If spark is still weak, or no spark is present, run tests on individual components to find the cause of the malfunction.

SPARK PLUG GAP ADJUSTMENT

Reason:

To ensure spark plug air gap is within specification.

Test Equipment:

- Wire Feeler Gauge

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Move transaxle shift lever or forward/reverse pedals to NEUTRAL position.
4. Engage park brake.

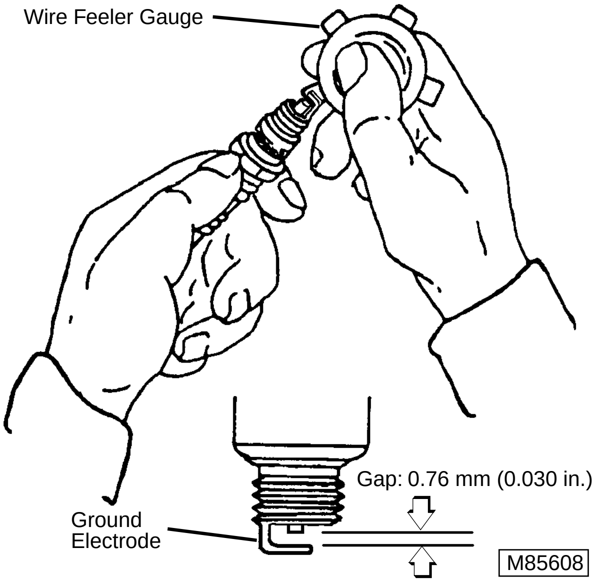
⚠ CAUTION

Engine components are HOT. Be careful not to touch, especially the exhaust pipe or muffler while making adjustments.

5. Remove spark plug.

IMPORTANT: Do not clean spark plug with sand paper or abrasives. Engine scoring can result.

6. Scrape or wire-brush deposits from spark plug.
7. Inspect spark plug for:
- Cracked porcelain
- Pitted or damaged electrodes



8. Check spark plug gap using a wire feeler gauge. Set gap to **0.76 mm (0.030 in.)**.
9. Install and tighten spark plug to **20 N•m (177 lb-in.)**.

MAGNETO IGNITION COIL RESISTANCE TEST

ALL ENGINES PRIOR TO AND INCLUDING:

FC420V-DS10 . . . . (—FC420VB50632)
FC540V-DS15 . . . . (—FC540VA00384)

Reason:

Test overall condition of magneto ignition coil.

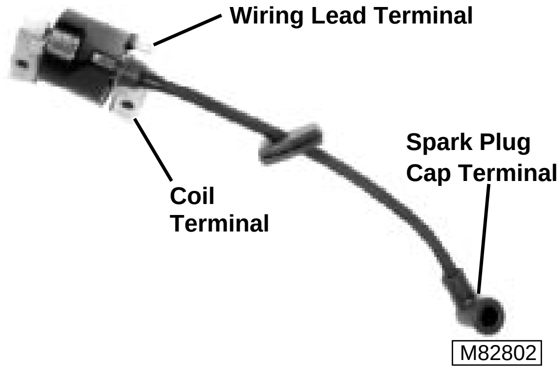
Test Equipment:

- JT05791 Digital Multimeter

Procedure:

NOTE: It is assumed that prior to performing this test, the air gap and power circuit up to the coil have been verified and are within specifications.

Coil removed from engine for clarity purposes only—it can be tested installed on the engine.



1. Measure resistance between wiring lead terminal and coil terminal. If resistance is **not within 0.48—0.72 ohms**, replace magneto ignition coil. (See IGNITION COIL—Removal/Installation.)
2. Measure resistance between spark plug cap terminal and coil terminal. If resistance is **not within 10.9—16.3 K ohms**, replace magneto ignition coil. (See IGNITION COIL—Removal/Installation.)

IGNITOR MODULE TEST

ALL ENGINES PRIOR TO AND INCLUDING:

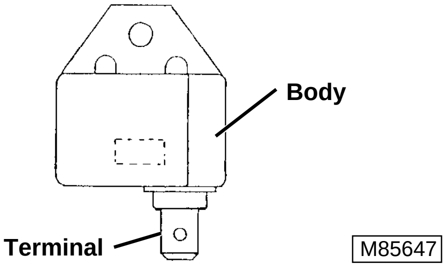
FC420V-DS10 . . . .(—FC420VB50632)
FC540V-DS15 . . . .(—FC540VA00384)

Reason:

Test condition of ignitor.

Procedure:

1. Be sure magneto ignition coil is good before proceeding with Step 2; otherwise, replacement ignitor module may be damaged. (See MAGNETO IGNITION COIL RESISTANCE TEST.)



NOTE: Many electrical problems are due to poor connections or grounds. Inspect all connections and grounds to ensure good test results.

2. Inspect and clean ignitor module terminal and wiring lead spade connector.
3. Check that ignitor module body is properly grounded.
4. Start engine.

Results:

- If engine DOES NOT start, replace ignitor module with a known good one. (See IGNITION MODULE—Replacement.)
- If new ignitor module DOES NOT solve the problem, test all other ignition system components.

MAGNETO IGNITION COIL/IGNITOR MODULE RESISTANCE TEST

ALL ENGINES AFTER AND INCLUDING:

FC420V-DS10 . . . . (FC420VB50633—)
FC540V-DS15 . . . . (FC540VA00385—)

Reason:

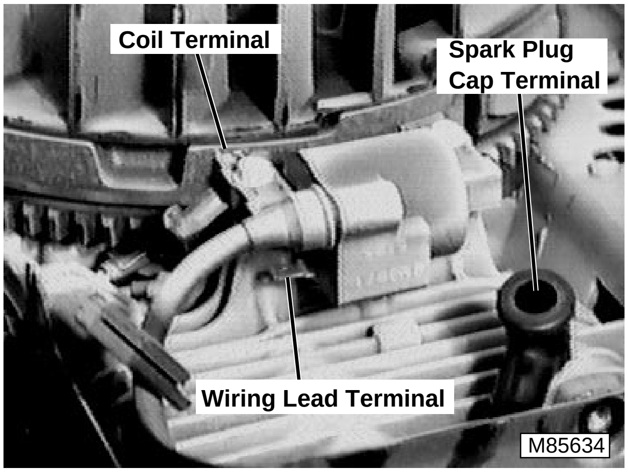
Test condition of magneto ignition coil/ignitor module.

Test Equipment:

- JT05791 Digital Multimeter

Procedure:

NOTE: It is assumed that prior to performing this test, the air gap and power circuit up to the coil have been verified and are within specifications.



1. Measure resistance between wiring lead terminal and coil terminal. If resistance is **not within 0.48—0.72 ohms**, replace magneto ignition coil/ignitor module. (See IGNITION COIL—Removal/ Installation.)

NOTE: Early model engines were equipped with standard spark plug cap. Late models have 5 K ohm resistor cap.

2. Measure resistance between spark plug cap terminal and coil terminal. If resistance is **not within 8.7—13.1 K ohms ± 10% (standard cap) or 18.0—19.0 K ohms ± 10% (resistor cap)**, replace magneto ignition coil/ignitor module. (See IGNITION COIL—Removal/Installation.)

NOTE: Magneto ignition coil/ignitor module will not retro-fit on earlier engines due to the reversed polarity of the flywheel magnet.

CRANKSHAFT END PLAY TEST AND ADJUSTMENT

Reason:

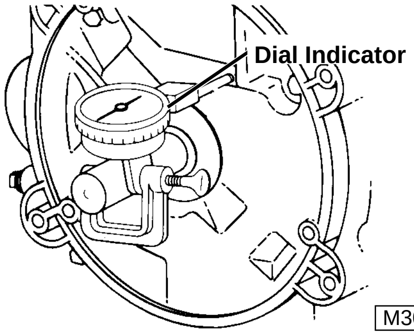
To ensure crankshaft or case halves are within wear tolerances.

Equipment:

- Dial Indicator

Test Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Move transaxle shift lever or forward/reverse pedals to NEUTRAL position.
4. Engage park brake.
5. Remove mower deck. (See procedure in ATTACHMENTS section.)
6. Remove PTO clutch assembly. (See procedure in ELECTRICAL section.)



M30048

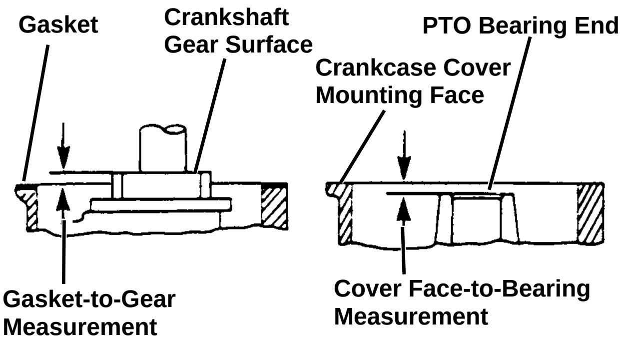
7. Measure end play using a dial indicator. Move crankshaft in and out. Crankshaft end play specification is **0.09—0.22 mm (0.004—0.009 in.)**.

Results:

- If not within specifications, perform following Adjustment procedure.

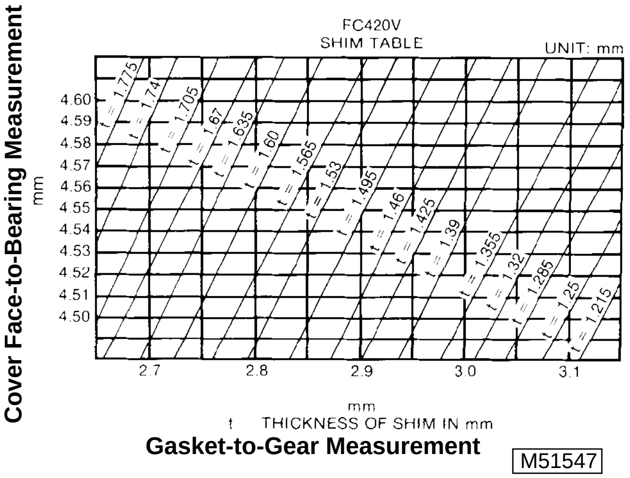
Adjustment Procedure:

1. Remove crankcase cover. (See CRANKCASE COVER—Removal/Installation.)

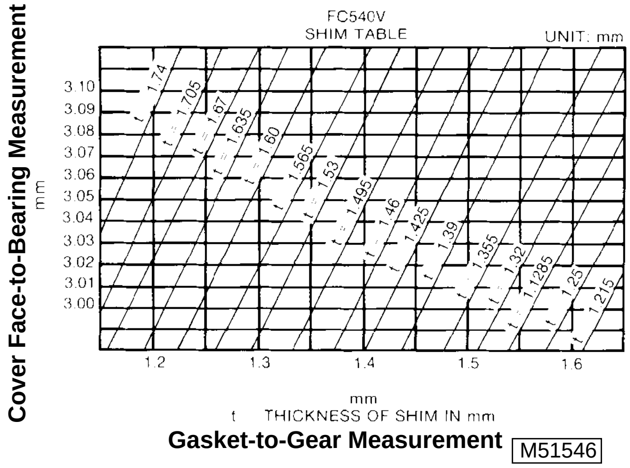


M51545

2. With gasket installed on crankcase, measure from gasket surface to crankshaft gear surface. Record measurement.
3. Measure from crankcase cover mounting face to PTO bearing end. Record measurement.



M51547



M51546

4. Locate measurement on table. Follow lines to where recorded measurements intersect. Choose the next smaller shim from the shim table.
5. Install shims on end of crankshaft.

STARTER NO LOAD AMPERAGE DRAW AND RPM BENCH TEST

Reason:

To determine if starter is binding or has excessive amperage draw under no-load.

Test Equipment:

- JT02153 Current Clamp-on Tester with JT05791 Analog Digital Multimeter (Fluke 23)
- JT07270 Digital Pulse Tachometer
- Jumper Cables
- Jumper Wire

Procedure:

IMPORTANT: Complete this test in 20 seconds or less to prevent starter damage.

NOTE: *Check that battery is fully charged and of proper size to ensure accuracy of test.*

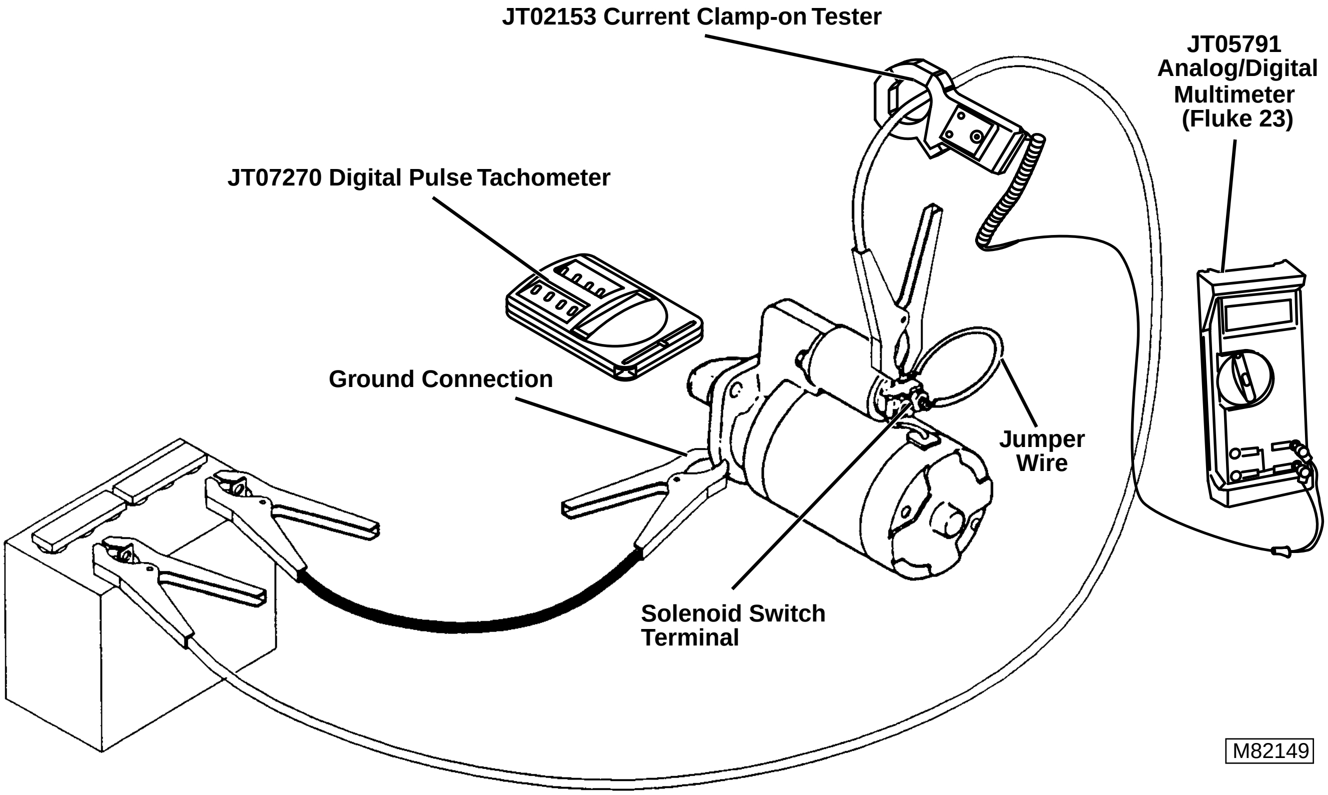
1. Remove starter from engine and clamp in bench vise. (See STARTER–Removal/Installation.)
2. Connect jumper cables to a 12-volt battery.
3. Connect positive (+) cable to solenoid battery terminal.
4. Connect negative (–) cable to starter body.
5. Attach current gun to positive (+) cable.
6. Use a jumper wire to briefly connect solenoid battery terminal to solenoid switch terminal. Starter should engage and run.
7. Read and record starter amperage and rpm.

Results:

- If solenoid “clicks” or chatters and motor does not turn, replace solenoid.
- If pinion gear engages and motor does not turn, repair or replace starter motor.
- If starter engages and runs, but amperage is **more than 50 amps at 6000 rpm**, repair or replace starter.
- If free-running rpm is **less than 6000 rpm**, repair or replace starter.

NOTE: *Starter repair is limited to brushes, end caps, and starter drive. Fields in starter are permanent magnets and are not serviceable. If housing or armature are damaged, replace starter.*

NOTE: *JT05712 Current Gun has been discontinued. If your shop does not use a current gun, substitute the JT02153 Current Clamp-on Tester with JT05791 Analog/Digital Multimeter (Fluke 23).*



REPAIR

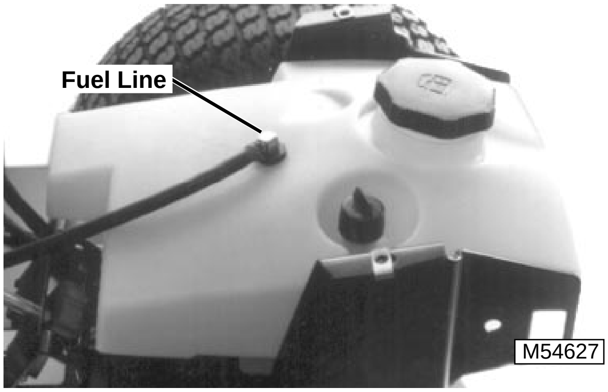
FUEL TANK

Removal/Installation

1. Lower mower deck to the ground.
2. Remove fender deck. (See procedure in MISCELLANEOUS section.)

⚠ CAUTION

Gasoline vapor is explosive. Do not expose to spark or flame. Serious personal injury can result.



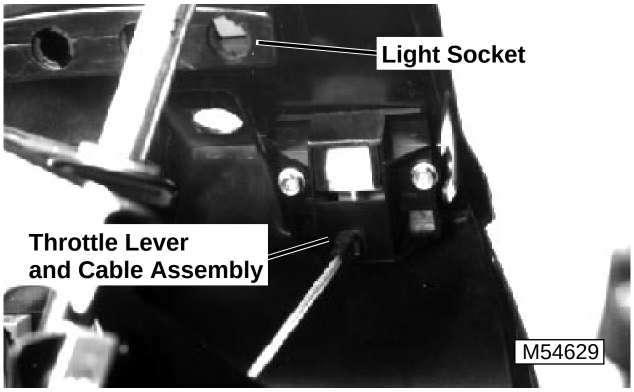
3. Disconnect fuel line.
4. Remove fuel tank.
5. Inspect fuel tank for wear or damage. Replace if necessary.

Installation is done in the reverse order of removal.

THROTTLE CONTROL LEVER AND CABLE

Removal/Installation

1. Remove steering wheel. (See procedure in STEERING section.)
2. Remove battery.
3. Disconnect throttle control cable at engine.
4. Remove park brake lever and linkage. (See procedure in BRAKES section.)



5. Remove indicator lights from sockets.
6. Remove four cap screws and washers securing instrument panel.
7. Remove two cap screws and throttle control lever and cable assembly.

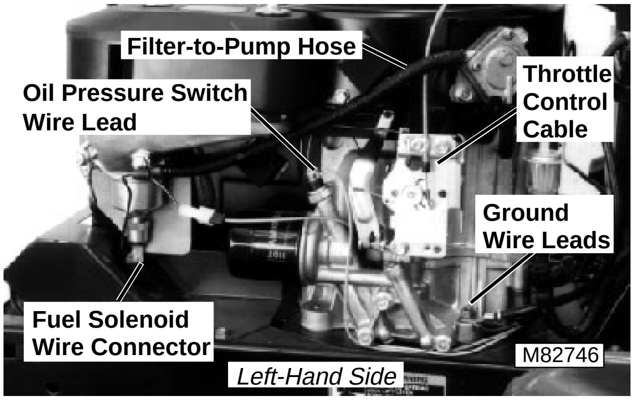
Installation is done in the reverse order of removal.

- Adjust throttle cable and choke plate. (See THROTTLE CABLE TEST AND ADJUSTMENT and CHOKE PLATE TEST AND ADJUSTMENT.)

ENGINE

Removal/Installation

1. Remove muffler. (See MUFFLER—Removal/ Installation.)
2. Remove engine hood. (See procedure in MISCELLANEOUS section.)
3. Disconnect negative (–) battery cable at battery.
4. Drain engine oil. Crankcase capacity with filter is approximately **1.6 L (3.4 U.S. pt)** for FC420V or 1.9 L (4.0 U.S. pt.) for FC540V.
5. Remove fuel pump shroud (GT262 and GT275).

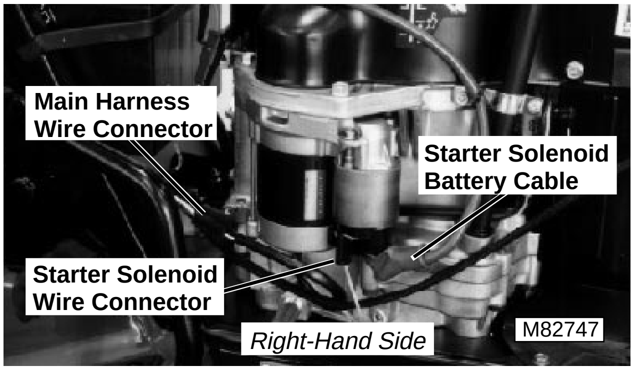


Left-Hand Side

6. Disconnect filter-to pump hose at fuel pump, cap hose.
7. On left-hand side of engine, label and disconnect the following:
   - Fuel solenoid wire connector.
   - Ground wire leads.
   - Oil pressure switch wire lead.
   - Throttle control cable.

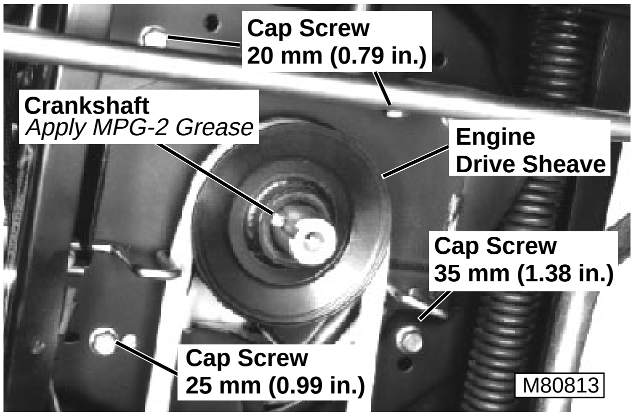
⚠ CAUTION

Gasoline vapor is explosive. Do not expose to spark or flame. Serious personal injury can result.



Right-Hand Side

8. On the right-hand side of engine, disconnect the following:
   - Starter solenoid wire connector.
   - Main harness wire connector.
   - Starter solenoid battery cable
9. Remove PTO clutch. (See procedure in ELECTRICAL section.)
10. Engage park brake to relieve tension from drive belt.



11. Remove engine drive sheave and key.
12. Remove cap screws.
13. Remove engine.

Installation is done in the reverse order of removal.

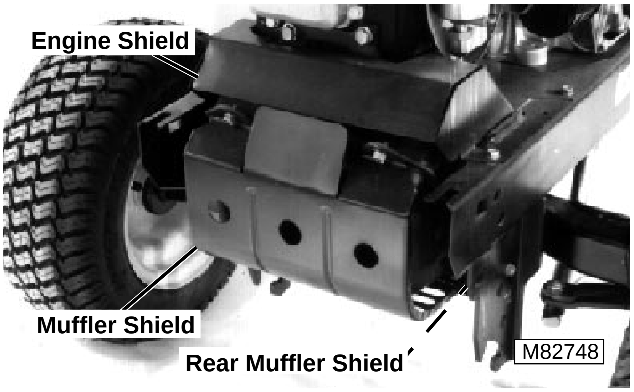
- Tighten engine mounting cap screws to **16.7–22.6 N•m (148.0–200.0 lb-in.)**.
- Apply MPG-2 grease to crankshaft before installing drive sheave and PTO clutch.
- Fill engine to proper level with oil of correct specifications. (See SPECIFICATIONS AND GENERAL INFORMATION section.)
- Adjust throttle cable and choke plate. (See THROTTLE CABLE TEST AND ADJUSTMENT and CHOKE PLATE TEST AND ADJUSTMENT.)
- Adjust belt tension. (See procedure in POWER TRAIN section.)

MUFFLER

Removal/Installation

1. Remove engine hood. (See procedure in MISCELLANEOUS section.)

> **⚠ CAUTION**
>
> **To prevent possible burns, allow engine to cool before removing muffler.**



2. Remove engine and muffler heat shields.

NOTE: On FC420V equipped models it may be necessary to remove engine mount cap screws and raise engine to access muffler manifold cap screws.

3. Remove muffler and gasket, discard gasket.

Installation is done in the reverse order of removal.

- Use new gaskets for installation.

AIR CLEANER

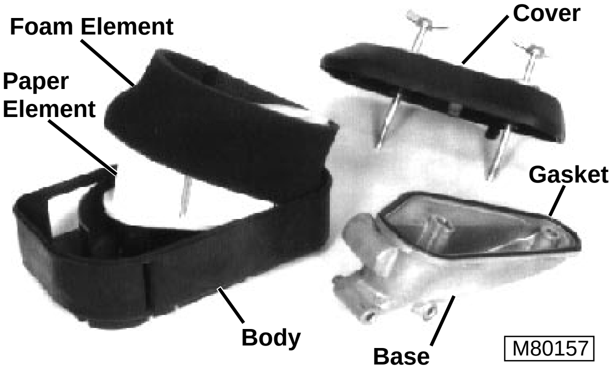
Service

IMPORTANT: Carefully remove air cleaner cover and elements. Inspect inside paper element and intake passage for signs of dust. If present, replace elements and test engine compression or inspect for damage.

Any time the air cleaner is removed, check for free choke operation during reassembly.

NOTE: Replace elements yearly or every 25 hours.

1. Remove and disassemble air cleaner.



2. Wash foam element in detergent and warm water. Rinse element thoroughly to remove all traces of detergent. Squeeze out excess water—DO NOT wring out element. Let element air dry.
3. Apply 12—15 drops of clean engine oil to foam element. Squeeze out excess oil.

IMPORTANT: Do not clean paper element with solvent or compressed air.

4. Gently tap paper element to remove dust.
5. Inspect paper element.
   - Element is still usable if you can see light through it and element appears clean.
   - Replace if oily, dirty, or damaged in any way.
6. Inspect body, gasket, and base for damage. Replace parts as necessary.
7. Assemble and install air cleaner.

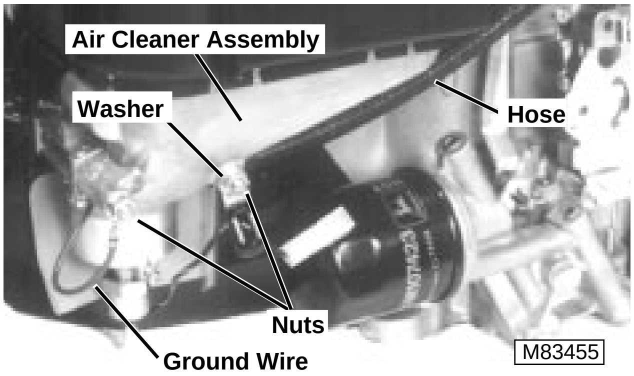
CARBURETOR

Removal/Installation

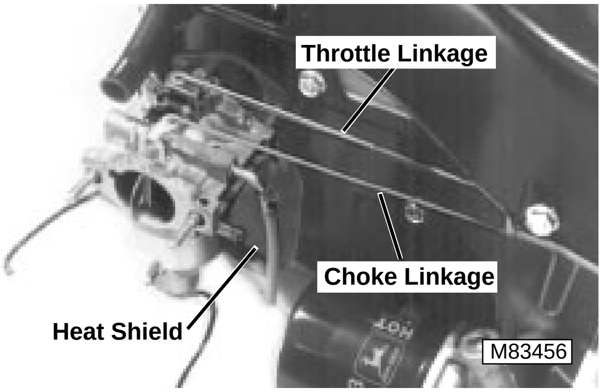
CAUTION

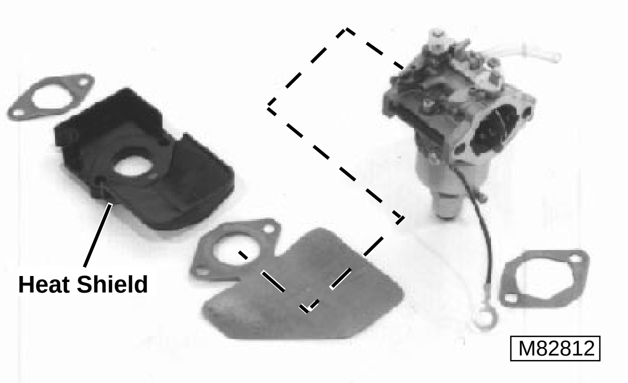
Gasoline is extremely flammable. Do not smoke. Always work in a ventilated area away from open flame or spark producing equipment; this includes equipment that utilizes pilot lights.

1. Drain fuel from carburetor.



2. Disconnect fuel hose.
3. Remove two nuts and washers.
4. Disconnect wire lead if carburetor is to be disassembled.
5. Remove air cleaner assembly. (See AIR CLEANER—Service.)





6. Separate carburetor from heat shield. Remove carburetor.
7. Disconnect choke linkage and throttle control linkage.

Installation is done in the reverse order of removal.

- Use new gaskets when installing.

Disassembly/Assembly

NOTE: For California Air Resources Board/ Environmental Protection Agency (CARB/EPA) Emissions Carburetors reference the following:

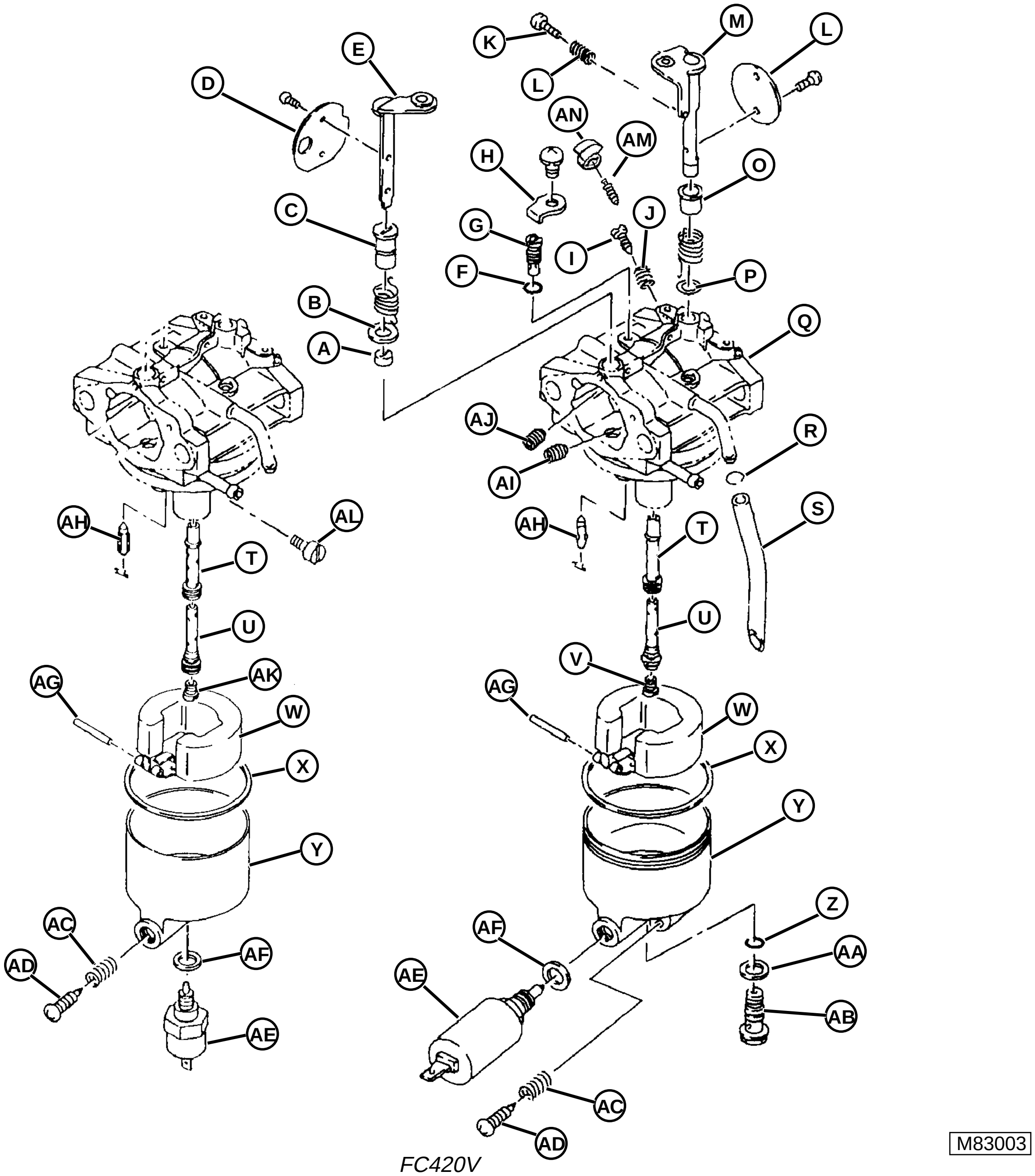
ALL ENGINES AFTER AND INCLUDING:
FC420V—ES10 . . . . (FC420VB78804–)
FC540V—ES15 . . . . (FC540VA17448–)

ATTENTION!

DO NOT attempt to repair, replace jets, or adjust the engine emissions carburetor unless you are a factory trained technician with authorization to service CARB/EPA Certified Emissions Carburetors.

IMPORTANT: There are a number of ball plugs on/ in the carburetor that should not be removed.

To remove float, use a long-nosed pliers on the deformed end of the float pin. DO NOT strike opposite end of pin. Damage to pin holder may result.

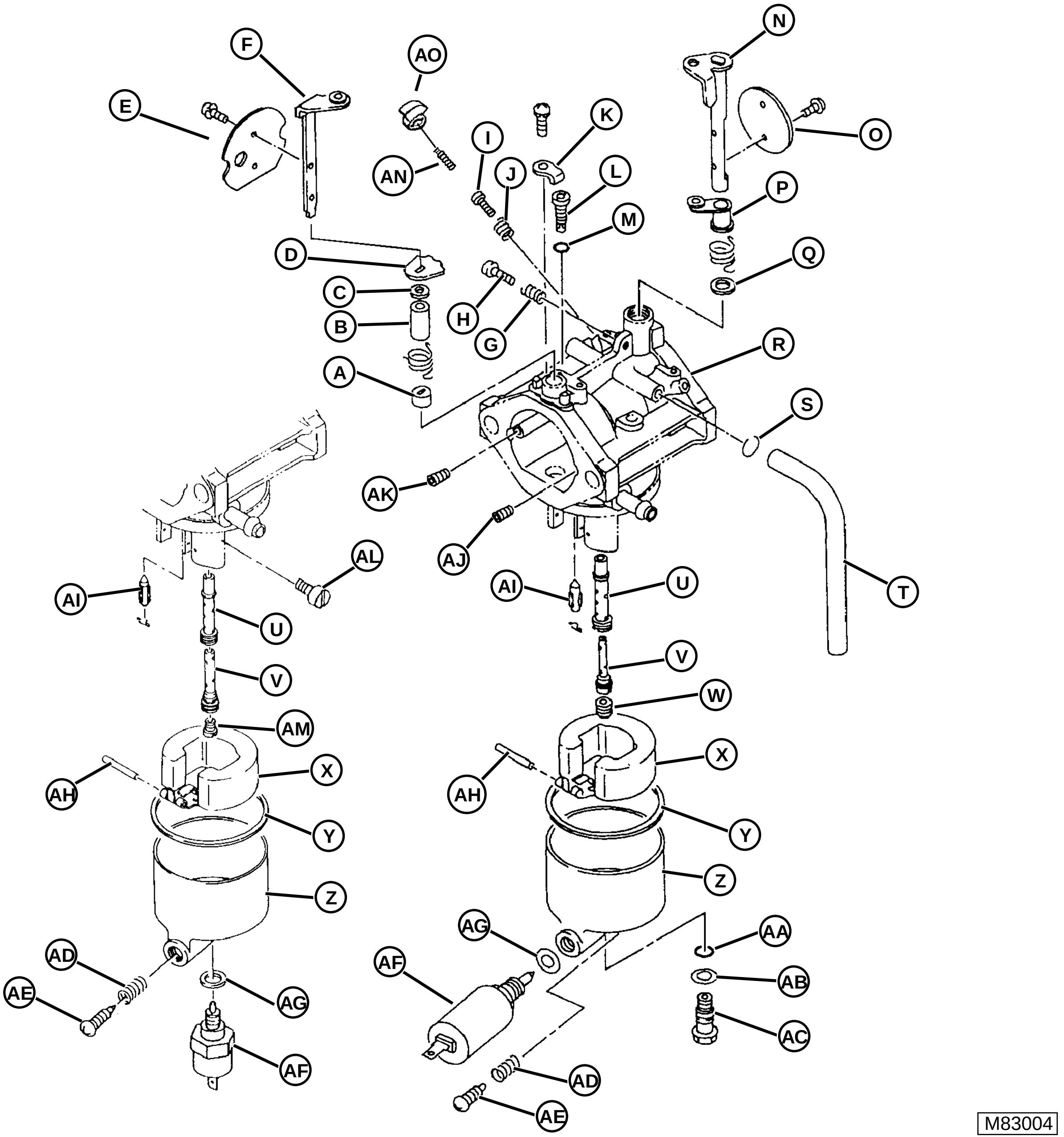


FC420V

A—Collar
B—Seal
C—Collar
D—Choke Plate
E—Choke Shaft
F—O-Ring
G—Pilot Jet-60
H—Plate
I—Slow Idle Mixture Screw
J—Spring
K—Slow Idle Stop Screw
L—Spring
M—Throttle Shaft
N—Throttle Plate
O—Ring
P—Seal
Q—Carburetor Body
R—Clamp
S—Hose
T—Main Nozzle
U—Bleed Pipe
V—Main Jet
W—Float
X—Gasket
Y—Float Chamber
Z—O-Ring
AA—Washer
AB—Plug
AC—Spring
AD—Drain Screw
AE—Fuel Shutoff Solenoid
AF—Washer
AG—Float Pin
AH—Needle Valve
AI—Main Air Jet
AJ—Pilot Air Jet
AK—Valve Seat
AL—Main Jet
AM—Slow Idle Mixture Screw (CARB/EPA)
AN—Black Limiter (CARB/EPA)

NOTE: Carburetor with vertical-mount fuel shutoff solenoid is used on late model engines.

Carburetor with horizontal-mount fuel shutoff solenoid is used on early model engines.



FC540V

A—Collar
B—Collar
C—Seal
D—Plate
E—Choke Plate
F—Choke Shaft
G—Spring
H—Slow Idle Stop Screw
I—Slow Idle Mixture Screw
J—Spring
K—Plate
L—Pilot Jet
M—O-Ring
N—Throttle Shaft
O—Throttle Plate
P—Ring
Q—Seal
R—Carburetor Body
S—Clamp
T—Hose
U—Main Nozzle
V—Bleed Pipe
W—Main Jet
X—Float
Y—Gasket
Z—Float Chamber
AA—O-Ring
AB—Washer
AC—Plug
AD—Spring
AE—Drain Screw
AF—Fuel Shutoff Solenoid
AG—Washer
AH—Float Pin
AI—Inlet Needle
AJ—Main Air Jet
AK—Pilot Air Jet
AL—Valve Seat
AM—Main Jet
AN—Slow Idle Mixture Screw (CARB/EPA)
AO—Black Limiter (CARB/EPA)

NOTE: Carburetor with vertical-mount fuel shutoff solenoid is used on late model.

Carburetor with horizontal-mount fuel shutoff solenoid is used on early model.

Clean/Inspect/Rebuild

IMPORTANT: DO NOT clean holes or passages with small drill bits or wire.

NOTE: *If all rubber or plastic parts cannot be removed for cleaning, use a cleaning solvent with a high flash point that will not damage these parts when cleaning.*

1. Remove rubber and plastic parts from carburetor. Soak all carburetor metal parts in a carburetor cleaning solution for 1/2 hour maximum.

⚠ CAUTION

Reduce compressed air to less than 210 kPa (30 psi) when using for cleaning purposes. Clear area of bystanders, guard against flying chips, and wear personal protection equipment including eye protection.

IMPORTANT: Rinse carburetor parts in warm water to neutralize corrosive action of cleaner on aluminum.

2. Rinse carburetor parts in warm water and dry with compressed air. Do not use rags or paper to dry parts; lint can plug holes and passages in carburetor.
3. Inspect all parts for wear or damage. Replace parts as necessary.

NOTE: *Float is plastic. The float cannot be adjusted. Replace if necessary.*

Main jet high altitude kits are available.

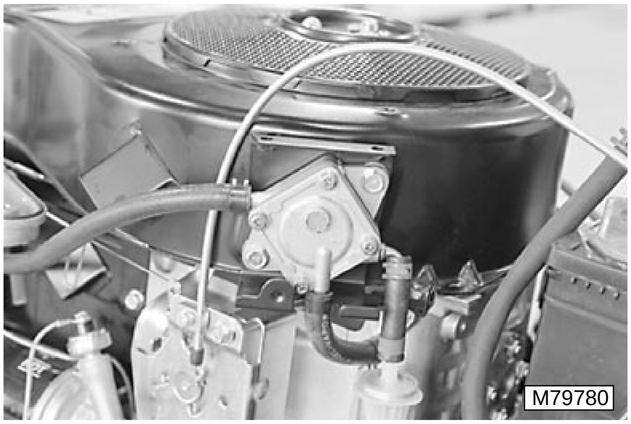
- Inspect the carburetor body for wear or damage. Verify all sealing surfaces and flanges are smooth and free of nicks or burrs. If worn or damaged, replace the float assembly and carburetor body as a set.
- Inspect the inlet needle for wear or damage. The tip should be smooth, without any grooves, scratches or cracks. If worn or damaged, replace the needle and carburetor body as a set.
- Inspect the idle mixture screw tapered end for wear or damage. Replace if necessary.

FUEL PUMP

Replacement

⚠ CAUTION

Gasoline is extremely flammable. Do not smoke. Always work in a ventilated area away from open flame or spark producing equipment; this includes equipment that utilizes pilot lights.



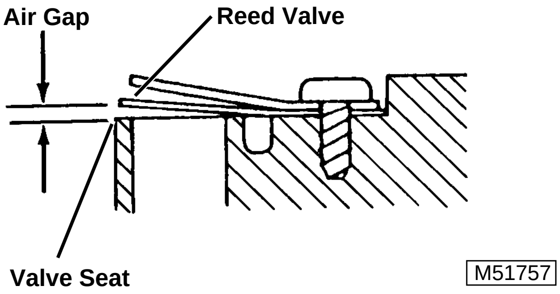
1. Remove fuel pump shroud (GT262 and GT275).
2. Disconnect fuel lines and vacuum hose.
3. Remove the following:
   - Cap screws.
   - Fiber washers (GT262 and GT275).
   - Fuel pump.
   - Fuel pump mounting plate (GT262 and GT275).

Installation is done in the reverse order of removal.

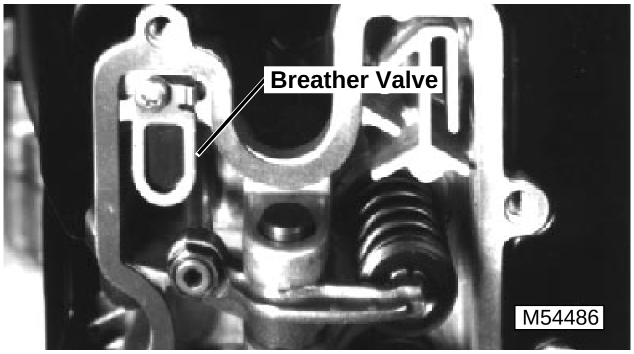
BREATHER

Inspection/Replacement

1. Remove valve cover. (See VALVE COVER ASSEMBLY—Removal/Installation.)



2. Measure air gap between reed valve and valve seat at valve tip. Air gap specification is **1—2 mm (0.040—0.080 in.)**. Replace if reed valve gap exceeds specifications.



3. Remove breather valve assembly.
4. Inspect breather valve for sticking, binding, cracks or distortion. Replace breather valve if worn or damaged.
5. Inspect valve seating surface. Surface must be free of nicks or burrs.

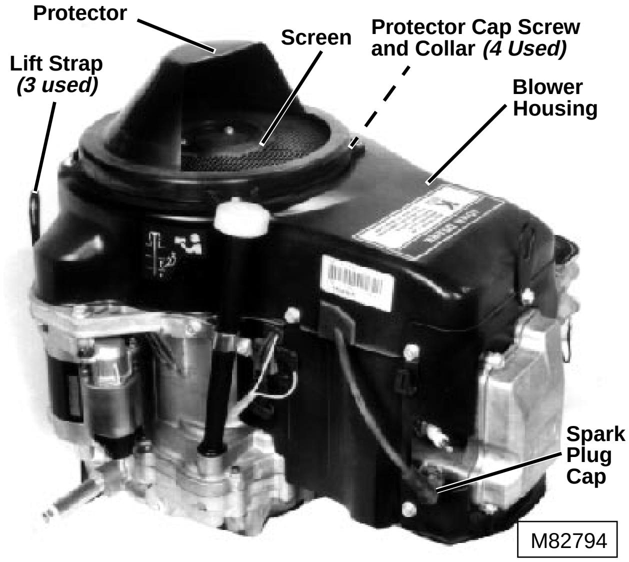
Installation is done in the reverse order of removal.

- Tighten valve cover cap screws to **6 N•m (53 lb-in.)**.

BLOWER HOUSING

Removal/Installation

GT242 Shown



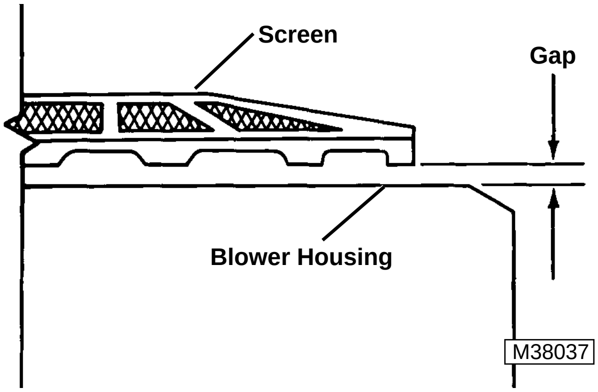
GT275 Shown

1. Disconnect spark plug cap.
2. Remove air cleaner cover and housing.
3. Remove fuel pump. (See FUEL PUMP—Replacement.)
4. Remove the following:
    - Vent cover (GT242).
    - Blower housing cap screws.
    - Lift straps (GT275).
    - Guard cap screws and guard (GT242 and GT262).
    - Protector cap screws, capscrew collars, and protector (GT275).
    - Screen mounting screws and screen.
5. Lift blower housing off engine.

Installation is done in the reverse order of removal.

- Tighten blower housing cap screws to **10 N•m (89 lb-in.)**.
- Adjust flywheel screen. (See Flywheel Screen Adjustment.)

Flywheel Screen Adjustment



M38037

1. Adjust gap between bottom edge of screen and blower housing using shims. Minimum gap is **1.5 mm (0.059 in.)**.
2. Tighten screen cap screws to **6 N•m (53 lb-in.)**.

Flywheel Screen Replacement (FC540V Only)

The FC540C Debris Screen (GT262 & GT275) has been modified to include a metal flywheel bracket and a revised design fan. If during repair, inspection reveals that the debris screen has become loose and/or the screen has cracked, order replacement parts as necessary to replace the old style fan/flywheel bracket with the revised parts.

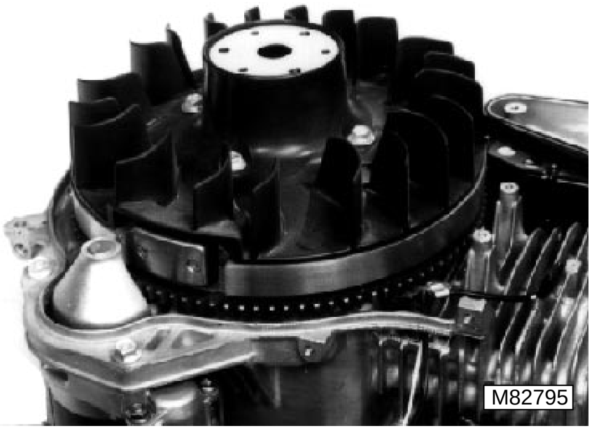
The necessary replacement parts include the following:

Part No.	Description
M131939	Revised Design Fan
M70082	Metal Bracket
19M7866	Bolts
AM109240	Debris Screen with shims

Removal/Installation

M82794

1. Disconnect spark plug cap.
2. Remove:
   - Air Cleaner cover and housing.
   - Fuel pump. (See FUEL PUMP Replacement)
   - Blower housing cap screws.
   - Lift straps (GT275).
   - Guard cap screws and guard (GT262).
   - Protector cap screws, cap screw collars and protector (GT275).
   - Screen mounting screws and screen.
3. Lift blower housing off of engine.



M82795

4. Remove fan retaining the four bolts which were removed.

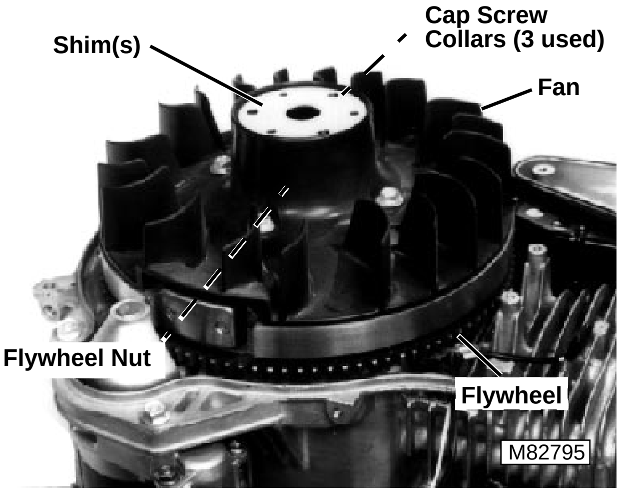
M79781

5. Install the new fan using the four bolts retained in the previous step.
6. Install the new metal bracket using three new bolts.
7. Return blower housing to engine.
8. Install the new flywheel screen. (See FLYWHEEL SCREEN ADJUSTMENT.)
9. Replace:
   - Protector cap screws, cap screw collars and protector (GT275).
   - Guard cap screws and guard (GT262).
   - Lift straps (GT275).
   - Blower housing cap screws. (TIGHTEN TO 10 N•m (89 lb-in.)).
   - Fuel pump. (See FUEL PUMP Replacement.)
   - Air cleaner cover and housing.
10. Reconnect spark plug cap.

FLYWHEEL

Removal/Installation

1. Remove blower housing. (See BLOWER HOUSING—Removal/Installation.)



FC420V/Early Model FC540V Configuration

2. Remove shim(s).
3. Remove cap screw collars—FC420V and early model FC540V or metal flywheel bracket—late model FC540V.

NOTE: *Early model FC540V engines are not equipped with metal flywheel bracket.*

4. Remove fan.
5. Hold flywheel and remove mounting nut.
6. Remove flywheel using a flywheel puller.

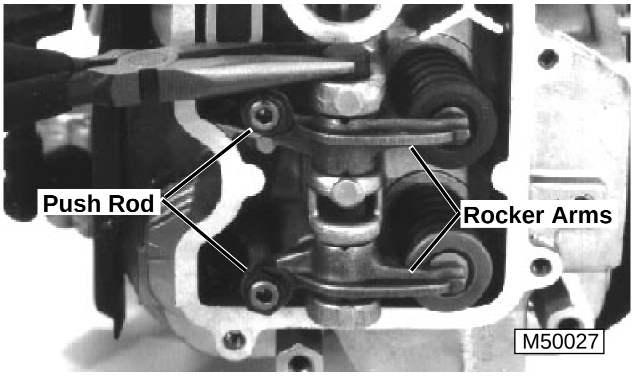
Installation is done in the reverse order of removal

- Tighten fan cap screws to **10 N•m (89 lb-in.)**.
- Tighten flywheel nut to **137 N•m (101 lb-ft.) FC420V** or **172 N•m (127 lb-ft.)—FC540V**.
- Tighten flywheel bracket cap screws to **12 N•m (102 lb-in.)**.
- Adjust coil air gap. (See MAGNETO IGNITION COIL or MAGNETO IGNITION COIL/IGNITOR MODULE.)
- Test flywheel magnet. (See procedure in ELECTRICAL section.)

ROCKER ARM ASSEMBLY

Removal/Installation

1. Remove valve cover.
2. Turn crankshaft until piston is at highest position on compression stroke (both intake and exhaust valves will be closed).



3. Remove rocker shaft and arms.

IMPORTANT: Mark push rods for reassembly in original locations.

4. Remove push rods.
5. Inspect all parts for wear or damage. (See Inspection procedure.)

Installation is done in the reverse order of removal.

IMPORTANT: Align rocker arms over push rods during assembly.

- Adjust valve clearance. (See VALVE CLEARANCE TEST AND ADJUSTMENT.)

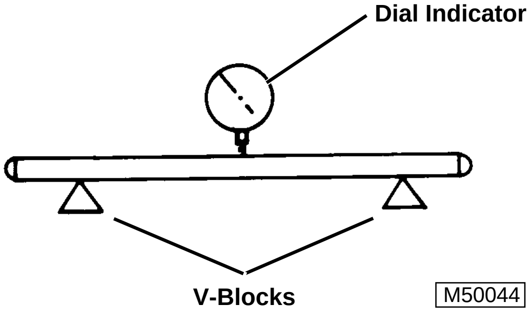
Inspection


M50028

- Measure outer diameter of rocker arm shaft. Replace if shaft diameter measures **less than 12.94 mm (0.509 in.)**.


M50029

- Measure inside diameter of rocker arm bearing. Replace bearing if inside diameter is **greater than 13.07 mm (0.515 in.)**.



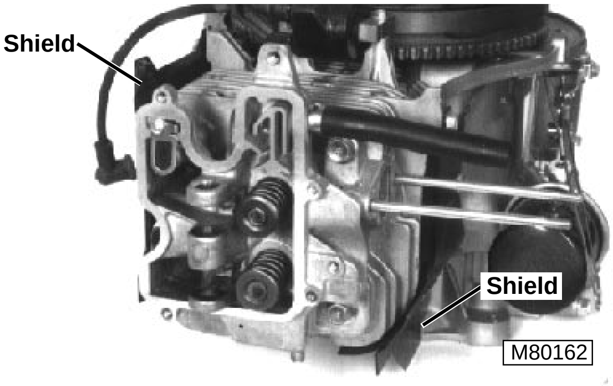
M50044

- Inspect push rod for bend using V-blocks and a dial indicator. Turn rod slowly and read variation on indicator. Replace if variation is **greater than 0.30 mm (0.012 in.)**.

CYLINDER HEAD AND VALVES

Removal/Installation

1. Remove valve cover, rocker arm assembly, and push rods. (See ROCKER ARM ASSEMBLY—Removal/Installation.)
2. Remove blower housing. (See BLOWER HOUSING—Removal/Installation.)
3. Remove muffler. (See MUFFLER—Removal/Installation.)
4. Remove carburetor. (See CARBURETOR—Removal/Installation.)
5. Remove spark plug.



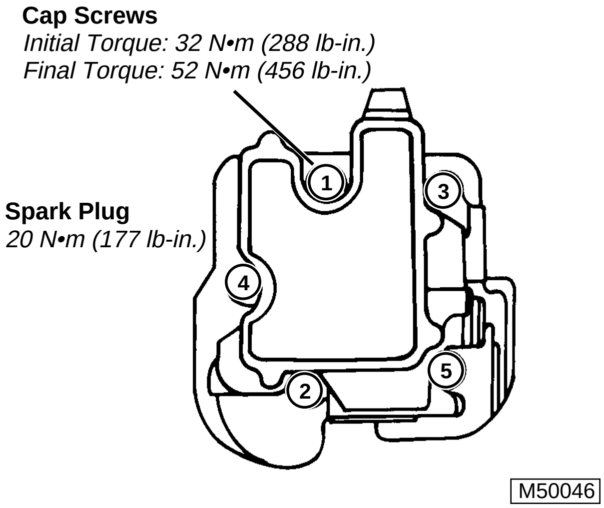
M80162

6. Remove shields.
7. Remove cylinder head assembly and gasket.
8. Disassemble and inspect cylinder head and valves. (See Disassembly/Assembly and Inspection procedures.)

Installation is done in the reverse order of removal.

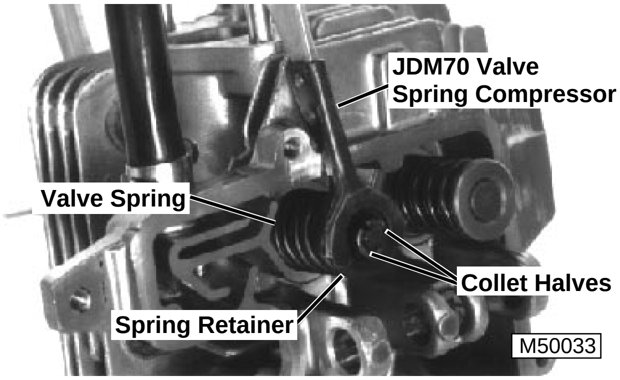
IMPORTANT: Gasket surfaces are coated with sealant. Do not damage surfaces or gasket during installation.

Torque should be applied in the sequence shown, at 7 N•m (62 lb-in.) increments, with an initial setting of 32 N•m (288 lb-in.) up to a final setting of 52 N•m (456 lb-in.).

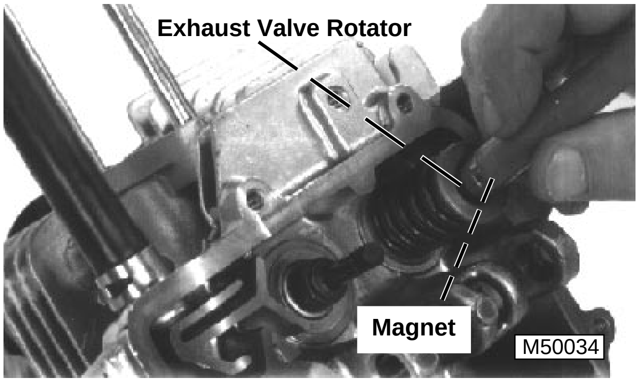


- Use new gaskets for installation.
- Adjust valve clearance. (See VALVE CLEARANCE TEST AND ADJUSTMENT on page 3-32.)

Disassembly/Assembly

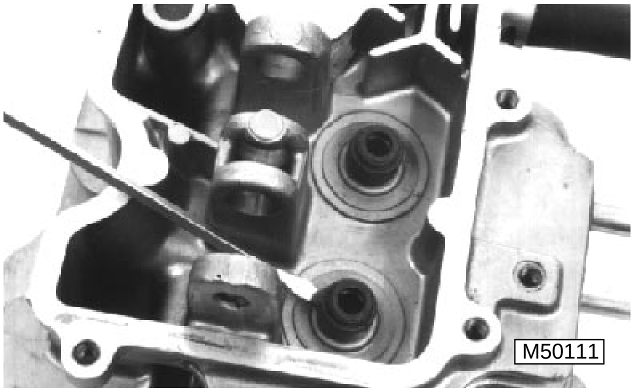


1. Compress intake valve spring with JDM70 Valve Spring Compressor and remove collet halves.
2. Remove spring retainer and spring.
3. Remove exhaust valve rotator with a magnet.
4. Support exhaust valve from below and press down on spring retainer.
5. Remove retainer, spring, and valves.



IMPORTANT: Bottom spring retainer can only be removed with valve stem seal. Removal of retainer or seal damages stem seal. Inspect seal. If seal is not damaged, do not remove it.

6. If necessary to replace stem seal, remove with screwdriver.



7. Inspect springs, valves, guides and seals for wear or damage. (See Inspection and Valve Guide Replacement procedures and ANALYZE VALVES.)

Assembly is done in the reverse order of disassembly.

Inspection

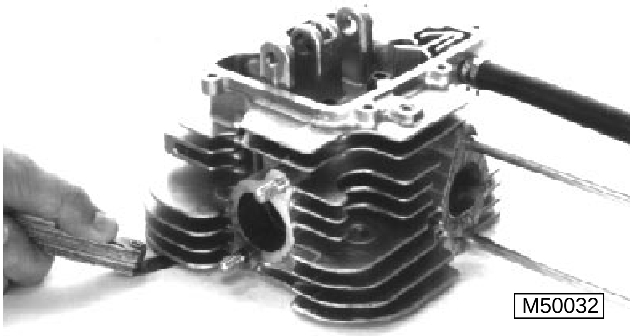
Cylinder Head:

1. Remove carbon deposits from combustion chamber and gasket surface using SCOTCH-BRITE® abrasive pads or an equivalent.

⚠ CAUTION

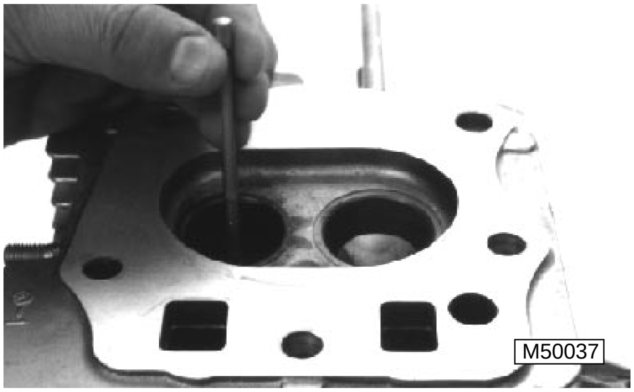
Reduce compressed air to less than 210 kPa (2 bar) (30 psi) when using for cleaning purposes. Clear area of bystanders, guard against flying chips, and wear personal protection equipment including eye protection.

2. Clean head with a suitable solvent and dry with compressed air.
3. Inspect head for cracks or broken cooling fins.
4. Inspect gasket surface for burrs and nicks.
5. Inspect head gasket for burns and traces of gas leakage. Replace if necessary.
6. Check that oil drainback passages are not plugged.


M50032

- Put cylinder head on a surface plate. Check for distortion at several points around the head using a feeler gauge. Replace head if distortion is **more than 0.05 mm (0.002 in.)**.

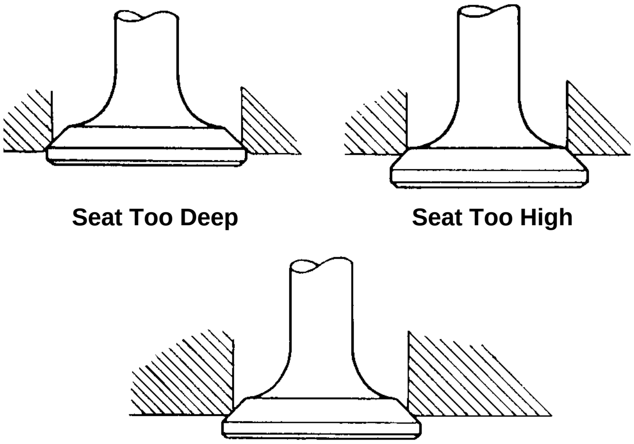
Valve Guides:


M50037

1. Clean inside of valve guides with valve guide cleaner.
2. Measure inside diameter of valve guide bushings. Replace bushing if inside diameter is **greater than 7.015 mm (0.2762 in.)—FC420V or 7.07 mm (0.278 in.)—FC540V**.

Valve Seats:

1. If valve seats are loose, warped or distorted beyond reconditioning, replace cylinder head. Pitted or worn seats can be re-faced using a seat cutter.



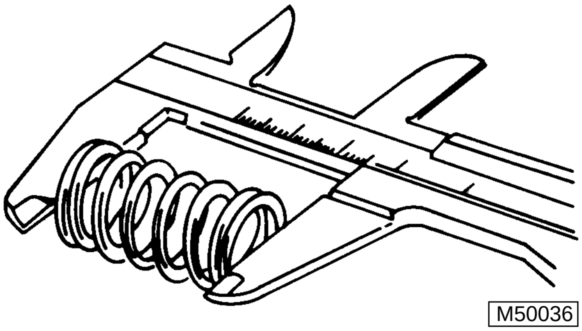
Correct Seat Position

M18615

2. Check valve seating pattern for correct width and evenness all around. If valve seats width is not within **1.10—1.46 mm (0.043—0.057 in.)**, recondition valve seat. (See RECONDITION VALVE SEATS.)
3. Lap valve after reconditioning with lapping compound and recheck valve seating surface for proper width and evenness of seating pattern. (See LAP VALVES.)

Valve Springs:

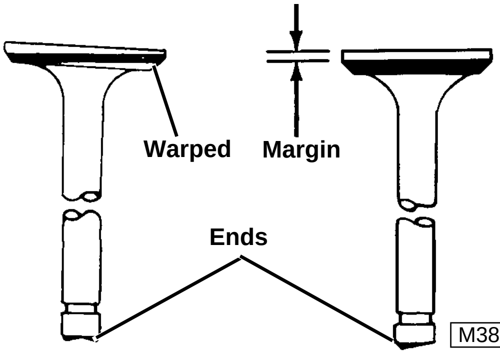
1. Inspect spring for pitting, rust, and burrs. Replace if necessary.



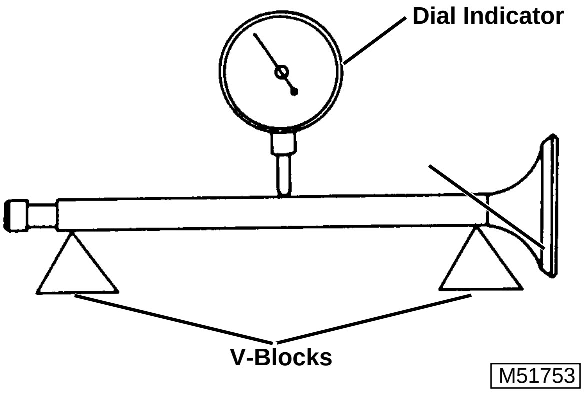
2. Measure spring free length. Replace spring if measurement is **less than 37.50 mm (1.476 in.)—early models or 35.50 mm (1.398 IN.)—late models.**

Intake and Exhaust Valves:

1. Remove carbon from valve head, face, and stem with a power-operated wire brush. Be sure carbon is removed, not merely burnished.
2. Inspect valve head, face, and stems for defects. Replace if necessary.



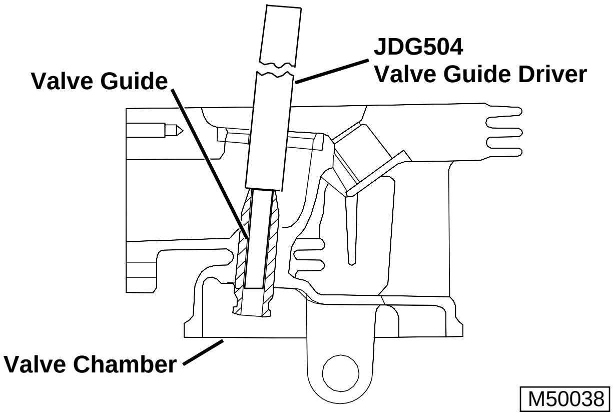
3. Replace warped valves or valves with **less than 0.60 mm (0.024 in.)** margin. Valve stem ends should be ground square before checking valve to tappet clearance.



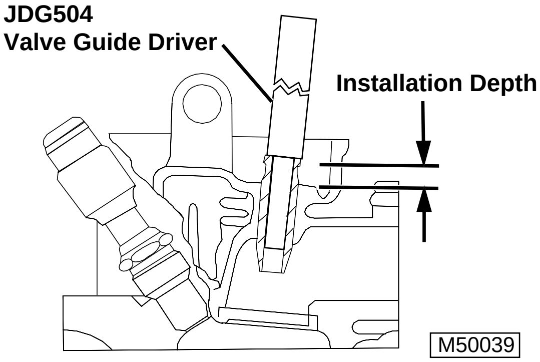
4. Check valve stem for bend using V-blocks and a dial indicator. Turn valve slowly and read variation on indicator. Replace if variation is **greater than 0.03 mm (0.001 in.)**.

Valve Guide Replacement

1. Place cylinder head so that valve seats face up.



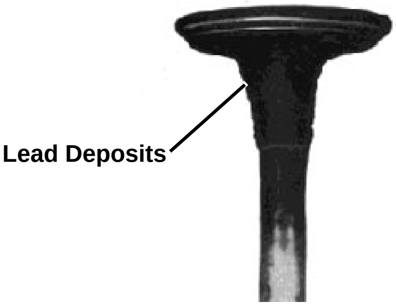
2. Drive valve guide out through valve chamber using JDG504 Valve Guide Driver.
3. Clean carbon deposits from valve guide port.
4. Turn cylinder head over so that valve seats face down.



NOTE: A snap ring was used as an installation stop on early model engines. For those engines, drive guides in until snap ring bottoms out on casting.

5. Install new guide using JDG504 Valve Guide Driver. Drive guide to an installation depth of **12 ±0.1 mm (0.472 ±0.004 in.)—FC420V or 9.5 ±0.1 mm (0.370 ±0.004 in.)—FC540V**.
6. Finish reaming valve guides with Stanisol or kerosene lubricant and a **7 mm (0.2756 in.)** valve guide reamer. Turn reamer clockwise. Finished valve guide diameter should be **7.00—7.02 mm (0.275—2.76 in.)**.

ANALYZE VALVES

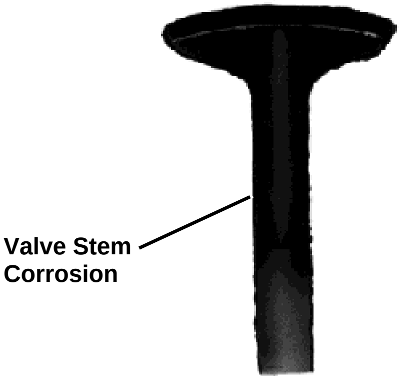


M29934

Lead deposits on the intake valve are caused by exhaust gas leakage past the valve. This indicates that the valve is not seating properly. Grind intake valve and re-face seat to correct this condition.

IMPORTANT: Do not grind the exhaust valve or valve life will be shortened.

NOTE: Be sure to reset valve-to-tappet clearance after grinding valves.

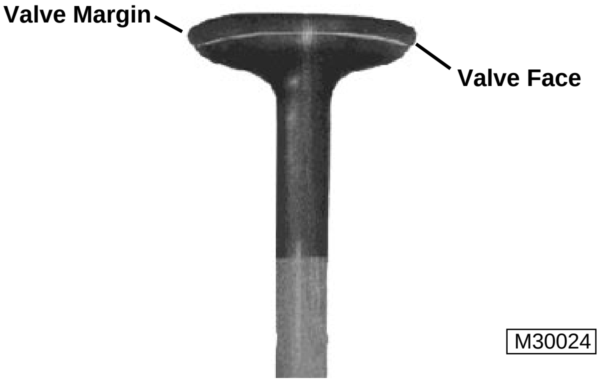


M5563

Valve stem corrosion is caused by moisture in the engine. Moisture in the fuel-air mixture can condense inside the engine when the engine is stopped and cools down.

Valve corrosion can also occur during storage. Fogging or pouring oil in the combustion chamber before storing helps prevent valve corrosion.

Corroded or pitted valves collect deposits and may cause sticking valves. Replace badly corroded or pitted valves.



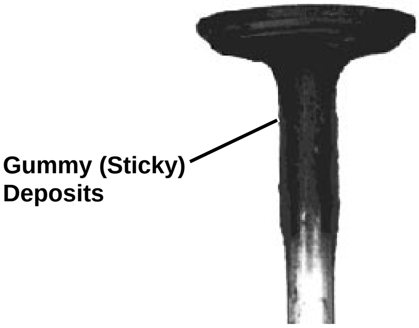
M30024

Exhaust valves are designed to function in temperatures exceeding 2760°C (5000°F). However, when operating at high temperatures for long periods of time, valve burning may occur. Valves running too hot will show a dark discoloration of the valve stem into the area protected by the valve guide. Another indication is distortion of the valve margin and valve face. Valve inserts may also begin to burn away.

IMPORTANT: Do not run engine with blower housing removed.

Poor engine cooling due to dirt or obstructions is a common cause for overheating an engine and valves. Remove blower housing and clean the engine cooling fins.

Other causes for valves running hot are worn valve guides or valve springs, incorrect valve clearance, lean fuel-air mixture, and incorrect or overheated spark plug.



M29936

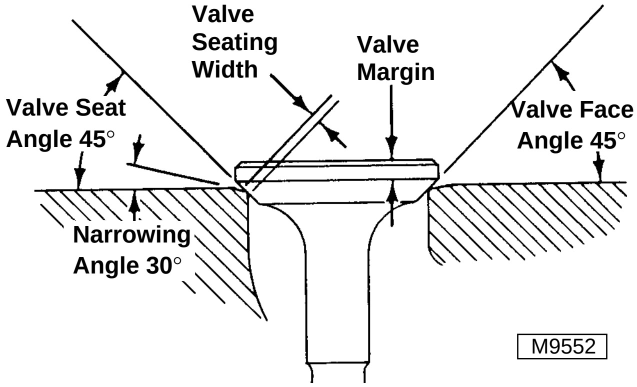
Using old or stale gasoline is a common cause for sticky valves.

This gummy deposit can be seen on the valve. When this condition exists, the carburetor may also contain gummy deposits and will require cleaning.

Always use fresh gasoline. If the machine is to be stored, add an approved fuel stabilizer to the fuel, or drain fuel tank, lines, and carburetor before storing machine.

RECONDITION VALVE SEATS

1. Inspect valve seats for damage. If seats are loose, warped or distorted beyond reconditioning, replace cylinder head. Pitted or worn seats can be re-faced using a seat cutter.

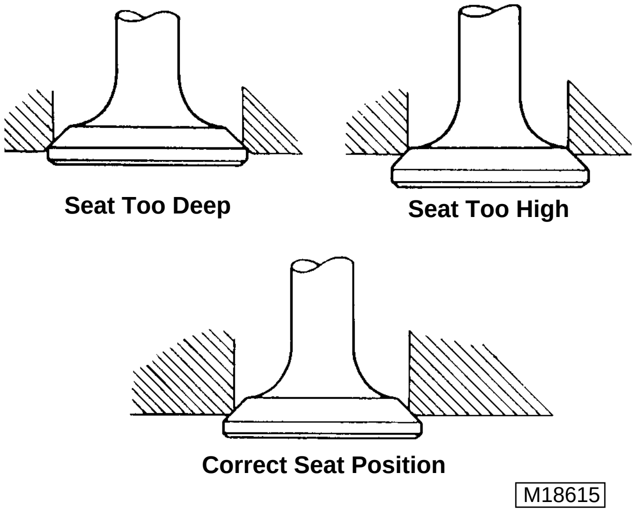


2. To recondition seat, cut at **45**° angle to clean up seat. Cut narrowing angle at **30**°. Finish cut at **45**° angle to establish valve seating surface width.
3. Cut valve seating surface as close as possible to specifications.

Specifications:

Valve Seating Width
(Standard) . . . . . 1.10—1.46 mm (0.043—0.057 in.)
Valve Seat Angle . . . . 45°
Valve Face Angle . . . . 45°
Valve Margin . . . . 0.60 mm (0.024 in.)
Valve Narrowing Angle . . . . 30°

4. Lap valves to seats after re-facing. (See LAP VALVES.)


Seat Too Deep

Seat Too High

Correct Seat Position

5. Center valve seat on the valve face.
6. Check seat for good contact using Prussian Blue Compound.

LAP VALVES

If valve seat does not make proper contact, lap the valve into the seat:

1. Apply a small amount of fine lapping compound to face of valve.

2. Grip top of valve with a vacuum cup tool and turn valve to lap valve to seat.
3. Lift valve from seat every 8 to 10 strokes. Lap until a uniform ring appears around the surface of the valve face.
4. Wash all parts in solvent to remove lapping compound. Dry parts.
5. Check position of lap mark on valve face. Lap mark must be on or near the center of valve face.
6. Apply a light coat of clean engine oil to seat and valve to prevent rusting.

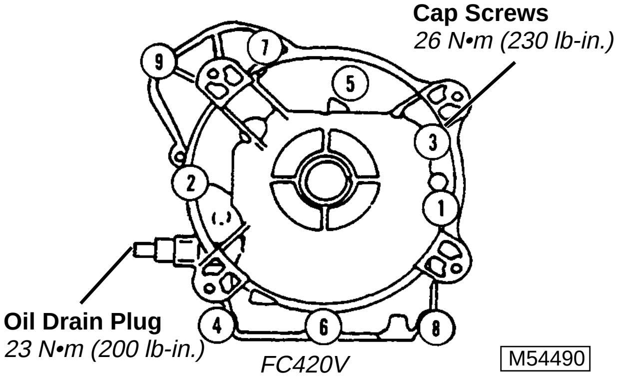
CRANKCASE COVER

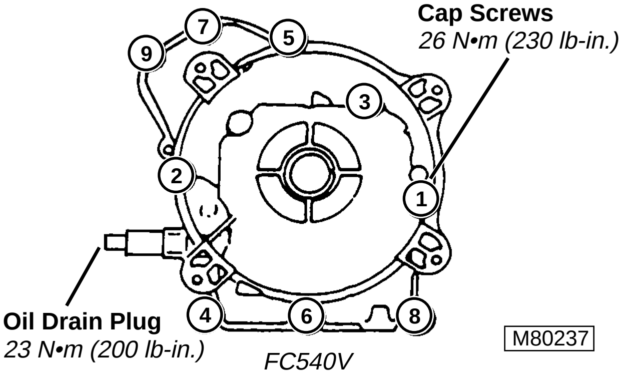
Removal/Installation

1. Drain crankcase. Crankcase capacity (with filter) is approximately **1.6 L (3.4 U.S. pt)—FC420V or 1.9L (4.0 U.S. pt)—FC540V.**
2. Remove crankcase cover and gasket.
3. Clean crankcase and crankcase cover gasket surfaces.

Installation is done in the reverse order of removal.

IMPORTANT: Do not force cover. Gears must mesh for proper positioning.



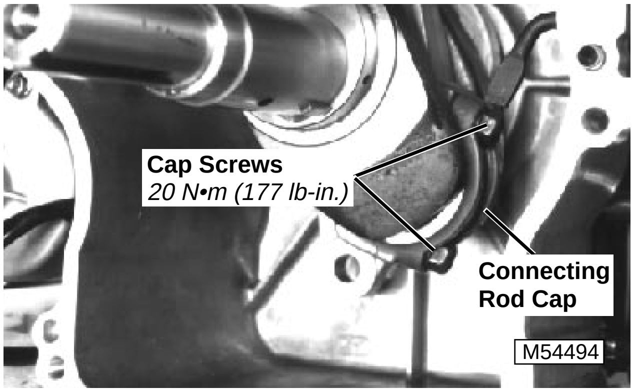


- Use new gasket for installation.
- Tighten mounting cap screws in the sequence shown to **26 N•m (230 lb-in.).**
- Tighten oil drain plug to **23 N•m (200 lb-in.).**

PISTON AND CONNECTING ROD

Removal

1. Remove cylinder head. (See CYLINDER HEAD—Removal/Installation.)
2. Remove crankcase cover. (See CRANKCASE COVER—Removal/Installation.)
3. Check cylinder bore for carbon and varnish ridges. These ridges can cause piston damage if not removed.
4. If necessary, remove ridge from top of cylinder bore using a ridge reamer.



5. Turn crankshaft to expose connecting rod end caps.
6. Remove cap screws and connecting rod cap.
7. Push piston and connecting rod assembly from cylinder bore.
8. Disassemble and inspect all parts for wear or damage. (See Disassembly and Inspection procedures.)

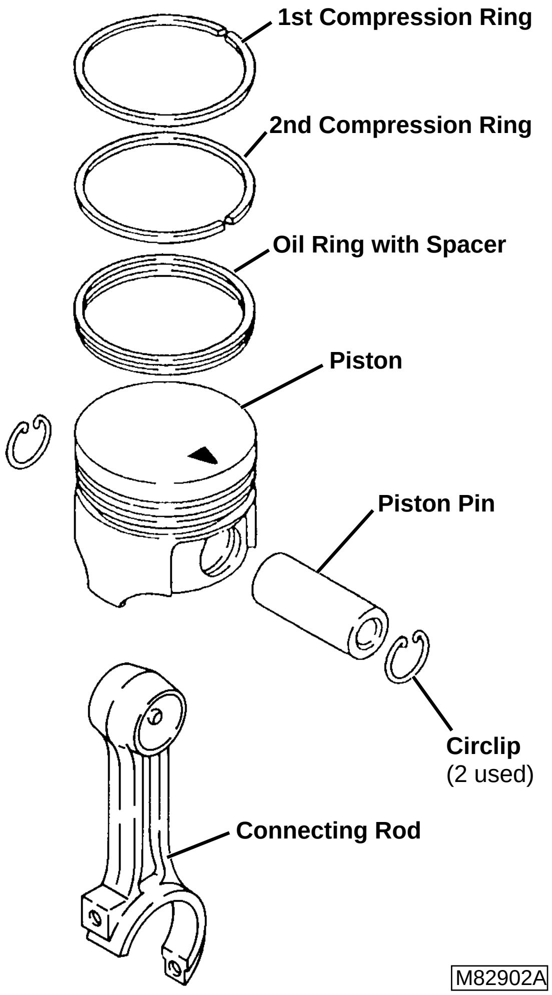
Installation

1. Deglaze cylinder bore. (See Deglaze Cylinder Bore.)
2. Stagger piston ring end gaps **180° apart**, but **DO NOT** align with oil ring side rail end caps.

3. Apply a light film of oil to piston and rings. Compress rings with a ring compressor.
4. Apply a light film of oil to cylinder bore, connecting rod bearing surface, and cap screws.
5. Install piston and connecting rod assembly in cylinder bore with engraved arrow match mark on piston head facing the flywheel side of the engine.
6. Install connecting rod cap and cap screws. Tighten cap screws to **20 N•m (177 lb-in.)**.
7. Install crankcase cover. (See CRANKCASE COVER—Removal/Installation.)
8. Install cylinder head. (See CYLINDER HEAD—Removal/Installation.)

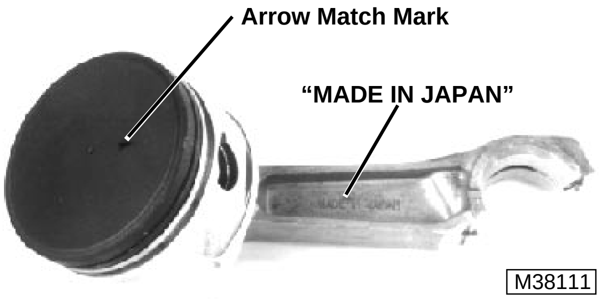
Disassembly

- Remove piston rings using a piston ring expander.
- Inspect all parts for wear or damage. Replace as necessary. (See Inspection procedure.)
- Analyze piston and piston ring wear. (See ANALYZE PISTON WEAR and ANALYZE PISTON RING WEAR.)

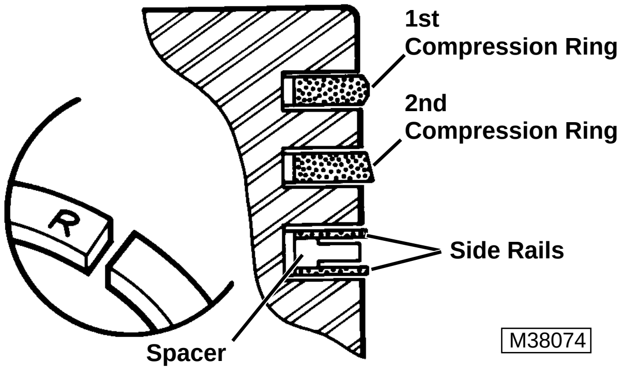


Assembly

- Apply a thin film of clean engine oil to piston pin and connecting rod bearing during assembly.



1. Align arrow match mark on piston head with “MADE IN JAPAN” on connecting rod, or if piston is marked with an “R” or “L”, align the “R” or “L” on the piston with the Japanese character on the connecting rod.
2. Install piston pin and circlips.
3. Before installing rings on piston, check ring end gap in cylinder bore. (See Inspection—Piston Rings procedure.)



4. Install oil control and compression rings:

   Oil ring: Install spacer, then side rails. Align side rail end gaps **180° apart** in the position shown.

   Install 2nd compression ring in middle groove with letter mark (R or L) or other mark **facing up**. Ring should turn freely in groove. Turn ring until gap is **120° away from oil ring gap**.

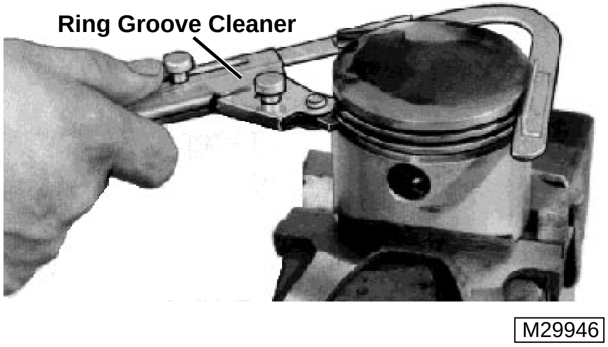
   Install 1st compression ring in top groove. Ring should turn freely in groove. Turn ring until gap is **120° away from second ring gap**.

Inspection

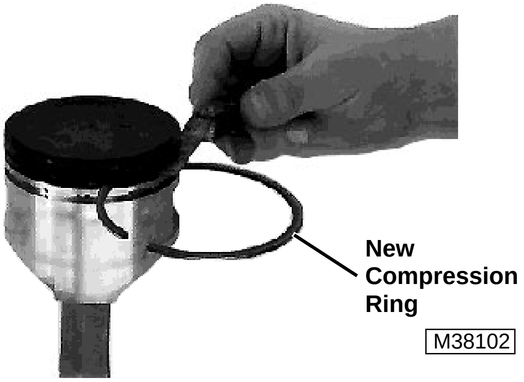
Piston:

IMPORTANT: Do not use a caustic cleaning solution or a wire brush to clean piston.

1. Remove all deposits from the piston.



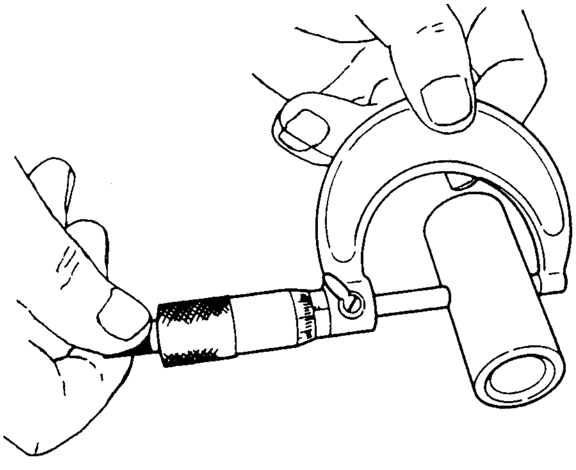
2. Clean carbon from piston ring grooves with a ring groove cleaner. If cleaning tool is not available, break an old ring and use it to carefully clean groove.
3. Check that all oil return passages in grooves are open.
4. Inspect piston for scoring or fractures. Replace piston if damaged.

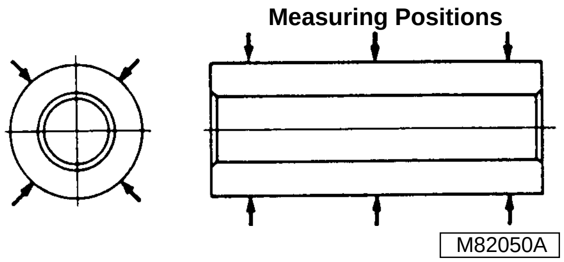


5. Using a new piston ring and feeler gauge, check ring grooves for wear at several points around piston. Replace piston if clearance is **greater than** specifications.

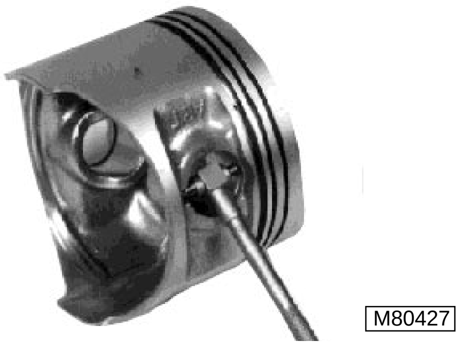
Ring Groove Clearance Specifications (Maximum):

1st Compression Ring
(Top) . . . . 0.17 mm (0.007 in.)
2nd Compression Ring
(Middle) . . . . 0.15 mm (0.006 in.)
Oil Control Ring . . . . 0.20 mm (0.008 in.)

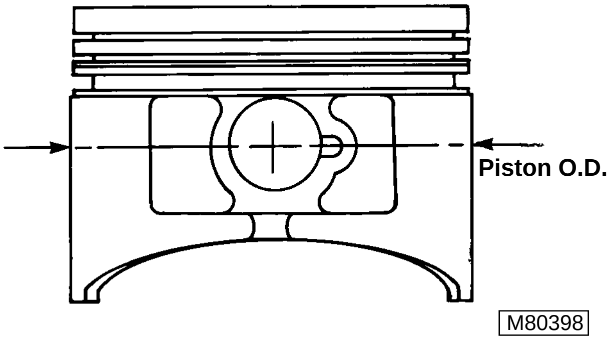




6. Measure piston pin diameter at six places. Replace pin if any measurement is **less than 21.98 mm (0.865 in.)—early models or 18.975 mm (0.747 in.)—late models**.



7. Measure piston pin bore diameter in piston. Replace piston if measurement is **greater than 22.04 mm (0.868 in.)—early models or 19.042 mm (0.7497 in.)—late models**.



Piston O.D. Specifications:

Standard Piston . . . . 88.83—88.864 mm
. . . . (3.4885—3.4984 in.)
Oversize Piston
0.50 mm (0.020 in.) . . . . 89.330—89.364 mm
. . . . (3.517—3.518 in.)
Piston-To-Cylinder Bore Clearance
. . . . 0.110—0.151 mm (0.0043—0.0059 in.)

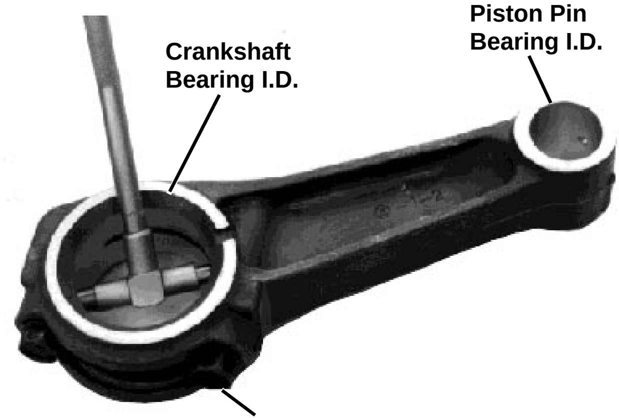
8. Measure piston O.D. perpendicular to piston pin bore. If piston diameter is less than specifications, install a new piston.

*NOTE: If the engine has had a previous major overhaul, oversize pistons and rings may have been installed. Pistons and rings are available in **oversize—0.50 mm (0.020 in.)**.*

9. Measure cylinder bore diameter. (See CYLINDER BLOCK—Inspection.)
10. Subtract piston O.D. measurement from cylinder bore measurement to determine piston-to-cylinder bore clearance.
11. Replace piston and/or rebore cylinder block if not within specification.

Connecting Rod:

1. Analyze crankshaft and connecting rod wear. (See ANALYZE CRANKSHAFT AND CONNECTING ROD WEAR.)
2. Clean and inspect rod. Replace if scored.



3. Install connecting rod cap. Tighten cap screws to **20 N•m (177 lb-in.)**.

NOTE: If the engine has had a previous overhaul, an undersized connecting rod may have been installed. A ***0.50 mm (0.020 in.) undersized rod*** *is available.*

4. Measure connecting rod crankshaft bearing inside diameter and piston pin bearing inside diameter. Replace connecting rod if either measurement is **greater than** specifications.

Connecting Rod Bearing I.D. (Maximum):

Crankshaft Bearing	
Standard	**41.07 mm (1.617 in.)**
Undersized	**40.56 mm (1.597 in.)**
Piston Pin Bearing	
Early Models	**22.06 mm (0.869 in.)**
Late Models	**19.051 mm (0.750 in.)**

Piston Rings:

1. Measure thickness of top and second compression rings at several places. Replace rings if thickness is **less than 1.94 mm (0.076 in.)**.
2. Check piston ring end gap:
   - Install compression ring using a piston to position it squarely in bore approximately **25.4 mm (1.0 in.)** down from top of cylinder.
   - Check end gap. Replace ring if end gap is **greater than** specifications.

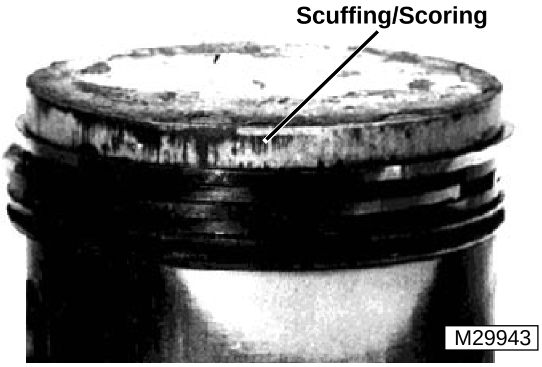
Ring End Gap Specifications:

Minimum End Gap	**0.18 mm (0.007 in.)**
Maximum End Gap	
Compression Rings (top and second)	
Early Models	**0.90 mm (0.035 in.)**
Late Models	**1.50 mm (0.059 in.)**
Oil Control Rings	
Side Rails	**1.30 mm (0.051 in.)**

ANALYZE PISTON RING WEAR

Rings of the wrong size or rings having improper end gaps will not conform to the shape of the cylinder. This results in high oil consumption and excessive blow-by.

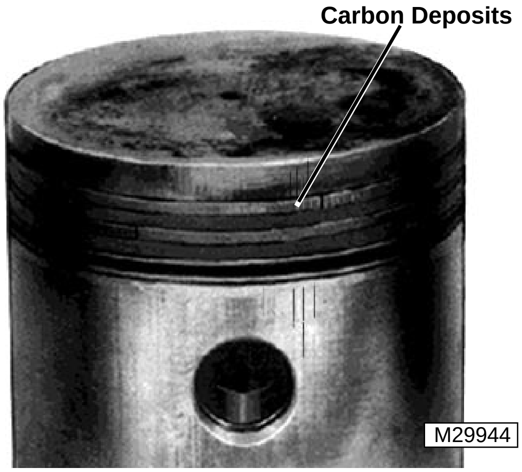
Ring end gaps should be staggered on the piston during installation. (See PISTON AND CONNECTING ROD.) End gaps in alignment can also cause oil consumption and blow-by.



Light scuffing or scoring of both rings and piston occurs when unusually high friction and combustion temperatures approach the melting point of the piston.

When this condition exists, it is due to one or more of the following:

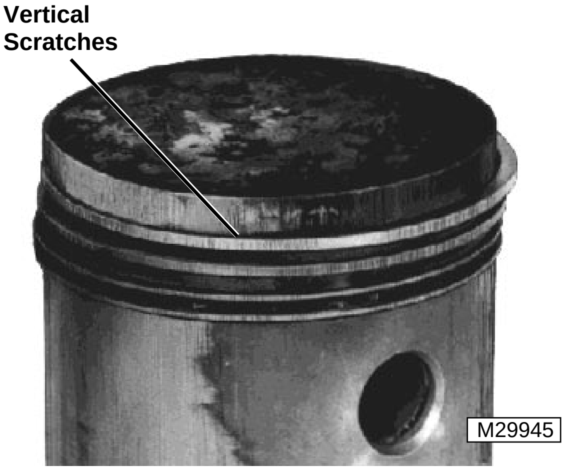
- Dirty cooling shroud and cylinder head.
- Lack of cylinder lubrication.
- Improper combustion.
- Wrong bearing or piston clearance.
- Too much oil in crankcase causing fluid friction.



The engine operating at abnormally high temperatures may cause varnish, lacquer, or carbon deposits to form in the piston grooves, making the rings stick. When this happens, excessive oil consumption and blow-by will occur.

Engine overheating and ring sticking is usually caused by one or more of the following:

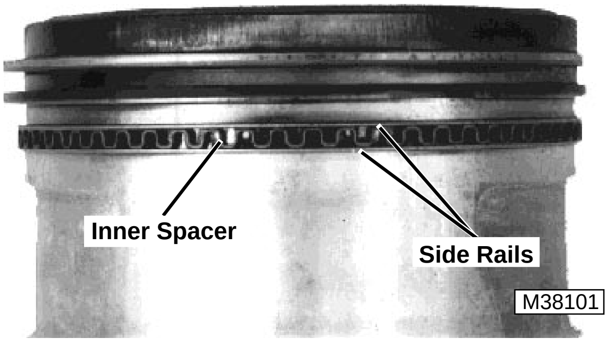
- Overloading.
- Incorrect ignition timing.
- Lean fuel mixture.
- Dirty cooling fins.
- Incorrect oil.
- Low oil supply.
- Stale fuel.



Vertical scratches across the piston rings are due to an abrasive in the engine. Abrasives may be airborne, may have been left in the engine during overhaul, or may be loose lead or carbon deposits.

When this condition exists, check for one or more of the following:

- Damaged, collapsed, or improperly installed air filter.
- Loose connection or damaged gasket between air cleaner and carburetor.
- Air leak around carburetor-to-cylinder head gasket.
- Air leak around throttle shaft.
- Failure to properly clean cylinder bore after reconditioning engine.



Abrasive particles in engine oil cause scratches on side rails of oil control ring. Inner spacer wear or distortion may cause:

- High oil consumption.
- Increased deposits in combustion chamber.
- Sticking compression rings.

Increased oil consumption may be caused by:

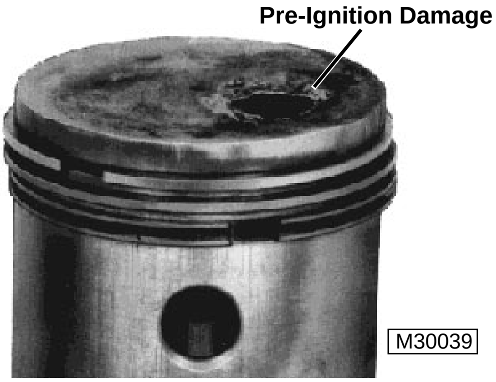
- Worn side rails with low tension.
- Worn or distorted inner spacer.

ANALYZE PISTON WEAR

Detonation, commonly called engine or timing knock, is abnormal combustion causing excessive temperature and pressure in the combustion chamber. Detonation produces an audible “knock” as the compressed fuel-air mixture ignites spontaneously to interrupt the normal ignition.

Detonation may be caused by one or more of the following:

- Pre-ignition.
- Lean fuel mixture.
- Low octane fuel.
- Advanced ignition timing.
- Engine lugging.
- Build-up of carbon deposits on piston or cylinder head, causing excessive compression.
- Wrong cylinder head or milling of head increasing compression ratio.



Pre-ignition is the igniting of the fuel-air mixture prior to regular ignition spark. Pre-ignition causes shock, resulting in pings, vibration, detonation, and power loss. Severe damage to piston, rings, and valves results from pre-ignition.

Check the following for causes of pre-ignition:

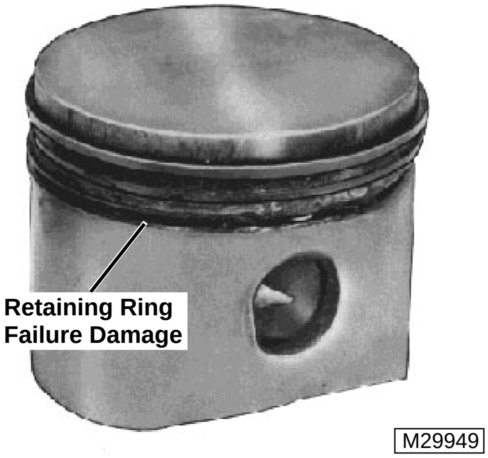
- Internal carbon deposits.
- Incorrect spark plug (high heat range).
- Broken ceramic in spark plug.
- Sharp edges on valves.
- Sharp edges in combustion chamber.

Check rod and piston alignment when piston shows a diagonal wear pattern extending across the skirt of the piston. Contact with the cylinder wall shows on the bottom of skirt at left and ring lands on the right.

A cylinder bored at an angle to the crankshaft can also cause improper ring contact with the cylinder.

This condition causes:

- Rapid piston wear.
- Uneven piston wear.
- Excessive oil consumption.



A broken retaining ring caused the damage shown.

Retaining rings loosen or break due to:

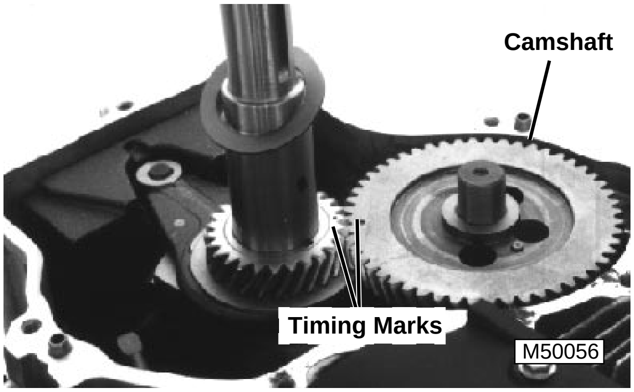
- Rod misalignment.
- Excessive crankshaft end play.
- Crankshaft journal taper.
- Weak retaining rings.
- Incorrectly installed retaining rings.

Inertia can cause a broken retaining ring to beat out the piston and cylinder, causing extensive damage.

CAMSHAFT AND TAPPETS

Removal

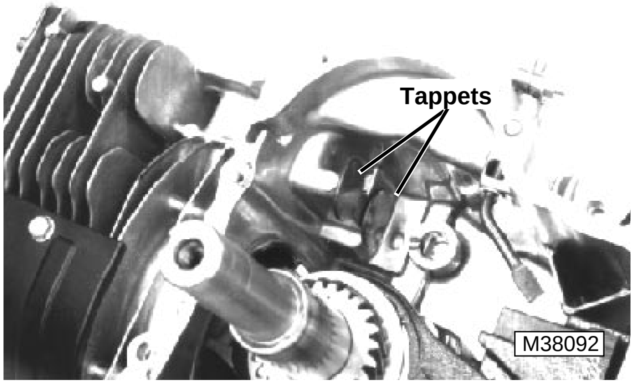
1. Remove crankshaft cover. (See CRANKCASE COVER—Removal/Installation.)



M50056

IMPORTANT: Align timing marks to prevent damage to tappets when removing camshaft.

2. Rotate crankshaft until timing marks align.
3. Remove and inspect camshaft. (See Inspection procedure.)



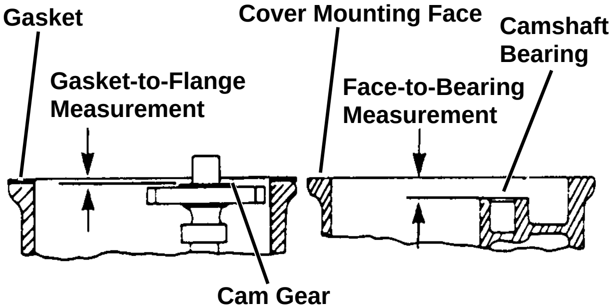
M38092

NOTE: Mark tappets so they can be installed in their original bores during assembly.

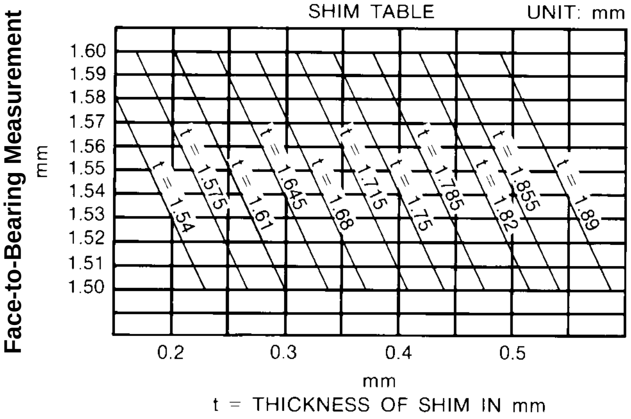
4. Remove and inspect tappets for wear or damage. Replace if necessary.

Installation

1. Apply a light coat of clean engine oil to tappets and bores and install tappets in original bores.
2. Apply a light coat of clean engine oil to camshaft lobes and journals.
3. Align timing mark with crankshaft and install camshaft.



M51542



Gasket-to-Flange Measurement

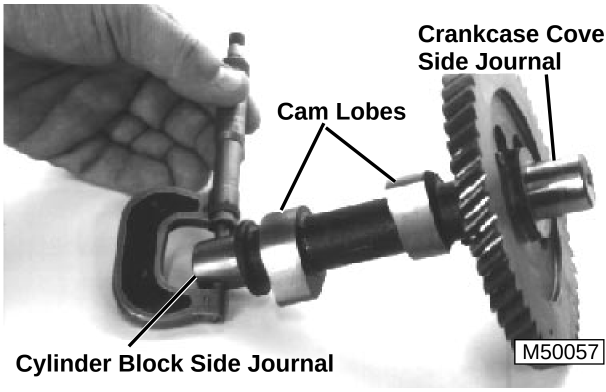
M51543

4. FC540V Only (Serial Number —014454) Check and adjust camshaft axial play. Axial play of camshaft after adjustment should be **0.07—0.19 mm (0.0028—0.0075 in.)**.
   - With gasket installed on crankcase, measure from gasket surface to cam gear timing flange. Record this measurement.
   - Measure from crankcase cover mounting face to camshaft bearing end. Record this measurement.
   - Locate measurement on shim table. Follow lines to where recorded measurements intersect. Choose the next smaller shim from table.
   - Install shim to cam gear timing flange, with chamfered side of shim toward cam gear.
5. Install crankcase cover.

Inspection

1. Inspect camshaft for worn or broken teeth.

NOTE: Camshaft and tappets are a matched set. Replace both camshaft and tappets if necessary.



2. Measure cylinder block side journal, crankcase cover side journal and cam lobe height. Replace camshaft and tappets if any measurement is less than specifications.

Camshaft Specifications (Minimum):

Crankcase Cover Side Journal

Both Engines . . . . 20.912 mm (0.8233 in.)

Cylinder Block Side Journal

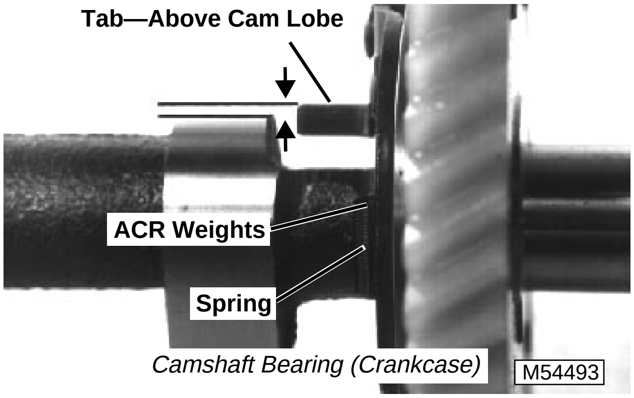
FC420V . . . . 19.912 mm (0.7839 in.)

FC540V . . . . 20.912 mm (0.8233 in.)

Cam Lobe Height

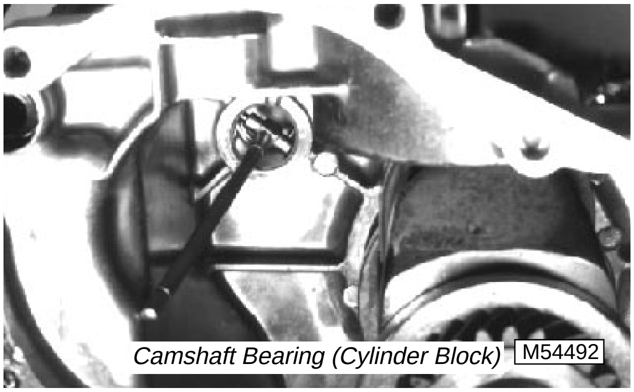
FC420V . . . . 36.75 mm (1.447 in.)

FC540V . . . . 37.10 mm (1.461 in.)



Camshaft Bearing (Crankcase)

3. Inspect Automatic Compression Release (ACR) for damage.
4. Inspect spring for wear or damage. Replace if necessary.
5. Move weights by hand to check for proper operation.
6. Check that tab sits slightly above cam lobe when weights are released. Tab should drop below cam when weights are engaged.



Camshaft Bearing (Cylinder Block)

7. Measure camshaft bearings in cylinder block. Replace block if inside diameter is **greater than 20.076 mm (0.7904 in.)—FC420V or 21.076 mm (0.8298 in.)—FC540V.**

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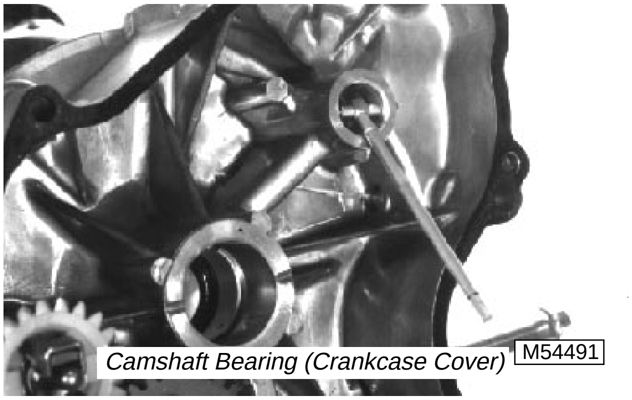


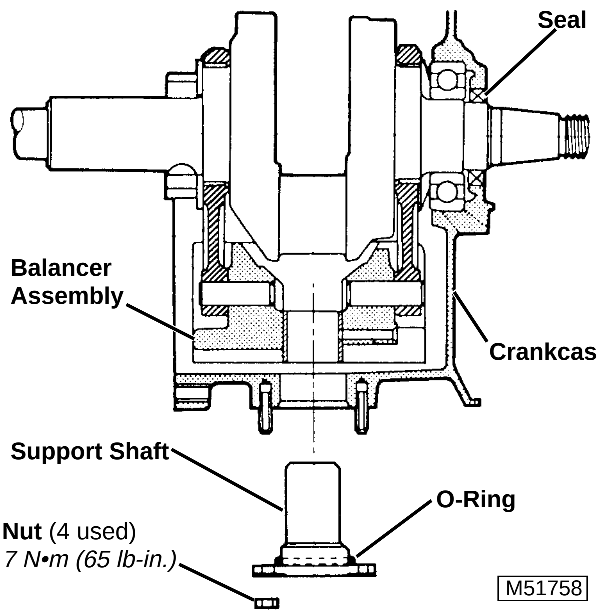
Camshaft Bearing (Crankcase Cover)

8. Measure camshaft bearings in crankcase cover. Replace cover if inside diameter is **greater than 21.076 mm (0.8298 in.)—both engines**.

RECIPROCATING BALANCER

Removal/Installation

1. Remove flywheel, camshaft and piston.

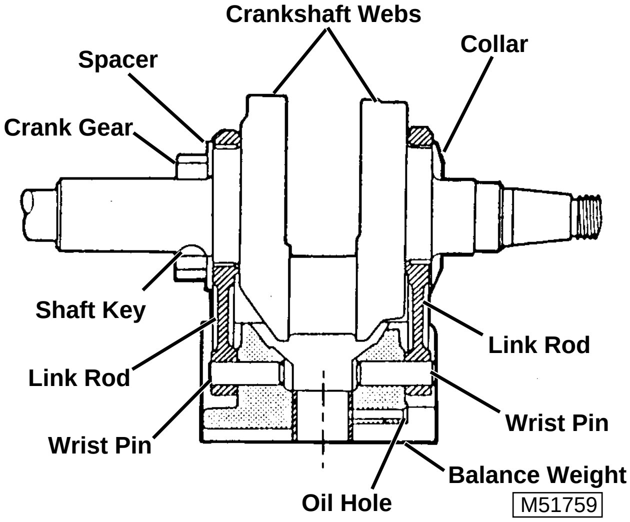


2. Remove four nuts, support shaft, and O-ring. Discard O-ring.
3. Remove crankshaft with balancer assembly from crankcase.
4. Remove and discard crankshaft oil seals. (See CRANKSHAFT OIL SEALS.)
5. Inspect balancer assembly. (See Inspection procedure.)

Installation is done in the reverse order of removal:

- Install new crankshaft oil seals. (See CRANKSHAFT OIL SEALS.)
- Cover keyway on flywheel end of crankshaft with tape to prevent damage to seal when installing assembly.
- Apply a light coat of clean engine oil on crankshaft bearing surfaces.
- Install new O-ring on support shaft.
- Tighten support shaft nuts to **7 N•m (65 lb-in.).**
- Adjust crankshaft end play. (See CRANKSHAFT END PLAY TEST AND ADJUSTMENT—End Play Adjustment.)

Disassembly/Assembly



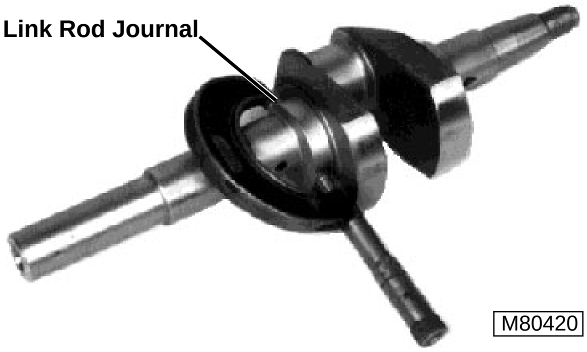
1. Remove collar, gear, shaft key, and spacer.
2. Remove link rods and crankshaft.
3. Inspect crankshaft. (See CRANKSHAFT AND MAIN BEARINGS—Inspection.)
4. Inspect balancer assembly. (See Inspection procedure.)

Assembly is done in the reverse order of disassembly:

- Apply a light coat of clean engine oil on bearing surfaces.
- Install link rods with oil grooves away from crankshaft webs.
- Install balance weight to crankshaft with oil hole, if equipped, facing flywheel side.
- Install spacer with chamfered face toward link rod.
- Install collar with cone face away from link rod.

Inspection

1. Clean and inspect all parts for obvious wear or damage. Replace parts as necessary.

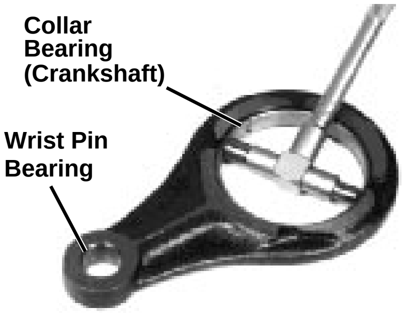


M80420

2. Measure link rod journal diameters on crankshaft. Replace crankshaft if diameters are **less than** specifications.

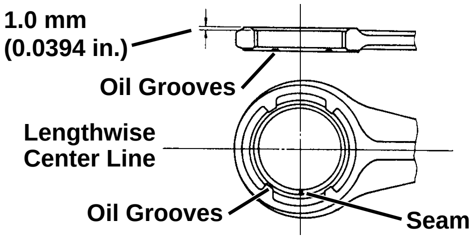
Minimum Link Rod Journal O.D.

FC420V	**53.950 mm (2.1240 in.)**
FC540V	**57.941 mm (2.2811 in.)**



M80421

3. Measure inside diameter of link rod bearings. Replace link rod if either bearing is **greater than** specifications.

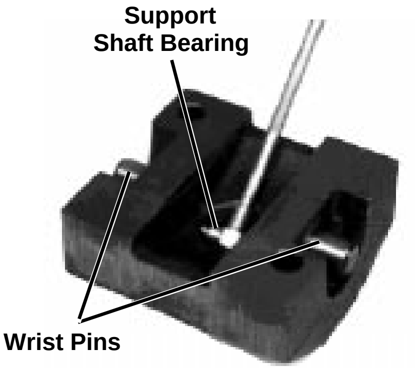


M885648

4. Install large end bearing from opposite side of oil grooves with seam at right angle to lengthwise center line. Seat link rod bearings on both ends below surface to specification.

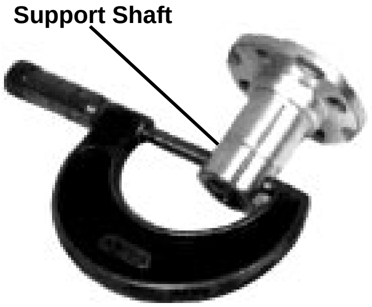
Maximum Link Rod Bearing I.D.

Wrist Pin Bearing	**12.601 mm (0.4961 in.)**
Collar Bearing (Crankshaft)	
FC420V	**54.121 mm (2.1307 in.)**
FC540V	**58.153 mm (2.2895 in.)**
Bearing Installation Depth Below Surface:	
Both Ends	**1.0 mm (0.0394 in.)**



M80422

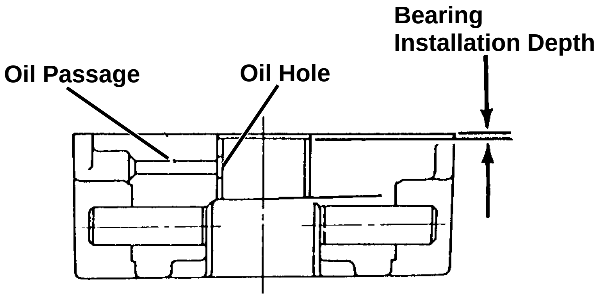
5. Measure support shaft bearing diameter of the balance weight. Replace bearing if measurement is **greater than 26.097 mm (1.0274 in.)**.
6. Inspect wrist pins for wear or damage.



M80423

7. Measure support shaft diameter. Replace shaft if diameter is **less than 25.927 mm (1.0208 in.)**.

Bearing Replacement



M51725

NOTE: Replace bearing using a driver set and a press.

1. Align oil hole in bearing with oil passage in weight.
2. Install bearing below surface to a depth of **0.50 mm (0.0197 in.)**.

CRANKSHAFT AND MAIN BEARINGS

Removal/Installation

1. Remove reciprocating balancer. (See RECIPROCATING BALANCER—Removal/ Installation.)
2. Remove balancer from crankshaft.
3. Inspect crankshaft for wear or damage. (See Inspection procedure.)

Installation is done in the reverse order of removal.

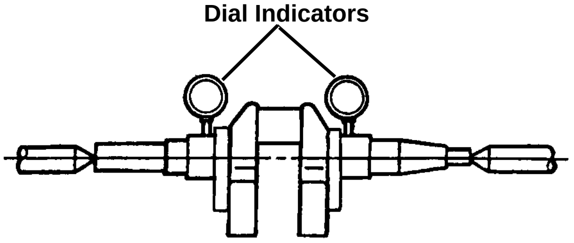
- Cover keyway on flywheel end of crankshaft with tape to prevent seal damage when installing crankshaft.
- Apply a light film of clean engine oil on crankshaft bearing surfaces before installation.
- Pack oil seals with lithium base grease.

Inspection

1. Analyze crankshaft and connecting rod wear. (See ANALYZE CRANKSHAFT AND CONNECTING ROD WEAR.)

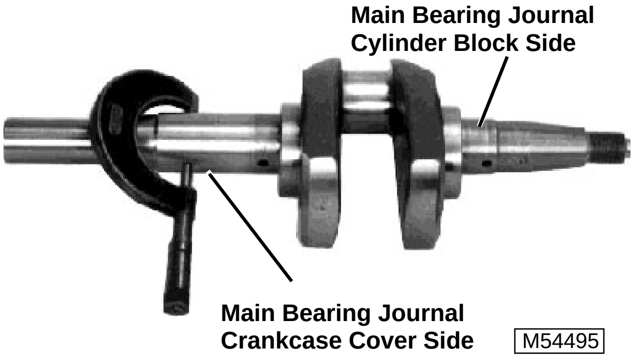
IMPORTANT: A bent crankshaft must be replaced; it cannot be straightened.

2. Clean and inspect crankshaft. Replace if scratched, damaged, or worn beyond specifications.



M80432

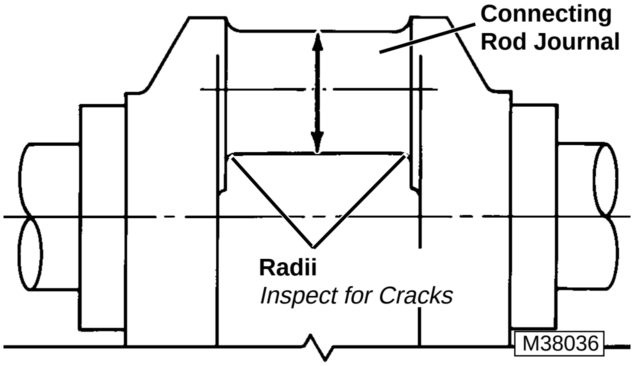
3. Place crankshaft into an alignment jig and slowly rotate crankshaft. Use dial indicators to measure maximum Total Indicated Runout (TIR). Replace crankshaft if runout exceeds **0.05 mm (0.002 in.)**.



M54495

4. Measure main bearing journal diameters. Replace crankshaft if either journal O.D. is **less than** specifications**.**

Crankshaft Main Bearing Journals (Minimum)
Crankcase Cover Side—
FC420V . . . . 34.919 mm (1.3747 in.)
FC540V . . . . 37.904 mm (1.4923 in.)
Cylinder Block Side—
Both Engines . . . . 34.945 mm (1.3757 in.).



M38036

NOTE: If the engine has had a previous overhaul, the connecting rod journals may have been resized to accept an undersized rod. ***0.50 mm (0.020 in.) undersized rod*** *is available.*

5. Measure connecting rod journal diameter and inspect journal radii for cracks. Replace crankshaft if any journal diameter is **less than** specifications.

Connecting Rod Journal O.D. (Minimum):

Standard . . . . 40.928 mm (1.6113 in.)
Undersize . . . . 40.47—40.48 mm
. . . . (1.5932—1.5937 in.)

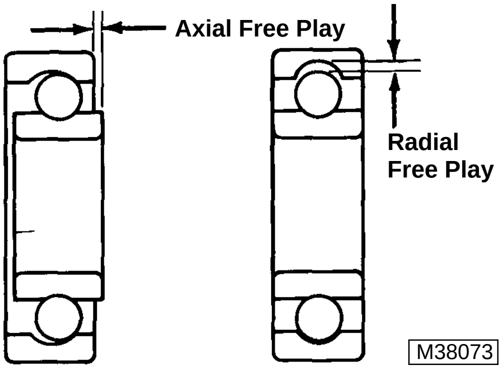
6. Measure crankshaft main bearing inside diameter in crankcase cover. Replace crankcase cover if bearing I.D. is **greater than** specifications.

Crankcase Cover Crankshaft Bearing I.D. (Maximum):

FC420V. . . . . 35.069 mm (1.3807 in.)

FC540V. . . . . 38.056 mm (1.4983 in.)

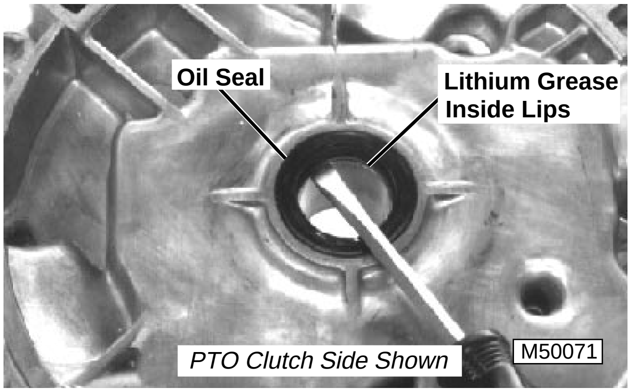
7. Inspect cylinder block crankshaft main ball bearing:
   - Remove oil seal.
   - Remove crankshaft bearing using appropriate driver set.
   - Thoroughly clean bearing in solvent. Dip bearing in light-weight oil.



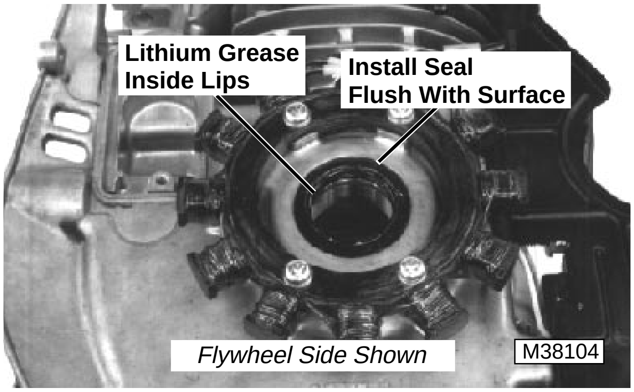
   - Spin the bearing by hand and check for axial and radial free play. Replace the bearing if it is noisy or has too much free play.
   - Install bearing flush to inside of crankcase.

CRANKSHAFT OIL SEALS

Replacement



1. Remove crankcase cover. (See CRANKCASE COVER—Removal/Installation.)
2. Remove worn or damaged oil seal using a screwdriver. DO NOT damage bore surfaces.
3. Pack lithium-based grease inside lips of seals.
4. Install seal with spring-held seal lip toward inside of engine using appropriate driver set.
5. Press in seal **until flush with surface**.



6. Remove crankshaft. (See CRANKSHAFT AND MAIN BEARINGS—Removal/Installation.)
7. Remove worn or damaged seal using a screwdriver. DO NOT damage bore surfaces.
8. Pack lithium-based grease inside lips of seals.
9. Install seal with spring-held seal lip toward inside of engine using seal and driver set.
10. Press in seal until flush with surface.

Oil Seal Installation Depth:

Both Sides/Both Engines . . . . . . flush with surface

ANALYZE CRANKSHAFT AND CONNECTING ROD WEAR

Check connecting rod and cap for damage or unusual wear patterns.

Lack of lubrication or improper lubrication can cause the connecting rod and cap to seize the crankshaft, the connecting rod and piston may both break causing other internal damage. Inspect block carefully before rebuilding engine.

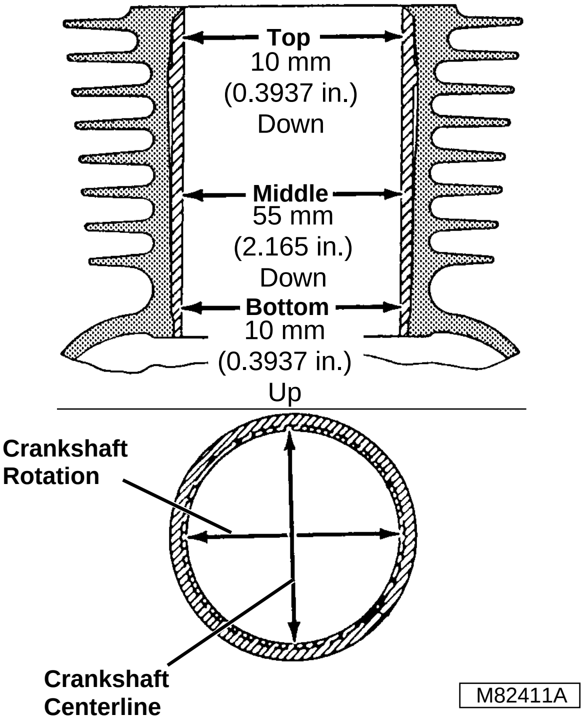
Crankshaft and connecting rod damage can also result from:

- Engine was run low on oil or without oil.
- Engine was run continually on too severe a slope for too long a time.
- Oil not changed regularly.
- Bearing cap installed incorrectly.

CYLINDER BLOCK

Inspection

1. Clean block and check for cracks:
    - Cracks not visible to the eye may be detected by coating the suspected area with a mixture of 25% kerosene and 75% light engine oil.
    - Wipe area dry and immediately apply coating of zinc oxide dissolved in wood alcohol.
    - If crack is present, coating becomes discolored at the defective area.
    - Replace block if any cracks are found.
    - A bare block is available for service.



2. Measure cylinder bore diameter at three positions; **top—10 mm (0.3937 in.) from top of block**, **middle—55 mm (2.165 in.) from top of block**, and **bottom—10 mm (0.3937 in.) from bottom of cylinder**. At these three positions, measure in both directions along crankshaft centerline and direction of crankshaft rotation.

*NOTE: If the engine has had a previous major overhaul, oversize piston and rings may have been installed. Piston and rings are available in **oversize—0.50 mm (0.020 in.)**.*

Cylinder Bore I.D.:

Standard Size Bore:

Standard . . . . 88.980—89.000 mm
. . . . (3.5031—3.5039 in.)
Wear Limit. . . . . 89.076 mm (3.5069 in.)

Oversize Bore—0.50 mm (0.020 in.):

Standard . . . . 89.480—89.500 mm
. . . . (3.5228—3.5236 in.)
Wear Limit. . . . . 89.576 mm (3.5266 in.)

3. If cylinder bore exceeds wear limit, rebore cylinder or replace cylinder block. (See Rebore Cylinder Block procedure.)

NOTE: If cylinders are rebored, oversize piston and rings must be installed.

Deglaze Cylinder Bore

1. Deglaze cylinder bore using a rigid hone with a coarse grit stone initially and fine grit stone for the final finish.
2. Use hone as instructed by manufacturer to obtain a 45° crosshatch pattern.

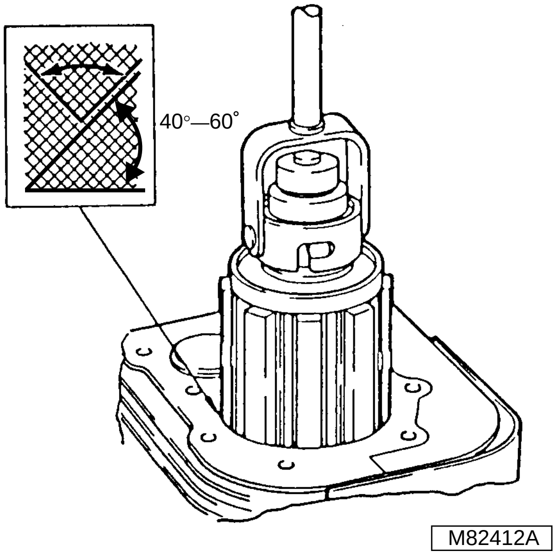
IMPORTANT: DO NOT use gasoline, kerosene, or commercial solvents to clean cylinder bores. Solvents will not remove all abrasives from cylinder walls.

3. Clean cylinder walls using clean white rags and warm soapy water. Continue to clean cylinder until white rags show no discoloration.
4. Dry cylinder and apply a light coat of clean engine oil.

Rebore Cylinder Block

IMPORTANT: Check stone for wear or damage. Use correct stone for the job.

*NOTE: The cylinder block can be rebored to use **0.50 mm (0.020 in.)** oversize pistons and rings. Have a reliable repair shop rebore the block, or use a drill press and honing tool. Rebore cylinder with honing tool to an initial (coarse grit stone) and a final (fine grit stone) bore according to following specifications.*



1. Align center of bore to drill press center.
2. Lower and raise hone until end extends **20—25 mm (0.75—1.0 in.)** past ends of cylinder.
3. Adjust hone stones until they contact narrowest point of cylinder walls.
4. Coat inside of cylinder with honing oil. Turn hone by hand and adjust if too tight.
5. Run drill press at **200—250 rpm**. Move hone up and down in cylinder approximately **20 times per minute**.
6. Stop press and check cylinder diameter.

*NOTE: Measure bore when cylinder is cool. Finish should not be smooth. It should have a **40—60° cross-hatch pattern**.*

7. Check bore for size, taper, and out-of-round.
8. If cylinder bores exceeds wear limit, rebore cylinder or replace block.
9. Hone the cylinder an additional **0.007—0.009 mm (0.0003—0.0004 in.)** for final bore specifications. This allows for **0.020 mm (0.0008 in.) shrinkage** when cylinder cools.

IMPORTANT: DO NOT use gasoline, kerosene, or commercial solvents to clean cylinder bores. Solvents will not remove all abrasives from cylinder walls.

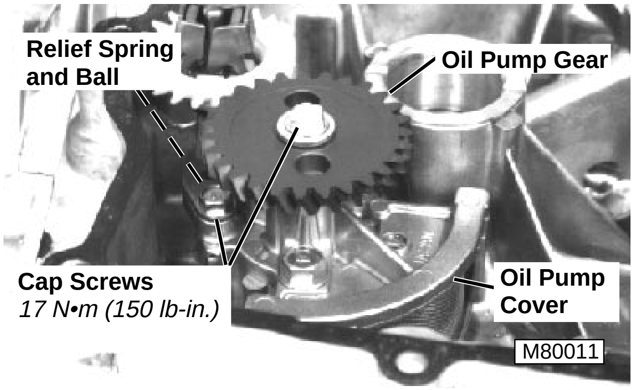
10. Clean cylinder walls using clean white rags and water. Continue to clean cylinder until white rags show no discoloration.
11. Dry cylinder.
12. Apply a light coat of clean engine oil.

OIL PUMP

Disassembly/Assembly

NOTE: FC540V shown. FC420V is similar.

1. Remove crankcase cover. (See CRANKCASE COVER—Removal/Installation.)

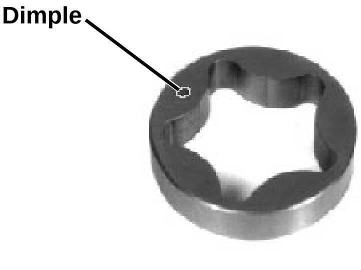


2. Remove oil pump gear.

IMPORTANT: Remove rotor shaft and oil pump cover to avoid damaging governor.

3. Remove oil pump cover.
4. Remove relief spring and ball.
5. Inspect all parts for wear or damage. (See Inspection procedure.)

Assembly is done in the reverse order of disassembly:



M80012

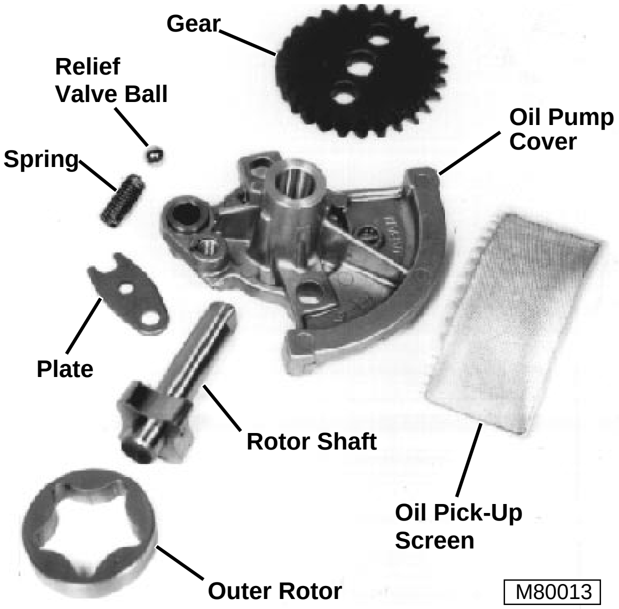
- Install outer rotor with dimple facing away from crankcase cover.
- Install oil pump gear with recess facing away from crankcase cover.
- Tighten cap screws to specification.

Oil PumpTorque Specifications:

Gear, Relief Spring, and Cover Cap Screws . . . . 17 N•m (150 lb-in.)

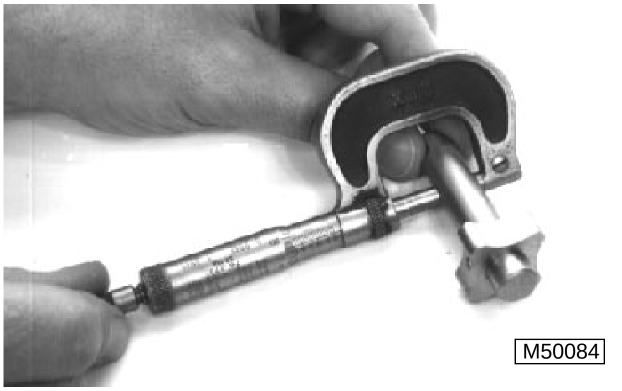
Inspection

NOTE: FC540V shown unless otherwise indicated. FC420V is similar.



M80013

1. Inspect all parts for wear or damage. Replace parts as necessary.

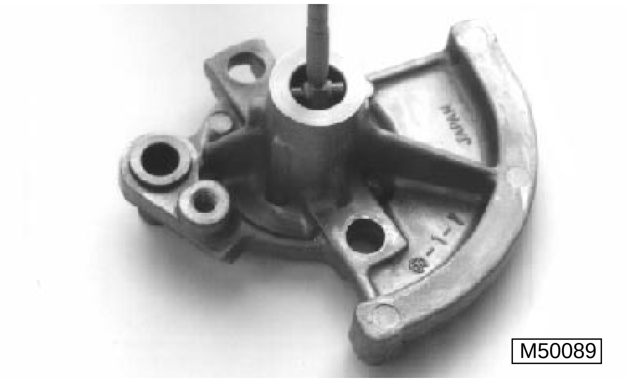


M50084

2. Measure rotor shaft diameter. Replace if shaft O.D. is **less than** specifications.

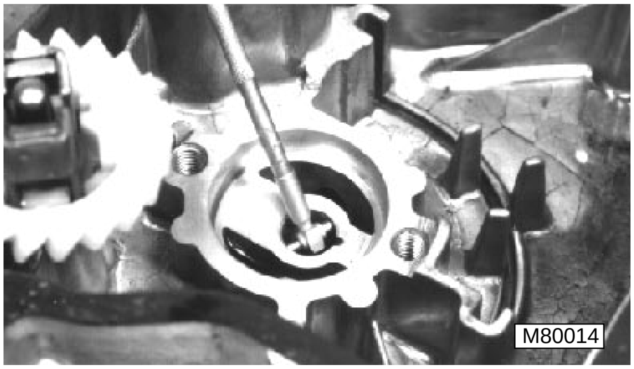
Minimum Rotor Shaft O.D.

FC420V (Large O.D.). . . . . . . 12.627 mm (0.4971 in.)
FC420V (Small O.D.). . . . . 7.935 mm (0.3125 in.)
FC540V . . . . 12.627 mm (0.4971 in.)



M50089

3. Measure rotor shaft bearing in oil pump cover. Replace oil pump cover if bearing I.D. is **greater than 12.76 mm (0.5024 in.)—both engines**.



M80014

4. Measure rotor shaft bearing in crankcase cover. Replace crankcase cover if bearing I.D. is **greater than** specifications.

Maximum Rotor Shaft Bearing I.D.:

FC420V . . . . 8.07 mm (0.3177 in.)
FC540V . . . . 12.76 mm (0.5023 in.)


M80015

5. Measure thickness of outer rotor. Replace if thickness is **less than** specifications.

Minimum Outer Rotor Thickness:

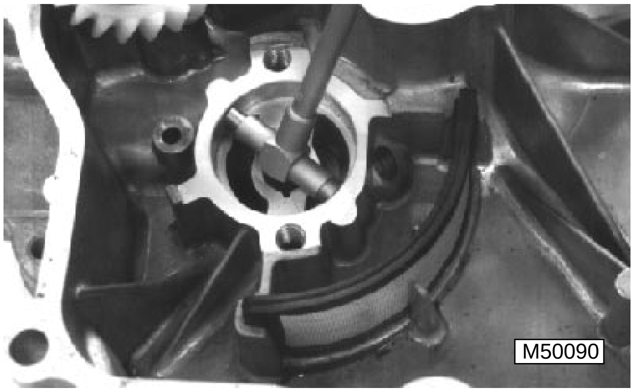
FC420V . . . . 11.92 mm (0.4692 in.)
FC540V . . . . 9.92 mm (0.3905 in.)


M80017

6. Measure outside diameter of outer rotor. Replace both outer rotor and shaft if O.D. is **less than** specifications.

Minimum Outer Rotor O.D.:

FC420V . . . . 28.95 mm (1.1397 in.)
FC540V . . . . 40.47 mm (1.5933 in.)

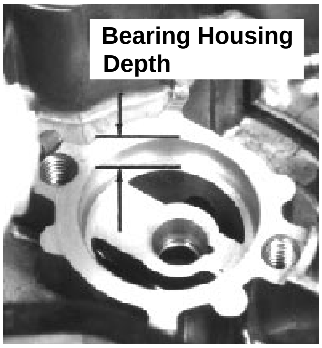

M50090

NOTE: On some early model engines, the rotor bearing is integrated into the oil pump cover instead of the crankcase cover as on late models.

7. Measure inside diameter of rotor bearing. If I.D is **greater than** specifications, replace oil pump cover or crankcase cover.

Maximum Outer Rotor Bearing I.D.:

FC420V . . . . 29.20 mm (1.1496 in.)
FC540V . . . . 40.77 mm (1.6051 in.)



M80016

NOTE: On some early model engines, the rotor bearing is integrated into the oil pump cover instead of the crankcase cover as on late models.

8. Measure outer rotor bearing housing depth. If depth is **greater than** specifications, replace oil pump cover or crankcase cover.

Maximum Outer Rotor Bearing Housing Depth:

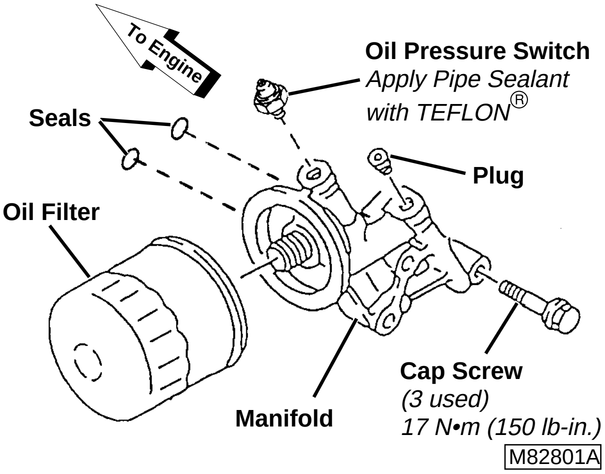
FC420V . . . . 12.14 mm (0.4779 in.)
FC540V . . . . 10.17 mm (0.4003 in.)


M50083

9. Measure relief valve spring. Replace spring if free length is **less than 19.00 mm (0.7480 in.)**.

OIL FILTER MANIFOLD

Removal/Installation



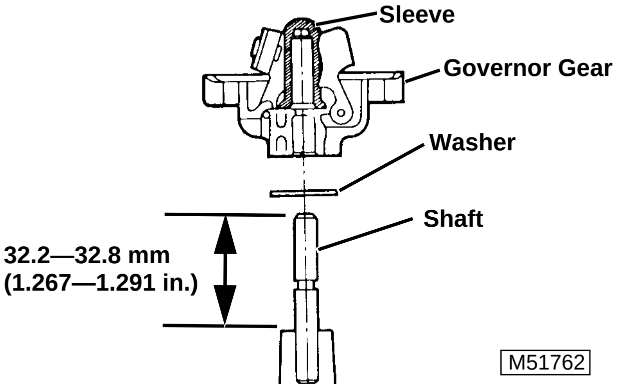
GOVERNOR

Inspection/Replacement

1. Remove crankcase cover. (See CRANKCASE COVER—Removal/Installation.)

IMPORTANT: DO NOT remove governor assembly or shaft unless damaged. Removal damages the gear assembly and entire assembly must be replaced.

2. Inspect governor for wear or damage. If necessary, to replace governor assembly, do the following:
   - Protect crankcase cover with soft pads.
   - Use two screwdrivers to pry between governor assembly and shaft. DO NOT damage crankcase sealing surfaces.



IMPORTANT: If shaft was removed and is not adequately secure when pressed into block, the crankcase cover must be replaced.

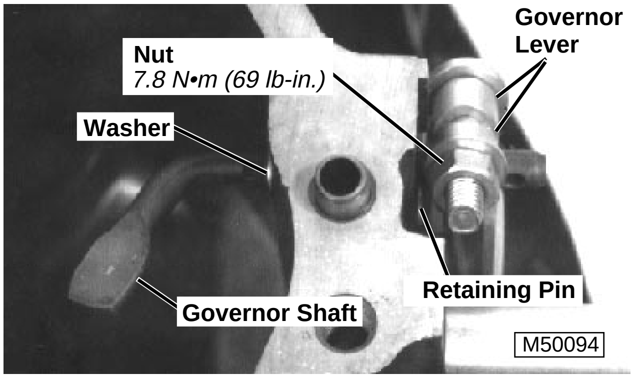
3. If shaft pulls loose or is removed, press shaft back into block until it protrudes **32.2—32.8 mm (1.267—1.291 in.)** above surface of opening.
4. Install sleeve into governor flyweights before gear assembly is installed onto shaft.
5. Install washer and governor assembly onto shaft.
6. Push down on assembly until it snaps into place.
7. Check assembly for freedom of movement.
8. Spin the governor assembly by hand and check flyweights for freedom of movement and verify center sleeve moves outward.
9. Install crankcase cover.

GOVERNOR SHAFT

Inspection/Replacement

NOTE: It is not necessary to remove governor shaft unless damaged.

1. Remove crankshaft cover. (See CRANKCASE COVER—Removal/Installation.)
2. Inspect governor shaft for wear or damage. Replace entire assembly only when necessary. If necessary, to replace governor assembly, do the following:
   - Scribe a mark across shaft and lever to aid in installation.
   - Loosen nut on lever.
   - Remove retaining pin, governor shaft, and washer.

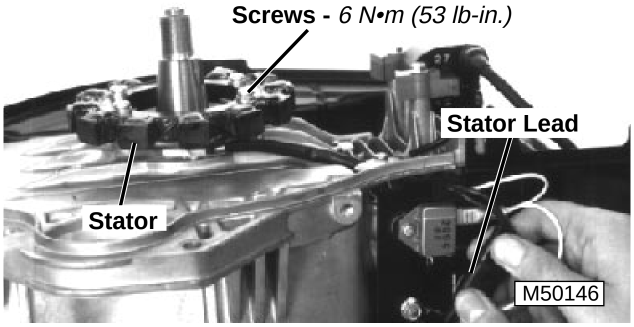


3. Install washer, shaft, and retaining pin.
4. Align marks made during removal.
5. Tighten nut to **7.8 N•m (69 lb-in.)**.

STATOR

Removal/Installation

1. Remove flywheel. (See FLYWHEEL—Removal/ Installation.)



2. Disconnect stator lead.
3. Remove cap screws and stator.

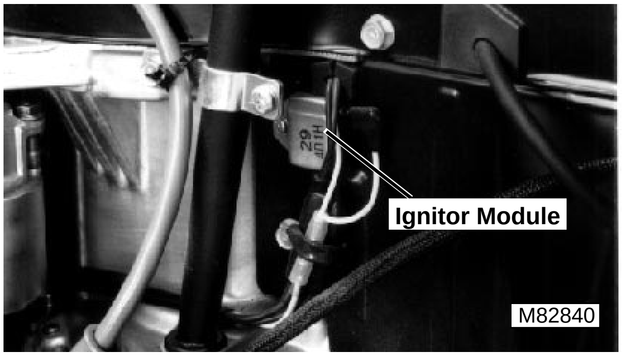
Installation is done in the reverse order of removal.

- Tighten stator cap screws to **6 N•m (53 lb-in.)**.

IGNITOR MODULE

ALL ENGINES PRIOR TO:
FC420V—DS10 (S/N FC420VB50633—)
FC540V—DS15 (S/N FC540VA00385—)

Replacement



NOTE: There is no way to test the ignitor module, if it is suspect, replace it with a know good ignitor module.

1. Disconnect wiring connector.
2. Remove cap screw to replace ignitor module.

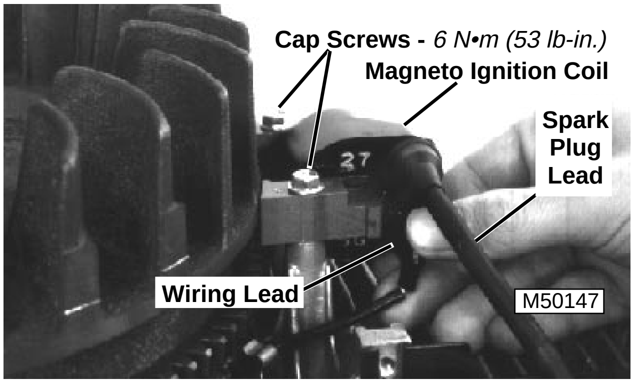
Installation is done in the reverse order of removal.

IGNITION COIL

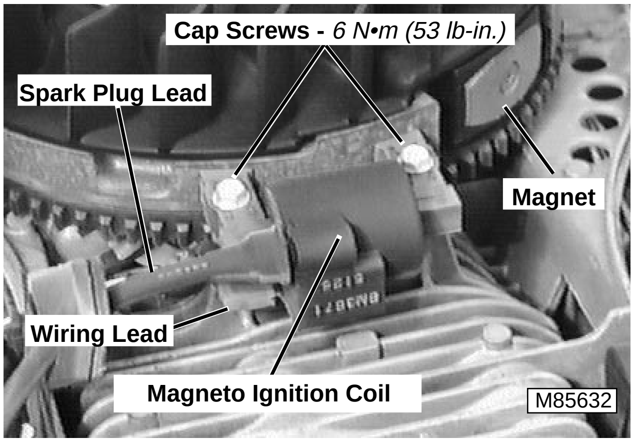
Removal/Installation

NOTE: On early model engines, the ignition coil and ignitor module are separate assemblies with the ignitor module mounted on the engine shroud. Late model engines have an ignition coil with built-in ignitor. Late model coils with built-in ignitor will not retro-fit on early model engines due to the reversed polarity of the flywheel magnet.

1. Remove blower housing. (See BLOWER HOUSING—Removal/Installation.)



Early Model



Late Model

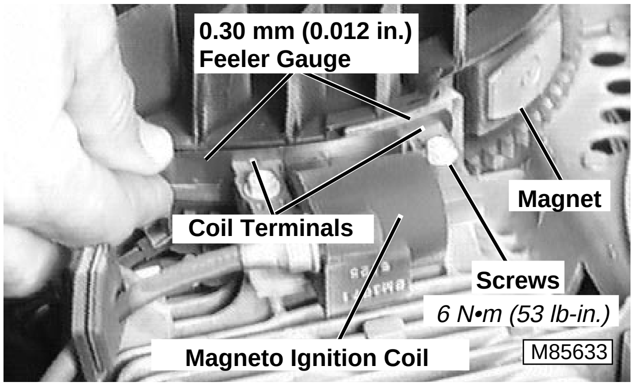
2. Disconnect spark plug lead from spark plug.
3. Turn flywheel so magnet is clear of ignition coil.
4. Disconnect wiring lead.
5. Remove cap screws and ignition coil.
6. Test ignition coil resistance. (See MAGNETO IGNITION COIL RESISTANCE TEST for early models or MAGNETO IGNITION COIL/IGNITOR MODULE RESISTANCE TEST for late models.)

Installation is done in the reverse order of removal.

- Adjust ignition coil air gap. (See following Air Gap Adjustment procedure.)
- Tighten cap screws to specifications.

Air Gap Adjustment

NOTE: Late model shown. Early model is similar.



1. Turn flywheel so magnet is clear of ignition coil terminals.
2. Loosen cap screws.
3. Insert a **0.30 mm (0.012 in.)** feeler gauge between flywheel and both ignition coil terminals.
4. Push ignition coil against feeler gauge and flywheel. Tighten screws to specification.
5. Turn flywheel to remove feeler gauge.

STARTER

Analyze Condition

The starter overheats because of:

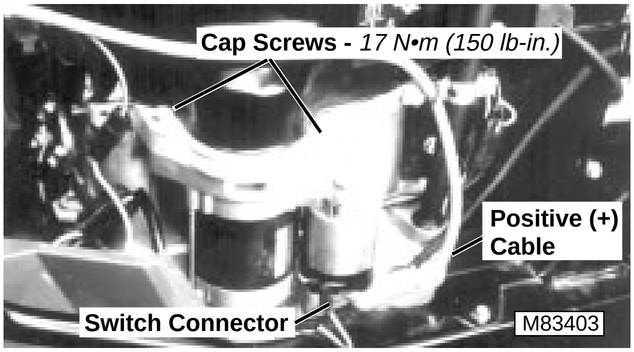
- Long cranking.
- Armature binding.

The starter operates poorly because of:

- Armature binding.
- Dirty or damaged starter drive.
- Badly worn brushes or weak brush springs.
- Excessive voltage drop in cranking system.
- Defective battery or wiring.
- Shorts, opens, or grounds in armature.

NOTE: If starter binding or excessive amperage draw are suspect, see STARTER AMPERAGE DRAW AND RPM BENCH TEST.

Removal/Installation



1. Disconnect negative (–) battery cable at the battery.
2. Remove switch connector and positive (+) battery cable.
3. Remove two starter mounting cap screws and starter.

Installation is done in the reverse order of removal.

- Clean starter motor and engine mounting flange to ensure proper ground contact.
- Tighten cap screws to specification.

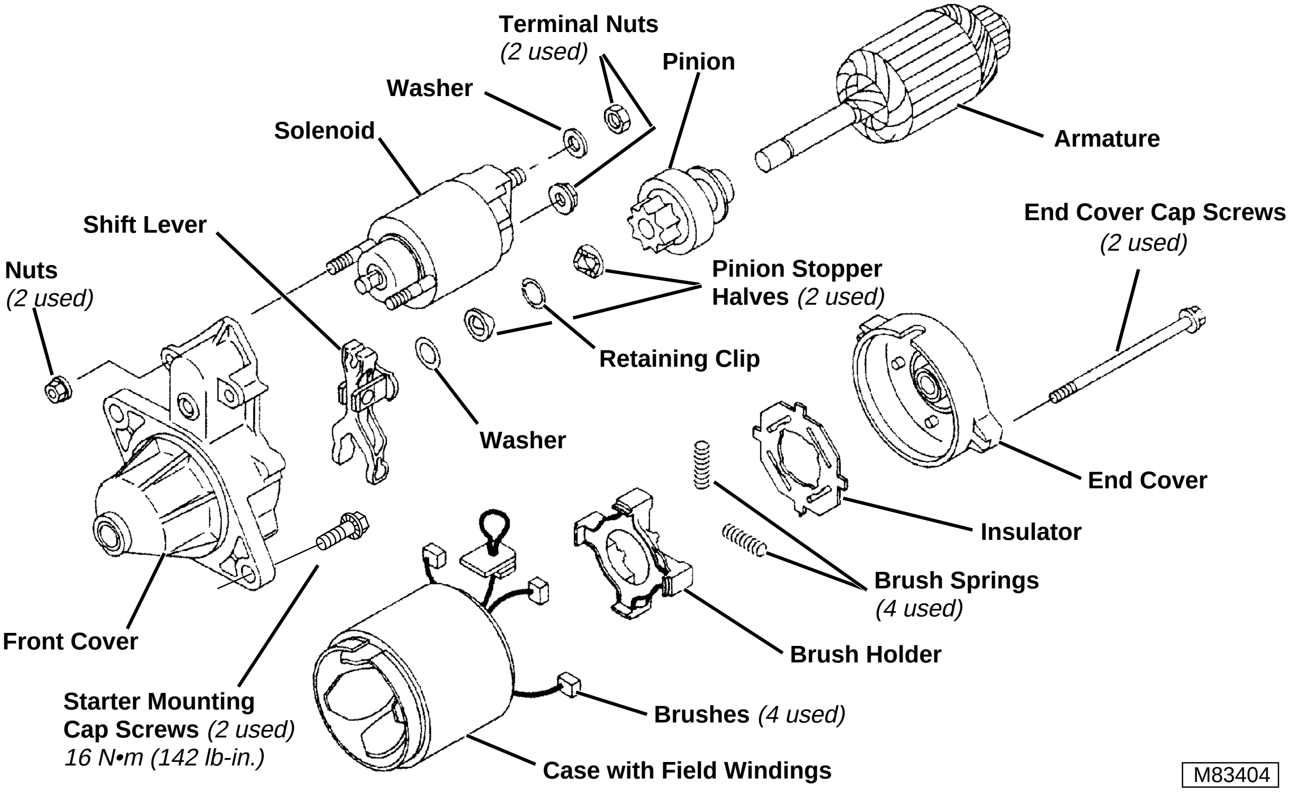
Torque Specification:
Starter Mounting Cap Screws . . . 16 N•m (142 lb-in.)

Disassembly/Assembly

1. Separate pinion stopper halves to remove retaining clip to remove starter drive components.
2. Inspect parts for wear or damage. Replace parts as necessary.
3. Check solenoid, brushes, field coil housing, and armature. (See following Inspection procedure.)

Assembly is done in the reverse order of disassembly.

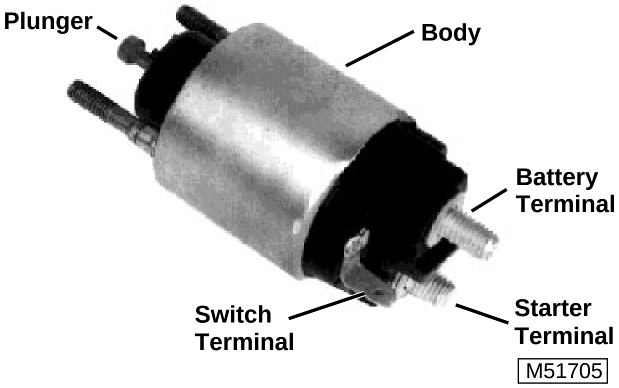
- Apply a very light coating of multipurpose grease to:
  - Sliding surfaces of armature and solenoid shift lever pivots.
  - Armature shaft spline.
  - Points where shaft contacts cover.
- Always replace retaining clip with new one.



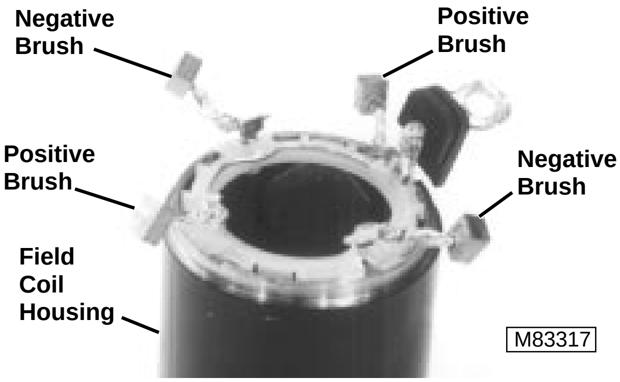
Inspection

1. Check solenoid:

.



- With plunger extended, check solenoid battery terminal and starter terminal for continuity—there should be **no continuity**.
- Depress plunger—there should be **continuity** when plunger is fully depressed.
- Test for open circuits between starter terminal and switch terminal—there should be **continuity**.
- Test for open circuits between switch terminal and body—there should be **continuity**.
- If solenoid fails any of the previous inspection steps, it is defective and must be replaced.

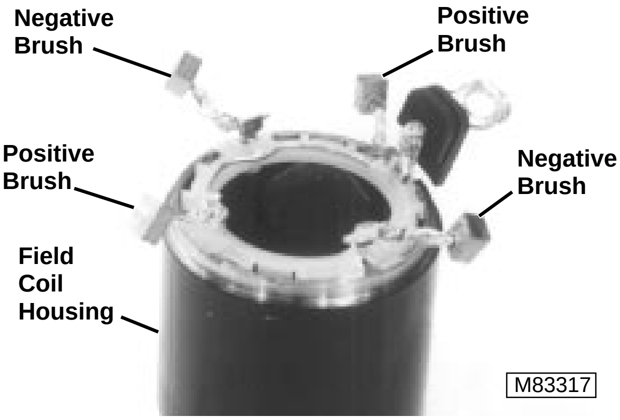


2. Measure brush lengths. If any one brush length is less than **6.0 mm (0.240 in.)—FC420V** or **10.5 mm (0.413 in.)—FC540V**, replace all four brushes.

NOTE: All replacement brushes must be soldered to their leads.

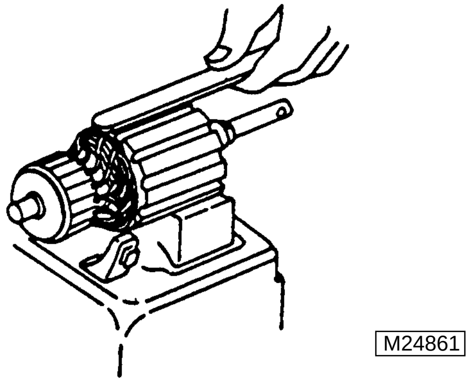
3. Inspect brush springs for wear or damage.

   If one brush is bad, replace ALL brushes. If one spring is bad, replace ALL springs.



4. Test for continuity between positive brushes—there should be **continuity** between positive brushes.
5. Test for continuity between negative brushes (field coil) and bare metal area of housing—there should be **continuity** between negative brushes and bare metal area.
6. Test for continuity between positive brushes and bare metal area of housing—there should be **no continuity** between positive brushes and bare metal area **of the housing**.

   If assembly fails any of the previous inspection steps, it is defective and must be replaced.



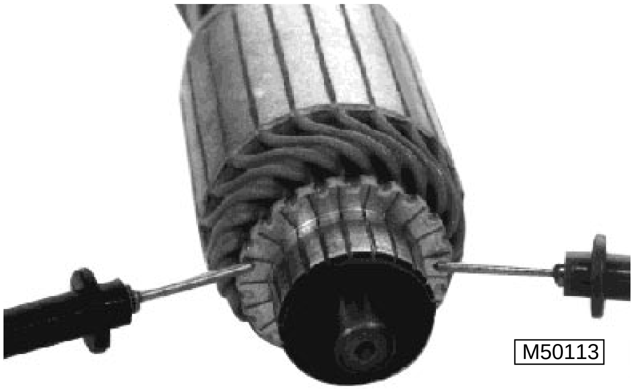
IMPORTANT: DO NOT clean armature with solvent. Solvent can damage insulation on windings. Use only mineral spirits and a brush.

7. Test for short circuits by rotating armature on a growler while holding a hacksaw blade or steel strip on armature. Hacksaw blade will vibrate in areas of any short circuits.

NOTE: A shorted circuit most often occurs because of copper dust or filings between two commutator segments.

If check indicates short circuit in windings, clean commutator of dust and filings. Check armature again. If a short circuit is still indicated, replace armature.

8. Use an ohmmeter or test light and touch probes on **each** commutator bar to check for grounded windings. Armature windings are connected in parallel, so **each** commutator bar must be checked. If there is **continuity**, replace armature.



9. Use an ohmmeter or test light and touch probes on **two** different commutator bars to check for open circuit. If there is **high resistance** or **no continuity**, replace armature.

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CONTENTS

Page

CONTENTS CONTINUED

TEST AND ADJUSTMENT SPECIFICATIONS

Battery:	GT242	GT262	GT275
Recommend Specific Gravity	1.265	1.265	1.265
	1.265	1.265	1.265
	1.265	1.265	1.265
Corrected Specific Gravity (Minimum)	1.225	1.225	1.225
	1.225	1.225	1.225
	1.225	1.225	1.225

Stator:	GT242	GT262	GT275
Size:	15 amps	15 amps	15 amps
Regulated Amperage (Minimum) at Fast Idle	13 amps	13 amps	13 amps
Regulated Voltage (Minimum) at Fast Idle	12.2-14.7 volts DC	12.2-14.7 volts DC	12.2-14.7 volts DC
Unregulated Voltage (Minimum) at Fast Idle	34 volts DC	34 volts DC	34 volts DC
Resistance	0.24-0.40 ohms	0.24-0.40 ohms	0.24-0.40 ohms

Starter:	GT242	GT262	GT275
Maximum Amperage (Load)	85 amps at 500 rpm	85 amps at 500 rpm	85 amps at 500 rpm

PTO Clutch:	GT242	GT262	GT275
Air Gap	0.31-0.46 mm (0.012-0.018 in.)	0.31-0.46 mm (0.012-0.018 in.)	0.31-0.46 mm (0.012-0.018 in.)
Resistance	2.4-2.6 ohms	2.4-2.6 ohms	2.4-2.6 ohms
Current Draw (Approximate)	4.84 amps	4.84 amps	4.874 amps

TORQUE SPECIFICATIONS

Electric PTO	GT242	GT262	GT275
Cap Screw Torque	75 N·m (55 lb-ft)	75 N·m (55 lb-ft)	56 N·m (45 lb-ft)

SPECIAL OR ESSENTIAL TOOLS

NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

JT05685 Battery Tester
Use to test battery performance.

JT07270 Pulse Engine Tachometer
Use to electronically check engine RPM.

JT02153 Current Clamp
Use in conjunction with JT05791 Multimeter to determine output of Voltage regulator/ rectifier, and condition of PTO clutch.

JT05791 Multimeter
Use in conjunction with JT02153 Current Clamp to determine output of Voltage regulator/rectifier, and condition of PTO clutch. Also use wherever voltmeter or ammeter are called for in Tests and Adjustments.

OTHER MATERIALS

Number	Name	Use
M79292	MPG-2® Multipurpose Polymer Grease	Apply to engine crankshaft. Use as moisture barrier for electrical connections.
T43512	John Deere Thread Lock and Sealer (Medium Strength)	Retains cap screws.
TY9375/ TY9480/592	Pipe Sealant with TEFLON®	Apply to threads of oil pressure switch.

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®TEFLON is a registered trademark of the DuPont Co.
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READING ELECTRICAL SCHEMATICS

The schematic is made up of individual circuits laid out in a sequence of related functions. It is formatted with all power wires (A) across the top and all ground wires (B) across the bottom. 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 (C) information unless needed to avoid confusion. If the connector is shown, the number next to it is the terminal pin location (D) in the connector.

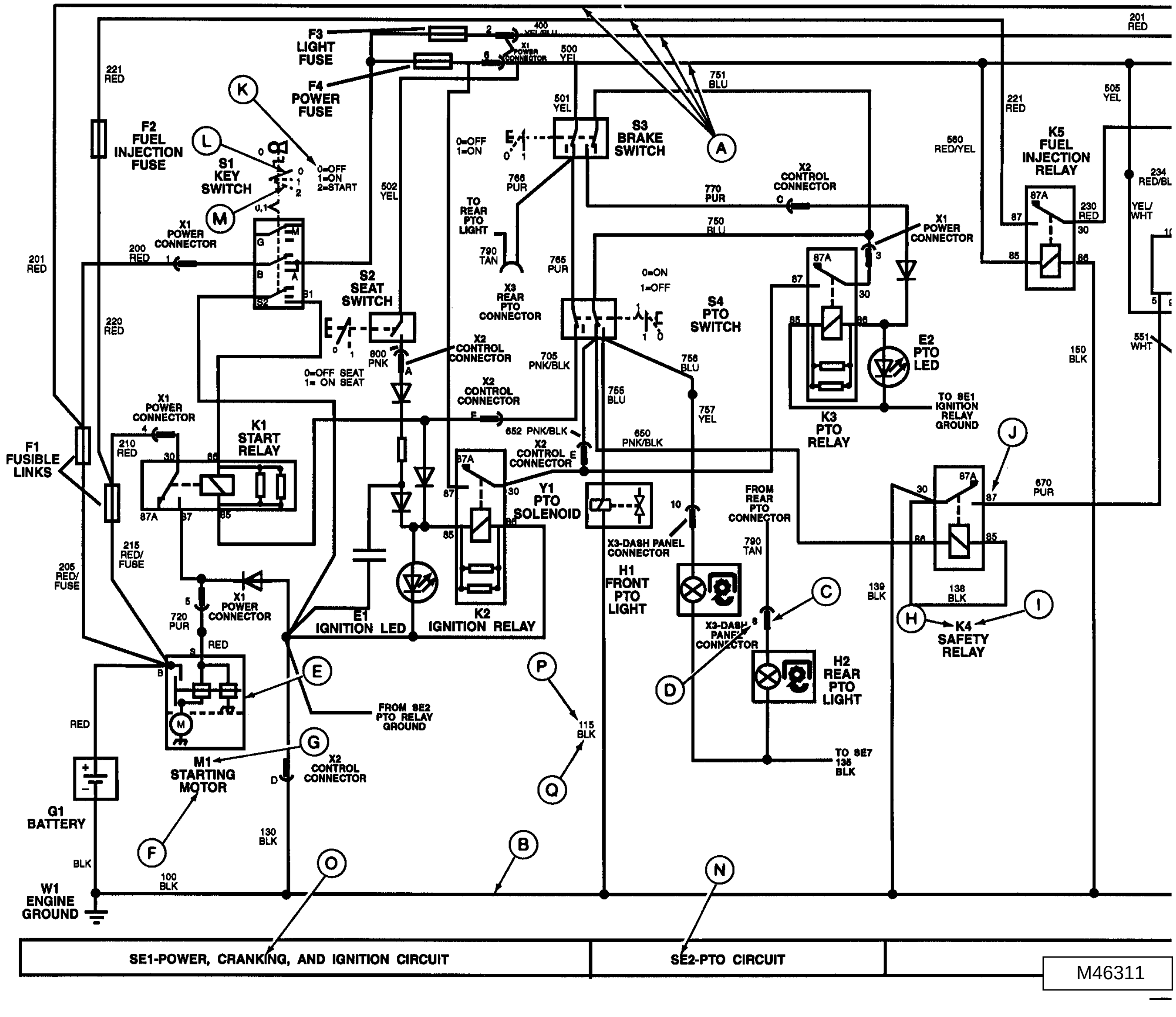
Each component is shown by a symbol (E), its name (F), and an identification code (G). The identification code contains a device identifying letter (H) and number (I).

The identifying letter is always the same for a specific component, but the identifying numbers are numbered consecutively from upper left to lower right. The terminal designation (J) is placed directly outside the symbol next to the connecting wire path. Switch positions (K) are also placed directly outside the symbol. The solid line (L) shows the position the switch is currently in and dash lines (M) represent other switch positions.

Each circuit is identified at the bottom of the drawing by a section number (N) and section name (O).

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

The same component name and identification code are used consistently on all diagrams in this section. Components can be easily cross-referenced.



THEORY OF OPERATION 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:

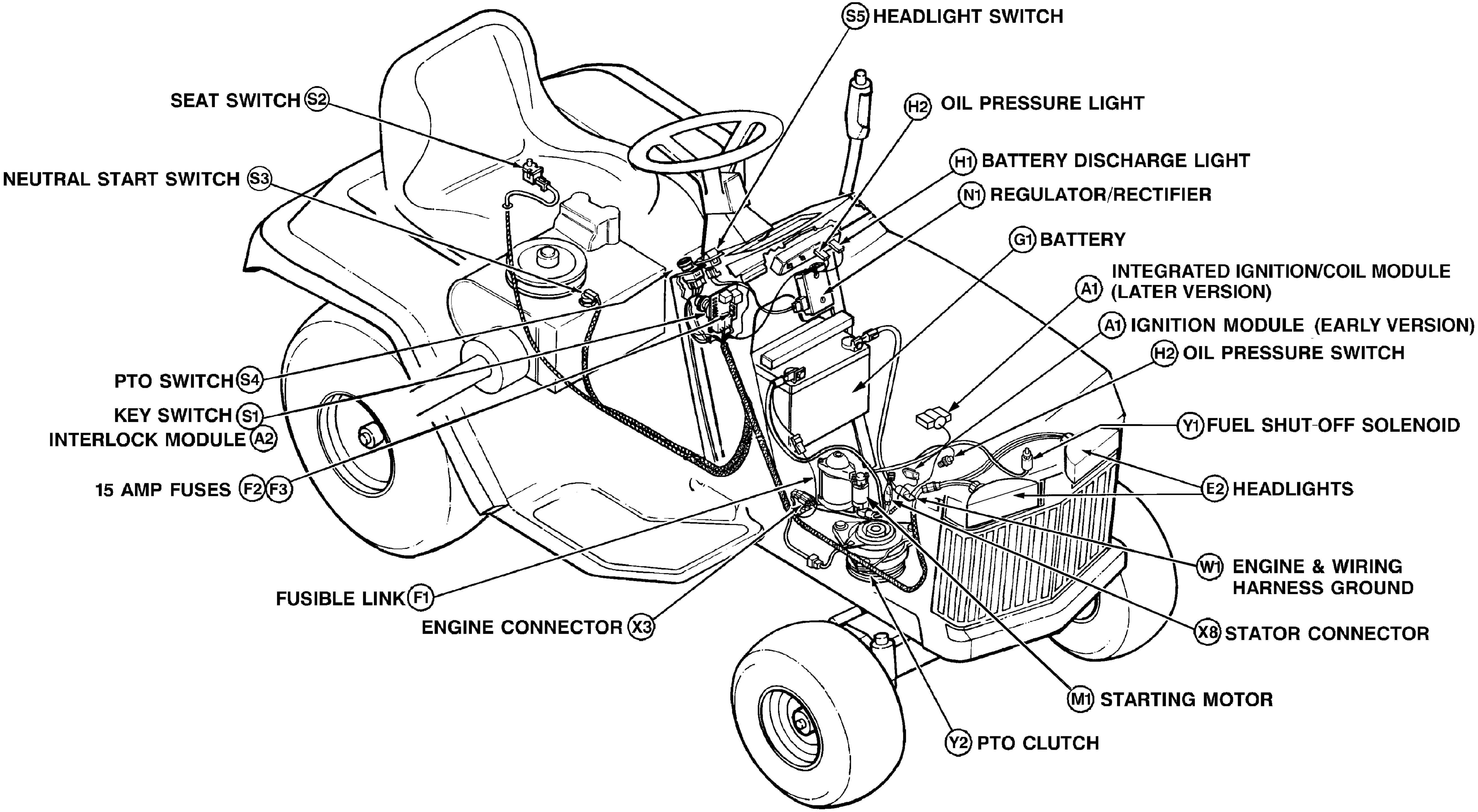
- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

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 arrow points to the exact point the test is to be made.

WIRE COLOR ABBREVIATION CHART

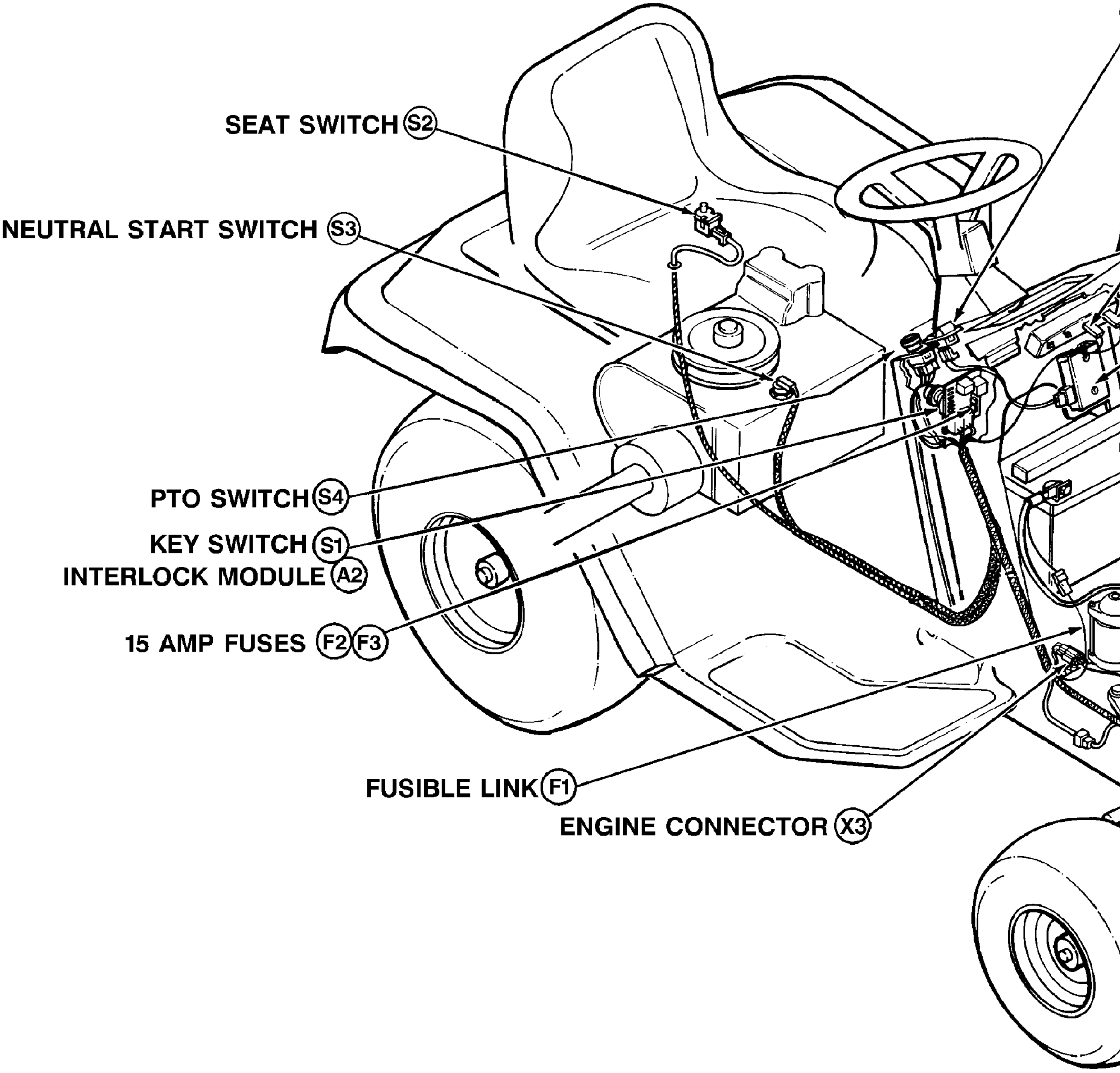
Blk	Black
Blu	Blue
Brn	Brown
Grn	Green
Gry	Gray
Org	Orange
Pnk	Pink
Pur	Purple
Red	Red
Tan	Tan
Wht	White
Yel	Yellow
Blk/Wht	Black/White
Blu/Wht	Blue/White
Brn/Wht	Brown/White
Brn/Yel	Brown/Yellow
Dk Blu	Dark Blue
Dk Brn/Lt Grn	Dark Brown/Light Green
Dk Brn/Red	Dark Brown/Red
Dk Brn/Yel	Dark Brown/Yellow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

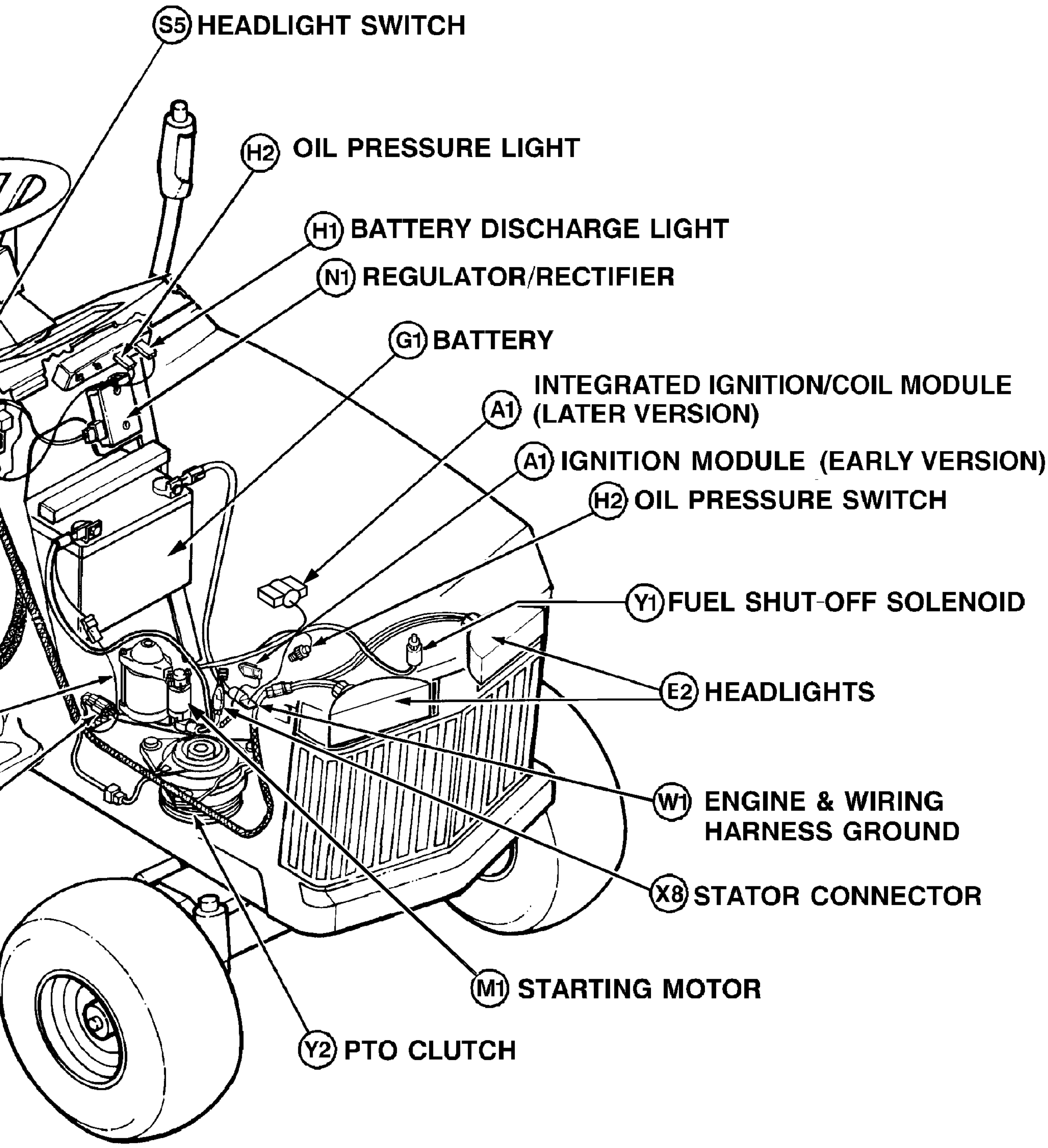
ELECTRICAL COMPONENTS



M79810

ELECTRICAL COMPONENTS




S5 HEADLIGHT SWITCH
H2 OIL PRESSURE LIGHT
H1 BATTERY DISCHARGE LIGHT
N1 REGULATOR/RECTIFIER
G1 BATTERY
A1 INTEGRATED IGNITION/COIL MODULE (LATER VERSION)
A1 IGNITION MODULE (EARLY VERSION)
H2 OIL PRESSURE SWITCH
Y1 FUEL SHUT-OFF SOLENOID
E2 HEADLIGHTS
W1 ENGINE & WIRING HARNESS GROUND
X8 STATOR CONNECTOR
M1 STARTING MOTOR
Y2 PTO CLUTCH

M79810

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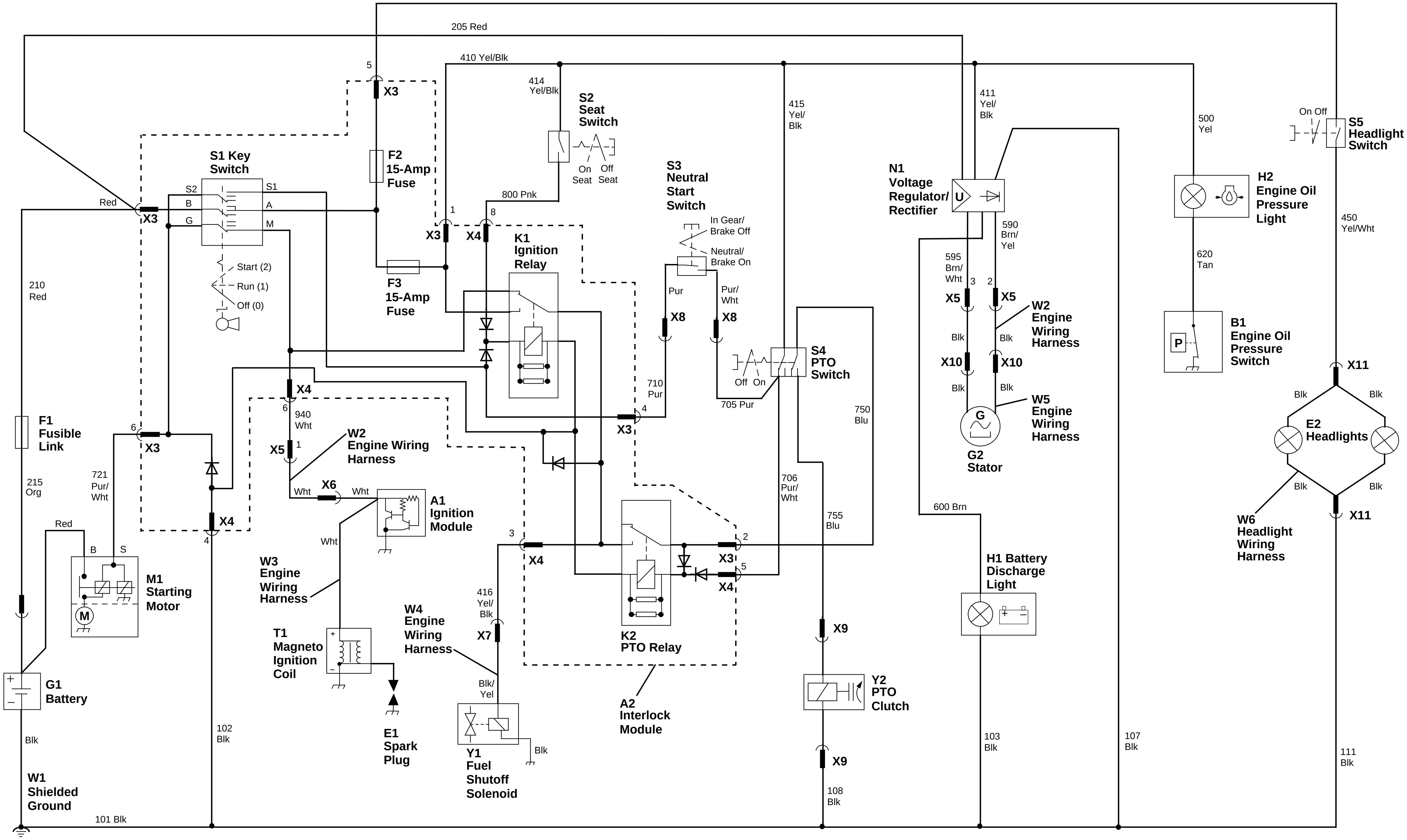
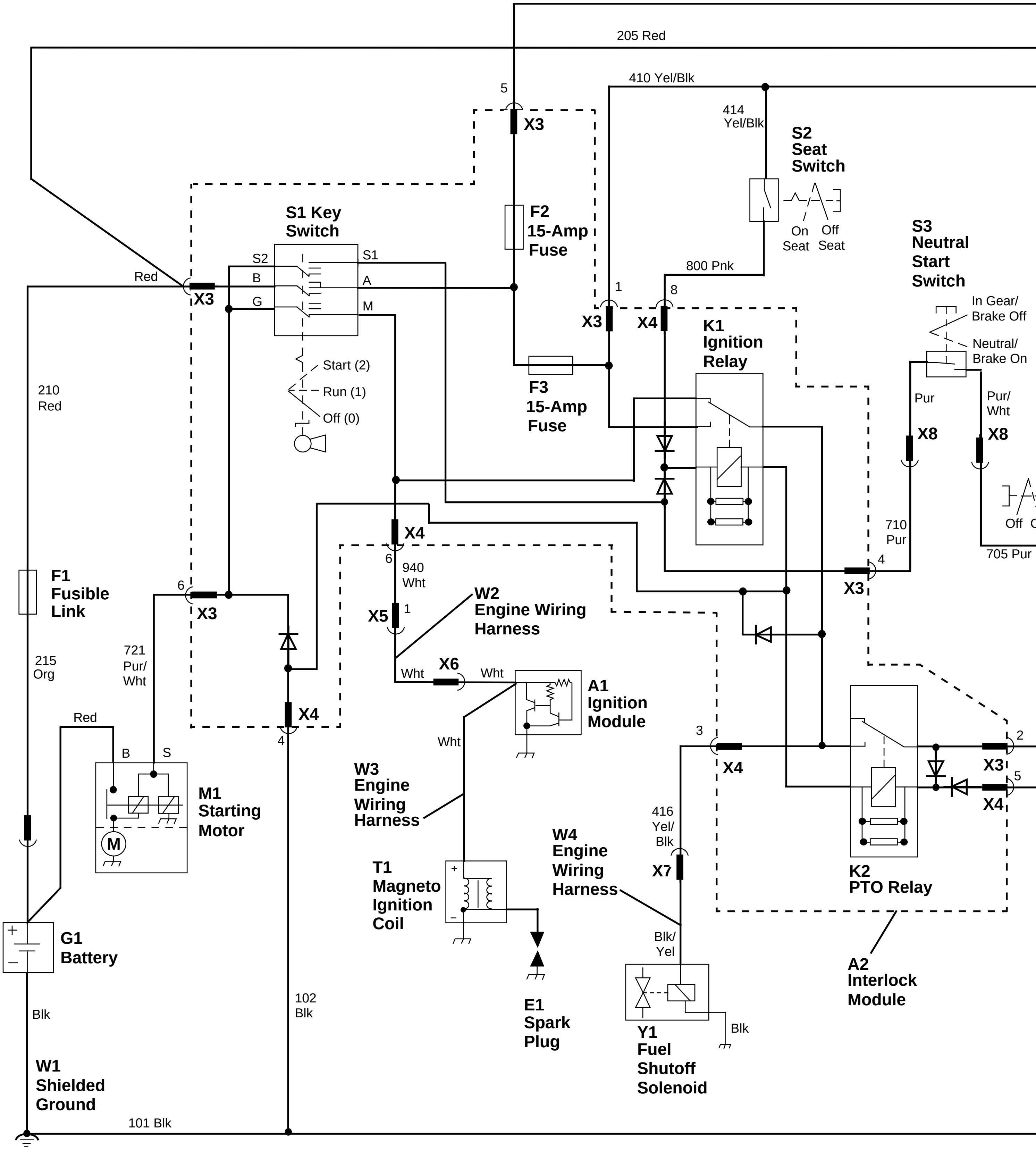
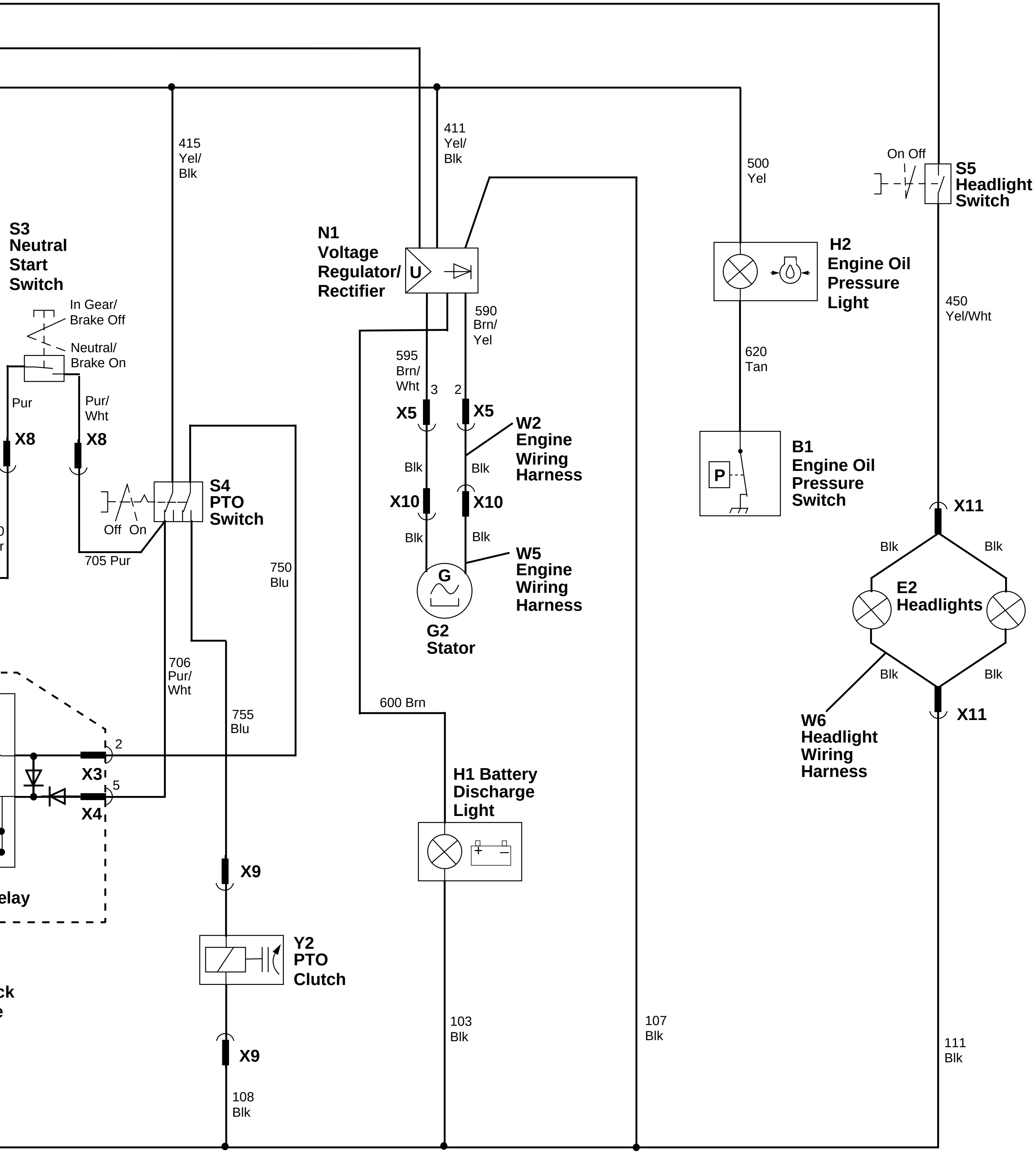
STANDARD ELECTRICAL SCHEMATIC (Early Version)

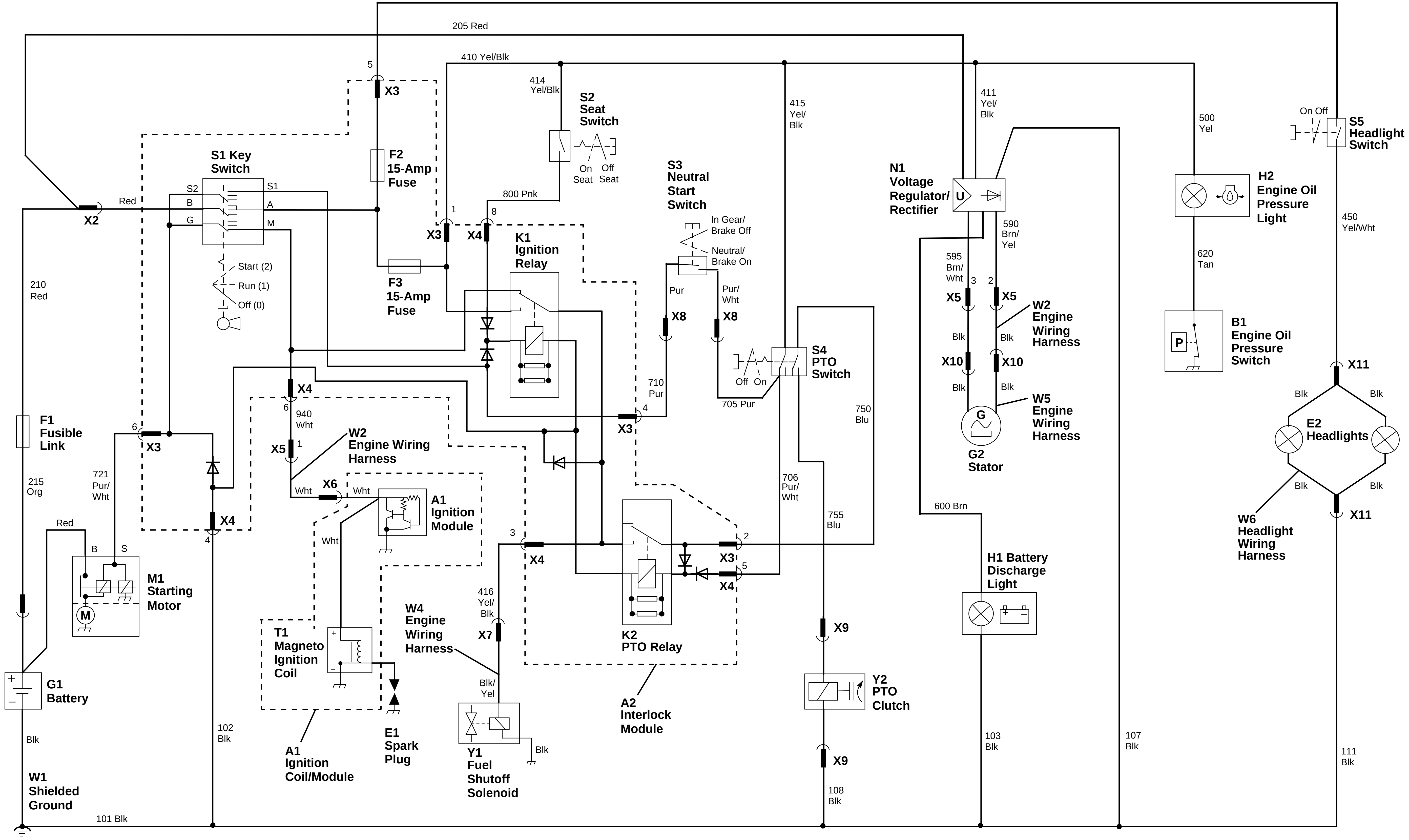


STANDARD ELECTRICAL SCHEMATIC (Early Version)

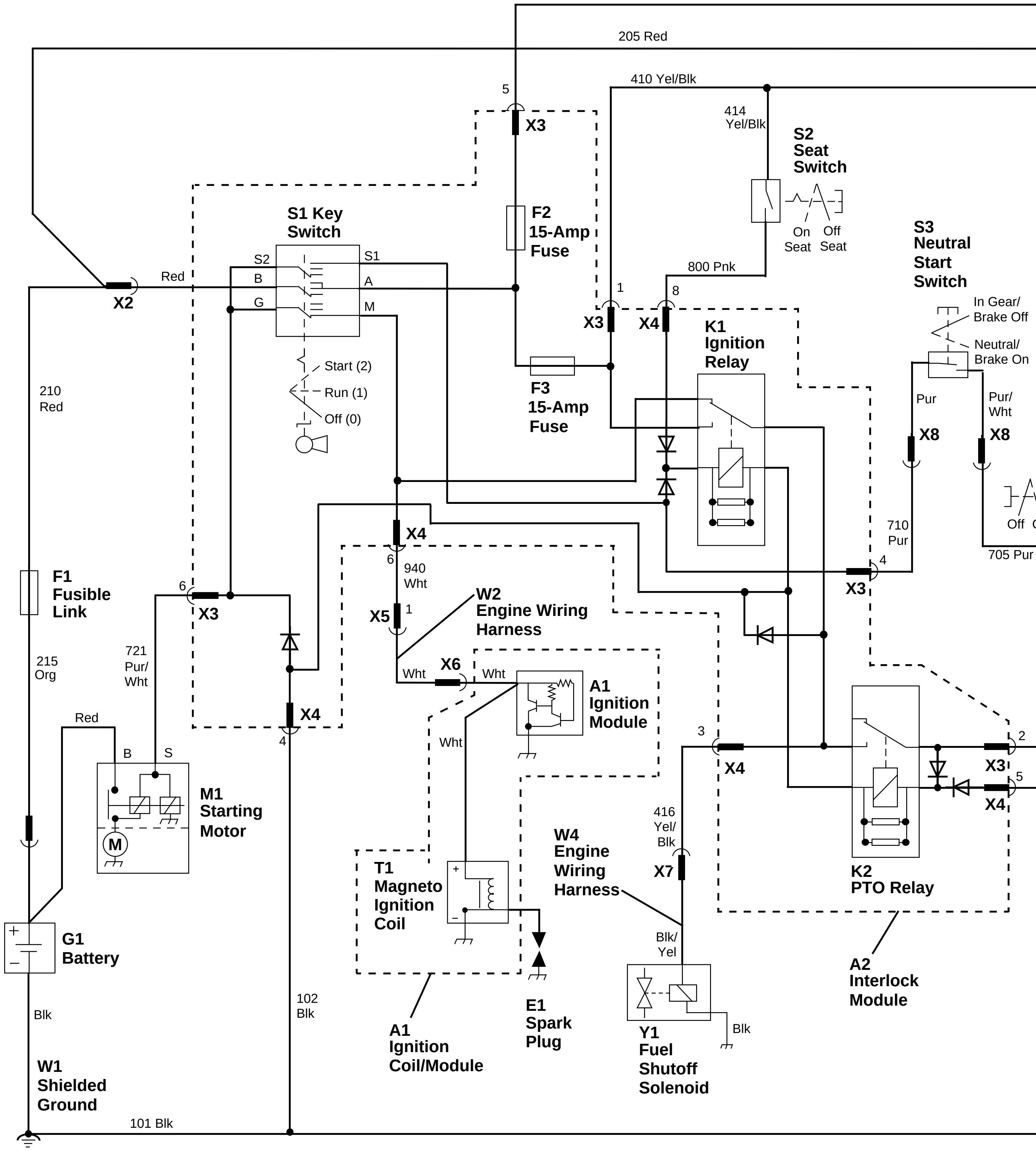


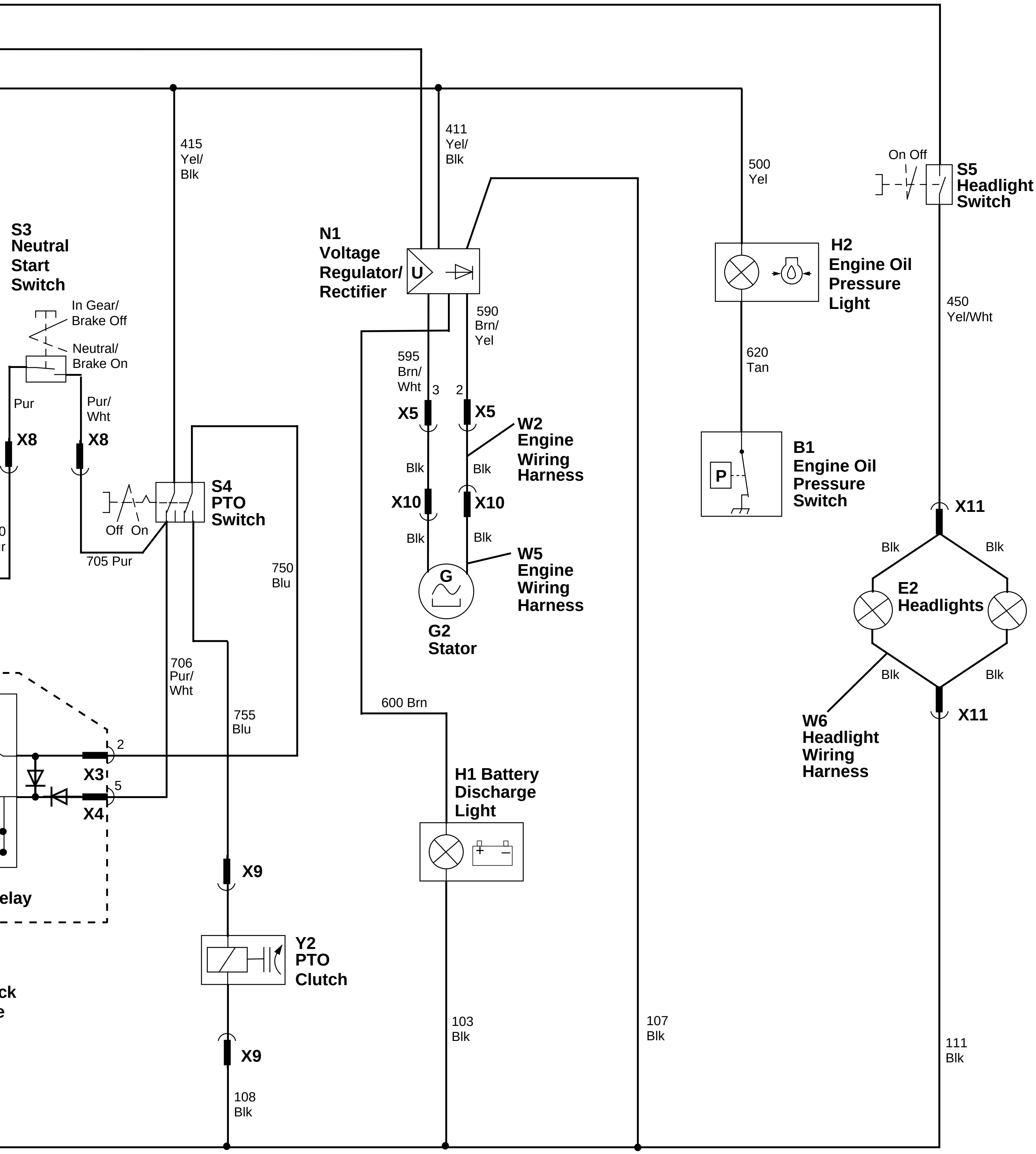

415
Yel/
Blk
411
Yel/
Blk
500
Yel
On Off
S5
Headlight
Switch
S3
Neutral
Start
Switch
N1
Voltage
Regulator/
Rectifier
U
H2
Engine Oil
Pressure
Light
450
Yel/Wht
In Gear/
Brake Off
Neutral/
Brake On
590
Brn/
Yel
595
Brn/
Wht
3
2
620
Tan
Pur
Pur/
Wht
X5
X5
X8
X8
W2
Engine
Wiring
Harness
Blk
Blk
B1
Engine Oil
Pressure
Switch
P
S4
PTO
Switch
X10
X10
X11
Off On
Blk
Blk
Blk
Blk
705 Pur
W5
Engine
Wiring
Harness
750
Blu
G
E2
Headlights
G2
Stator
706
Pur/
Wht
Blk
Blk
755
Blu
600 Brn
X11
W6
Headlight
Wiring
Harness
2
X3
5
X4
H1 Battery
Discharge
Light
X9
elay
Y2
PTO
Clutch
ck
e
103
Blk
107
Blk
111
Blk
X9
108
Blk

STANDARD ELECTRICAL SCHEMATIC (Later Version)

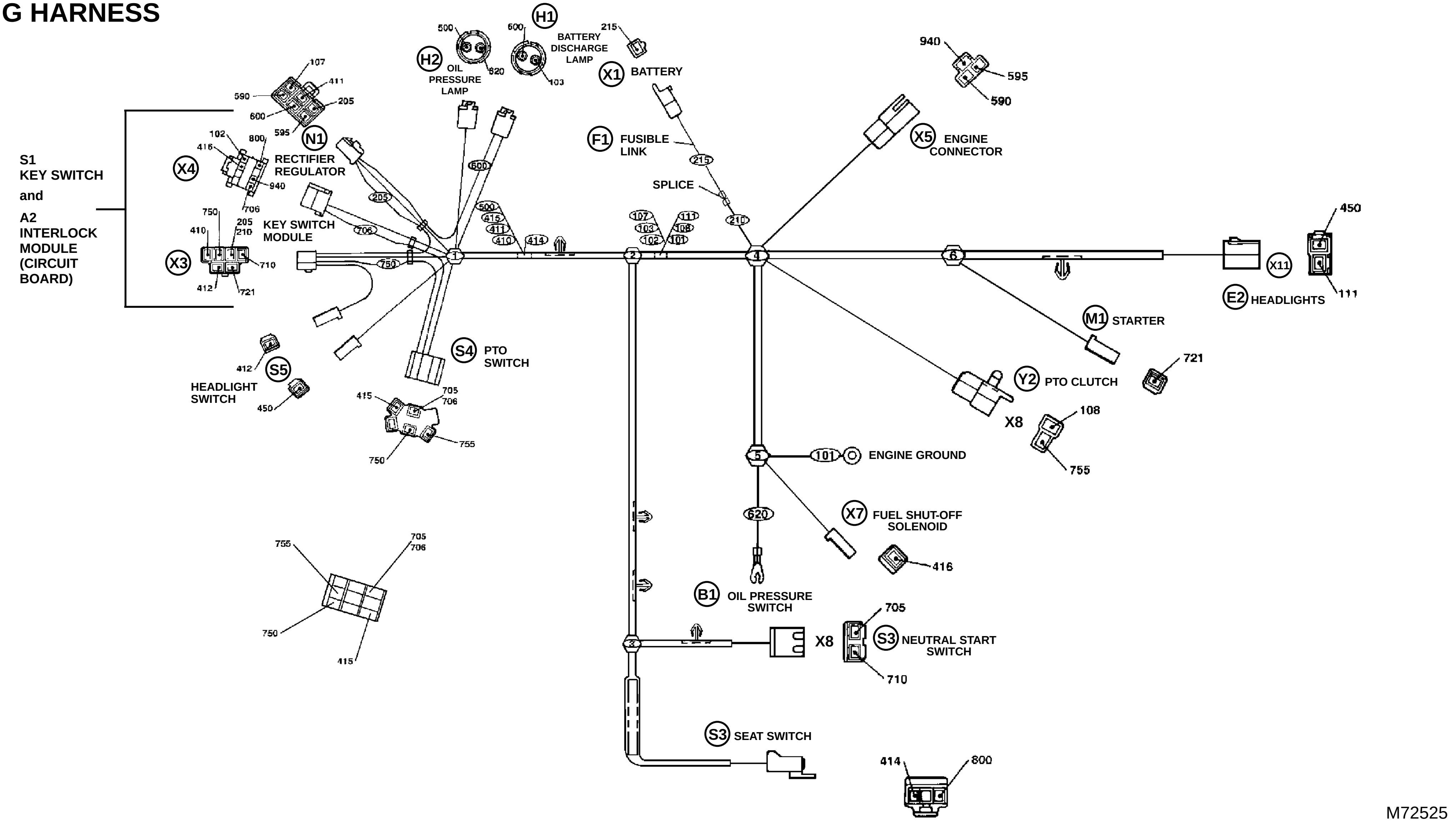


STANDARD ELECTRICAL SCHEMATIC (Later Version)




415
Yel/
Blk
411
Yel/
Blk
500
Yel
On Off
S5
Headlight
Switch
S3
Neutral
Start
Switch
N1
Voltage
Regulator/
Rectifier
U
H2
Engine Oil
Pressure
Light
In Gear/
Brake Off
Neutral/
Brake On
590
Brn/
Yel
450
Yel/Wht
595
Brn/
Wht
3
2
620
Tan
Pur
Pur/
Wht
X5
X5
W2
Engine
Wiring
Harness
X8
X8
B1
Engine Oil
Pressure
Switch
P
Blk
Blk
S4
PTO
Switch
X10
X10
X11
Off On
Blk
Blk
Blk
Blk
705 Pur
W5
Engine
Wiring
Harness
750
Blu
G
E2
Headlights
G2
Stator
706
Pur/
Wht
Blk
Blk
600 Brn
W6
Headlight
Wiring
Harness
X11
755
Blu
2
X3
5
X4
H1 Battery
Discharge
Light
X9
elay
Y2
PTO
Clutch
ck
e
103
Blk
107
Blk
111
Blk
X9
108
Blk

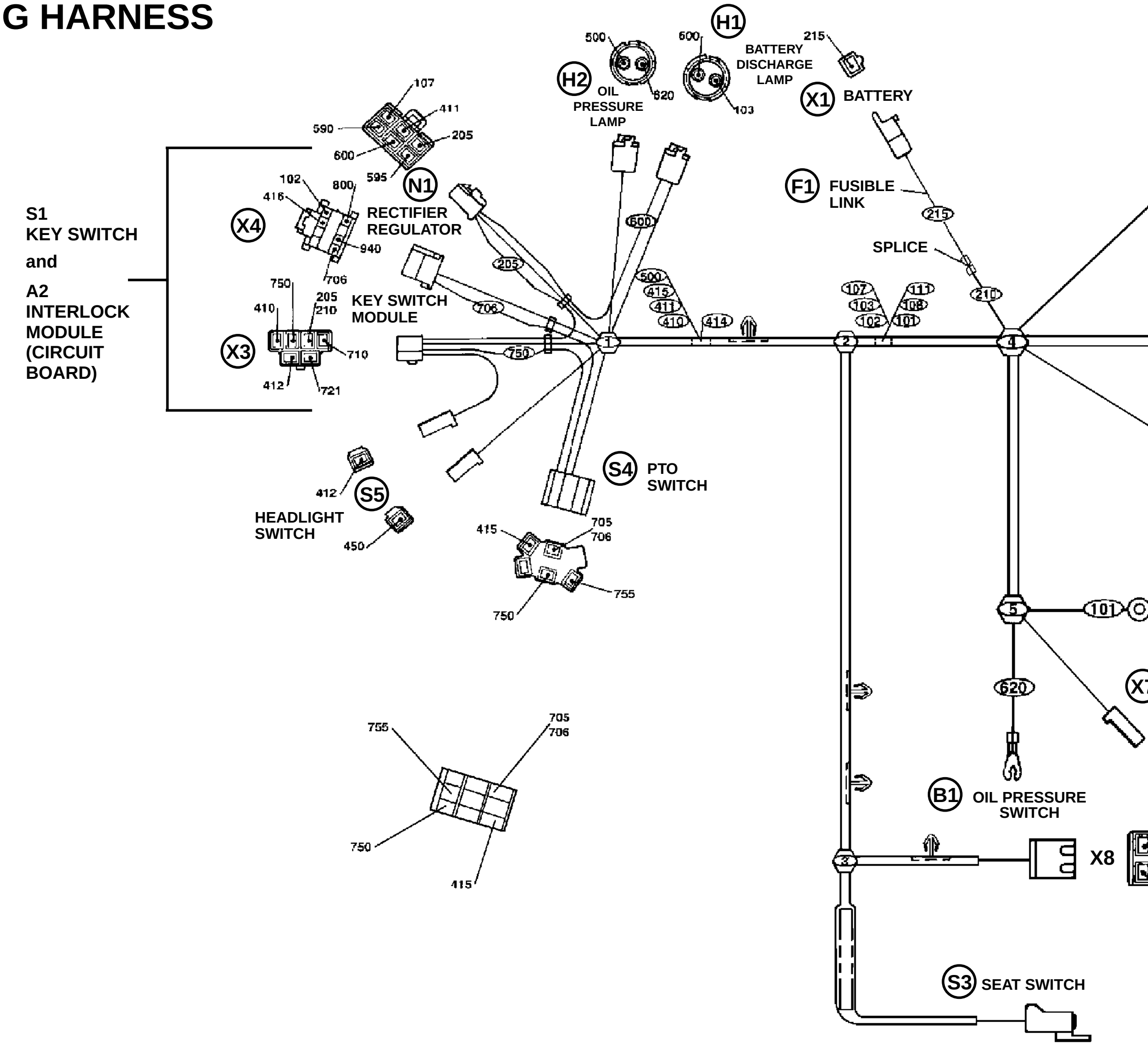
W1 MAIN WIRING HARNESS (Early Version)



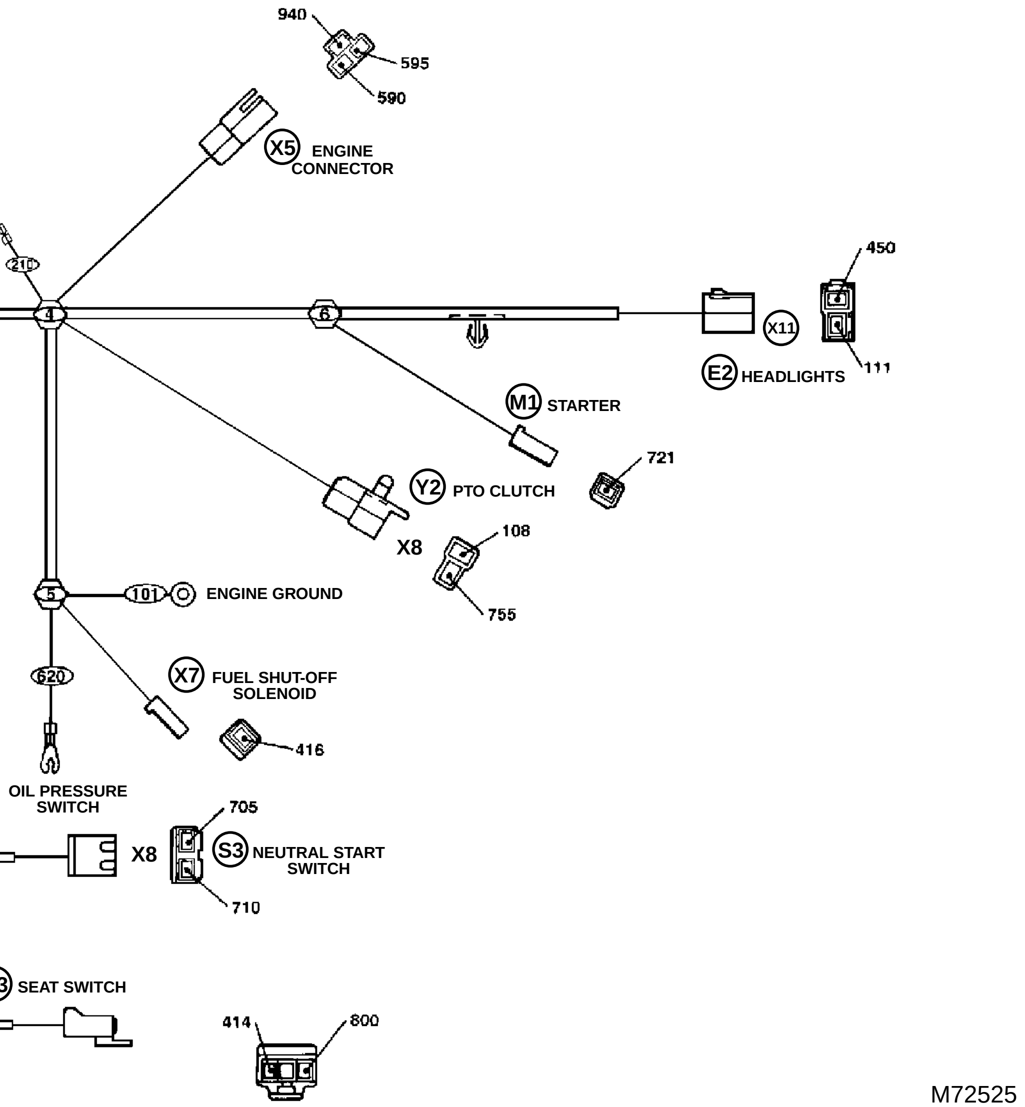
M72525

Circuit No.	Gage	Color	Termination Points
101	2.0 mm^2 (14)	Blk	Soldered Tie Point (102-Blk, 108-Blk, 103-Blk, 107-Blk, 111-Blk), W1 (Ground)
102	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), X4
103	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), H1
107	1.0 mm^2 (16)	Blk	Soldered Tie Point (101-Blk), N1
108	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), X9
111	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), X11
205	1.0 mm^2 (16)	Red	X3, N1
210	2.0 mm^2 (14)	Red	F1, X3
215	0.8 mm^2 (18)	Org	X1, Fusible Link (F1)
410	1.0 mm^2 (16)	Yel/Blk	Soldered Tie Point (414-Yel/Blk, 415-Yel/Blk, 411-Yel/Blk, 500-Yel), X3
411	0.8 mm^2 (18)	Yel/Blk	Soldered Tie Point (410-Yel/Blk), N1
412	0.8 mm^2 (18)	Yel/Blk	X3, S5
414	0.8 mm^2 (18)	Yel/Blk	Soldered Tie Point (410-Yel/Blk), S2
415	1.0 mm^2 (16)	Yel/Blk	Soldered Tie Point (410-Yel/Blk), S4
416	0.8 mm^2 (18)	Yel/Blk	X4, X7
450	0.8 mm^2 (18)	Yel/ Wht	S5, X11
500	0.8 mm^2 (18)	Yel	Soldered Tie Point (410-Yel/Blk), H2
590	2.0 mm^2(14)	Brn/Yel	N1, X10
595	2.0 mm^2 (14)	Brn/ Wht	N1, X10
600	0.8 mm^2 (18)	Brn	N1, H1
620	0.8 mm^2 (18)	Tan	H2, B1
705	1.0 mm^2 (16)	Pur	S3, X8
706	0.8 mm^2 (18)	Pur/ Wht	S4, X4
710	1.0 mm^2 (16)	Pur	S3, X8
721	1.0 mm^2 (16)	Pur/ Wht	X3, M1
750	0.8 mm^2 (18)	Blu	S4, X3
755	0.8 mm^2 (18)	Blu	S4, X9
800	0.8 mm^2 (18)	Pnk	S2, X4
940	0.8 mm^2 (18)	Wht	X4, X5

W1 MAIN WIRING HARNESS (Early Version)



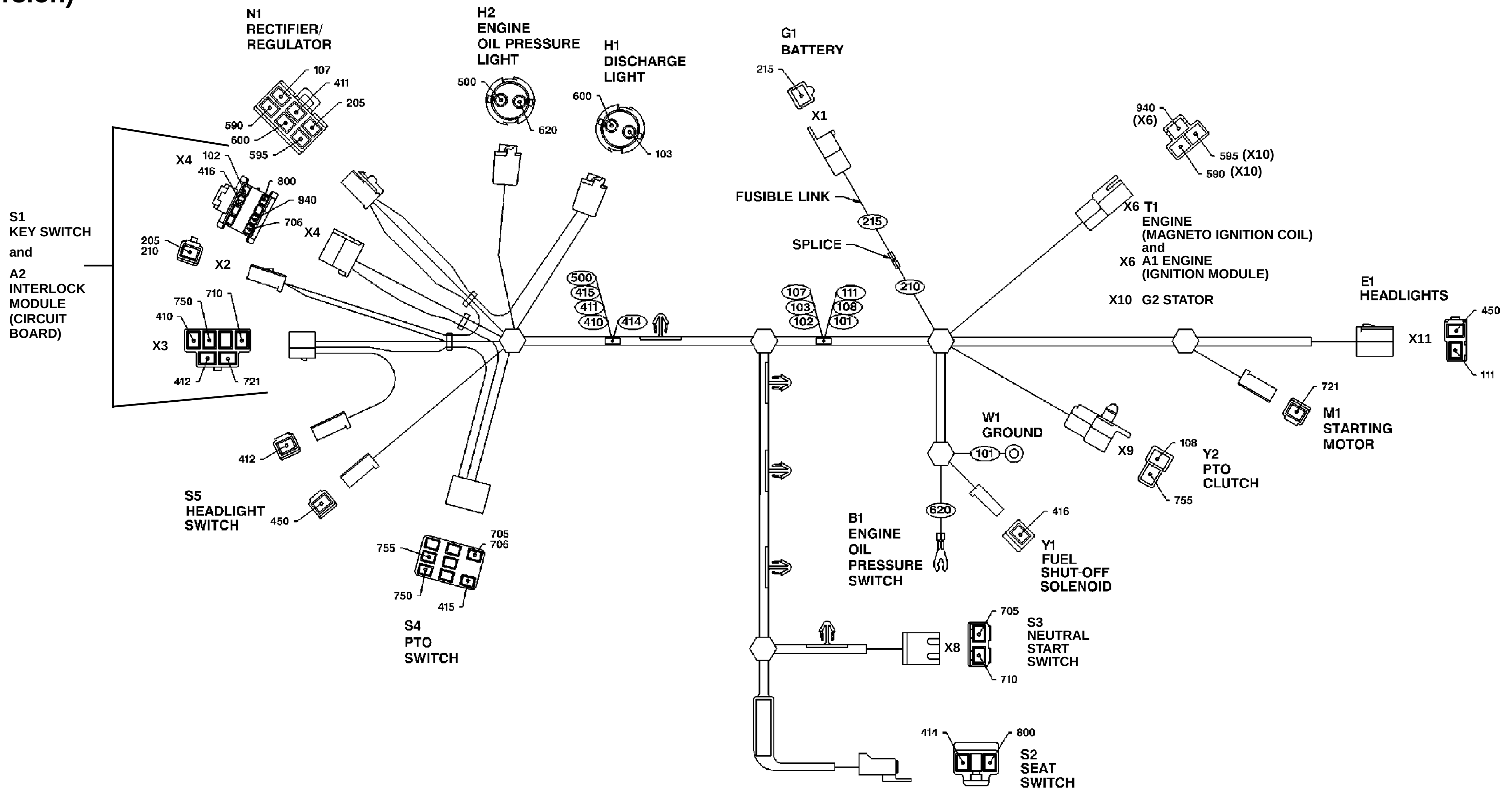
Circuit No.	Gage	Color	Termination Points
101	2.0 mm² (14)	Blk	Soldered Tie Point (102-Blk, 108-Blk, 103-Blk, 107-Blk, 111-Blk), W1 (Ground)
102	0.8 mm² (18)	Blk	Soldered Tie Point (101-Blk), X4
103	0.8 mm² (18)	Blk	Soldered Tie Point (101-Blk), H1
107	1.0 mm² (16)	Blk	Soldered Tie Point (101-Blk), N1
108	0.8 mm² (18)	Blk	Soldered Tie Point (101-Blk), X9
111	0.8 mm² (18)	Blk	Soldered Tie Point (101-Blk), X11
205	1.0 mm² (16)	Red	X3, N1
210	2.0 mm² (14)	Red	F1, X3
215	0.8 mm² (18)	Org	X1, Fusible Link (F1)
410	1.0 mm² (16)	Yel/Blk	Soldered Tie Point (414-Yel/Blk, 415-Yel/Blk, 411-Yel/Blk, 500-Yel), X3
411	0.8 mm² (18)	Yel/Blk	Soldered Tie P
412	0.8 mm² (18)	Yel/Blk	X3, S5
414	0.8 mm² (18)	Yel/Blk	Soldered Tie P
415	1.0 mm² (16)	Yel/Blk	Soldered Tie P
416	0.8 mm² (18)	Yel/Blk	X4, X7
450	0.8 mm² (18)	Yel/ Wht	S5, X11
500	0.8 mm² (18)	Yel	Soldered Tie P
590	2.0 mm²(14)	Brn/Yel	N1, X10
595	2.0 mm² (14)	Brn/ Wht	N1, X10
600	0.8 mm² (18)	Brn	N1, H1



or	Termination Points
lk	Soldered Tie Point (410-Yel/Blk), N1
lk	X3, S5
lk	Soldered Tie Point (410-Yel/Blk), S2
lk	Soldered Tie Point (410-Yel/Blk), S4
lk	X4, X7
/ t	S5, X11
	Soldered Tie Point (410-Yel/Blk), H2
Yel	N1, X10
/ t	N1, X10
n	N1, H1

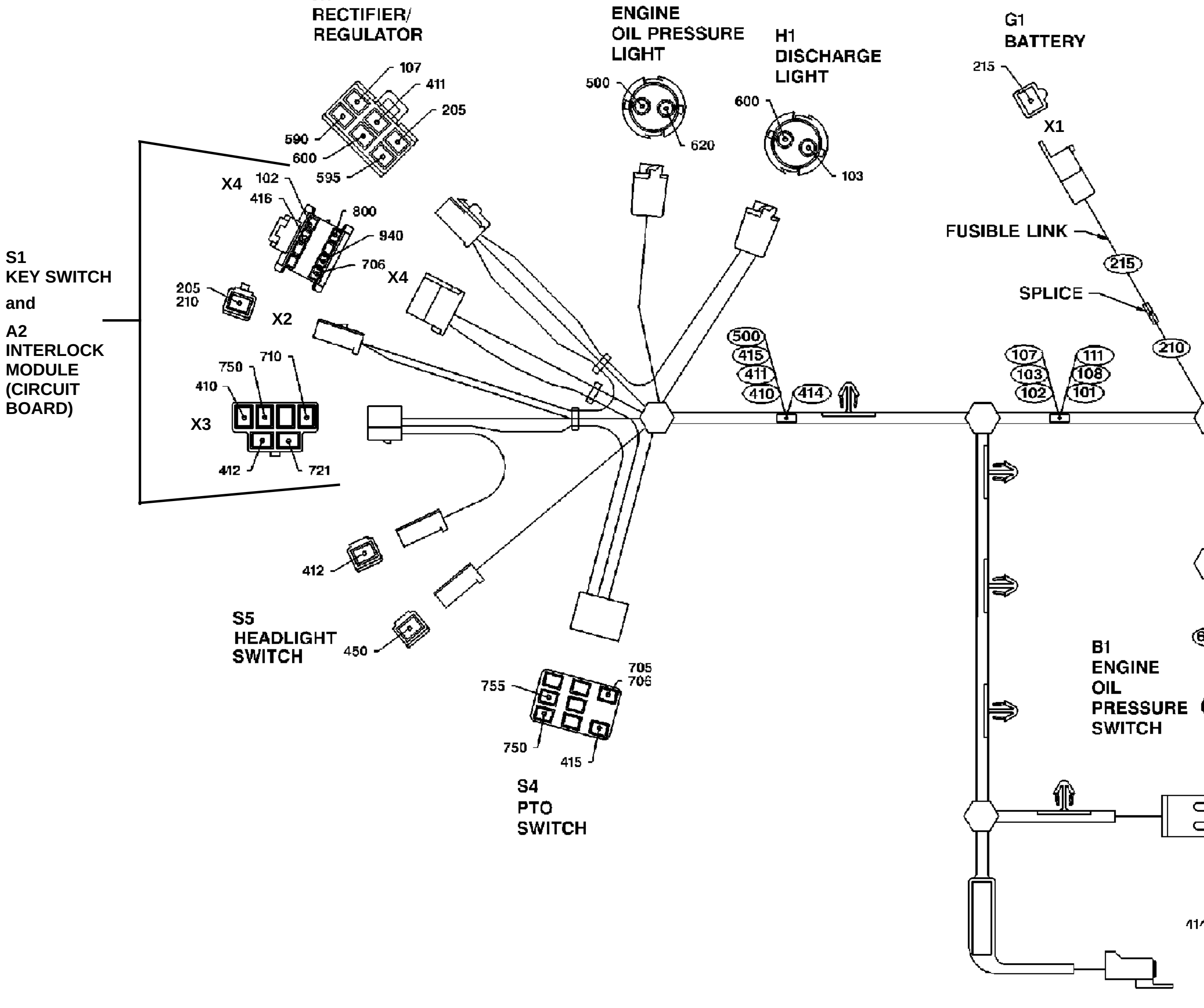
Circuit No.	Gage	Color	Termination Points
620	0.8 mm^2 (18)	Tan	H2, B1
705	1.0 mm^2 (16)	Pur	S3, X8
706	0.8 mm^2 (18)	Pur/ Wht	S4, X4
710	1.0 mm^2 (16)	Pur	S3, X8
721	1.0 mm^2 (16)	Pur/ Wht	X3, M1
750	0.8 mm^2 (18)	Blu	S4, X3
755	0.8 mm^2 (18)	Blu	S4, X9
800	0.8 mm^2 (18)	Pnk	S2, X4
940	0.8 mm^2 (18)	Wht	X4, X5

W1 MAIN WIRING HARNESS (Later Version)



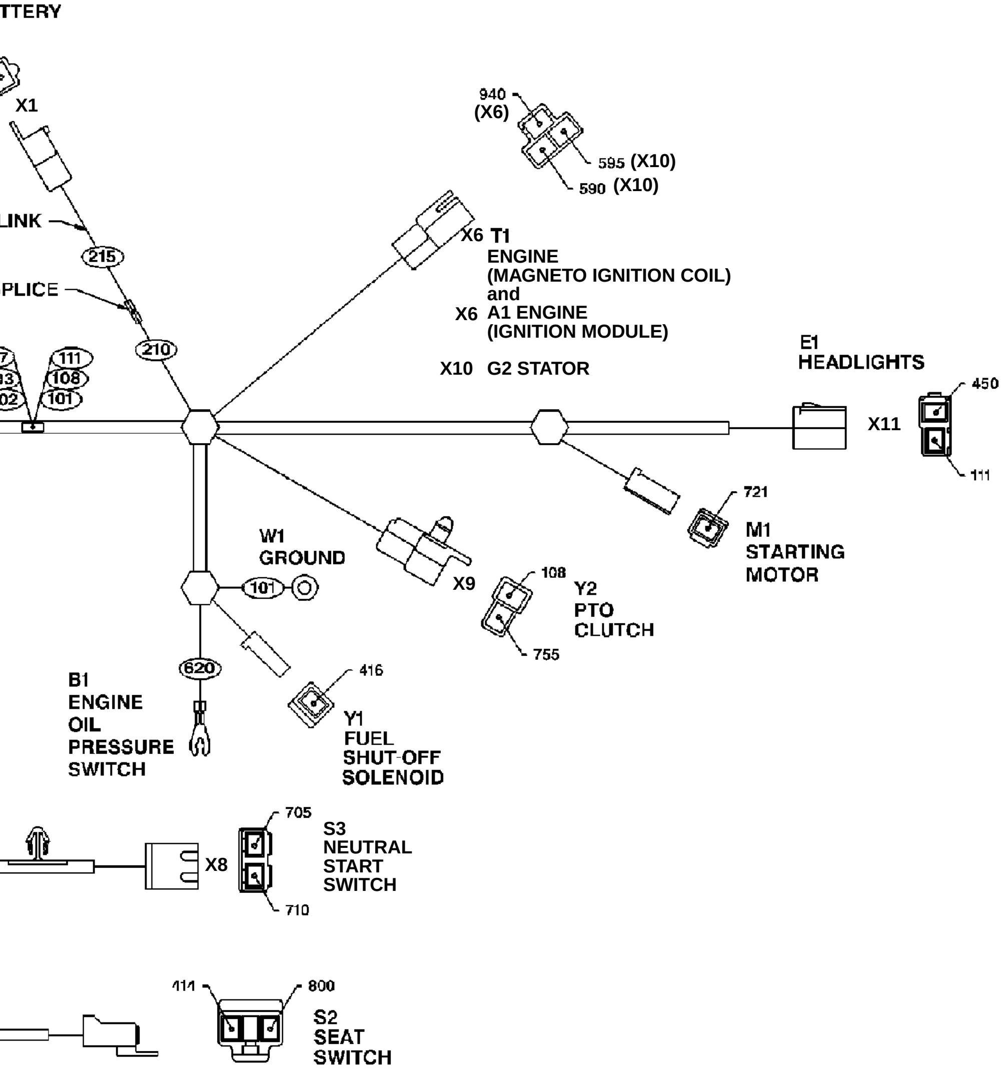
Circuit No.	Gage	Color	Termination Points
101	2.0 mm^2 (14)	Blk	Soldered Tie Point (102-Blk, 108-Blk, 103-Blk, 107-Blk, 111-Blk), W1 (Ground)
102	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), X4
103	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), H1
107	1.0 mm^2 (16)	Blk	Soldered Tie Point (101-Blk), N1
108	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), X9
111	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), X11
205	1.0 mm^2 (16)	Red	X2, N1
210	2.0 mm^2 (14)	Red	F1, X2
215	0.8 mm^2 (18)	Org	X1, Fusible Link (F1)
410	1.0 mm^2 (16)	Yel/Blk	Soldered Tie Point (414-Yel/Blk, 415-Yel/Blk, 411-Yel/Blk, 500-Yel), X3
411	0.8 mm^2 (18)	Yel/Blk	Soldered Tie Point (410-Yel/Blk), N1
412	0.8 mm^2 (18)	Yel/Blk	X3, S5
414	0.8 mm^2 (18)	Yel/Blk	Soldered Tie Point (410-Yel/Blk), S2
415	1.0 mm^2 (16)	Yel/Blk	Soldered Tie Point (410-Yel/Blk), S4
416	0.8 mm^2 (18)	Yel/Blk	X4, X7
450	0.8 mm^2 (18)	Yel/ Wht	S5, X11
500	0.8 mm^2 (18)	Yel	Soldered Tie Point (410-Yel/Blk), H2
590	2.0 mm^2(14)	Brn/Yel	N1, X10
595	2.0 mm^2 (14)	Brn/ Wht	N1, X10
600	0.8 mm^2 (18)	Brn	N1, H1
620	0.8 mm^2 (18)	Tan	H2, B1
705	1.0 mm^2 (16)	Pur	S3, X8
706	0.8 mm^2 (18)	Pur/ Wht	S4, X4
710	1.0 mm^2 (16)	Pur	S3, X8
721	1.0 mm^2 (16)	Pur/ Wht	X3, M1
750	0.8 mm^2 (18)	Blu	S4, X3
755	0.8 mm^2 (18)	Blu	S4, X9
800	0.8 mm^2 (18)	Pnk	S2, X4
940	0.8 mm^2 (18)	Wht	X4, X5

W1 MAIN WIRING HARNESS (Later Version)



Circuit No.	Gage	Color	Termination Points
101	2.0 mm^2 (14)	Blk	Soldered Tie Point (102-Blk, 108-Blk, 103-Blk, 107-Blk, 111-Blk), W1 (Ground)
102	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), X4
103	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), H1
107	1.0 mm^2 (16)	Blk	Soldered Tie Point (101-Blk), N1
108	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), X9
111	0.8 mm^2 (18)	Blk	Soldered Tie Point (101-Blk), X11
205	1.0 mm^2 (16)	Red	X2, N1
210	2.0 mm^2 (14)	Red	F1, X2
215	0.8 mm^2 (18)	Org	X1, Fusible Link (F1)
410	1.0 mm^2 (16)	Yel/Blk	Soldered Tie Point (414-Yel/Blk, 415-Yel/Blk, 411-Yel/Blk, 500-Yel), X3

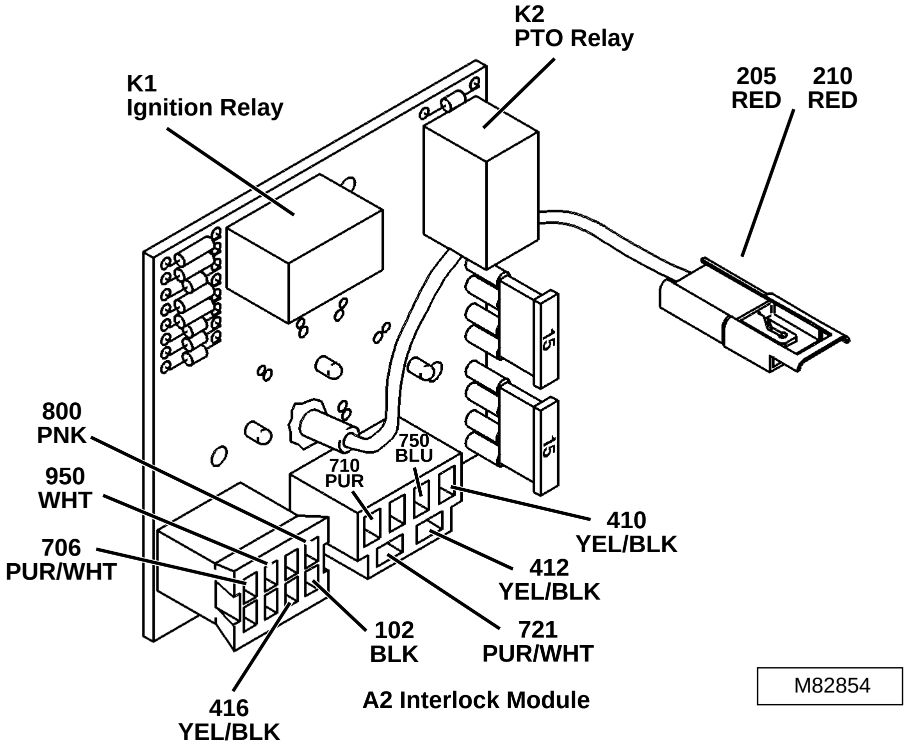
Circuit No.	Gage	Color	Term
411	0.8 mm^2 (18)	Yel/Blk	Soldered Tie P
412	0.8 mm^2 (18)	Yel/Blk	X3, S5
414	0.8 mm^2 (18)	Yel/Blk	Soldered Tie P
415	1.0 mm^2 (16)	Yel/Blk	Soldered Tie P
416	0.8 mm^2 (18)	Yel/Blk	X4, X7
450	0.8 mm^2 (18)	Yel/ Wht	S5, X11
500	0.8 mm^2 (18)	Yel	Soldered Tie P
590	2.0 mm^2(14)	Brn/Yel	N1, X10
595	2.0 mm^2 (14)	Brn/ Wht	N1, X10
600	0.8 mm^2 (18)	Brn	N1, H1



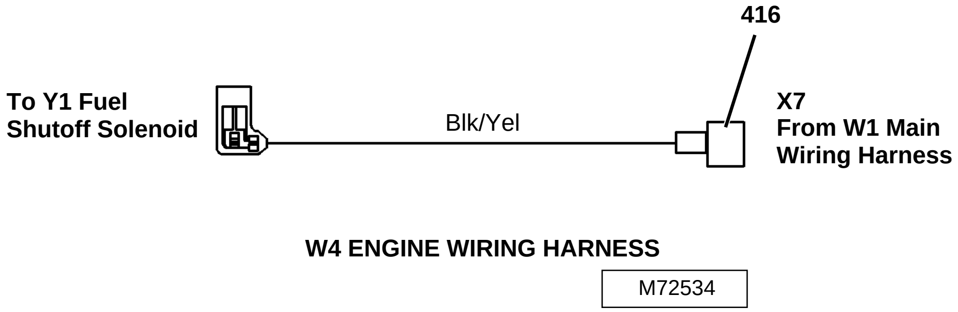
or	Termination Points
lk	Soldered Tie Point (410-Yel/Blk), N1
lk	X3, S5
lk	Soldered Tie Point (410-Yel/Blk), S2
lk	Soldered Tie Point (410-Yel/Blk), S4
lk	X4, X7
/ t	S5, X11
	Soldered Tie Point (410-Yel/Blk), H2
Yel	N1, X10
/ t	N1, X10
n	N1, H1

Circuit No.	Gage	Color	Termination Points
620	0.8 mm^2 (18)	Tan	H2, B1
705	1.0 mm^2 (16)	Pur	S3, X8
706	0.8 mm^2 (18)	Pur/ Wht	S4, X4
710	1.0 mm^2 (16)	Pur	S3, X8
721	1.0 mm^2 (16)	Pur/ Wht	X3, M1
750	0.8 mm^2 (18)	Blu	S4, X3
755	0.8 mm^2 (18)	Blu	S4, X9
800	0.8 mm^2 (18)	Pnk	S2, X4
940	0.8 mm^2 (18)	Wht	X4, X5

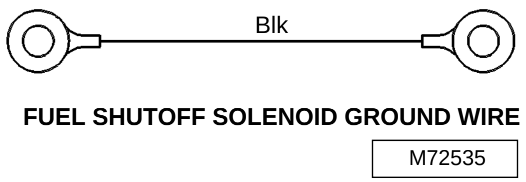
ELECTRICAL WIRING HARNESSES (Early Version)



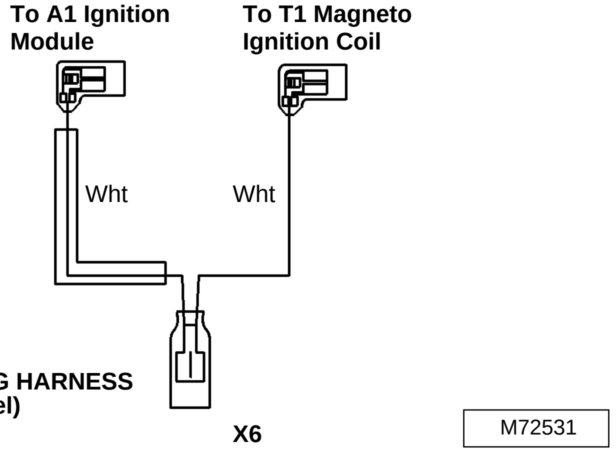
**EARLY MODEL
S1 KEY SWITCH and
A2 INTERLOCK MODULE
(CIRCUIT BOARD)**



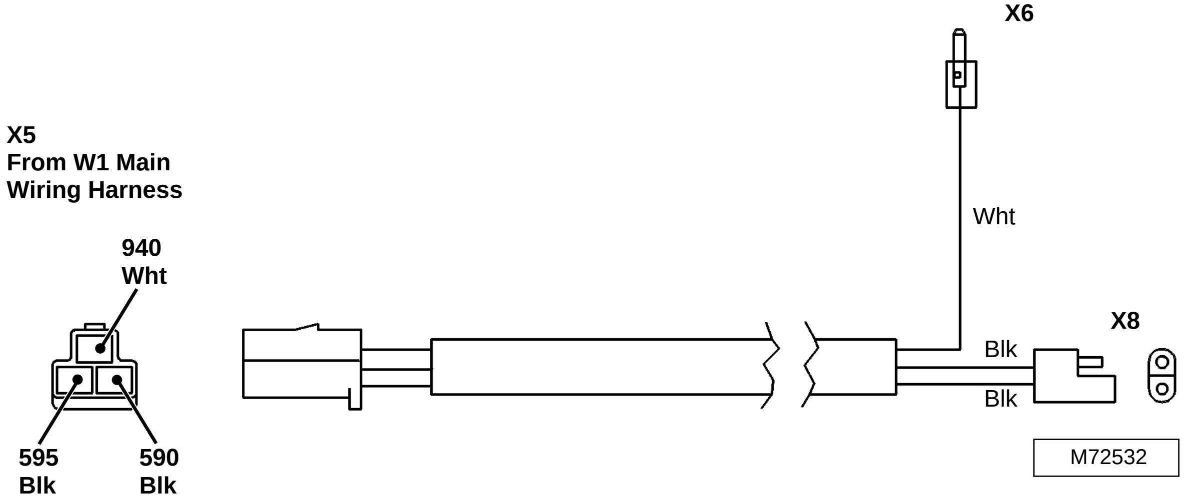
W4 ENGINE WIRING HARNESS



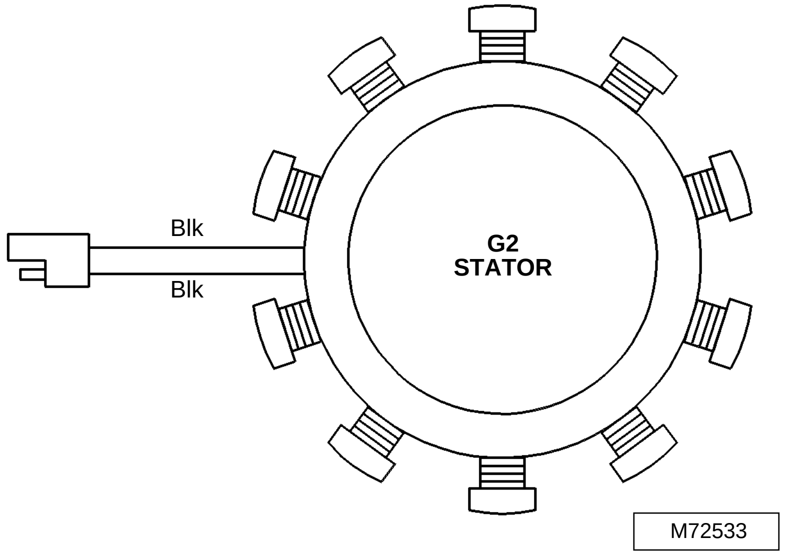
FUEL SHUTOFF SOLENOID GROUND WIRE



W3 ENGINE WIRING HARNESS
(Early Model)

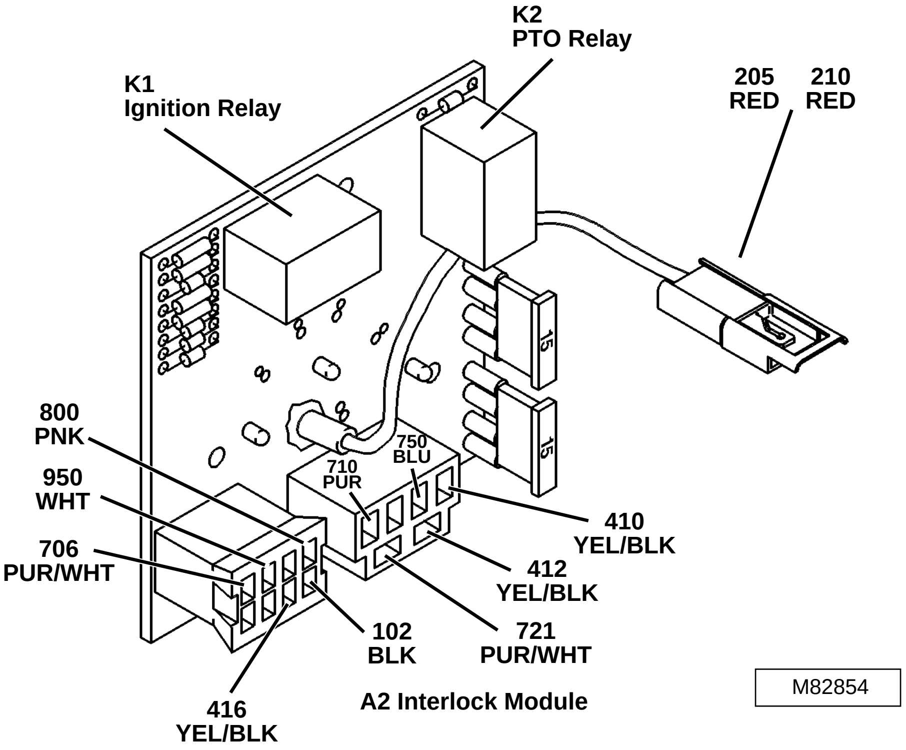


W2 ENGINE WIRING HARNESS



W5 ENGINE WIRING HARNESS

ELECTRICAL WIRING HARNESSES (Early Version)



**EARLY MODEL
S1 KEY SWITCH and
A2 INTERLOCK MODULE
(CIRCUIT BOARD)**

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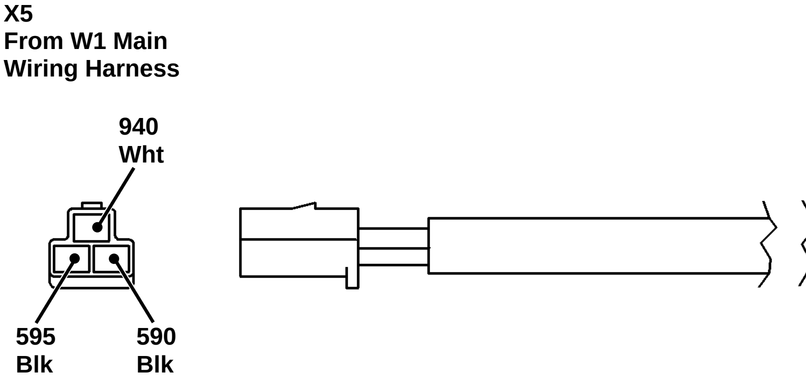
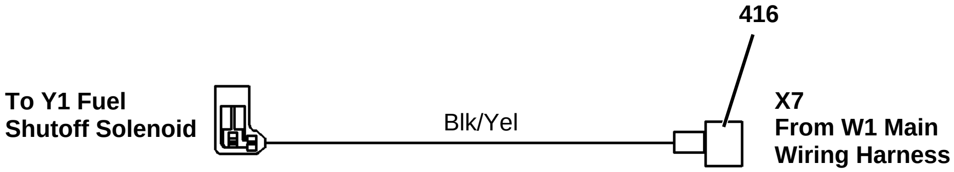
**W3 ENGINE WIRING H
(Early Model)**

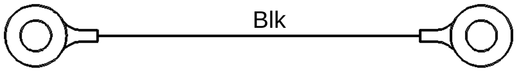


W2 ENGINE WIRING HARNESS



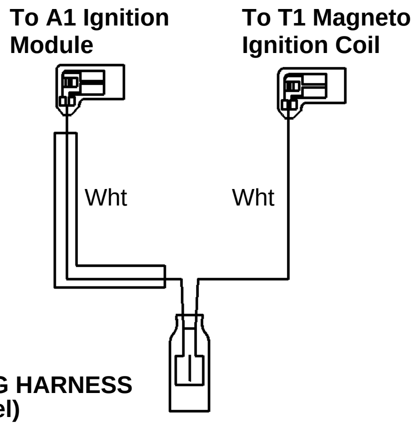
W4 ENGINE WIRING HARNESS

M72534



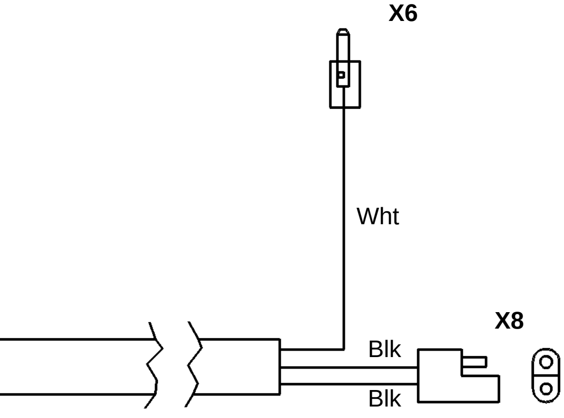
FUEL SHUTOFF SOLENOID GROUND WIRE

M72535



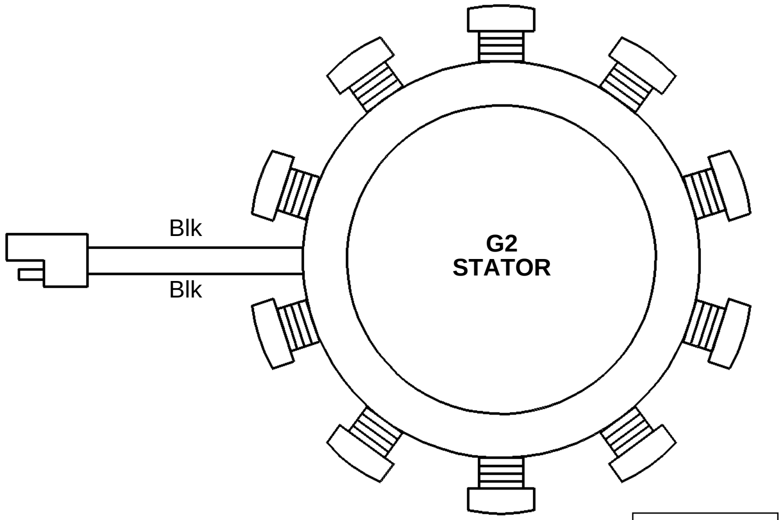
NGINE WIRING HARNESS
(Early Model)

M72531



M72532

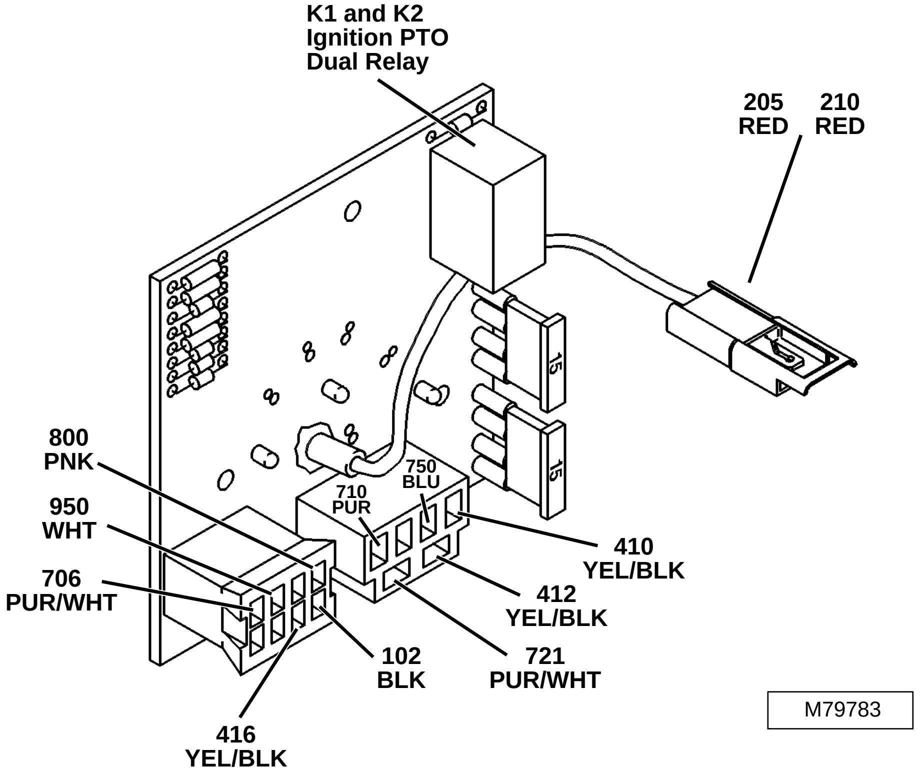
NG HARNESS



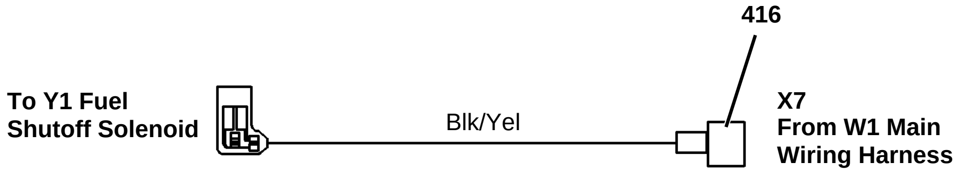
M72533

W5 ENGINE WIRING HARNESS

ELECTRICAL WIRING HARNESSES (Later Version)

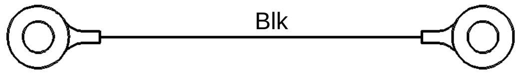


LATE MODEL
S1 KEY SWITCH and
A2 INTERLOCK MODULE
(CIRCUIT BOARD)



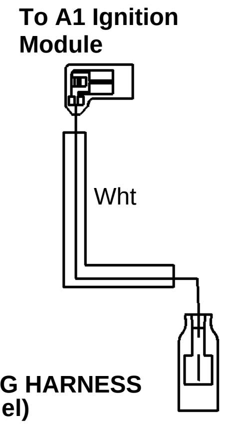
W4 ENGINE WIRING HARNESS

M72534



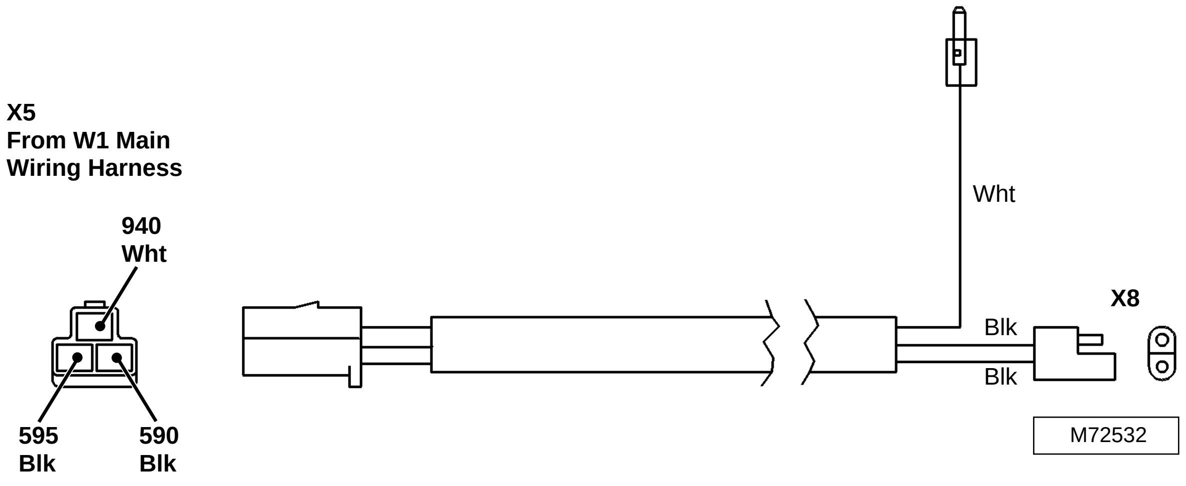
FUEL SHUTOFF SOLENOID GROUND WIRE

M72535

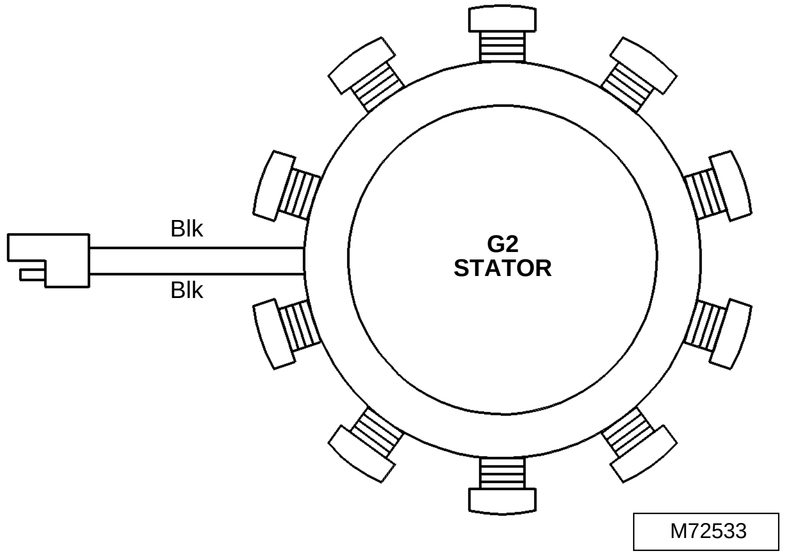


W3 ENGINE WIRING HARNESS
(Later Model)

M72531A

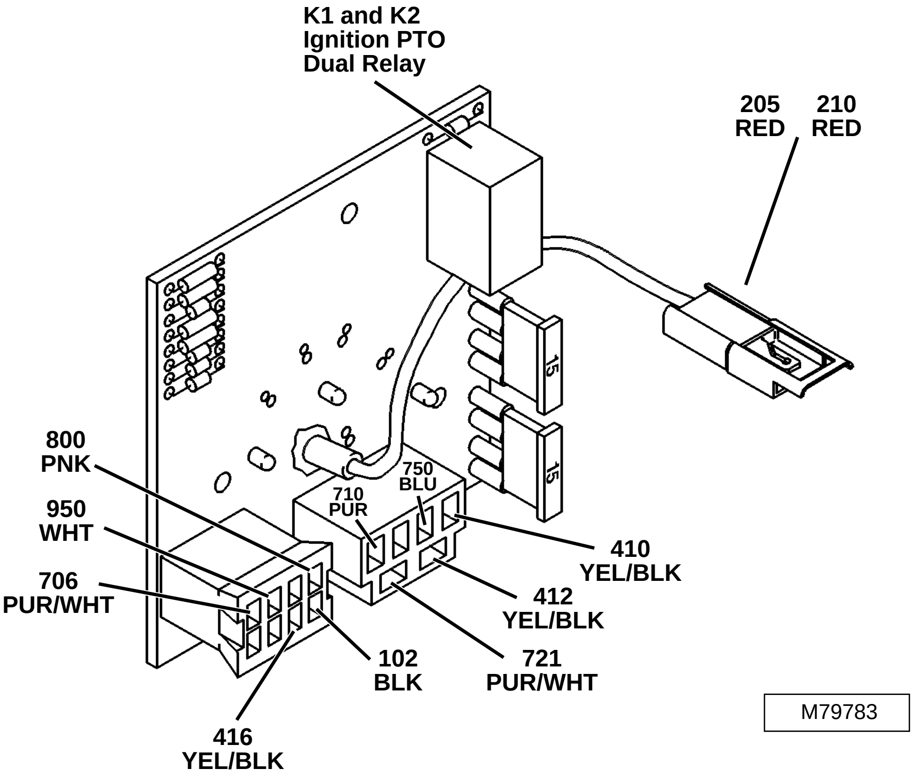


W2 ENGINE WIRING HARNESS



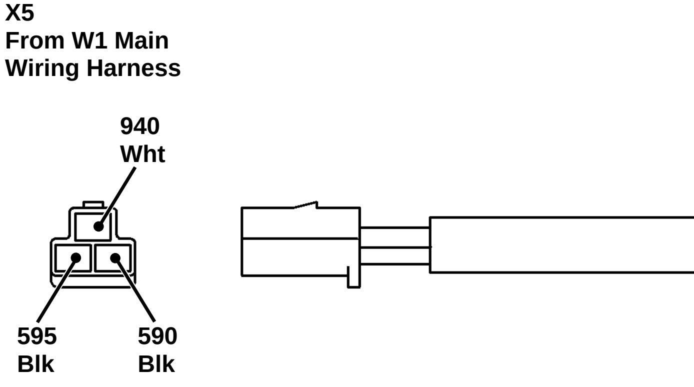
W5 ENGINE WIRING HARNESS

ELECTRICAL WIRING HARNESSES
(Later Version)

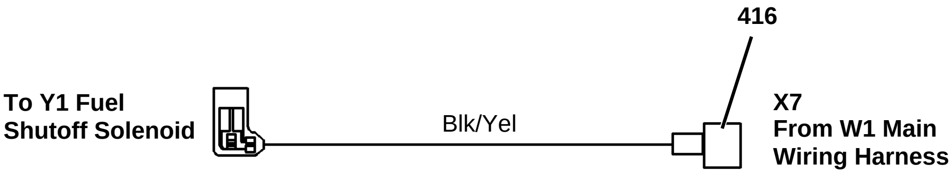


LATE MODEL
S1 KEY SWITCH and
A2 INTERLOCK MODULE
(CIRCUIT BOARD)

W3 ENGINE
(Late

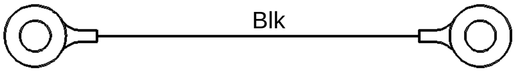


W2 ENGINE WIRING HA



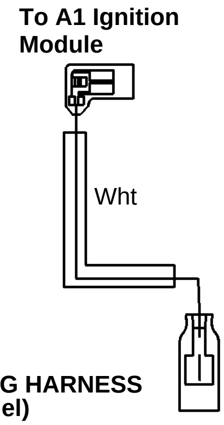
W4 ENGINE WIRING HARNESS

M72534



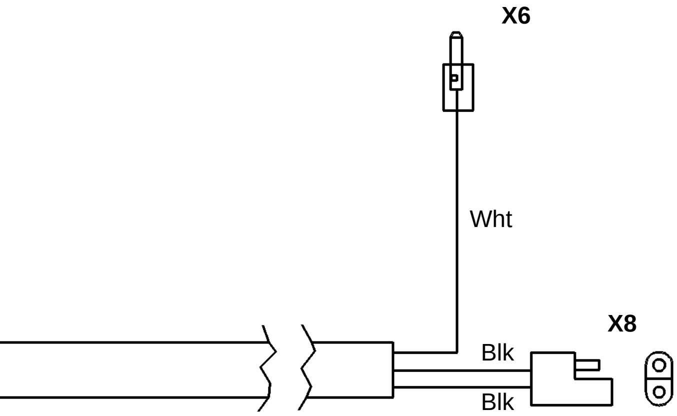
FUEL SHUTOFF SOLENOID GROUND WIRE

M72535



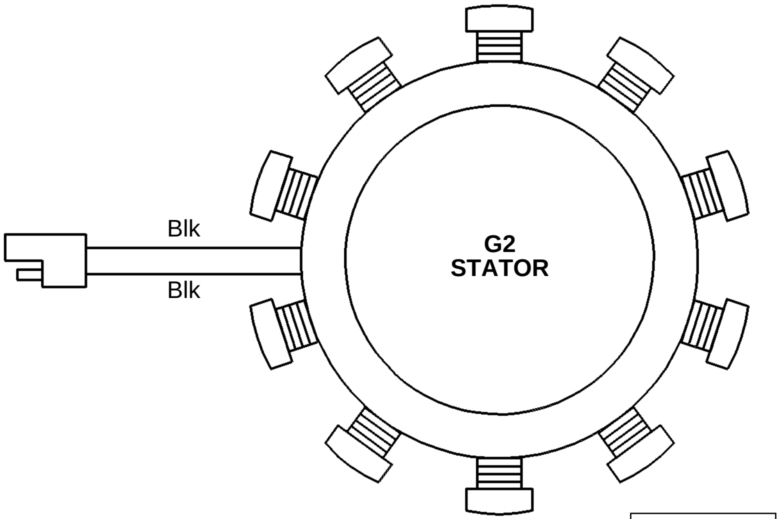
W3 ENGINE WIRING HARNESS (Later Model)

M72531A



M72532

GINE WIRING HARNESS



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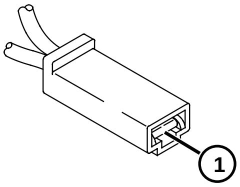
W5 ENGINE WIRING HARNESS

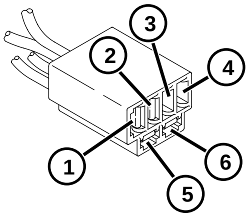
ELECTRICAL COMPONENT CONNECTIONS

A2 INTERLOCK MODULE - X2 CONNECTOR



Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1[a]	205	Red	1.0 mm^2 (16)	N1 - Voltage Regulator
1[a]	210	Red	2.0 mm^2 (14)	F1 - Fusible Link

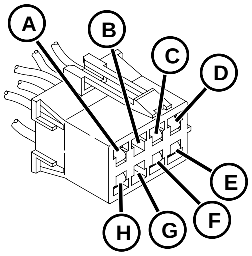
A2 INTERLOCK MODULE - X3 CONNECTOR



Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	410	Yel/Blk	1.0 mm^2 (16)	S2 - Seat Switch S4 - PTO Switch N1 - Voltage Rec/Reg H2 - Engine Oil Pressure Light
2	750	Blu	0.8 mm^2 (18)	S4 - Pro Switch
3[b]	—	—	—	—
1[a]	205	Red	1.0 mm^2 (16)	N1 - Voltage Regulator
1[a]	210	Red	2.0 mm^2 (14)	F1 - Fusible Link
4	710	Pur	1.0 mm^2 (16)	S3 - Neutral Start Switch
5	412	Yel/Blk	0.8 mm^2 (18)	S5 - Headlight Switch
6	721	Pur/Wht	1.0 mm^2 (16)	M1 - Starting Motor

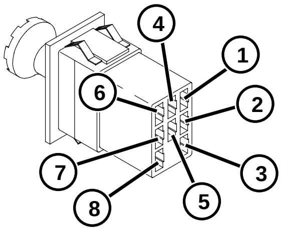
[a] Late model tractors only
[b] Early model tractors only

A2 INTERLOCK MODULE - X4 CONNECTOR



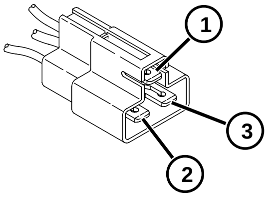
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
A	—	—	—	—
B	—	—	—	—
C	416	Yel/Blk	0.8 mm^2 (18)	Y1- Fuel Shutoff Solenoid
D	102	Blk	0.8 mm^2 (18)	W1 - Shielded Ground
E	800	Pnk	0.8 mm^2 (18)	S2 - Seat Switch
F	—	—	—	—
G	940	Wht	0.8 mm^2 (18)	W2 - Eng Wiring Harness
H	706	Pur/Wht	0.8 mm^2 (18)	S4 - PTO Switch

S4 - PTO SWITCH CONNECTIONS



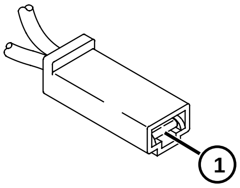
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	—	—	—	—
2	—	—	—	—
3	705 706	Pur Pur/Wht	1.0 mm^2 (16) 0.8 mm^2 (18)	S3 - Neutral Start Switch K2 - PTO Relay
4	755	Blu	2.0 mm^2 (14)	Y2 - PTO Clutch
5	—	—	—	—
6	750	Blu	0.8 mm^2 (18)	K2 - PTO Relay
7	—	—	—	—
8	415	Yel/Blk	1.0 mm^2 (16)	X3 - A2 Interlock Module

MAIN WIRING HARNESS - X5 CONNECTOR



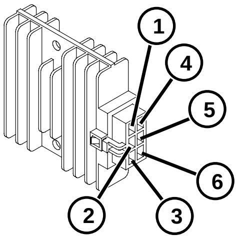
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	940	Wht	1.0 mm^2 (16)	A1 - Ignition Module T1 - Magneto Ignition Coil E1 - Spark Plug
2	590	Brn/Yel	2.0 mm^2 (14)	G2 - Stator
3	595	Brn/Wht	2.0 mm^2 (14)	G2 - Stator

MAIN WIRING HARNESS - S5 HEADLIGHT SWITCH CONNECTION



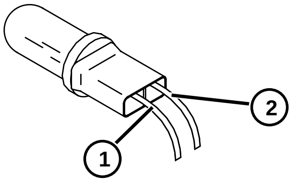
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	412	Yel/Blk	0.8 mm^2 (18)	S5 - Headlight Switch

MAIN WIRING HARNESS - N1 VOLTAGE REGULATOR/RECTIFIER



Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	205	Red	1.0 mm^2 (16)	X1 - S1 Key Switch X1- F1 Fusible Link
2	411	Yel/Blk	0.8 mm^2 (18)	X3 - A2 Interlock Module
3	107	Blk	1.0 mm^2 (16)	W1 - Shielded Ground
4	595	Brn/Wht	2.0 mm^2 (14)	G2 - Stator
5	600	Brn	0.8 mm^2 (18)	H1 - Discharge Light
6	590	Brn/Yel	2.0 mm^2 (14)	G2 - Stator

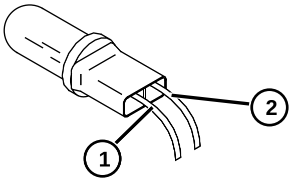
MAIN WIRING HARNESS - H2 OIL PRESSURE LAMP*



Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	620	Tan	0.8 mm^2 (18)	B1 - Oil Pressure Switch
2	500	Yel	0.8 mm^2 (18)	X3 - A2 Interlock Module

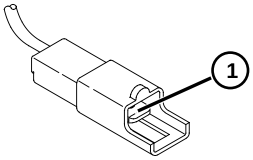
NOTE: Circuit is present in the FC420V (GT242) Wiring Harness, but the pressure switch is not used on this engine. While the socket for the Oil Pressure lamp is present, it is not used as both the pressure switch and operators panel decal are not present.

MAIN WIRING HARNESS - H1 BATTERY DISCHARGE LAMP



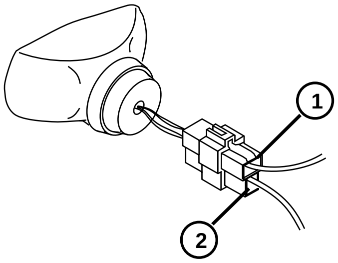
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	103	Blk	0.8 mm^2 (18)	W1 - Shielded Ground
2	600	Brn	0.8 mm^2 (18)	N1 - Voltage Regulator/Rectifier

MAIN WIRING HARNESS - G1 FUSIBLE LINK CONNECTOR



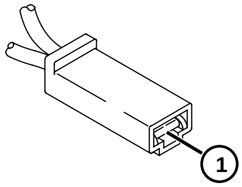
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	215	Red-Fus	0.8 mm^2 (18)	G1 - Battery

MAIN WIRING HARNESS - E2 HEADLIGHT CONNECTIONS



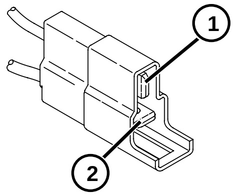
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	450	Yel/Wht	0.8 mm^2 (18)	E2 - Headlights
2	111	Blk	0.8 mm^2 (18)	W1 - Engine Ground

MAIN WIRING HARNESS - M1 STARTING MOTOR CONNECTION



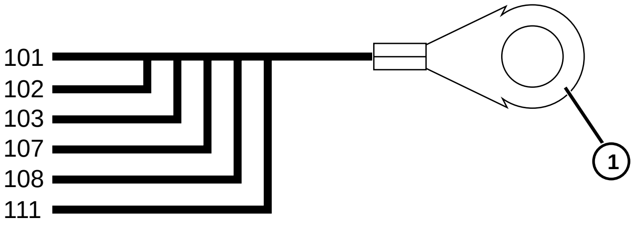
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	721	Pur/Wht	1.0 mm^2 (16)	A2 - S1 Key Switch A2 - K1 Ignition Relay

MAIN WIRING HARNESS - Y2 PTO CLUTCH CONNECTIONS



Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	755	Blu	2.0 mm^2 (14)	Y2 - PTO Clutch
2	108	Blk	2.0 mm^2 (14)	W1 - Shielded Ground

MAIN WIRING HARNESS - W1 ENGINE GROUND CONNECTIONS

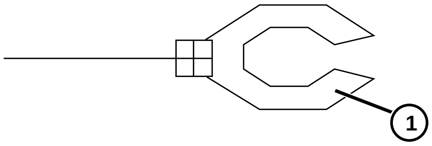


Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	101	Blk	2.0 mm^2 (14)	W1 - Shielded Ground
1	102	Blk	0.8 mm^2 (18)	Circuit 101
1	103	Blk	0.8 mm^2 (18)	Circuit 101
1	107	Blk	1.0 mm^2 (16)	Circuit 101
1	108	Blk	2.0 mm^2 (14)	Circuit 101
1	111	Blk	0.8 mm^2 (18)	Circuit 101

MAIN WIRING HARNESS - Y1 FUEL SHUTOFF SOLENOID CONNECTION

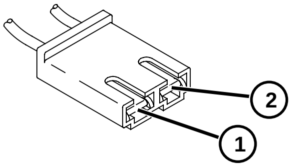
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	416	Yel/Blk	0.8 mm^2 (18)	Y1 - Fuel Shutoff Solenoid

MAIN WIRING HARNESS - B1 OIL PRESSURE SWITCH CONNECTION



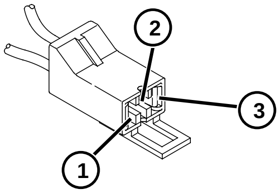
Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	620	Tan	0.8 mm^2 (18)	B1 - Oil Pressure Switch

MAIN WIRING HARNESS - S3 NEUTRAL START SWITCH CONNECTIONS



Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	705	Pur	1.0 mm^2 (16)	S4 - PTO Switch
2	710	Pur	1.0 mm^2 (16)	X3 - A2 Interlock Module

MAIN WIRING HARNESS - S2 SEAT SWITCH CONNECTIONS



Terminal	Circuit #	Color	Size (Gauge)	Circuit Termination Points
1	414	Yel/Blk	0.8 mm^2 (18)	X3 - A2 Interlock Module
2	—	—	—	—
3	800	Pnk	0.8 mm^2 (18)	X4 - A2 Interlock Module (K1)

ELECTRICAL SYSTEM TROUBLESHOOTING CHART

PROBLEM OR SYMPTOM CHECK OR SOLUTION	Starter cranking problems.	Engine cranks but will not start.	No spark.	Engine Will not shut off.	Improper component operating with switch.	Battery goes dead, discharges or overcharges.	Oil light problem.	Discharge light problem.	Coolant light problem.	Instrument light problem.	Headlight problems.
See power circuit diagnosis.	●										
See cranking circuit diagnosis.	●										
Check ground circuit.	●	●									
Test battery and battery connections.	●										
See ignition circuit diagnosis.		●	●	●							
See charging circuit diagnosis.						●		●			
See instrumentation circuits.							●	●	●	●	
Check for shorted circuit.				●	●						
See headlight circuit.											●

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POWER CIRCUIT OPERATION

Unswitched Power Circuit

Function:

Provides unswitched power to the primary machine operating components whenever the battery is connected. In addition to the fuses, this circuit is also protected by the fusible link.

Operating Conditions, Unswitched Circuits:

Voltage should be present at the following locations with the key switch in the “OFF” position:

- Battery positive terminal
- Battery terminal of starter solenoid bolt
- “B” terminal of Key Switch
- Battery/Red wire terminal of Voltage regulator/rectifier

The positive battery cable connects the the battery to the starter solenoid. The starter solenoid to starter bolt is used as a tie point for the rest of the electrical system.

The battery cables and the starter tie point connections must be good working condition in order for the electrical system to function properly.

The ground cable connections are equally important as the positive connections. Proper starter operation depends on good cables and connections in order to carry the high current load.

The circuit between the starter and the key switch is fused by use of a fusible link. This link is a short length of wire that is designed to protect the main wiring harness and will fail if current load becomes excessive.

Switched Power Circuit

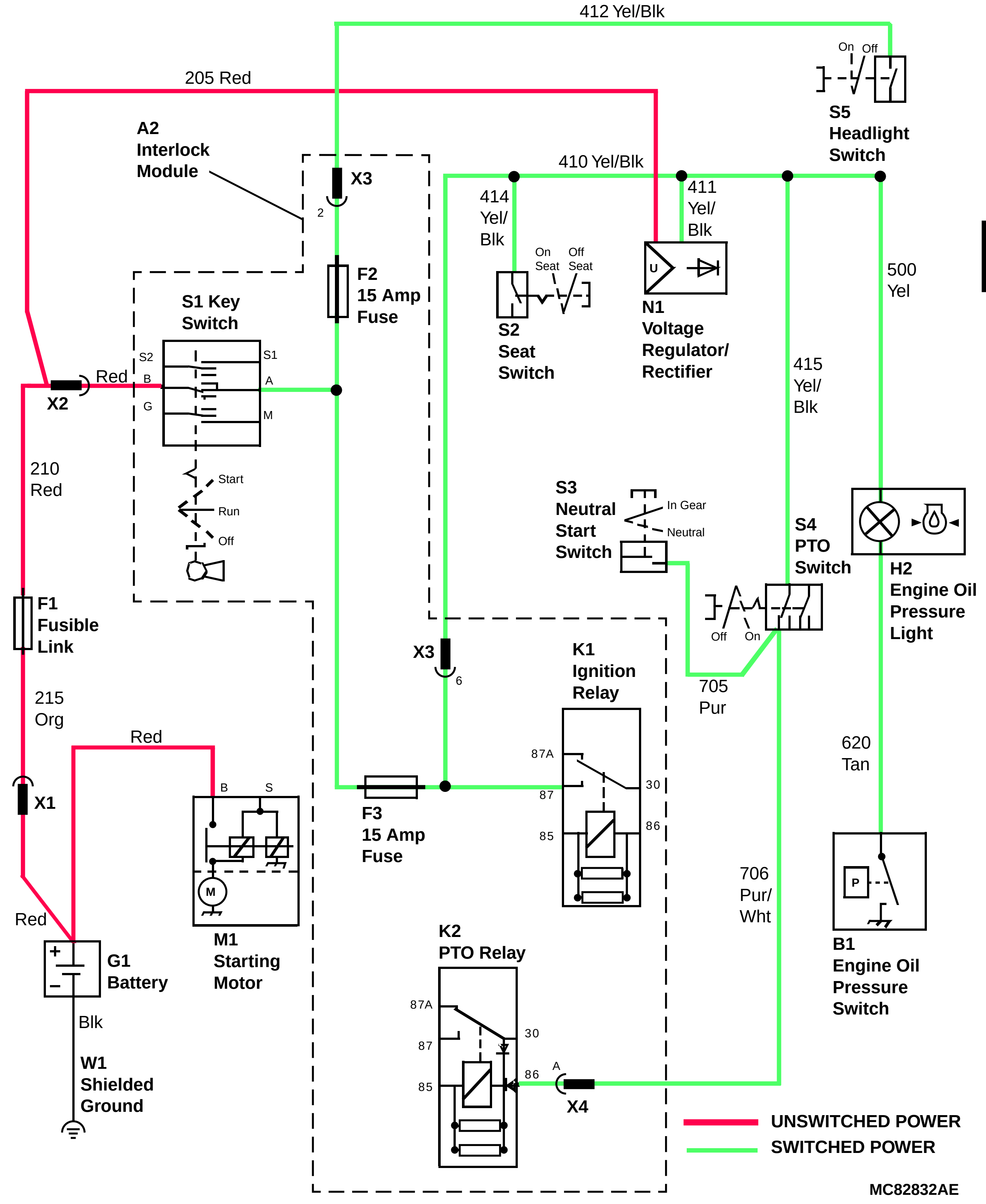
Function:

Provides switched power to the primary machine operating components by means of the key switch. In addition to the fuses, this circuit is also protected by the fusible link.

Operating Conditions, Switched Power:

Voltage should be present at the following locations with the key switch in the “START” or “RUN” position:

- S1 Key Switch–Terminals “A”, “B”, and S1
- A2 Interlock Module
  - Terminals “2” and “6”/X3 connector
- A2 Interlock Module–F2 and F3 fuse terminals
- N1 Voltage Regulator/Rectifier
  - Red wire/terminal
- N1 Voltage Regulator/Rectifier
  - Yel/Blk wire/terminal
- S5 Headlight Switch–Yel/Blk wire/terminal
- H2 Engine Oil Pressure Light–Yel wire
- S2 Seat Switch–Yel/Blk wire
- S4 PTO Switch–Yel/Blk, Pur/Wht, Pur wires


412 Yel/Blk
On
Off
S5
Headlight
Switch
205 Red
A2
Interlock
Module
X3
2
410 Yel/Blk
414
Yel/
Blk
411
Yel/
Blk
500
Yel
F2
15 Amp
Fuse
On
Seat
Off
Seat
U
N1
Voltage
Regulator/
Rectifier
S1 Key
Switch
S2
B
G
S1
A
M
S2
Seat
Switch
Red
X2
415
Yel/
Blk
210
Red
Start
Run
Off
S3
Neutral
Start
Switch
In Gear
Neutral
S4
PTO
Switch
H2
Engine Oil
Pressure
Light
Off
On
F1
Fusible
Link
X3
6
K1
Ignition
Relay
705
Pur
215
Org
620
Tan
Red
87A
30
87
86
85
X1
B
S
F3
15 Amp
Fuse
M
P
706
Pur/
Wht
Red
B1
Engine Oil
Pressure
Switch
G1
Battery
M1
Starting
Motor
K2
PTO Relay
87A
30
87
86
A
85
X4
Blk
W1
Shielded
Ground
UNSWITCHED POWER
SWITCHED POWER
MC82832AE

520 X 628

POWER CIRCUIT DIAGNOSIS

Test Conditions:

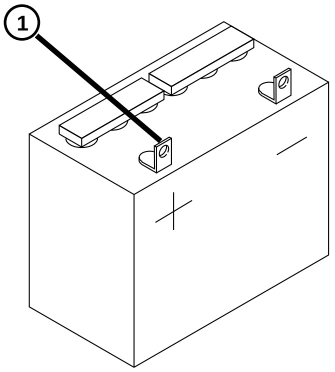
- Parking brake ENGAGED. (Neutral start switch in NEUTRAL position.)
- Key switch in **"OFF"** position.
- Meter negative (-) lead on battery negative (-) terminal.
- Meter positive (+) lead on battery positive (+) terminal.
- Check connection(s) for corrosion and looseness when checking/testing.

Test Location	Normal	If Not Normal
1. Battery — Positive (+) terminal.	11.8—13.2 volts.	Test battery.
2. Starter solenoid bolt — Battery terminal.	Battery voltage.	Check battery cables and clamps. Clean and tighten connections.
3. Key switch — "B" terminal.	Battery voltage.	Check orange wire No. 215, red wire No. 210, fusible link (F1), red wire (connector to key switch) and connections.
4. Voltage regulator/ rectifier — Battery terminal.	Battery voltage.	Check red wire No. 205 and connections.

Test Conditions:

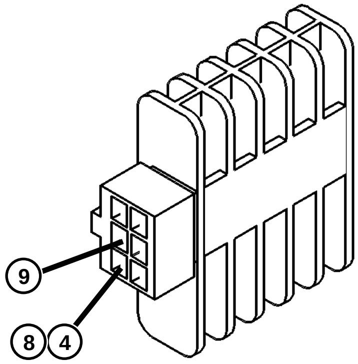
- Key switch in **"RUN"** position.

Test Location	Normal	If Not Normal
5. Key switch — "A" terminal.	Battery voltage.	Test key switch.
6. Interlock Module — "2", "6", "A" terminals.	Battery voltage.	Check F2 and F3 fuses, red wire (ignition switch to interlock module).
7. Interlock Module — F2, F3 fuses.	Battery voltage.	Replace.
8. Voltage regulator/ rectifier.	Battery voltage.	Check red wire No. 205 (X1 to N1).
9. Voltage regulator/ rectifier.	Battery voltage.	Check yel/blk wire No. 411 (X3 to N1).
10. Seat switch.	Battery voltage.	Check yel/blk wire No. 414 (X3 to S2).
11. Headlight switch.	Battery voltage.	Check yel/blk wire No. 412 (X3 to S5).



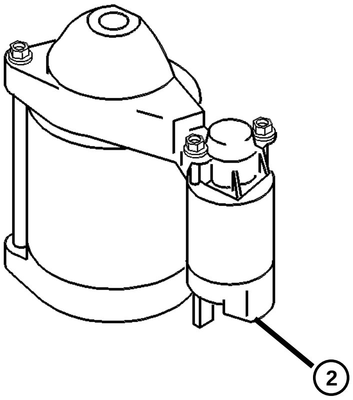
G1 Battery

M82886



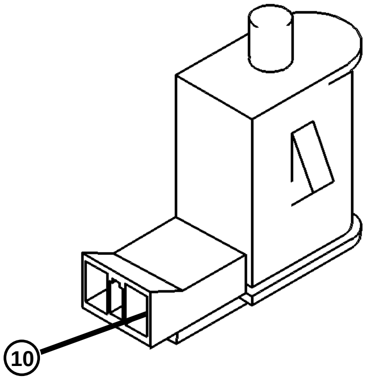
N1 Regulator/Rectifier

M82855



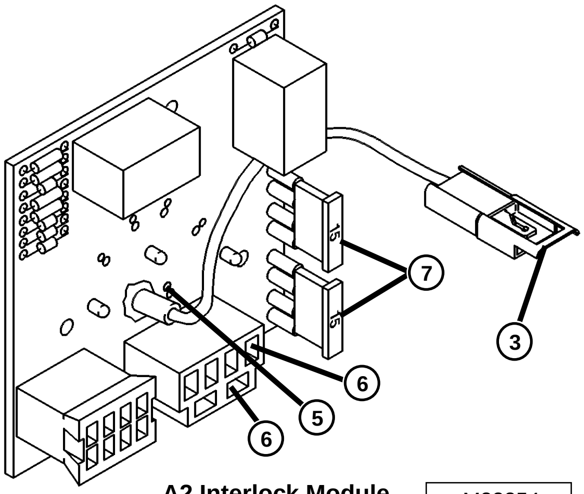
M1 Starting Motor

M82887



S2 Seat Switch

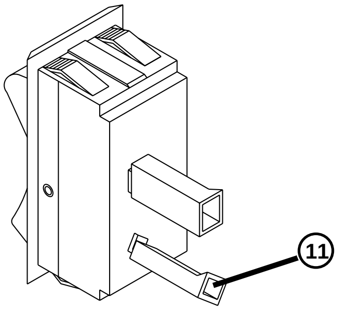
M82856



A2 Interlock Module

M82854

NOTE: Relay configuration on A2 Interlock Module may vary per machine. Module may be equipped with either two separate relays, as shown, or a single dual relay.

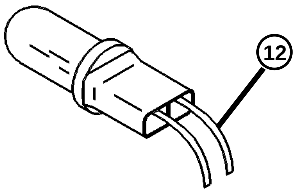


S5 Headlight Switch

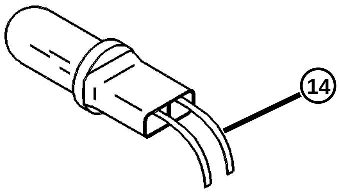
M82852AE

POWER CIRCUIT DIAGNOSIS, continued

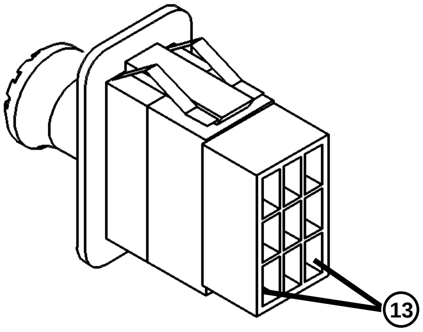
Test Location	Normal	If Not Normal
12. Discharge light.	Light is on.	Check brn wire No. 600 (N1 to H1).
13. PTO switch.	Battery voltage.	Check yel/blk No. 415, pur No. 705, pur/wht No. 706 wires.
14. Oil pressure light.	Light is on.	Check yel wire No. 500 (S4 to H2).



H1 Discharge Light M82857



H2 Engine Oil Pressure Light M82857



S4 PTO Switch M82858

CRANKING CIRCUIT OPERATION

Function:

The cranking system is used to energize the starting motor.

Operating Conditions:

- Key switch in START position.
- Neutral start switch in NEUTRAL position. (Parking brake engaged.)
- PTO switch in OFF position.

NOTE: The operator does not have to be in the seat (seat switch closed) to crank engine.

System Operation:

NOTE: The key switch and 15 amp fuse terminals are mounted on a printed circuit board (A2 Interlock Module). The components are solid state and are not serviced separately except for the 15 amp fuses. Lines within dashed border of the Interlock Module (A2) are circuit paths on the circuit board and are not wires in the harness.

The starting motor is a solenoid shift design. The power circuit provides current to the key switch (S1) and protects the cranking circuit with a 15 amp fuse (F3). Current flows from the battery (G1) positive (+) terminal to the starter solenoid battery terminal, fusible link (F1) and key switch battery terminal.

With the key switch in the start position, current flows to the 15 amp fuse and PTO switch (S4).

The PTO switch is used with the neutral start circuit to prevent the engine from cranking if the PTO is engaged. With the PTO switch closed (PTO disengaged), current flows to the neutral start switch (S3).

GT242 and GT262:

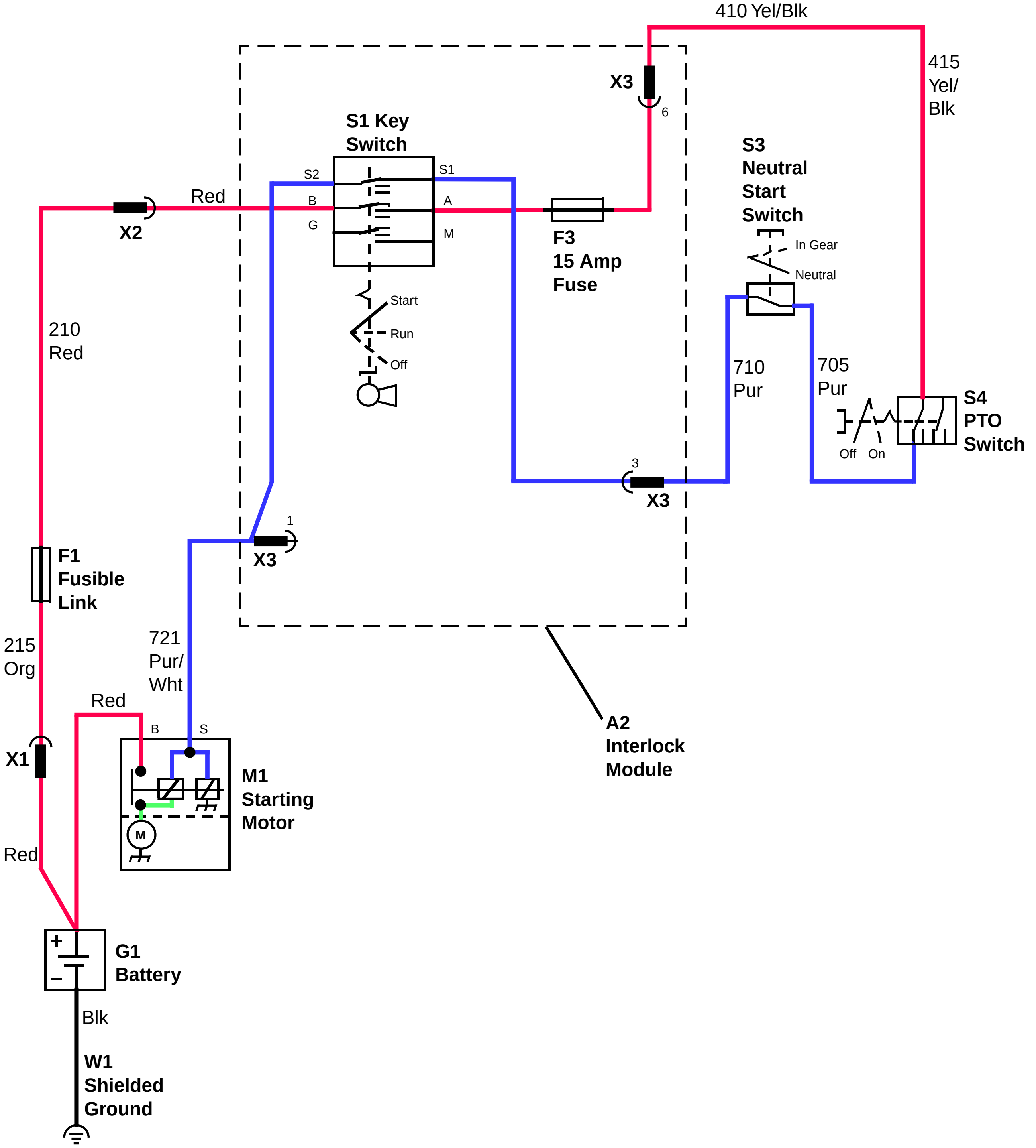
The neutral start switch is located on the top of the transaxle transmission and is activated only when the gear shift lever is set to NEUTRAL. Even if parking brake is set, the gear shift lever must be set to NEUTRAL in order to crank the engine.

G275:

NOTE: The neutral start switch is located on the top of the transmission and is activated by the brake actuator linkage. When the parking brake is engaged (transmission is automatically shifted into NEUTRAL), the brake actuator linkage closes the neutral start switch. The neutral start switch is used in the neutral start circuit to prevent the engine from cranking if the transmission is engaged.

With the neutral start switch closed, current flows to the key switch S1-S2 terminals and starter solenoid, engaging the solenoid. The solenoid is engaged by current flowing through both pull-in and hold-in windings, pulling the plunger inward. The plunger closes the solenoid main contacts. When the main contacts are closed, both ends of the pull-in windings have the same voltage so current through the pull-in windings stops. Current continues through the hold-in windings, keeping the solenoid engaged.

With the solenoid main contacts closed, high current from the battery flows across the main contacts to the starter motor (M1) causing it to turn.



🟥 POWER CIRCUIT

🟦 NEUTRAL START CIRCUIT

🟩 STARTER POWER CIRCUIT

⬛ GROUND CIRCUIT

MC82833AE

520 X 628

CRANKING CIRCUIT DIAGNOSIS

Test Conditions:

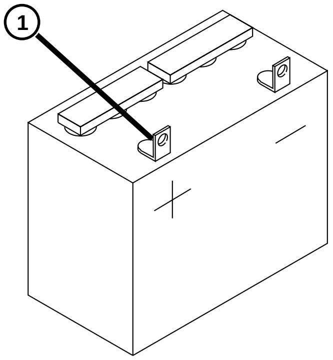
- Seat switch depressed, or jumper installed in connector.
- Parking brake ENGAGED. (Neutral start switch in NEUTRAL position.)
- PTO switch in OFF position.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Battery positive (+) terminal.	11.8—13.2 volts.	Test Battery.
2. Starter solenoid bolt Battery terminal.	Battery voltage.	Check battery cables and clamps. Clean and tighten connections.
3. Key switch — ”B” terminal.	Battery voltage.	Check orange wire No. 215, red wire No. 210, fusible link (F1), red wire (connector to key switch) and connections.

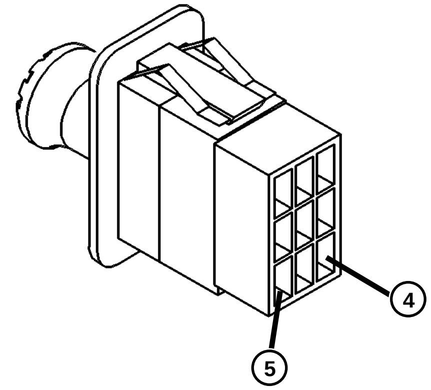
Test Conditions:

- Key switch in START position.

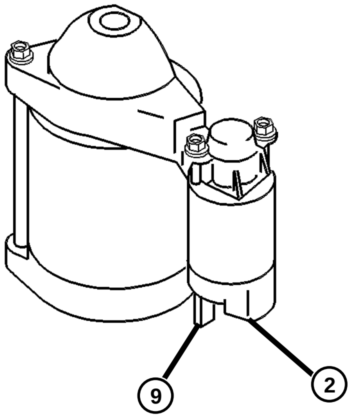
Test Location	Normal	If Not Normal
4. PTO Switch.	Battery voltage.	Check yellow/black wires No. 415 and 410, fuse (F3) and connections.
5. PTO Switch.	Battery voltage.	Test PTO switch. (See procedure in Tests and Adjustments.)
6. Neutral start switch.	Battery voltage.	Check purple wire No. 705 and connections.
7. Neutral start switch.	Battery voltage.	Test neutral start switch. (See procedure in Tests and Adjustments.)
8. Interlock module.	Battery voltage.	Check purple wire No. 710 and connections.
9. Starter solenoid.	Battery voltage.	Check purple/white wire No. 721, key switch (S1) and connections.



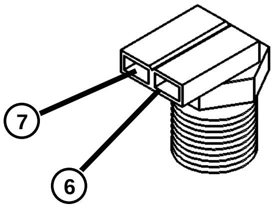
G1 Battery M82886



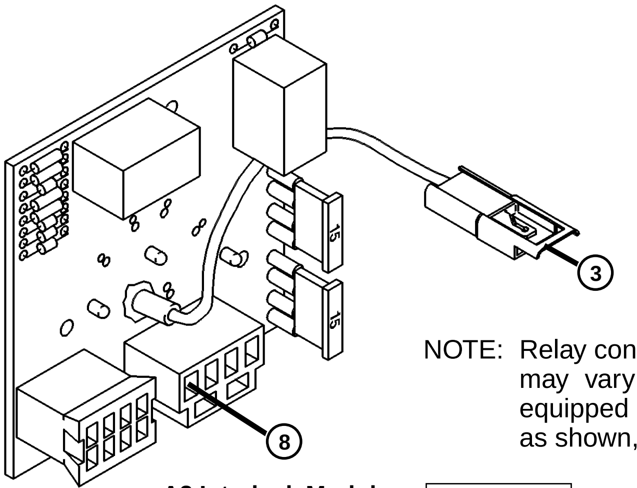
S4 PTO Switch M82858



M1 Starting Motor M82887



S3 Neutral Start Switch M82859



NOTE: Relay configuration on A2 Interlock Module may vary per machine. Module may be equipped with either two separate relays, as shown, or a single dual relay.

A2 Interlock Module M82854

IGNITION CIRCUIT OPERATION—ENGINE RUNNING

Function:

To create a spark that ignites the fuel/air mixture in the engine.

Operating Conditions:

- Key switch in START or RUN position.
- Operator on seat. (Seat switch CLOSED.)

or

- PTO switch in OFF position.
- GT242 and GT262 - Parking brake engaged with gear shift lever set to neutral.
- GT275 - Parking brake engaged (neutral start switch CLOSED).

System Operation:

NOTE: The key switch and 15 amp fuse terminals are mounted on a printed circuit board (A2 Interlock Module). The components are solid state and are not serviced separately except for the 15 amp fuses. Lines within dashed border of the Interlock Module (A2) are circuit paths on the circuit board and are not wires in the harness.

The ignition system is a transistor-controlled magneto design. Ignition timing is controlled by the ignition module and is not adjustable. The engine is shut off by grounding the ignition coil through the key switch (terminals M and G) and the ignition relay (terminals 87A and 30). The ignition coil is grounded (Spark stopped) if the operator gets off the seat with the PTO or transmission engaged.

With the key switch (S1) in the START or RUN position, the key switch eliminates one path to ground for ignition current. The ignition relay (K1) when energized by the neutral start circuit or seat switch circuit, eliminates the second path to ground so a spark can be produced. The power circuit provides current to the key switch (S1) energizing the ignition relay circuit, and protects the ignition circuit with a 15 amp fuse (F3). Current flows from the battery (G1) positive (+) terminal to the fusible link (F1), and key switch battery terminal. With the key switch in the RUN position, current flows to the 15 amp fuse, ignition relay terminal 87, seat switch (S2), and PTO switch (S4).

The PTO switch is also used in the neutral start circuit to prevent the engine from starting if the PTO is engaged. With the PTO switch closed (PTO disengaged), current flows to the neutral start switch (S3).

GT242 and GT262:

The neutral start switch is located on the top of the transaxle transmission and is activated only when the gear shift lever is set to neutral. Even if parking brake is set, the gear shift lever must be set to neutral in order to activate the ignition circuit.

GT275:

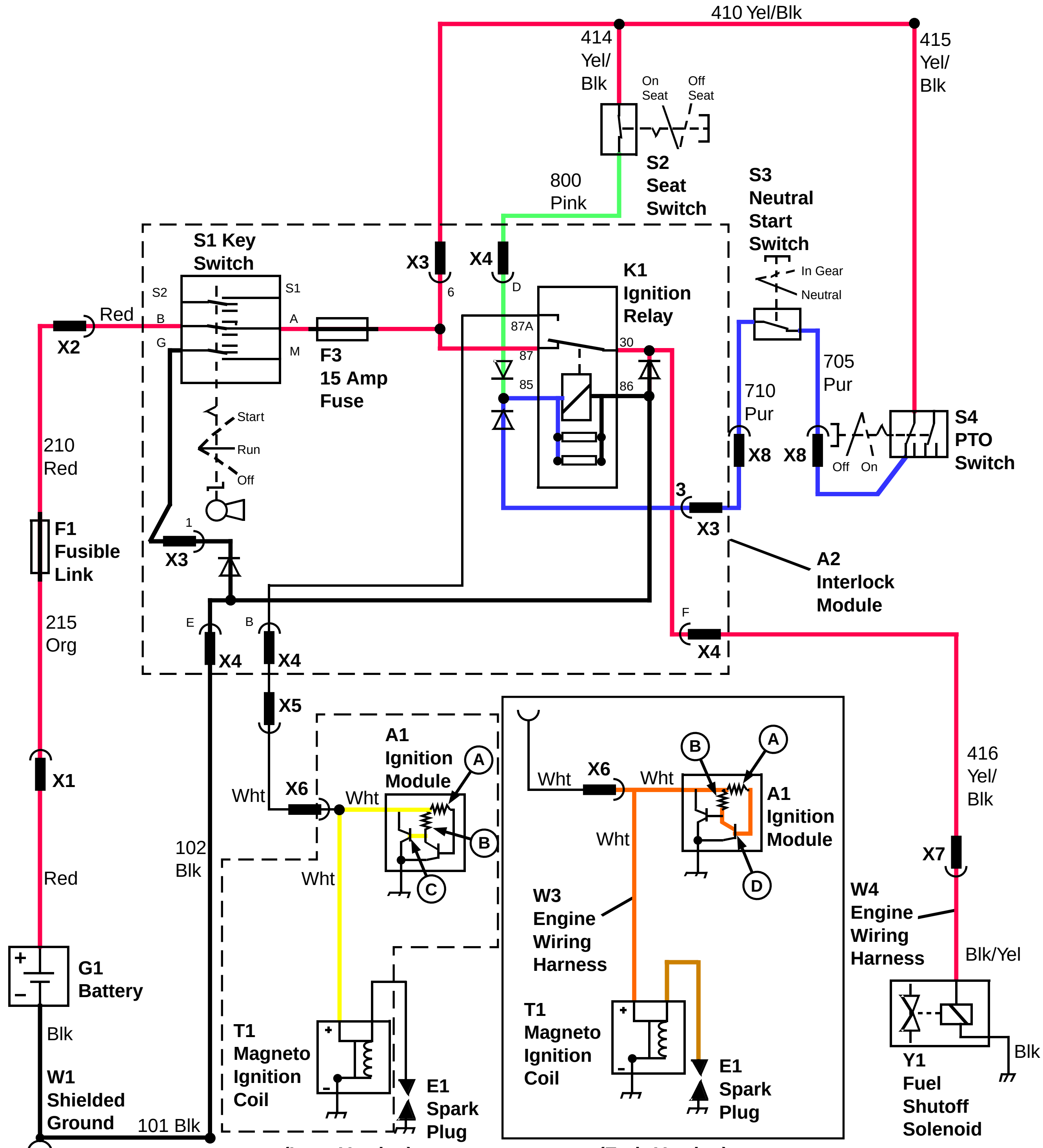
NOTE: The neutral start switch is located on the top of the transmission and is activated by the brake actuator linkage.

When the parking brake is engaged the transmission is automatically shifted into neutral, the brake actuator linkage closes the neutral start switch. The neutral start switch is used in the neutral start circuit to prevent the ignition relay from energizing if the transmission is engaged.

With the neutral start switch closed, current flows to the ignition relay coil terminal 85 energizing the coil, closing the relay. Closing the relay breaks the path to ground for the ignition coil current between terminals 87A and 30 and sends battery current to the fuel shutoff solenoid (Y1) through terminals 87 and 30. An alternate current path is provided to keep ignition relay energized when the PTO is engaged, the transmission is engaged, or the brake pedal is not depressed. With the operator on the seat, the seat switch (S2) is closed and current flows to the ignition relay coil keeping the relay energized.

As the flywheel turns, a magnet in the flywheel starts to align with the ignition coil and produces current in the primary coil by electromagnetic induction. In the initial stage low voltage current is produced. The low voltage current flows to a transistor (C), and resistors (A and B) in the ignition module (A1). Resistor (A) has high resistance so current will flow through resistor (B) to transistor (C). This energizes the transistor base which closes the transistor and provides a path to ground for ignition coil current flow.

In the “spark stage” (spark produced), the flywheel magnet is fully aligned with the ignition coil a high voltage (maximum) current is induced in the primary coil. The high voltage current will now flow through resistor (A) to transistor (D). The transistor base (D) is energized which closes the transistor and provides a path to ground for current that was flowing to transistor (C) base. With current no longer applied to transistor (C) base, the transistor opens breaking the path to ground. This sudden reduction of current flow, induces high voltage current in the secondary coil. The high voltage current flows through the coil wire to the spark plug (E1). The voltage is now high enough to jump the spark plug gap and a spark is produced, igniting the fuel/air mixture in the cylinder.



(Later Version) (Early Version)

🟥 POWER CIRCUIT

🟩 SEAT CIRCUIT

🟧 HIGH VOLTAGE PRIMARY CIRCUIT

🟦 NEUTRAL START CIRCUIT

🟫 SECONDARY COIL CIRCUIT

🟨 LOW VOLTAGE PRIMARY CIRCUIT

⬛ GROUND CIRCUIT

MC82851AE

520 X 628

IGNITION CIRCUIT OPERATION—ENGINE SHUTTING OFF

Function:

To shut the engine off by grounding the ignition coil through the key switch and ignition relay.

Operating Conditions:

- Key switch in OFF position.
- Operator off seat with PTO engaged.
- Operator off seat with transmission engaged.

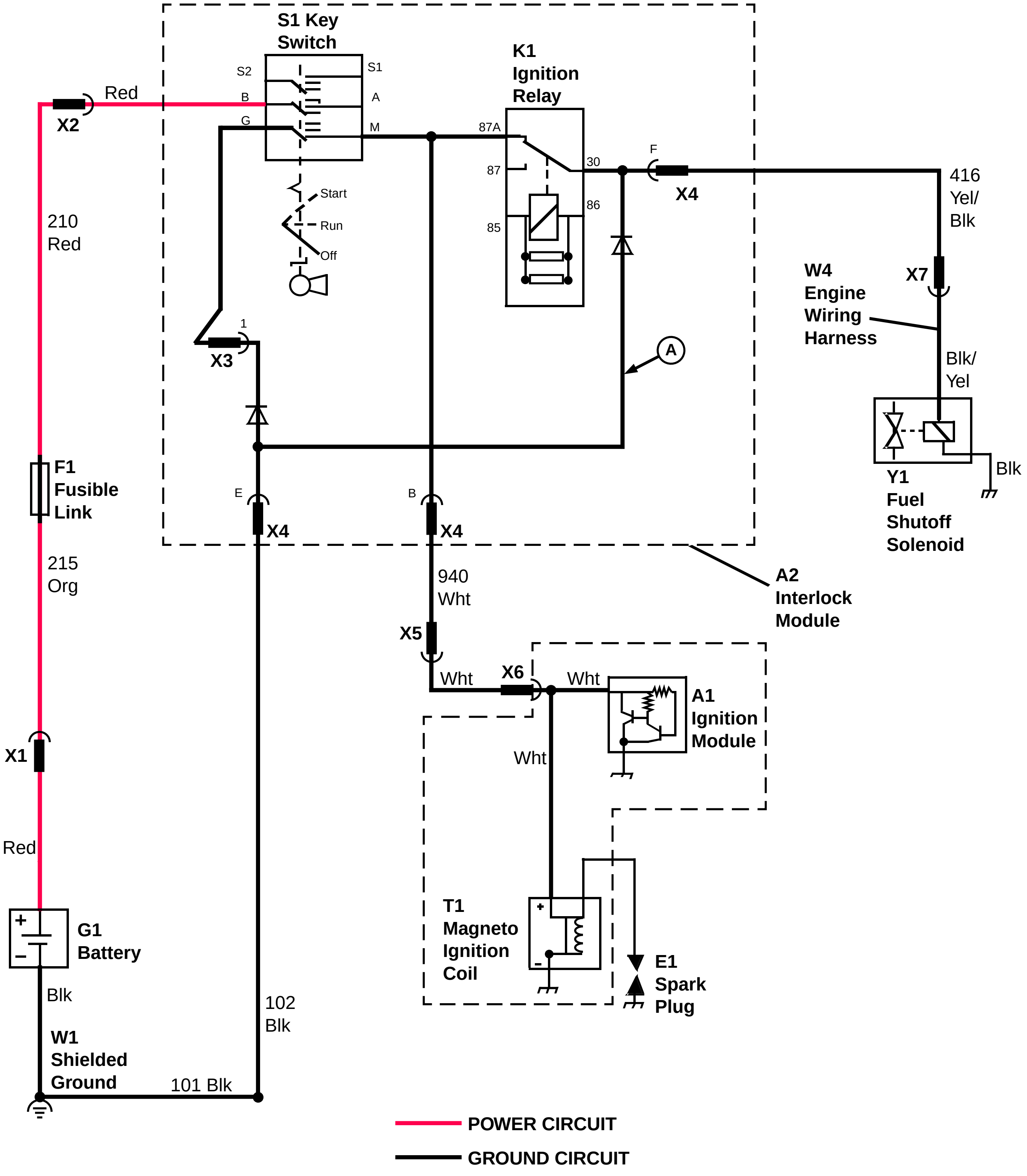
System Operation:

NOTE: The key switch and 15 amp fuse terminals are mounted on a printed circuit board (A2 Interlock Module). The components are solid state and are not serviced separately except for the 15 amp fuses. Lines within dashed border of the Interlock Module (A2) are circuit paths on the circuit board and are not wires in the harness.

When the key switch (S1) is turned to the OFF position, a path to ground through key switch terminals M and G is provided for the magneto ignition coil (T1) current. At the same time, the power circuit current flow is stopped at the key switch. The low voltage current produced in the primary coil of the ignition coil flows to the ignition module (A1) and key switch. It is easier for low voltage current to flow to the key switch and then to ground, than to flow through the ignition module resistors, so the current does not energize the ignition module transistors. Since no voltage is induced in the secondary coil, no spark occurs and the engine stops.

A second path to ground is provided for the ignition coil current through the ignition relay (K1) terminals 87A and 30. The ignition relay coil is energized by current from the seat switch circuit or neutral start circuit. If the operator gets off the seat (seat switch opens) with the PTO engaged or with the transmission engaged, current flow to the ignition relay coil is stopped. The low voltage current produced in the primary coil of the magneto ignition coil flows to the ignition module (A1) and ignition relay terminal 87A. The ignition relay coil de-energizes and grounds ignition coil current through ignition relay terminals 87A and 30 and the through ground path (A).

Whenever the ignition relay is de-energized, the fuel shutoff solenoid is also de-energized and fuel flow to the carburetor is stopped.



MC82834AE

520 X 628

IGNITION CIRCUIT DIAGNOSIS

When diagnosising an ignition problem, isolate the magneto circuit from the ground circuit by separating the engine connector (X5). If the engine will not start check the magneto circuit first and then the ground circuit. If the engine will not shut off, check the ground circuit first. Remember the engine is stopped by grounding the ignition coil through either the key switch or ignition relay. The ignition relay must be energized to prevent the ignition coil from being grounded.

Test Conditions:

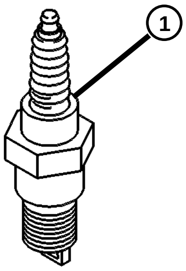
- Key switch in START position.
- PTO switch in OFF position.
- Parking brake ENGAGED. (Neutral start switch CLOSED.)
- Engine connector (X5) DISCONNECTED.

Test Location	Normal	If Not Normal
1. Spark plug/Spark Tester.	Spark test indicates hot blue spark.	No spark present: Test ignition coil and ignition module. Check armature air gap, and flywheel magnets. Spark present: Check spark plug gap and condition of spark plug. If plug is good, continue testing ground circuit.

Test Conditions:

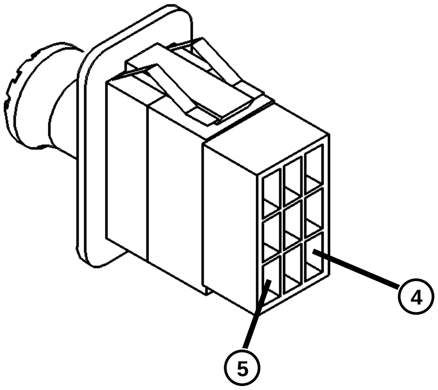
- Key switch in RUN position.
- Engine connector (X5) CONNECTED.
- Operator on seat. (Seat switch CLOSED.)

Test Location	Normal	If Not Normal
2. Battery positive (+) terminal.	11.8—13.2 volts.	Test Battery.
3. Key switch “B” terminal.	Battery voltage.	Check orange wire No. 215, red wire No. 210, fusible link (F1), red wire (connector to key switch) and connections. If ok, replace interlock module.
4. PTO Switch.	Battery voltage.	Check yellow/black wires No. 415 and 410, fuse (F3) and connections.
5. PTO Switch.	Battery voltage.	Test PTO switch. (See procedure in Tests and Adjustments.)
6. Neutral start switch.	Battery voltage.	Check purple wire No. 705 and connections.
7. Neutral start switch.	Battery voltage.	Test neutral start switch. (See procedure in Tests and Adjustments.)



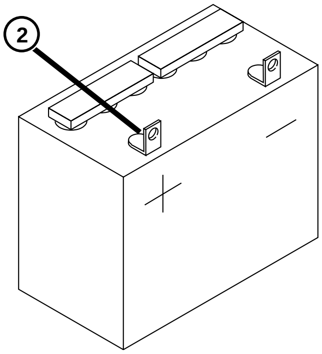
E1 Spark Plug

M82882



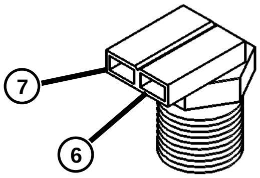
S4 PTO Switch

M82858



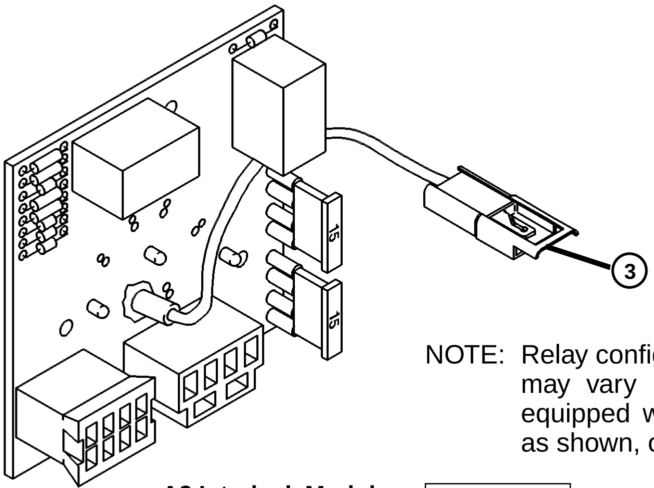
G1 Battery

M82886



S3 Neutral Start Switch

M82859



NOTE: Relay configuration on A2 Interlock Module may vary per machine. Module may be equipped with either two separate relays, as shown, or a single dual relay.

A2 Interlock Module

M82854

IGNITION CIRCUIT DIAGNOSIS, continued

Test Location	Normal	If Not Normal
8. Interlock module, Terminal X3—3.	Battery voltage.	Check purple wire No. 710 and connections.
9. Seat switch.	Battery voltage.	Check yellow/black wires No. 414 and 410, fuse (F3) and connections.
10. Seat switch.	Battery voltage.	Test seat switch. (See procedure in Tests and Adjustments.)
11. Interlock module, terminal X4—D.	Battery voltage.	Check pink wire No. 800 and connections. Test seat switch. (See procedure in Tests and Adjustments.)

Test Conditions:

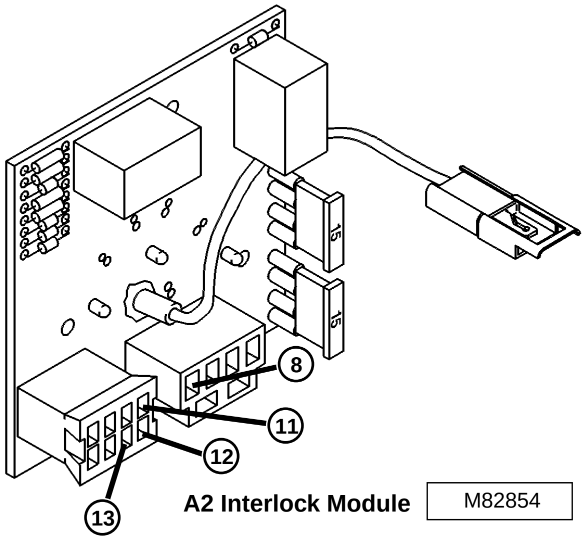
- Key switch in OFF position.

Test Location	Normal	If Not Normal
12. Interlock module, Terminal X4—E.	Maximum 0.1 ohms resistance.	Check battery negative cable shielded ground, black wires No. 101 and 102.

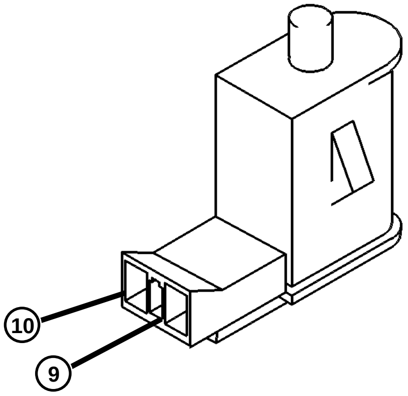
Test Conditions:

- Key switch in RUN position.

Test Location	Normal	If Not Normal
13. Interlock module, terminal X4—F.	Battery voltage.	Replace interlock module.



A2 Interlock Module M82854



S2 Seat Switch M82856

NOTE: Relay configuration on A2 Interlock Module may vary per machine. Module may be equipped with either two separate relays, as shown, or a single dual relay.

CHARGING CIRCUIT OPERATION

Function:

To maintain battery voltage between 11.8 and 13.2 volts DC.

Operating Conditions:

- Key switch in RUN position.
- Engine running.

System Operation:

NOTE: The key switch and 15 amp fuse terminals are mounted on a printed circuit board (A2 Interlock Module). The components are solid state and are not serviced separately except for the 15 amp fuses. Lines within dashed border of the Interlock Module (A2) are circuit paths on the circuit board and are not wires in the harness.

The charging system is a permanent magnet and stator design. Charging output is controlled by a regulator/rectifier. A battery discharge light warns the operator if the stator stops charging. The battery discharge light circuit monitors stator output, not battery voltage.

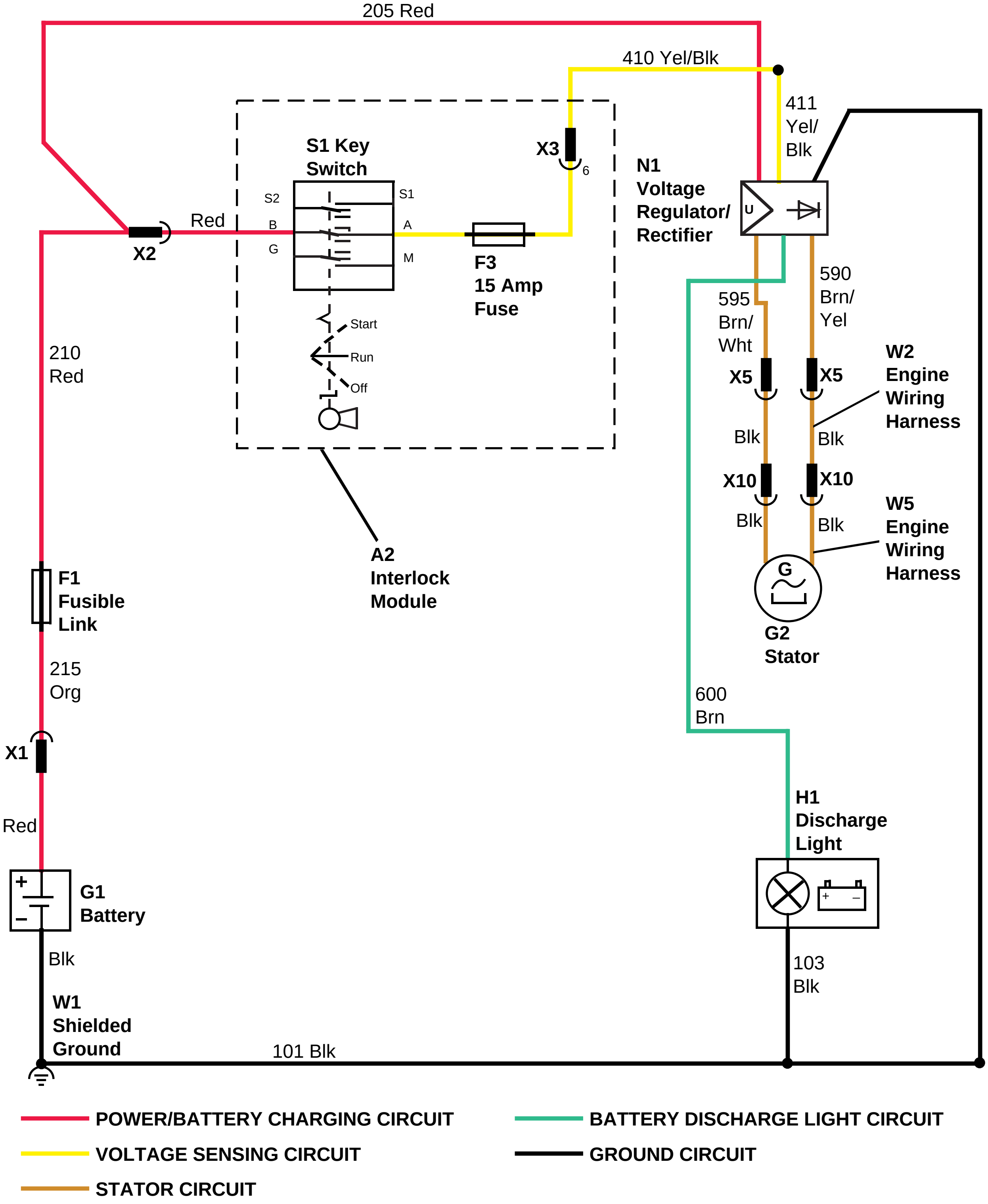
The power/battery charging circuit provides current to the key switch (S1) battery terminal and protects the charging circuit with a fusible link (F1). With the key switch in the RUN position, current flows from battery (G1) positive (+) terminal to fusible link, key switch, 15 amp fuse (F3), and regulator/rectifier (N1). The voltage sensing circuit allows the regulator/rectifier to monitor battery voltage.

As the flywheel turns, a permanent magnet located in the flywheel induces AC current in the stator (G2) windings. The AC current flows to the regulator/rectifier. The regulator/rectifier converts the AC current to DC current needed to charge the battery.

If the battery voltage is low, the regulator/rectifier allows DC current to flow to the battery to charge it through the power/battery charging circuit. When the battery is fully charged, the regulator stops current flow to the battery.

If stator output current to the regulator/rectifier stops, the regulator/rectifier provides current to the battery discharge light (H1) to illuminate the light.

The ground circuit provides a path to ground for the regulator/rectifier.


205 Red
410 Yel/Blk
411 Yel/ Blk
S1 Key Switch
X3
6
N1 Voltage Regulator/ Rectifier
U
S2
S1
B
A
G
M
Red
X2
F3 15 Amp Fuse
595 Brn/ Wht
590 Brn/ Yel
Start
Run
Off
210 Red
X5
X5
W2 Engine Wiring Harness
Blk
Blk
X10
X10
Blk
Blk
W5 Engine Wiring Harness
A2 Interlock Module
G
F1 Fusible Link
G2 Stator
215 Org
600 Brn
X1
H1 Discharge Light
Red
+
−
G1 Battery
Blk
W1 Shielded Ground
103 Blk
107 Blk
101 Blk
POWER/BATTERY CHARGING CIRCUIT
VOLTAGE SENSING CIRCUIT
STATOR CIRCUIT
BATTERY DISCHARGE LIGHT CIRCUIT
GROUND CIRCUIT

MC82835AE

CHARGING CIRCUIT DIAGNOSIS

Test Conditions:

- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Battery positive (+) terminal.	11.8—13.2 volts.	Test Battery.
2. Key switch “B” terminal.	Battery voltage.	Check orange wire No. 215, red wire No. 210, fusible link (F1), red wire (connector to key switch) and connections.
3. Voltage regulator/ rectifier.	Battery voltage.	Check red wire No. 205 and connections.
4. Voltage regulator/ rectifier.	Maximum 0.1 ohms resistance.	Check battery negative cable, shielded ground, black wires No. 101 and 107.
5. Discharge light.	Maximum 0.1 ohms resistance.	Check black wire No. 103.

Test Conditions:

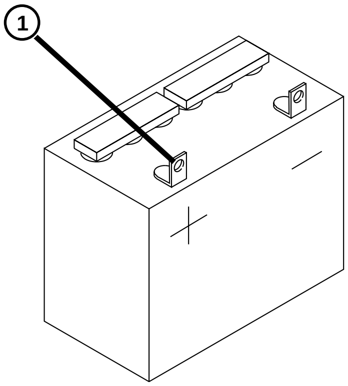
- Key switch in RUN position—Engine not running.

Test Location	Normal	If Not Normal
6. Voltage regulator/ rectifier.	Battery voltage.	Check yellow/black wire No. 411, fuse (F3) and connections. If ok, replace interlock module.
7. Discharge light.	Battery voltage.	Check brown wire No. 600 and connections. If ok, replace voltage regulator/rectifier.

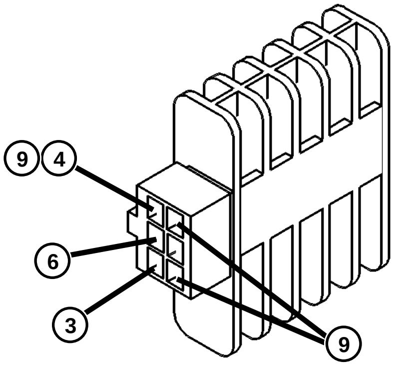
Test Conditions:

- Key switch in RUN position—Engine running.

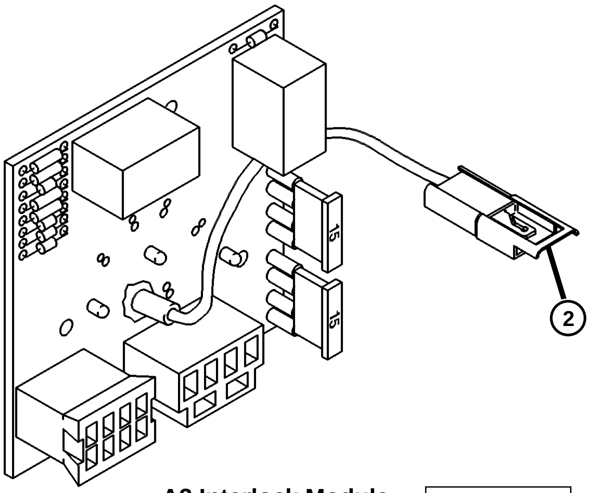
Test Location	Normal	If Not Normal
8. Stator connector. (Perform Unregulated Voltage Output Test.)	Voltage output to specifications.	See Unregulated Voltage Output Test.
9. Voltage regulator/ rectifier — Red wire No. 205. (Perform Regulated Amperage Test).	Regulated amperage to specification.	Check brown/white wire No. 595, brown/yellow wire No. 590 and black wires. If ok, replace voltage regulator/rectifier.



G1 Battery M82886

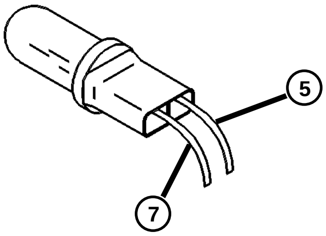


N1 Regulator/Rectifier M82855

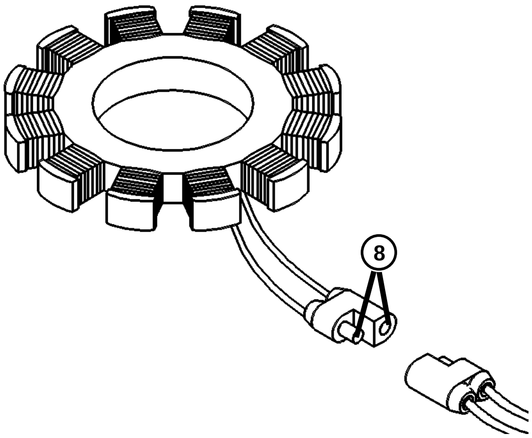


A2 Interlock Module M82854

NOTE: Relay configuration on A2 Interlock Module may vary per machine. Module may be equipped with either two separate relays, as shown, or a single dual relay.



H1 Discharge Light M82857



G2 Stator M82883

PTO CIRCUIT OPERATION— PTO OFF

Function:

To provide power to energize the PTO relay and clutch.

Operating Conditions:

- Key switch in RUN position.
- PTO switch in OFF position.
- Operator on seat. (Seat switch CLOSED.)

or

- PTO switch OFF.
- Neutral start switch CLOSED.

System Operation:

NOTE: The key switch and 15 amp fuse terminals are mounted on a printed circuit board (A2 Interlock Module). The components are solid state and are not serviced separately except for the 15 amp fuses. Lines within dashed border of the Interlock Module (A2) are circuit paths on the printed circuit board and are not wires in the harness.

The PTO circuit uses a seat switch (S2), ignition relay (K1), and PTO relay (K2) to stop current flow to the PTO clutch (Y2), if the operator gets off the seat with the PTO engaged.

The power circuit provides current to the key switch (S1) and protects the PTO circuit with a 15 amp fuse (F3). Current flows from the battery (G1) positive (+) terminal to the fusible link (F1) and key switch battery terminal. With the key switch in the RUN position, current flows to the ignition relay (K1), seat switch (S2), and PTO switch (S4). Current cannot flow to the PTO relay until the ignition relay is energized. Energizing current for the ignition relay must come from the neutral start circuit and energizing current for the PTO relay must come from the PTO switch.

The PTO switch is used in the PTO safety circuit to prevent the PTO relay from energizing if the PTO switch is in the ON position. With the PTO switch OFF (PTO disengaged), current flows to the PTO relay coil terminal 86 energizing the relay. The PTO relay now has continuity between terminals 30 and 87.

The PTO switch is also used in the neutral start circuit to prevent the ignition relay from energizing if the PTO is engaged with the operator off the seat. With the PTO switch closed (PTO disengaged), current flow to the neutral start switch (S3) is enabled.

GT275:

NOTE: The neutral start switch is located on the top of the transmission and is activated by the brake actuator linkage. When the parking brake is engaged (transmission is automatically shifted into NEUTRAL), the brake actuator linkage closes the neutral start switch.

GT242 and GT262:

NOTE: The neutral start switch is located on top of the 6-speed transaxle transmission. It is activated either;

When the gear shift lever is set to neutral.

When the clutch is engaged.

When the parking brake is engaged.

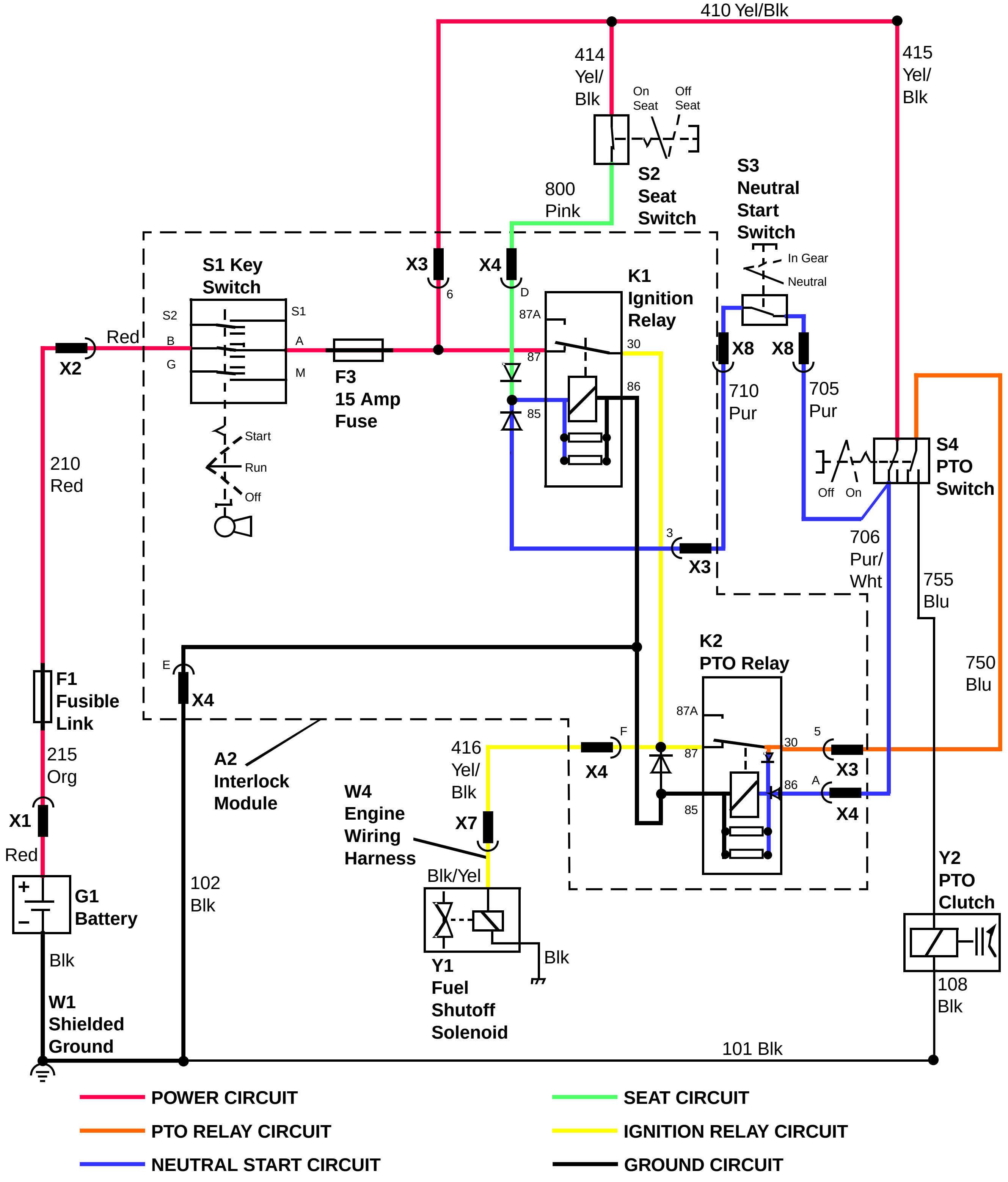
If any of the above circumstances, or any combination of these settings are true, then the neutral start switch is set to the closed condition.

The neutral start switch is used in the neutral start circuit to prevent the ignition relay from energizing if the transmission is engaged with the operator off the seat.

With the neutral start switch closed, current flows to the ignition relay coil terminal 85 energizing the coil, closing the relay. Closing the relay sends ignition relay current to the PTO relay terminal 87. PTO relay circuit current from terminals 87 and 30 flows to the PTO switch and is available to operate the PTO clutch when the PTO switch is turned ON.

An alternate current path is provided to keep the ignition relay energized when the PTO is engaged and the transmission is engaged. With the operator on the seat, the seat switch (S2) is closed and current flows to the ignition relay coil, keeping the relay energized.

The ground circuit provides a path to ground for the PTO and ignition relay coils.



MC82836AE

520 X 628

PTO CIRCUIT OPERATION— PTO ON

Function:

To provide power to energize or de-energize the PTO Clutch when desired by the operator.

Operating Conditions:

- Key switch in RUN position.
- PTO switch in ON position.
- Operator on seat. (Seat switch CLOSED.)

System Operation:

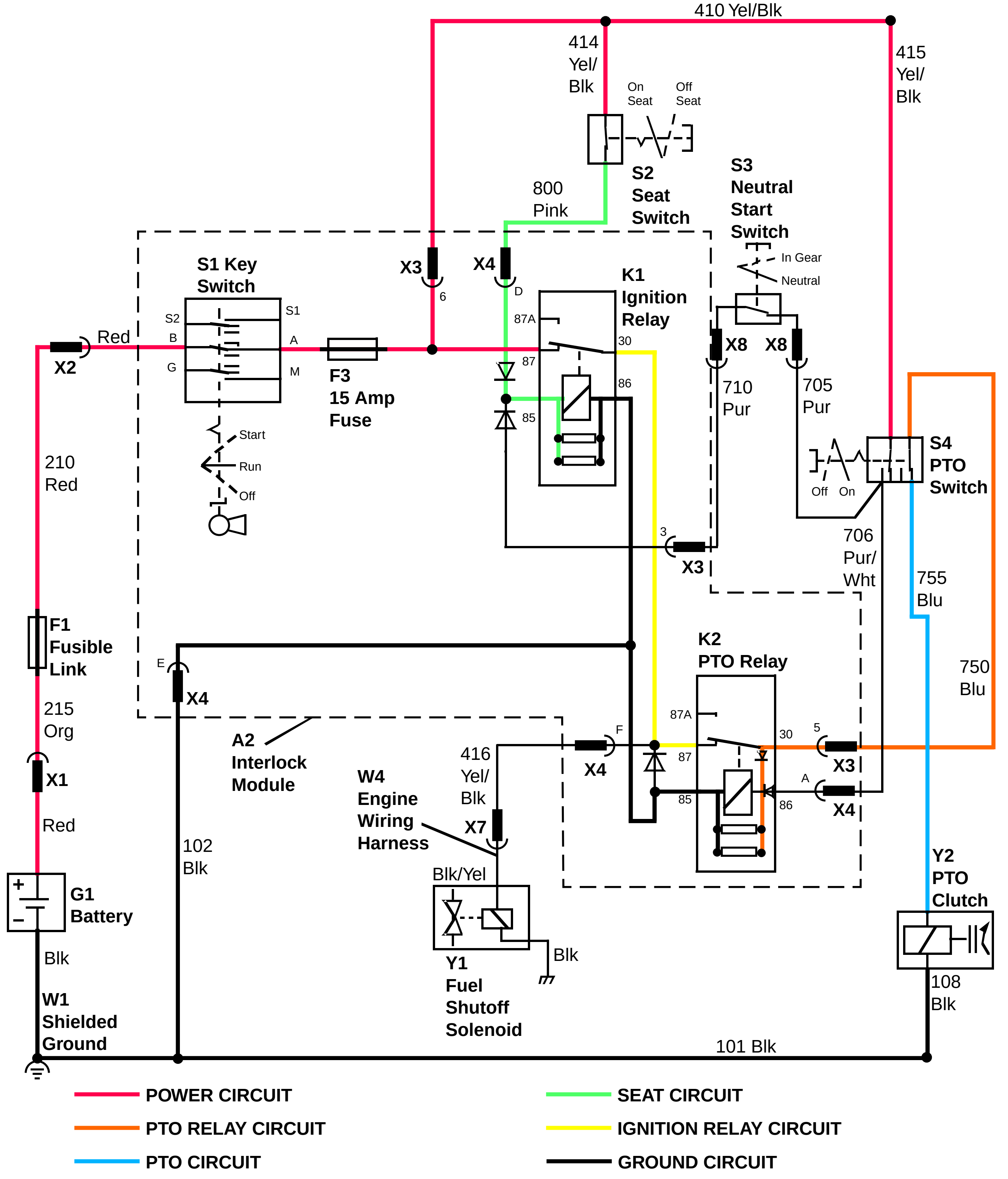
NOTE: The key switch and 15 amp fuse terminals are mounted on a printed circuit board (A2 Interlock Module). The components are solid state and are not serviced separately except for the 15 amp fuse. Lines within dashed border of the Interlock Module (A2) are circuit paths on the circuit board and are not wires in the harness.

The PTO circuit uses a seat switch (S2), ignition relay (K1), and PTO relay (K2) to stop current flow to the PTO clutch (Y2), if the operator gets off the seat with the PTO engaged.

With the key switch (S1) in the RUN position and the PTO circuit energized, current flows to the PTO switch (S4) terminal B and is available to operate the PTO clutch when the PTO switch is moved to the ON position. When the PTO switch is moved to the ON position, current flows through the PTO switch and energizes the PTO clutch. An alternate path for the PTO relay energizing current must be provided when the PTO switch in ON. With the PTO switch ON, terminals E and F no longer have continuity which stops current flow from the PTO switch to the PTO relay coil terminal 86. Since the PTO relay is closed, the PTO relay coil 86 receives energizing current from the PTO relay terminal 30. Current flows from terminal 87 to 30, and then to 86, keeping the relay energized.

With the PTO switch ON, current flow to the neutral start switch is stopped, so the seat circuit must keep the ignition relay energized. The seat switch (S2) de-energizes the ignition and PTO relays, which stops current flow to the PTO clutch if the operator gets off the seat with the PTO switch ON.

The ground circuit provides a path to ground for the ignition and PTO relay coils and PTO clutch.



MC82850AE

520 X 628

PTO CIRCUIT DIAGNOSIS

Test Conditions:

- Key switch in RUN position.
- PTO switch in OFF position.
- Parking brake ENGAGED. (Neutral start switch CLOSED.)
- Operator on seat. (Seat switch CLOSED.)

Test Location	Normal	If Not Normal
1. Battery positive (+) terminal.	11.8—13.2 volts.	Test Battery.
2. Key switch “B” terminal.	Battery voltage.	Check orange wire No. 215, red wire No. 210, fusible link (F1), red wire (connector to key switch) and connections.
3. PTO Switch.	Battery voltage.	Check yellow/black wires No. 415 and 410, fuse (F3) and connections. If ok, replace interlock module.
4. PTO Switch.	Battery voltage.	Test PTO switch. (See procedure in Tests and Adjustments.)
5. Neutral start switch.	Battery voltage.	Check purple wire No. 705 and connections.
6. Neutral start switch.	Battery voltage.	Test neutral start switch. (See procedure in Tests and Adjustments.)
7. Interlock module, Terminal X3—3.	Battery voltage.	Check purple wire No. 710 and connections.
8. Seat switch.	Battery voltage.	Check yellow/black wires No. 414 and 410, fuse (F3) and connections.
9. Seat switch.	Battery voltage.	Test seat switch. (See procedure in Tests and Adjustments.)
10. Interlock module, terminal X4—D.	Battery voltage.	Check pink wire No. 800 and connections.

Test Conditions:

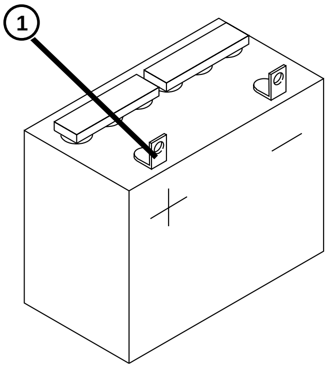
- Key switch in OFF position.

Test Location	Normal	If Not Normal
11. Interlock module, terminal X4—E.	Maximum 0.1 ohms resistance.	Check battery negative cable, shielded ground, and black wires No. 101 and 102.

Test Conditions:

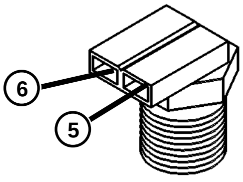
- Key switch in RUN position.

Test Location	Normal	If Not Normal
12. Interlock module, terminal X4—F.	Battery voltage.	Replace interlock module.



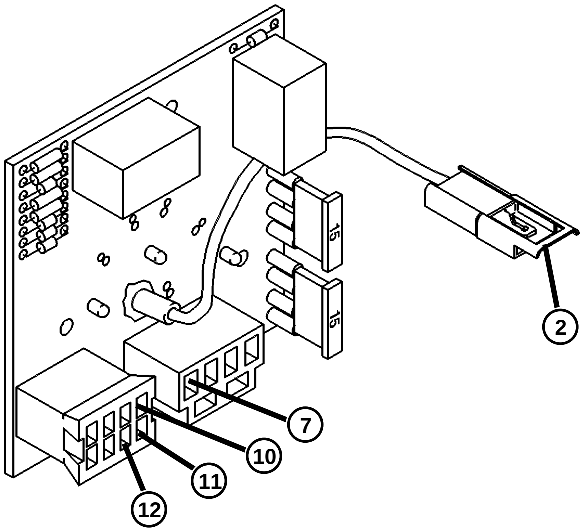
G1 Battery

M82886



S3 Neutral Start Switch

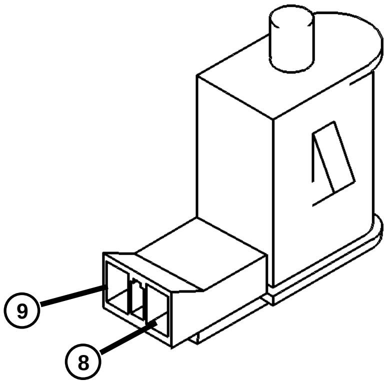
M82859



A2 Interlock Module

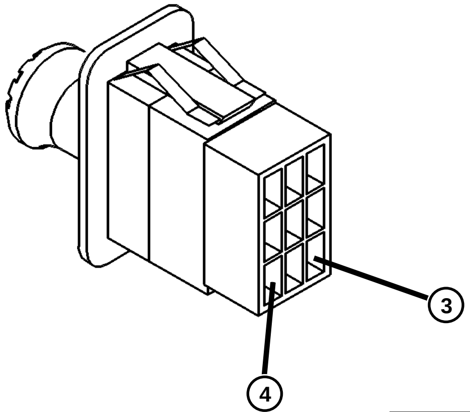
M82854

NOTE: Relay configuration on A2 Interlock Module may vary per machine. Module may be equipped with either two separate relays, as shown, or a single dual relay.



S2 Seat Switch

M82856



S4 PTO Switch

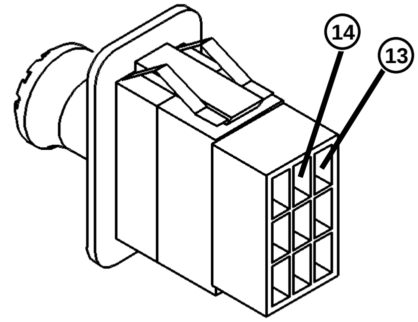
M82858

PTO CIRCUIT DIAGNOSIS, continued

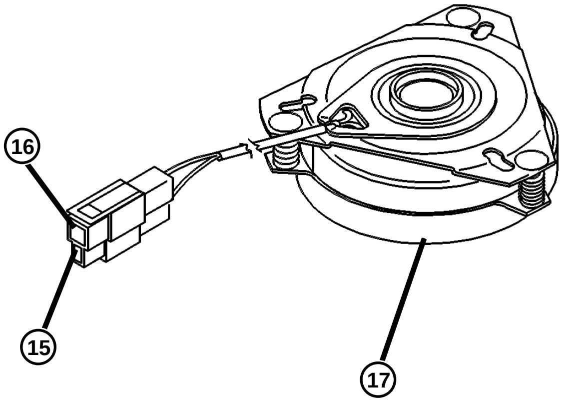
Test Conditions:

- Key switch in RUN position.
- PTO switch in ON position.

Test Location	Normal	If Not Normal
13. PTO switch.	Battery voltage.	Check blue wire No. 750 and connections. If ok, replace interlock module.
14. PTO switch.	Battery voltage.	Test PTO switch. (See procedure in Tests and Adjustments.)
15. PTO clutch.	Battery voltage.	Check blue wire No. 755 and connections.
16. PTO clutch.	Greater than 0 — less than 0.2 volts.	Greater than 0.2 volts: check PTO clutch ground circuit. 0 volts: Test PTO clutch. (See procedure in Tests and Adjustments.)
17. PTO clutch.	PTO clutch air gap within specification.	Adjust air gap. (See procedure in Tests and Adjustments.)



S4 PTO Switch M82858



Y2 PTO Clutch M82884

LOW OIL PRESSURE LIGHT CIRCUIT OPERATION - GT262 and GT275

Function:

To light the low oil pressure light to alert the operator that the oil pressure is too low for continued operation.

Operating Conditions

- Key switch in RUN position.
- Oil pressure switch CLOSED (engine OFF or low oil pressure).

System Operation:

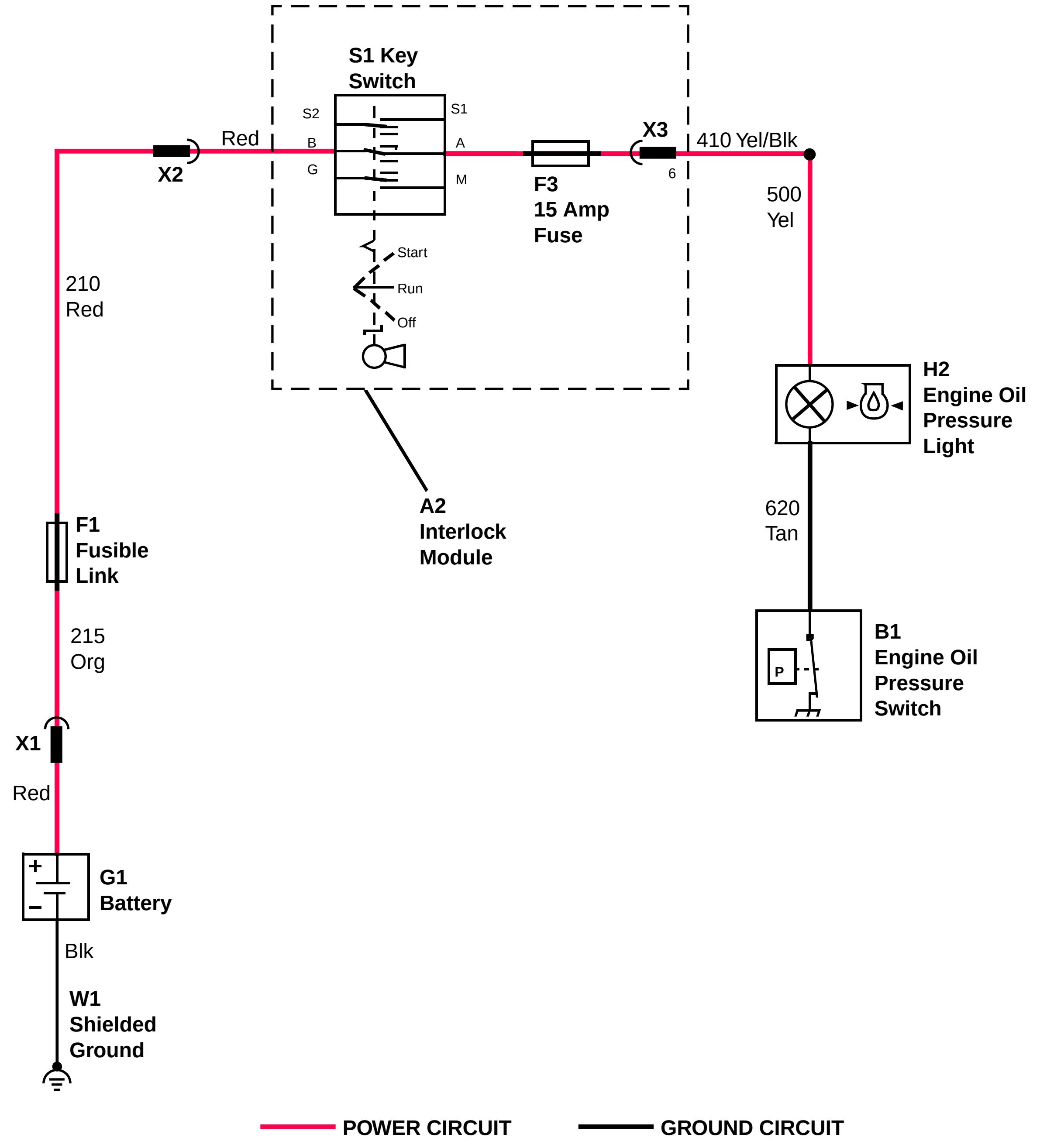
NOTE: The key switch and 15 amp fuse terminals are mounted on a printed circuit board (A2 Interlock Module). The components are solid state and are not serviced separately except for the 15 amp fuses. Lines within dashed border of the Interlock Module (A2) are circuit paths on the circuit board and are not wires in the harness.

The low oil pressure light system uses a pressure activated switch to provide a path to ground for the oil pressure light. The switch is closed when engine oil pressure is at or below 28 kPa (4 psi).

The power circuit provides current to the key switch (S1) and protects the low oil pressure light circuit with a 15 amp fuse (F3). Current flows from the battery (G1) positive (+) terminal to the fusible link (F1) and key switch battery terminal. With the key switch in the RUN position, current flows to the 15 amp fuse (F3) and the oil pressure light (H2).

If the engine is not running or oil pressure is at or below 28 kPa (4 psi), the oil pressure switch (B1) will be closed. The oil pressure switch completes the path to ground and the low pressure light comes ON. When the engine starts and oil pressure increases above 28 kPa (4 psi), the oil pressure switch opens, breaking the path to ground and the light goes out.

The ground circuit provides a path to ground through the oil pressure switch, for the oil pressure light.



MC82837AE

520 X 628

LOW OIL PRESSURE LIGHT CIRCUIT DIAGNOSIS

Test Conditions:

- Key switch in RUN position.
- Engine oil pressure switch lead disconnected.

Test Location	Normal	If Not Normal
1. Battery positive (+) terminal.	11.8—13.2 volts.	Test Battery.
2. Key switch “B” terminal.	Battery voltage.	Check orange wire No. 215, red wire No. 210, fusible link (F1), red wire (connector to key switch) and connections.
3. Engine oil pressure light.	Battery voltage.	Check yellow wire No. 500, yellow/black wire No. 410, fuse (F3) and connections. If ok, replace interlock module.
4. Engine oil pressure switch lead.	Battery voltage.	Check tan wire No. 620 and connections.

Test Conditions:

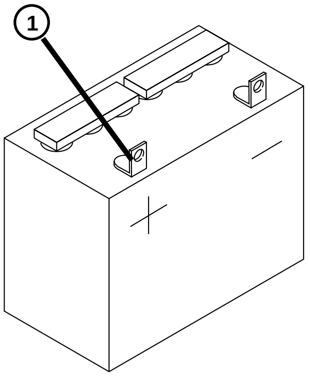
- Key switch in OFF position.

Test Location	Normal	If Not Normal
5. Engine oil pressure switch.	Continuity to ground—maximum 0.1 ohms resistance.	Check ground circuit, if ok, replace engine oil pressure switch.

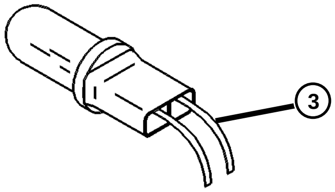
Test Conditions:

- Key switch in RUN position.
- Engine running.

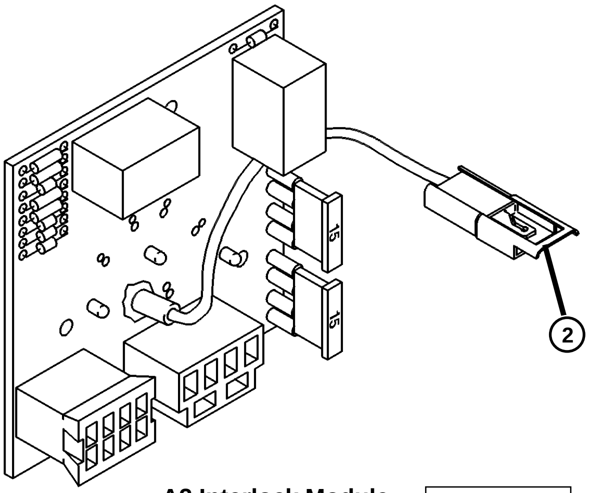
Test Location	Normal	If Not Normal
6. Engine oil pressure switch.	No continuity to ground (maximum resistance).	Check engine oil pressure, if ok, replace engine oil pressure switch.



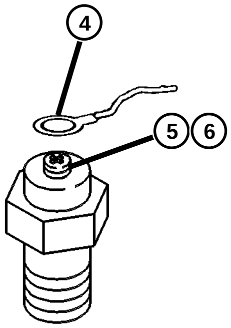
G1 Battery M82886



H2 Engine Oil Pressure Light M82857



A2 Interlock Module M82854



B1 Engine Oil Pressure Switch M82881

NOTE: Relay configuration on A2 Interlock Module may vary per machine. Module may be equipped with either two separate relays, as shown, or a single dual relay.

HEADLIGHT CIRCUIT OPERATION

Function:

To provide power to the headlights for illumination if desired by the operator.

Operating Conditions

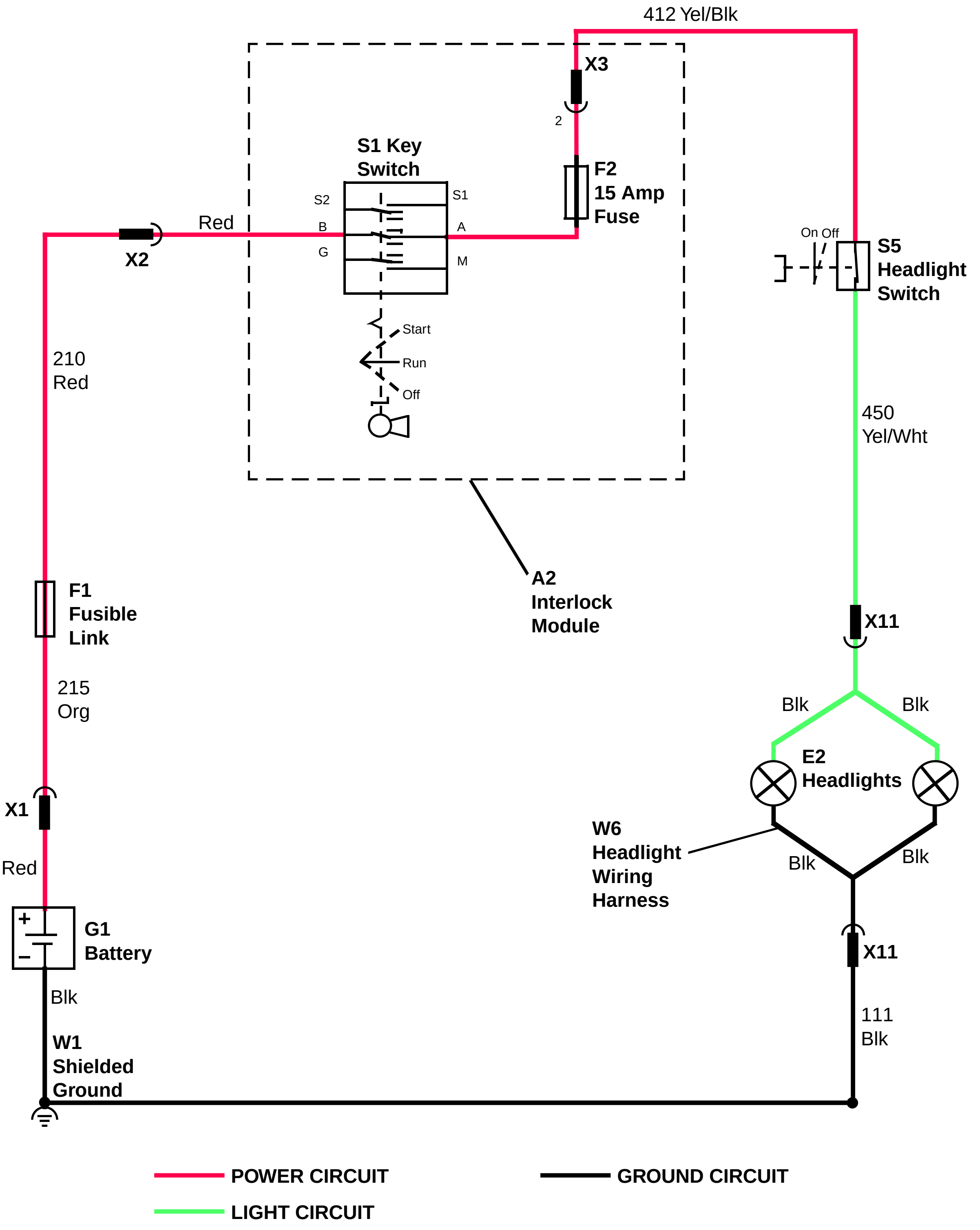
- Key switch in RUN position.
- Headlight switch in ON position.

System Operation:

NOTE: The key switch and 15 amp fuse terminals are mounted on a printed circuit board (A2 Interlock Module). The components are solid state and are not serviced separately except for the 15 amp fuses. Lines within dashed border of the Interlock Module (A2) are circuit paths on the circuit board and are not wires in the harness.

The power circuit provides current to the key switch (S1) and protects the circuit with a 15 amp fuse (F2). With the key switch in the RUN position, current flows from the battery (G1) positive (+) terminal to the fusible link (F1), key switch battery terminal, 15 amp fuse (F2) and headlight switch (S5). With the headlight switch in the ON position, current flows to the headlights (E2) and illuminates the lamps.

The ground circuit provides a path to ground for the headlight.



MC82838AE

520 X 628

HEADLIGHT CIRCUIT DIAGNOSIS

Test Conditions:

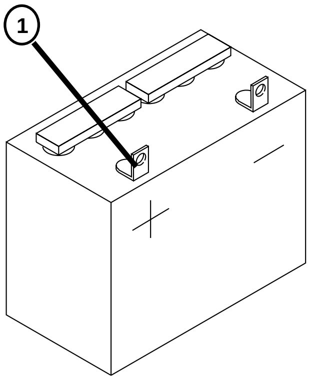
- Key switch in RUN position.
- Headlight switch in ON position.

Test Location	Normal	If Not Normal
1. Battery Positive (+) terminal.	11.8—13.2 volts.	Test Battery.
2. Key switch “B” terminal.	Battery voltage.	Check orange wire No. 215, red wire No. 210, fusible link (F1), red wire (connector to key switch) and connections.
3. Headlight switch.	Battery voltage.	Check yellow/black wire No. 412, fuse (F2) and connections. If ok, replace interlock module.
4. Headlight switch.	Battery voltage.	Test headlight switch. (See procedure in Tests and Adjustments.)
5. Headlight connector.	Battery voltage.	Check yellow/white wire No. 450, Black wires (from connector to headlights) and connections.
6. Headlights.	Headlights ON.	Test bulbs.

Test Conditions:

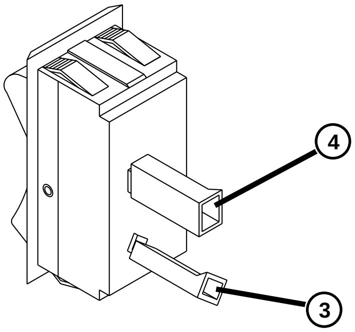
- Key switch in OFF position.

Test Location	Normal	If Not Normal
7. Headlight ground.	Maximum 0.1 ohms resistance.	Test ground circuit, black wires No. 111 and 101 and connections.



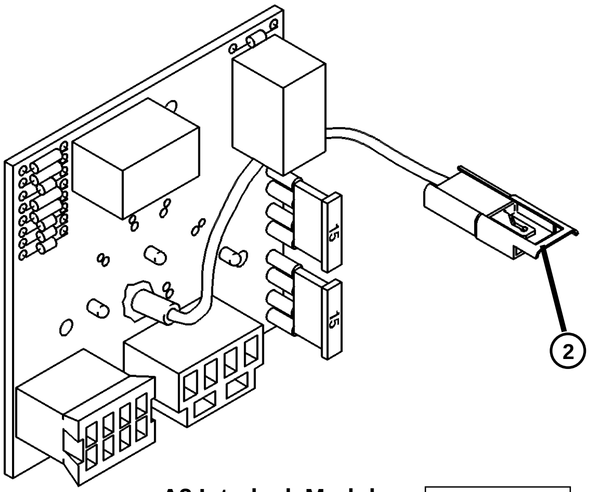
G1 Battery

M82886



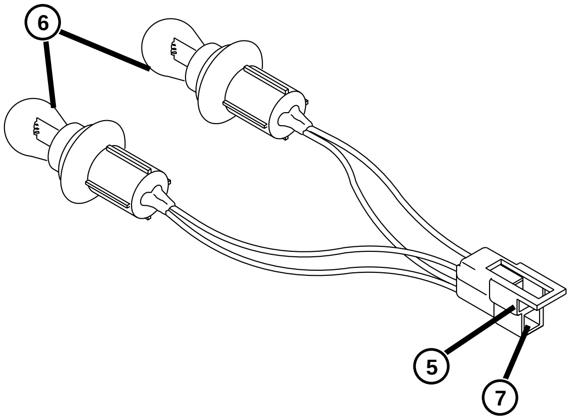
S5 Headlight Switch

M82852AE



A2 Interlock Module

M82854



E2 Headlights

M82853AE

NOTE: Relay configuration on A2 Interlock Module may vary per machine. Module may be equipped with either two separate relays, as shown, or a single dual relay.

FUEL SHUTOFF SOLENOID CIRCUIT OPERATION

Function:

To energize the fuel shutoff solenoid when the ignition relay is energized.

Operating Conditions:

- Key switch in START or RUN position.
- Operator on seat. (Seat switch CLOSED.)

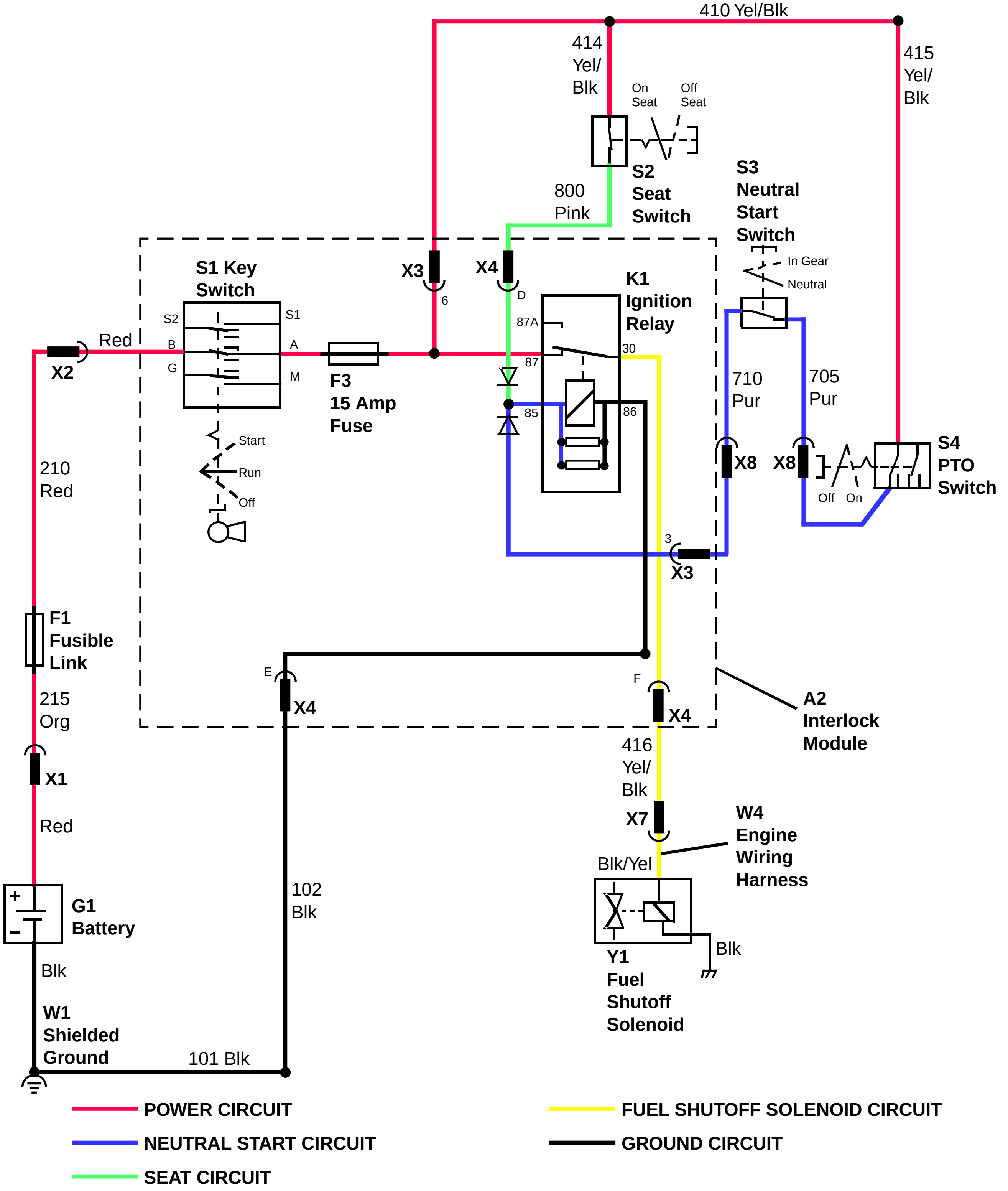
  or
- PTO switch in OFF position.
- Parking brake ENGAGED. (Neutral start switch CLOSED.)

System Operation:

NOTE: The key switch and 15 amp fuse terminals are mounted on a printed circuit board (A2 Interlock Module). The components are solid state and are not serviced separately except for the 15 amp fuses. Lines within dashed border of the Interlock Module (A2) are circuit paths on the circuit board and are not wires in the harness.

The fuel shutoff solenoid (Y1) uses an electro-magnetic coil to operate a plunger. The fuel shutoff solenoid plunger stops fuel flow in the carburetor bowl when the solenoid is de-energized. The ignition relay (K1) provides power to the fuel shutoff solenoid. When the ignition relay is de-energized, the fuel shutoff solenoid stops fuel flow at the same time the spark is stopped, helping to prevent backfire at engine shutdown.

The power circuit provides current to the key switch (S1), energizes the ignition relay circuit, and protects the fuel shutoff solenoid circuit with a 15 amp fuse (F3). Current flows from the battery (G1) positive (+) terminal to the fusible link (F1), and key switch battery terminal. With the key switch in the RUN position, current flows to the 15 amp fuse (F3), ignition relay terminal 87, seat switch (S2), and PTO switch (S4). Current cannot flow to the fuel shutoff solenoid until the ignition relay is energized. The ignition relay coil is energized by current from the seat switch circuit or neutral start circuit.



MC82839AE

520 X 628

FUEL SHUTOFF SOLENOID CIRCUIT DIAGNOSIS

Test Conditions:

- Key switch in RUN position.
- Operator on seat. (Seat switch CLOSED.)
- PTO switch in OFF position.
- Parking brake ENGAGED. (Neutral start switch CLOSED.)

Test Location	Normal	If Not Normal
1. Battery Positive (+) terminal.	11.8—13.2 volts.	Test Battery.
2. Key switch “B” terminal.	Battery voltage.	Check orange wire No. 215, red wire No. 210, fusible link (F1), red wire (connector to key switch) and connections.
3. PTO switch.	Battery voltage.	Check yellow/black wires No. 415 and 410, fuse (F3) and connections. If ok, replace interlock module.
4. PTO switch.	Battery voltage.	Test PTO switch. (See procedure in Tests and Adjustments.)
5. Neutral start switch.	Battery voltage.	Check purple wire No. 705 and connections.
6. Neutral start switch.	Battery voltage.	Test neutral start switch. (See procedure in Tests and Adjustments.)
7. Interlock module, terminal X3—3.	Battery voltage.	Check purple wire No. 710 and connections.
8. Seat switch.	Battery voltage.	Check yellow/black wires No. 414 and 410, fuse (F3) and connections.
9. Seat switch.	Battery voltage.	Test seat switch. (See procedure in Tests and Adjustments.)
10. Interlock module, terminal X4—D.	Battery voltage.	Check pink wire No. 800 and connections.

Test Conditions:

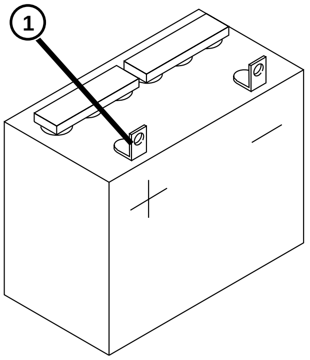
- Key swith in OFF position.

Test Location	Normal	If Not Normal
11. Interlock module, terminal X4—E.	Maximum 0.1 ohms resistance.	Check battery negative cable, shielded ground and black wires No. 101 and 102 and connections.
12. Fuel shutoff solenoid (black wire).	Maximum 0.1 ohms resistance.	Check black wire. (Side of carburetor-to-carburetor mounting nut.)

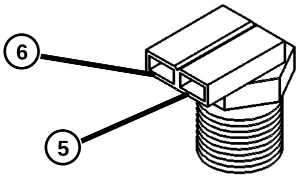
Test Conditions:

- Key switch in RUN position.

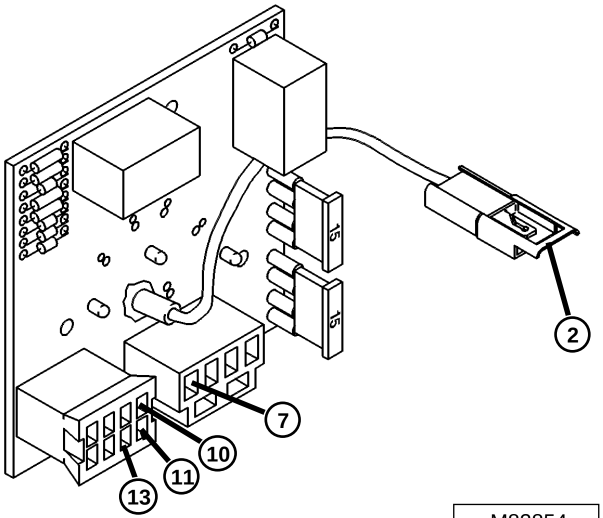
Test Location	Normal	If Not Normal
13. Interlock module, terminal X4—F	Battery voltage.	Replace interlock module.
14. Fuel shutoff solenoid.	Battery voltage.	Check black/yellow wire (engine wiring harness), yellow/black wire No. 416 and connections. If ok, replace fuel shutoff solenoid.



G1 Battery M82886

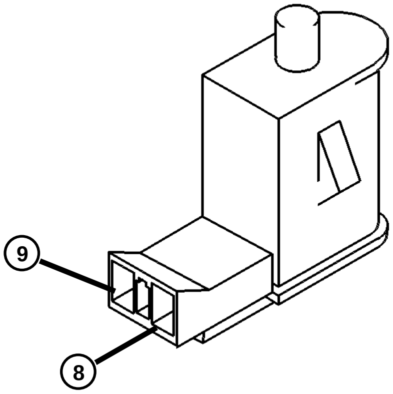


S3 Neutral Start Switch M82859

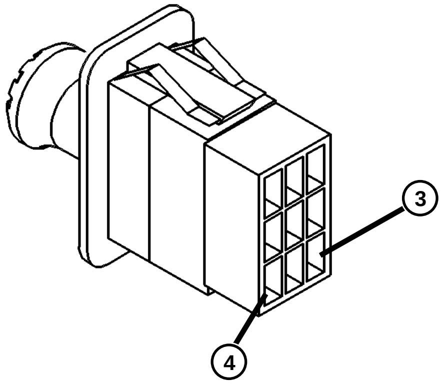


A2 Interlock Module M82854

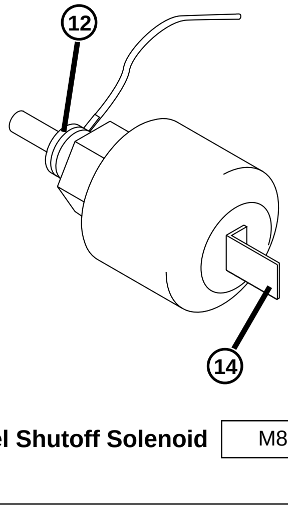
NOTE: Relay configuration on A2 Interlock Module may vary per machine. Module may be equipped with either two separate relays, as shown, or a single dual relay.



S2 Seat Switch M82856



S4 PTO Switch M82858



Y1 Fuel Shutoff Solenoid M82885

COMMON CIRCUIT TEST

Shorted/Grounded Circuit:

A shorted circuit on the ground side of a component (i.e. improper wire-to-wire or wire to ground contact) may result in improper component operation.

A shorted circuit on the power side of a component or contact of two power circuits (i.e. improper wire-to-wire or wire to ground contact) may result in blown fusible links and fuses.

To test for a shorted or improperly wired circuit:

1. Turn component switch ON.
2. Start at the controlling switch of the component that should not be operating.
3. Follow the circuit and disconnect wires at connectors until components stop operating.
4. Shorted or improper connections will be the last two wires disconnected.

High Resistance or Open Circuit:

High resistance or open circuits usually result in slow, dim, or no component operation (i.e. poor, corroded, or severed connections). Voltage at the component will be low when the component is in operation. To test for high resistance and open circuits:

1. Check all terminals and ground connections of the circuit for corrosion.
2. If terminals are not loose or corroded, the problem is in the component or wiring.

GROUND CIRCUIT TEST

Reason:

To check for open circuits, loose terminal wire crimps, poor connections, or corrosion in the ground circuit.

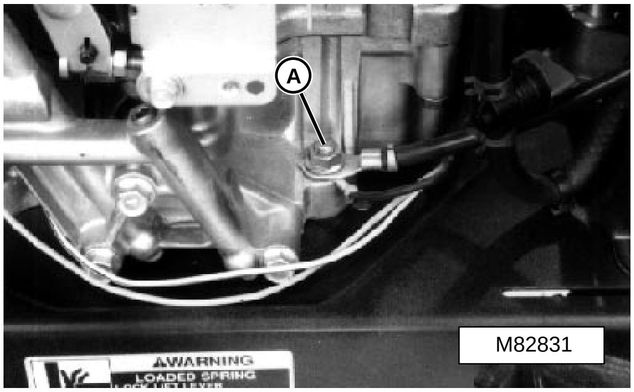
Equipment:

- Ohmmeter or Voltmeter.

NOTE: The voltmeter method checks ground connections under load.

Procedure—OHMMETER METHOD:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.
   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Raise hood.
6. Connect ohmmeter to negative (black) to negative terminal of battery. Connect meter positive (red) lead to negative terminal of battery and record reading.
7. Connect ohmmeter red lead to ground terminal (A) of circuit or component to be tested that is closest to the battery negative terminal. **Resistance reading must be the same or very close to as the battery negative terminal reading. Work backward 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 the connectors closely, as disconnecting and connection may **temporarily** solve problem.



Procedure—VOLTMETER METHOD:

1. Park machine on level surface.
2. GT275 - Move Forward/Reverse pedals to NEUTRAL position.
   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
3. Engage parking brake.
4. Turn key switch to ON position.
5. Raise hood.
6. Connect voltmeter negative (black) lead to negative terminal of battery.
7. Connect voltmeter positive (red) lead to ground terminal (A) of circuit or component to be tested. Be sure that component circuit is activated (key ON, switches CLOSED) so that 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 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.

BATTERY TEST

⚠ CAUTION

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

Avoid the hazard by:

1. **Filling batteries in a well-ventilated area.**
2. **Wearing eye protection and rubber gloves.**
3. **Avoiding breathing fumes when electrolyte is added.**
4. **Avoid spilling or dripping electrolyte.**
5. **Use proper jumpstart procedure.**

If you spill acid on yourself:

1. **Flush your skin with water.**
2. **Apply baking soda or lime to help neutralize the acid.**
3. **Flush your eyes with water for 10—15 minutes. 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.**

Reason:

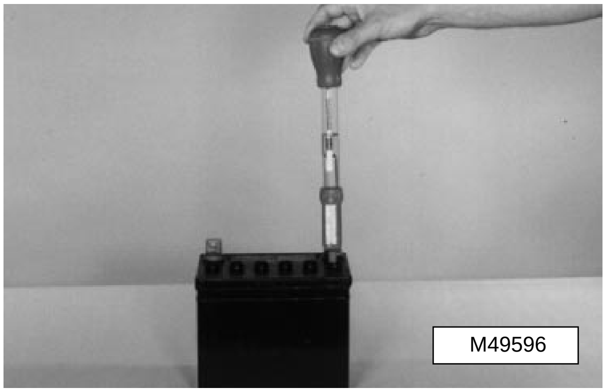
To check condition of battery and determine battery voltage.

Equipment:

- Hydrometer
- Voltmeter or JT05685 Battery Tester

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Engage parking brake.
4. Clean cable ends, battery terminals and top of battery.
5. Remove battery to workbench.
6. Inspect battery terminals and case for breakage or cracks.
7. Check electrolyte level in each battery cell. Add clean, soft water as needed. If water is added, charge battery for **20 minutes at 10 amps**.
8. Remove surface charge by placing a small load on the battery for 15 seconds.



9. Use an hydrometer to check for a **minimum specific gravity of 1.225 with less than 50 point variation in each cell.**

Results:

- If all cells are **less than 1.175**, charge battery at 10 amp rate.
- If all cells are **less than 1.225 with less than 50 point variation**, charge battery at 10 amp.
- If all cells are **more than 1.225 with less than 50 point variation**, load test battery.
- If **more than 50 point variation**, replace battery.

10. Use a voltmeter or JT05685 Battery Tester to check for a **minimum battery voltage of 11.8 volts**.

Results:

- If battery voltage is **less than 11.8 VDC**, charge battery. (See Charge Battery).
- If battery voltage is **more than 13.2 VDC**, test specific gravity. (See Step 9).

11. Install battery.

CHARGE BATTERY

Reason:

To increase battery charge after the battery has been discharged.

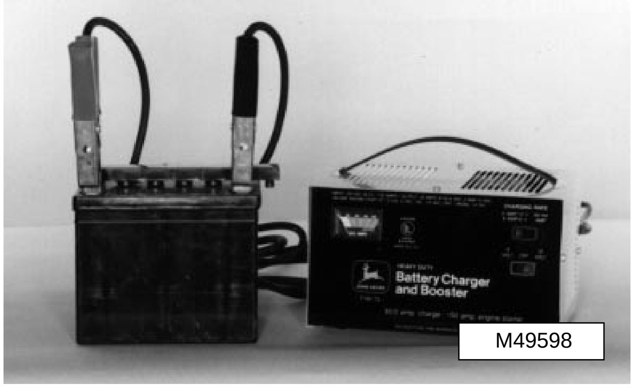
Equipment:

- Battery charger (variable rate).

Procedure:

NOTE: See BATTERY TEST before charging battery.

1. Park machine on level surface.
2. Turn key switch OFF.
3. Engage parking brake.
4. Clean cable ends, battery terminals and top of battery.
5. Remove battery to workbench.



6. Connect variable rate charger to battery.
7. 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.
8. Check if battery is accepting 10 amp charge rate after 10 minutes at boost setting.

Results:

- If battery WILL NOT accept 10 amp charge after 10 minutes at boost setting, replace battery.
- If battery is accepting 10 amp charge after 10 minutes at boost setting, and battery did NOT need water, go to Steps 9 and 10.
- If 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 9 and 10.

9. Set charger at 15—25 amps.

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

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

Results:

- If MORE THAN 50 point variation between cells, replace battery;
- If LESS THAN 50 point variation between cells, go to Step 10 and 11.

NOTE: If battery was discharged at slow or unknown rate, charge battery at 10-15 amps for 6-12 hours. (Maintenance-free battery: 4-8 hours).

11. Continue to charge battery until specific gravity is **1.230-1.265 points**.
12. Load test battery.
13. Install battery.

BATTERY LOAD TEST

Reason:

To check condition of battery under load.

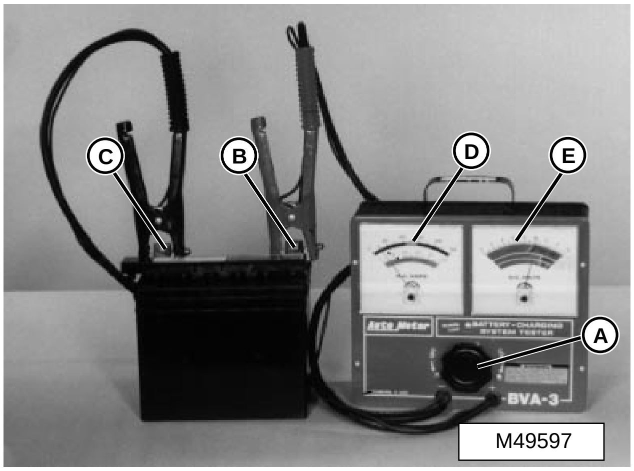
Equipment:

- JT05685 Battery Tester.

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Clean cable ends, battery terminals and top of battery.
6. Remove battery.



7. Turn load knob (A) counterclockwise to OFF position.
8. Connect tester positive (red) cable to battery positive (+) terminal (B).
9. Connect tester negative (black) cable to battery negative (-) terminal (C).
10. Turn load knob (A) of tester clockwise (in) until amperage reading (D) is equal to:

- cold cranking amperage rating of battery (use blue scale).

or

- three times ampere hour rating (use black scale).

11. Hold for 15 seconds and turn load knob (A) of tester counterclockwise (out) into OFF position.
12. Repeat Steps 10 and 11 above and read condition of battery at DC Volts scale (E).

Results:

- If battery DOES NOT pass test and has NOT been charged, charge battery and retest.
- If battery DOES NOT pass test and HAS BEEN charged, replace battery.

REGULATED AMPERAGE TEST

Reason:

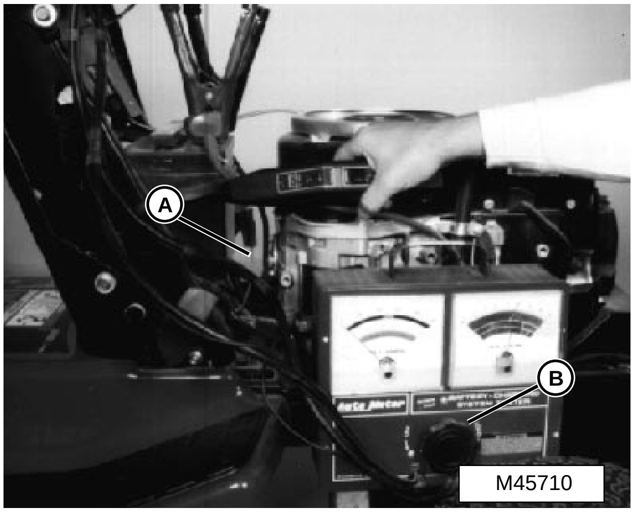
To determine charging output of regulator/rectifier.

Test Equipment:

- JT02153 Current Clamp
- JT05791 Multimeter

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.
   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Raise hood.



NOTE: JT05712 Current Gun is no longer available through SERVICE GUARD. It has been replace with JT02153 Current Clamp-on Tester used with JT05791 Digital/Analog Multimeter.

6. Put JT02153 Current Clamp over SMALL RED WIRE (A).
7. Set Current Gun for DC current.
8. Turn load knob (B) fully out (counterclockwise).
9. Connect JT05685 Battery Tester to battery:
   - Connect tester positive (red) cable to battery positive (+) terminal.
   - Connect tester negative (black) cable to battery negative (-) terminal.

IMPORTANT: Perform this test quickly to prevent damage to battery tester. DO NOT apply full load to battery for more than 5—10 seconds.

10. Start and run engine at **fast idle (3350±50 rpm)**.
11. Turn load knob in (clockwise) until voltage read on the tester voltage scale is 11 volts and read amperage. Amperage should read a **minimum of 13 amps**.

Results:

- If reading does not meet specifications, test unregulated voltage output. (See UNREGULATED VOLTAGE OUTPUT TEST.)
- If unregulated voltage output meets specifications and voltage and ground to the regulator/rectifier is verified, replace the regulator/rectifier.

REGULATED VOLTAGE TEST

Reason:

To determine regulated voltage output of the regulator/ rectifier.

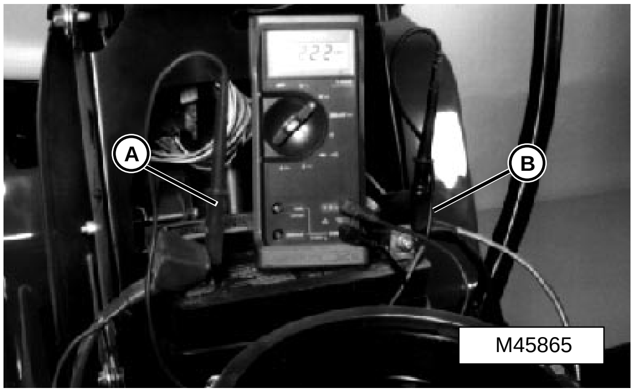
Test Equipment:

- Voltmeter

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Raise hood.
6. Remove surface charge from battery by placing a small load on the battery for 15 seconds.
7. Set voltmeter for 25 or 50 DC volt scale.



8. Connect meter red lead (A) to battery positive (+) terminal.
9. Connect meter black lead (B) to battery negative (-) terminal.
10. Start and run engine at **fast idle (3350±50 rpm)**.
11. Read meter several times during 5 minutes of running time. Voltage should remain between **12.2—14.7 volts DC**.

Results:

- If the DC voltage remains below the minimum specification, test unregulated voltage output. (See UNREGULATED VOLTAGE OUTPUT TEST.)
- If the DC voltage goes above than maximum specification, replace the regulator/rectifier.

UNREGULATED VOLTAGE OUTPUT TEST

Reason:

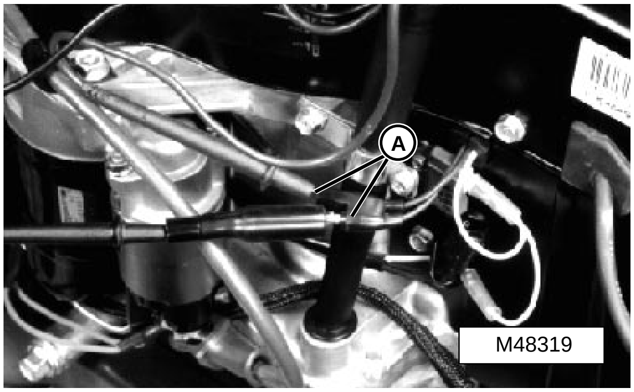
To measure stator voltage output to determine stator condition.

Test Equipment:

- Voltmeter

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.
   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Raise hood.
6. Disconnect stator 2-pin connector.
7. Set voltmeter to 50 volt AC scale.
8. Connect meter across terminals (A).



9. Start and run engine at **fast idle (3350 ± 50 rpm)**.

10. Measure stator voltage. Voltage should read a **minimum of 34 volts AC**.

Results:

- If voltage is less than specifications, test flywheel magnet and then replace stator. (See FLYWHEEL MAGNET TEST.)

STARTER SOLENOID TEST

Reason:

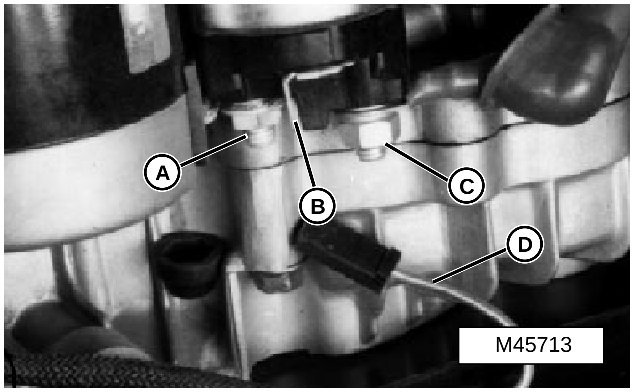
To determine if the starter solenoid or starter motor is defective.

Test Equipment:

- Jumper wire

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.
   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Raise hood.
6. Remove spark plug high tension lead and ground to engine.



7. Disconnect purple/white wire no. 721 (D) from starter solenoid.
8. Connect jumper wire to positive battery terminal and briefly jump to starter tang (B).

Results:

- Starter runs: solenoid is good, check circuit wiring. (See CRANKING CIRCUIT DIAGNOSIS.)
- Starter does not run: go to step 9.

9. Remove red and black rubber boots from terminals (A and C).
10. Connect jumper wire briefly between starter solenoid large terminals (A and C).

Results:

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

STARTER LOADED AMPERAGE DRAW TEST

Reason:

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

Test Equipment:

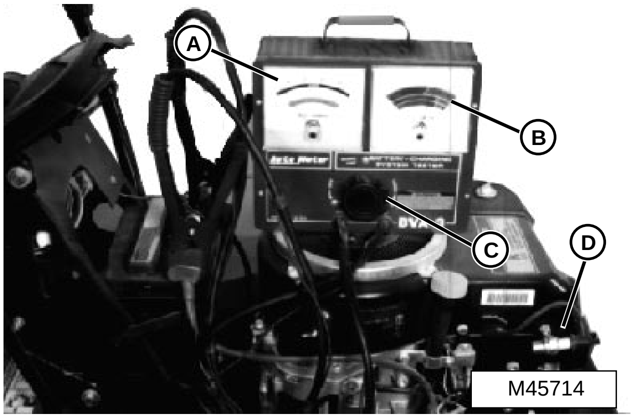
- JT05685 Battery Tester
- JT05719 Photo Tachometer or JT07270 Pulse Engine Tachometer

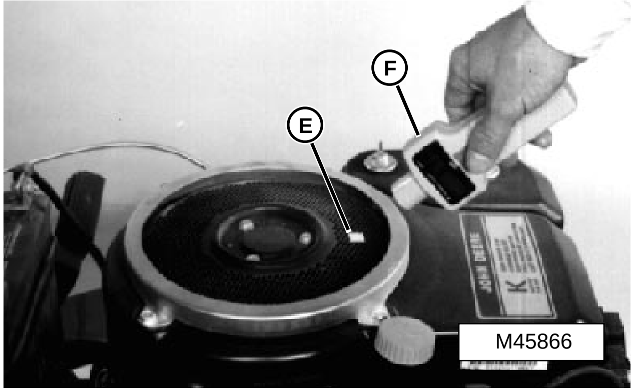
Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Test system ground connections. (See GROUND CIRCUIT TEST procedure.)
6. Test battery. (See BATTERY TEST procedure.)
7. Turn knob (C) of battery tester counterclockwise to OFF position.
8. Connect red clamp of battery tester to positive (+) terminal of battery and black clamp to negative (-) terminal of battery.
9. If using Photo Tachometer, install tachometer reflective tape (E) on flywheel screen.

10. Remove spark plug high tension lead (D) and ground to engine.





A— DC Amperage Scale

B— DC Voltage Scale

C— Battery Tester Knob

D— Spark Plug High Tension Lead

E— Reflective Tape

F— JT05719 Photo Tachometer or JT07270 Pulse Engine Tachometer

11. Crank engine and read voltage on DC voltage scale (B) of Battery Tester and check engine rpm using JT05719 Photo Tachometer (F). If using Pulse Engine Tachometer, hold tach within 2 inches of but not touching spark plug cable.

12. Turn key switch to OFF position.

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

13. Turn knob on Battery Tester clockwise until the DC voltage is the same as when cranking.

14. Read DC amperage (A) on Battery Tester. **Starter amperage draw should be a maximum of 85 amps at 500 rpm**.

Results:

- If amperage is above specification, or cranking rpm is low, test starter no-load rpm and amperage. (See procedure in ENGINE section.)

IGNITION MODULE TEST

Reason:

To determine if the ignition module is defective.

Procedure:

1. Park machine on level surface.

2. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

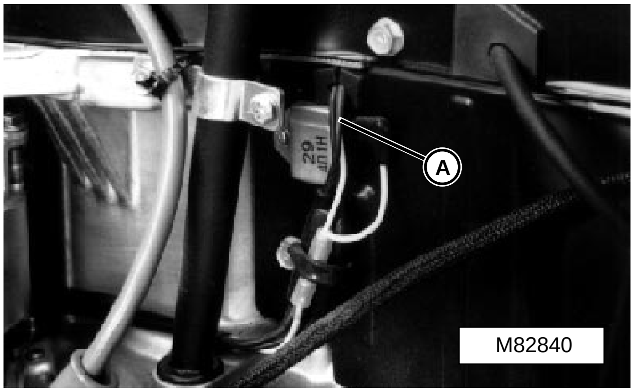
   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).

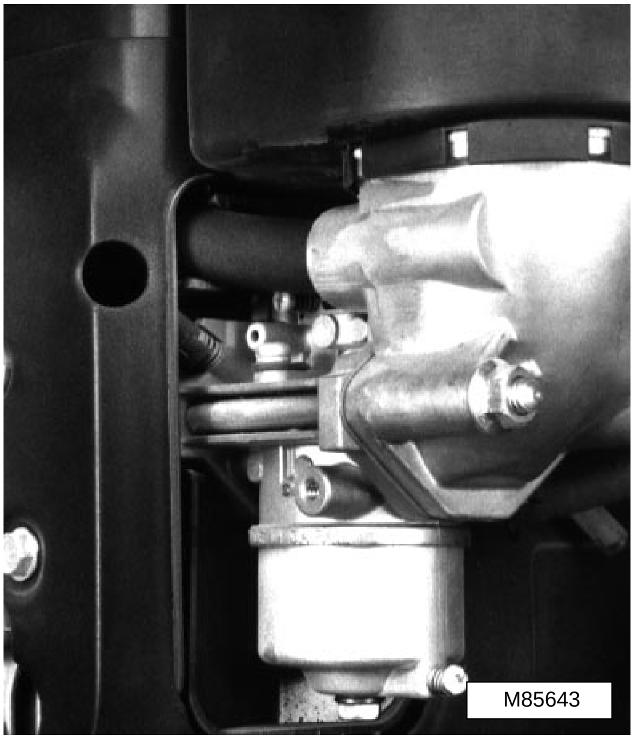
3. Engage parking brake.

4. Turn key switch OFF.

5. Raise hood.

6. The ignition module (A) is very sensitive to the type of meter used to check resistance. Due to variations in meters, the best way to determine if the ignition module is good is to replace the questionable ignition module with a known good module.





Results:

NOTE: During production, an integrated coil/ignition module replaced the separate coil and ignition modules. Check to see if old style ignition module is present adjacent to the oil dipstick. If no ignition module is present, then the machine is equipped with the integrated module, which is located under the blower housing.

- If the new ignition module does not solve the problem, check other ignition components.

> **⚠ CAUTION**
>
> **The older style ignition and coil modules CANNOT be replaced by the newer integrated coil/ignition because of polarity variations. Replace with the same style part(s) as are removed.**

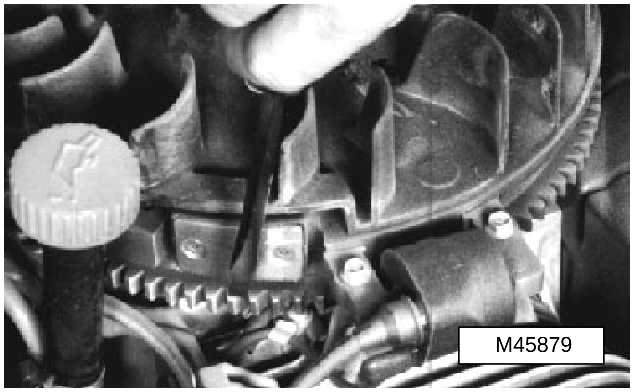
FLYWHEEL MAGNET TEST

Reason:

To make sure the flywheel magnet has enough force to induce current in the ignition coil.

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.
   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Remove blower housing. (See procedure in ENGINE section.)



6. Hold a steel tool about 25 mm (1.0 in.) from flywheel magnet. The tool should be attracted by the magnet.

Results:

- Replace the flywheel if the magnet is weak.

NEUTRAL START SWITCH TEST

Reason:

To make sure that the transmission neutral start switch has continuity when the transmission is in neutral.

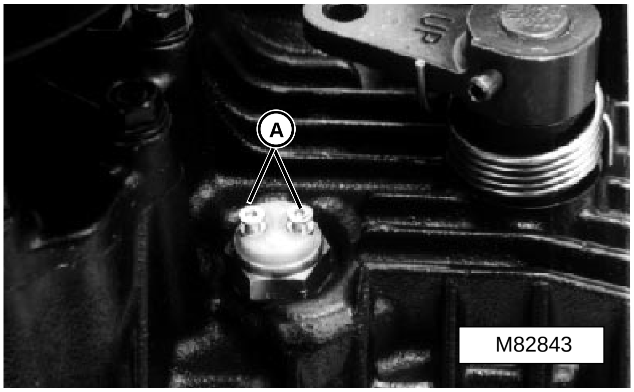
Test Equipment:

- Ohmmeter or continuity tester

GT275 - Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Move Forward/Reverse pedals to NEUTRAL position.
4. Engage parking brake.
5. Remove mower deck. (See procedure in ATTACHMENTS section.)

6. Disconnect transmission neutral switch connector.
7. Check continuity across terminals (A). There should be continuity.



8. Depress and hold forward or reverse pedal to engage transmission.
9. Check continuity across terminals. There should be no continuity.

GT275 - Results:

- If continuity is not correct, replace switch and repeat test.
- If after replacing switch, there is still no continuity when the transmission is in the NEUTRAL position, inspect transmission linkage.

GT242 and GT262 - Procedure:

1. Park machine on level surface
2. Turn key switch to OFF.
3. Pressing the clutch pedal, set gear shift lever to "N" (NEUTRAL).
4. Engage the parking brake.
5. Remove mower deck. (See procedure in ATTACHMENTS section.)
6. Disconnect transmission neutral switch connector.
7. Check continuity across terminals (A). There should be continuity.
8. Pressing the clutch pedal, set gear shift lever to "1" to engage the transmission.
9. Check continuity across the terminals. There should be no continuity.

GT242 and GT262 - Results:

If continuity is not correct, replace switch and repeat test.

If after replacing switch, there is still no continuity when the transmission is in the NEUTRAL position, inspect transmission linkage.

PTO SWITCH TEST

Reason:

To verify terminal continuity is correct when in the ON and OFF positions.

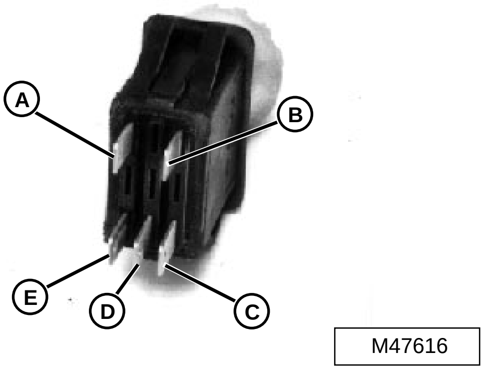
Test Equipment:

- Ohmmeter or continuity tester

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

   GT242 and GT262 - Pressing the clutch pedal, set gear lever to "N" (NEUTRAL).
4. Engage parking brake.
5. Disconnect PTO switch connector.
6. Move PTO switch to OFF position.
7. Connect leads of ohmmeter or continuity tester to terminals (A and B). There should be continuity.
8. Connect leads of ohmmeter or continuity tester to terminals (C and E). There should be continuity.
9. Move PTO switch to ON position.
10. Connect leads of ohmmeter or continuity tester to terminals (D and E). There should be continuity.



Results:

- If continuity is not correct, replace PTO switch.

PTO CLUTCH TEST

Reason:

To check condition of PTO clutch coil and to check operation under load.

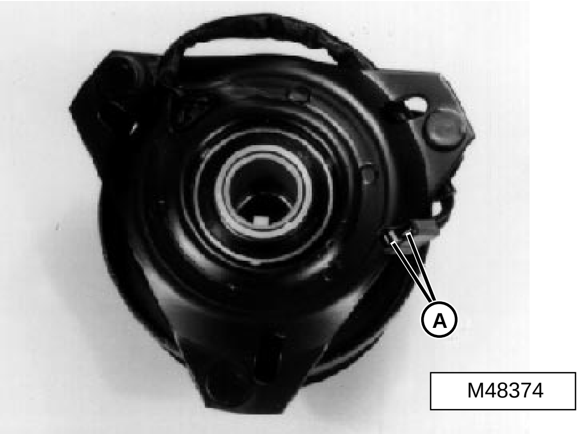
Test Equipment:

- Ohmmeter
- JT05712 Current Gun OR JT02153 Currrent Clamp and JT05791 Multimeter

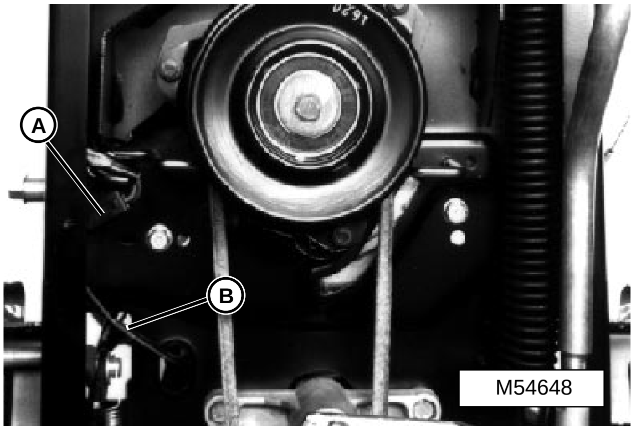
Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Remove mower deck. (See procedure in ATTACHMENTS section.)
6. Disconnect PTO clutch connector.
7. Set ohmmeter for 1x scale.
8. Measure resistance across terminals (A). Resistance should measure **2.4—2.6 ohms**.



9. Connect PTO clutch connector (A).
10. Put JT05712 Current Gun or JT02143 Current Clamp over blue PTO clutch wire (B).



11. Start and run engine at **slow idle (1450 ± 75 rpm.)**
12. Turn the PTO switch to the ON position.
13. Measure PTO clutch current draw. The current draw should be approximately **4.84 amps**.

Results:

- If resistance does not meet specifications, replace the PTO clutch.
- Normal current draw is approximately 4 amps. Low current draw will cause a weak PTO clutch. If the current draw is less than 4 amps, replace clutch.

SEAT SWITCH TEST

Reason:

To verify continuity between seat switch terminals when operator is on the seat (plunger depressed).

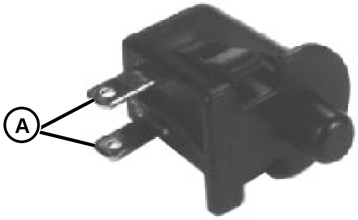
Test Equipment:

- Ohmmeter or continuity tester

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
4. Engage parking brake.
5. Disconnect seat switch connector.



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6. Connect leads of ohmmeter or continuity tester to terminals (A) of switch.

7. Set ohmmeter for 1x scale.

8. Check continuity across switch terminals. There should be no continuity.

9. Depress plunger and check continuity across switch terminals. There should be continuity.

Results:

- If the seat switch does have continuity with the operator on seat, check seat switch bracket and spring for damage.

- If the seat switch does not have continuity with plunger depressed, or continuity is not correct, replace the switch.

HEADLIGHT SWITCH TEST

Reason:

To verify headlight switch terminals have continuity when the headlight switch is ON.

Test Equipment:

- Ohmmeter or continuity tester

Procedure:

1. Park machine on level surface.

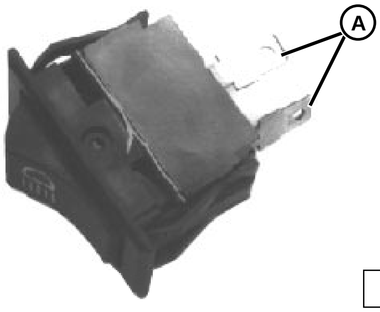
2. Turn key switch OFF.

3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).

4. Engage parking brake.

5. Disconnect headlight switch connector.



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6. Connect leads of ohmmeter or continuity tester to terminals (A) of switch.

7. Set ohmmeter for 1x scale.

8. Move headlight switch to the ON position and then the OFF position. Check continuity between terminals.

Results:

- If NO continuity with switch in ON position, replace switch.

- If continuity exists with switch in OFF position, replace switch.

OIL PRESSURE SWITCH TEST - GT262 and GT275

Reason:

To determine the proper operation of the oil pressure switch.

Test Equipment:

- Ohmmeter

Procedure:

1. Park machine on level surface.

2. Turn key switch OFF.

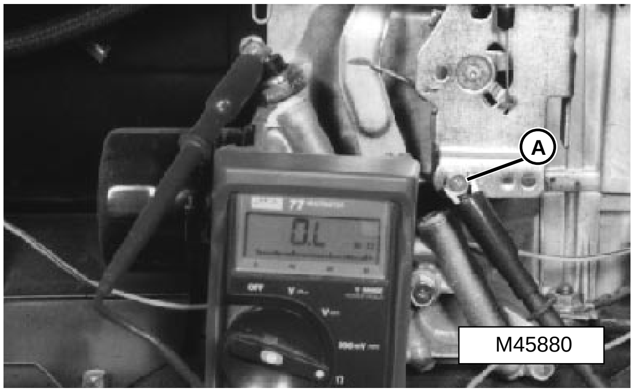
3. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

4. Engage parking brake.

5. Raise hood.

IMPORTANT: Do not allow connector of wire to contact the engine or frame as there will be voltage at it during the test.

6. Disconnect tan wire no. 620 from oil pressure switch.



7. Connect black lead of ohmmeter to engine block (A) and red lead of ohmmeter to terminal of switch.

8. Set ohmmeter for 1x scale.

9. Measure resistance between terminal and engine block. There should be continuity between terminal and ground.

10. Start and run engine.

11. Measure resistance between terminal and engine block. There should be no continuity between terminal and ground.

Results:

- If switch does NOT have continuity to ground when the engine is not running, replace the switch.

- If the switch does have continuity to ground with the engine running, check engine oil pressure. (See procedure in ENGINE section.) If the oil pressure is to specifications, replace the switch.

NOTE: Be sure to apply Pipe Sealant with TEFLON® to threads of switch anytime it is installed.

FUEL SHUTOFF SOLENOID TEST

Reason:

To determine if the fuel shutoff plunger retracts when the solenoid is energized.

Test Equipment:

- 2 Jumper wires

Procedure:

CAUTION

Keep gasoline away from sparks, flame, or hot engine parts or personal injury can result.

1. Remove drain screw and spring to drain gasoline from carburetor float bowl.
2. Disconnect fuel shutoff solenoid connector.
3. Remove fuel shutoff solenoid, washer and float bowl.

4. Connect a jumper wire from the battery positive (+) terminal to solenoid terminal (C).

NOTE: It may be necessary to push plunger (A) inward slightly for plunger to retract.

5. Connect a jumper wire from the battery negative (-) terminal to solenoid threads (B). Plunger must retract when solenoid is energized.
6. Remove jumper wire from the battery negative (-) terminal. Plunger must extend.

Results:

- If plunger does not move, replace solenoid.

PTO CLUTCH ADJUSTMENT

Reason:

To set PTO clutch air gap at a specific dimension for proper operation.

Equipment:

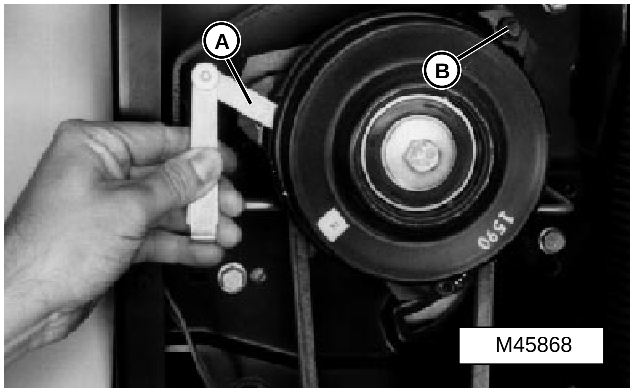
- Feeler Gauge (Blade type)

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Move PTO switch to OFF position.
4. GT275 - Move Forward/Reverse pedals to NEUTRAL position.
GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
5. Engage parking brake.
6. Remove mower deck. (See procedure in ATTACHMENTS section.)
7. Insert **0.31 mm (0.012 in.)** feeler gauge through slot (A) in brake plate to check PTO clutch air gap. Gauge should be between clutch armature and rotor. Check air gap at all three slots.

IMPORTANT: DO NOT overtighten lock nuts (B).

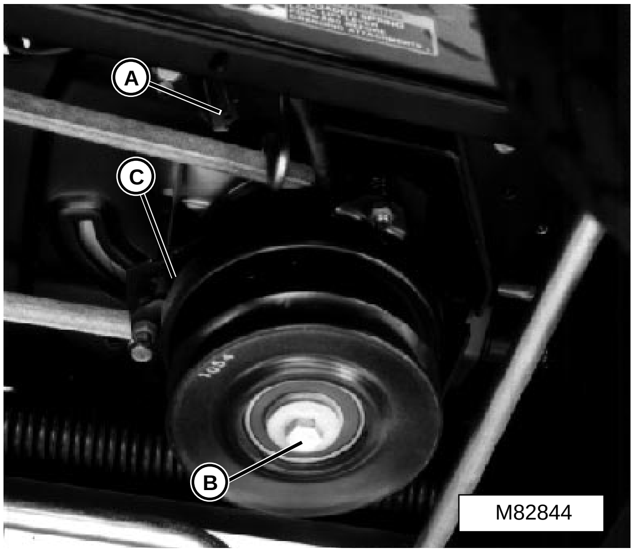
8. If the air gap is **more than 0.46 mm (0.018 in.)**, adjust lock nut (B) until a **0.31 mm (0.012 in.)** feeler gauge begins to bind between the armature and rotor. Use a sweeping motion with feeler gauge while making this adjustment.
9. Repeat procedure on remaining nuts as necessary.
10. Engage and disengage the PTO clutch several times. Recheck adjustment.



ELECTRIC PTO CLUTCH

Removal/Installation

1. Remove mower deck. (See procedure in MISCELLANEOUS section.)
2. Disconnect wiring connector (A).
3. Remove cap screw (B), washer and PTO clutch.



Installation is done in the reverse order of removal.

- Apply MPG-2® Multipurpose Polymer Grease to engine crankshaft.
- Install clutch on crankshaft with pin (C) through slot in coil housing.
- Install washer with concave side toward PTO clutch.
- Tighten cap screw to **56 N•m (45 lb-ft) - GT275, 75 N•m (55 lb-ft) - GT242 and GT262**.
- Adjust PTO clutch. (See Tests and Adjustments.)
- Break-in new PTO clutch, if installed. (See Break-In procedure.)

Break-In Procedure

1. Park machine on level surface.
2. GT275 - Move Forward/Reverse pedals to NEUTRAL position.

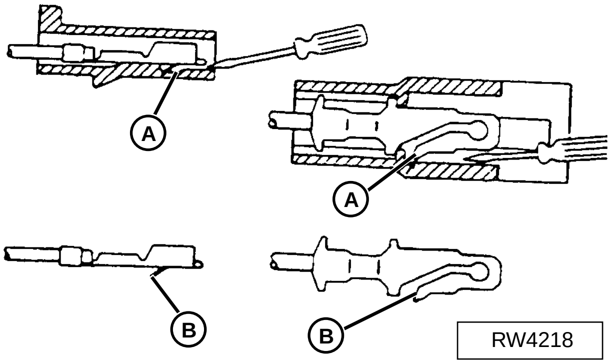
   GT242 and GT262 - Pressing the clutch pedal, set gear lever to “N” (NEUTRAL).
3. Engage parking brake.
4. Start engine.
5. Set throttle control to half-speed.
6. Turn PTO switch ON and OFF 8—10 times in 4—5 second intervals at no-load.

CONNECTOR BODY— BLADE TERMINALS

Replacement

Use a small screwdriver to depress locking tang (A) terminal. Slide connector body off.

Be sure to bend locking tang back to its original position (B) before installing connector body.



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CONTENTS

ADJUSTMENT SPECIFICATIONS

Item	Specifications
Clutch Actuating Spring Set Length	
(At the belt tension idler with the pedal released)	31—35 mm (1.2—1.3 in.)
Belt Tension	
(Measured at clutch spring)	31—35 mm (1.2—1.3 in.)

REPAIR SPECIFICATIONS

Item	New Part Specifications	Wear Tolerance
Transaxle		
Fork Shaft O.D.	16.96—17.00 mm (0.668—0.669 in.)	—
Fork Shaft Bore I.D.	17.02—17.04 mm (0.670—0.671 in.)	—
Maximum Clearance Between Fork Shaft O.D. and Fork Shaft Bore I.D.	—	0.50 mm (0.020 in.)
Brake Assembly		
Shift Fork		
Shift Fork Groove Width	6.10—6.20 mm (0.240—0.244 in.)	—
Shift Fork Thickness	5.70—5.90 mm (0.224—0.232 in.)	—
Maximum Clearance Between Shift Fork Groove Width and Shift Fork Thickness	—	1.00 mm (0.039 in.)
Shift Arm		
Shift Arm Pin O.D.	7.96—8.00 mm (0.313—0.315 in.)	—
Shift Pin Groove Width	8.05—8.15 mm (0.317—0.321 in.)	—
Maximum Clearance Between Shift Arm Pin O.D. and Shift Pin Groove Width	—	1.00 mm (0.039 in.)
Differential		
Differential Gear Washer Thickness	0.73—0.87 mm (0.029—0.034 in.)	—
Minimum Thickness - Differential Gear Washer	—	0.50 mm (0.020 in.)
Pinion Gear Washer Thickness	0.75—0.85 mm (0.030—0.034 in.)	—
Minimum Thickness Between Differential Gear Washer and Pinion Gear Washer	—	0.50 mm (0.020 in.)

Item	New Part Specifications	Wear Tolerance
Brake Assembly (continued)		
Pinion		
Pinion Gear I.D.	14.02—14.03 mm (0.552—0.553 in.)	—
Pinion Shaft O.D.	13.97—13.98 mm (0.550—0.551 in.)	—
Maximum Clearance Between Pinion Gear I.D. and Pinion Shaft O.D.	—	0.40 mm (0.016 in.)
Axle Shaft Washers		
Axle Shaft Washers Thickness	1.90—2.10 mm (0.075—0.079 in.)	—
Minimum Thickness	—	1.50 mm (0.059 in.)
Differential Assembly		
Housing Bolts	51 N·m (38 lb—ft)	—
Shifter Key Assembly		
Force necessary to push in the 3rd key when assembling the shifter.	2.70 kg (6 lbs)	—
Replaced Transaxle Cases		
Force necessary to torque the six (6) bolts in the area of the reduction shaft and a seventh (7th) at the opposite end of the housing.		
- New Case	29 N·m (22 lb—ft)	—
- Used Case	24 N·m (216 lb—in.)	—
Reduction Shaft End Play		
	>0.10 mm (>0.004 in. but not ≤0.0 end play)	—
Input Shaft Backlash		
	0.20—0.35 mm (0.008—0.014 in.)	—
Bearing depth below snap ring groove (Right-hand and Left-hand)	4—5 mm (0.16—0.20 in.)	—

Item	New Part Specifications	Wear Tolerance
Brake Assembly (continued)		
Transaxle Cap Screws		
- New Case	29 N·m	—
	(22 lb—ft)	
- Used Case	24 N·m	—
	(216 lb—in.)	
Oil Drain Plugs		
Torque Specifications	39 N·m	—
	(29 lb—ft.)	
Retainer Cap Screws		
- New Case	29 N·m	
	(22 lb—ft)	—
- Used Case	24 N·m	
	(216 lb—in.)	—

SPECIAL OR ESSENTIAL TOOLS

NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

JDST28 Belt Tension Gauge

Used to measure the force necessary to insert the 3rd key when assembling the Transaxle transmission.

OTHER MATERIALS

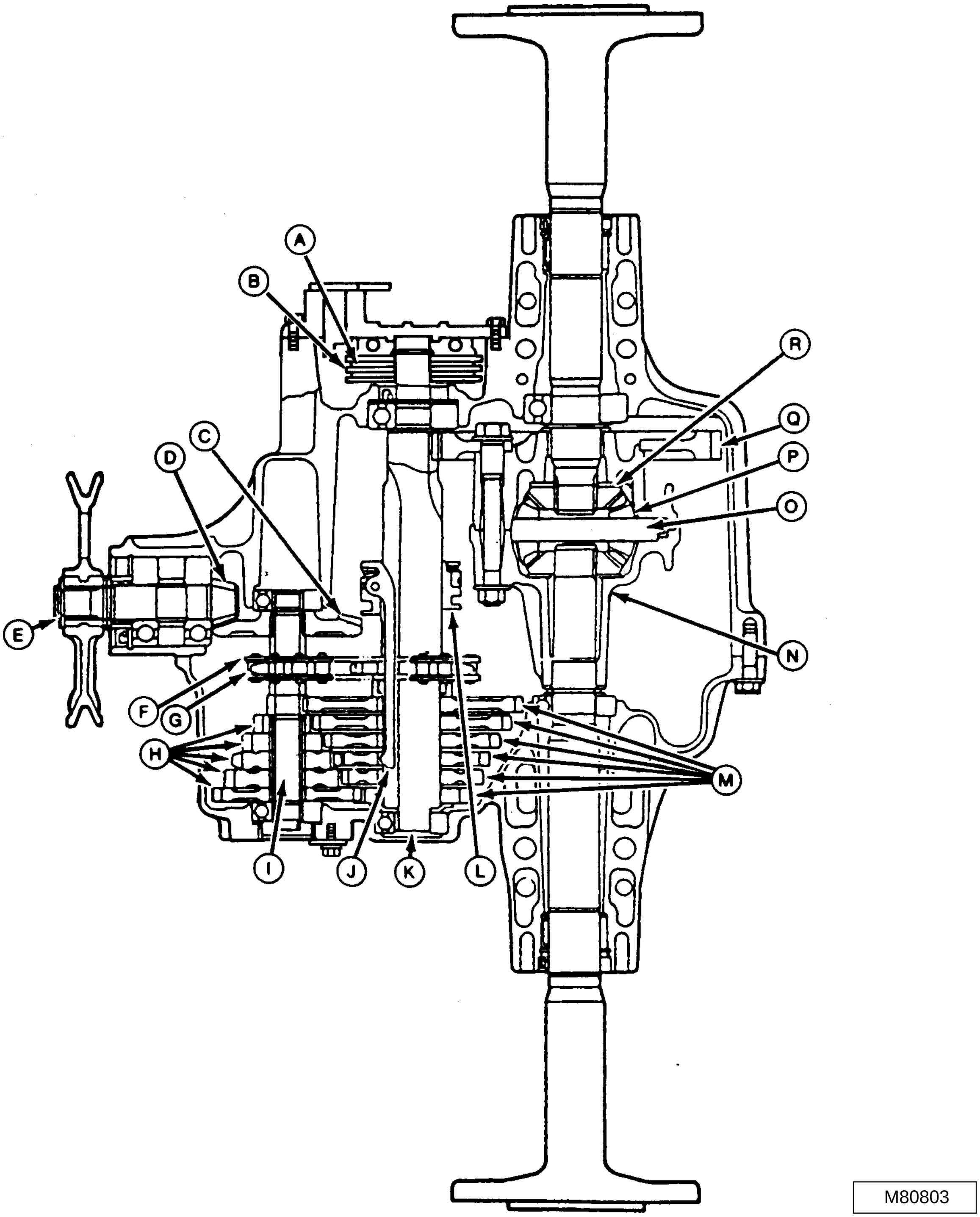
Number	Name	Use
T43512	John Deere Thread Lock and Sealer (medium strength)	Retains fittings and cap screws.
TY6305	John Deere Clean and Cure Primer	Cleans parts and speeds cure of sealant.
TY15130	John Deere Form-In-Place Gasket Sealant	Seals transaxle case.
179292	MPG-2, Polymer Multipurpose Grease	Prevents parts from seizing. Apply to axles and shafts.

SERVICE PARTS KITS

The following kits are available through the parts catalog.

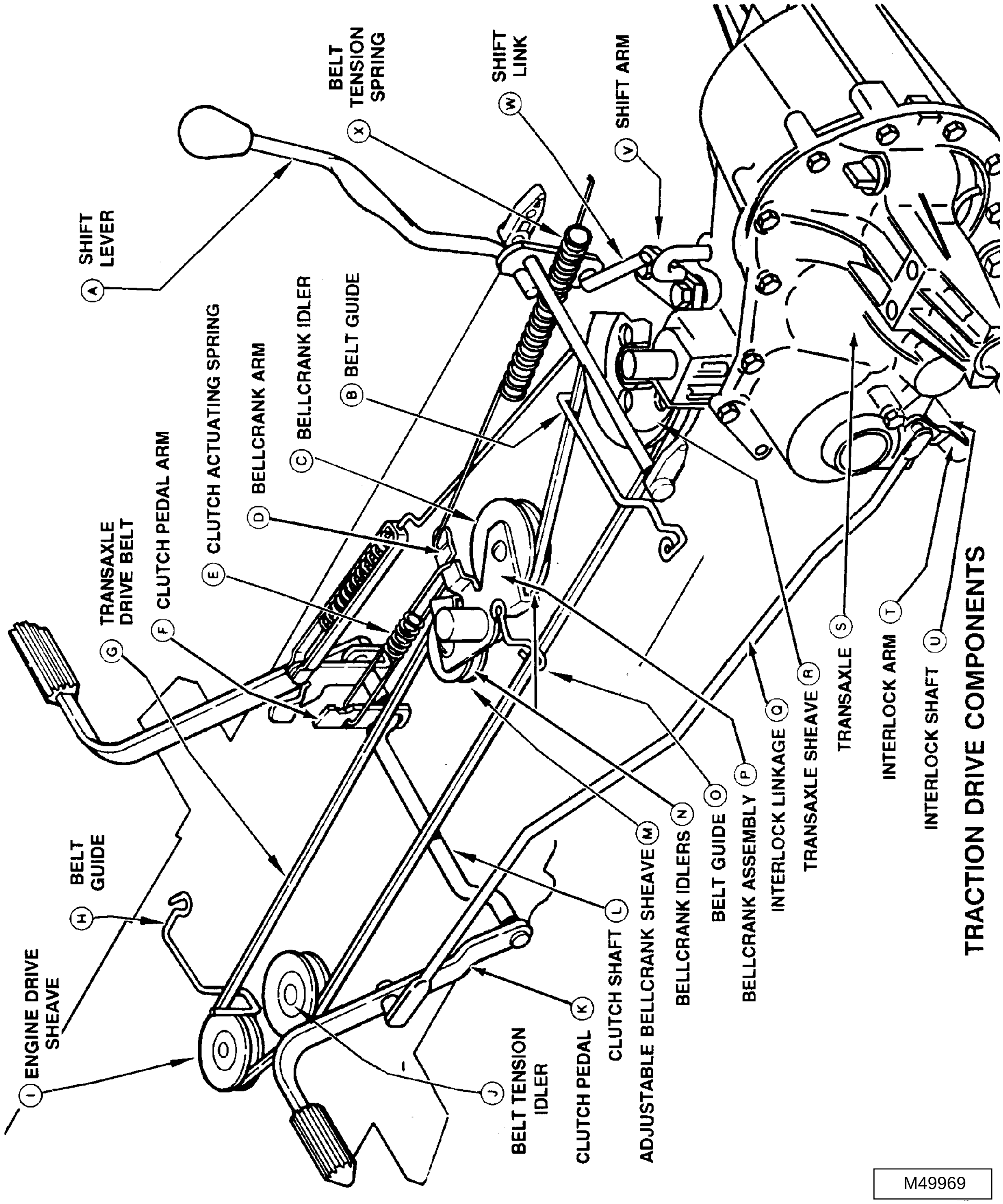
- Bearing Block Kit
- Differential Gear Kit

TRANSAXLE CROSS SECTION



A— Brake Disc (2 used)	J— Shift Key
B— Brake Plate (3 used)	K— Shift Shaft
C— Ring Gear	L— Shift Collar
D— Spiral Input Gear	M— Shift Gears
E— Input Shaft	N— Differential Housing
F— Roller Chain	O— Pinion Shaft
G— Sprocket	P— Pinion Gear
H— Reduction Gears	Q— Final Gear
I— Reduction Shaft	R— Differential Gear

TRACTION DRIVE COMPONENTS



A— Shift Lever
B— Belt Guide
C— Bellcrank Idler
D— Bellcrank Arm
E— Clutch Actuating Spring
F— Clutch Pedal Arm
G— Transaxle Drive Belt
H— Belt Guide
I— Engine Drive Sheave
J— Belt Tension Idler
K— Clutch Pedal
L— Clutch Shaft
M— Adjustable Bellcrank Sheave
N— Bellcrank Idlers
O— Belt Guide
P— Bellcrank Assembly
Q— Interlock Linkage
R— Transaxle Sheave
S— Transaxle
T— Interlock Arm
U— Interlock Shaft
V— Shift Arm
W— Shift Link
X— Belt Tension Spring

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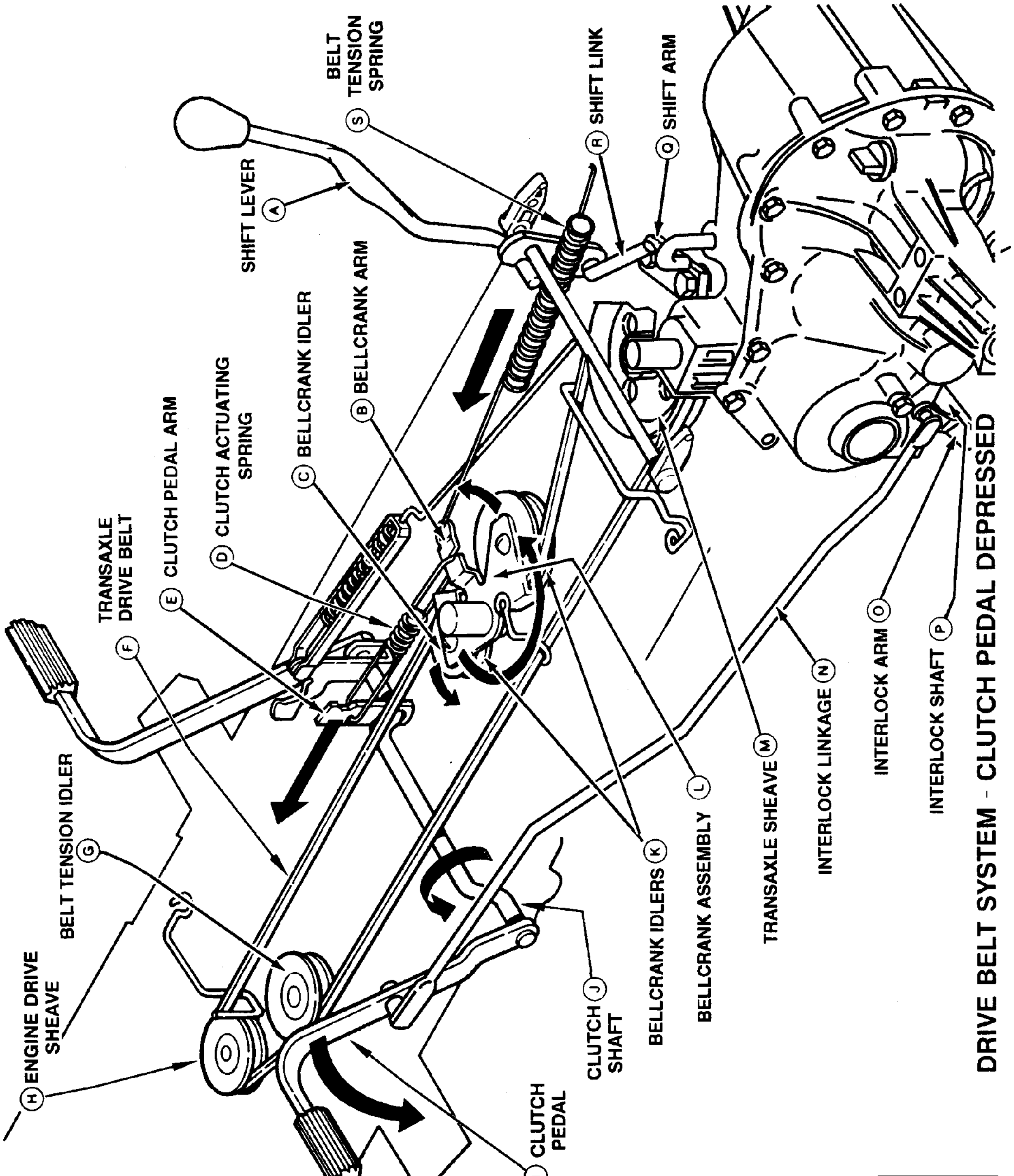
BELT DRIVE SYSTEM - CLUTCH PEDAL DEPRESSED

The gear power train uses a belt drive system to transfer power from the engine drive sheave (H) to the transaxle sheave (M). Transaxle belt drive (F) tension is adjusted by moving the belt tension idler (G) until the clutch actuating spring (D) is **31—35 mm (1.2—1.3 in.)** long with the clutch pedal (I) released. The bellcrank idler (C) can also be adjusted to make up for belt stretch. The transaxle controls the speed and direction of tractor motion. In order to shift gears, the clutch pedal (I) must be depressed (transmission drive belt slipping) and the interlock shaft (P) rotated (shifter fork unlocked).

When the clutch pedal (I) is depressed, the clutch pedal arm (E) moves forward and compresses the clutch actuating spring (D). As the spring is compressed, it pulls the bellcrank arm (B) forward and the belt tension spring (S) extends. The bellcrank idlers (K) pivot counterclockwise causing belt tension to decrease and belt slippage to occur (transaxle sheave stopping).

As the clutch pedal (I) is depressed, it pulls the interlock linkage (N) forward, which turns the interlock arm counterclockwise. With the interlock arm in this position, the shifter fork is unlocked and a shift can be made. While shifting, the shift lever (A) moves the shift link (R) which turns the shift arm (Q). The shift arm is connected to shift fork inside the transaxle. The shift fork moves the shift collar to select a specific gear.



DRIVE BELT SYSTEM - CLUTCH PEDAL DEPRESSED

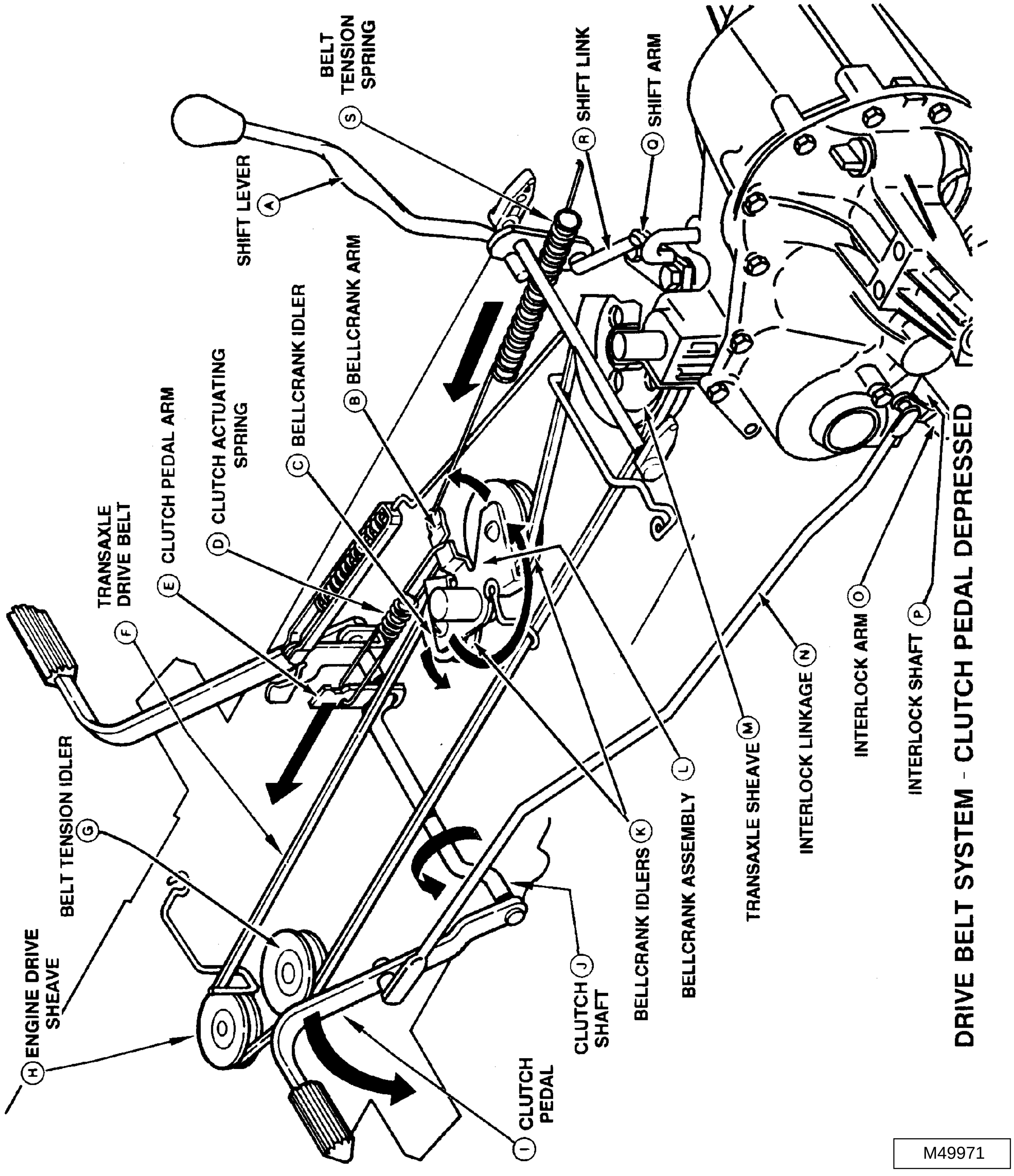
M49970

A— Shift Lever
B— Bellcrank Arm
C— Bellcrank Idler
D— Clutch Actuating Spring
E— Clutch Pedal Arm
F— Transaxle Drive Belt
G— Belt Tension Idler
H— Engine Drive Sheave
I— Clutch Pedal
J— Clutch Shaft
K— Bellcrank Idlers
L— Bellcrank Assembly
M— Transaxle Sheave
N— Interlock Linkage
O— Interlock Arm
P— Interlock Shaft
Q— Shift Arm
R— Shift Link
S— Belt Tension Spring

BELT DRIVE SYSTEM - CLUTCH PEDAL RELEASED

When the clutch pedal (F) is released, the clutch pedal arm (D) moves rearward and allows the clutch actuating spring (C) to expand. As the spring expands, the bellcrank arm (B) is pulled rearward by the belt tension spring (M). The bellcrank idlers (I) pivot clockwise causing the belt tension to increase and belt to sheave engagement (transaxle sheave turning). Full belt tension is now applied to the transaxle drive belt (h) to minimize belt slippage during operation. Proper belt tension and belt guide adjustment also help to minimize belt slippage.

As the clutch pedal arm moves rearward, the interlock linkage (K) is pushed rearward. This turns the interlock arm (L) clockwise, locking the shifter fork on the interlock shaft inside the transaxle. With the shifter fork locked, an accidental shift is prevented.



DRIVE BELT SYSTEM - CLUTCH PEDAL DEPRESSED

M49971

A— Transaxle Sheave
B— Bellcrank Arm
C— Clutch Actuating Spring
D— Clutch Pedal Arm
E— Engine Drive Sheave
F— Clutch Pedal
G— Clutch Shaft
H— Transaxle Drive Belt
I— Bellcrank Idlers
J— Bellcrank Assembly
K— Interlock Linkage
L— Interlock Arm
M— Belt Tension Spring

TRANSAXLE OPERATION - NEUTRAL

FUNCTION:

Neutral operations allows the power flow from the engine to the transaxle to be interrupted with the clutch pedal depressed. It is placed between reverse and forward gears allowing power interruption between direction changes. It also provides a means of operating the engine for testing purposes and moving the tractor around without starting the engine.

MAJOR COMPONENTS:

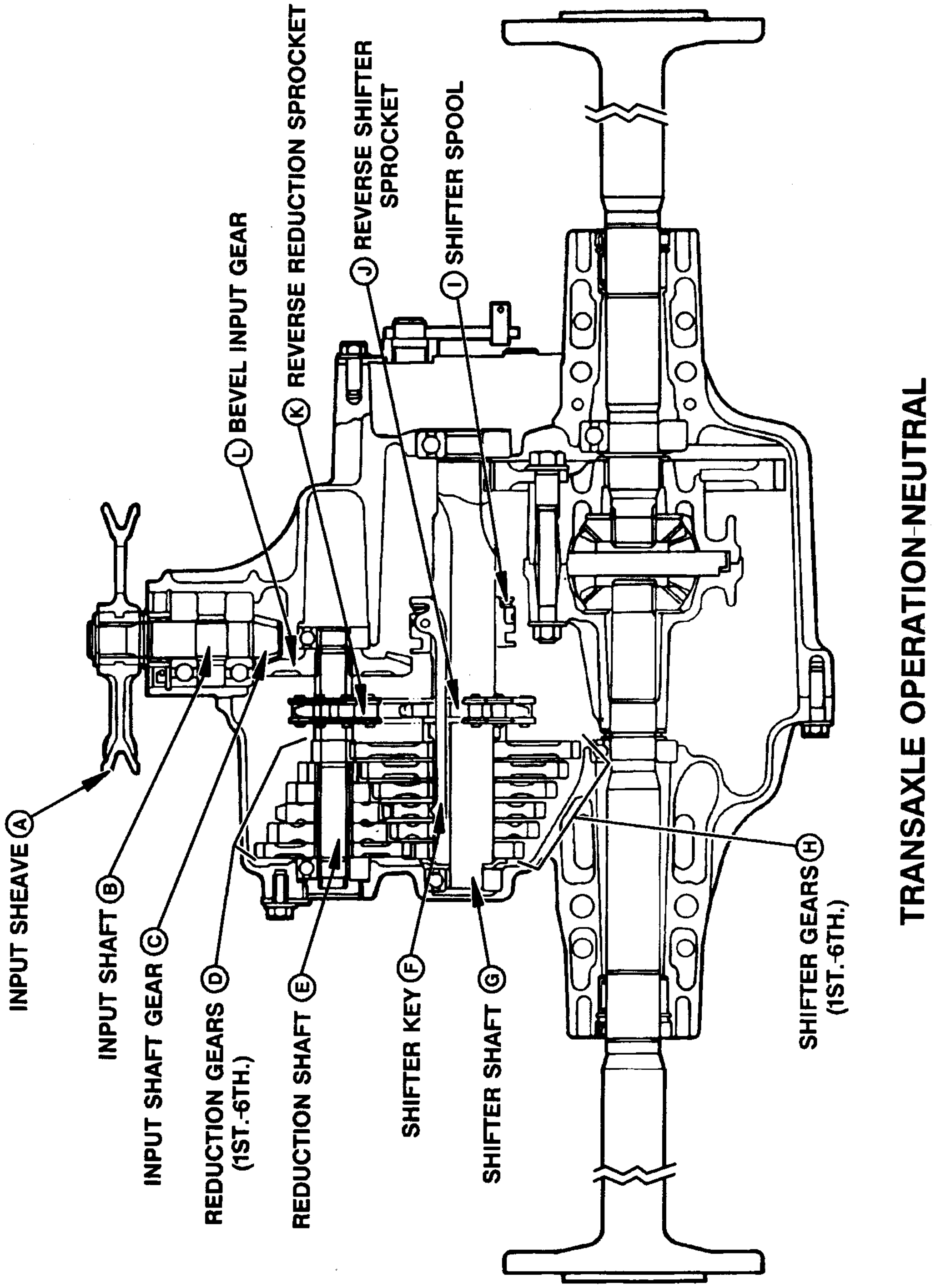
- Input shaft and gear
- Reduction shaft and gears
- Shifter shaft
- Shift fork and spool
- Shift keys

THEORY OF OPERATION:

The transaxle input sheave (A) is keyed to the input shaft (B). Splined to the shaft is the input shaft gear (C) that drives the bevel input gear (L) which is splined to the reduction shaft (E). Also splined to the shaft is 1st - 6th reduction gears and sprocket (K). Therefore, whenever the input shaft is turning, so are the reduction gears and the reverse shifter shaft sprocket is direct driven by chain. These gears and sprocket float freely on the shifter shaft (G).

The shifter shaft has 3 machined keyways that hold the shifter keys (F). These keys are actuated by the shifter spool (I) which engages the keys into pockets of a selected gear. When engaged in the pocket of a gear, power is transferred from the shifter gears to the shifter shaft.

In neutral, the shift fork places the keys outside the gears. Therefore, no power is transmitted to the shifter shaft and neutral is attained.



TRANSAXLE OPERATION-NEUTRAL

M49966

A— Input Sheave

B— Input Shaft

C— Input Shaft Gear

D— Reduction Gears (1st-6th)

E— Reduction Shaft

F— Shifter Key

G— Shifter Shaft

H— Shifter Gears (1st-6th)

I— Shift Spool

J— Reverse Shifter Sprocket

K— Reverse Reduction Sprocket

L— Bevel Input Gear

TRANSAXLE OPERATION - FORWARD (1ST-6TH GEARS)

FUNCTION:

The function of this mode is to transfer power from the belt drive system to the rear wheels in different speed ranges in a forward direction.

MAJOR COMPONENTS:

- Input shaft and gear
- Reduction shaft and gears
- Shifter shaft and gears
- Shifter shaft and keys
- Differential assembly
- Wheel axles

THEORY OF OPERATION:

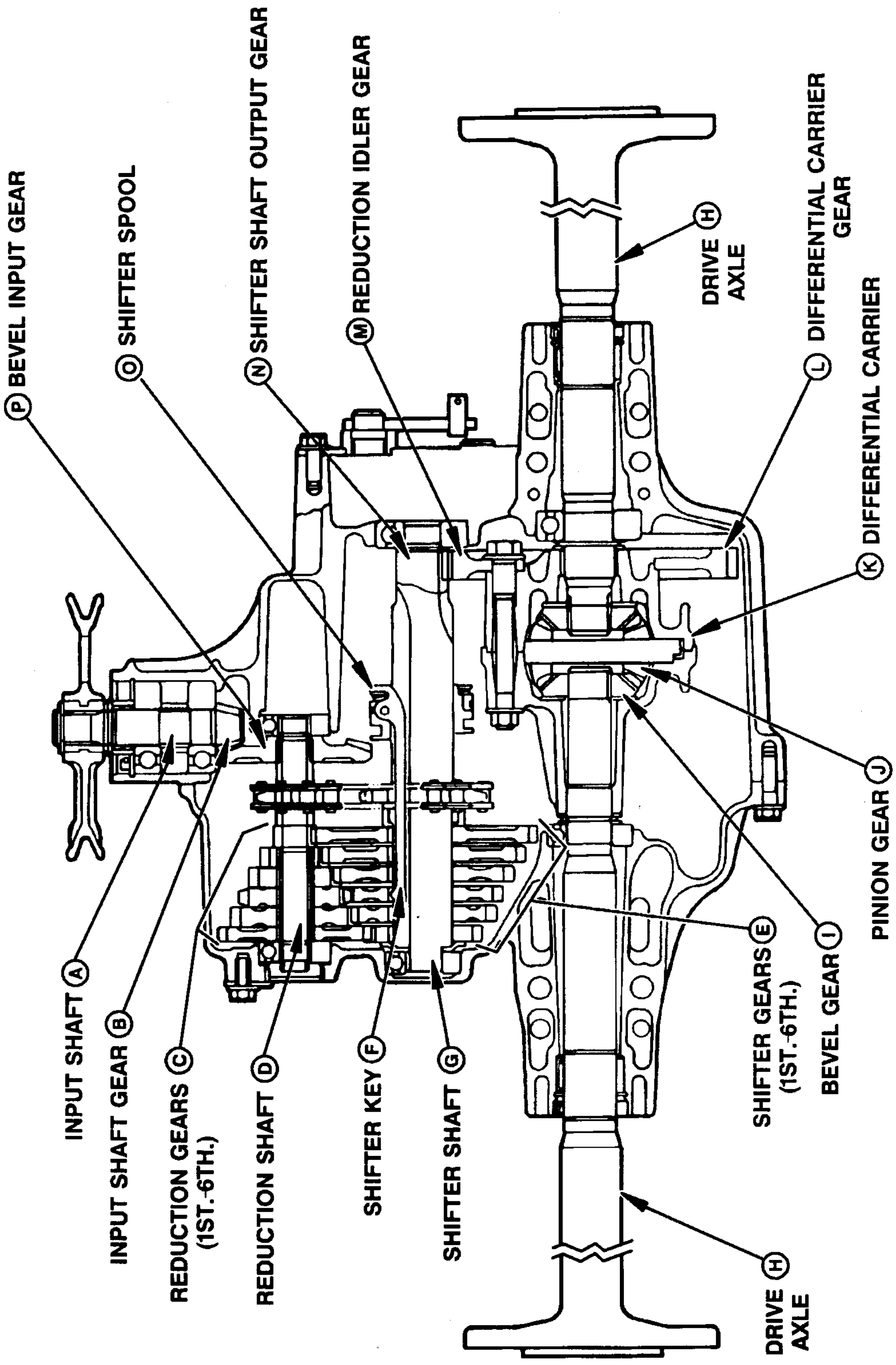
The transaxle input sheave is keyed to the input shaft (A). Splined to the other end of the input shaft is the input shaft gear (B) which drives the bevel input gear (P). The bevel input gear is splined to the reduction shaft (D) along with the reduction gears (C) for first through sixth gears and the reverse sprocket.

Whenever the input shaft turns, all the reduction gears turn also.

The shifter gears (E) are in constant mesh with the reduction gears and float freely on the shifter shaft (G). The shifter shaft has 3 machined keyways in which shift keys (F) slide into and engage in pockets in one of the shifter gears at a time. These keys are actuated by the shifter spool (O).

By moving the shifter spool, the keys engage in pockets of a selected gear. Power from the shifter gear is transferred to the shifter shaft through the keys. The shifter shaft output gear (N) transfers power to the reduction idler gear (M) which transfers the power to the differential carrier gear (L).

The differential carrier (K) transfers power to the drive axles (H) through the differential pinion gears (J) that mate with the axle bevel gears (I).



TRANSAXLE OPERATION-FORWARD, 1ST-6TH GEARS

M49967

A— Input Shaft
B— Input Shaft Gear
C— Reduction Gears (1st-6th)
D— Reduction Shaft
E— Shifter Gears (1st-6th)
F— Shifter Key
G— Shifter Shaft
H— Drive Axle
I— Bevel Gear
J— Pinion Gear
K— Differential Carrier
L— Differential Carrier Gear
M— Reduction Idler Gear
N— Shifter Shaft Output Gear
O— Shifter Spool
P— Bevel Input Gear

TRANSAXLE OPERATION - REVERSE

FUNCTION:

The function of the transaxle in reverse is to transfer power from the engine to the rear wheels and propel the unit in a rearward direction.

MAJOR COMPONENTS:

- Input shaft, pinion and bevel gear
- Reduction shaft and reverse reduction sprocket
- Shifter shaft and reverse shifter sprocket
- Shifter keys and spool
- Differential assembly

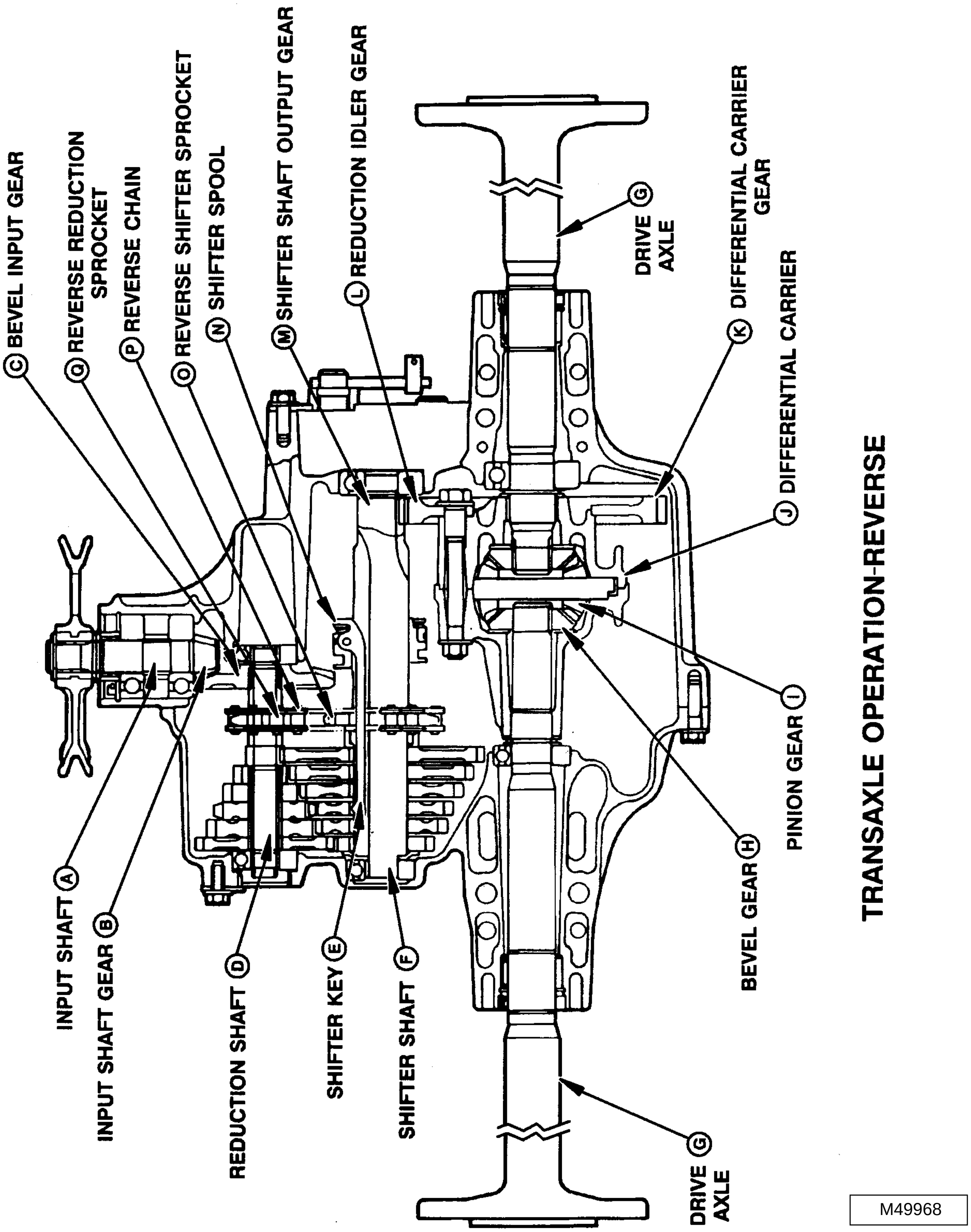
THEORY OF OPERATION:

The transaxle input sheave is keyed to the input shaft (A). Splined to the other end of the shaft is the input shaft gear (B) that drives the bevel input gear (C) which is splined to the reduction shaft (D). The reverse reduction sprocket (Q) is also splined to the reduction shaft. Therefore, whenever the input shaft is turning, so is the reduction shaft reverse sprocket.

A chain (P) connects the reverse sprocket on the reduction shaft to the reverse shifter sprocket (O). This sprocket floats freely on the shifter shaft (F).

Three keys (E) ride in keyways in the shifter shaft. When the transmission is placed in reverse, the shifter spool (N) moves the keys into pockets in the shifter shaft reverse sprocket. This allows power to be transferred from the reduction shaft sprocket through the chain to the shifter shaft sprocket. The sprocket transfers power through the keys to the shifter shaft, which now turns in the opposite direction as it did during any forward gear operations.

The shifter shaft output gear (M) transfers power to the reduction idler gear (L) which transfers power to the differential carrier gear (K) on the differential carrier (J). The differential carrier transfers power to the drive axles (G) through the differential pinion gears (I) that mate with the axle bevel gears (H).



A— Input Shaft

B— Input Shaft Gear

C— Bevel Input Gear

D— Reduction Shaft

E— Shifter Keys

F— Shifter Shaft

G— Drive Axle

H— Bevel Gear

I— Pinion Gear

J— Differential Carrier

K— Differential Carrier Gear

L— Reduction Idler Gear

M— Shifter Shaft Output Gear

N— Shifter Spool

O— Reverse Shifter Sprocket

P— Reverse Chain

Q— Reverse Reduction Sprocket

GEAR TRANSMISSION TROUBLESHOOTING CHART - GT242 & GT262

PROBLEM OR SYMPTOM / CHECK OR SOLUTION	Machine will not move forward or reverse.	Transmission noisy.	Machine moves while in neutral.	Machine moves only in forward direction.	Machine moves only in reverse direction.	Erratic direction.	Machine does not achieve rated ground speed.	Machine does not move in forward or is slow.	Machine is slow in reverse.	Machine is too aggressive.	Parking brake does not hold machine on hill.	Hard to shift.
Oil level low.	●	●				●	●	●	●			●
Temperature too cold.		●				●	●					
Wrong oil or incorrect viscosity.		●				●						
Parking brake engaged.	●	●				●		●	●			
Inspect transaxle shift arm.		●										●
Check control linkage.	●	●	●	●	●	●	●					
Check brake linkage.	●										●	
Transmission oil filter plugged.	●						●					
Traction drive belt worn or broken.	●	●				●	●			●		
Debris or trash on transmission.	●	●				●						
Adjust idler.	●	●				●				●		
Adjust shim pack.	●											
Inspect fork.	●											●
Inspect keys.	●	●				●						●
Inspect gears.	●	●				●						
Check splines.	●	●				●	●	●	●			
Inspect and replace sheaves as required.	●	●				●				●		
Inspect bellcrank assembly.		●								●		
Replace spring.		●				●				●		
Inspect clutch pedal linkage.	●											●
Inspect interlock linkage.	●											●
Inspect interlock lever.												●
Adjust linkage or quadrant.	●											

GEAR TRANSMISSION TROUBLESHOOTING CHART (GT242 & GT262) Continued

PROBLEM OR SYMPTOM CHECK OR SOLUTION	Machine will not move forward or reverse.	Transmission noisy.	Machine moves while in neutral.	Machine moves only in forward direction.	Machine moves only in reverse direction.	Erratic direction.	Machine does not achieve rated ground speed.	Machine does not move in forward or is slow.	Machine is slow in reverse.	Machine is too aggressive.	Parking brake does not hold machine on hill.	Hard to shift.
Inspect shift arm.	●	●				●				●		
Inspect shift collar.		●				●				●		
Inspect shift fork.	●	●				●				●		
Inspect shift detent spring/ ball.												●
Check lubricant.												●
Replace faulty bearings.		●				●				●		
Adjust or repair brake assembly.		●									●	

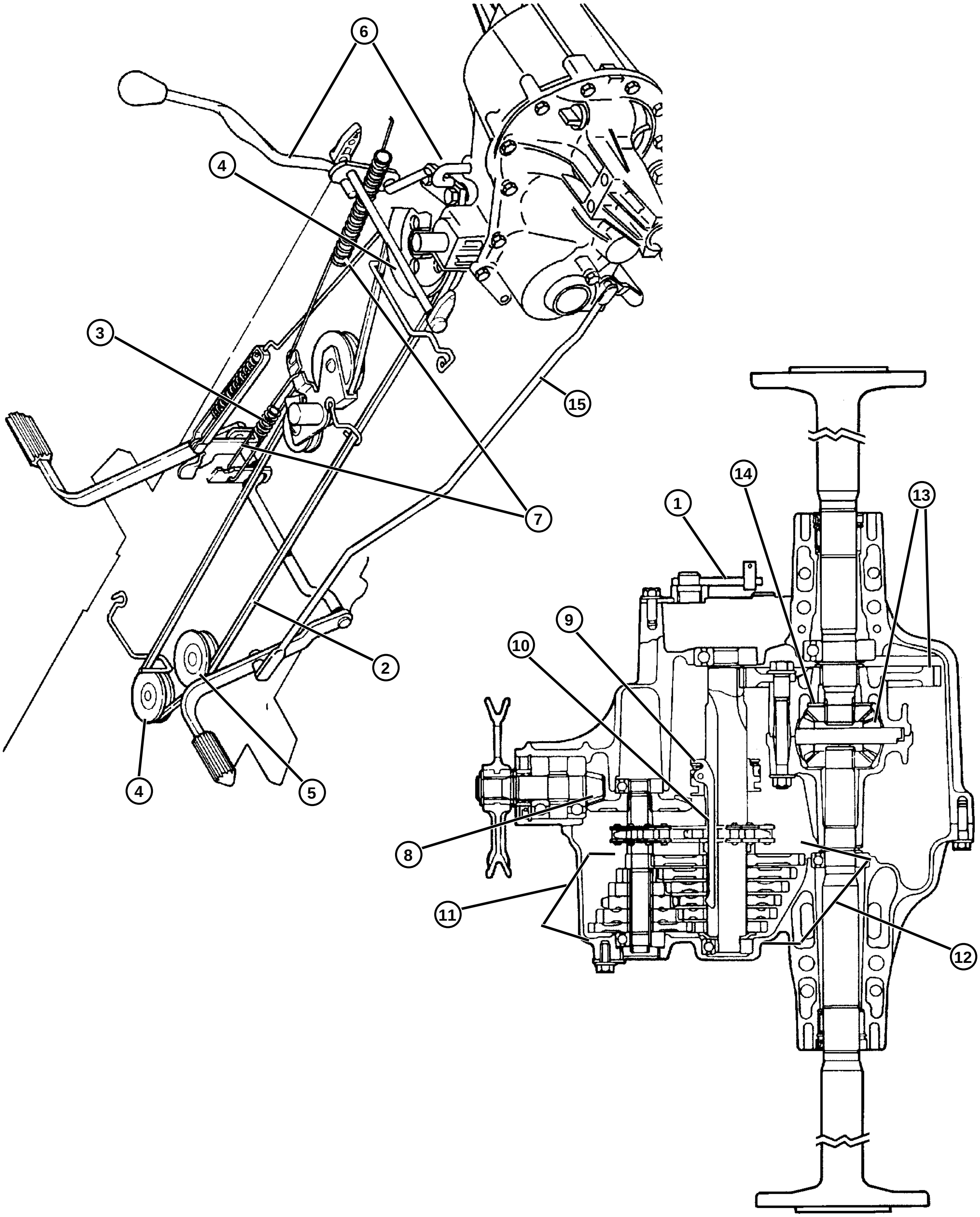
LACK OF DRIVE - BOTH DIRECTIONS

Test Conditions:

- Key switch in off position
- Transaxle in neutral
- Clutch pedal released

Test Location	Normal	If Not Normal
1. Brake linkage and arm.	Disengaged, move freely.	Check brake linkage and adjust.
2. Drive belt.	Intact, not worn, frayed, glazed or stretched.	Replace belt.
3. Belt tension.	Measured at clutch spring **31—35 mm (1.2—1.3 in.)**.	Adjust belt tension.
4. Engine and/or transaxle sheaves.	Tight on shafts, keys intact, not distorted. No evidence of belt riding in bottom of groove.	Replace faulty components.
5. Engine idler.	Adjusted correctly.	Adjust idler.
6. Shift lever/linkage.	Lever in correct position in quadrant. Actuates transaxle into all gear ranges.	Adjust. Replace faulty components.
7. Clutch pedal linkage and spring.	Not binding. Spring tensions bellcrank. Spring not stretched or fatigued. Bellcrank not binding.	Replace faulty components.
8. Input pinion and bevel gear.	Gear teeth not chipped or worn. Positive engagement. Gear backlash-**0.2—0.35 mm (0.008—0.014 in.)**	Replace faulty components. Adjust shim pack at end of reduction shaft.
9. Shift fork.	Intact, not bent or failed.	Replace fork.
10. Shift keys.	Not failed, worn or fatigued.	Replace keys.
11. Reduction shaft, gears and sprocket.	Intact, not failed. Splines good.	Replace faulty components.
12. Shifter shaft, gears and sprocket.	Intact, not failed. Gear pockets not worn.	Replace faulty components.
13. DIfferential pinion and ring gear.	Intact, not failed or worn.	Replace faulty components.
14. Differential bevel gears.	Intact, not failed.	Replace faulty components.
15. Interlock linkage.	Linkage must move freely when clutch pedal is depressed.	Replace interlock linkage.

LACK OF DRIVE - BOTH DIRECTIONS



M79806

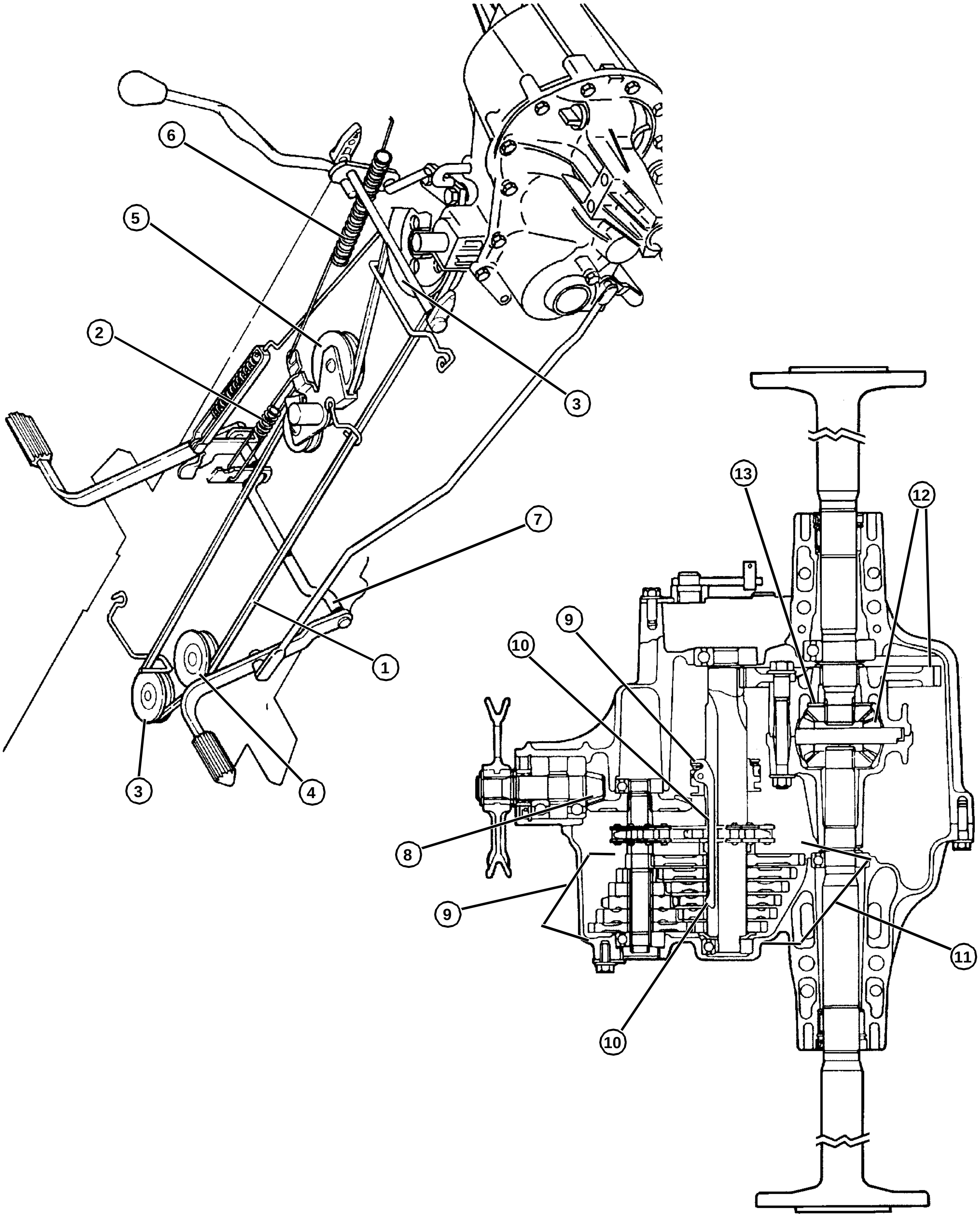
LOSES POWER UNDER LOAD, BELT SLIPS, ERRATIC DRIVE

Test Conditions:

- Key switch in off position.
- Transaxle in neutral.
- Clutch pedal released.

Test Location	Normal	If Not Normal
1. Drive belt.	Intact, not worn, frayed, glazed or stretched. Routed incorrectly.	Replace drive belt. Route correctly.
2. Belt tension.	Within specification - measured at clutch spring assembly. **31—35 mm (1.2—1.3 in.)**	Adjust belt tension.
3. Engine and/or Transaxle sheaves.	Tight on shafts. Keys in place. No evidence of belt riding on bottom of sheave.	Replace faulty sheaves.
4. Engine idler.	Correctly adjusted.	Adjust idler.
5. Bellcrank assembly.	Moves freely, does not bind.	Repair bellcrank assembly.
6. Clutch spring.	Holds belt in tension when clutch is released. Not stretched or fatigued.	Replace spring.
7. Clutch pedal and linkage.	Had complete travel, not binding.	Repair pedal linkage.
8. Input pinion and bevel gear.	Gear teeth not chipped or worn. Positive engagement.	Replace faulty components.
9. Reduction shaft gears and sprocket.	Teeth not chipped, worn or failed. Splines intact on shaft and gears.	Replace faulty components.
10. Shift keys and components.	Not failed, worn or fatigued.	Replace.
11. Shifter shaft gears and components.	Not failed or worn.	Replace faulty components.
12. Differential pinion and ring gear sprocket.	Positive engagement. Not failed or worn.	Replace faulty components.
13. Differential bevel and axle gears.	Not failed or worn.	Replace faulty components.

LOSES POWER UNDER LOAD, BELT SLIPS



M79806

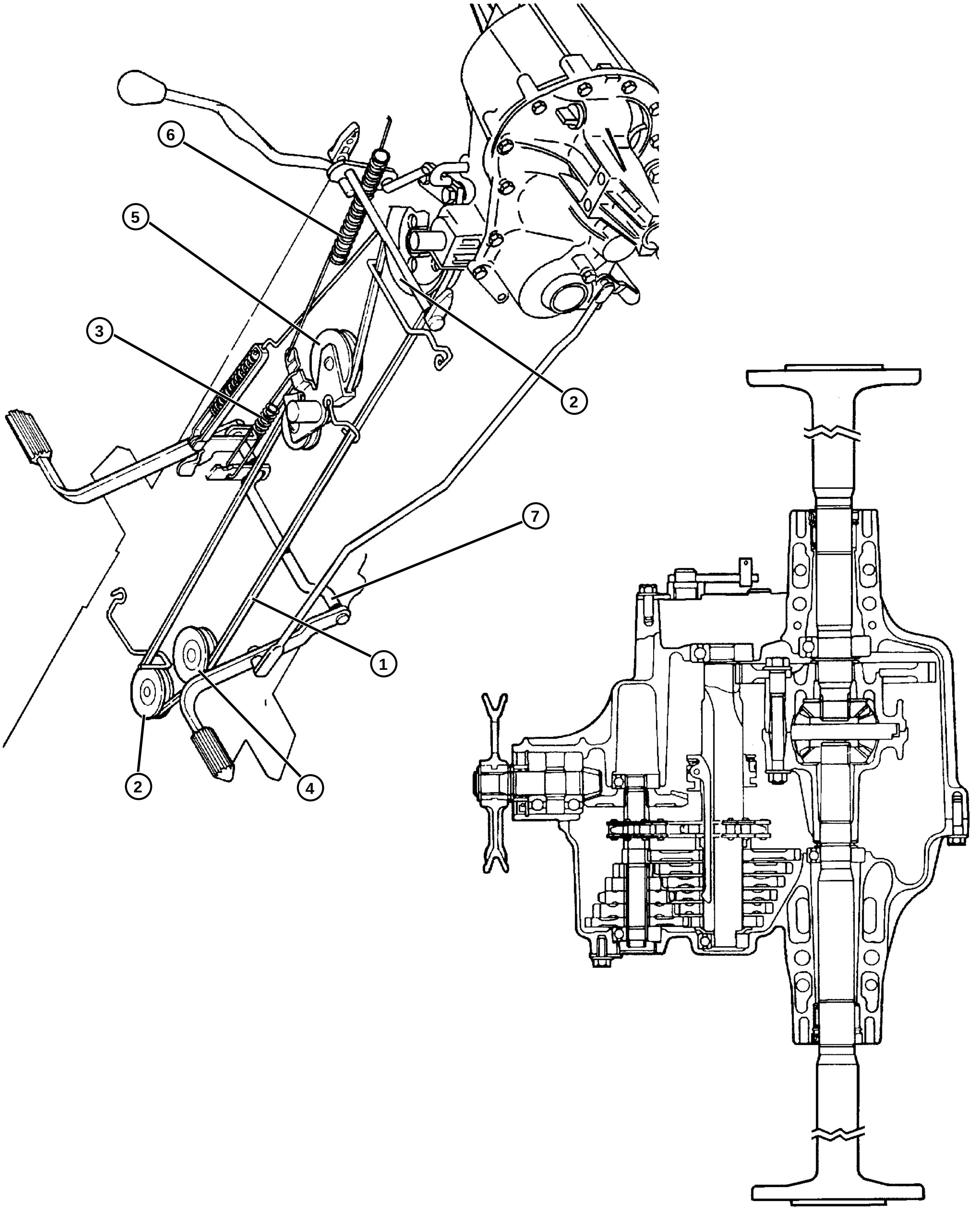
JERKY, AGGRESSIVE ENGAGEMENT

Test Conditions:

- Key switch in off position.
- Transaxle in neutral.
- Clutch pedal is released.

Test Location	Normal	If Not Normal
1. Drive belt.	Correct belt for application.	Install new belt.
2. Engine/transaxle drive sheaves.	Intact, not damaged. V-groove clean and dry.	Clean or replace sheaves.
3. Belt tension.	Adjusted correctly, adjustment made at clutch spring assembly **31—35 mm (1.2—1.3 in.).**	Adjust belt drive tension.
4. Engine idler.	Correctly adjusted.	Adjust idler.
5. Bellcrank assembly.	Moves freely throughout travel. Does no bind.	Repair or replace bellcrank assembly.
6. Belt tension spring.	Correct spring, installed correctly.	Repair or replace spring.
7. Clutch pedal and shaft.	Full travel, moves freely.	Repair or replace faulty components.

JERKY AGRESSIVE ENGAGEMENT



M79806

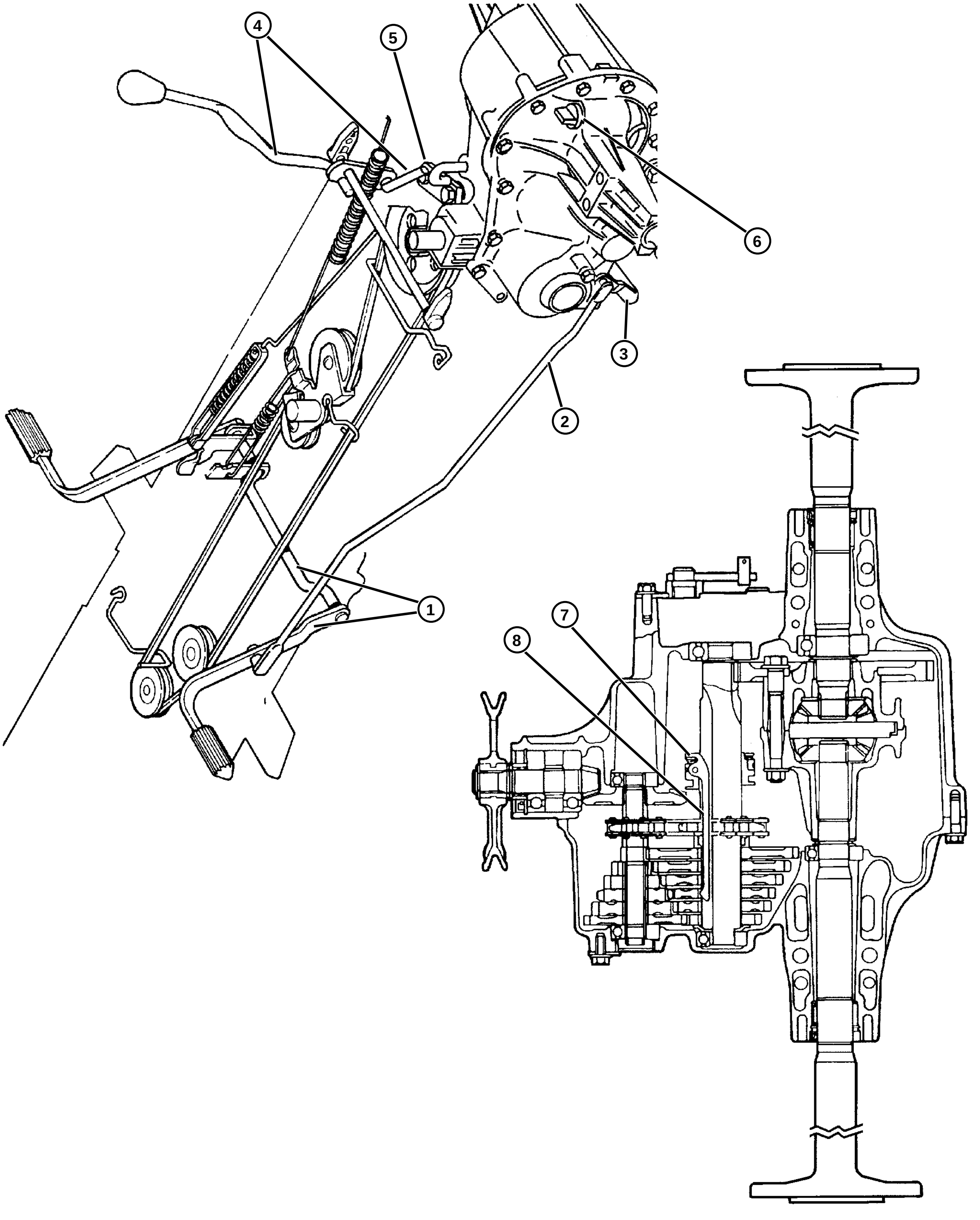
SHIFTS HARD

Test Conditions:

- Key switch in off position.
- Transaxle in neutral.
- Clutch pedal released.

Test Location	Normal	Not Normal
1. Clutch pedal and shaft.	Must move freely and return after pedal released.	Replace faulty components.
2. Interlock linkage.	Linkage must move freely when clutch pedal is depressed.	Replace interlock linkage.
3. Interlock lever.	Lever must move freely and contact stop when clutch pedal is depressed.	Replace interlock lever.
4. Shift lever and linkage.	Moves freely throughout normal travel. Shift detents noticeable, correct position in quadrant.	Repair faulty components and adjust linkage or quadrant.
5. Transaxle shift arm.	Firmly attached to transaxle. Not worn.	Replace shift arm.
6. Transaxle lubrication.	Filled with correct lubricant. No rusty components.	Clean components and add lubricant.
7. Shift collar, shift fork and shift detent.	Shift collar moves freely. Shift fork not bent or worn. Shift detent not damaged. Shift fork not damaged.	Replace shift collar. Replace shift fork. Replace shift detent spring/ball. Replace shift keys or fork.
8. Shift keys and keyways.	Keys intact, not rusted, bent or binding.	Replace keys.

SHIFTS HARD



M79806

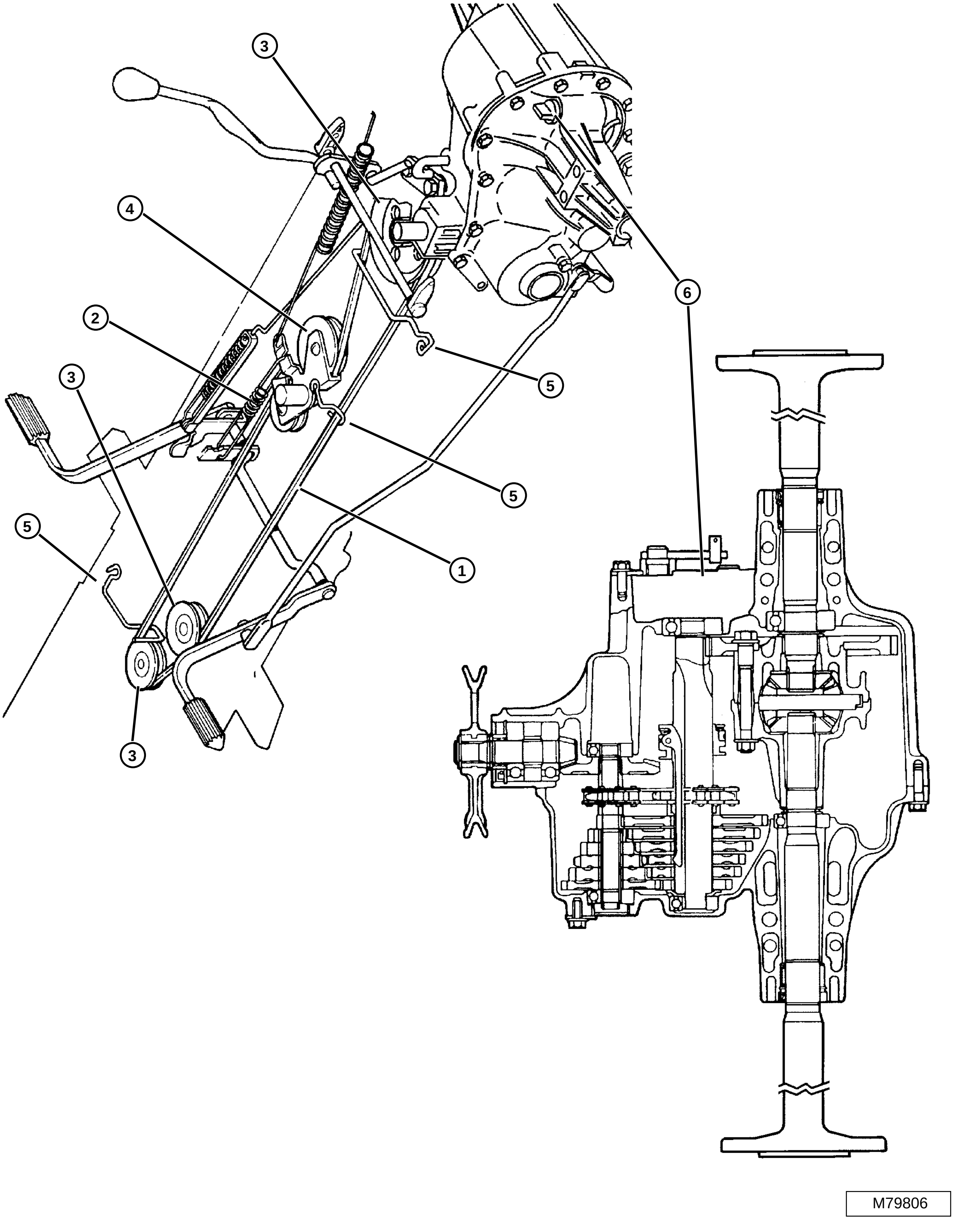
NOISY OPERATION

Test Conditions:

- Key switch on.
- Engine running.
- Transaxle in neutral.
- Operate the tractor in neutral, forward and reverse to isolate the problem area.

Test Location	Normal	If Not Normal
1. Drive belt	Intact, not worn, stretched, frayed, irregular, or glazed.	Replace belt.
	Routed correctly.	Route correctly.
2. Belt tension.	Properly tensioned.	Tension drive belt.
3. Sheaves, idlers.	Intact, not damaged.	Replace faulty components.
4. Bellcrank assembly.	Moves freely, does not bind.	Replace faulty components.
5. Belt guides.	Intact, in place.	Repair or replace belt guides.
6. Transaxle	Correct amount of specified lubricant.	Replace lubricant.
	Gears and shafts not damaged or worn.	Replace faulty components.
	Bearings not worn or failed.	Replace faulty bearings.
	DIfferential bevel and ring gears intact.	Replace faulty components.
	Brake assembly not worn, adjusted to specification.	Adjust or repair brake assembly.

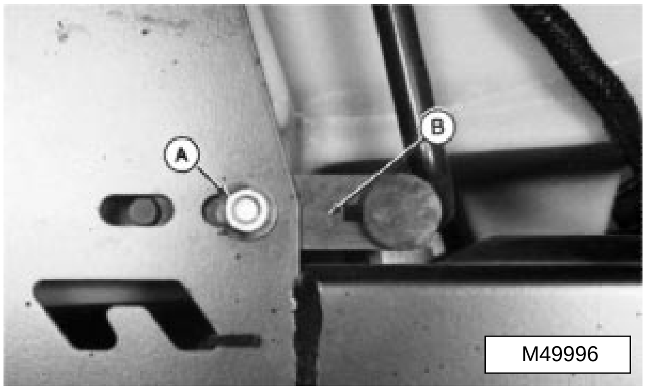
NOISY OPERATION



GEAR SHIFT LEVER NEUTRAL ADJUSTMENT

Reason:

The purpose of this adjustment is to insure that the operator can achieve all ranges and directions available. It also insures that the lever is coordinated with the markings on the shift quadrant.



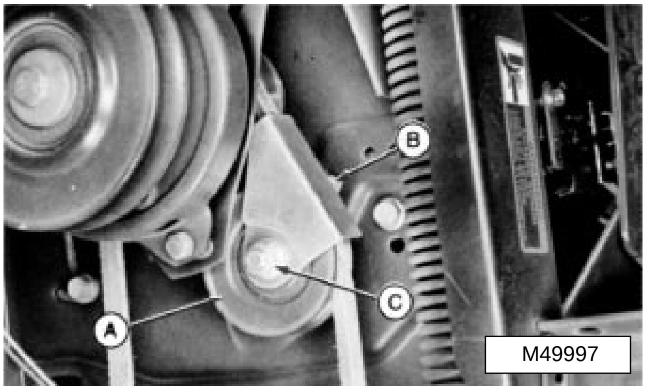
Procedure:

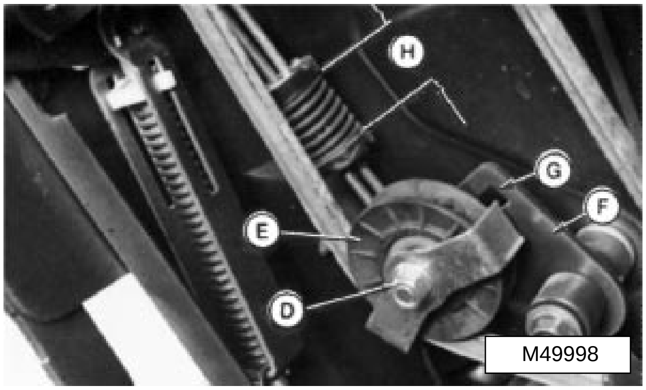
1. Position the gear selector lever so that the transaxle is in neutral.
2. Loosen nut (A) located on the right rear side of machine, behind the wheel.
3. Slide bracket (B) forward or rearward to position the gear selector lever in the center of the neutral slot on the shift quadrant. Tighten the nut.
4. Check that the gear selector lever will engage in all gear ranges and directions. If not, adjust the position of the lever slightly to achieve all gears.

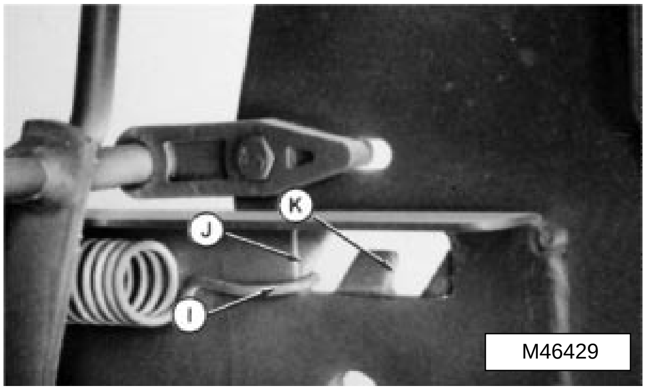
Results:

The gear selector lever should be in the neutral position when the transaxle is in neutral. The operator should be able to achieve all speed ranges, and direction selections, without bottoming out the lever in the quadrant.

BELT DRIVE TENSION ADJUSTMENT







A— Idler

B— Slot

C— Nut

D— Nut

E— V-Idler

F— Pivot Assembly

G— Slot

H— Dimension

I— Spring Lock

J— Position

K— Position

Reason:

Provide proper drive belt tension to prevent belt slipping or jerky drive.

Equipment:

- Measuring tape or small ruler.

Procedure (Engine Idler Adjustment):

NOTE: Engine idler (A) must be adjusted to the center of the slot (B). Proper adjustment of the belt idler at the engine is important to have proper clutch operation.

1. Release clutch pedal so drive belt has tension.
2. Check location of idler in slot.
3. If adjustment is needed, loosen nut (C) and change position of idler as needed.

Procedure (Belt Tension Adjustments):

1. Loosen nut (D) on V-idler (E) of pivot assembly (F).
2. Move the idler in slot (G) to get dimension (H) between **31 and 35 mm (1.2 to 1.3 in.)**. Tighten nut.

Procedure (Tension Spring Adjustment):

NOTE: Adjust the tension spring if the drive belt is slipping or if the drive is too aggressive or jerky. Locate the spring hook (I) at position (J). if the drive is too aggressive or jerky, or position (K) if the drive belt is slipping.

1. Use a spring hook or wire to move the spring as needed.

Specifications:

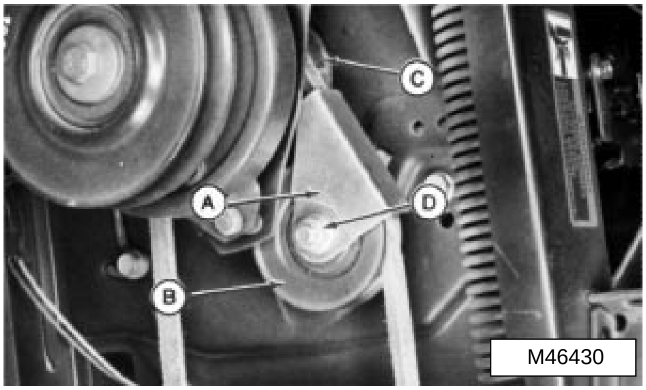
- Clutch spring assembly **31—35 mm (1.2—1.3 in.)**.

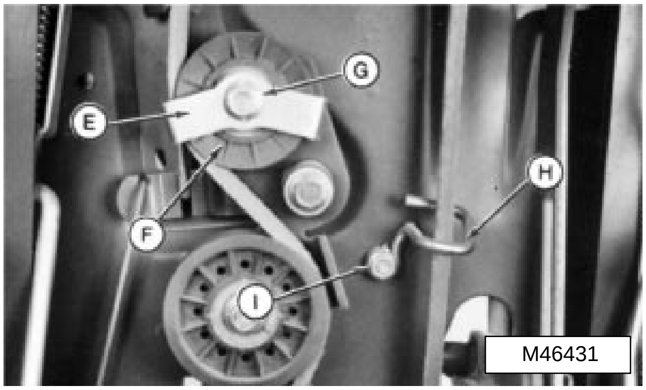
Results:

- If the drive belt slips, move the tension spring as covered in PROCEDURE (TENSION SPRING ADJUSTMENT). and perform the PROCEDURE (BELT TENSION ADJUSTMENT) again.

- If the drive is too aggressive or jerky, move the tension spring as covered in PROCEDURE (TENSION SPRING ADJUSTMENT) and perform the PROCEDURE (BELT TENSION ADJUSTMENT) again.

ADJUSTMENT FOR BELT GUIDES





A— Belt Guide
B— Idler
C— Drive Sheave
D— Nut
E— Belt Guide
F— Idler Sheave
G— Nut

Reason:

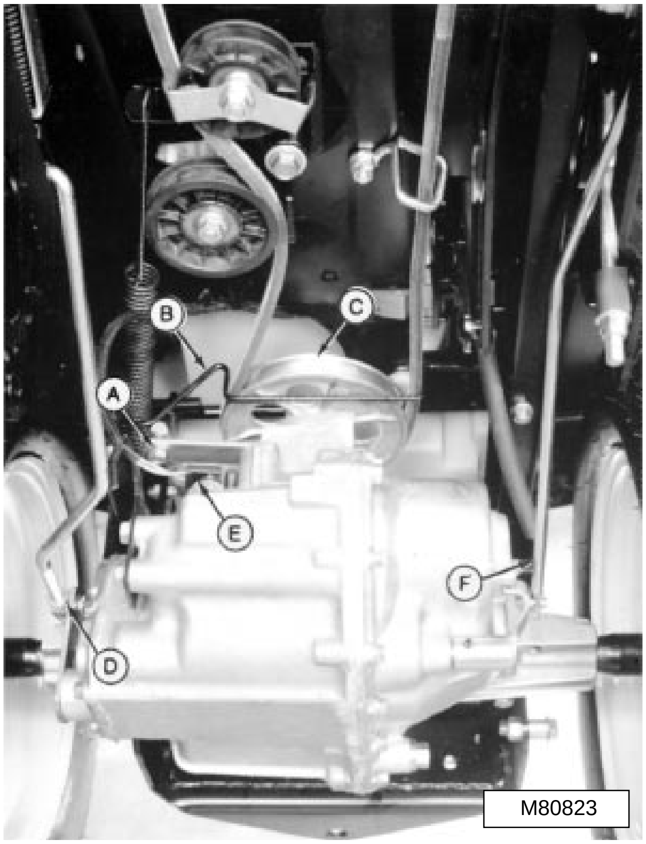
Belt guide adjustment insures that the belt tracks as it should and doesn't jump off the sheaves or idlers. It also reduces belt vibrations.

Procedure:

1. Belt guide (A) located at the engine idler (B) should be adjusted so that the backside of the guide is parallel with the belt between the idler and the engine drive sheave (C).
2. Loosen nut (D) and position the guide parallel with the belt. Be certain the belt tension is not changed when adjusting the guide.
3. Belt guide (E) is adjusted to the center of the contact of the drive belt on idler sheave (F). Loosen nut (G) and position the guide.
4. Belt guide (H) is adjusted by loosening nut (I) and centering the belt within the guide. Tighten in place.

TRANSAXLE TRANSMISSION

Removal



A— Shift Linkage

B— Belt Guide

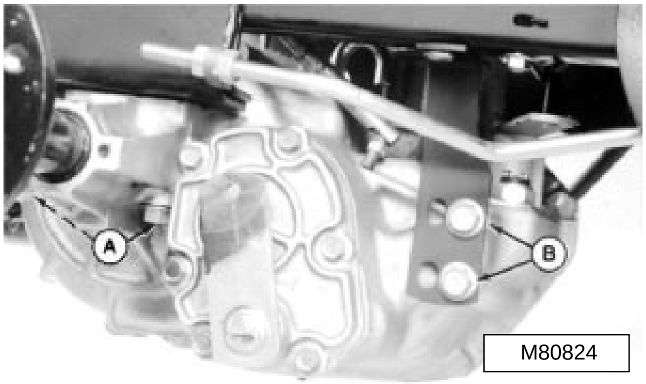
C— Input Sheave

D— Brake Linkage

E— Neutral Start Switch Wiring Connector

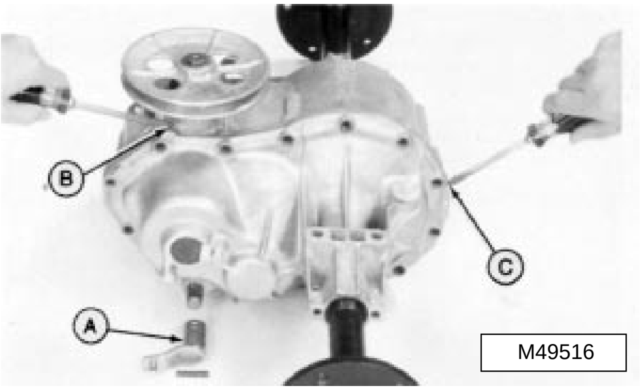
F— Clutch Linkage

1. Remove mower deck
2. Remove rear wheels
3. Drain transaxle oil.
4. Engage park/service brake.
5. Remove belt guide (B).
6. Remove drive belt from sheave (C).
7. Disengage park/service brake.
8. Disconnect wiring connector (E).
9. Disconnect Linkages (A, D and F).



10. Remove cap screws (B).
11. Install support jack under axle.
12. Remove four nuts and washers (A).
13. Remove transaxle.
14. Make repairs as necessary.

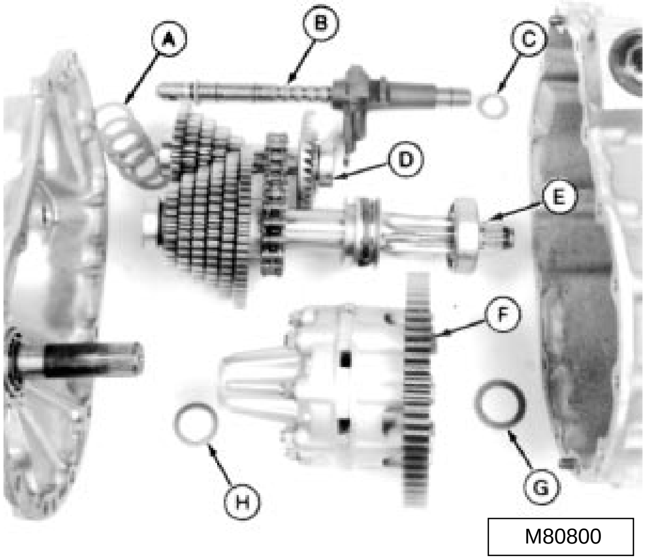
Disassemble Transaxle:



1. Clean transaxle case.
2. Remove brake assembly. (See Brakes - Section 8.)
3. Remove interlock arm (A).
4. Remove transaxle case hardware.

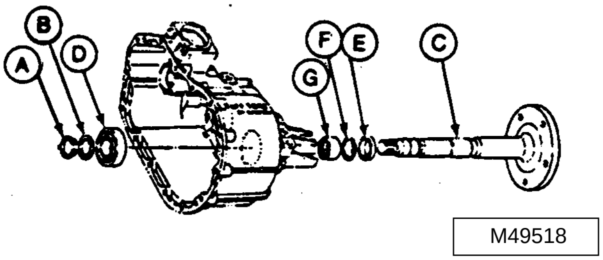
IMPORTANT: Avoid damage to sealing surfaces when separating housing. Pry behind tab (B) and in slot (C).

5. Separate transaxle housings.



A— Shims (as required)
B—Fork Shaft Assembly
C—Thrust Washer
D—Reduction Shaft Assembly
E—Shift Shaft Assembly
F—DIfferential Assembly
G—Thrust Washer
H—Thrust Washer

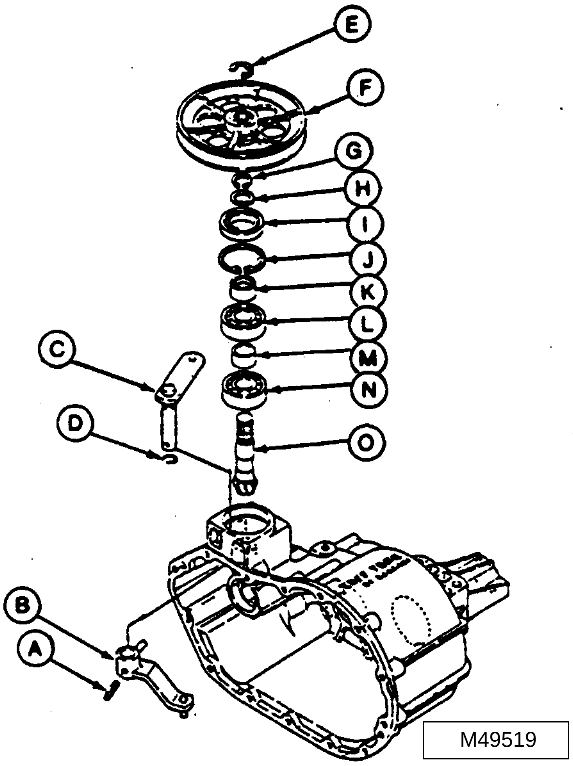
6. Remove assemblies (B, D, E and F).
7. Remove shims (A).
8. Remove washers (C, G and H).



NOTE: Axle (C) and bearing (G) must be pressed out.

9. Remove parts (A-G) from R.H. axle housing.

A—Snap Ring
B—Washer
C—Axle
D—Bearing
E—Seal
F—Snap Ring
G—Needle Bearing

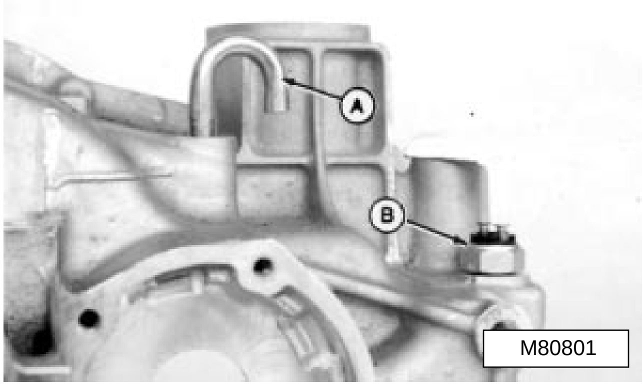


A—Double Roll Pins
B—Shift Arm
C—Range Lever
D—O-Ring
E—Snap Ring
F—Input Sheave
G—Snap Ring
H—Washer
I—Seal
J—Snap Ring
K—Sleeve
L—Bearing
M—Spacing
N—Bearing
O—Input Shaft

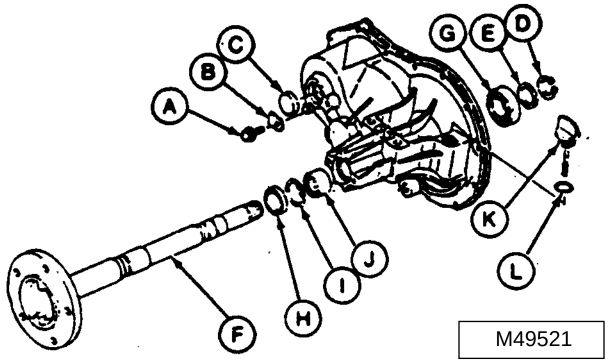
10. Remove parts (A-D).

NOTE: Parts (K-N) must be pressed off.

11. Remove parts (E-O).



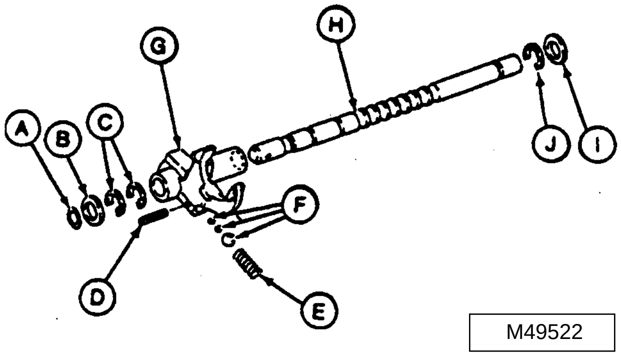
12. Remove rubber vent cap cover and pull the rubber vent out (A).
13. Remove neutral start switch and O-ring (B)



NOTE: Axle (F) and bearing (J) must be pressed out.

14. Remove part (A-L) from the L.H. axle housing.

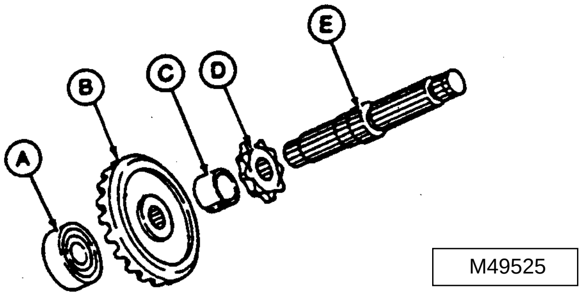
A—Bolt
B—Clip
C—Plug
D—Snap Ring
E—Washer
F—Axle
G—Bearing
H—Seal
I—Snap Ring
J—Needle Bearing
K—Dip Stick
L—O-Ring



A—O-Ring
B—Washer
C—Snap Ring
D—Roll Pin
E—Spring
F—Detent Balls
G—Shift Fork
H—Fork Shaft
I—Washer
J—Snap Ring

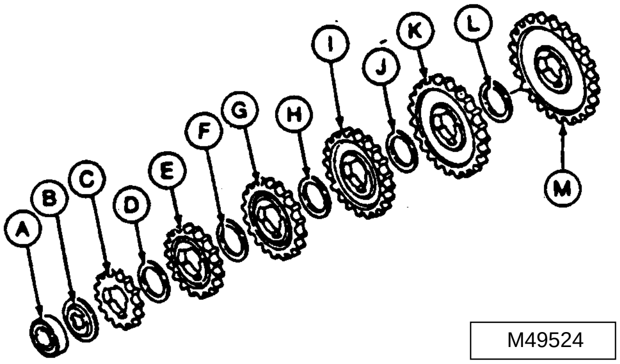
NOTE: Shaft (H) must be removed to get the last detent ball (F) out.

15. Remove parts (A-J) being careful not to lose detent balls (F).



A—Bearing
B—Reduction 6th Gear
C—Reduction 5th Gear
D—Reduction 4th Gear
E—Reduction 3rd Gear
F—Reduction 2nd Gear

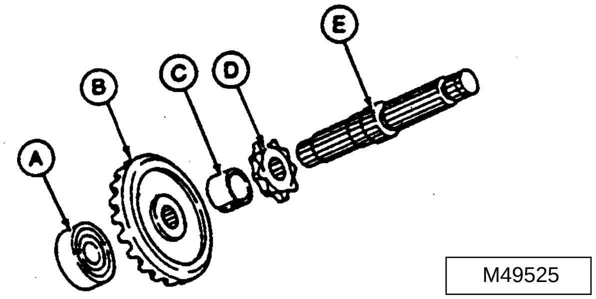
16. Remove parts (A-F) from reduction shaft.



M49524

A—Bearing
B—Toothed Washer
C—Shifter-6th Gear
D—Washer
E—Shifter-5th Gear
F—Washer
G—Shifter-4th Gear
H—Washer
I—Shifter-3rd Gear
J—Washer
K—Shifter-2nd Gear
L—Washer
M—Shifter-1st Gear

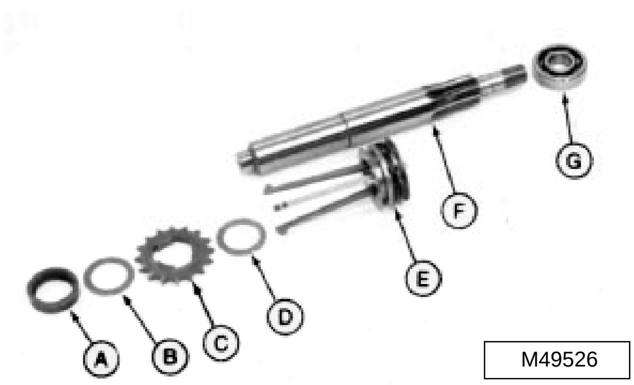
17. Remove parts (A-M) from the shift shaft.



M49525

A—Bearing
B—Ring Gear
C—Collar
D—Chain Sprocket
E—Reduction Shaft

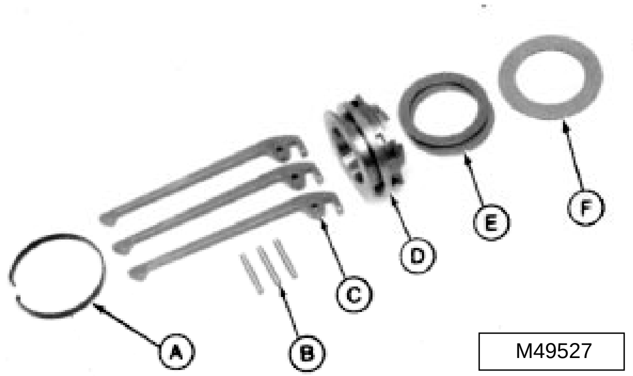
18. Remove parts (A-D) from reduction shaft (E).



M49526

A—Neutral Collar
B—Washer
C—Chain Sprocket
D—Washer
E—Shifter Key Assembly
F—Shift Shaft
G—Bearing

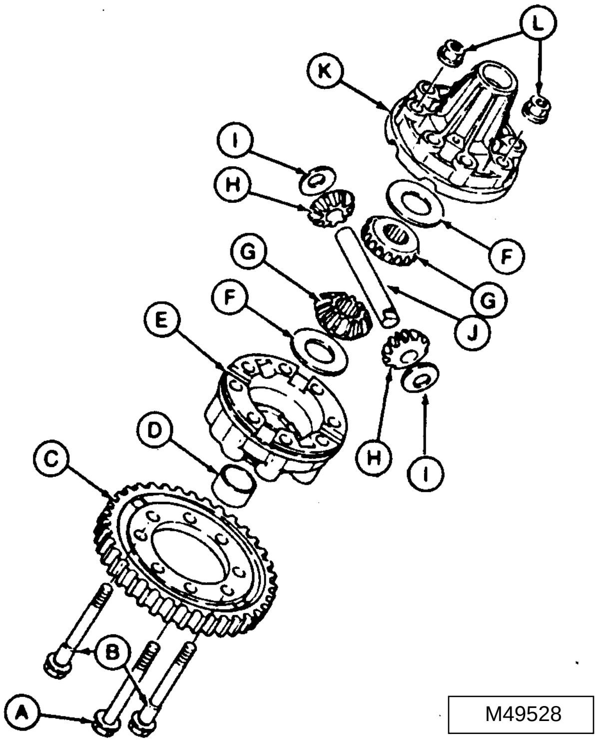
19. Remove parts (A-E) and (G) from shift shaft.



M49527

A—Spring Ring
B—Pins
C—Shift Keys
D—Shifter
E—Spring Washer
F—Washer

20. Remove spring ring (A).
21. Drive out pins (B) and disassemble parts (C-F).



A—Cap Screw (6 used)	**G—Differential Gear**
B—Shoulder Cap Screw (2 used)	**H—Pinion Gear**
C—Final Gear	**I—Pinion Washer**
D—Bearing	**J—Pinion Shaft**
E—Case	**K—Case**
F—Differential Washer	**L—Nut (8 used)**

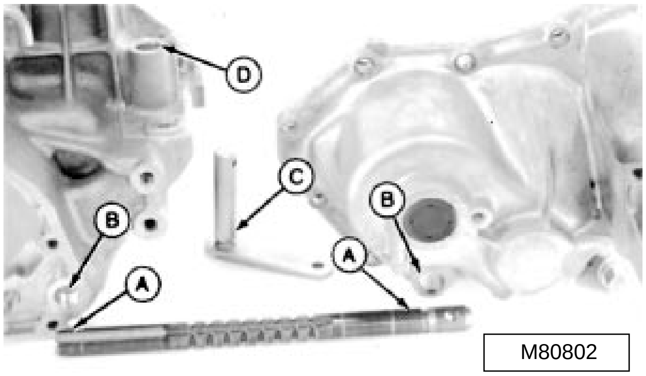
IMPORTANT: Bearing (D) must be pressed to the outside of the DIfferential case. There is a machined shoulder under the bearing to retain it.

22. Remove parts (A-L).

INSPECT TRANSAXLE

NOTE: Clean all parts before inspection.

1. Inspect parts for wear or damage. Replace if not within specification.



A—Fork Shaft O.D. Measurement Area

B—Fork Shaft Bore

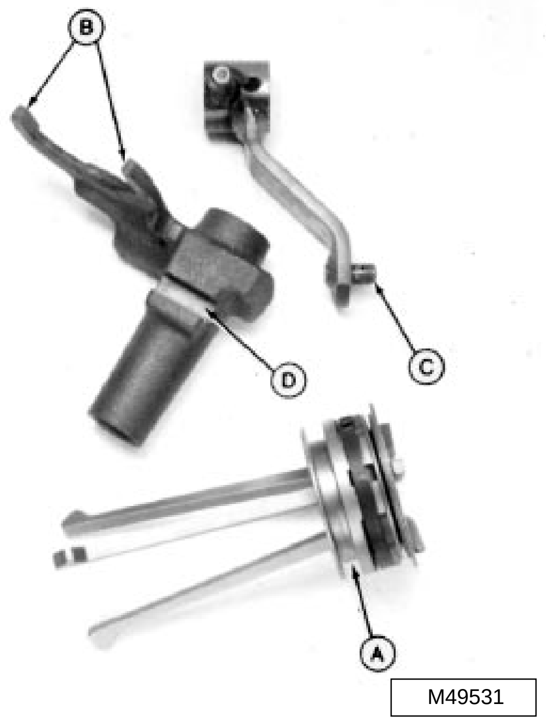
C—Range Arm O.D. Measurement Area

D—Range Arm Bore

SPECIFICATIONS

Item	Part Specifications	Wear Tolerance
Fork Shaft O.D. (A)	16.96—17.00 mm (0.668—0.669 in.)	—
Fork Shaft Bore I.D. (B)	17.02—17.04 mm (0.670—0.671 in.)	—
Maximum Clearance Between A and B.	—	0.50 mm (0.020 in.)
Range Arm Bore I.D. (D)	17.02—17.04 mm (0.670—0.671 in.)	—
Maximum Clearance Between (C) and (D)	—	0.50 mm (0.020 in.)

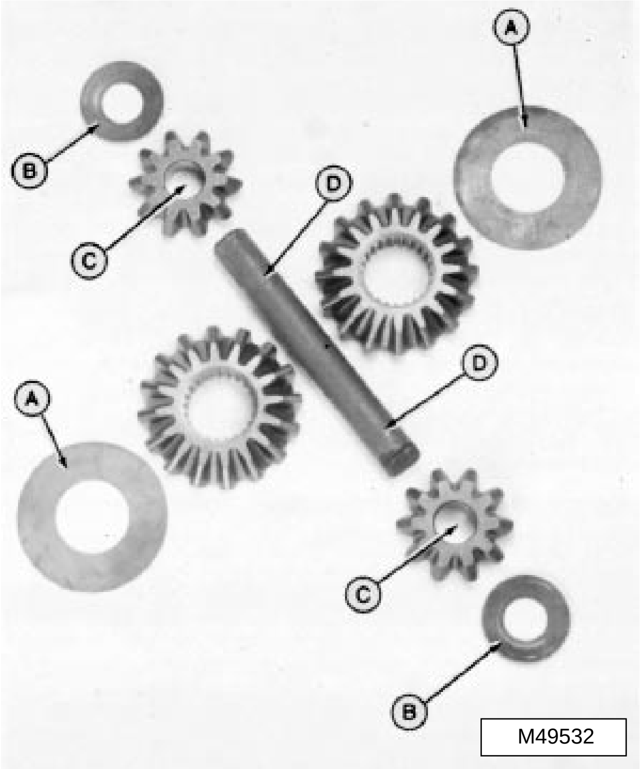
2. Inspect brake assembly.
3. Inspect parts for wear or damage. Replace if not within specification.



A—Shift Fork Groove
B—Shift Fork Measurement Area
C—Shift Arm Pin
D—Shift Arm Pin Groove

SPECIFICATIONS

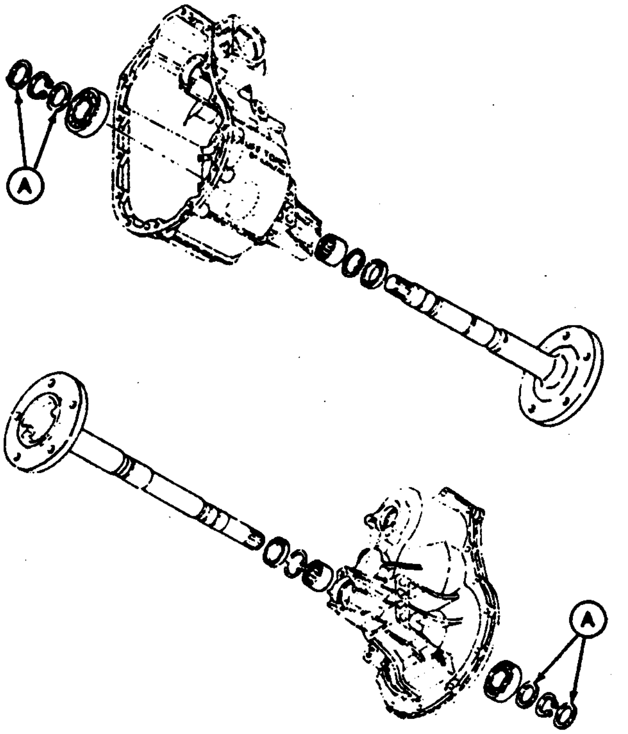
Item	New Part Specifications	Wear Tolerance
Shift Fork Groove Width (A)	6.10—6.20 mm (0.240—0.244 in.)	—
Shift Fork Thickness (B)	5.70—5.90 mm (0.224—0.232 in.)	—
Maximum Clearance Between (A) and (B)	—	1.00 mm (0.039 in.)
Shift Arm Pin O.D. (C)	7.96—8.00 mm (0.313—0.315 in.)	—
Shift Pin Groove Width (D)	8.05—8.15 mm (0.317—0.321 in.)	—
Maximum Clearance Between (C) and (D).	—	1.00 mm (0.039 in.)



A—Differential Gear Washer
B—Pinion Gear Washer
C—Pinion Gear ID
D—Pinion Gear Shaft OD

SPECIFICATIONS

Item	New Part Specification	Wear Tolerance
Differential Gear Washer Thickness (A)	0.73—0.87 mm (0.029—0.034 in.)	—
Minimum Thickness	—	0.50 mm (0.020 in.)
Pinion Gear Washer Thickness (B)	0.75—0.85 mm (0.030—0.034 in.)	—
Minimum Thickness Between (A) and (B)	—	0.50 mm (0.020 in.)
Pinion Gear I.D. (C)	14.02—14.03 mm (0.552—0.553 in.)	—
Pinion Shaft O.D. (D)	13.97—13.98 mm (0.550—0.551 in.)	—
Maximum Thickness Between (C) and (D)	—	0.40 mm (0.016 in.)



M49569

A—Axle Shaft Washers

SPECIFICATIONS

Item	New Part Specification	Wear Tolerance
Axle Shaft Washers (A) Thickness	1.90—2.10 mm (0.075—0.079 in.)	—
Minimum Thickness	—	1.50 mm (0.059 in.)

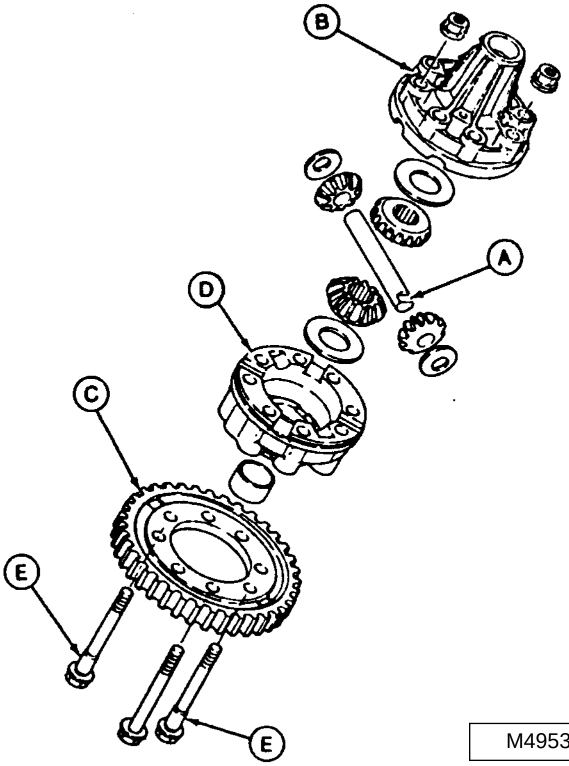
ASSEMBLE TRANSAXLE

IMPORTANT: DO NOT use air wrenches when tightening into aluminum. The aluminum threads can be easily damaged.

Use new seals and O-rings during assembly. Damaged seals or O-rings will leak.

NOTE: Lubricate all internal parts with clean transaxle oil during assembly.

1. Assemble differential. Align notch (A) with the offset inside differential housing (B). Two holes in the final gear (C) and housing (D) are larger to accommodate 2 shoulder bolts (E).
2. Apply thread lock and sealer (medium strength) to all housing bolts. Tighten to 51 N·m (38 lb—ft).



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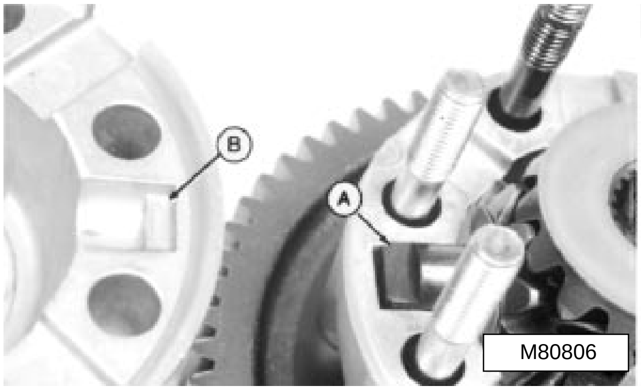
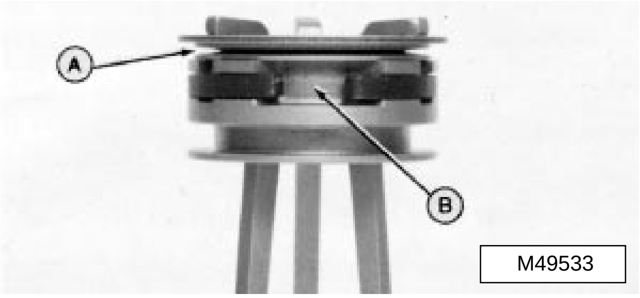
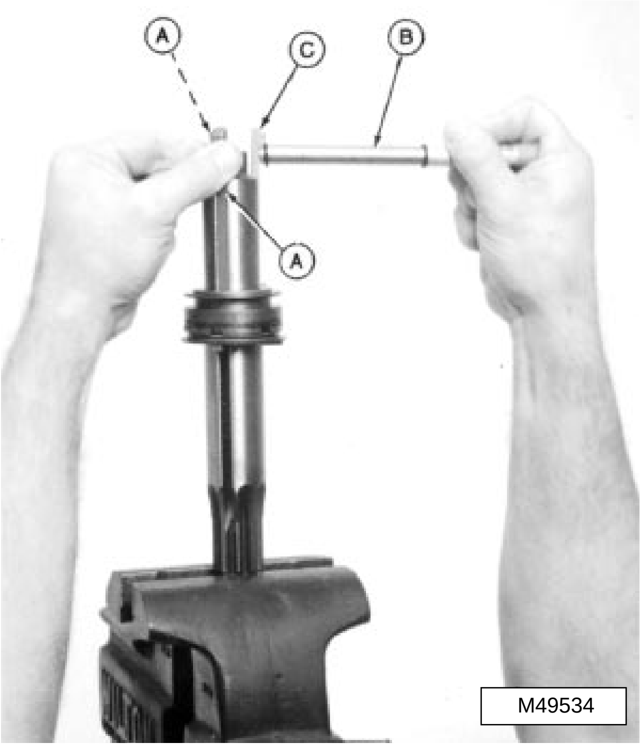


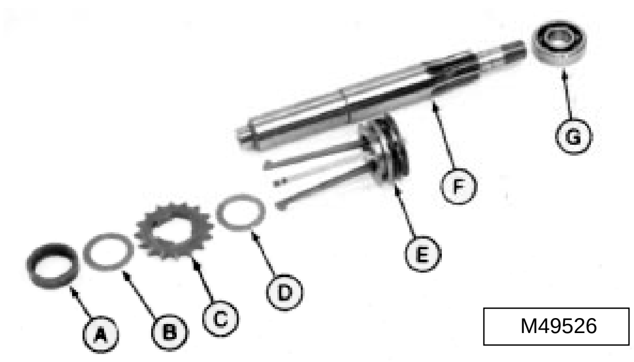
A—Pinion Shaft Notch
B—Differential Housing Offset
C—Final Gear
D—Housing
E—Shoulder Bolts (2 used)



3. Install spring washers with outside edge (A) of the washers away from each other when assembling the shifter key assembly. The spring ring gap (B) must be between 2 of the pins.

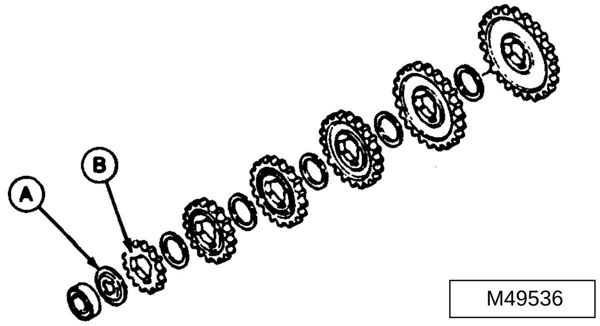


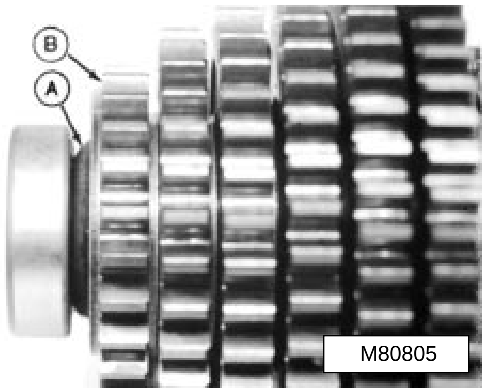
4. Hold 2 keys (A) all the way into the grooves when checking shifter key tension. Using the JDST28 Belt Tension Gauge (B). It should take a minimum of **2.70 kg (6 lbs)** of pressure to push the 3rd key (C) all the way in. Check all three keys.



A—Neutral Collar
B—Washer
C—Chain Sprocket
D—Washer
E—Shifter Key Assembly
F—Shift Shaft

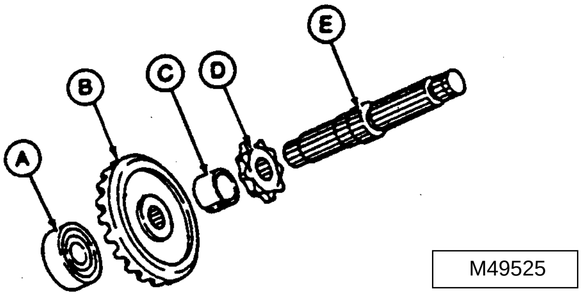
5. Assemble bearing (G) on shaft (F).
6. Install parts (D), (C) and (B) on shifter key assembly (E).
7. Install collar (A) with largest I.D. facing sprocket (C).
8. Install shaft (F) into shifter key assembly. Move the shifter key assembly as far as it will go toward the spline end of the shifter key.





NOTE: The outer edge of dished toothed washer (A) is installed against the smallest shifter gear.

9. Install the shifter gears and washers.
10. Press the bearing on as far as it will go against the toothed washer (A).

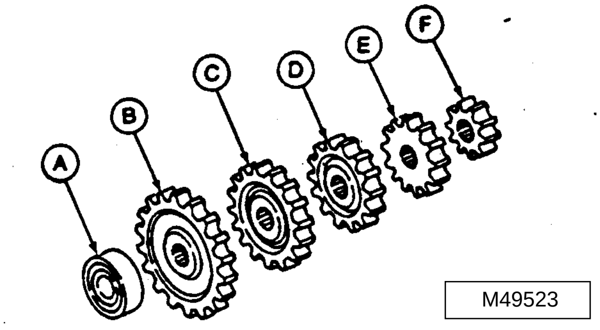


A—Bearing
B—Ring Gear
C—Collar
D—Chain Sprocket
E—Reduction Shaft

11. Assemble parts (A-D) to Reduction shaft (E).

NOTE: Bearing (A) must be pressed on.

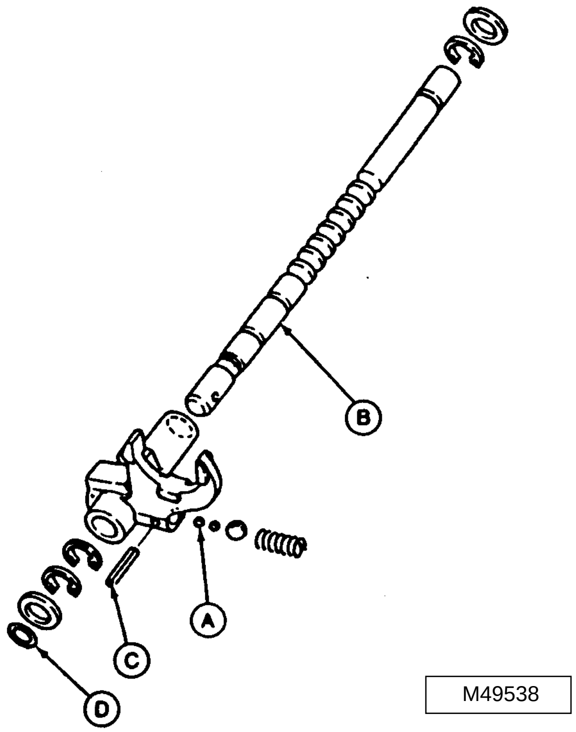
12. Install drive chain on the reduction shaft and shift shaft chain sprockets.



A—Bearing
B—Reduction-6th Gear
C—Reduction-5th Gear
D—Reduction-4th Gear
E—Reduction-3rd Gear
F—Reduction-2nd Gear

NOTE: Bearing (A) must be pressed on.

13. Install parts (A-J) on reduction shaft.



A—O-Ring

B—Washer

C—Snap Ring

D—Roll Pin

E—Spring

F—Detent Balls

G—Shift Fork

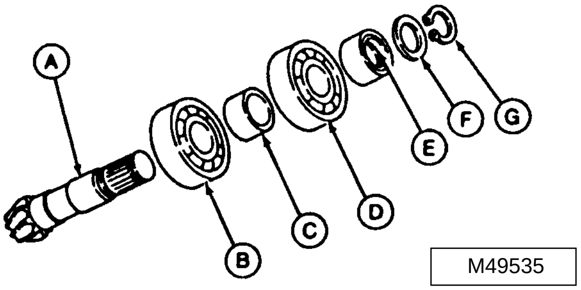
H—Fork Shaft

I—Washer

J—Snap Ring

IMPORTANT: Apply grease to O-ring (D) and shaft (B) before installing. Slot in roll pin (C) must face away for the spring when installing the roll pin.

14. Install detent ball (A) in shift fork.
15. Assemble fork shaft assembly.



A—Input Shaft

B—Bearing

C—Spacer

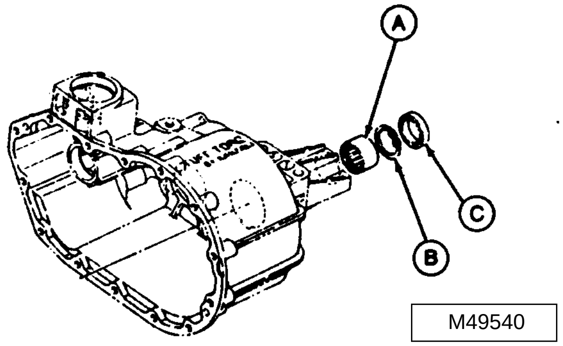
D—Bearing

E—Sleeve

F—Washer

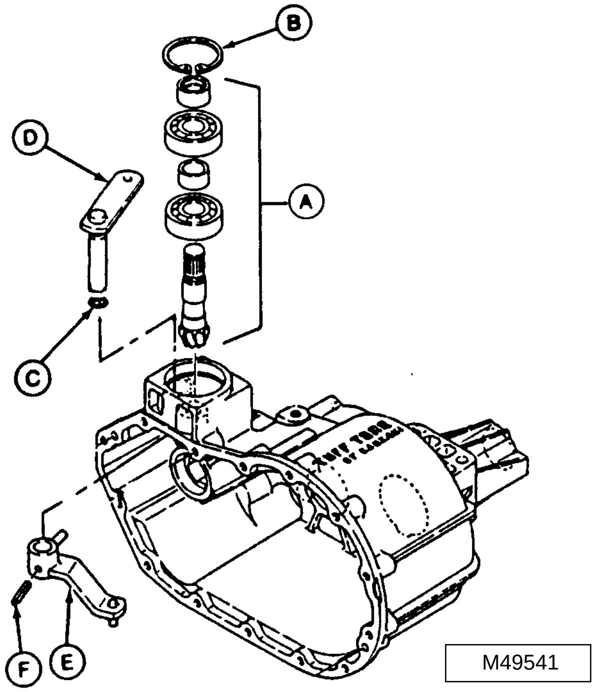
G—Snap Ring

16. Grease bearings (B) and (D) and rubber inside of sleeve (E) when assembling input shaft (A). Assemble items (B-G) to input shaft.



IMPORTANT: Printing on bearing (A) must face out when installed.

17. Press bearings (A) into both housings.
18. Install snap rings (B).
19. Apply multipurpose grease to seals (C). Install seals flush to housing using a bearing, bushing and seal driver set.



A—Input Shaft Assembly

B—Snap Ring

C—O-ring

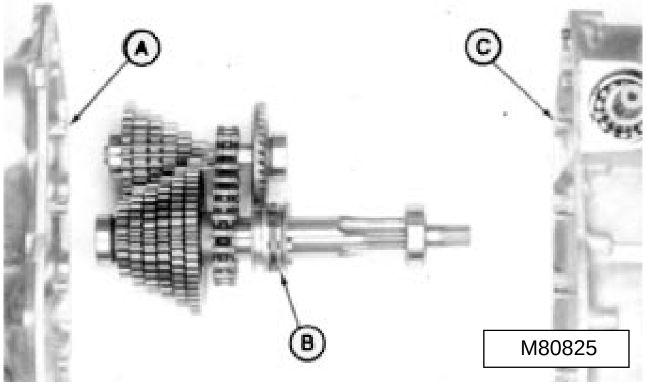
D—Range Lever

E—Shift Arm

F—Double Roll Pin

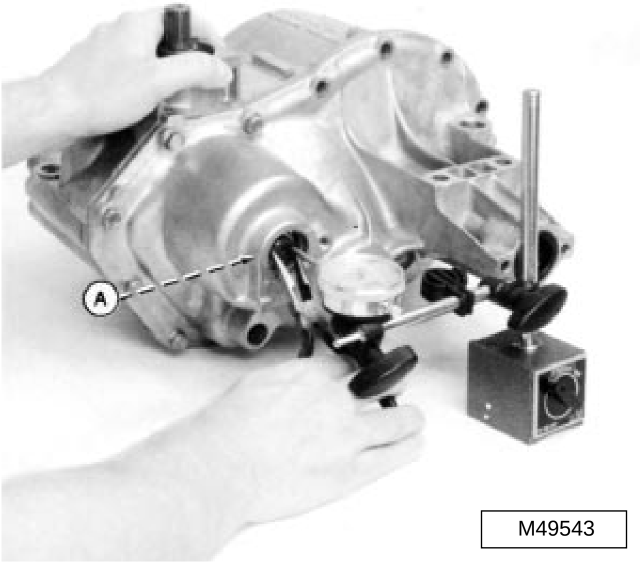
NOTE: Lever (D) must point toward axle side of housing.

20. Apply multipurpose grease to assembly (A) and O-ring (C).
21. Install parts (A-F).



NOTE: Sealant is NOT being applied at this time because this is not final assembly.

22. Install reduction and shift shaft assembly (B) into R.H. axle housing (C).
23. Install L.H. axle housing (A), without sealant, onto R.H. housing.

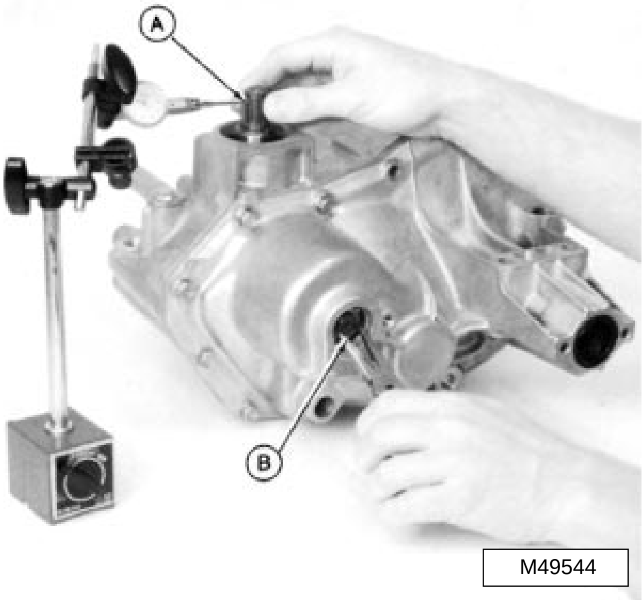


NOTE: New transaxle cases have untapped cap screw holes. Use the higher torque when installing tapping cap screws.

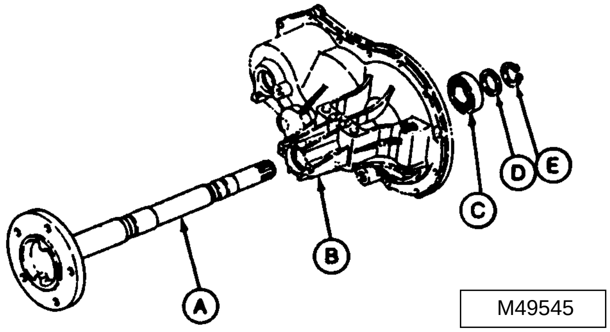
24. Install six bolts in housing around reduction shaft area and one at opposite end of housing. Tighten to:
    New Case - **29 N·m (22 lb—ft)**
    Used Case - **24 N·m (216 lb—in)**

NOTE: Shim pack consists of:
0.1 - 2 shims
0.3 - 1 shim
0.5 - 1 shim

25. Adjust reduction shaft end play:
    - Place dial indicator at end of reduction shaft.
    - Move shaft to check end play.
    - Add shims between housing and reduction shaft bearing (A) until end play is less than **0.10 mm (0.004 in.)**, but not zero end play.

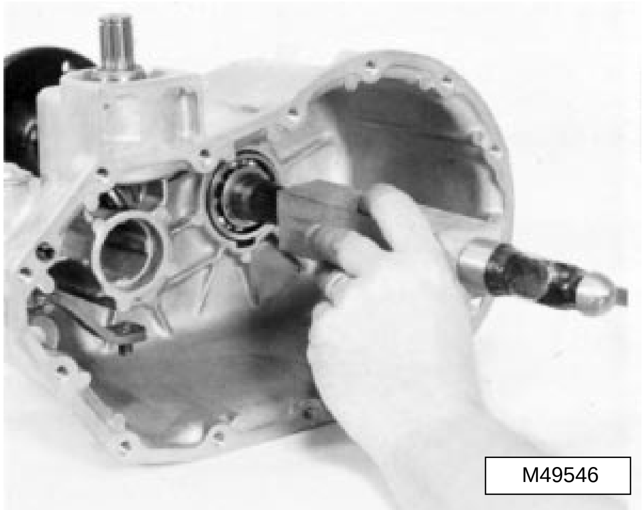


26. Check backlash:
    - Place dial indicator in splines on side of input shaft (A).
    - Pull out and hold reduction shaft (B) to prevent it from turning.
    - Rotate input shaft (A) back and forth to check backlash.
    - Adjust shims at end of reduction shaft until backlash is **0.20—0.35 mm (0.008—0.014 in.)**.

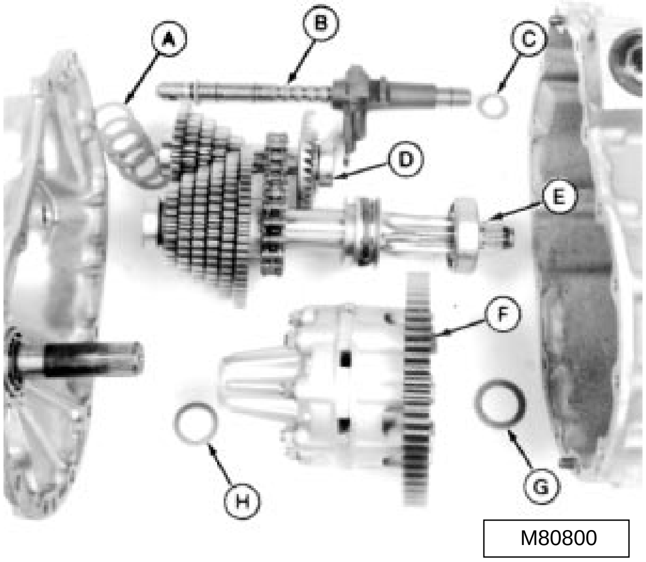


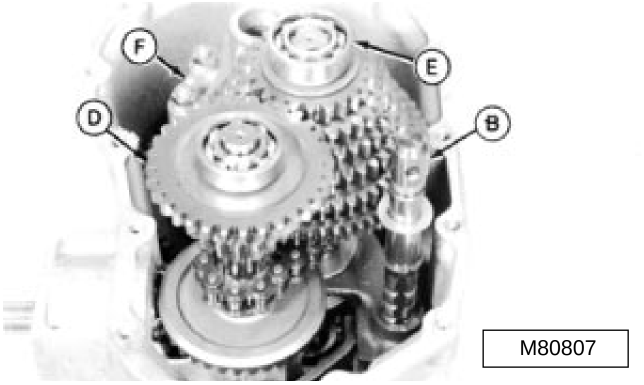
A—Left Hand Axle
B—Left Axle Housing
C—Bearing
D—Washer
E—Snap Ring

27. Remove L.H. axle housing and shift and reduction gear assembly.
28. Install L.H. axle (A) into housing (B).
29. Press bearing (C) **4—5 mm (0.16—0.20 in.)** below snap ring groove.
30. Install washer (D) and snap ring (E).
31. Repeat procedure to R.H. axle and housing assembly.



32. Strike end of axle shaft lightly until snap ring is tight against washer and bearing.
33. Repeat procedure to L.H. axle and housing assembly.





A—Shim Pack (as required)
B—Fork Shaft Assembly
C—Washer
D—Reduction Shaft Assembly
E—Shift Shaft Assembly
F—Differential Assembly
G—Washer
H—Washer

34. Install washer (G) on R.H. axle shaft.
35. Install washer (H) on L.H. axle shaft
36. Install washer (C) on fork shaft (B).

NOTE: Place thinnest shims to inside of shim pack.

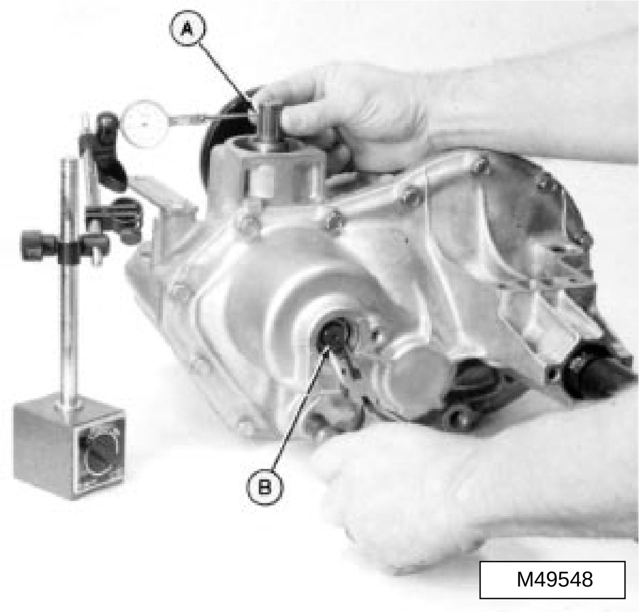
37. Apply multipurpose grease to shims (A). Install shims into L.H. axle housing.
38. Assemble fork shaft assembly (B) and differential assembly (F) to shift shaft assembly (E). Install in R.H. axle housing.
39. Clean mating surfaces of transaxle housing halves using clean and cure primer. Apply a coat of John Deere Form-In-Place Gasket Sealant, or equivalent to housing halves.

IMPORTANT: Check that shim pack remains in place in L.H. housing during installation.

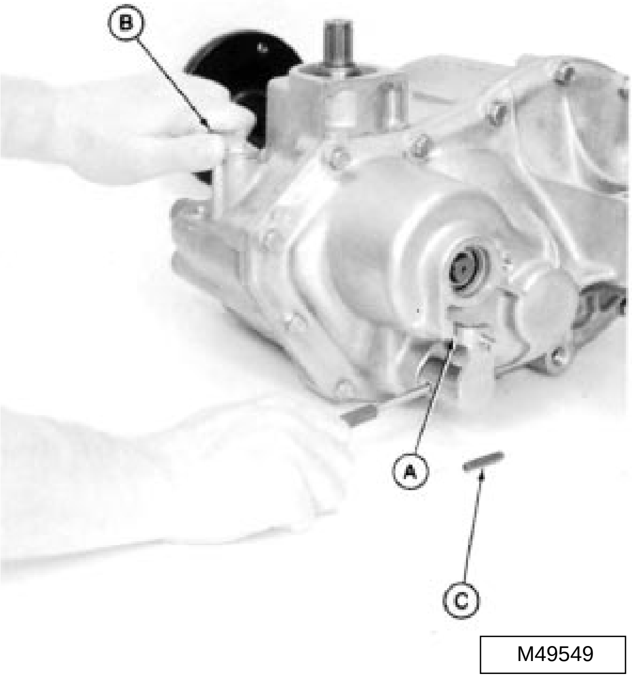
40. Assemble housing halves.

NOTE: New transaxle cases have untapped cap screw holes. Use the higher torque when installing self-tapping cap screws.

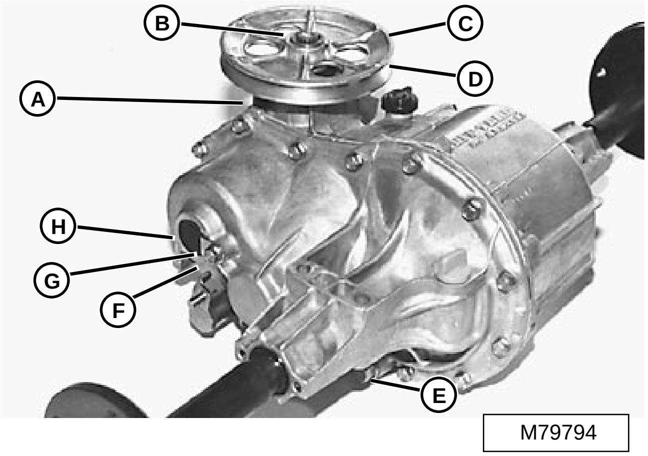
41. Install transaxle cap screws and tighten to:
    New Case - **29 N·m (22 lb—ft)**
    Used Case - **24 N·m (216 lb—in.)**



42. Check backlash:
    - Place dial indicator in splines on side of input shaft (A).
    - Pull out and hold reduction shaft (B) to prevent it from turning.
    - Rotate input shaft (A) back and forth to check backlash.
    - Adjust shims at end of reduction shaft until backlash is **0.20—0.35 mm (0.008—0.014 in.)**.



43. Install interlock arm on the fork shaft. Insert a punch through the interlock and shaft roll pin bore. Be sure the interlock arm is against the housing stop (A).
44. Shift gears using shift lever (B). If lever will not move, remove interlock arm and rotate fork shaft 180°. Repeat step 43.
45. Install roll pin (C) through interlock arm and fork shaft.



A—Neutral Start Switch
B—E-Clip
C—Input Sheave
D—Dipstick
E—Oil Drain Plug
F—Retainer Cap Screw
G—Retainer
H—Seal

NOTE: Check condition of all O-rings. Replace if worn or damaged.

46. Install O-ring and switch (A).
47. Press the rubber vent cap in place and replace the cover (D).
48. Install sheave (C) and E-clip (B).
49. Install O-ring and dipstick (E).
50. Install O-ring and drain plug (F). Tighten to specifications.
51. Apply multipurpose grease to seal (I). Install seal flush with surface of transaxle.

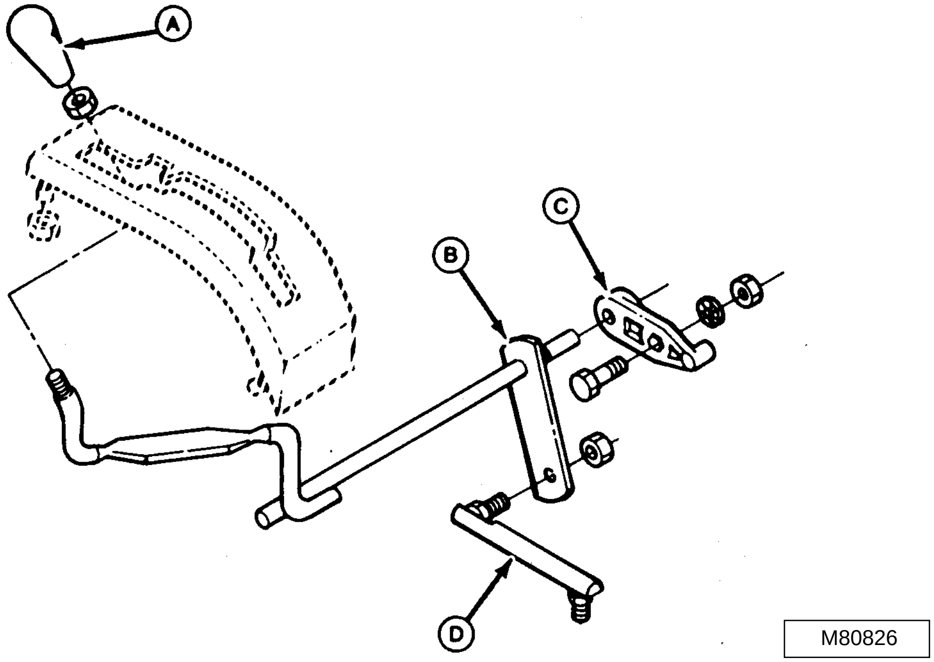
NOTE: New transaxle cases have untapped cap screw holes. Use the higher torque when installing the self-tapping cap screws.

52. Install retainer (H) and cap screw (G). Tighten cap screw to specifications.
53. Install brake.

Torque Specifications

Oil Drain Plug	39 N·m (29 lb—ft)
Retainer Cap Screw	
New Case	29 N·m (22 lb—ft)
Used Case	24 N·m (216 lb—in.)

SHIFT LEVER AND LINKAGE



A—Knob

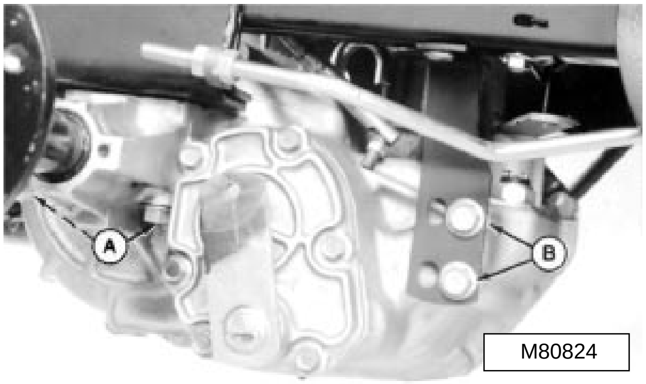
B—Shift Lever

C—Shift Lever Bearing (2 used)

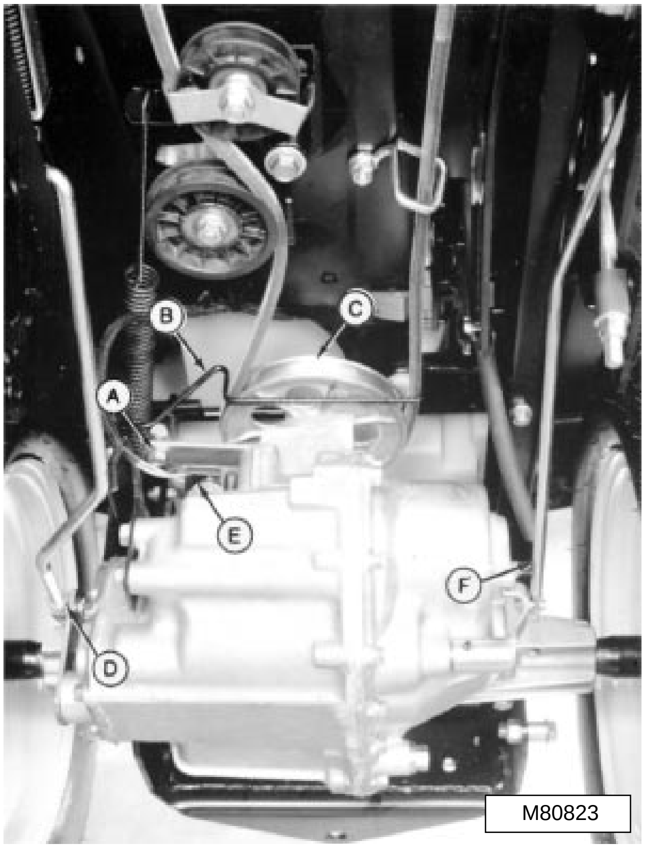
D—Shift Link

1. Remove fuel tank. (See Section 3 - Engine)
2. Remove parts (A)-(D).
3. Inspect parts for wear or damage. Replace as necessary.
4. Install all parts.
5. Install fuel tank.
6. Adjust shift lever linkage. Shift detents should be noticeable, and the correct gear position must be indicated on the quadrant.

TRANSAXLE UNIT INSTALLATION



1. Install transaxle. Install four washers and nuts (A) loosely.
2. Install cap screws (B) in forward holes of bracket.
3. Tighten cap screws and nuts to 50 N·m (37 lb—ft).



A—Shift Linkage

B—Belt Guide

C—Input Sheave

D—Brake Linkage

E—Neutral Start Switch Wiring Connector

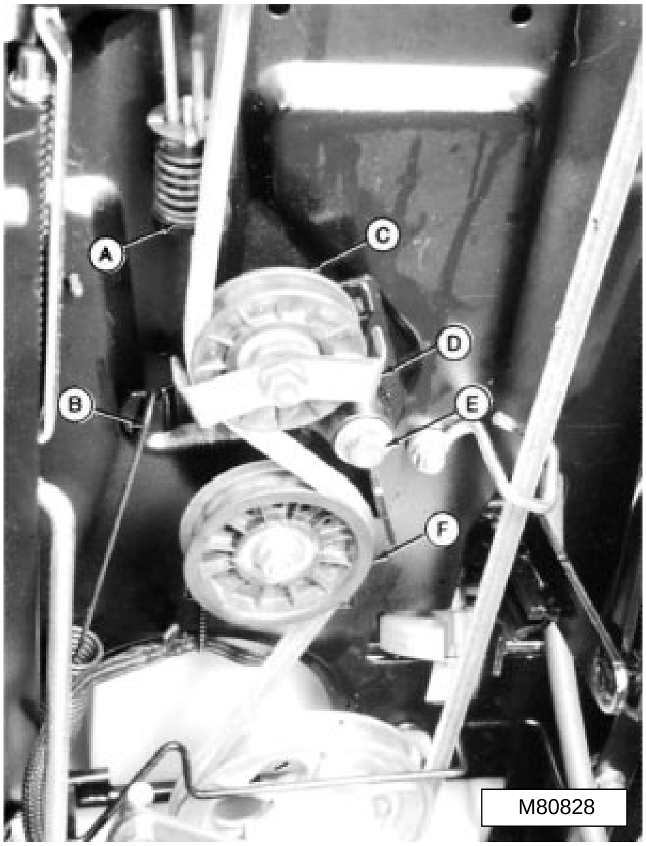
F—Clutch Linkage

4. Connect linkages (A, D and F).
5. Connect wiring connector (E).
6. Engage park/service brake.
7. Install drive belt on sheave (C).
8. Disengage park/service brake.
9. Install and adjust belt guide (B).
10. Install rear wheels
11. Fill transaxle with Low Viscosity HY-GARD to full mark on dipstick.

*NOTE: Approximate transaxle oil capacity is **3.6 L (3.8 U.S. Qt.)**.*

CLUTCH ASSEMBLY

Remove, Inspect And Install Clutch Assembly



A—Extension Rod

B—Return Spring

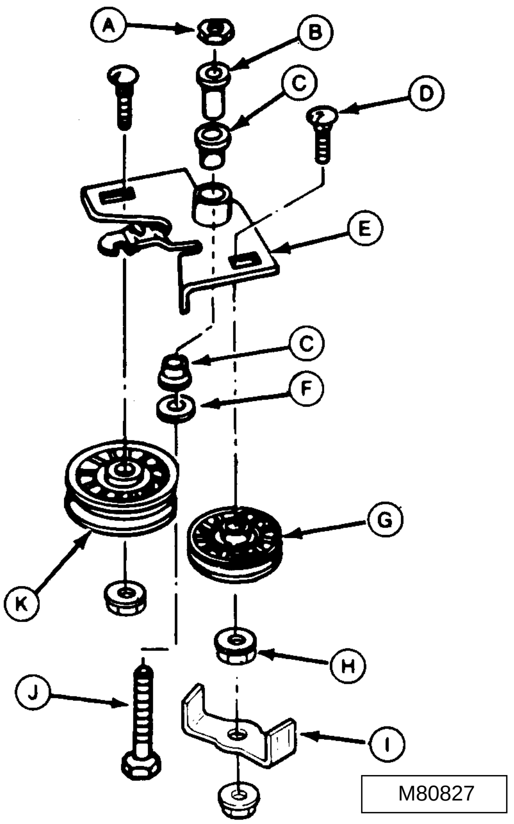
C—V-Idler Sheave

D—Belt Guide

E—Cap Screw

F—Flat Idler Sheave

1. Remove mower deck. (See Mowers in Attachments - Section 9 of this manual.)
2. Remove fenderdeck. (See Engine - Section 3 of this manual.)
3. Disconnect spring (B) and rod (A).
4. Remove guide (D) and sheaves (C and F).
5. Remove cap screw (E) and clutch assembly.



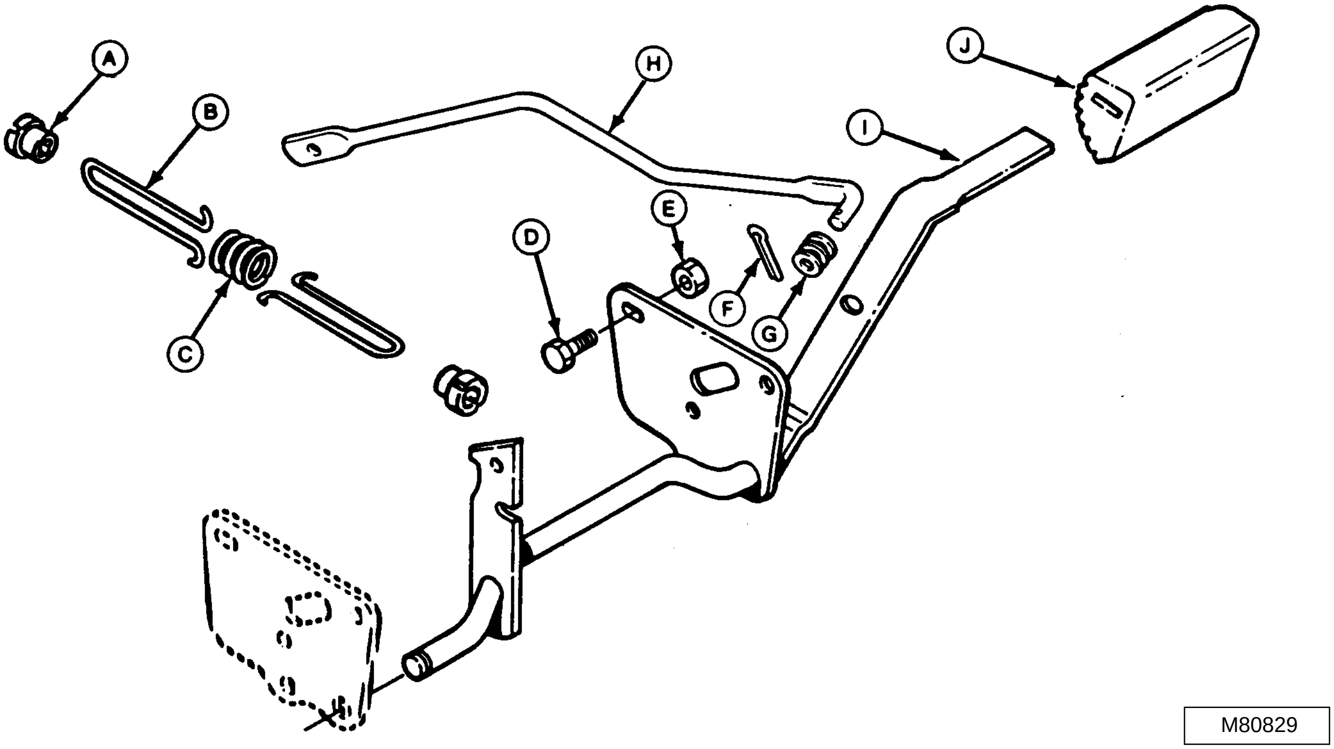
A—Flange Nut
B—Bushing
C—Plastic Bushing (2 used)
D—Carriage Bolt (2 used)
E—Clutch Arm
F—Washer
G—V-Idler Sheave
H—Flange Nut (3 used)
I—Belt Guide
J—Cap Screw
K—Flat Idler Sheave

NOTE: Bushings (C) are plastic.

6. Inspect parts (A-K) for wear or damage. Replace if necessary.
7. Install clutch assembly.
8. Install sheaves (G and K)
9. Install belt guide (I). Adjust clearance. (See Belt Guide in this section.)
10. Connect rod and return spring.
11. Install fenderdeck.
12. Install mower deck.

CLUTCH PEDAL AND LINKAGE

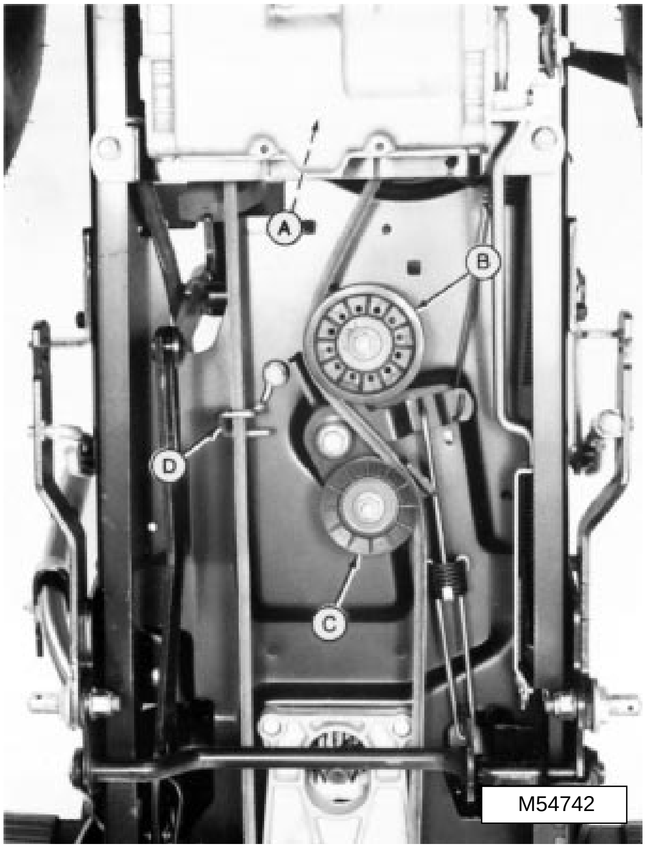
Inspect and Repair Clutch Pedal and Linkage



A—Cap (2 used)
B—Extension Rod (2 used)
C—Extension Spring
D—Cap Screw (3 used)
E—Nut (3 used)
F—Cotter Pin
G—Washers
H—Linkage Rod
I—Clutch/Brake Pedal Shaft
J—Clutch Pedal Pad

1. Remove brake pedal and linkage.
2. Disconnect extension rod (B).
3. Remove cap screws (D) and nuts (E).
4. Remove parts (F-H).
5. Remove shaft (I).
6. Inspect parts for wear of damage. Replace as necessary.
7. Install pedal shaft.
8. Connect linkage and extension rods.
9. Install brake pedal and linkage.

REPLACE TRACTION DRIVE BELT



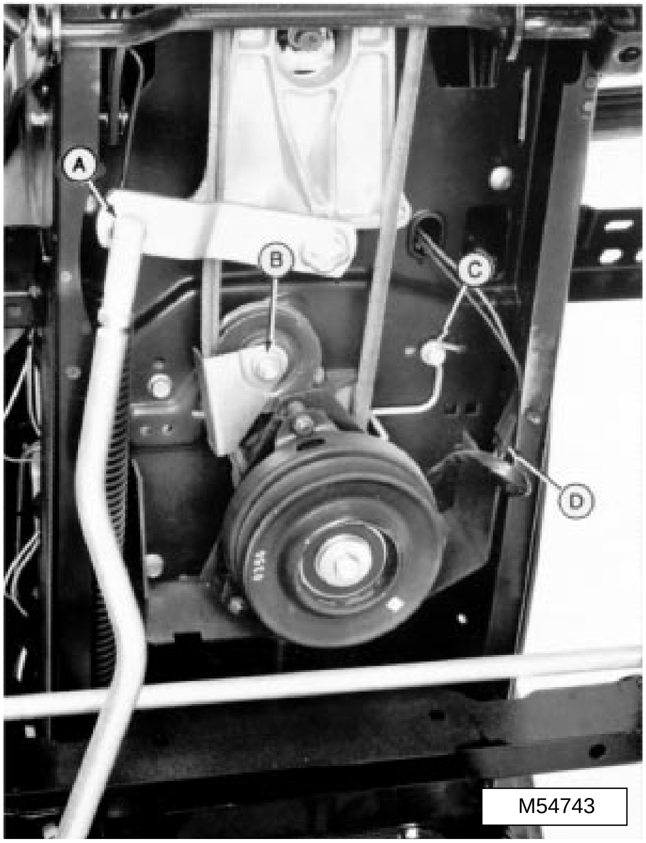
A—Transaxle Driven Sheave

B—Flat Idler Sheave

C—V-Idler Sheave

D—Belt Guide

1. Remove mower deck. (See Attachments - Section 9.)
2. Depress clutch and brake pedal and lock park brake.
3. Remove belt from transaxle driven sheave (A).
4. Remove belt guide (D).
5. Remove sheaves (B and C).



A—Steering Drag Link

B—Nut

C—Belt Guide

D—Electric PTO Wiring Connector

6. Remove nut (B).
7. Remove belt guide (C).
8. Disconnect wiring connector (D).
9. Disconnect drag link (A).
10. Replace drive belt.
11. Connect steering link and wiring connector.
12. Install guides and sheaves. Adjust guides. (See this section.)
13. Install mower deck.

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CONTENTS

ADJUSTMENT SPECIFICATIONS

Forward Pedal Arm-to-Frame Height	76—80 mm (3—3.100 in.)

REPAIR SPECIFICATIONS

Transmission

Transmission Oil Capacity	4.3 L (4.7 qts)
Rear Transmission-to-Frame Mounting Nut Torque	54 N•m (40 lb-ft)
Front Transmission-to-Frame Mounting Nut Torque	27 N•m (20 lb-ft)
Final Pinion	
Bushing I.D.	17.050—17.130 mm (0.671—0.674 in.)
Shaft O.D.	16.970—16.990 mm (0.668—0.669 in.)
Bushing/Shaft Clearance	0.060—0.160 mm (0.002—0.006 in.)
Bushing/Shaft Clearance (wear limit)	0.500 mm (0.197 in.)
Differential Gears	
Pinion Gear I.D.	15.050—15.060 mm (0.592—0.593 in.)
Pinion Shaft O.D.	14.960—14.980 mm (0.589—0.590 in.)
Pinion Gear/Shaft Clearance	0.050—0.100 mm (0.002—0.004 in.)
Pinion Gear/Shaft Clearance (wear limit)	0.500 mm (0.197 in.)
Axle Shafts	
Bearing I.D.	25.440—25.530 mm (1.001—1.005 in.)
Axle Shaft O.D.	25.320—25.380 mm (0.997—1.00 in.)
Axle Shaft/Bushing Clearance	0.060—0.210 mm (0.002—0.008 in.)
Axle Shaft/Bushing Clearance (wear limit)	0.500 mm (0.019 in.)
Brake Assembly	
Steel Plate Thickness	4.400—4.600 mm (0.160—0.180 in.)
Steel Plate Thickness (Minimum)	4.300 mm (0.170 in.)
Friction Plate Thickness	2.900—3.100 mm (0.110—0.120 in.)
Friction Plate Thickness (Minimum)	2.700 mm (0.100 in.)
Steel Plate Thickness	1.100—1.300 mm (0.040—0.050 in.)
Steel Plate Thickness (Minimum)	1.000 mm (0.039 in.)
Motor Actuator/Thrust Bearing	
Actuator Contact Face/Ball Measurement	14.185—14.335 mm (0.558—0.564 in.)
Housing Contact Face/Ball Measurement	34.125—34.325 mm (1.340—1.350 in.)
Swash Plate/Shift Blocks	
Swash Plate/Shift Block Clearance	0.010—0.110 mm (0.00039—0.0043 in.)
Swash Plate/Shift Block Clearance (wear limit)	0.150 mm (0.006 in.)
Center Case Cap Screw Torque	54 N•m (40 lb-ft)
Relief Valve Plug Torque	22 N•m (195 lb-in.)
Pump Body Cap Screw Torque	23 N•m (204 lb-in.)
Drain Plug Cap Screw Torque	15 N•m (133 lb-in.)
Housing Cap Screw Torque	23 N•m (204 lb-in.)

OTHER MATERIALS

Number	**Name**	**Use**
M79292	MPG-2® Polymer Multipurpose Grease	Prevents parts from seizing. Apply to axles shafts.
TY6305	John Deere Clean & Cure Printer	Cleans parts and speeds cure of sealant
T43514	John Deere Plastic Gasket	Seals transmission case.
T43512	John Deere Thread Lock and Sealer (Medium Strength)	Retains cap screws.

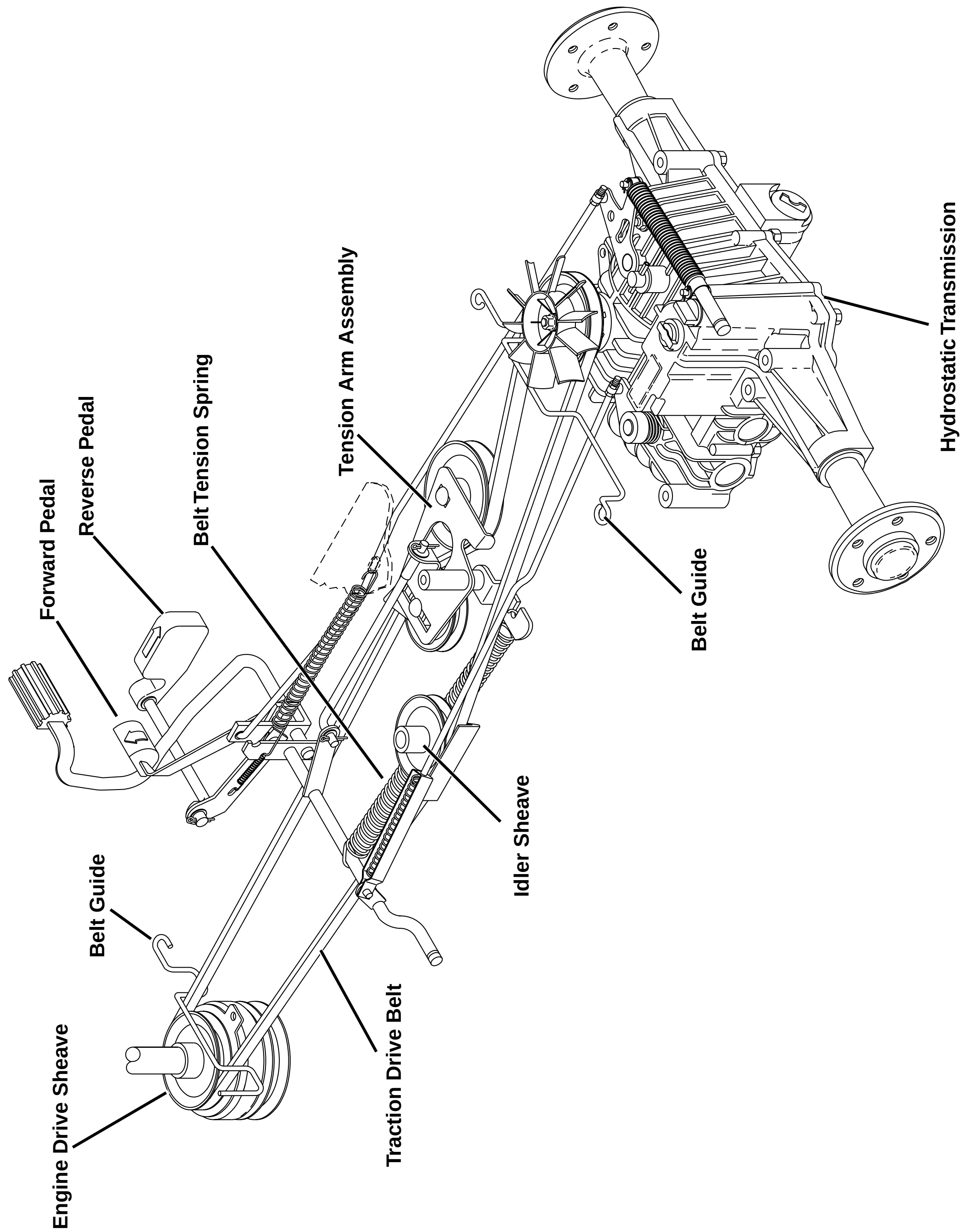
SERVICE PARTS KITS

The following kits are available through your parts catalog:

- Bearing Block Kit
- Differential Gear Kit

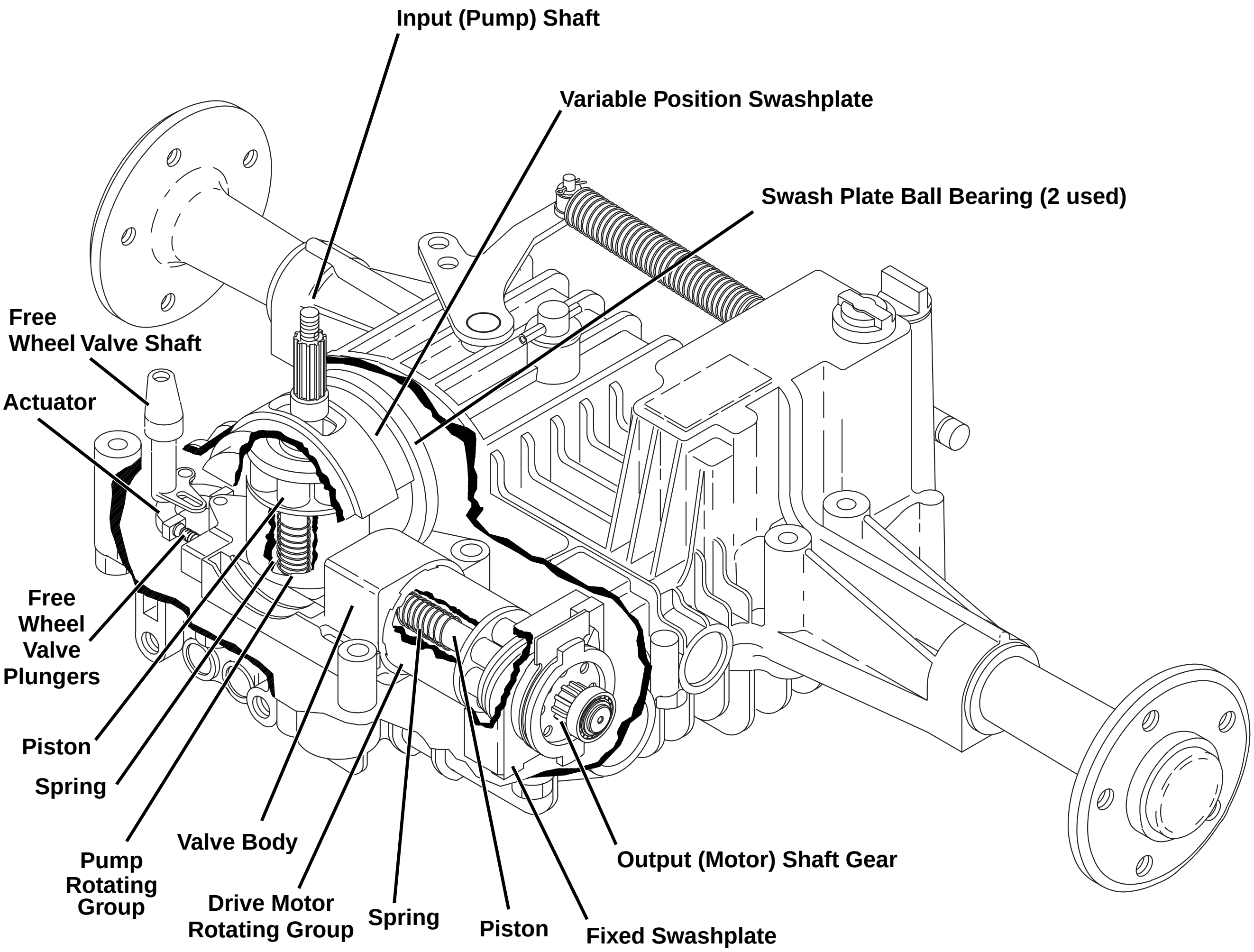
® MPG-2 is a registered trademark of DuBois USA.
® LOCTITE is a registered trademark of the Loctite Corp.

BELT DRIVE SYSTEM AND MAJOR COMPONENTS



M82755AE

HYDROSTATIC TRANSMISSION COMPONENTS



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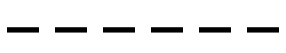
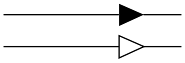
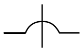
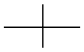
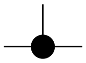
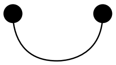
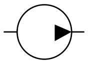
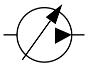
JIC HYDRAULIC CIRCUIT SYMBOLS

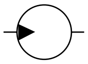
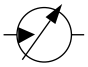
LINES

1		Working (Main) Lines
2		Pilot Control Lines
3		Drain Line
4		Hydraulic Pneumatic } Flow Direction
5	 or 	Crossing Lines
6		Joining Lines
7		Flexible Line

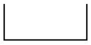
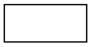
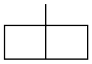
PUMPS

8		Fixed Displacement
9		Variable Displacement

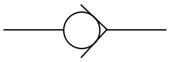
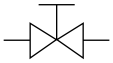
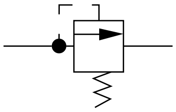
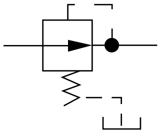
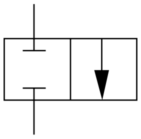
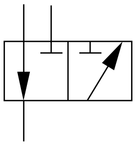
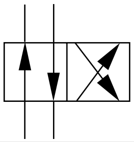
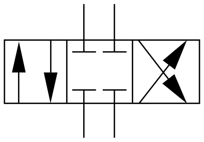
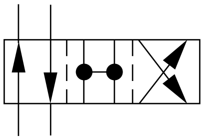
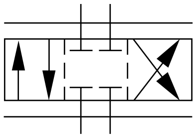
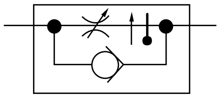
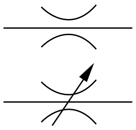
MOTORS

10		Fixed Displacement
11		Variable Displacement

RESERVOIR

12		Vented Reservoir
13		Pressurized Reservoir
14		Reservoir Return -Above Fluid Level
15		Reservoir Return -Below Fluid Level

VALVES

16		Check Valve
17		Manual On/Off Valve
19		Pressure Relief Valve
20		Pressure Reduction Valve
21		Two Position, Two Connection Valve
22		Two Position, Three Connection Valve
23		Two Position, Four Connection Valve
24		Three Position, Four Connection Valve
25		Two Position, Four Connection Valve with Transmission
26		Three Position, Four Connection Valve with Infinite Positioning
27		Adjustable Flow Control Valve (Temperature and Pressure Compensated)
18		Fixed Variable } Orifice

M82612AE

VALVE OPERATORS

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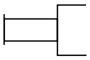
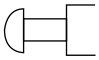
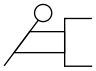
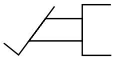
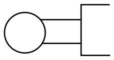
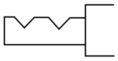
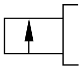
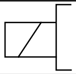
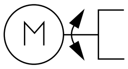
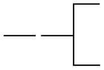
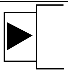
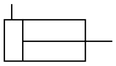
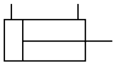
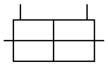
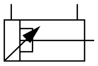
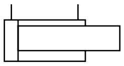
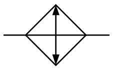
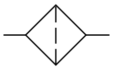
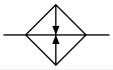
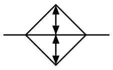
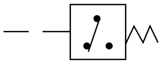
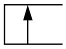
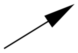
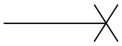
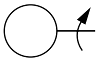
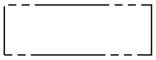
29		Manual
30		Push Button
31		Push/Pull Lever
32		Pedal or Treadle
33		Mechanical
34		Detents
35		Pressure Compensated
36		Solenoid-Single Winding
37		Reversing Motor
38		Pilot Pressure -Remote Supply
39		Pilot Pressure -Internal Supply

CYLINDERS

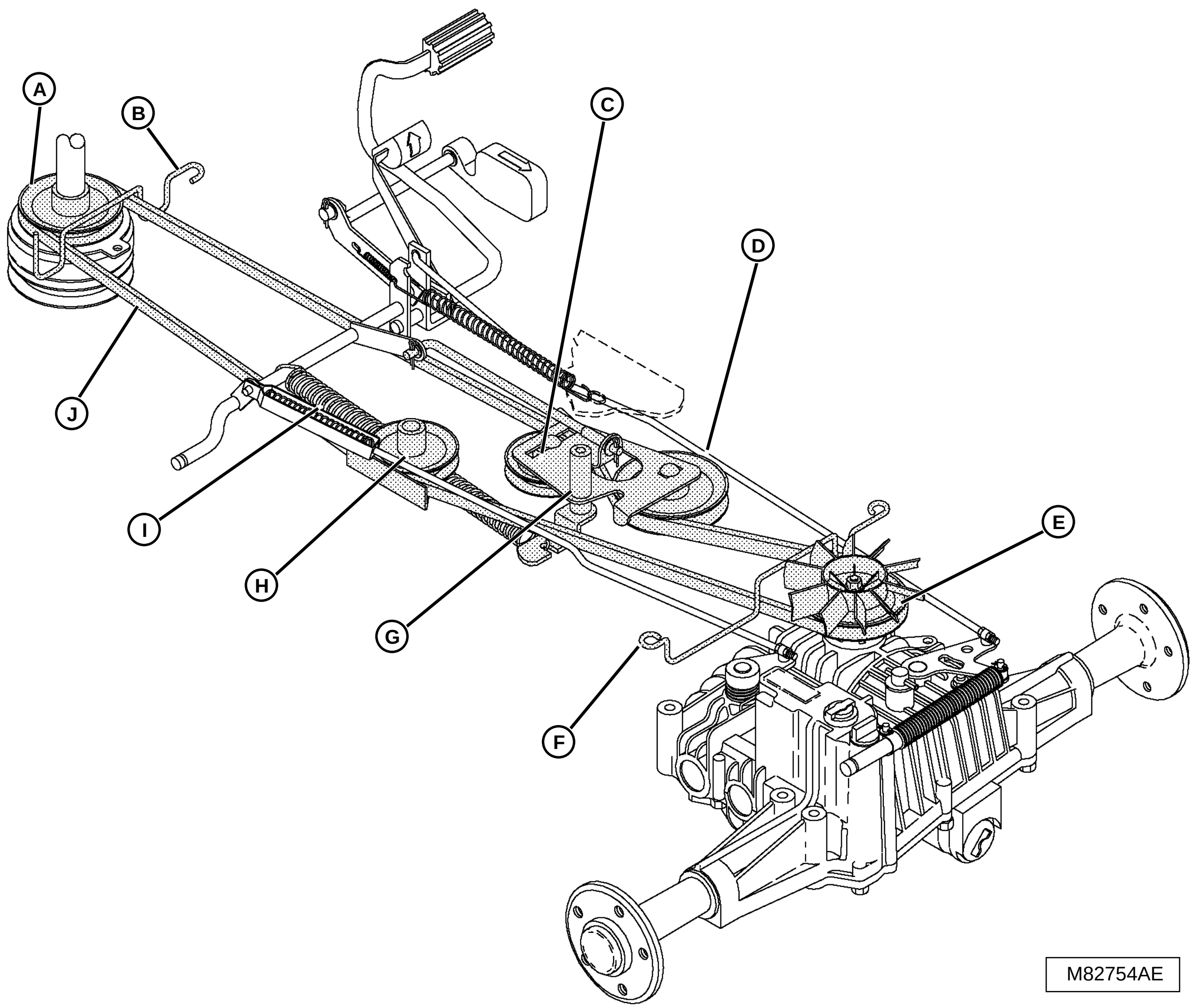
40		Single Acting
41		Double Acting, Single Rod
42		Double Acting, Double Rod
43		Double Acting, Adj. Cushion, Extend Only
44		Double Acting, Differential Piston

MISCELLANEOUS

45		Cooler
46		Filter, Strainer
47		Heater
48		Temperature Controller
49		Pressure Switch
50		Pressure Indicator
51		Temperature Indicator
52		Pressure Compensated
53		Variable Component (Symbol Thru Component)
54		Plug, Test Port, Pressure Supply Test
55		Gas Charged Accumulator
56		Spring Loaded Accumulator
57		Electric Motor
58		Shaft Rotation (Arrow on Near Side of Shaft)
59		Component Outline

M82613AE

TRACTION DRIVE BELT SYSTEM OPERATION



A— Engine Drive Sheave

B— Belt Guide

C— Belt Tensioning Sheave

D— Idler Sheave

E— Transmission Input Sheave

F— Belt Guide

G— Tension Arm Assembly

H— Idler Sheave

I— Belt Tension Spring

J— Traction Drive Belt

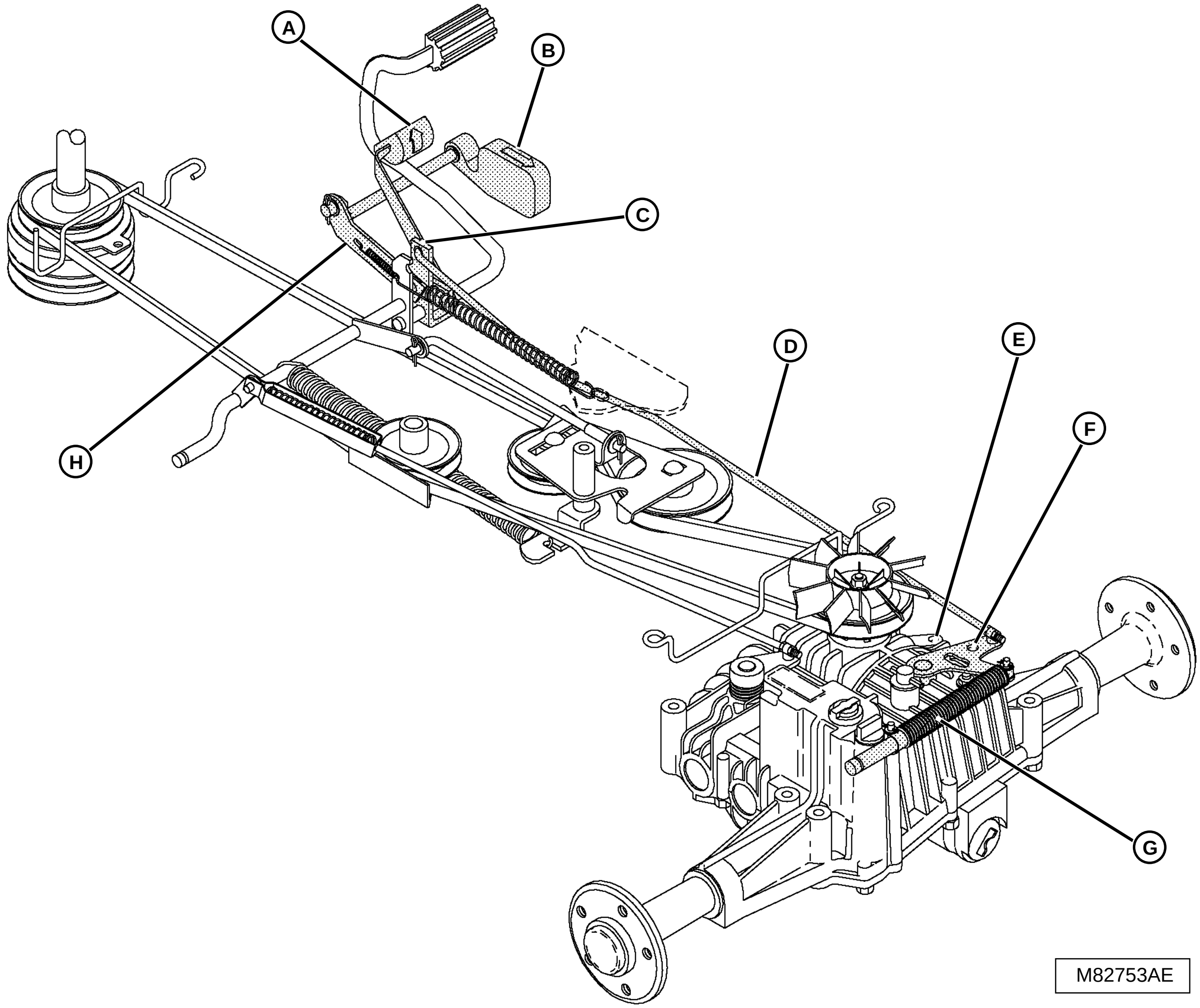
Function:

The function of the drive belt system is to transmit power from the engine to the transmission.

Theory of Operation:

The engine drive sheave (A) is keyed to the engine crankshaft. Power is transmitted through the drive belt (J) to the transmission input sheave (E). Belt tension is maintained by a tension arm assembly (G) and belt tension spring (I). Belt tension is adjusted by moving belt tensioning sheave (C) in its slotted mounting hole. Belt guides (B and F) keep the belt in the correct position and reduce unwanted vibration.

PEDAL CONTROL SYSTEM OPERATION



Forward and Reverse

Function:

The pedal control system actuates the mechanism within the transmission for forward and reverse machine movement.

Theory of Operation:

Forward

When the forward pedal (A) is depressed, lever (C) which is part of the forward pedal assembly rotates toward the front of the machine. As the lever moves, control rod (D) connected to the lever and the hydrostatic control arm (F) also moves forward. This causes the transmission to shift into forward drive.

Reverse

The reverse pedal (B) is connected to lever (C) by the reverse link (H). As the reverse pedal is depressed, the reverse link, lever and control rod are also driven toward the rear of the machine. This causes the transmission to shift into reverse drive.

When the Forward/Reverse pedals are released, the transmission is returned to the neutral position by a return spring located inside the transmission, and the motion is dampened by the shock absorber (G).

A— Forward Pedal Assembly

B— Reverse Pedal Assembly

C— Lever

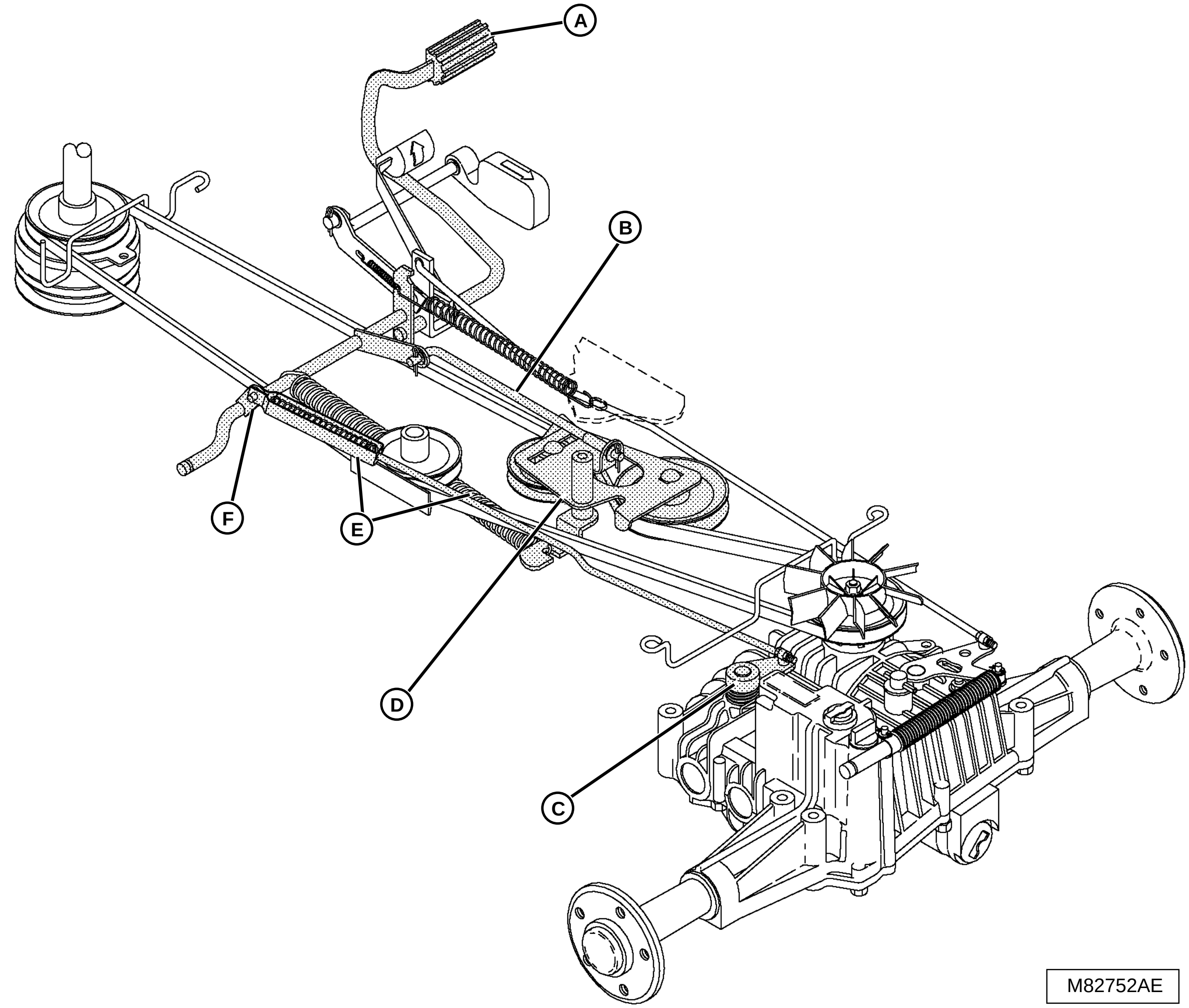
D— Control Rod

E— Free Wheel Valve Control Arm

F— Hydrostatic Control Arm

G— Shock Absorber

H— Reverse Link



Brake Linkage, Drive Belt Disengagement

Function:

To stop machine motion and disengage power from the engine to the transmission.

Theory of Operation:

When the break pedal (A) is depressed it rotates the brake pedal shaft (F) forward. Attached to the lever is the belt tension release rod (B). Movement of the lever is transferred to the rod which engages the end of the slot in the tension arm assembly (D). Continued movement pulls the left side of the tensioner arm forward and disengages drive belt tension.

Also attached to shaft (F) is the brake actuating arm and spring assembly (E). Movement of the lever is transferred through the rod to the transmission brake control arm (C) to provide braking action.

A— Brake Pedal

B— Belt Tension Release Rod

C— Brake Control Arm

D— Tension Arm Assembly

E— Actuating Arm and Spring Assembly

F— Brake Pedal Shaft

HYDROSTATIC SYSTEM OPERATION

Function:

Transfers power from the input sheave to the gear drive components of the transmission. It also provides infinitely variable speed and torque within a range in forward and reverse direction.

Theory of Operation:

As the input (pump) shaft (H) is turned by the drive belt and input sheave, the pump rotating group consisting of the pump (G) and charge pump (F) also turn. The charge pump draws pressure-free oil from the reservoir (K) through the filter (J) and pressurizes it to approximately 356 kPa (36 psi). The pressure of the charge oil is enough to unseat the forward and/or reverse check valve (D and N), supplying charge pressure oil to the pump.

Neutral

With the transmission in the neutral position, springs in the pump cylinder block force the pump pistons against the variable position swash plate which is parallel to the pump body. With the swash plate parallel to the pump body, the pistons do not reciprocate in the cylinder block, they merely rotate, no oil is being drawn in or discharged from the pump. The pump is in a zero displacement position and the machine remains stationary.

Forward

As the direction control arm is moved to the forward position, the variable position swash plate is moved from the neutral position (parallel to the pump body) to a forward angle position. Springs inside the cylinder bores force the pistons against the swash plate. As the pistons rotate and follow the contour of the swash plate they move outward, drawing oil into their bores. As the pistons continue to rotate, the swash plate angle forces the pistons back into the bores, forcing oil out of the bores through the valve plate.

High pressure oil from the pump forces the forward check valve (D) closed and supplies high pressure oil to the drive motor rotating group (B). The motor rotating works in conjunction with a fixed position swash plate. Oil enters the piston bore through a port in the valve plate at a point where the piston is compressed in its bore.

As the oil fills the piston bore, the piston is forced out and follows the contour of the swash plate. This causes the motor rotating group to rotate. Oil pressure within these components is directly proportional to the load encountered. This is known as the high pressure side of the system.

As the motor continues to rotate, the piston is now compressed by the angle of the swash plate and oil is forced from the piston bore into the other port in the valve plate. This oil is directed back to the suction side of the pump. There is minimal oil pressure from the back to the motor and this is referred as the low pressure side of the system.

Reverse

As the direction control arm is moved to the reverse position, the variable position swash plate is moved from the neutral position (parallel to the pump body) to an reverse angle position. Springs inside the cylinder bores force the pistons against the swash plate. As the pistons rotate and follow the contour of the swash plate they move outward, drawing oil into their bores. As the pistons continue to rotate, the swash plate angle forces the pistons back into the bores, forcing oil out of the bores through the valve plate.

High pressure oil from the pump forces the reverse check valve (N) closed and supplies high pressure oil to the drive motor rotating group (B). Some high-pressure oil is bled off to the charge make-up oil through the fixed orifice (O).

The motor rotating works in conjunction with a fixed position swash plate. Oil enters the piston bore through a port in the valve plate at a point where the piston is compressed in its bore. As the oil fills the piston bore, the piston is forced out and follows the contour of the swash plate. This causes the motor rotating group to rotate, but in a reverse direction.

As the motor continues to rotate, the piston is now compressed by the angle of the swash plate and oil is forced from the piston bore into the other port in the valve plate. This oil is directed back to the suction side of the pump. There is minimal oil pressure from the back to the motor and this is referred as the low pressure side of the system.

This cycle where the oil is moved from the pump to the motor and back to the pump again is referred as a closed loop system.

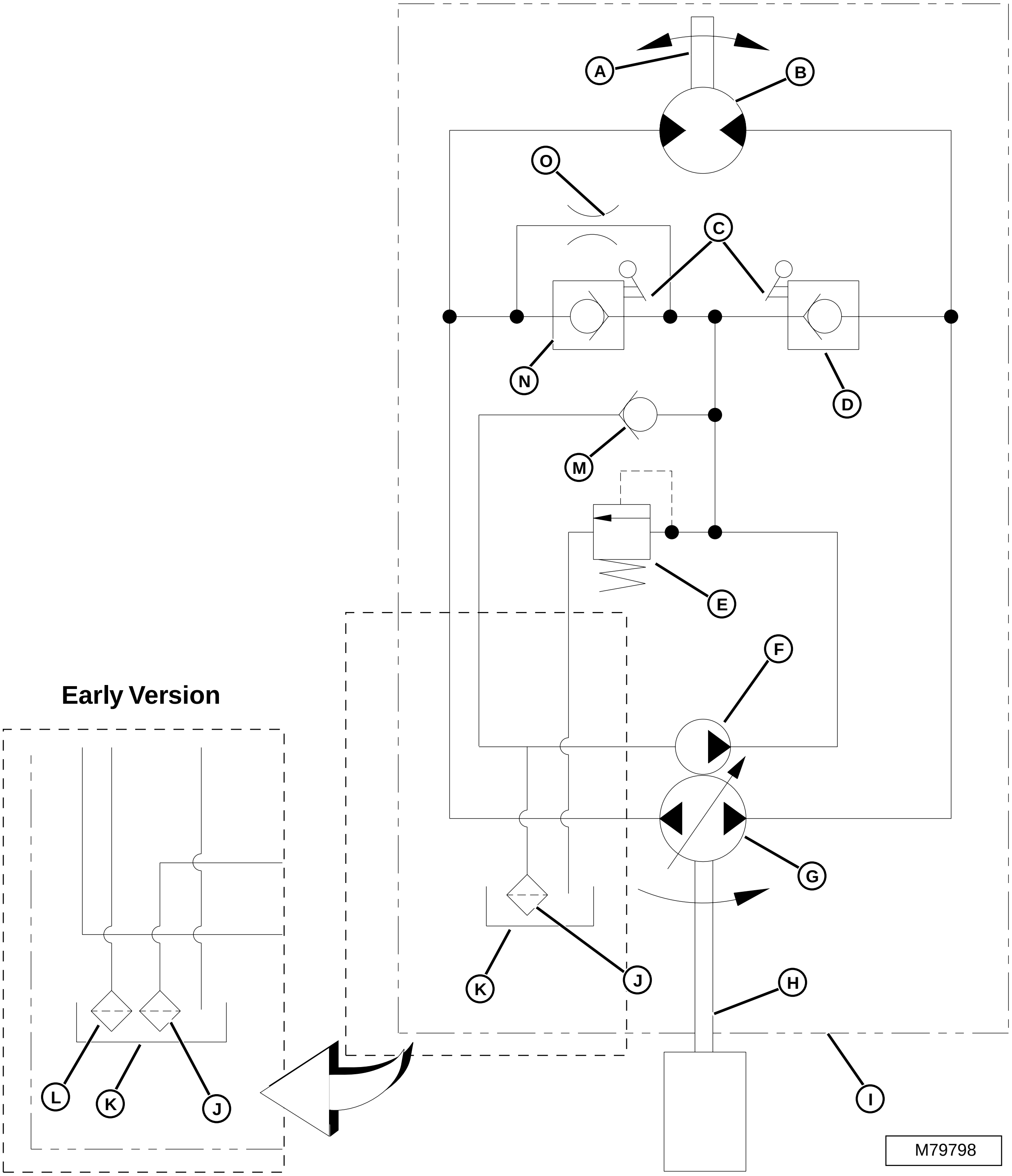
A certain amount of oil is lost in the closed loop due to internal leakage, if charge pressure drops, the charge pump bypass valve (M) will open supplying additional make-up oil to the pump.

If the charge oil pressure becomes excessive, the charge relief valve (E) will open dumping oil to the reservoir (K).

Free Wheel

When the free wheel valve control lever is engaged this rotates the eccentric, moving the actuator. The actuator moves the free wheel valve plungers (C) against the forward/reverse check valves (D and N). This forces the check valves off their seats and allows oil to flow from both sides of the motor to the reservoir. Normally the motor would have excessive resistance to movement due to dynamic braking of the hydrostatic closed loop.

A— **Output (Motor) Shaft**
B— **Hydrostatic Drive Motor Rotating Group**
C— **Free Wheel Valve Plungers**
D— **Forward Check Valve**
E— **Charge Pump Relief Valve**
F— **Charge Pump**
G— **Variable Hydrostatic Pump**
H— **Input (Pump) Shaft**
I— **Transmission Case**
J— **Internal Oil Filter**
K— **Reservoir**
L— **Bypass Valve Screen (Early Version Only)**
M— **Charge Pump Bypass Valve**
N— **Reverse Check Valve**
O— **Fixed Orifice**



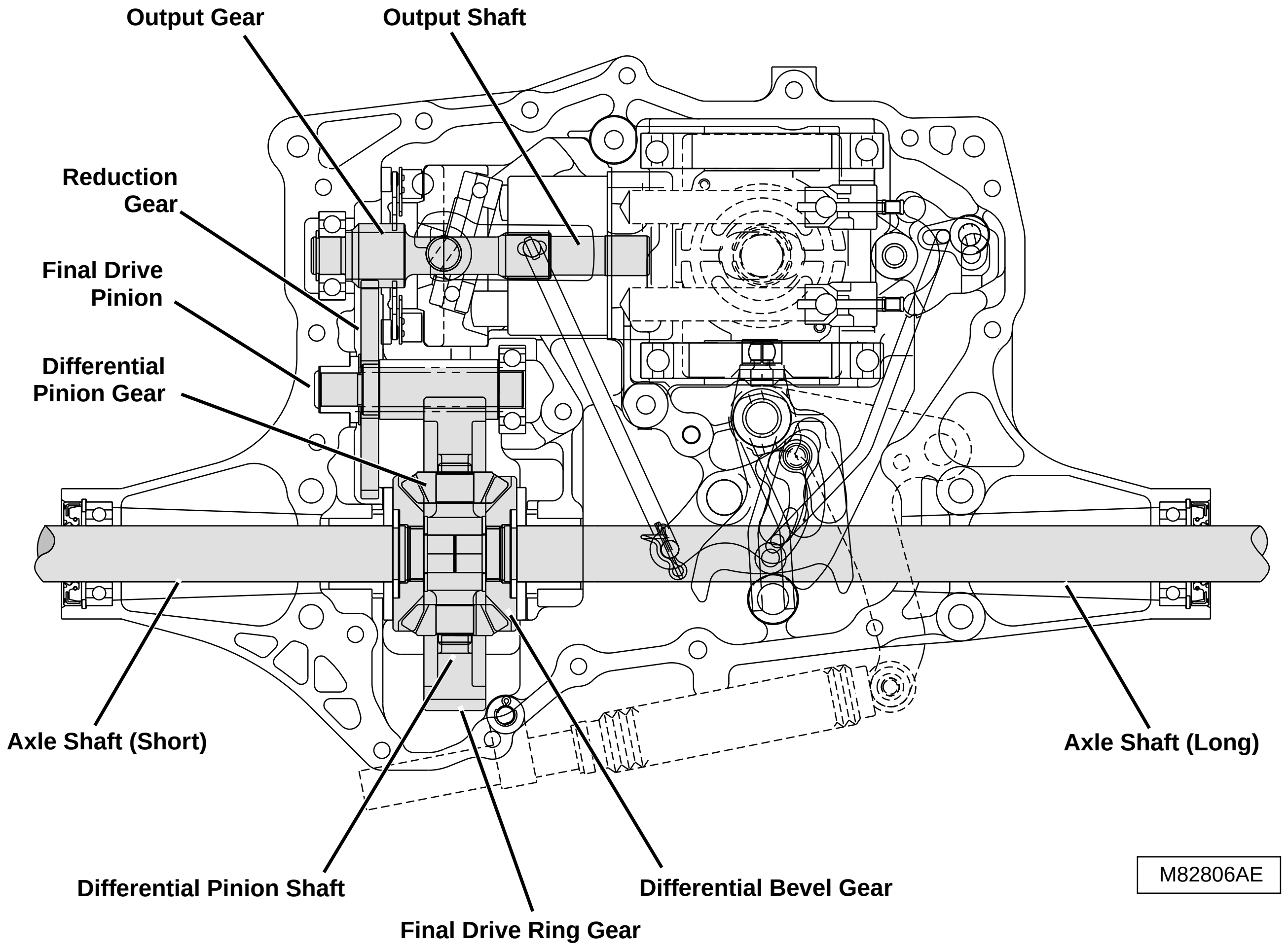
TRANSAXLE OPERATION— GEAR POWER FLOW

Function:

The gear components transfer power from the hydrostatic transmission components of the transmission to the drive wheels. They also provide a means of making turns with differential action for smooth operation.

Theory of Operation:

Output shaft and gear are splined to the hydrostatic motor. Power from the motor is transferred to the shaft. The output shaft gear meshes with the reduction gear which drives the final drive pinion. The final drive pinion drives the final drive ring gear. Power is transferred from the ring gear to the differential pinion shaft and differential pinion gears, the differential pinion gears in turn transfer power to the differential bevel gears. The differential bevel gears transfer power directly to the axle shafts.



TRANSMISSION HYDROSTATIC CONTROL LINKAGE OPERATION

Function:

The function of the internal linkage is to control the movement of the hydrostatic swash plate to include forward, reverse, return to neutral and true neutral.

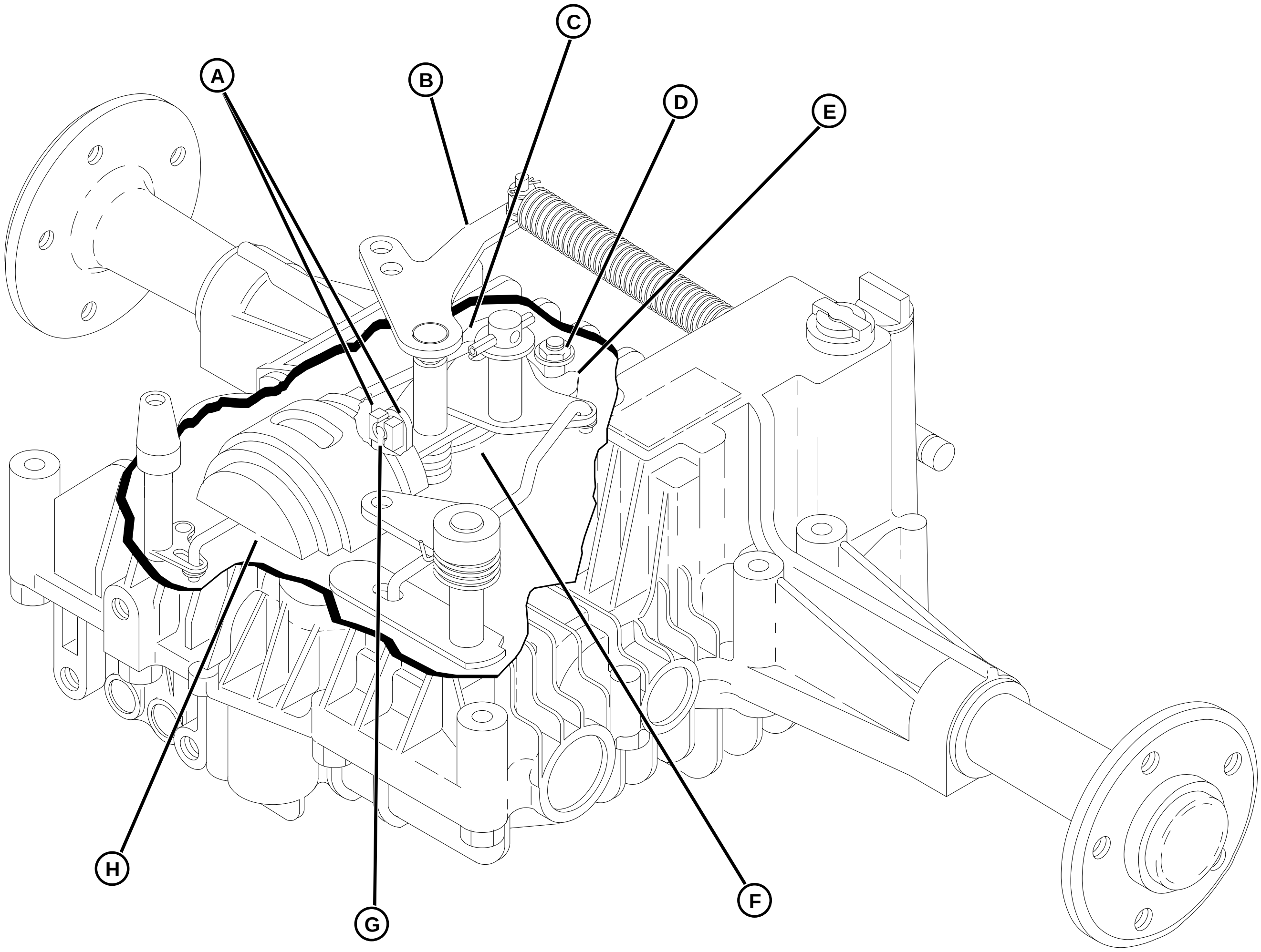
Theory of Operation:

When the hydrostatic control arm (B) is moved to the forward position, the swashplate control cam (C) moves an equal amount. A ball joint pivot (G) attached to the control cam transfers movement to the swashplate through the shift blocks (A). As the swashplate is moved, the angle of the swashplate changes allowing the pump pistons to reciprocate.

When force is removed from the swashplate control arm the swashplate returns to the neutral position. The neutral control spring (F) applies pressure on the lobe attached to the swashplate control cam. This forces the swashplate back to the neutral position.

When in neutral, the lobe on the swashplate control cam is retained between the two legs of the torsion spring. The spring legs rest on the neutral adjustment eccentric cam (E). When the neutral adjustment eccentric is turned, it moves the spring legs and swashplate control cam to obtain true neutral. The neutral adjustment eccentric is held in place by nut (D).

A— Shift Blocks
B— Hydrostatic Control Arm
C— Swashplate Control Cam
D— Neutral Adjustment Eccentric Nut
E— Neutral Adjustment Eccentric
F— Neutral Control Spring
G— Ball Joint Pivot
H— Variable Position Swashplate



M82807AE

POWER TRAIN TROUBLESHOOTING CHART

PROBLEM OR SYMPTOM / CHECK OR SOLUTION	Machine will not move forward or reverse.	Transmission noisy.	Machine moves with control pedals in neutral and brake not applied.	Machine moves in forward direction only.	Machine moves in reverse direction only.	Erratic speed.	Machine does not achieve full ground speed.	Machine will not move in forward or is slow in forward.	Machine is slow in reverse.	Machine is too aggressive in forward or reverse.	Parking brake does not hold machine on hill.	Neutral start switch will not engage.	Free wheel valve will not work.	Free wheel valve will not stay open with engine off.
Oil level low.	●	●				●	●	●	●					
Temperature too cold.		●	●				●	●						
Wrong oil/incorrect viscosity.		●	●						●		●			
Control linkage out of adjustment or damaged.	●		●	●	●		●	●	●			●		
Brake linkage damaged.	●	●				●	●	●	●		●	●		
Defective neutral switch.												●		
Parking brake engaged.	●	●						●	●					
Traction drive belt broken, worn, etc.	●					●	●	●	●					
Air in system.		●				●	●	●	●					
Check pivot free wheel lever for binding/debris/paint between lever and housing.														●
Internal oil filter plugged.	●	●				●	●	●	●					
Cooling fan broken. Oil too hot.							●	●	●					
Debris/trash on transmission. Oil too hot.							●	●	●			●		
Water in oil.		●				●								
Shock absorber binding/ damaged.	●		●	●	●		●	●	●	●	●	●		
Neutral eccentric out of adjustment.			●								●			
Control arm roll pin broken.	●		●				●	●	●					
Control arm broken.[a]	●		●	●	●		●	●	●		●			
Internal transmission damage (pump or motor).[a]	●	●				●	●	●	●					

Continued on next page.

POWER TRAIN TROUBLESHOOTING CHART, continued

PROBLEM OR SYMPTOM CHECK OR SOLUTION	Machine will not move forward or reverse.	Transmission noisy.	Machine moves with control pedals in neutral and brake not applied.	Machine moves in forward direction only.	Machine moves in reverse direction only.	Erratic speed.	Machine does not achieve full ground speed.	Machine will not move in forward or is slow in forward.	Machine is slow in reverse.	Machine is too aggressive in forward or reverse.	Parking brake does not hold machine on hill.	Neutral start switch will not engage.	Free wheel valve will not work.	Free wheel valve will not stay open with engine off.
Damaged charge pump. [a]		●					●	●	●					
Input shaft broken. [a]	●													
Charge relief valve stuck open, dirty or damaged. [a]		●					●	●	●					
Free wheel valve stuck open or damaged. [a]	●	●				●	●	●	●				●	
Reverse check valve stuck open. [a]	●			●		●			●		●			
Reverse check valve orifice plugged. [a]			●							●	●			
Forward check valve stuck open. [a]	●				●	●	●	●						
Wrong check valve in the reverse circuit. [a]			●							●				
Charge pump check valve open (3rd valve). [a]		●					●	●	●					
Motor shaft damaged. [a]	●					●					●			
Motor shaft gear damaged. [a]	●					●					●			
Final drive pinion damaged. [a]	●	●				●					●			
Final ring gear damaged. [a]	●	●				●					●			
Differential gears damaged. [a]	●										●			
Axle shaft damaged. [a]	●										●			

[a] *Requires removal of transmission from machine and disassembly.*

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MACHINE WILL NOT MOVE FORWARD OR REVERSE

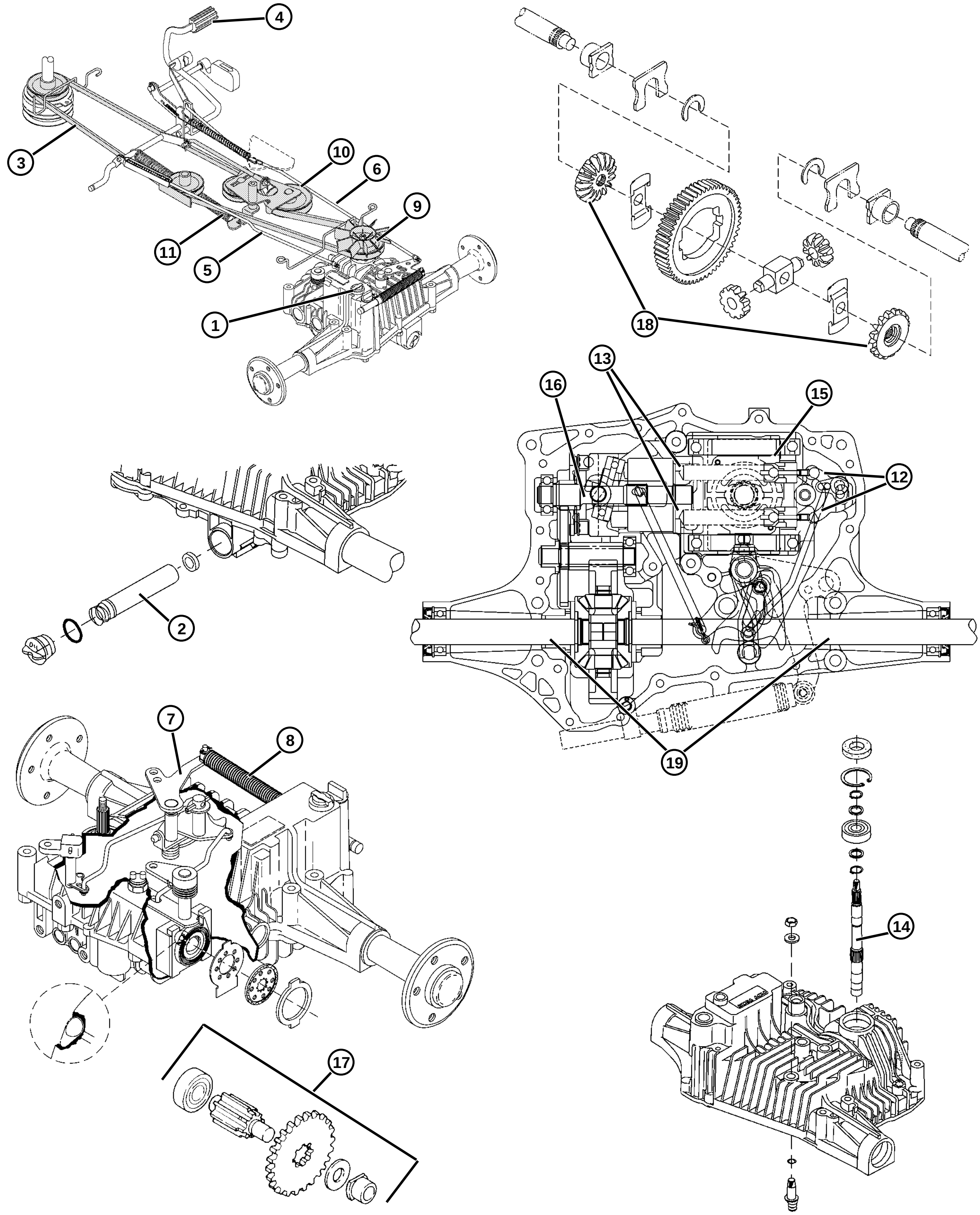
Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Hydrostatic transmission reservoir/dipstick cap.	Hydraulic oil at full mark with cap completely backed out of threads.	Fill to correct level with low viscosity HY-GARD® oil.
2. Hydrostatic oil filter.	Clean, free of debris, not plugged.	Replace filter.
3. Traction drive belt.	Not broken, worn, frayed, glazed or stretched. Properly tensioned.	Replace drive belt. Perform Drive Belt Tension Adjustment.
4. Parking Brake.	Brake not depressed and locked.	Release parking brake.
5. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding and/or replace damaged components. Adjust brake linkage to specifications. (See procedure in BRAKES section.)
6. Forward/Reverse pedal linkage.	Linkage properly adjusted. Linkage moves freely, not damaged.	Perform Pedal Height Adjustment. Eliminate binding and/or replace faulty or damaged components.
7. Control arm.	Not damaged. Roll pin not broken or missing.	Replace control arm. Replace roll pin.
8. Shock absorber.	Not binding or damaged.	Eliminate binding or replace shock absorber.
9. Transmission drive sheave.	No damage to drive keys or keyways, sheave intact with no evidence of wear at bottom of sheave.	Replace sheaves and/or keys.
10. Idler arm assembly.	Pivots freely, no wear in bearing area.	Lubricate and/or replace assembly.
11. Belt idler assembly tension spring.	Maintains tension on drive belt, not stretched or damaged.	Replace tension spring.
12. Free wheel valves.[a]	Components move freely. Components not damaged.	Clean, free up valves or replace plungers and springs.
13. Forward/Reverse check valves and seat assemblies.[a]	Ball and seats not deformed, damaged, or stuck in bores, sealing properly.	Clean, free up valves or replace forward/ reverse check valve components.
14. Input (pump) shaft.[a]	Splines not worn or damaged, positively engaged in pump.	Correct engagement or replace shaft.
15. Pump/Motor rotating groups.[a]	No scoring on valve body interface, no scoring on pistons.	Replace scored parts of rotating groups and valve body.
16. Motor output shaft with gear.[a]	Shaft with gear not worn or damaged.	Replace shaft.
17. Final drive pinion and ring gear.[a]	Pinion and gear not worn or damaged.	Replace worn or damaged components.
18. Differential gears.[a]	Gears not damaged.	Replace gears.
19. Axle shafts.[a]	Shafts not damaged.	Replace axle shafts.

[a] *Requires removal of transmission from machine and disassembly.*

MACHINE WILL NOT MOVE FORWARD OR REVERSE



M79799

MACHINE MOVES IN FORWARD DIRECTION ONLY

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Forward/Reverse pedal linkage.	Linkage properly adjusted. Linkage moves freely, not damaged.	Perform Pedal Height Adjustment. Eliminate binding and/or replace damaged components.
2. Shock absorber.	Not binding or damaged.	Eliminate binding or replace shock absorber.
3. Control arm.	Not damaged.	Replace control arm.
4. Reverse check valve.[a]	Moves freely, not stuck in open position.	Clean, unstick and/or replace check valve components.

MACHINE MOVES IN REVERSE DIRECTION ONLY

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Forward/Reverse pedal linkage.	Linkage properly adjusted. Linkage moves freely, not damaged.	Perform Pedal Height Adjustment. Eliminate binding and/or replace damaged components.
2. Shock absorber.	Not binding or damaged.	Eliminate binding or replace shock absorber.
3. Control arm.	Not damaged.	Replace control arm.
4. Forward check valve.[a]	Moves freely, not stuck in open position.	Clean, unstick valve and/or replace check valve components.

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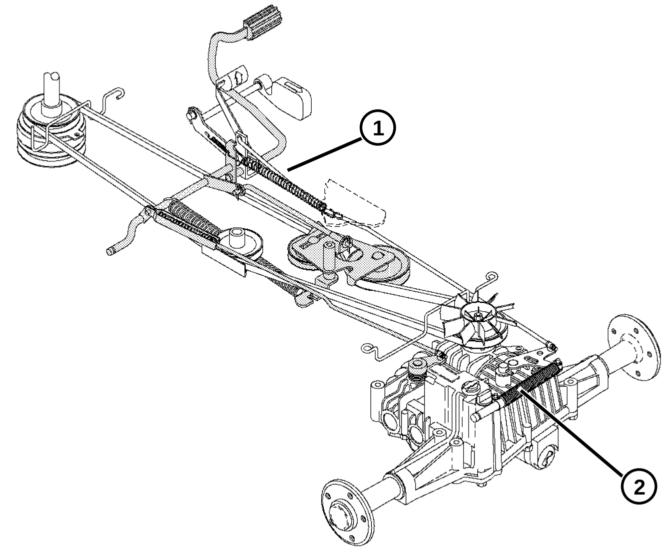
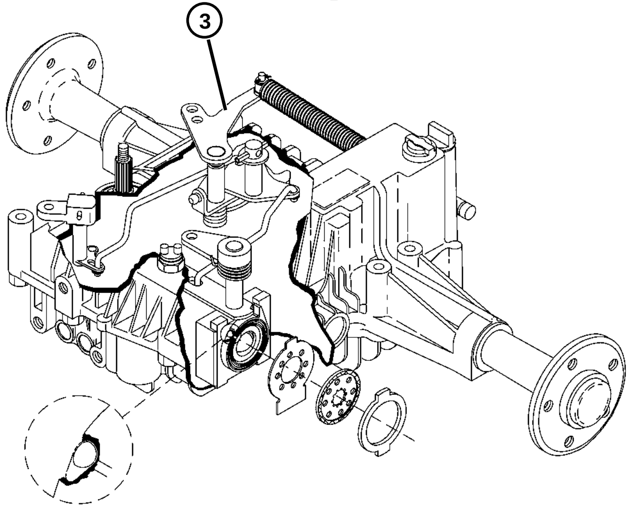
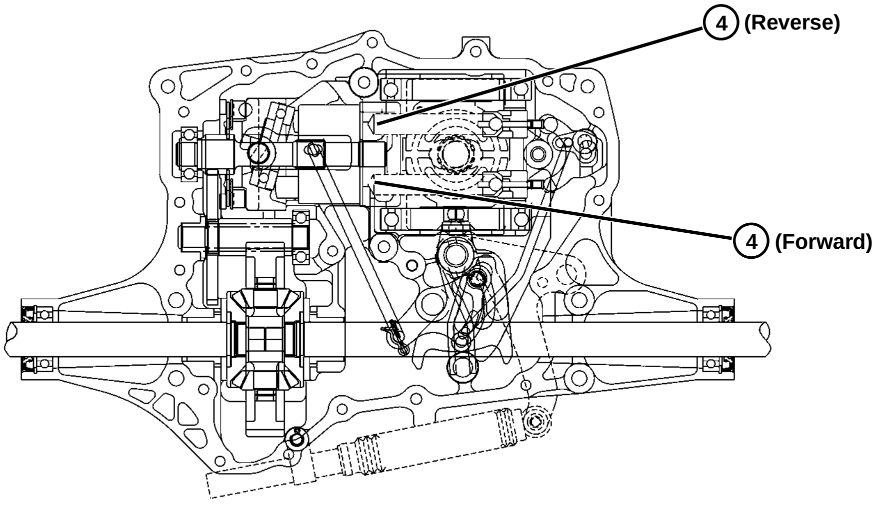
[a] *Requires removal of transmission from machine and disassembly.*

MACHINE MOVES IN FORWARD DIRECTION ONLY
MACHINE MOVES IN REVERSE DIRECTION ONLY







M79800

ERRATIC SPEED

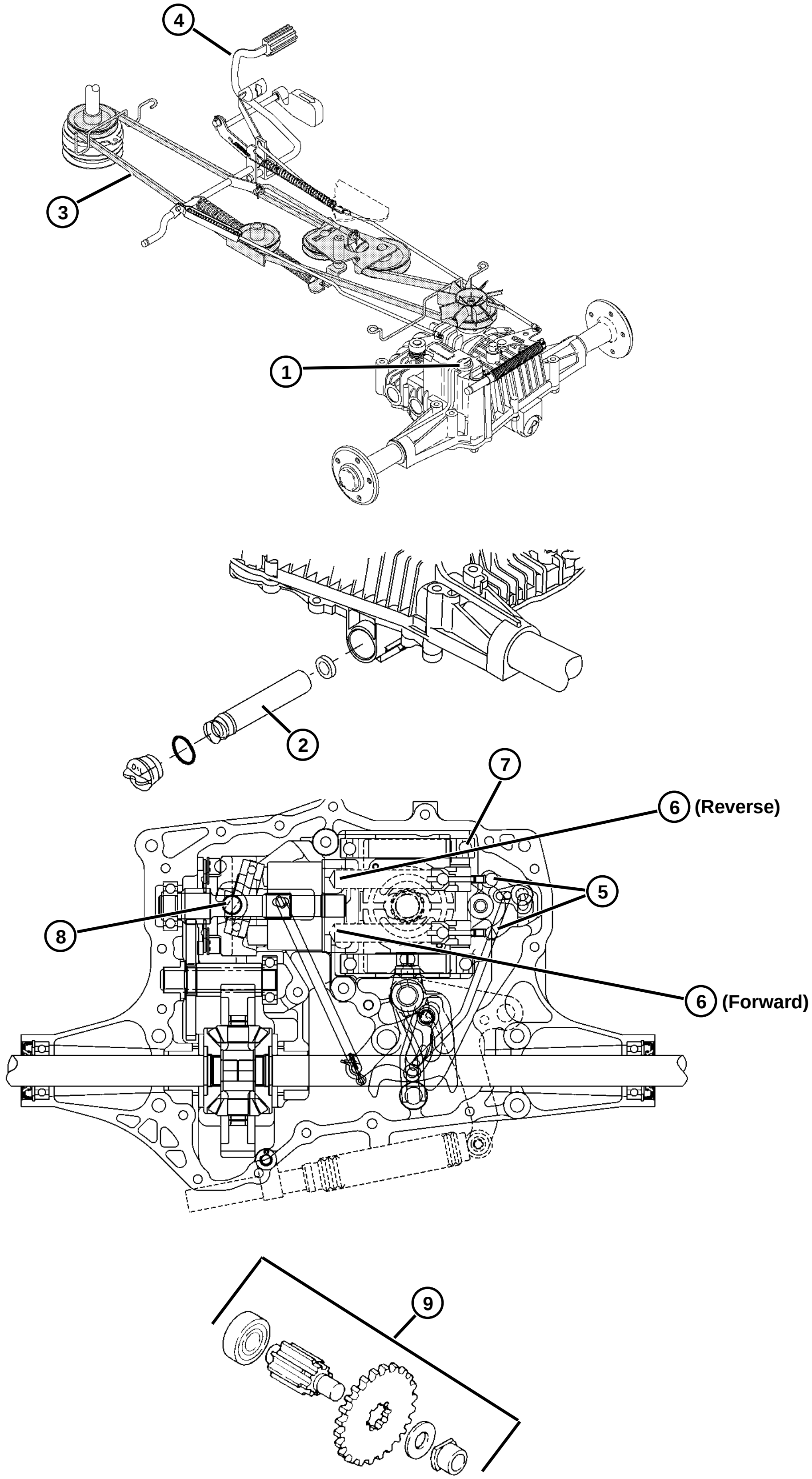
Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Hydrostatic transmission reservoir/dipstick cap.	Hydraulic oil at full mark with cap completely backed out of threads. Oil not contaminated, no water in oil. No air in system.	Fill to correct level with low viscosity HY-GARD® oil. Drain transmission and fill to correct level with low viscosity HY-GARD® oil. Start engine and run for 10-20 seconds to bleed air from system.
2. Hydrostatic oil filter.	Clean, free of debris, not plugged.	Replace filter.
3. Traction drive belt.	Not broken, worn, frayed, glazed or stretched. Properly tensioned.	Replace drive belt. Perform Drive Belt Tension Adjustment.
4. Parking brake linkage.	Brake rod and lever not damaged or binding.	Eliminate binding and/or replace damaged components.
5. Free wheel valves.[a]	Components move freely. Components not damaged.	Clean, free up valves or replace plungers and springs.
6. Forward/Reverse check valves and seat assemblies.[a]	Ball and seats not deformed, damaged, or stuck in bores, sealing properly.	Clean, free up valves or replace forward/reverse check valve components.
7. Pump/Motor rotating groups.[a]	No scoring on valve body interface, no scoring on pistons.	Replace scored parts of rotating groups and valve body.
8. Motor output shaft with gear.[a]	Shaft with gear not worn or damaged.	Replace shaft.
9. Final drive pinion and ring gear.[a]	Pinion and gear not worn or damaged.	Replace worn or damaged components.

[a] *Requires removal of transmission from machine and disassembly.*

ERRATIC SPEED



M79801

TRANSMISSION NOISY

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Hydrostatic transmission reservoir/dipstick cap.	Hydraulic oil at full mark with cap completely backed out of threads. No air in system. Low viscosity HY-GARD® oil. Oil not contaminated, no water in oil. Oil at room temperature. Check cold.	Fill to correct level with low viscosity HY-GARD® oil. Drain transmission and fill to correct level with low viscosity HY-GARD® oil. Start engine and run for 10-20 seconds to bleed air from system. Warm up oil.
2. Hydrostatic oil filter.	Clean, free of debris, not plugged.	Replace filter.
3. Parking brake.	Brake not depressed and locked.	Release parking brake.
4. Brake linkage.	Brake rod and lever not damaged or binding.	Eliminate binding and/or replace damaged components.
5. Charge pump.[a]	Inner and outer rotors and pump case not worn or damaged.	Replace worn or damaged charge pump components.
6. Charge relief valve.[a]	Valve moves freely, not stuck open, not dirty or damaged.	Clean, free up valves, or replace damaged charge relief valve components.
7. Pump/Motor rotating groups.[a]	No scoring on valve body interface, no scoring on pistons.	Replace scored parts of rotating groups and valve body.
8. Free wheel valves.[a]	Components move freely. Components not damaged.	Clean, free up valves or replace plungers and springs.
9. Charge pump check valve.[a]	Moves freely, not stuck in open position.	Clean, free up valve or replace components.
10. Final drive pinion and ring gear.[a]	Pinion and gear not worn or damaged.	Replace worn or damaged parts.

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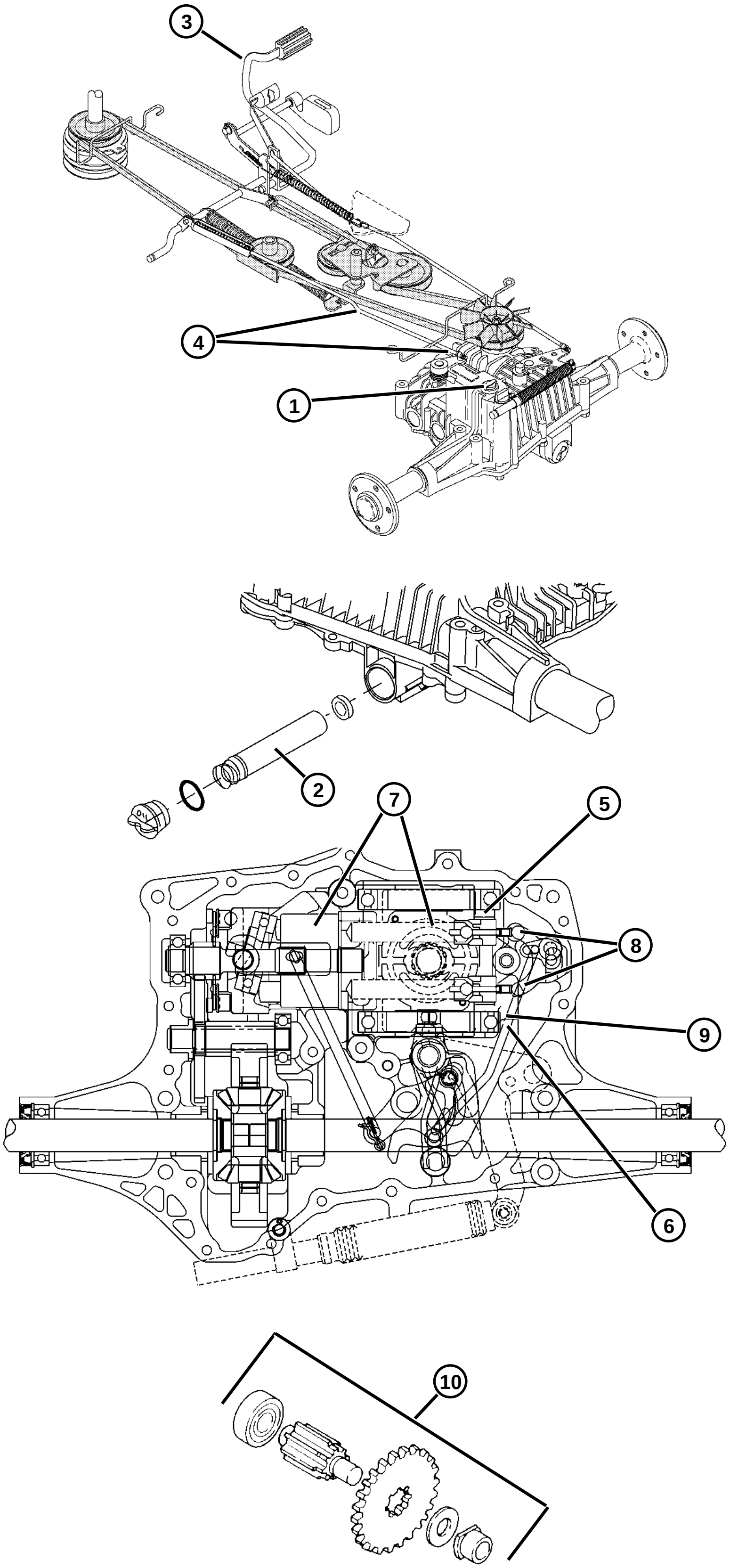
[a] *Requires removal of transmission from machine and disassembly.*

TRANSMISSION NOISY



M79801

MACHINE MOVES WITH ENGINE RUNNING AND FORWARD/REVERSE PEDALS IN NEUTRAL AND BRAKE NOT APPLIED

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Hydrostatic transmission reservoir/dipstick cap.	Low viscosity HY-GARD® oil. Oil at room temperature. Check cold.	Drain transmission and fill to correct level with low viscosity HY-GARD® oil. Warm up oil.
2. Forward/Reverse pedal linkage.	Linkage properly adjusted. Linkage moves freely, not damaged.	Perform Pedal Height Adjustment. Eliminate binding and/or replace faulty or damaged components.
3. Control arm.	Control arm not damaged. Roll pin not broken or missing.	Replace control arm. Replace roll pin.
4. Shock absorber.	Not binding or damaged.	Eliminate binding and/or replace shock absorber.
5. Neutral eccentric.	Properly adjusted for no wheel movement at fast idle, one wheel off the ground.	Perform Neutral Adjustment.
6. Reverse check valve.[a]	Orifice clean, free of debris, not plugged. Moves freely, not stuck open.	Unplug and clean orifice or replace pump/motor center case. Clean, unstick valve or replace.
7. Variable position swash plate.[a]	Ball joint, shift blocks, cradle bearings not worn or damaged, thrust washers and bearings not binding, scored.	Replace damaged or worn components.
8. Swash plate control shaft.[a]	Ball socket not bent or worn.	Replace swash plate control shaft.
9. Neutral return spring.[a]	Returns swashplate to neutral position when Forward/Reverse pedals released. Not fatigued or damaged.	Replace spring.

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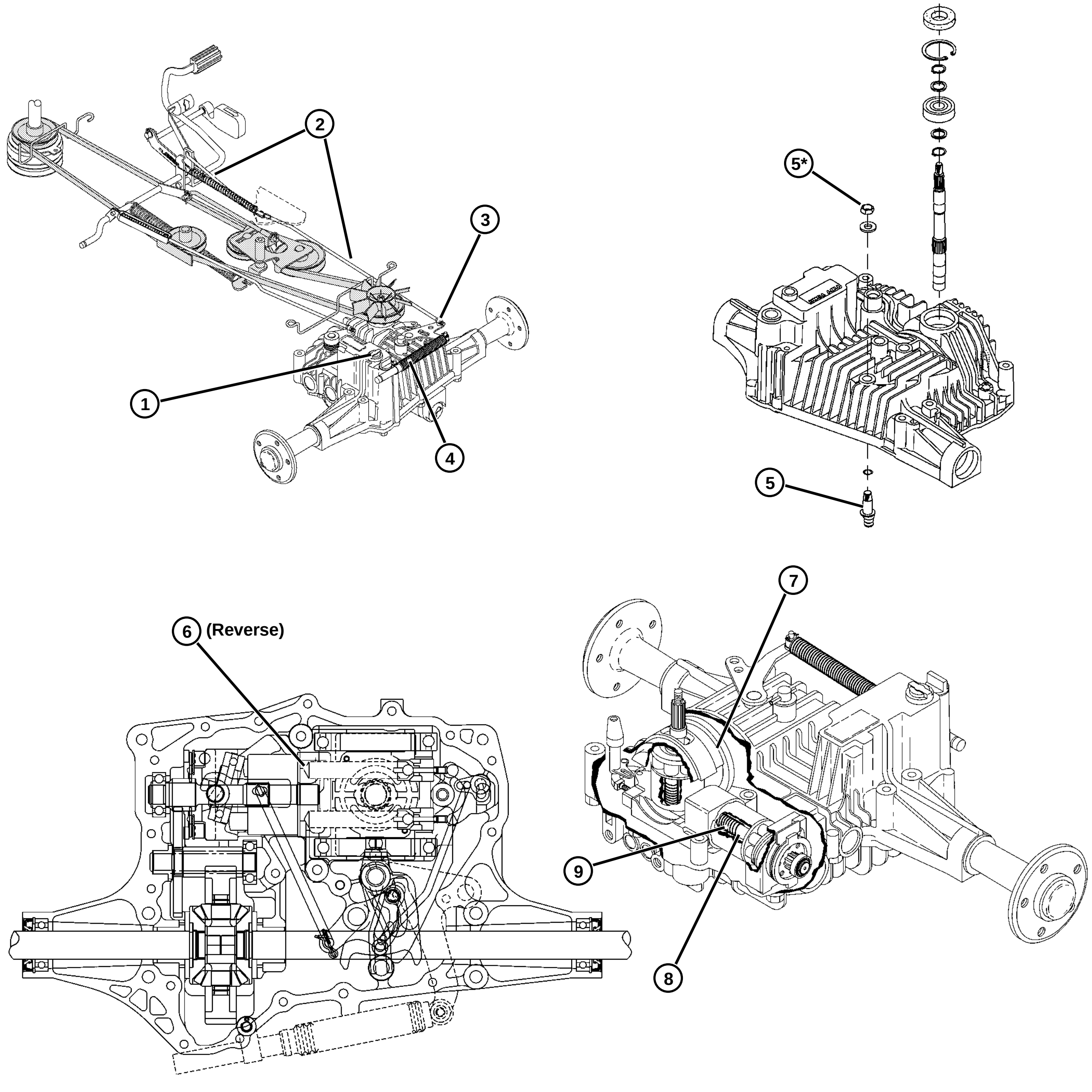
[a] *Requires removal of transmission from machine and disassembly.*

MACHINE MOVES WITH ENGINE RUNNING, FORWARD/REVERSE PEDALS IN NEUTRAL AND BRAKE NOT APPLIED



*Neutral Eccentric Adjustment Nut

M79805

MACHINE DOES NOT ACHIEVE FULL GROUND SPEED

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Hydrostatic transmission.	Transmission free of debris.	Remove debris from transmission.
2. Cooling fan.	Not damaged.	Replace cooling fan.
3. Hydrostatic transmission reservoir/dipstick cap.	Hydraulic oil at full mark with cap completely backed out of threads. No air in system. Oil at room temperature. Check cold.	Fill to correct level with low viscosity HY-GARD® oil. Start engine and run for 10-20 seconds to bleed air from system. Warm up oil.
4. Hydrostatic oil filter/ assembly.	Clean, free of debris, not plugged.	Replace filter.
5. Traction drive belt.	Not broken, worn, frayed, glazed or stretched. Properly tensioned.	Replace drive belt. Perform Drive Belt Tension Adjustment.
6. Forward/Reverse pedal linkage.	Linkage properly adjusted. Linkage moves freely, not damaged.	Perform Pedal Height Adjustment. Eliminate binding and/or replace faulty or damaged components.
7. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding and/or replace damaged components. Adjust brake linkage to specifications. (See procedures in BRAKES section.)
8. Control arm.	Not damaged. Roll pin not broken or missing.	Replace control arm. Replace roll pin.
9. Shock absorber.	Not binding or damaged.	Eliminate binding or replace shock absorber.
10. Charge pump.[a]	Inner, outer rotors and pump case not worn or damaged.	Replace worn or damaged charge pump components.
11. Charge relief valve.[a]	Valve moves freely, not stuck open, not dirty or damaged.	Clean, unstick valve or replace damaged charge relief valve components.
12. Pump/Motor rotating groups.[a]	No scoring on valve body interface, no scoring on pistons.	Replace scored parts of rotating groups and valve body.
13. Free wheel valves.[a]	Components move freely. Components not damaged.	Clean, free up valves or replace plungers and springs.
14. Charge pump check valve.[a]	Moves freely, not stuck in open position.	Clean, unstick valve and/or replace components.
15. Forward check valve.[a]	Moves freely, not stuck in open position.	Clean, unstick valve and/or replace check valve components.

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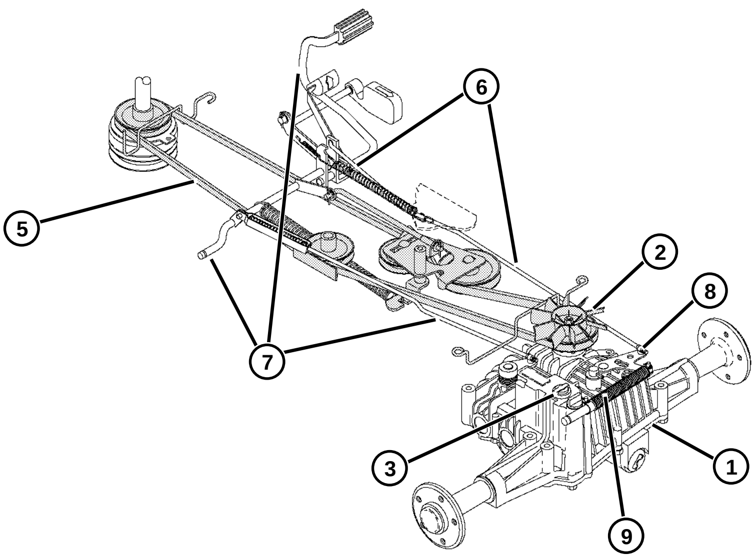
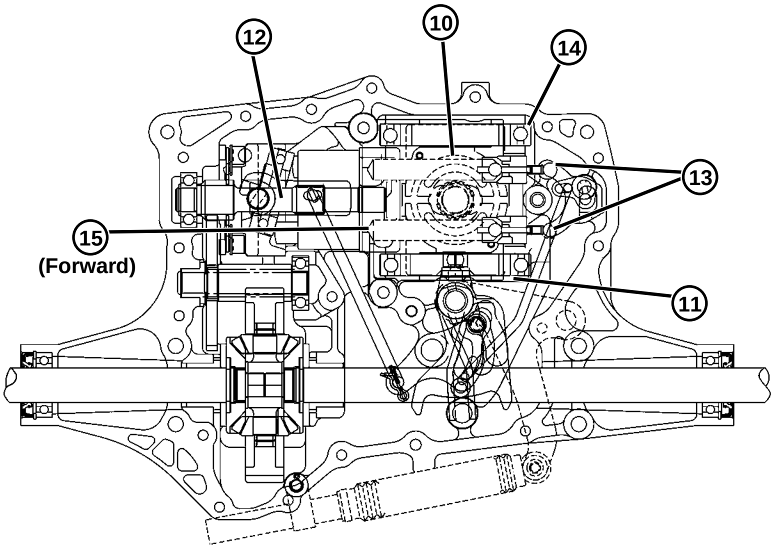
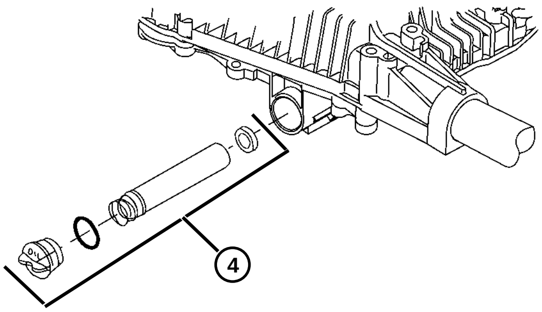
[a] *Requires removal of transmission from machine and disassembly.*

MACHINE DOES NOT ACHIEVE FULL GROUND SPEED







M79802

MACHINE WILL NOT MOVE IN FORWARD DIRECTION OR IS SLOW IN FORWARD

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Hydrostatic transmission.	Transmission free of debris.	Remove debris from transmission.
2. Cooling fan.	Not damaged.	Replace cooling fan.
3. Hydrostatic transmission reservoir/dipstick cap.	Hydraulic oil at full mark with cap completely backed out of threads. No air in system.	Fill to correct level with low viscosity HY-GARD® oil. Start engine and run for 10-20 seconds to bleed air from system.
4. Hydrostatic oil filter.	Clean, free of debris, not plugged.	Replace filter.
5. Traction drive belt.	Not broken, worn, frayed, glazed or stretched. Properly tensioned.	Replace drive belt. Perform Drive Belt Tension Adjustment.
6. Parking brake.	Brake not depressed and locked.	Release parking brake.
7. Brake linkage.	Brake rod and lever not damaged or binding.	Eliminate binding and/or replace damaged components.
8. Forward/Reverse pedal linkage.	Linkage properly adjusted. Linkage moves freely, not damaged.	Perform Pedal Height Adjustment. Eliminate binding and/or replace faulty or damaged components.
9. Control arm.	Not damaged. Roll pin not broken or missing.	Replace control arm. Replace roll pin.
10. Shock absorber.	Not binding or damaged.	Replace shock absorber.
11. Charge pump.[a]	Inner and outer rotors and pump case not worn or damaged.	Replace worn or damaged charge pump components.
12. Charge relief valve.[a]	Valve moves freely, not stuck open, not dirty or damaged.	Clean, unstick valve or replace charge valve components.
13. Charge pump check valve.[a]	Moves freely, not stuck in open position.	Clean, unstick valve and/or replace components.
14. Pump/Motor rotating groups.[a]	No scoring on valve body interface, no scoring on pistons.	Replace scored parts of rotating groups and valve body.
15. Free wheel valves.[a]	Components move freely. Components not damaged.	Clean, free up valves or replace plungers and springs.
16. Forward check valve.[a]	Moves freely, not stuck in open position.	Clean, unstick valve and/or replace check valve components.

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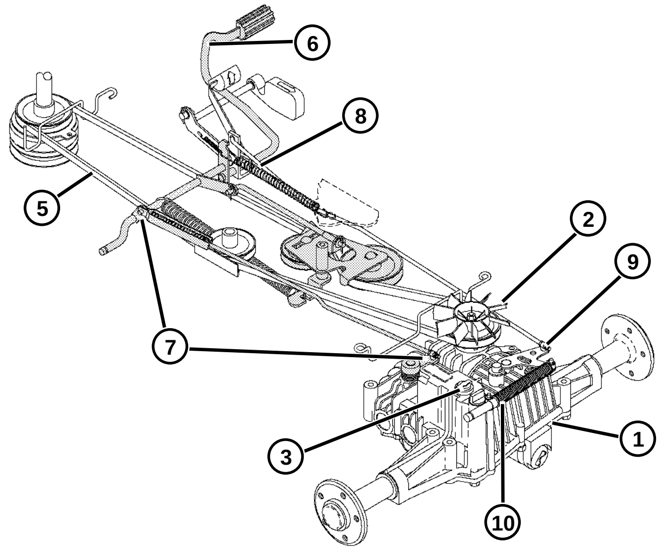
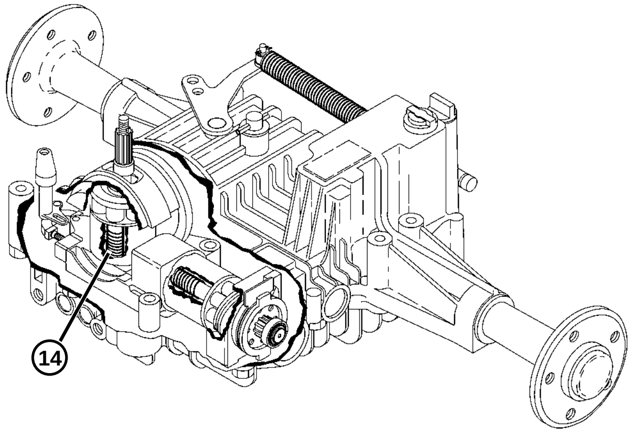
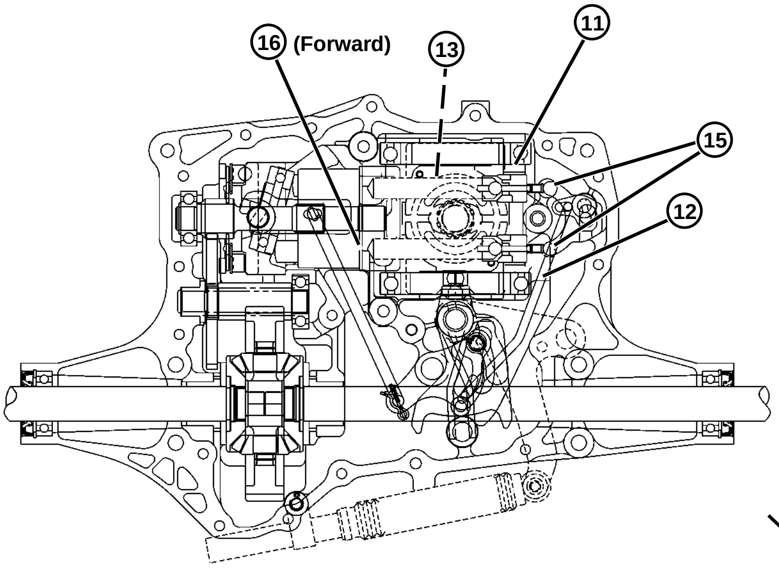
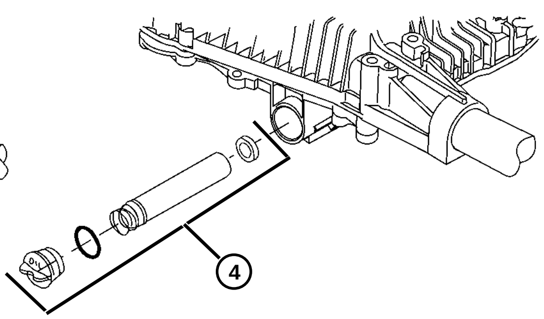
[a] *Requires removal of transmission from machine and disassembly.*

MACHINE WILL NOT MOVE IN FORWARD DIRECTION OR IS SLOW IN FORWARD









M79803

MACHINE IS SLOW IN REVERSE

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Hydrostatic transmission.	Transmission free of debris.	Remove debris from transmission.
2. Cooling fan.	Not damaged.	Replace cooling fan.
3. Hydrostatic transmission reservoir/dipstick cap.	Hydraulic oil at full mark with cap completely backed out of threads. No air in system. Correct oil viscosity.	Fill to correct level with low viscosity HY-GARD® oil. Drain transmission and fill to correct level with low viscosity HY-GARD® oil. Start engine and run for 10-20 seconds to bleed air from system.
4. Hydrostatic oil filter.	Clean, free of debris, not plugged.	Replace filter.
5. Traction drive belt.	Not broken, worn, frayed, glazed or stretched. Properly tensioned.	Replace drive belt. Perform Drive Belt Tension Adjustment.
6. Parking brake.	Brake not depressed and locked.	Release parking brake.
7. Brake linkage.	Brake rod and lever not damaged or binding.	Eliminate binding and/or replace damaged components.
8. Forward/Reverse pedal linkage.	Linkage properly adjusted. Linkage moves freely, not damaged.	Perform Pedal Height Adjustment. Eliminate binding and/or replace faulty or damaged components.
9. Control arm.	Not damaged. Roll pin not broken or missing.	Replace control arm. Replace roll pin.
10. Shock absorber.	Not binding or damaged.	Eliminate binding or replace shock absorber.
11. Charge pump.[a]	Inner and outer rotors and pump case not worn or damaged.	Replace worn or damaged charge pump components.
12. Charge relief valve.[a]	Valve moves freely, not stuck open, not dirty or damaged.	Clean, unstick valve or replace damaged charge relief valve components.
13. Charge pump check valve.[a]	Moves freely, not stuck in open position.	Clean, free up valve and/or replace components.
14. Pump/Motor rotating groups.[a]	No scoring on valve body interface, no scoring on pistons.	Replace scored parts of rotating groups and valve body.
15. Free wheel valves.[a]	Components move freely. Components not damaged.	Clean, free up valves or replace plungers and springs.
16. Reverse check valve.[a]	Moves freely, not stuck in open position.	Clean, unstick valve and/or replace check valve components.

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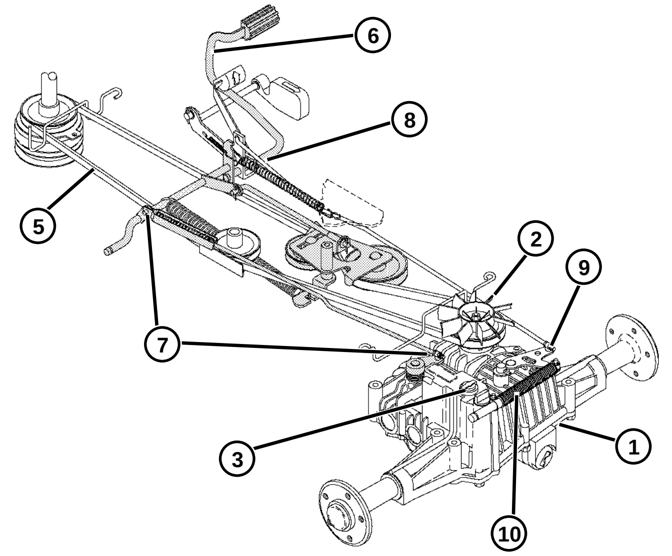
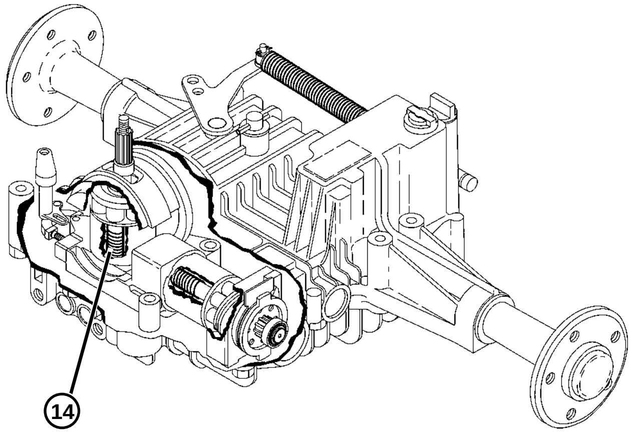
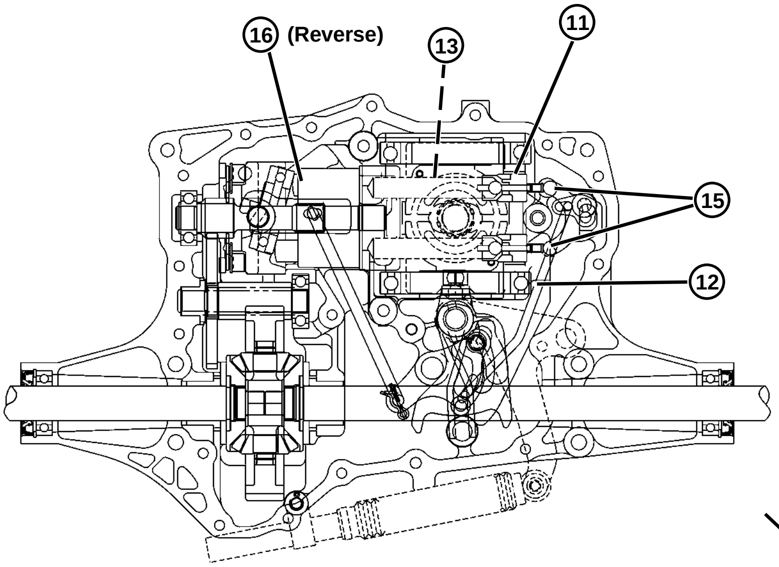
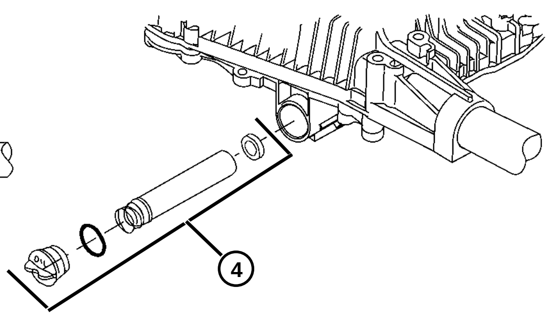
[a] *Requires removal of transmission from machine and disassembly.*

MACHINE IS SLOW IN REVERSE









M79803

MACHINE IS TOO AGGRESSIVE IN FORWARD OR REVERSE

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Shock absorber.	Not binding or damaged.	Replace shock absorber.
2. Reverse check valve.[a]	Orifice clean, free of debris, not plugged. Correct check valve installed.	Unplug and clean orifice or replace pump/motor center case. Install correct check valve.
3. Forward check valve.	Orifice clean, free if debris, not plugged. Correct check valve installed.	Unplug and clean orifice or replace pump/motor center case. Install correct check valve.

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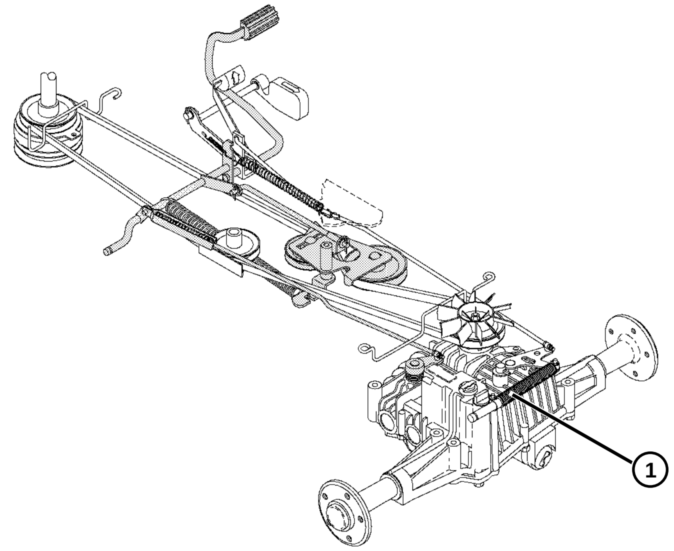
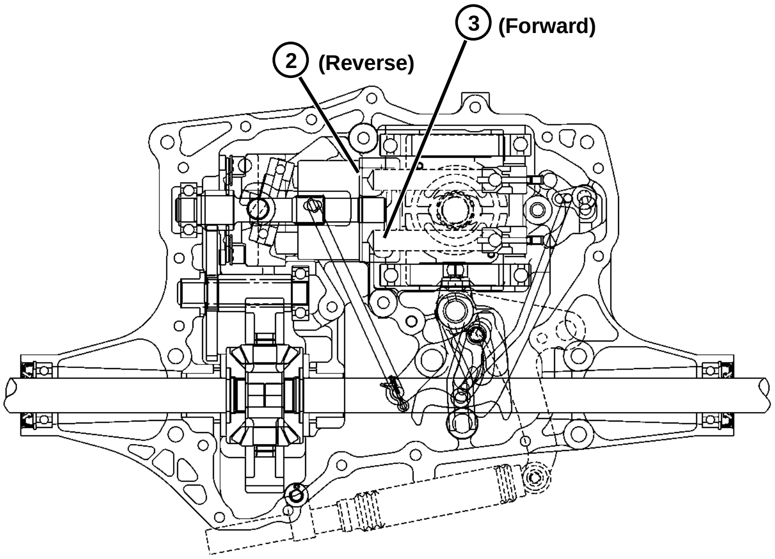
[a] *Requires removal of transmission from machine and disassembly.*

MACHINE IS TOO AGRESSIVE IN FORWARD OR REVERSE





M79804

PARKING BRAKE DOES NOT HOLD MACHINE ON HILL

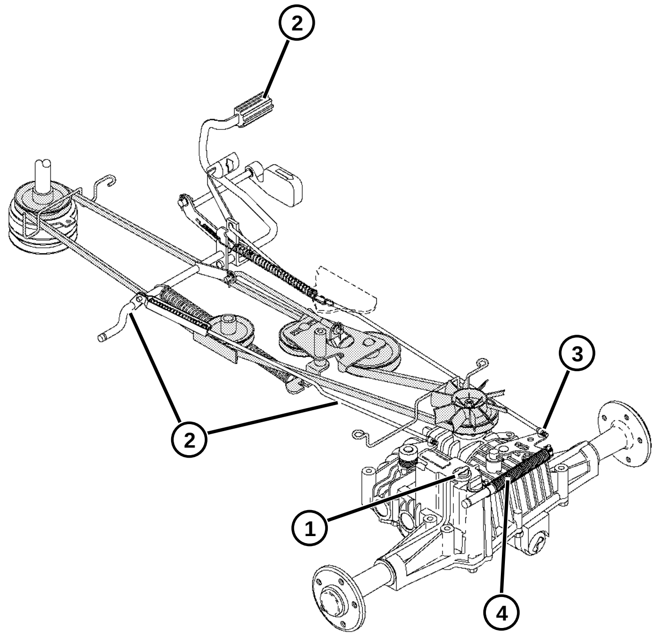
Test Conditions:

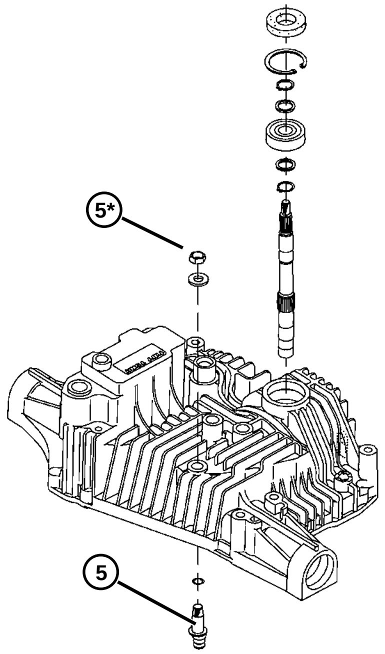
- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

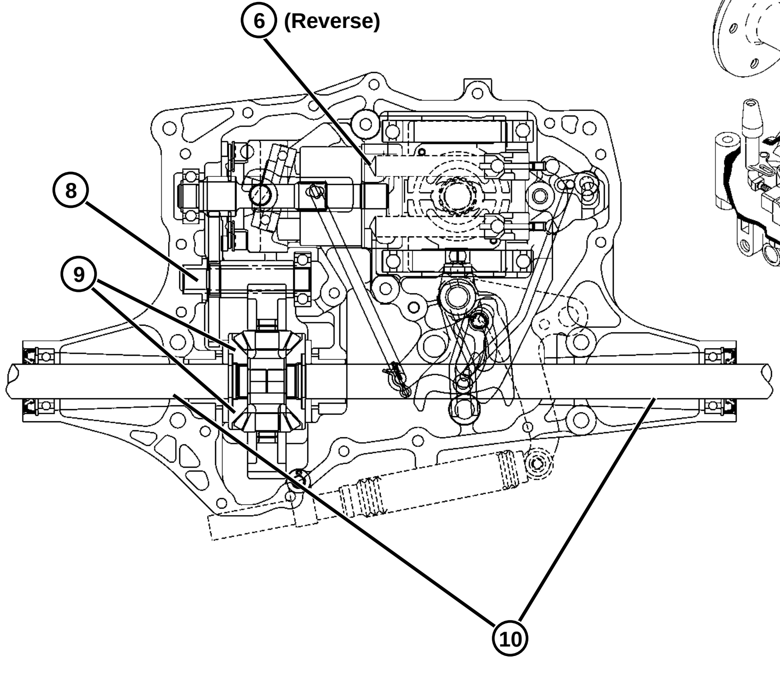
Test Location	Normal	If Not Normal
1. Hydrostatic transmission reservoir/dipstick cap.	Hydraulic oil at full mark with cap completely backed out of threads. Low viscosity HY-GARD® oil.	Fill to correct level with low viscosity HY-GARD® oil.
2. Brake linkage.	Brake rod and lever not damaged or binding.	Eliminate binding and/or replace damaged components.
3. Control arm.	Control arm not damaged.	Replace control arm.
4. Shock absorber.	Not binding or damaged.	Eliminate binding and/or replace shock absorber.
5. Neutral eccentric.	Properly adjusted for no wheel movement at fast idle, one wheel off the ground.	Perform Neutral Adjustment.
6. Reverse check valve.[a]	Orifice Clean, free of debris, not plugged. Check valve moves freely, not stuck in open position.	Unplug and clean orifice or replace pump/motor center case. Clean, unstick valve and/or replace check valve components.
7. Motor output shaft with gear.[a]	Shaft with gear not worn or damaged.	Replace shaft.
8. Final drive pinion and ring gear.[a]	Pinion and gear not worn or damaged.	Replace worn or damaged components.
9. Differential gears.[a]	Gears not damaged.	Replace gears.
10. Axle shafts.[a]	Shafts not damaged.	Replace axle shafts.

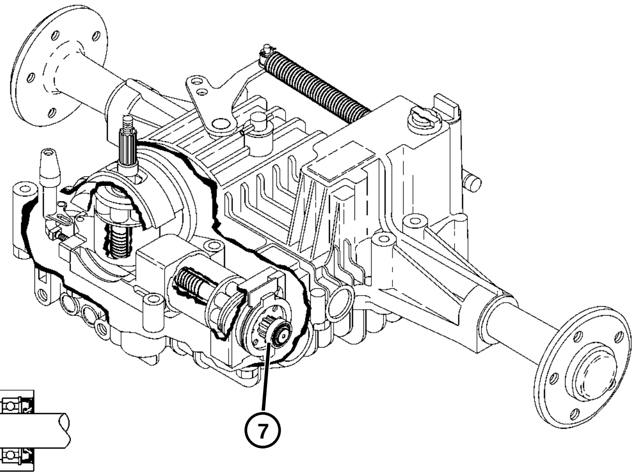
[a] *Requires removal of transmission from machine and disassembly.*

PARKING BRAKE DOES NOT HOLD MACHINE ON HILL









***Neutral Eccentric Adjustment Nut**

M79805

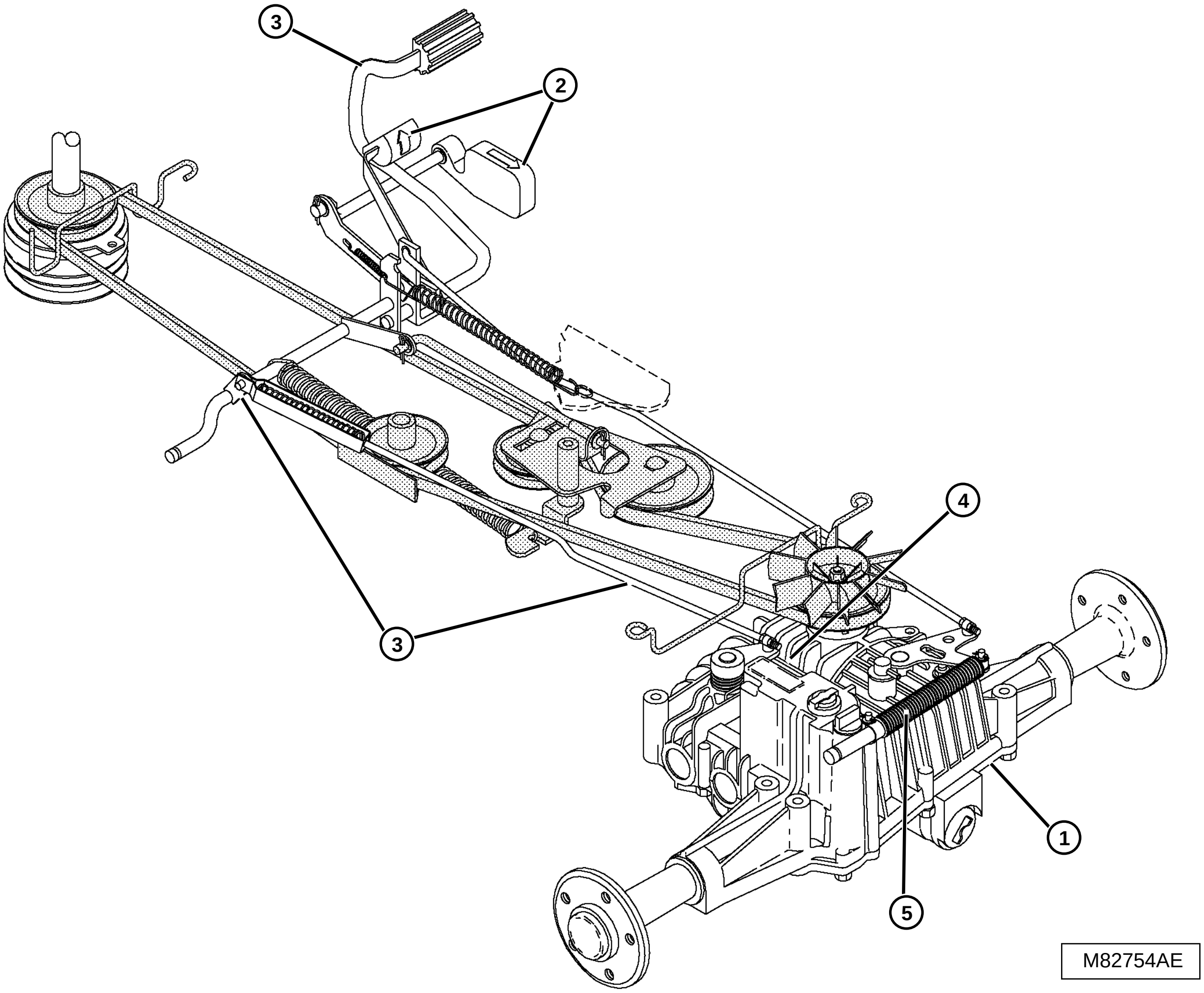
NEUTRAL START SWITCH DOES NOT ENGAGE

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Hydrostatic transmission.	Transmission free of debris.	Remove debris from transmission.
2. Forward/Reverse pedal linkage.	Linkage properly adjusted. Linkage moves freely, not damaged.	Perform Pedal Height Adjustment. Eliminate binding and/or replace faulty or damaged components.
3. Brake linkage.	Brake rod and lever not damaged or binding.	Eliminate binding and/or replace damaged components.
4. Neutral start switch.	Continuity through switch with transmission in gear.	Replace neutral start switch.
5. Shock absorber.	Not binding or damaged.	Eliminate binding and/or replace shock absorber.

NEUTRAL START SWITCH DOES NOT ENGAGE



M82754AE

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[a] *Requires removal of transmission from machine and disassembly.*

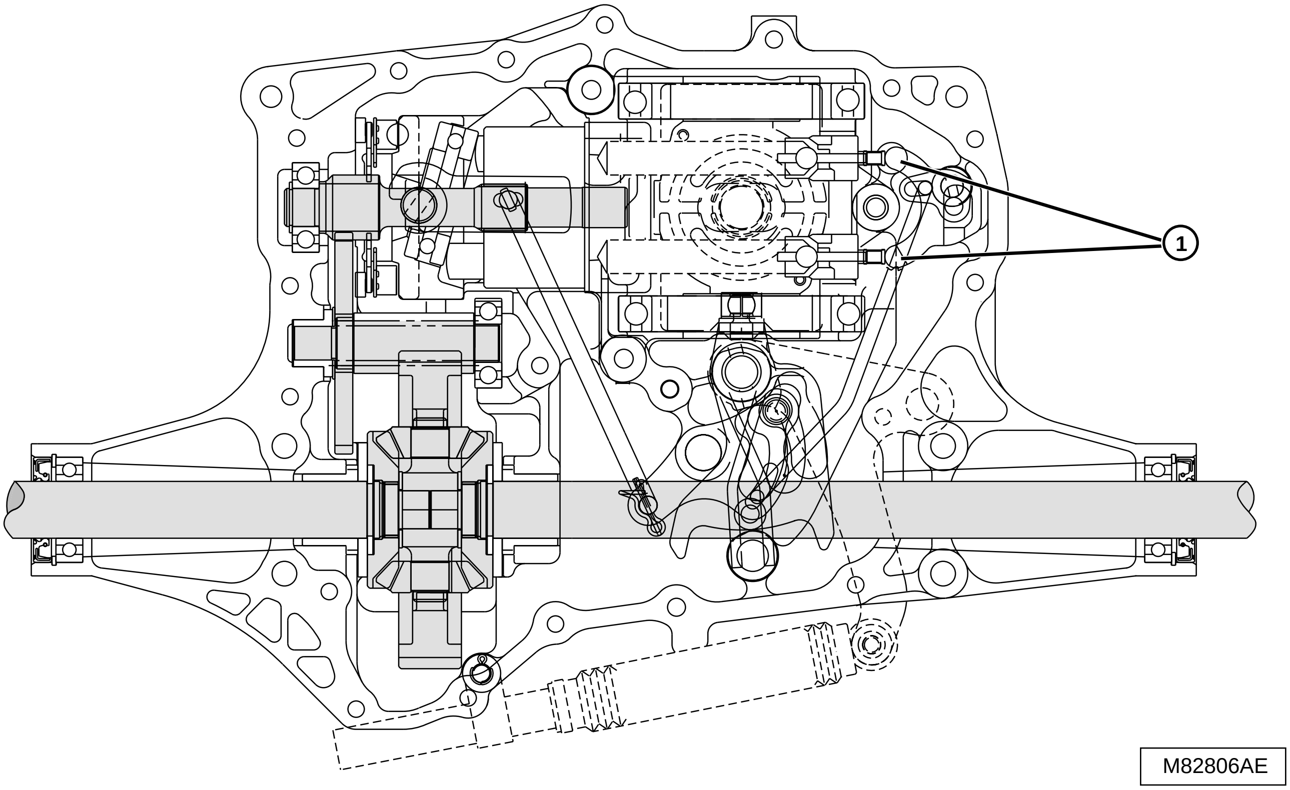
FREE WHEEL VALVE WILL NOT WORK

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Free wheel valves.[a]	Components move freely, not stuck open. Components not damaged.	Clean, unstick valves and/or replace damaged components.

FREE WHEEL VALVE WILL NOT WORK



M82806AE

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[a] *Requires removal of transmission from machine and disassembly.*

FREE WHEEL VALVE WILL NOT STAY OPEN WITH ENGINE OFF

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Free wheel lever/ linkage.	Transmission free of debris. Lever/linkage moves freely.	Remove debris and clean area. Repair or replace binding linkage.
2. Check valve.	Pins move freely in and out.	Replace pins and/or springs.

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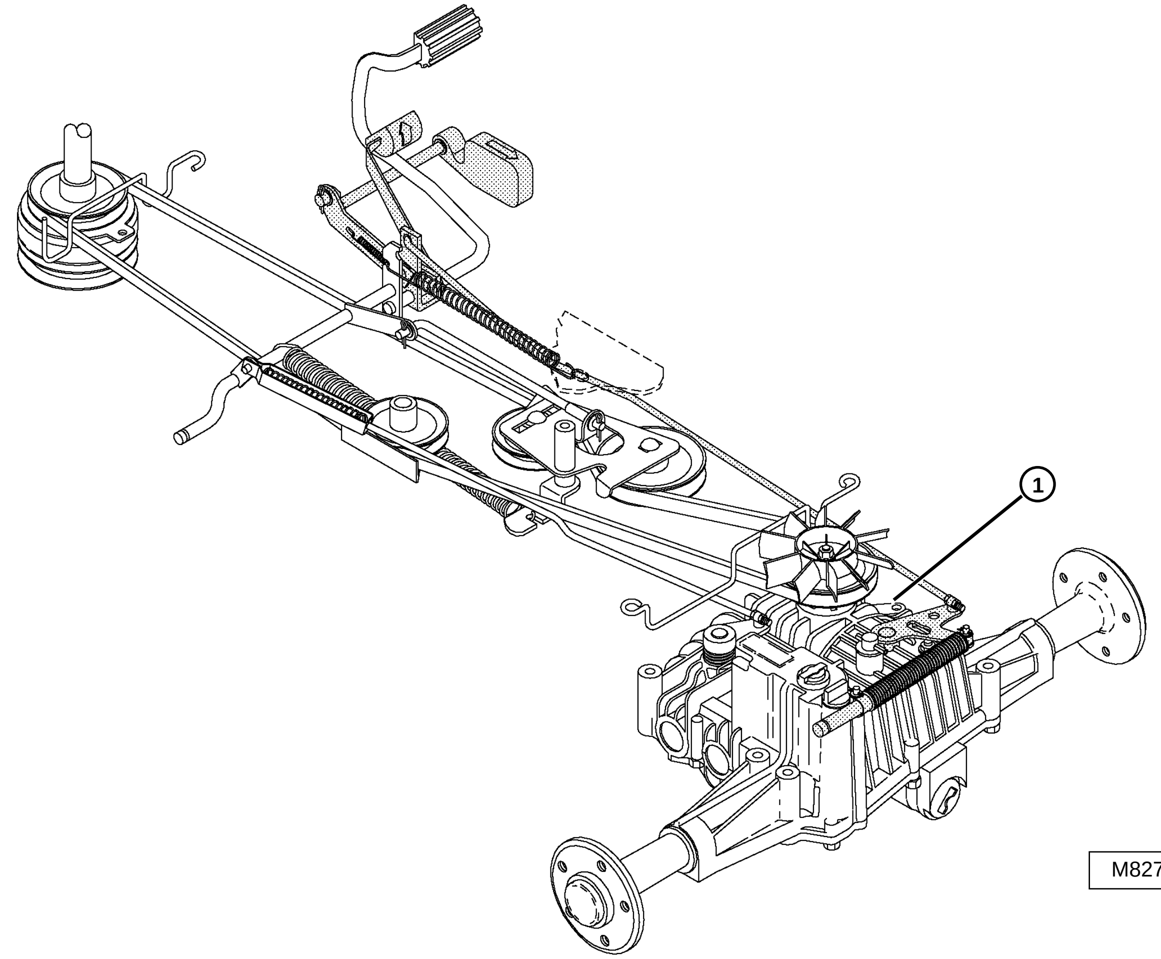
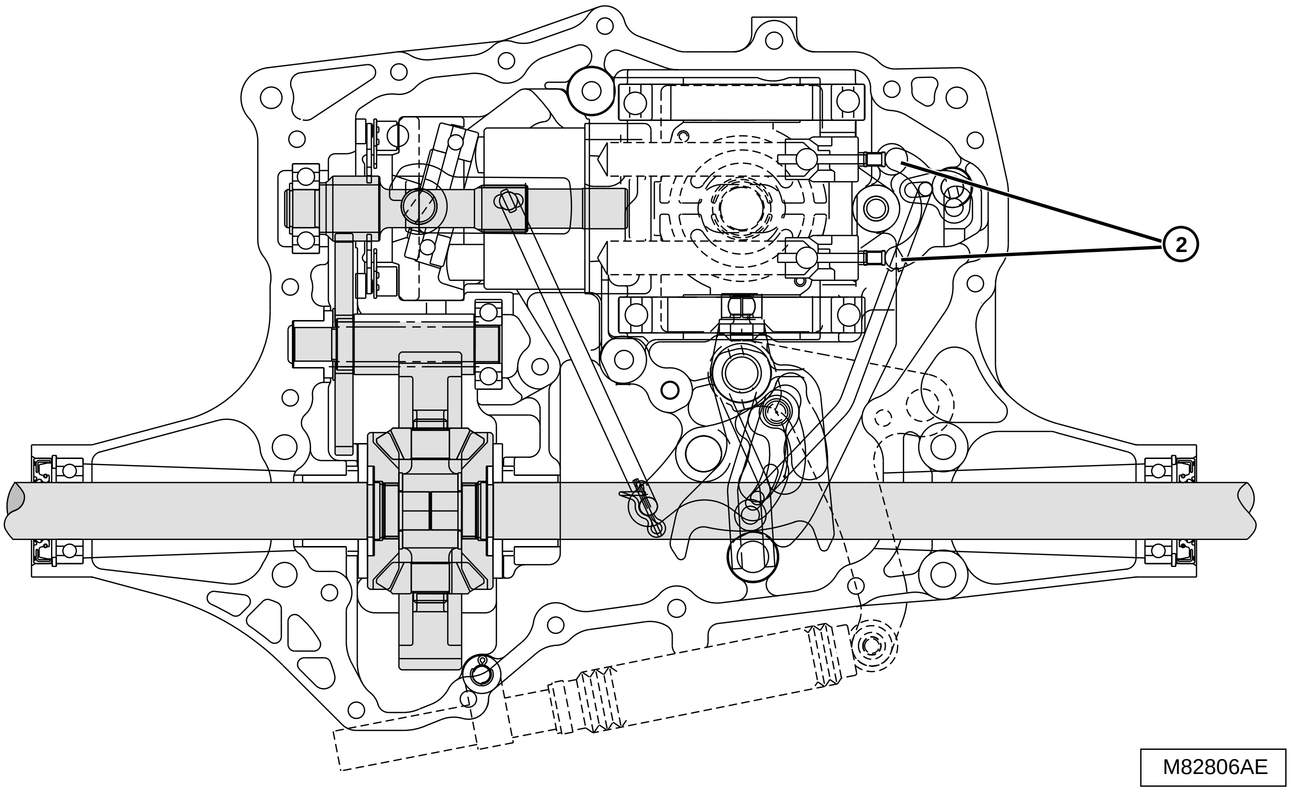
[a] *Requires removal of transmission from machine and disassembly.*

FREE WHEEL VALVE WILL NOT STAY OPEN WITH ENGINE OFF



M82753AE



M82806AE

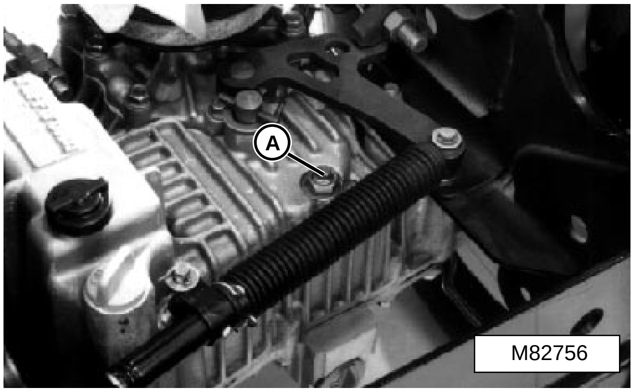
NEUTRAL CREEP ADJUSTMENT

Reason:

If the machine creeps forward or backward with the forward/reverse pedals in the neutral position, parking brake released, and the engine running, the neutral eccentric must be adjusted.

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Engage parking brake.
4. Block front wheels.
5. Lift rear of machine until wheels are just barely off the ground and support with jackstands.
6. Remove fender deck. (See procedure in MISCELLANEOUS section.)



7. Pull fuel tank forward to gain access to eccentric shaft (A).

CAUTION

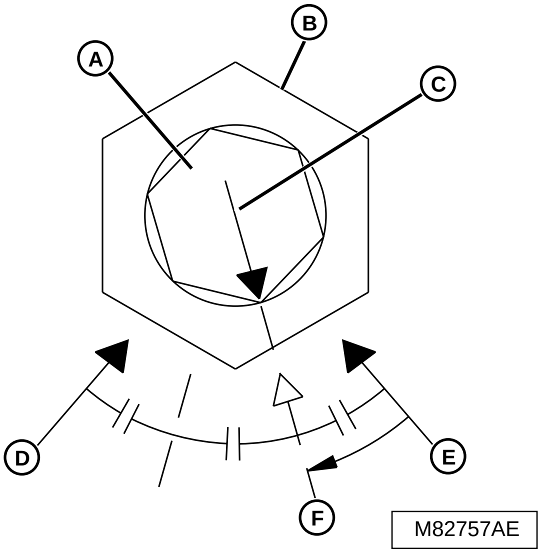
Keep hands away from transmission fan and wheels during procedure or fingers can be injured.

NOTE: Engine will not start with seat switch disconnected. Use a jumper wire to by-pass switch.

8. Start and run engine at **fast idle (3350 ± 50 rpm)**.

NOTE: If axle shafts do not rotate in reverse after turning the eccentric shaft one full turn, see steps 15—18.

9. Loosen lock nut (B) and turn the eccentric shaft (A) clockwise until the axle shaft rotates in reverse, mark the top of the eccentric shaft as position (C).
10. Turn the eccentric shaft slowly counterclockwise until the axle shaft stops, mark the transmission case as the reverse stop position (D).
11. Turn the eccentric shaft slowly counterclockwise until the axle shaft rotates forward.
12. Turn the eccentric shaft clockwise until the axle shaft stops, mark the transmission case as the forward stop position (E).
13. Turn the eccentric shaft slowly clockwise until the mark is approximately 1/3 the distance between the forward and reverse stop positions initial neutral position (F).
14. Hold eccentric shaft (A) with wrench and tighten lock nut (B).



A— Eccentric Shaft

B— Lock Nut

C— Eccentric Mark

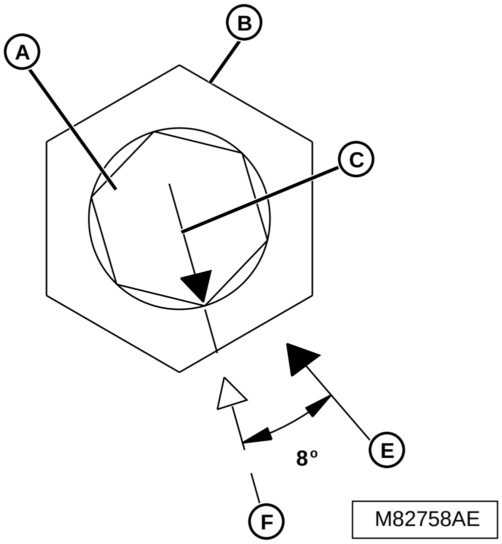
D— Reverse Stop Position

E— Forward Stop Position

F— Initial Neutral Position

NOTE: If the axle shafts do not rotate in reverse although the eccentric shaft has been turned one full turn, adjust neutral eccentric as follows:

15. Turn eccentric shaft counterclockwise until axle shafts rotate forward.
16. Turn eccentric shaft clockwise until the axle shaft stops, mark the top of the eccentric shaft as position (C), and transmission case as position (E).
17. Turn the eccentric shaft clockwise approximately 8° from forward stop position.
18. Hold eccentric shaft (A) with wrench and tighten lock nut (B).



A— Eccentric Shaft

B— Lock Nut

C— Eccentric Mark

E— Forward Stop Position

F— Initial Neutral Position

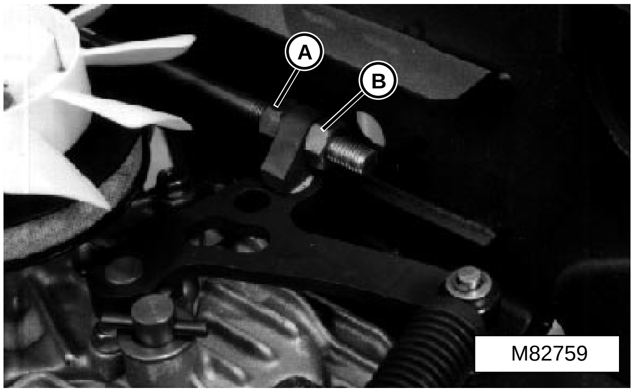
PEDAL HEIGHT ADJUSTMENT

Reason:

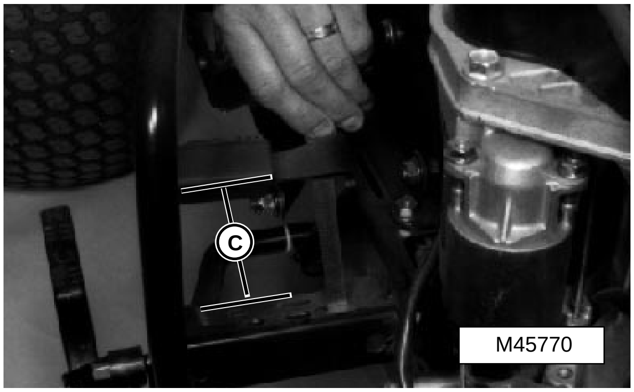
To insure full travel speeds in forward and reverse directions. This also insures that the transmission swashplate and control arm will not act as a mechanical stop for the pedal linkage.

Procedure:

1. Remove fender deck. (See procedure in MISCELLANEOUS section.)
2. Pull fuel tank forward to gain access to the adjustment.



3. Loosen control rod end retaining nuts (A and B).



4. With transmission in neutral, adjust the position of control rod end, until distance (C) is **76—80 mm (3—3.1 in.)** between the forward pedal arm and the frame.
5. Tighten retaining nuts.

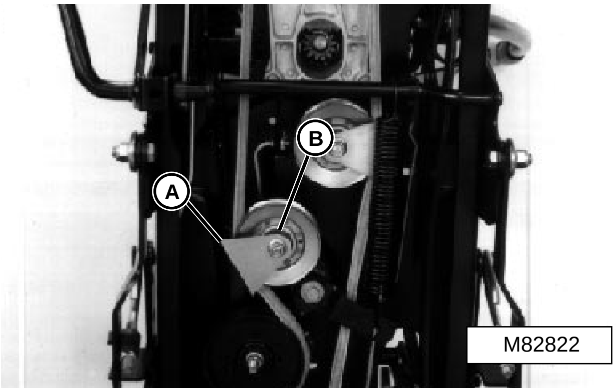
BELT TENSION ADJUSTMENT

Reason:

To insure adequate power transfer from the engine to the transmission.

Procedure:

1. Park the machine on a level surface.
2. Turn key switch OFF.
3. Engage parking brake.
4. Remove mower deck. (See procedure in ATTACHMENTS section.)

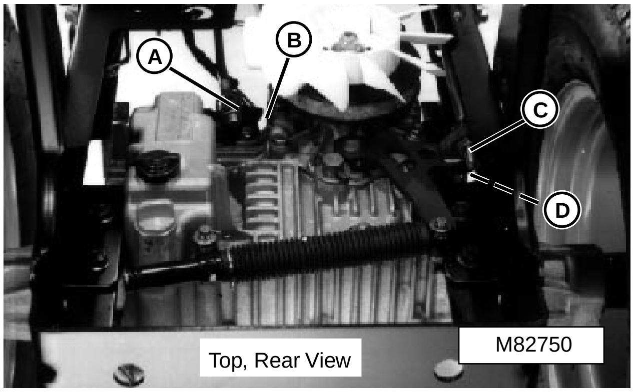


5. Remove belt guard (A).
6. Loosen idler pulley nut (B).
7. Slide idler pulley left to INCREASE belt tension, slide idler right to DECREASE tension.
8. Tighten idler pulley nut.
9. Install belt guard.

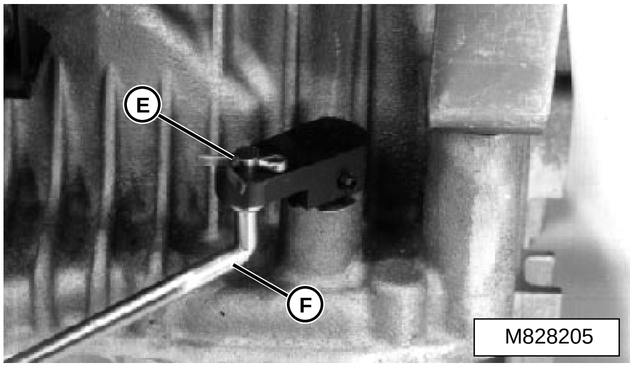
HYDROSTATIC TRANSMISSION

Removal/Installation

1. Remove:
   - Traction drive belt (See TRACTION DRIVE BELT.)
   - Fuel tank (See procedure in ENGINE section.)
   - Battery



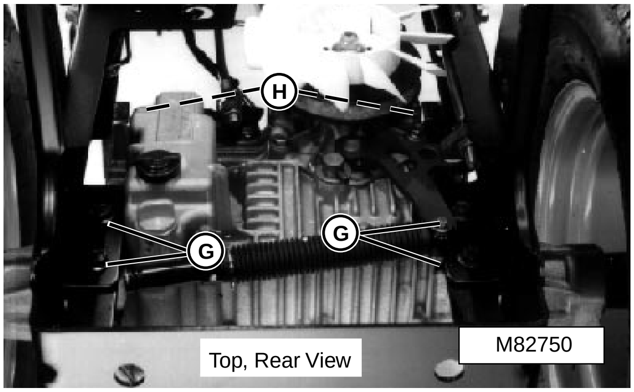
2. Disconnect wiring connector (B) and brake rod (A).
3. Remove cotter pin (D) and disconnect control rod (C).



4. Remove cotter pin (E) and free wheel release rod (F).

NOTE: Rear tires must be at least 76 mm (3 in.) off the ground, for transmission to clear machine frame.

5. Lift and support rear of machine with jackstands.
6. Support transmission with a floor jack.



7. Remove cap screws (G) and nuts (H).

NOTE: Spacers are located between frame and transmission.

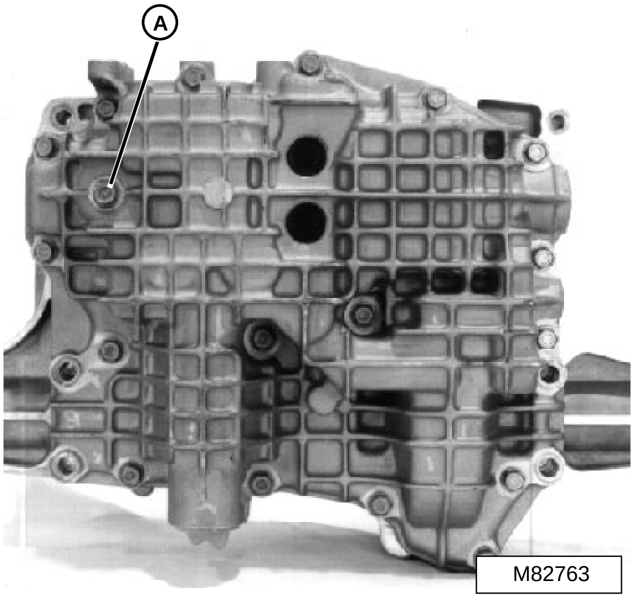
8. Lower transmission to the ground and roll away from frame. Remove spacer plates.
9. Remove wheels if transmission is in need of repair. (See procedure in MISCELLANEOUS section.)

Installation is done in the reverse order of removal.

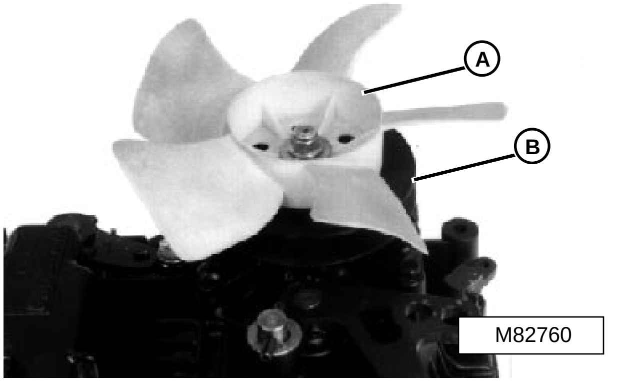
- Tighten rear transmission mounting nuts to **54 N•m (40 lb-ft)**.
- Tighten front transmission mounting nuts to **27 N•m (20 lb-ft)**.
- Fill transmission to proper level with low viscosity HY-GARD® oil. (See SPECIFICATIONS AND GENERAL INFORMATION section.)
- Adjust brake linkage. (See procedure in BRAKES section.)
- Adjust pedal height. (See Adjustments.)

Disassembly/Inspection

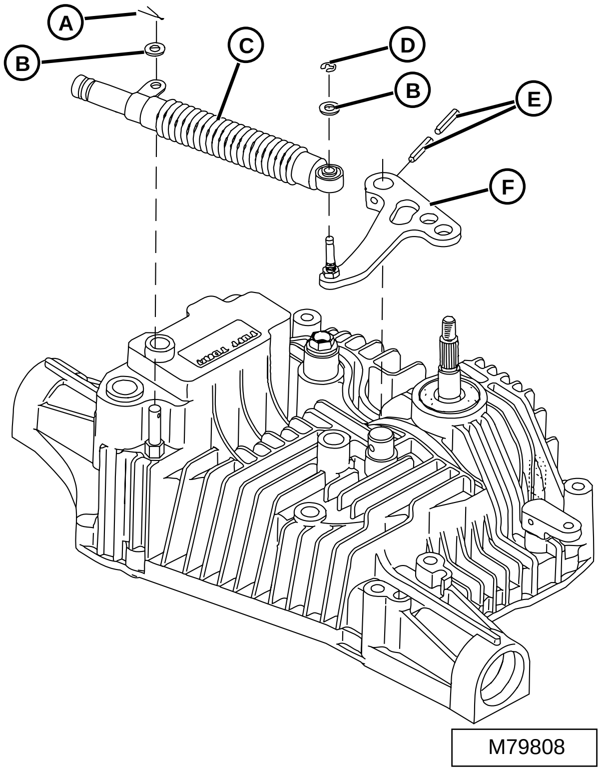
1. Thoroughly clean the outside of the transmission.



2. Remove drain plug with washer (A) and drain oil from transmission. Capacity is approximately **4.3 L (4.7 qts)**.



3. Remove cooling (suction) fan (A) and pulley (B).



A— Cotter Pin

B—Washers (2 used)

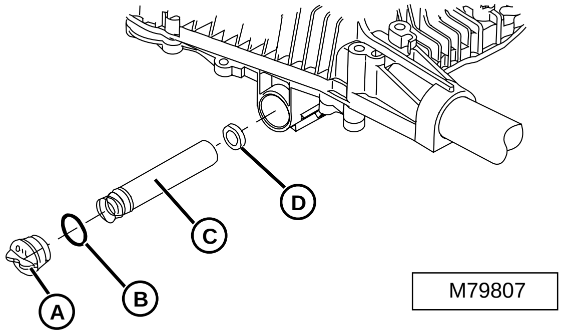
C—Damper

D—Retaining Ring

E—Roll pins (2 used)

F—Control Arm

4. Remove cotter pin (A), retaining ring (D), washers (B), and damper (C).
5. Remove inner and outer roll pins (E) and control arm (F).



A—Filter Cap

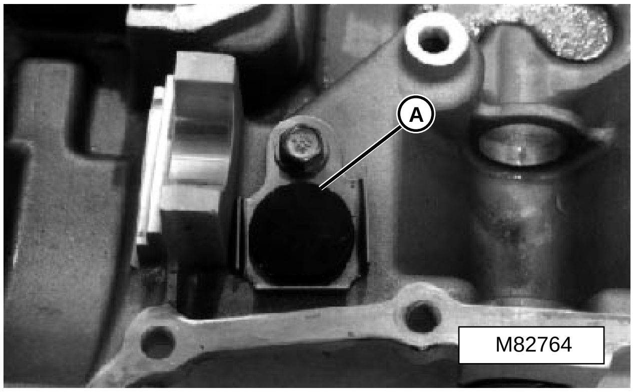
B—O-Ring

C—Filter

D—Gasket

NOTE: Old filter assembly may vary slightly from one shown.

6. Turn transmission over.
7. Remove parts (A—D).
8. Remove 19 cap screws and separate case halves.

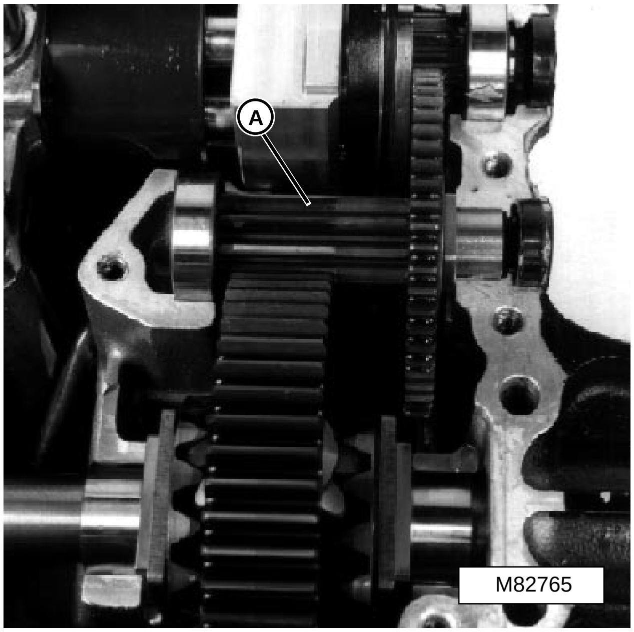


9. Remove magnet (A) from bottom case half, only if replacement is necessary.

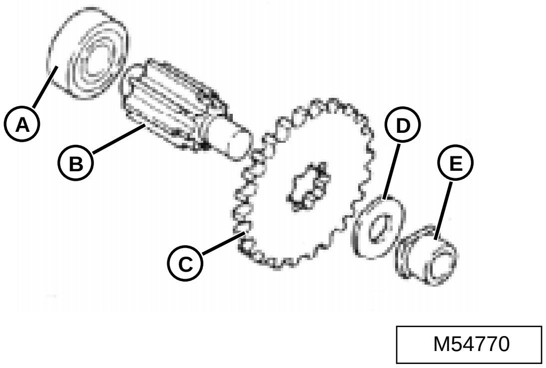
⚠ CAUTION

Reduce compressed air to less than 210 kPa (2 bar) (30 psi) when using for cleaning purposes. Clear area of bystanders, guard against flying chips, and wear personal protection equipment including eye protection.

10. Remove metal particles from magnet with compressed air.

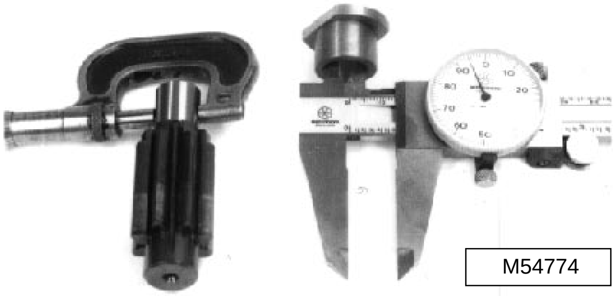


11. Remove final pinion assembly (A) from top case half.



12. Remove bearing (A), bushing (E), washer (D), and final shaft gear (C) from final pinion shaft (B).

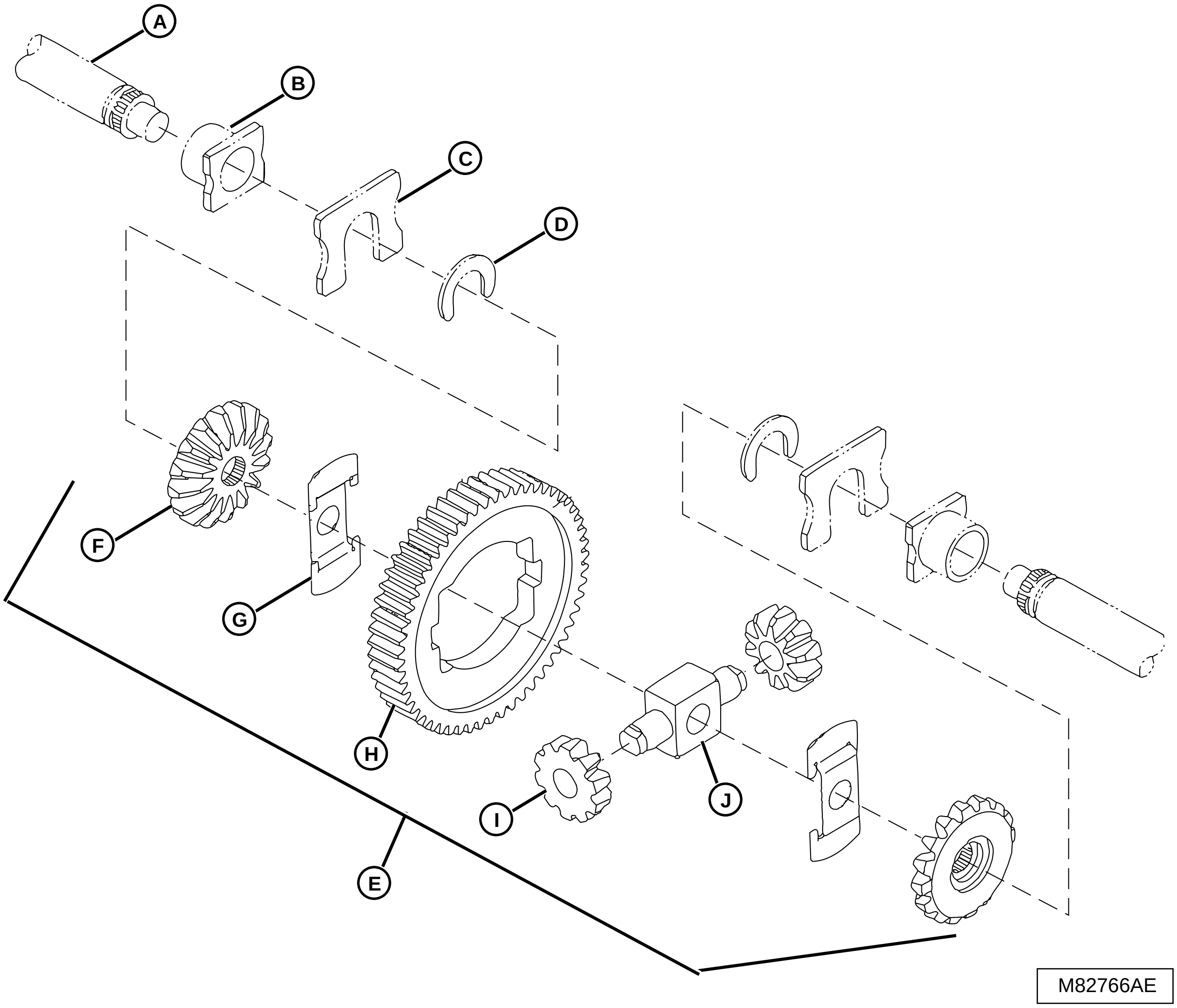
Inspect all parts for wear or damage. Replace as necessary.



13. Measure I.D. of bushing. Replace if measurement is greater than specifications.
14. Measure O.D. of final pinion shaft. Replace if measurement is less than specifications.
15. Subtract final pinion shaft O.D. from bushing I.D. to find clearance. Replace final pinion shaft and bushing if clearance if greater than wear limit.

Specifications:

Bushing I.D.	**17.050—17.130 mm (0.671—0.674 in.)**
Final Pinion Shaft O.D.	**16.970—16.990 mm (0.668—0.669 in.)**
Clearance	**0.060—0.160 mm (0.002—0.006 in.)**
Clearance (Wear Limit)	**0.500 mm (0.197 in.)**



A— Axle Shaft (LH and RH)

B— Bushing (2 used)

C— Collar (2 used)

D— Ring (2 used)

E— Differential Gear Assembly

F— Differential Bevel Gear (2 used)

G— Thrust Washers

H— Final Drive Gear

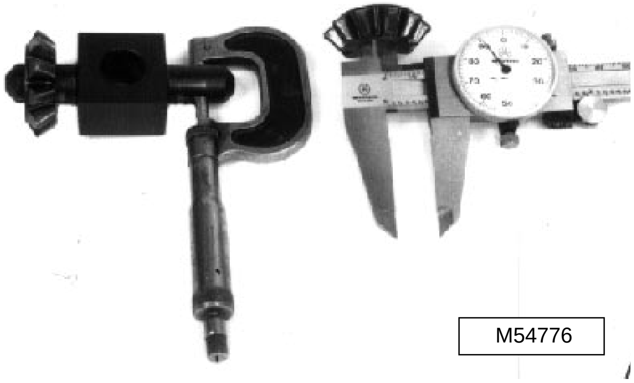
I— Pinion Gear (2 used)

J— Pinion Shaft

NOTE: Note position of collars and rings for assembly.

16. Remove collars (C) and rings (D) from axle shafts.
17. Hold differential gear assembly (E) together. Pull axles shafts (A) out until shafts clear gears (F), then remove differential gear assembly.
18. Disassemble differential gear assembly (E); parts (F—J).
19. Remove axle shafts (A) and bushings (B).

Inspect all parts for wear or damage. Replace as necessary.



20. Measure I.D. of pinion gears (I). Replace if measurement is greater than specifications.
21. Measure O.D.'s of pinion shaft (J). Replace if measurement is less than specifications.

22. Subtract pinion shaft O.D. from pinion gear I.D. to find clearance. Replace final pinion shaft and bushing if clearance if greater than wear limit.

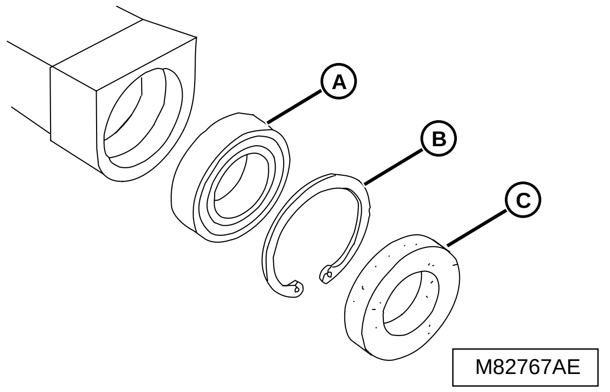
Specifications:

Pinion Gear I.D. . . . . 15.050—15.060 mm (0.592—0.593 in.)

Pinion Shaft O.D. . . . . 14.960—14.980 mm (0.589—0.590 in.)

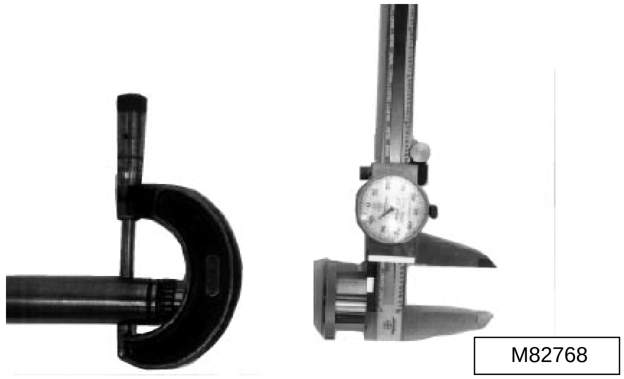
Clearance . . . . 0.050—0.100 mm (0.002—0.004 in.)

Clearance (Wear Limit) . . . 0.500 mm (0.197 in.)



IMPORTANT: Always replace seals with new. Used or damaged seals will leak.

23. Remove seal (C), retaining ring (B), and bearing (A) from transmission top case half.



24. Measure I.D. of bearing. Replace bearing if diameter is greater than specifications.
25. Measure O.D. of axle shaft. Replace axle shaft if diameter is less than specifications.
26. Subtract shaft O.D. from bearing I.D. to find clearance. Replace both axle shaft and bearing if clearance is greater than wear limit.

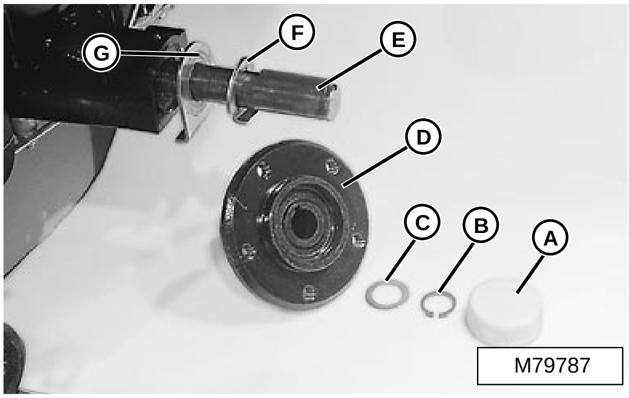
Specifications:

Bearing I.D. . . . . 25.440—25.530 mm (1.001—1.005 in.)

Axle Shaft O.D. . . . . 25.320—25.380 mm (0.997—1.000 in.)

Clearance . . . . 0.060—0.210 mm (0.002—0.008 in.)

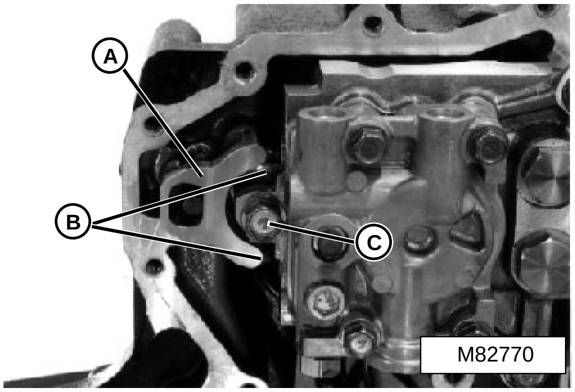
Clearance (Wear Limit) . . . . 0.500 mm (0.019 in.)



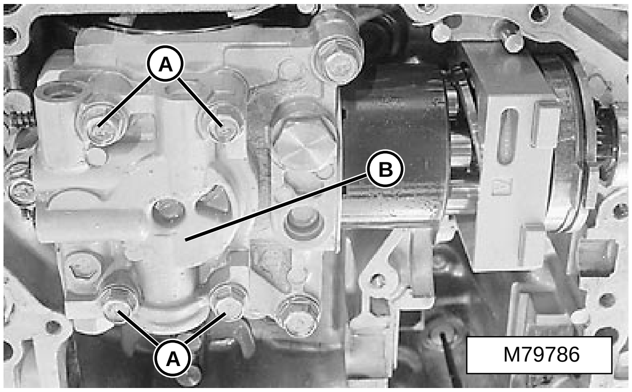
A—Cap
B—Ring
C—Washer
D—Hub
E—Key
F—Rotating Tab Washer
G—Stationary Tab Washer

NOTE: Hubs do not need to be removed unless axle shafts are to be replaced.

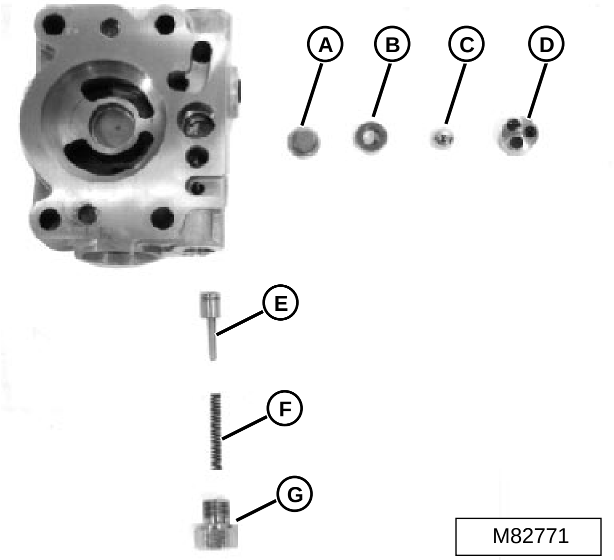
27. Remove cap (A), retaining ring (B), washer (C), and hub (D).
28. Remove key (E) washer (F) and washer (G).



29. Remove arm (A) from free wheel shaft (C).
30. Remove push-pins (B) and springs from pump body.

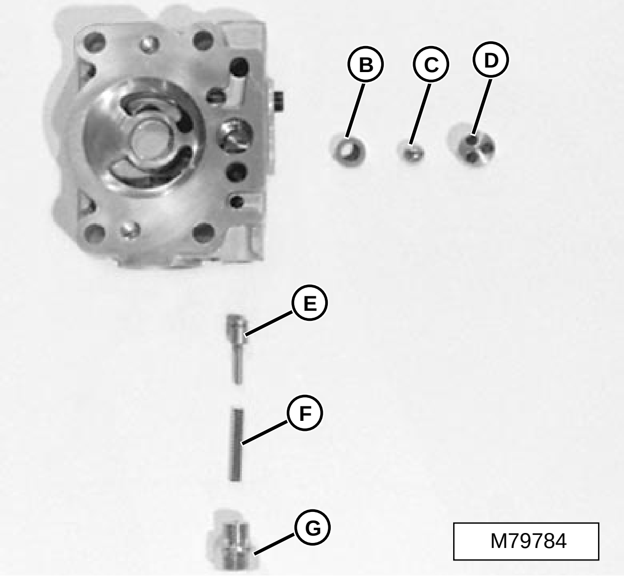


31. Remove four cap screws (A) and pump case (B).



Early Version

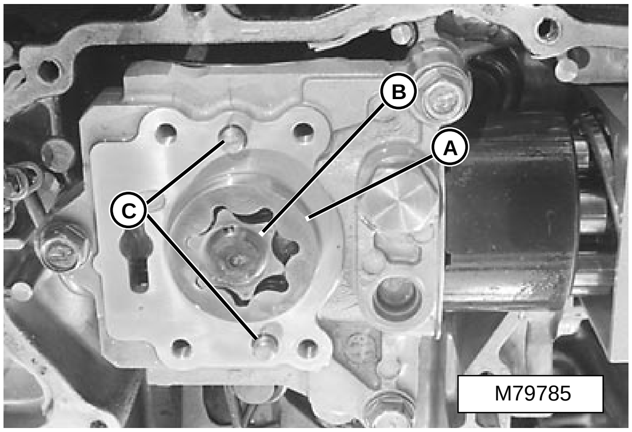
A— Screen
B— Sleeve
C— Ball
D— Orifice
E— Relief Valve
F— Spring
G— Plug



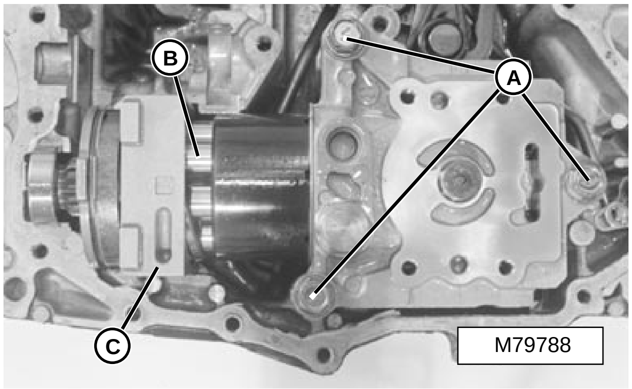
Later Version

A— Screen (Not Used)
B— Sleeve
C— Ball
D— Orifice
E— Relief Valve
F— Spring
G— Plug

32. Remove plug (G), spring (F), relief valve (E).
33. Remove charge pump bypass valve parts (A—D).



34. Remove pump outer rotor (A), inner rotor and pin (B) and locator pins (C).



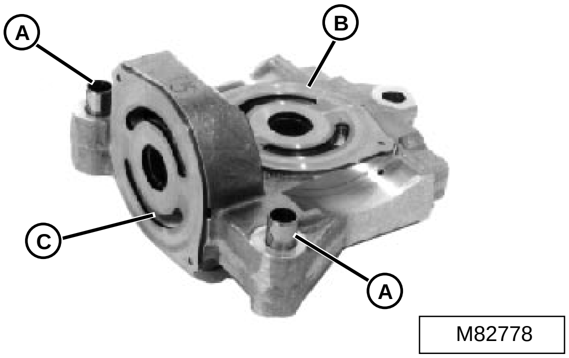
⚠ CAUTION

The center case is spring loaded, hold case down when removing cap screws.

35. Remove three cap screws (A).
36. Apply pressure against housing (C) to compress pistons (B) and remove motor shaft, brake, and center case assemblies as a unit.

IMPORTANT: Be careful not to damage machined surfaces of center case, valve plates, or cylinder block. Scratched or nicked parts can cause early transmission failure.

37. Remove center case assembly from motor/brake assembly.

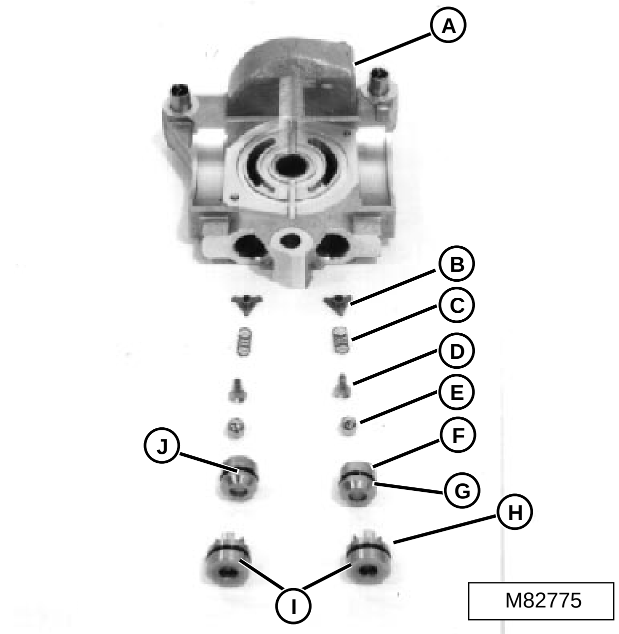


NOTE: Note location and position of valve plates (B and C) for assembly.

38. Remove pump valve plate (B) and motor valve plate (C).

NOTE: If either plate is to be replaced, also replace mating cylinder block assembly.

39. Remove alignment pins (A), if necessary.

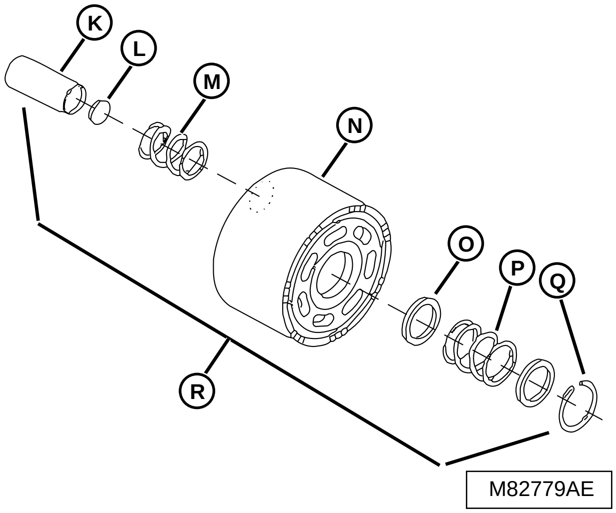


A— Center Case
B— Bypass Holder (2 used)
C— Spring (2 used)
D— Ball Holder (2 used)
E— Ball (2 used)
F— O-Ring (2 used)
G— Reverse Bypass Valve with Orifice
H— O-Ring (2 used)
I— Bypass Bodies
J— Forward Bypass Valve

NOTE: Note location of bypass valve with orifice (G) for assembly.

40. Remove valve assemblies (B—J).

Inspect parts for wear or damage. Replace as necessary.



Motor Shaft Cylinder Block Assembly

K— Piston
L— Disc
M— Spring
N— Cylinder Block
O— Washer (2 used)
P— Spring
Q— Retaining Ring
R— Cylinder Block Assembly

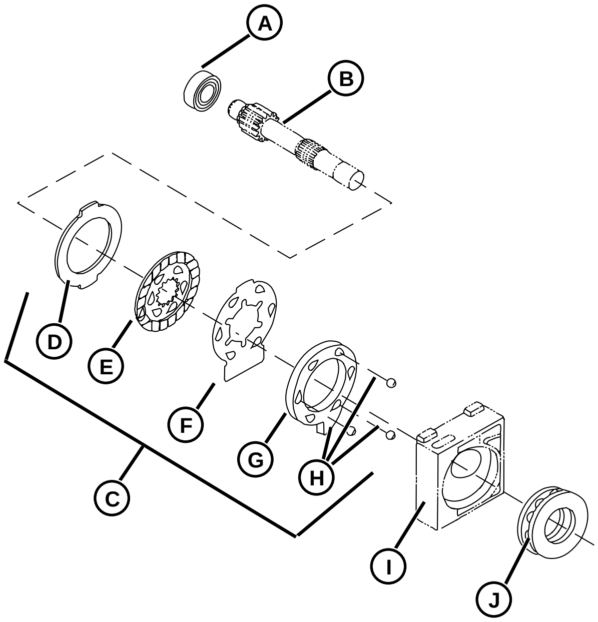
41. Remove cylinder block assembly (R) from motor shaft assembly.

IMPORTANT: Note location of pistons as they are removed. Pistons must be installed into the same bores as they were removed from.

42. Disassemble parts (K—M) and (O—Q).

NOTE: If the cylinder block is to be replaced, also replace motor valve plate.

Inspect all parts for wear or damage. Replace as necessary.



M79812

Motor Shaft and Brake Assembly

A— Bearing
B— Motor Shaft
C— Brake Assembly
D— Steel Plate (Thick)
E— Friction Plate
F— Steel Plate (Thin)
G— Actuator Plate
H— Ball (3 used)
I— Housing
J— Thrust Bearing (three pieces)

43. Disassemble parts (A—J).

Inspect all parts for wear or damage. Replace if necessary.

44. Inspect brake assembly (C):

- Measure thickness of steel plates (D and F), and friction plate (E). Replace if less than minimum specification.

Specifications:

Steel Plate (D) Thickness

Standard. . . . . 4.400—4.600 mm (0.160—0.180 in.)

Wear Limit . . . . 4.300 mm (0.170 in.)

Friction Plate (E) Thickness

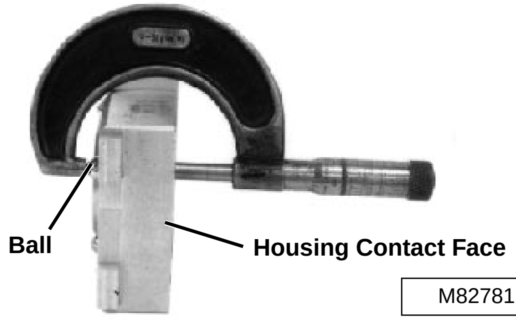
Standard. . . . . 2.900—3.100 mm (0.110—0.120 in.)

Wear Limit . . . . 2.700 mm (0.100 in.)

Steel Plate (F) Thickness

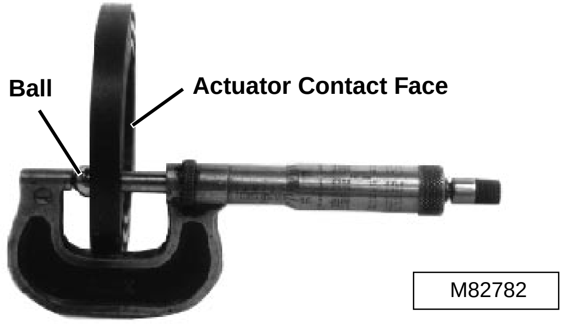
Standard. . . . . 1.100—1.300 mm (0.040—0.050 in.)

Wear Limit . . . . 1 mm (0.039 in.)



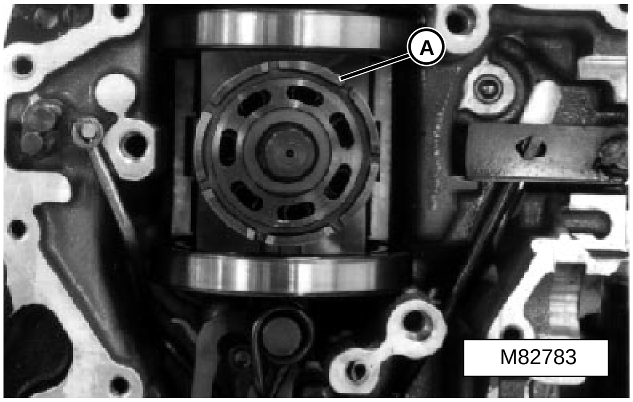
M82781

- Place balls in housing and measure the distance from the ball to the housing contact face. Replace housing and balls if measurement is not within **34.125—34.325 mm (1.340—1.350 in.)**.



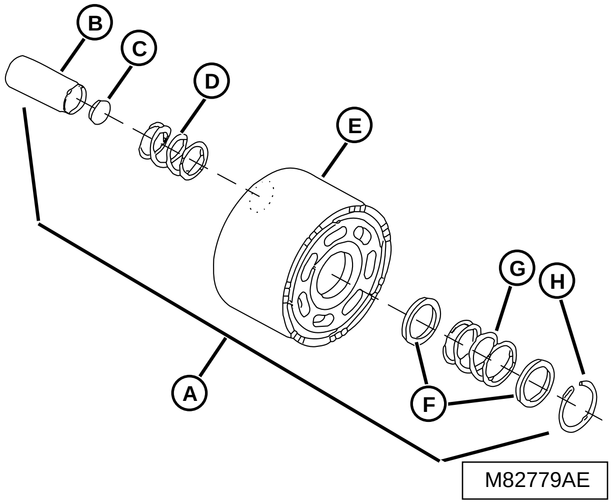
M82782

- Place ball in actuator and measure the distance from the ball to the actuator contact face. Replace actuator and balls if measurement is not within **14.185—14.335 mm (0.558—0.564 in.)**.



NOTE: When removing cylinder block, hold pistons to prevent them from falling into case.

45. Remove cylinder block assembly (A).



Pump Shaft Cylinder Block Assembly

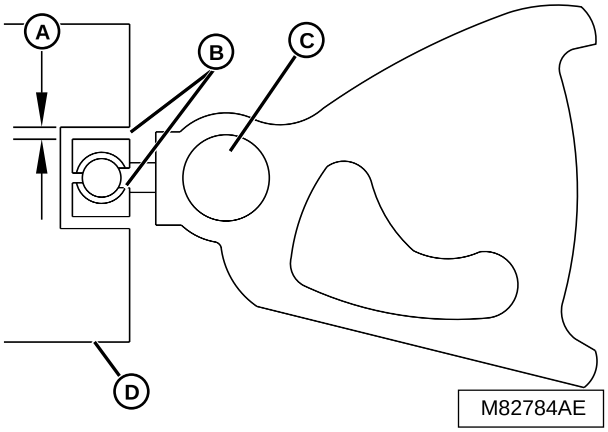
A— Cylinder Block Assembly
B— Piston
C— Disc
D— Spring
E— Cylinder Block
F— Washer (2 used)
G— Spring
H— Retaining Ring

IMPORTANT: Note location of pistons as they are removed. Pistons must be installed into the same bores they were removed from.

46. Disassemble parts (B—D) and (F—H).

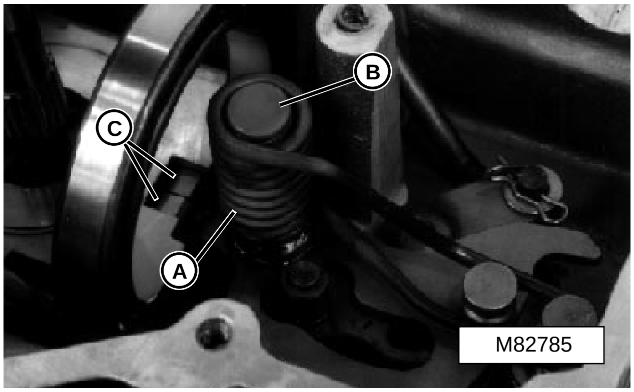
NOTE: If the cylinder block is to be replaced, also replace pump valve plate.

Inspect all parts for wear or damage. Replace as necessary.



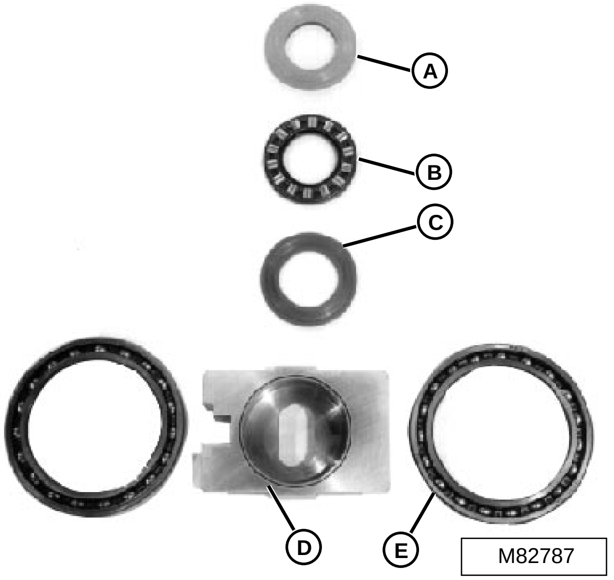
A— Clearance
B— Shift Blocks
C— Control Shaft
D— Swash Plate

47. Measure clearance (A) between swash plate (D) and shift blocks (B). If measurement is **greater than 0.150 mm (0.006 in.)**, replace both shift blocks and swash plate.



48. Remove spring (A), control shaft (B) and shift blocks (C).

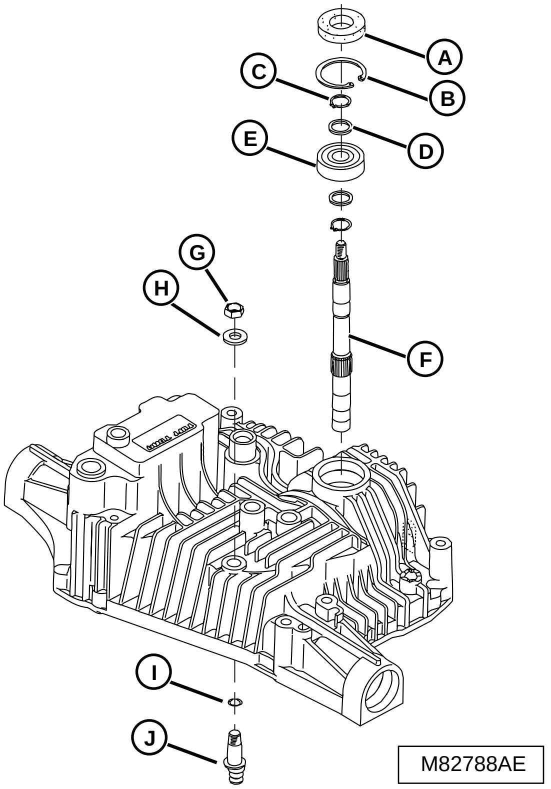
Inspect all parts for wear or damage. Replace if necessary.



A— Thrust Plate (Thick)
B— Thrust Bearing
C— Thrust Plate (Thin)
D— Swash Plate
E— Bearing (2 used)

49. Remove parts (A—E) as a unit.

Inspect parts for wear or damage. Replace as necessary.



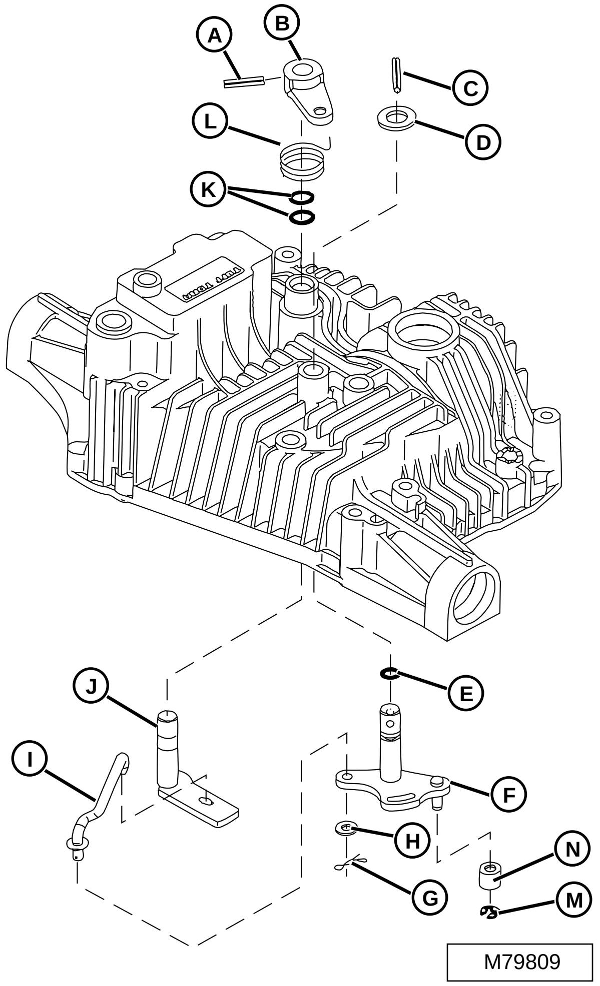
A— Seal
B— Retaining Ring
C— Retaining Ring (2 used)
D— Washer (2 used)
E— Bearing
F— Pump Shaft
G— Nut
H— Washer
I— O-Ring
J— Neutral Eccentric

50. Turn case over.

IMPORTANT: Always replace seals with new. Used or damaged seals will leak.

51. Remove pump shaft seal (A).
52. Remove retaining ring (B) and pump shaft assembly.
53. Disassemble pump shaft assembly; parts (C—F).
54. Remove parts (G—J).

Inspect all parts for wear or damage. Replace as necessary.



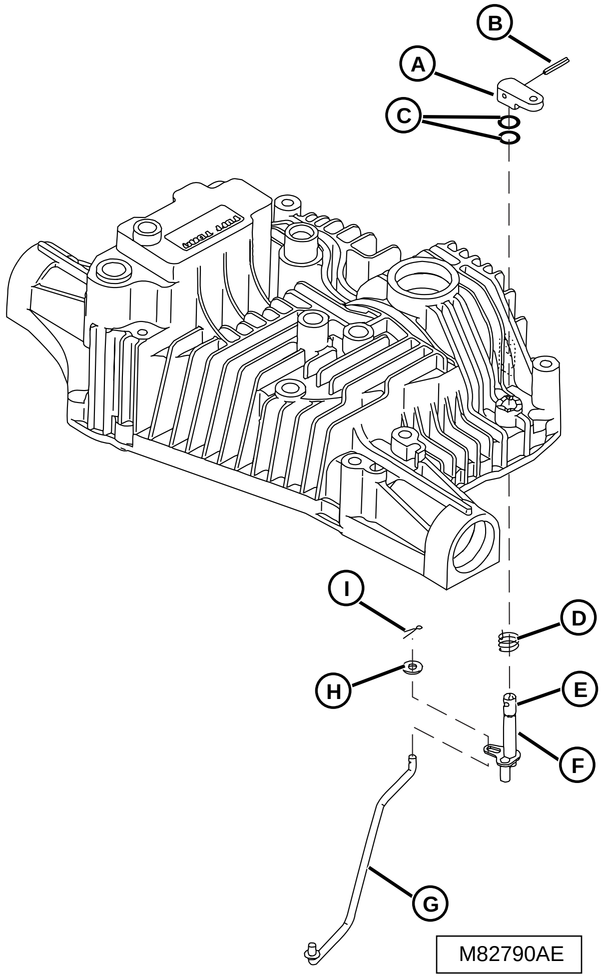
A— Roll Pin
B— Brake Arm
C— Roll Pin
D— Washer
E— O-Ring
F— Brake Idler Shaft
G— Cotter Pin
H— Washer
I— Rod
J— Brake Arm Actuator Shaft
K— O-Rings
L— Spring
M— E-Ring
N— Bushing

55. Remove roll pin (C) and washer (D).

NOTE: Note position of brake arm and spring to aid in assembly.

56. Remove roll pin (A).
57. Remove brake arm (B) and spring (L).
58. Remove cotter pin (G) and washer (H).
59. Remove brake idler shaft (F) and O-ring (E).
60. Remove brake arm actuator shaft (J) and rod (I).
61. Remove O-rings (K) from upper case.

Inspect all parts for wear or damage. Replace as necessary.



M82790AE

A— Free Wheel Valve Arm
B— Roll Pin
C— O-Rings
D— Spring
E— O-Ring
F— Free Wheel Shaft
G— Rod
H— Washer
I— Cotter Pin

62. Remove ring (M) and bushing (N).
63. Remove roll pin (B) and free wheel valve arm (A).
64. Remove O-rings (C).
65. Remove parts (D—I).

Inspect all parts for wear or damage. Replace as necessary.

IMPORTANT: Absolute cleanliness is essential when working on transmission. Contamination can result in serious damage or inadequate operation.

DO NOT use shop towels or rags to dry clean parts. Lint will clog passages in hydrostatic system and cause damage.

⚠ CAUTION

Reduce compressed air to less than 210 kPa (2 bar) (30 psi) when using for cleaning purposes. Clear area of bystanders, guard against flying chips, and wear personal protection equipment including eye protection.

66. Clean all metal parts with solvent and blow dry with compressed air.

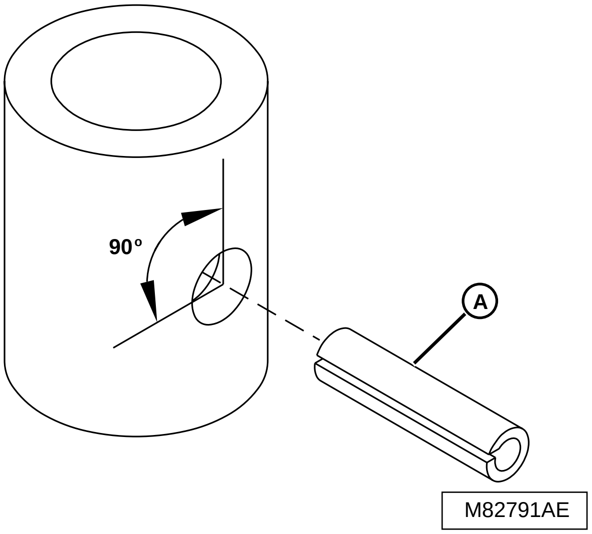
Inspect case halves for wear or damage. Replace as necessary.

Assembly

IMPORTANT: Always use new seals and O-rings. Damaged or used parts will leak.

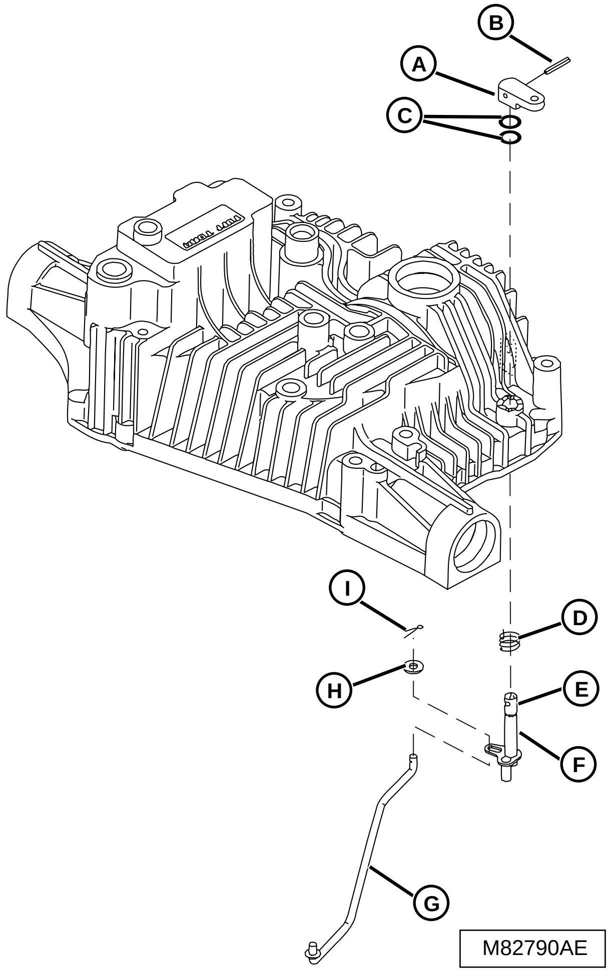
NOTE: Lubricate all seals and O-rings with petroleum jelly during assembly.

Apply clean hydrostatic/hydraulic Low Viscosity HY-GARD® oil to all internal parts during assembly.



M82791AE

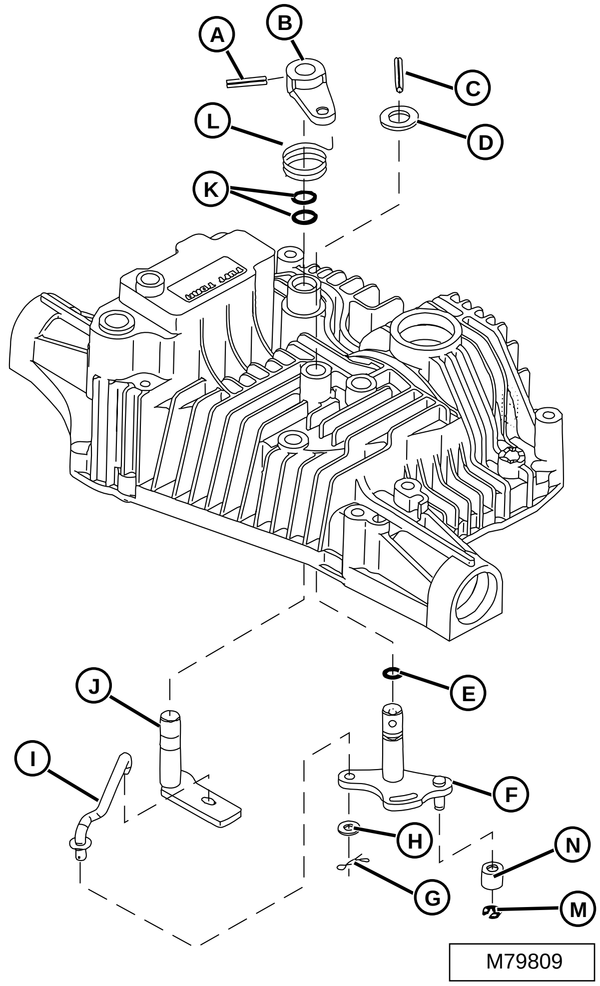
NOTE: When installing roll pins (A), position split as shown.



M82790AE

A— Free Wheel Valve Arm
B— Roll Pin
C— O-Rings
D— Spring
E— O-Ring
F— Free Wheel Shaft
G— Rod
H— Washer
I— Cotter Pin

1. Assemble parts (D—I).
2. Install shaft assembly in top case half.
3. Install new O-rings (C) and free wheel valve arm (A) on shaft.
4. Align holes in arm and shaft and install roll pin (B).



M79809

A— Roll Pin
B— Brake Arm
C— Roll Pin
D— Washer
E— O-Ring
F— Brake Idler Shaft
G— Cotter Pin
H— Washer
I— Rod
J— Brake Arm Actuator Shaft
K— O-Rings
L— Spring
M— E-Ring
N— Bushing

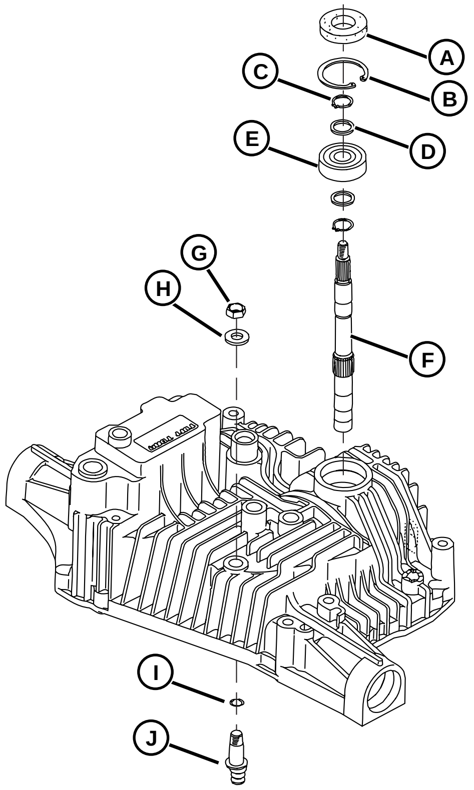
5. Install new O-rings (K) in case bore.
6. Install brake rod (I), on brake shaft (J).

NOTE: Apply a light coat of multipurpose grease to the shaft bore in the upper case.

7. Install brake shaft (J) into shaft bore. Install spring (L) and brake arm (B).
8. Align holes in brake arm and shaft and install roll pin (A).
9. Install new O-ring (E) on shaft (F).

NOTE: Apply a light coat of multipurpose grease to the shaft bore in the upper case.

10. Install bushing (N) and ring (M).
11. Install brake idler shaft (F) into shaft bore.
12. Install brake rod (I), washer (H) and cotter pin (G).
13. Install washer (D) and roll pin (C).



M82788AE

A— Seal
B— Retaining Ring
C— Retaining Ring (2 used)
D— Washer (2 used)
E— Bearing
F— Pump Shaft
G— Nut
H— Washer
I— O-Ring
J— Neutral Eccentric

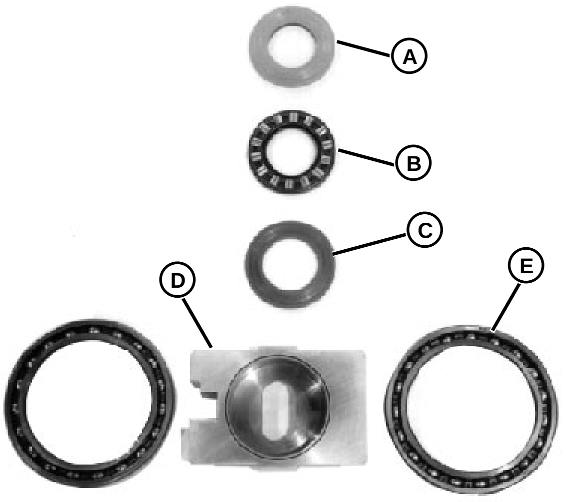
14. Install parts (G—J).

NOTE: Make sure that the retaining rings (C) seat completely in grooves.

15. Assemble pump shaft assembly; parts (C—F).
16. Install shaft assembly in top case half.
17. Install retaining ring (B).

NOTE: Apply multipurpose grease to lip of seal before installation.

18. Press a new seal (A) onto pump shaft and into case bore.
19. Turn case over and support securely.



M82787

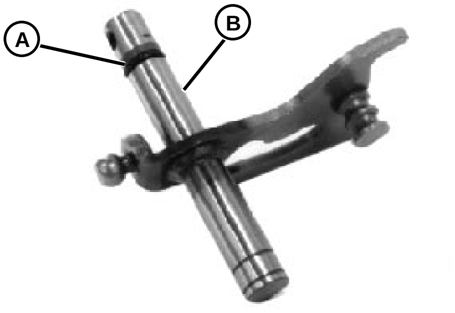
A— Thrust Plate (Thick)
B— Thrust Bearing
C— Thrust Plate (Thin)
D— Swash Plate
E— Bearing (2 used)

IMPORTANT: When assembling swash plate parts, position thin thrust plate (C) in the bottom of the swash plate (D). Position thick thrust plate (A) toward pump.

20. Install thrust plate (C) (thin), bearing (B), and thrust plate (A) (thick) in swash plate (D).

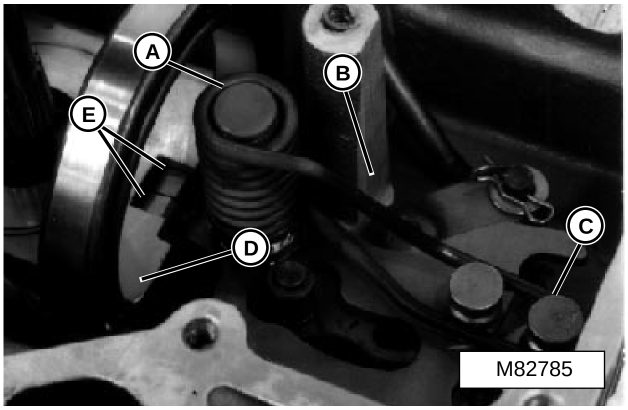
IMPORTANT: Make sure that swash plate moves freely after installed.

21. Install bearings (E) onto swash plate and install assembly into upper case.



M82793

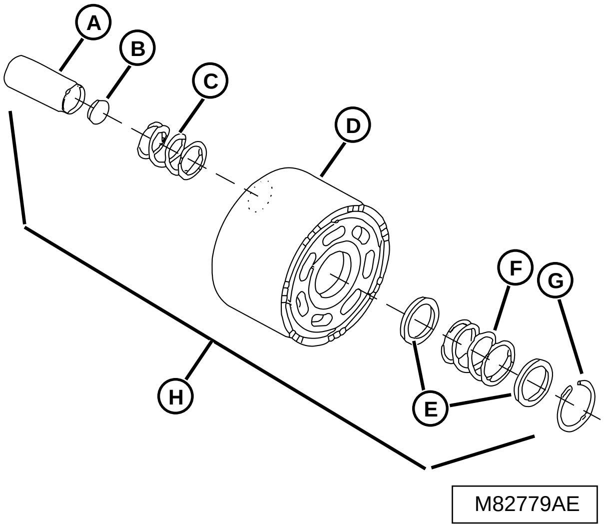
22. Install new O-ring (A) on control shaft (B).



A— Control Shaft
B— Torsion Spring
C— Neutral Eccentric
D— Swash Plate
E— Shift Blocks

NOTE: Apply a light coat of multipurpose grease to the control shaft bore in the upper case.

23. Apply a small amount of petroleum jelly to shift blocks (E) to hold blocks in place. Install blocks on control shaft (A).
24. Align shift blocks with opening in swash plate (D). Install control shaft (A) in top case half.
25. Install torsion spring (B) onto neutral eccentric (C).



Pump Shaft Cylinder Block Assembly

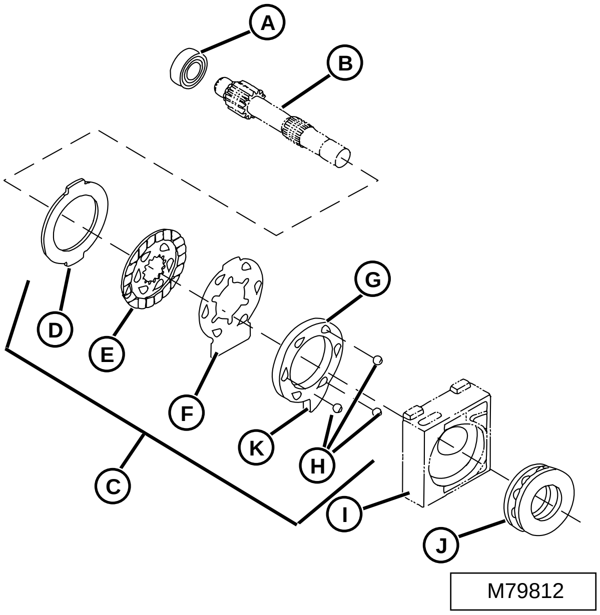
A— Piston
B— Disc
C— Spring
D— Cylinder Block
E— Washer (2 used)
F— Spring
G— Retaining Ring
H— Cylinder Block Assembly

IMPORTANT: Install pistons into same bore as removed from.

26. Assemble cylinder block assembly (H); parts (A—G).

NOTE: When installing cylinder block assembly onto pump shaft, hold pistons to prevent them from falling out.

27. Install cylinder block assembly on pump shaft.
28. Fill pistons with clean hydrostatic/hydraulic low viscosity HY-GARD® oil.



Motor Shaft and Brake Assembly

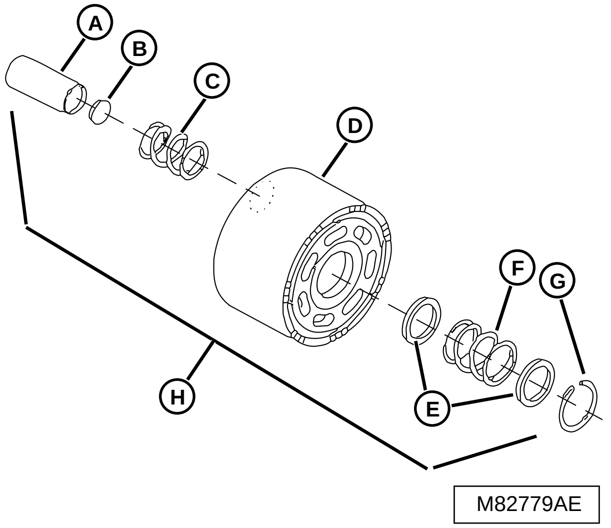
A— Bearing
B— Motor Shaft
C— Brake Assembly
D— Steel Plate
E— Friction Plate
F— Steel Plate
G— Actuator Plate
H— Balls (3 used)
I— Housing
J— Thrust Bearing (three pieces)
K— Cam Arm

29. Install bearing (A) on motor shaft (B).

IMPORTANT: Place larger diameter of thrust bearing toward housing.

30. Install three piece thrust bearing (J) into housing (I). The larger bearing raceway piece should be installed first with the raceway facing out from the housing. This is identified by engraved markings on the face of the larger raceway. Install the bearing package with the cripped edge of the bearing facing inwards towards the previously installed large raceway piece. Finally place the smaller raceway piece over the flat side of the bearing package to complete thrust bearing/ housing assembly.

31. Apply a small amount of petroleum jelly to balls (H) to hold in place, and install balls into actuator plate (G).
32. Install actuator plate (G) with cam arm (K) toward "B" marking on the bottom of housing (I).
33. Install steel plate (F), friction plate (E), and steel plate (D).
34. Install assembly on motor shaft (B) with the “A” side of the housing (I) facing up.



Motor Shaft Cylinder Block Assembly

A— Piston

B— Disc

C— Spring

D— Cylinder Block

E— Washer (2 used)

F— Spring

G— Retaining Ring

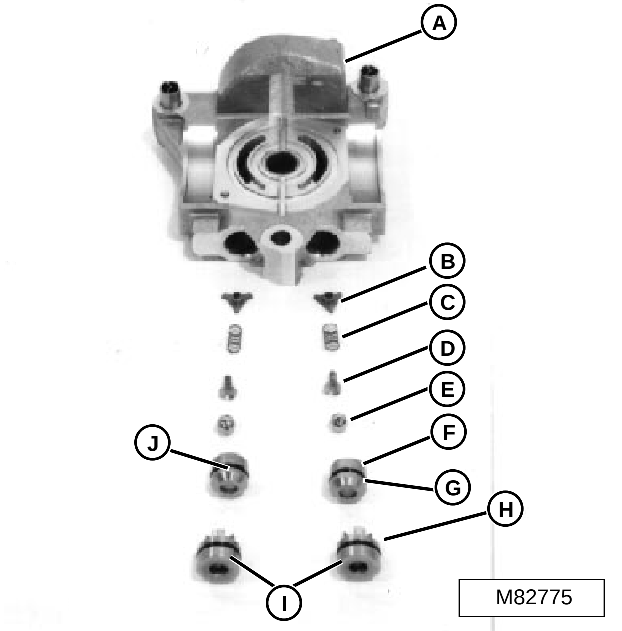
H— Cylinder Block Assembly

IMPORTANT: Install pistons into same bore as removed from.

35. Assemble cylinder block assembly (H); parts (A—G).

NOTE: When installing cylinder block assembly onto motor shaft, hold pistons to prevent them from falling into case.

36. Install cylinder block assembly onto motor shaft.



A— Center Case

B— Bypass Holder (2 used)

C— Spring (2 used)

D— Ball Holder (2 used)

E— Ball (2 used)

F— O-Ring (2 used)

G— Reverse Bypass Valve with Orifice

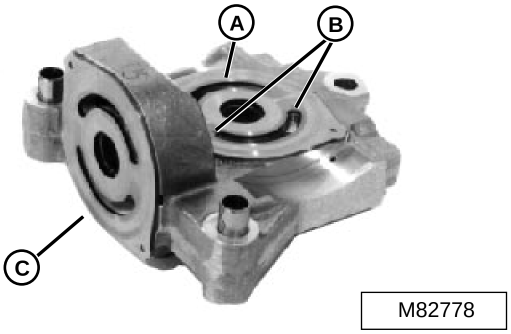
H— O-Ring (2 used)

I— Bypass Bodies

J— Forward Bypass Valve

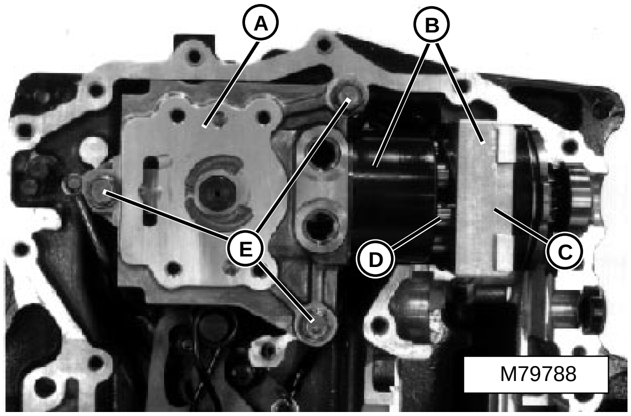
IMPORTANT: Bypass valve with orifice (G) must be installed in center case at location shown. Transmission will not operate properly if installed at different location.

37. Install parts (B—J) into center case (A).
38. After bypass valve assemblies have been installed, push on balls (E) to check for “free” movement.



NOTE: Pump and motor valve plates (A and C) are different. Pump valve plate (A) has “ramps” on one side. Do not interchange.

39. Apply a small amount of petroleum jelly to pump plate (A) and motor plate (C) to hold in place.
40. Install pump valve plate (A) onto center case with “ramps” (B) facing away from center case.
41. Install motor valve plate (C).

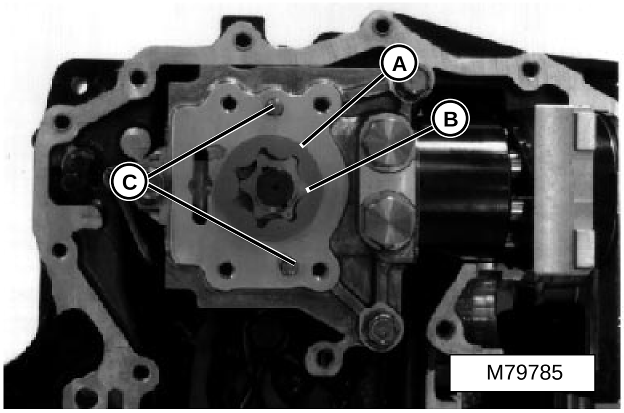


IMPORTANT: Be careful not to damage machined surfaces of center case, valve plates, or cylinder block. Scratched or nicked parts can cause early transmission failure.

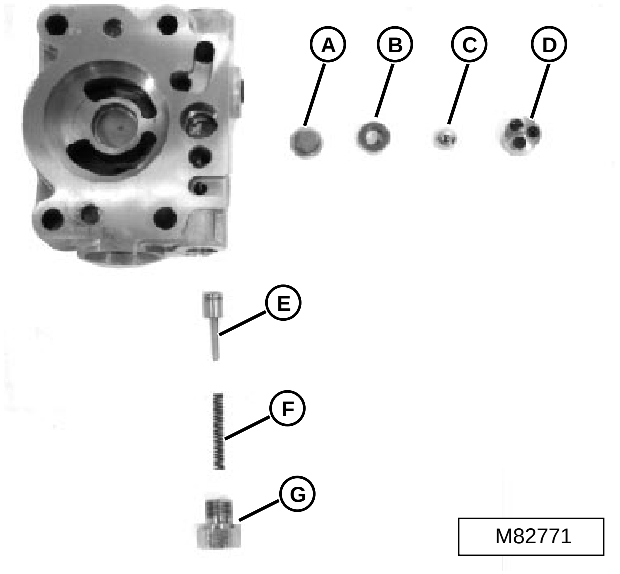
42. Assemble motor shaft/brake assembly (B) into center case assembly (A).

IMPORTANT: Motor shaft/brake/center case assembly must be installed into upper case as a unit, with “B” mark on thrust bearing housing (C) facing upper case. Incorrect installation will result in improper operation of transmission.

43. Gently compress motor shaft/brake/center case assembly, by applying pressure against thrust bearing housing (C) to compress pistons (D). Install complete assembly into upper case with “B” mark on side of thrust bearing housing (C) facing upper case.
44. Install three caps screws (E), into center case. Draw cap screws down evenly. Tighten to **54 N•m (40 lb-ft.)**.

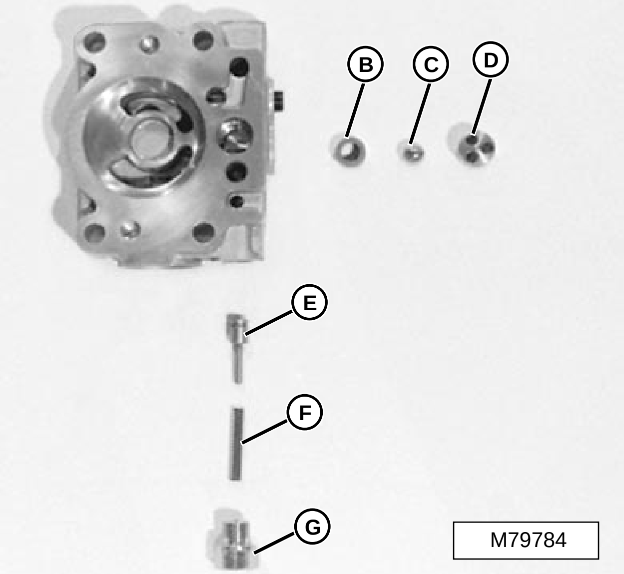


45. Install two locator pins (C) in center case.
46. Align the “dimples” and install pin and inner rotor (B).



Early Version

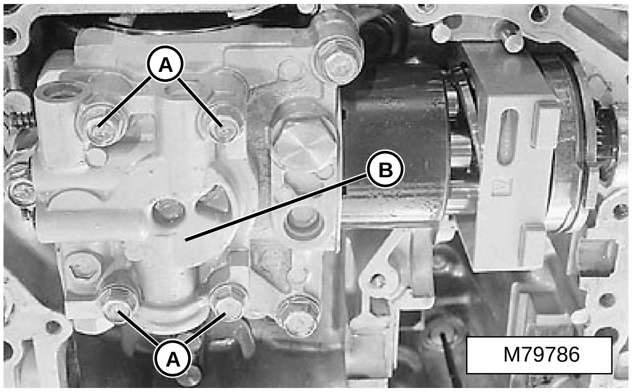
A— Screen
B— Sleeve
C— Ball
D— Orifice
E— Relief Valve
F— Spring
G— Plug



Later Version

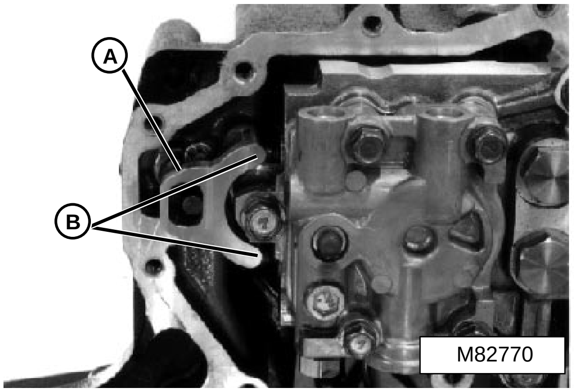
A— Screen (Not Used)
B— Sleeve
C— Ball
D— Orifice
E— Relief Valve
F— Spring
G— Plug

47. Apply a small amount of petroleum jelly to orifice (D) to hold in place.
48. Install charge pump bypass valve parts (A—D).
49. Install relief valve (E), spring (F) and plug (G). Tighten plug (G) to **22 N•m (195 lb-in.)**.

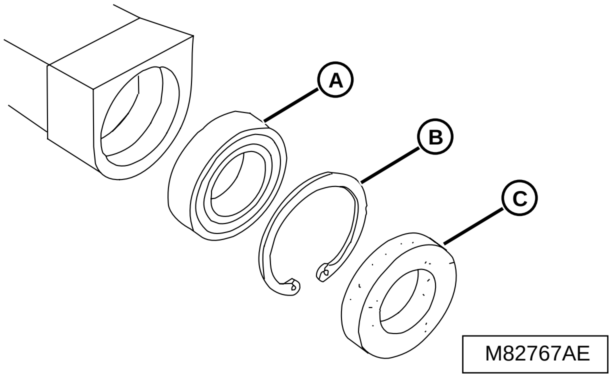


IMPORTANT: Be careful not to damage machined surfaces of pump body, outer rotor, or center case during installation.

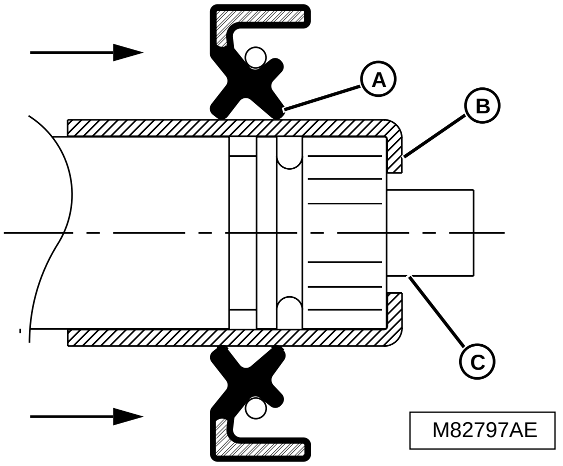
50. Install pump body (B) on center case.
51. Install four cap screws (A) into pump body. Tighten to **23 N•m (204 lb-in.)**.



52. Install springs and push pins (B).
53. Push in push pins and install arm (A).
54. Check arm and push pins for free movement.

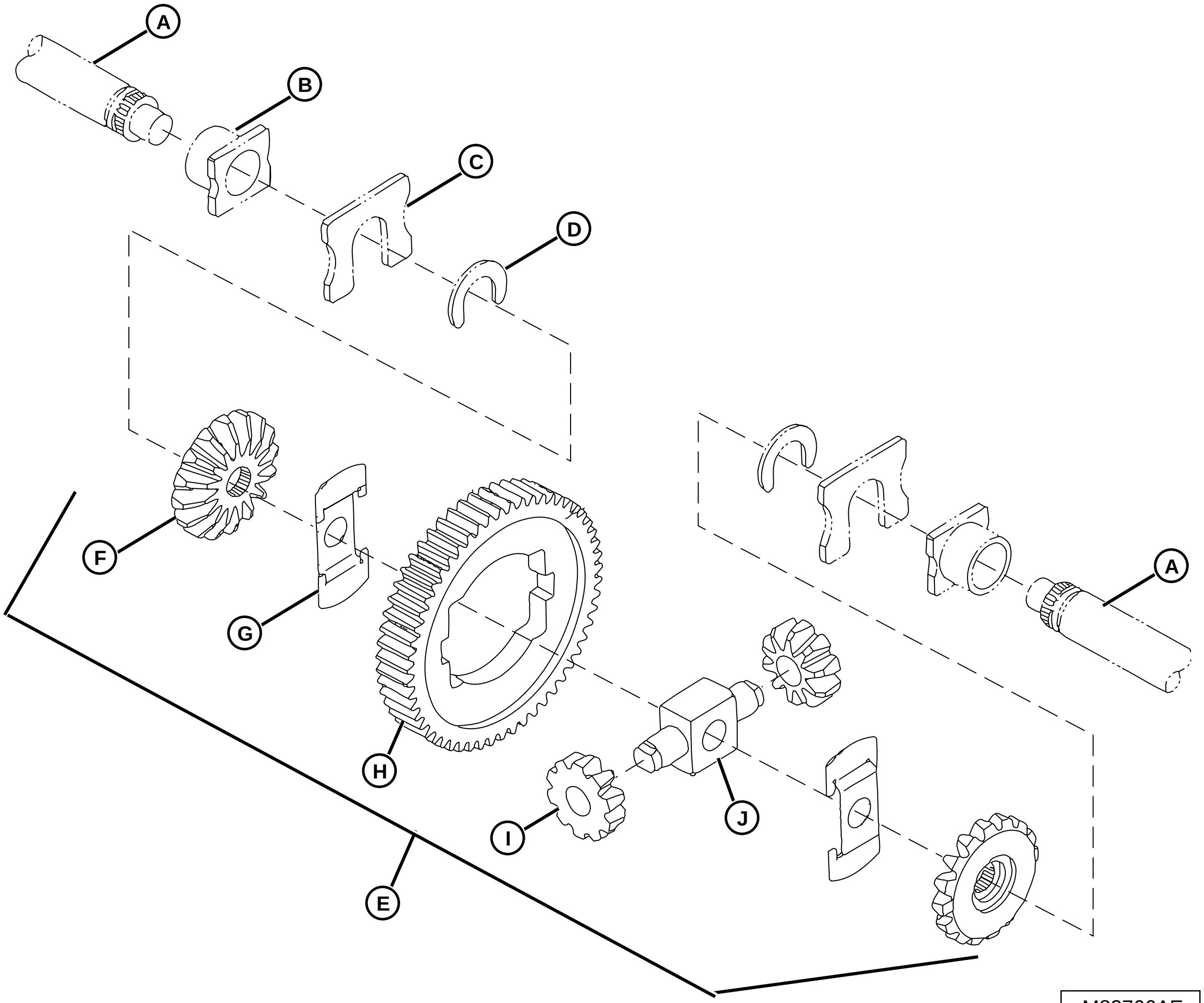


55. Install axle bearings (A), retaining rings (B), and seals (C) into transmission top case half.



IMPORTANT: Apply multipurpose grease to lips of seal (A) and tape end of axle shaft to prevent seal damage during axle installation.

56. Apply tape (B) to ends of axle shaft (C) and install axles.



M82766AE

A— Axle Shaft (LH and RH)

B— Bushing (2 used)

C— Collar (2 used)

D— Ring (2 used)

E— Differential Gear Assembly

F— Differential Bevel Gear (2 used)

G— Thrust Washers (2 used)

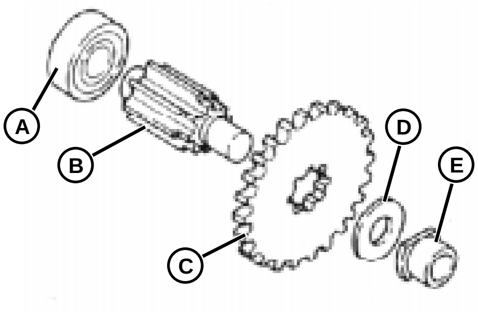
H— Final Drive Gear

I— Pinion Gear (2 used)

J— Pinion Shaft

NOTE: Push axle shafts into bushing so that the ends do not extend past bushing.

57. Install bushings (B) into top case half.
58. Assemble differential gear assembly (E).
59. Install differential gear assembly (E) into case and push axle shafts (A) into side differential bevel gears (F).
60. Install ring (D) on each side of differential gear assembly.
61. Install collar (C) between ring and bushing on each side of differential gear assembly.



Final Pinion Shaft Assembly M54770

A— Bearing

B— Final Pinion Shaft

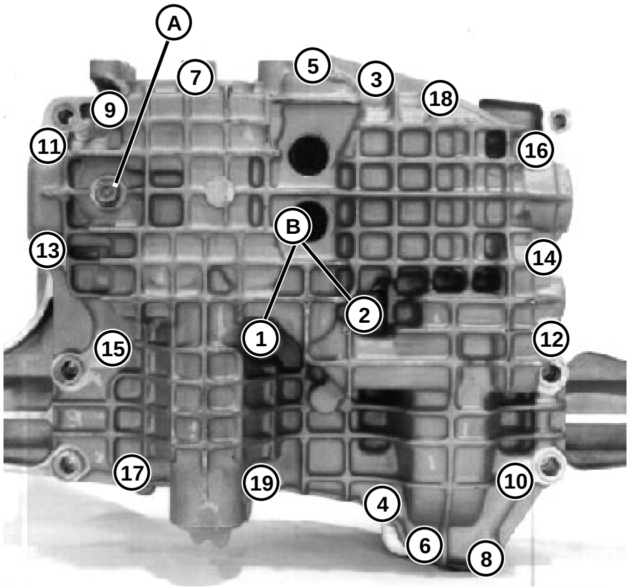
C— Final Pinion Shaft Gear

D— Washer

E— Bushing

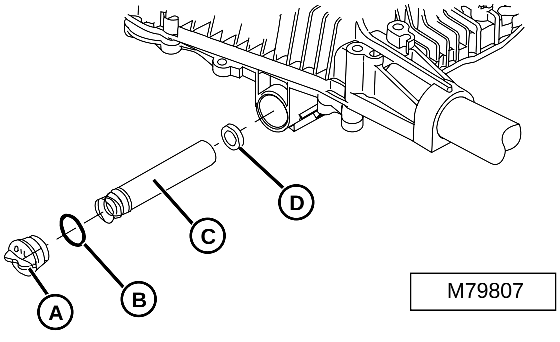
62. Assemble final pinion shaft parts (A—E).

63. Install final pinion shaft assembly in top case half.
64. Install magnet in bottom case half, if removed.



M82763

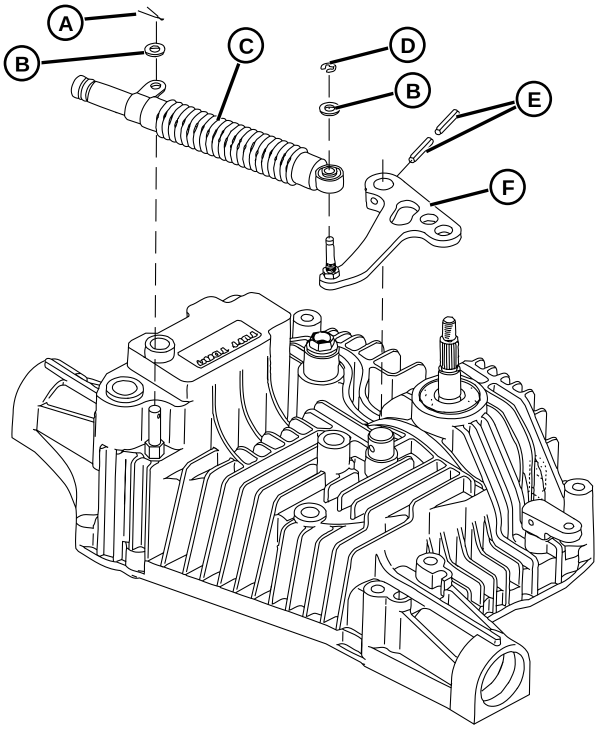
65. Install drain plug and seal washer (A) in bottom case. Tighten plug to **15 N•m (133 lb-in.)**.
66. Clean mating surfaces of transmission case using Clean and Cure Primer. Apply a coat of Flexible Sealant or equivalent to top and bottom case halves.
67. Install bottom case on top case.
68. Install 19 case cap screws. Tighten center cap screws (B) first, then tighten outside screws in a sequence shown. Tighten all cap screws to **23 N•m (204 lb-in.)**.



M79807

A— Filter Cap
B— O-Ring
C— Filter with Spring
D— Gasket

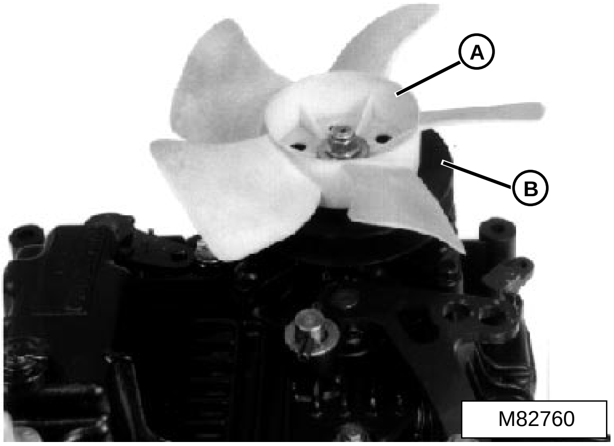
69. Install filter parts (A—D).



M79808

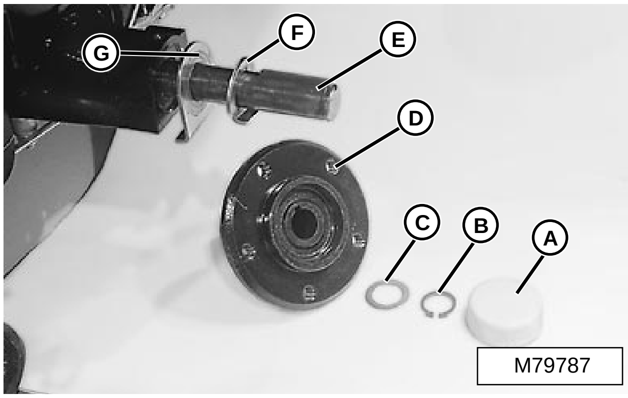
A— Cotter Pin
B—Washers (2 used)
C—Damper
D—Retaining Ring
E—Roll pins (2 used)

70. Turn transmission over.
71. Install control arm (F) and roll pin (E).
72. Install shock absorber (C), washers (B), cotter pin (A), and retaining ring (D).



M82760

73. Install pulley (B) and cooling (suction) fan (A).

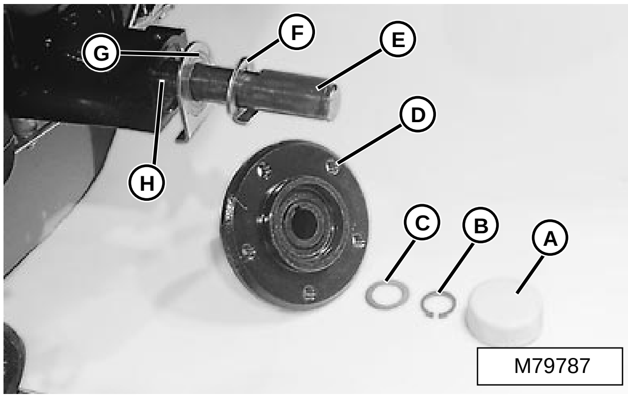


A—Cap
B—Ring
C—Washer
D—Hub
E—Key
F—Rotating Tab Washer
G—Stationary Tab Washer (Tab Towards Bottom)

74. Apply MPG-2® Polymer Multipurpose Grease to axle shafts.
75. Install parts (A—G).
76. Fill transmission to proper level with clean hydrostatic/hydraulic low viscosity HY-GARD® oil. (See SPECIFICATIONS AND GENERAL INFORMATION section.)

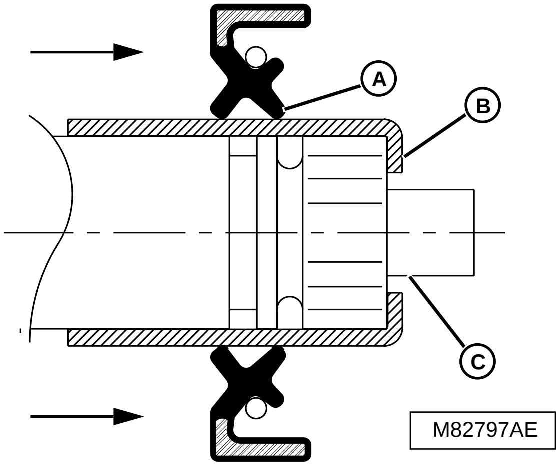
Case Seals—Replacement

1. Remove rear wheel. (See procedure in MISCELLANEOUS section.)



A—Cap
B—Retaining Ring
C—Washer
D—Hub
E—Key
F—Rotating Tab Washer
G—Stationary Tab Washer (Tab Towards Bottom)
H—Seal

2. Remove parts (B—H).
3. Pry out seal (H).



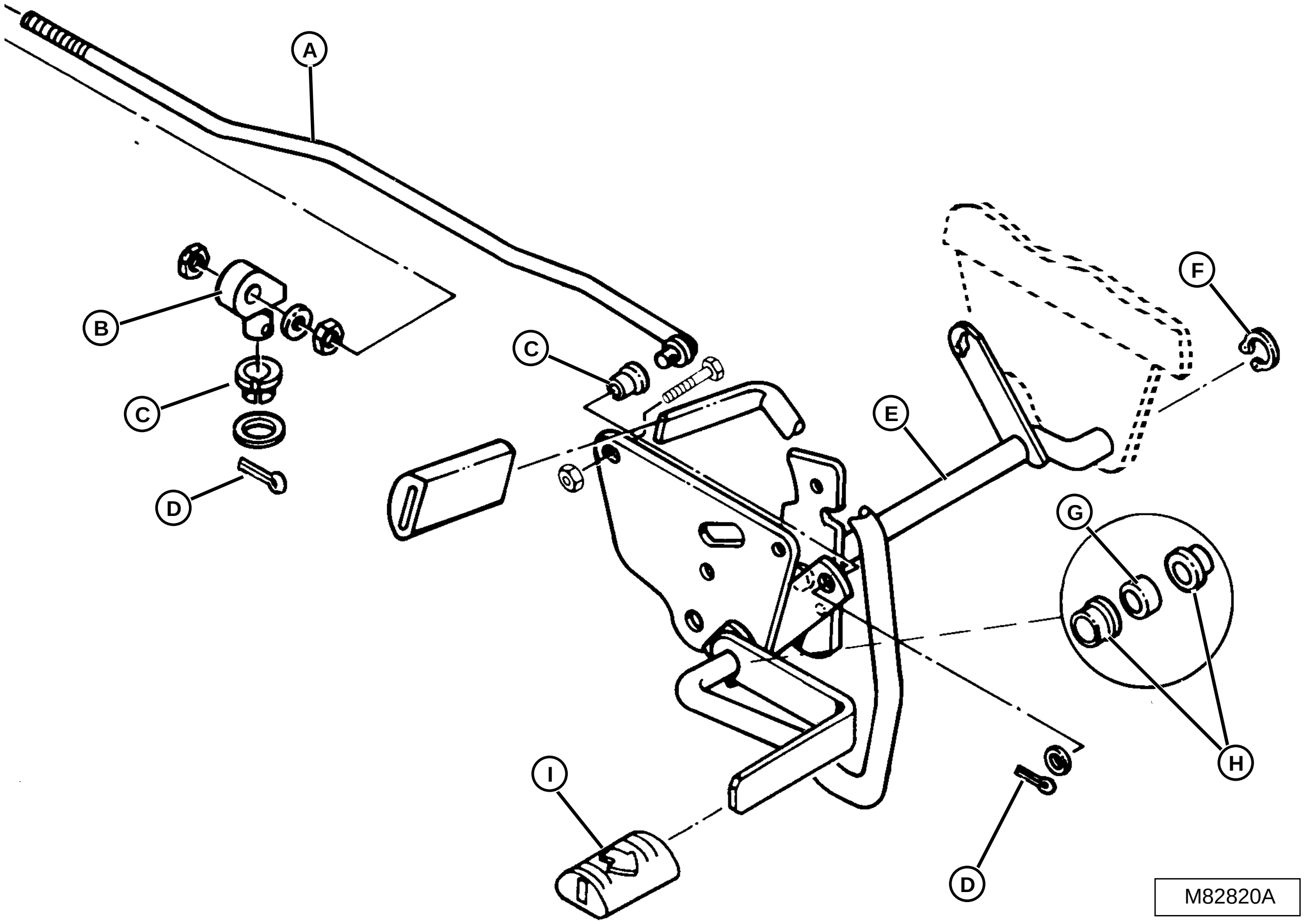
IMPORTANT: Apply multipurpose grease to lip of seal (A) and tape end of axle shaft to prevent seal damage during installation.

4. Apply multipurpose grease to lip of seal (A).
5. Apply tape (B) to ends of axle shaft (C).
6. Install seal (A) using a hammer and an appropriate driver.
7. Apply MPG-2® Polymer Multipurpose Grease to axle shafts.
8. Install washers, key, hub, retaining ring, cap, and rear wheel.
9. Repeat procedures on opposite end, if necessary.

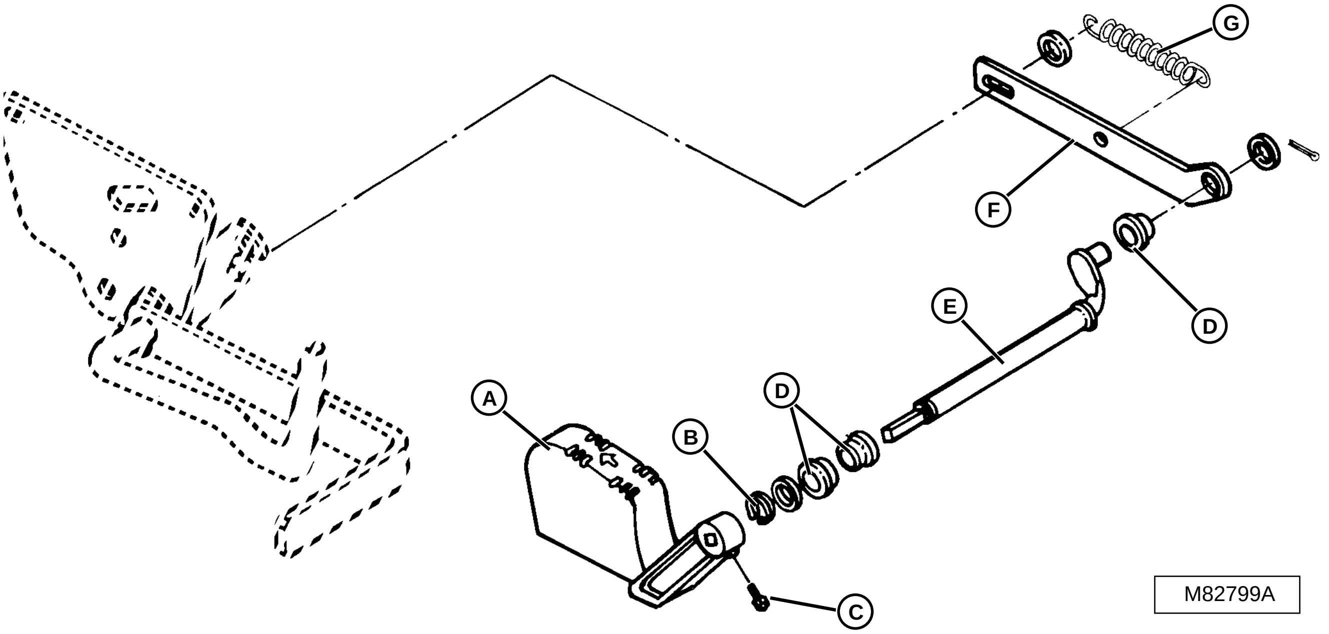
CONTROL PEDALS AND LINKAGE—FORWARD

1. Remove mower deck. (See procedure in ATTACHMENTS section.)
2. Remove fuel tank. (See procedure in ENGINE section.)
3. Inspect all parts for wear or damage. Replace as necessary.
4. Adjust linkage and pedal height. (See Adjustments.)

A— Link Rod
B— Rod End
C— Bushing
D— Cotter Pin
E— Shaft
F— Snap Ring
G— Spacer
H— Bushings
I— Forward Pedal Pad



CONTROL PEDALS AND LINKAGE—REVERSE



A— Reverse Pedal
B— Clip
C— Set Screw
D— Bushings
E— Shaft
F— Link
G— Spring

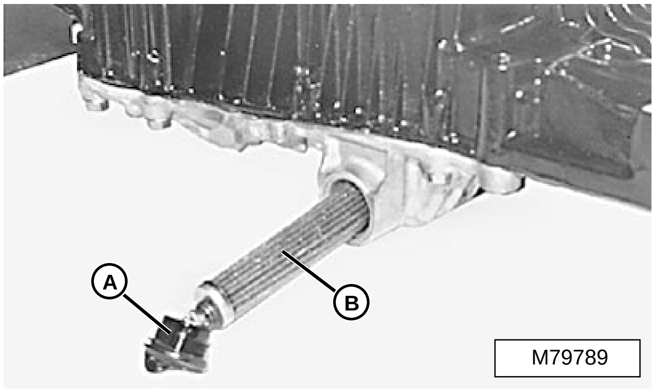
1. Inspect all parts for wear or damage. Replace as necessary.
2. Adjust pedal height. (See Adjustments.)

CHANGING TRANSMISSION FILTER

1. Drain transmission oil from plug on bottom of pan.

CAUTION

Do NOT drain from filter access cap on back of transmission.



2. After oil has completely drained, remove access cap (A) and filter (B).

NOTE: Earlier hydrostatic transmissions used a filter which had a separate spring and a white spacer. If transmission has this older style filter, you may discard the spring and spacer and use the current model transmission filter in its place.

3. Install new filter (C) in bore with spring end facing out towards the cap. Install original access cap.
4. Refill transmission with fresh (new) John Deere Low Viscosity HY-GARD® J20D Transmission Oil.

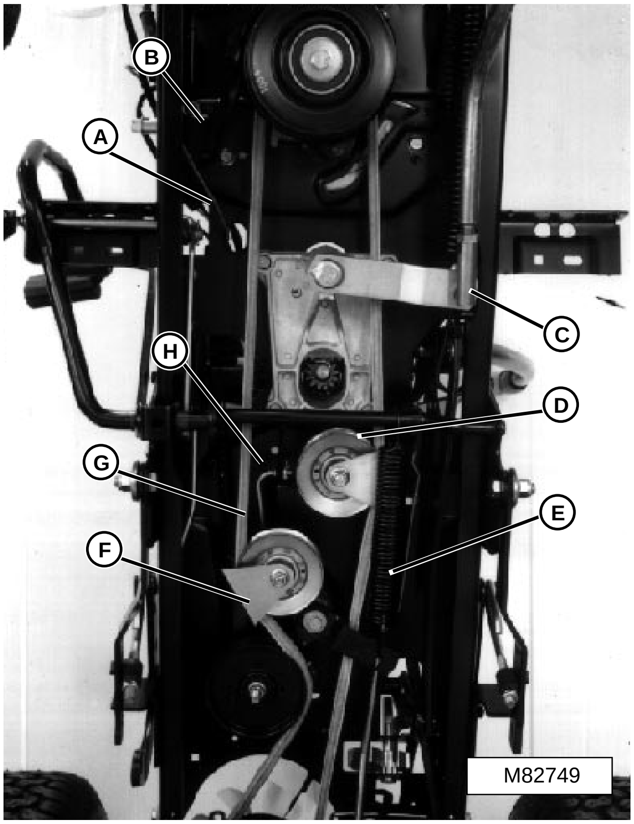
TRACTION DRIVE BELT

Replacement

1. Remove mower deck. (See procedure in ATTACHMENTS section.)
2. Remove fender deck. (See procedure in MISCELLANEOUS section.)
3. Move fuel tank forward.
4. Remove spring (E).
5. Disconnect wiring connector (A).
6. Remove belt guide (B).
7. Disconnect drag link (C).
8. Remove sheave (D) and guide (F).
9. Disconnect tension release rod (H).
10. Replace belt (G).

Installation is done in the reverse order of removal.

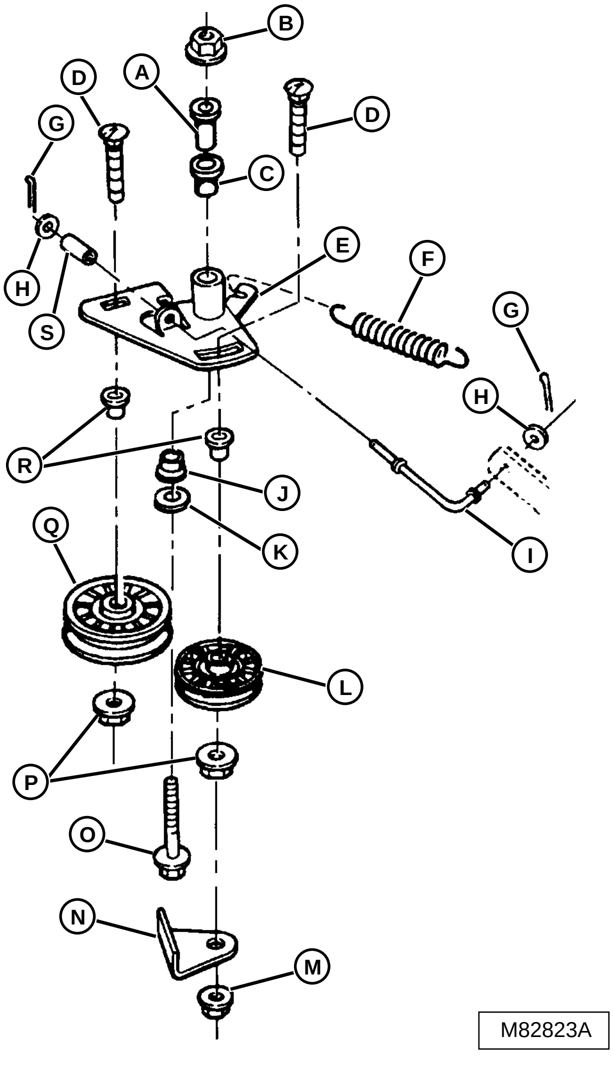
- Position the belt guides parallel with the belt.
- Adjust belt tension. (See Adjustments.)



A— PTO Clutch Wiring Connector
B— Belt Guide
C— Drag Link
D— Sheave
E— Spring
F— Belt Guide
G— Traction Drive Belt
H— Tension Release Rod

DRIVE BELT TENSIONER ASSEMBLY

1. Remove mower deck. (See procedure in ATTACHMENTS section.)
2. Remove fender deck. (See procedure in MISCELLANEOUS section.)
3. Remove traction drive belt. (See TRACTION DRIVE BELT.)
4. Release parking brake.
5. Inspect all parts for wear or damage. Replace parts if necessary.
6. Position the belt guide (N) parallel with the belt.
7. Adjust belt tension. (See Adjustments.)



A— Bushing
B— Nut
C— Bushing
D— Carriage Bolts (2 used)
E— Tension Bracket
F— Spring
G— Cotter Pin (2 used)
H— Washer (2 used)
I— Tension Release Rod
J— Bushing
K— Washer
L— Sheave
M— Nut
N— Belt Guide
O— Cap Screw
P— Nuts
Q— Sheave
R— Bushings
S— Sleeve

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CONTENTS

STEERING SYSTEM COMPONENTS AND OPERATION

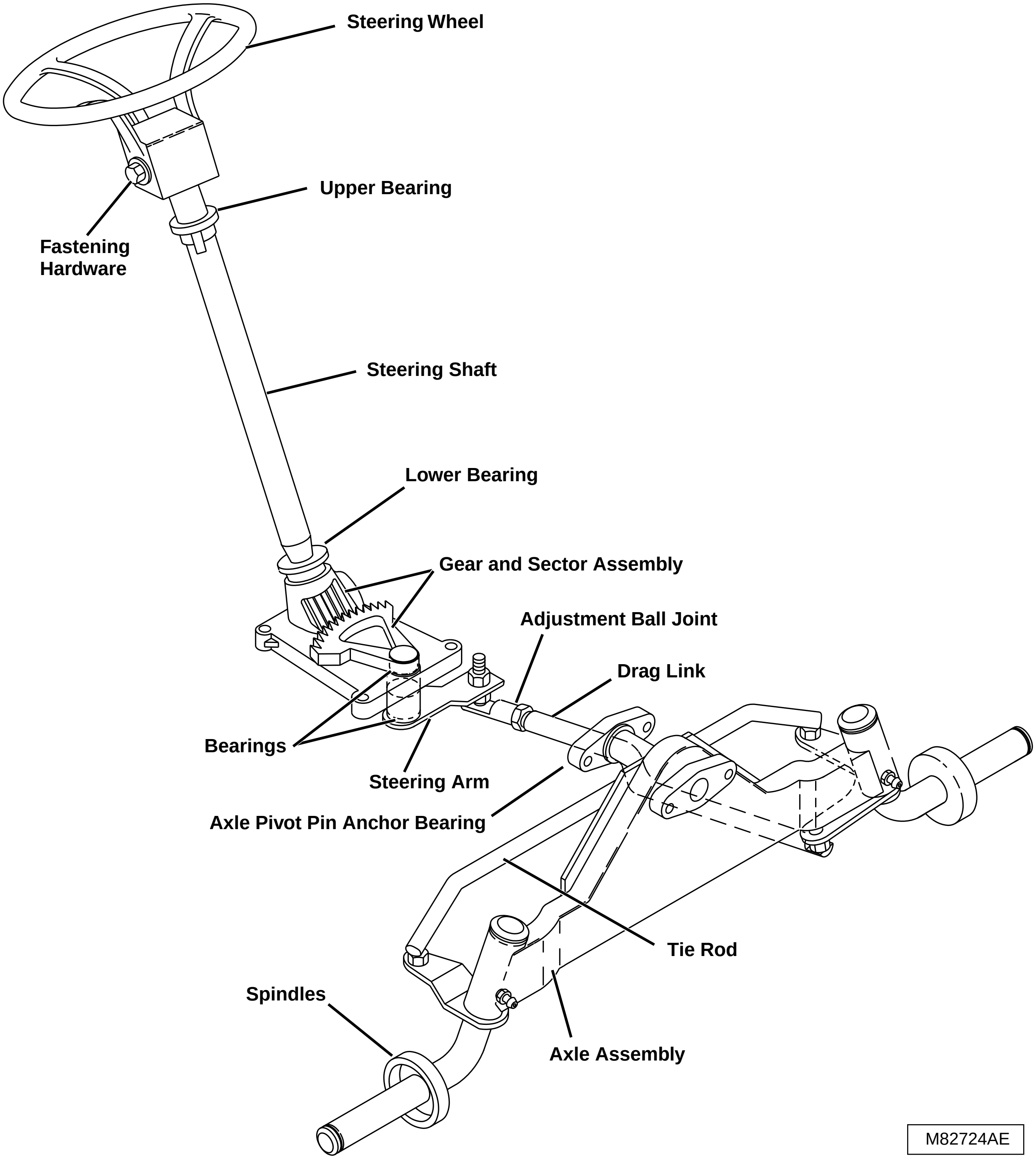
Function:

To allow the operator to change machine travel direction.

Theory of Operation:

As the steering wheel is turned, the steering shaft and gear rotate. The steering gear meshes with the sector gear, causing the sector gear and steering arm to rotate.

As the steering arm moves, the drag link is moved (forward—left turn, backward—right turn) causing the spindle to rotate. Since the spindles are connected by the tie rod both spindles are turned at the same time.



STEERING SYSTEM TROUBLESHOOTING CHART

PROBLEM OR SYMPTOM CHECK OR SOLUTION	Steering wander.	Lash (lost motion) at steering wheel.	Steering wheel turns further in one direction.	Wheels won't track straight.	Left wheel contacts drag arm in extreme left turn.
Steering wheel loose on column.		●			
Steering linkage loose or worn.		●			
Gear and/or sector teeth worn or damaged.	●	●			
Drag link out of adjustment.			●		
Tie rod ends worn.	●	●			
Tie rod bent.				●	
Enlarge stop post.					●

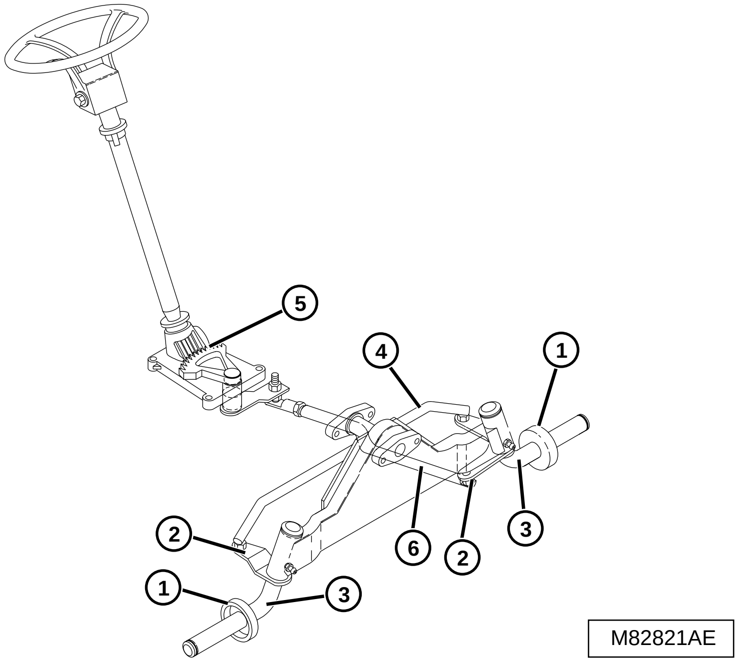
STEERING SYSTEM DIAGNOSIS

NOTE: Before checking for a steering problem, make sure that tire inflation is correct, front ballasting is not excessive, and front implement is properly installed.

Test Conditions:

- Machine parked on a level surface.
- Parking brake ENGAGED.
- Front axle raised safely off ground.
- Key switch in OFF position.

Test/Check Point	Normal	If Not Normal
1. Front wheel bearings.	Wheels rotate freely without feeling rough spots.	Check front bearings and lubrication.
2. Spindles.	Spindles move freely without feeling rough spots.	Check axle bushings and lubrication.
3. Axle pivot pin.	Not binding, damaged, or worn. Turns freely.	Adjust drag link. Check upper and lower bearings.
4. Tie rod.	Not binding, damaged, bent, or worn.	Replace tie rod.
5. Gear and sector assembly.	Teeth not worn or damaged. Not binding.	Replace gear and sector assembly. Check bearings.
6. Drag link and steering arm.	Not binding, damaged or worn.	Replace linkage.



DRAG LINK ADJUSTMENT

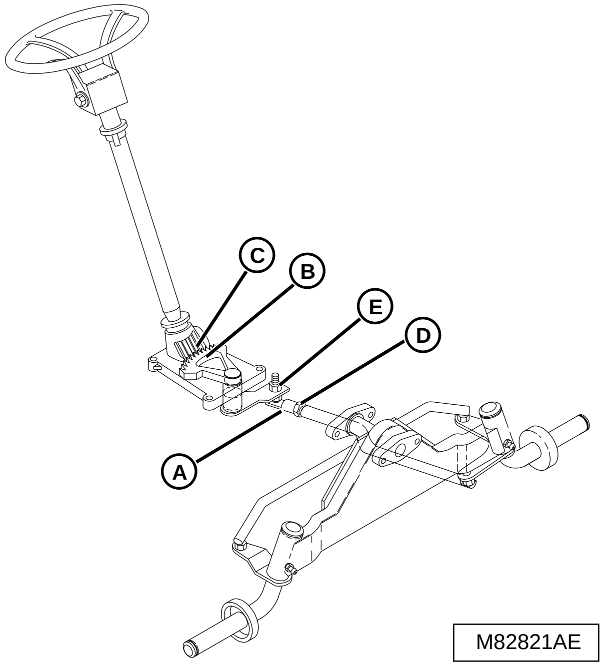
Reason:

To adjust the steering linkage so that wheels are straight ahead.

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. GT242 and 262: Set gear selector to NEUTRAL.

   GT275: Move forward/reverse pedals to NEUTRAL position.
4. Engage parking brake.
5. Disconnect drag link ball joint (A).
6. Align sector gear mark (B) with pinion gear mark (C).
7. Put wheels in straight forward position.
8. Loosen nut (D). Turn drag link ball joint until stud aligns with the hole in the steering arm (E). Tighten nut (D).
9. Connect drag link ball joint (A). Tighten nut to **30 N•m (22 lb-ft)**.
10. Turn steering wheel to the full left position and check that the sector gear contacts the stop before the tie rod hits the axle.
11. Repeat check for full right turn. Adjust drag link slightly if tie rod contacts axle.



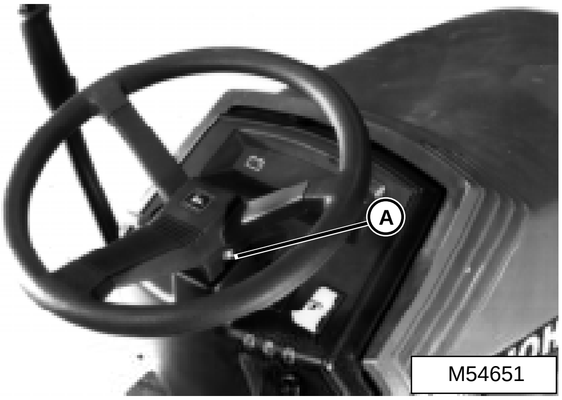
A — Ball Joint
B — Alignment Mark (Sector Gear)
C — Alignment Mark (Pinion Gear)
D — Nut
E — Arm

STEERING WHEEL

Removal/Installation

1. Remove lock nut (A).
2. Drive shoulder bolt out of steering wheel.
3. Remove steering wheel.

Installation is done in the reverse order of removal.



STEERING SHAFT

Removal/Inspection/Installation

1. Remove the following:
   - Mower deck (See procedure in ATTACHMENTS section.)
   - Steering wheel
   - Battery

NOTE: Turn shaft (C) to gain clearance to cotter pin (E).

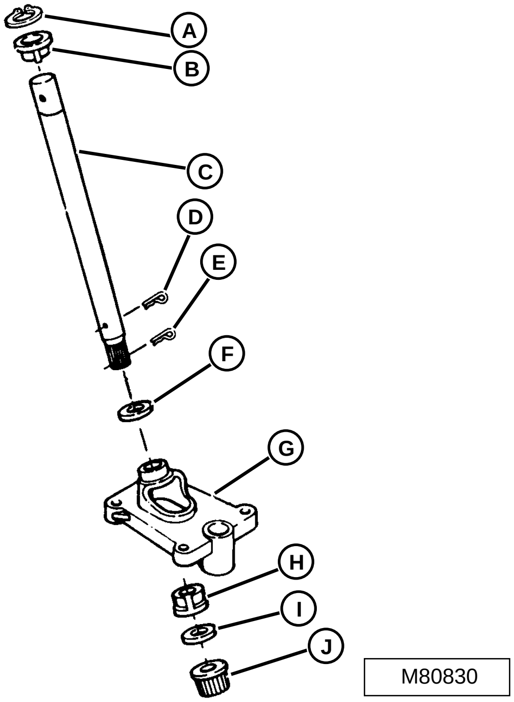
2. Remove cotter pins (D and E).
3. Remove gear (J) and washer (I).
4. Loosen four instrument panel mounting cap screws.

NOTE: Some force is required for the snap ring (A) to pass through panel.

5. Remove shaft (C) through top of the instrument panel.

NOTE: Bushings (B and H) are slip fit.

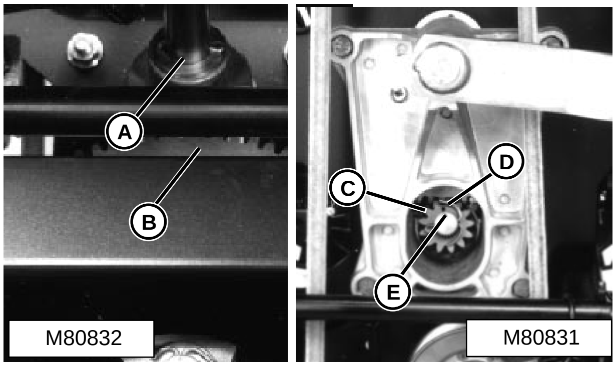
6. Inspect all parts for wear or damage. Replace parts as necessary.
   - If gear (J) requires replacement, also replace steering sector gear.
   - If support (G) requires replacement, remove steering sector assembly.



A— **Snap Ring**
B— **Bushing**
C— **Steering Shaft**
D— **Cotter Pin**
E— **Cotter Pin**
F— **Washer**
G— **Support**
H— **Bushing**
I— **Washer**
J— **Pinion Gear**

Installation is done in the reverse order of removal.

- Check that front wheels are straight and alignment mark (B) is centered with steering shaft (A).
- When installing pinion gear (C), align marks (D, E and B).



A— **Steering Shaft**
B— **Sector Gear Alignment Mark**
C— **Pinion Gear**
D— **Pinion Gear Alignment Mark**
E— **Steering Shaft Alignment Mark**

STEERING SECTOR ASSEMBLY

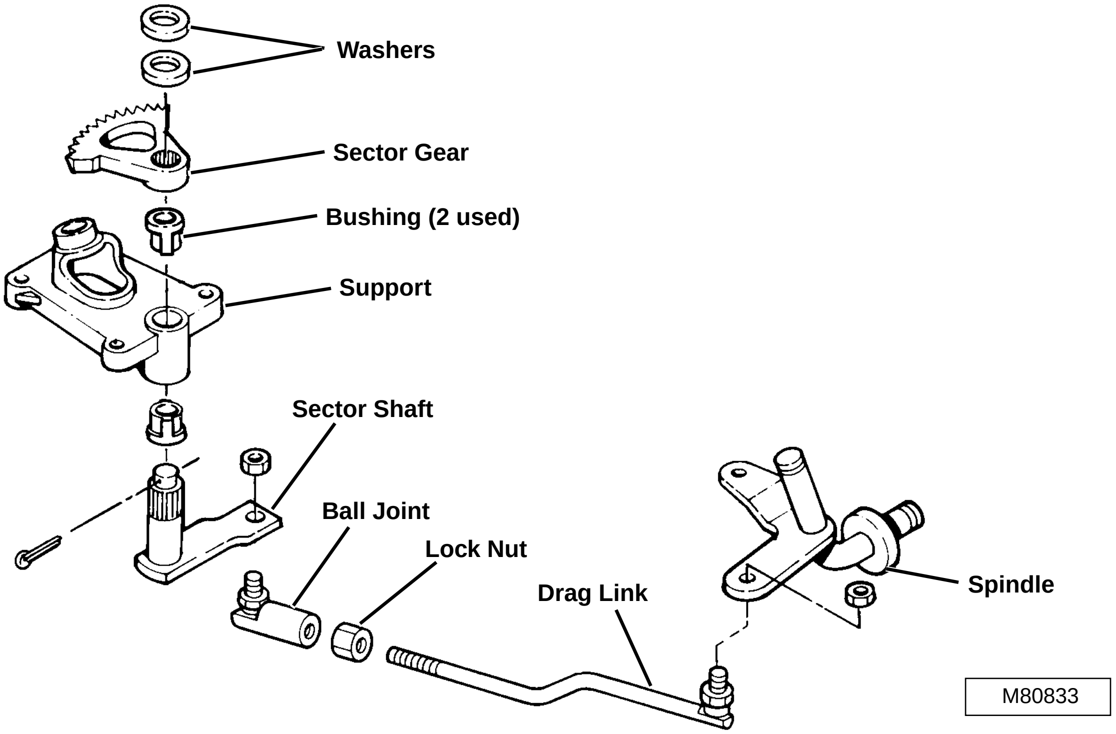
Removal/Inspection/Installation

1. Remove the following:

- Mower deck (See procedure in ATTACHMENTS section.)
- Battery
- Drag link
- Cotter pin and washers
- Shaft
- Gear

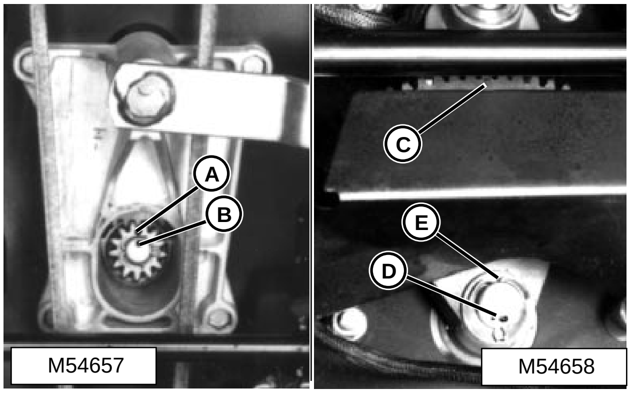
NOTE: Bushings are slip fit.

2. Inspect all parts for wear or damage. Replace parts as necessary.
   - If sector gear requires replacement, also replace pinion gear.
   - If support requires replacement, remove steering shaft. (See STEERING SHAFT.)



Installation is done in the reverse order of removal.

- Do not bend cotter pin (E) in place until marks (A—D) are aligned.



A— Pinion Gear Alignment Mark
B— Steering Shaft Alignment Mark
C— Sector Gear Alignment Mark
D— Sector Shaft Alignment Mark
E— Cotter Pin

- Tighten drag link nuts to **30 N•m (22 lb-ft)**.
- Adjust drag link. (See Adjustments).

MODIFY LEFT TURN STOP POST

Reason:

Left wheel in contact with drag arm when in extreme left turn.

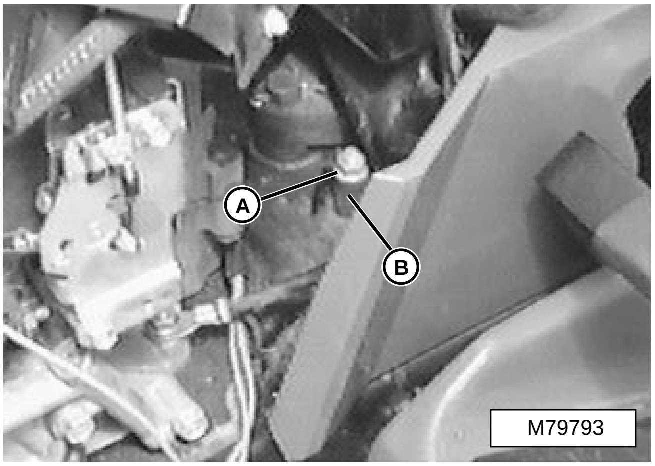
Required Parts:

Order No.	Qty.	Description	Qty/Pkg
24H1746	1 Pkg.	0.781" ID X 1.125" OD X 0.125 Thick	10/Pkg.
24H1294	1 Pkg.	0.344" ID X 1.125" OD X 0.063 Thick	50/Pkg.

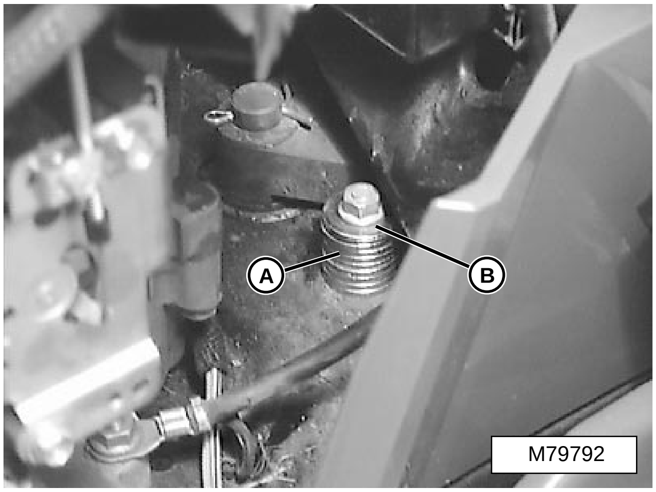
Procedure:

1. Park machine on level surface.
2. Turn key switch to OFF.
3. **GT275:** Move forward/reverse pedals to NEUTRAL position.

   GT242/262: Set gear selector to neutral.
4. Engage parking brake.
5. Open hood and remove battery.
6. Align wheels so they are pointed straight ahead.



7. Holding left hand steering stop bolt from beneath the frame, remove nut (A) from bushing (B).
8. Remove bolt and bushing.



9. Install 9 washers (A) (24H1746) over the top of the bushing.
10. Install 1 washer (B) (24H1294) on top of the bushing and the 9 washers
11. Place assembled washers and bushing over left stop bolt and insert bolt from the bottom through the assembled washers and bushing.
12. Secure assembly with the nut previously removed.

CONTENTS

CONTENTS CONTINUED

ADJUSTMENT SPECIFICATIONS

Hydrostatic Transmission - GT275

Brake Rod Clearance (Between bracket and cotter pin)	3 mm (0.118 in.) Minimum
Transmission Brake Arm distance forward from full “OFF” position	3—5 mm (0.118—0.197 in.)

Gear Transmission - GT242 & GT262

Brake Rod Clearance (Between bracket and cotter pin)	18—20 mm (0.71—0.79 in.)

REPAIR SPECIFICATIONS

Hydrostatic Transmission - GT275

Gear Transmission - GT242 & GT262

Cover Bore ID	20.02—20.05 mm (0.788—0.789 in.)
Lever Shaft OD	19.95—20.00 mm (0.785—0.787 in.)
Shaft to Bore Clearance	0.50 mm (0.020 in.)
Transaxle Oil Capacity	3.6 L (3.8 U.S. qt)

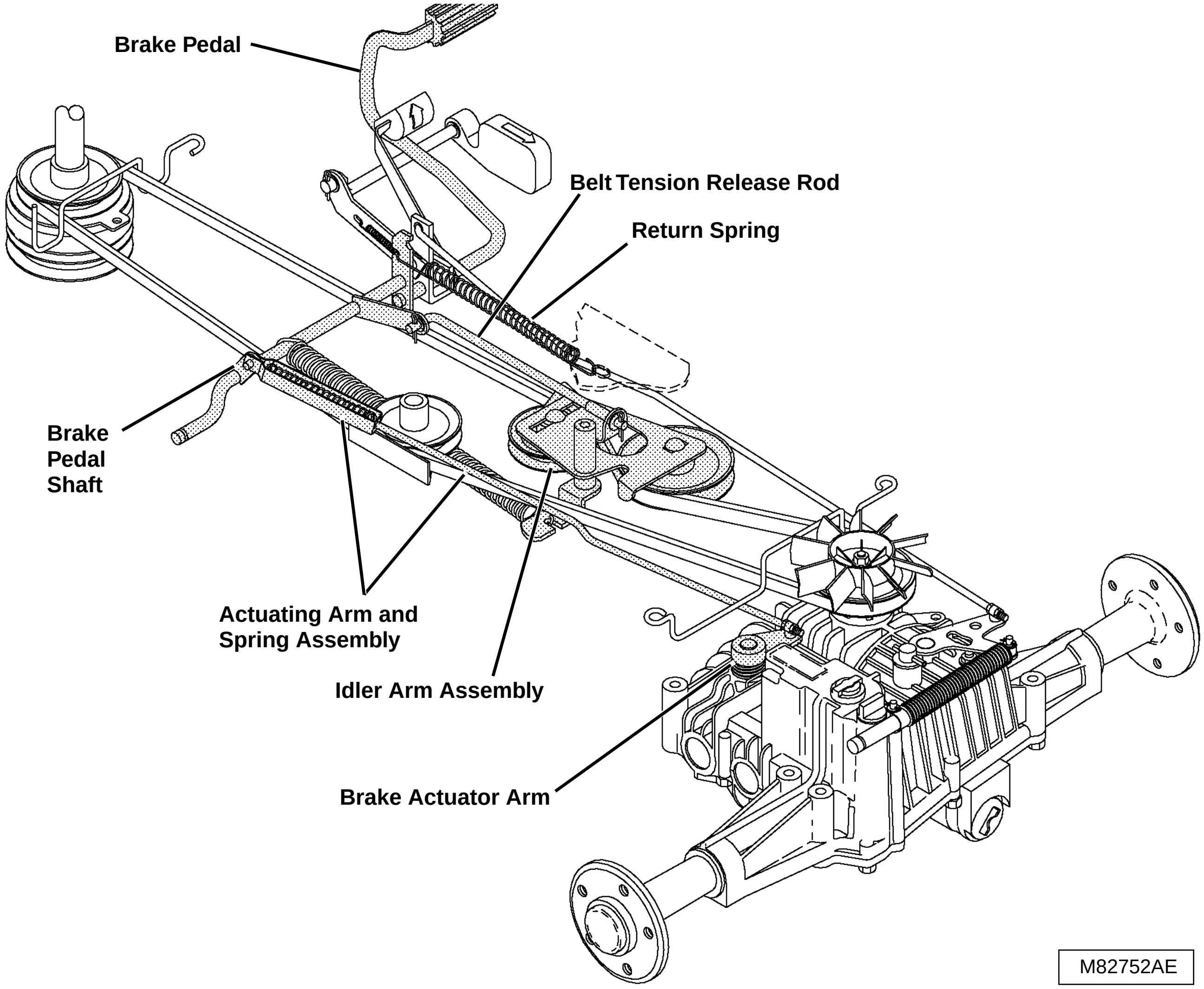
CAP SCREW TORQUE SPECIFICATIONS

New Transaxle Case	29 N·m (22 lb-ft)
Used Transaxle Case	24 N·m (216 lb-in.)

OTHER MATERIAL

Number	Name	Use
TY6305	John Deere Clean & Cure Primer	Cleans parts and speeds cure of sealant
T43514	John Deere Plastic Gasket	Seals brake cover.
T43512	John Deere Thread Lock and Sealer (Medium Strength)	Retains cap screws.

EXTERNAL BRAKE LINKAGE OPERATION - GT275



Function:

To stop machine forward or reverse directional motion and disengage power from the engine to the transmission.

Theory of Operation:

When the brake pedal is depressed, it rotates the brake pedal shaft forward. Attached to the shaft is the belt tension release rod. Movement of the shaft is transferred to the rod which engages the end of the slot in the idler arm assembly. Continued movement pulls the left side of the idler arm forward and disengages drive belt tension.

Also attached to the brake pedal shaft is the brake actuating arm and spring assembly. Movement of the lever is transferred through the rod to the transmission brake actuator arm to provide braking action.

INTERNAL BRAKE LINKAGE OPERATION - GT275

Function:

The brake assembly is a wet pad/disc system located inside the transmission, used to slow down or stop the machine.

The internal linkages perform multiple functions. First it applies the transmission brake which can also be used as a parking brake. Through the same linkage it activates the neutral start switch which requires the brake to be applied in order to crank the engine. Along with these functions the forward/reverse pedals are locked in place (neutral), and the freewheel valve is deactivated if it was previously engaged.

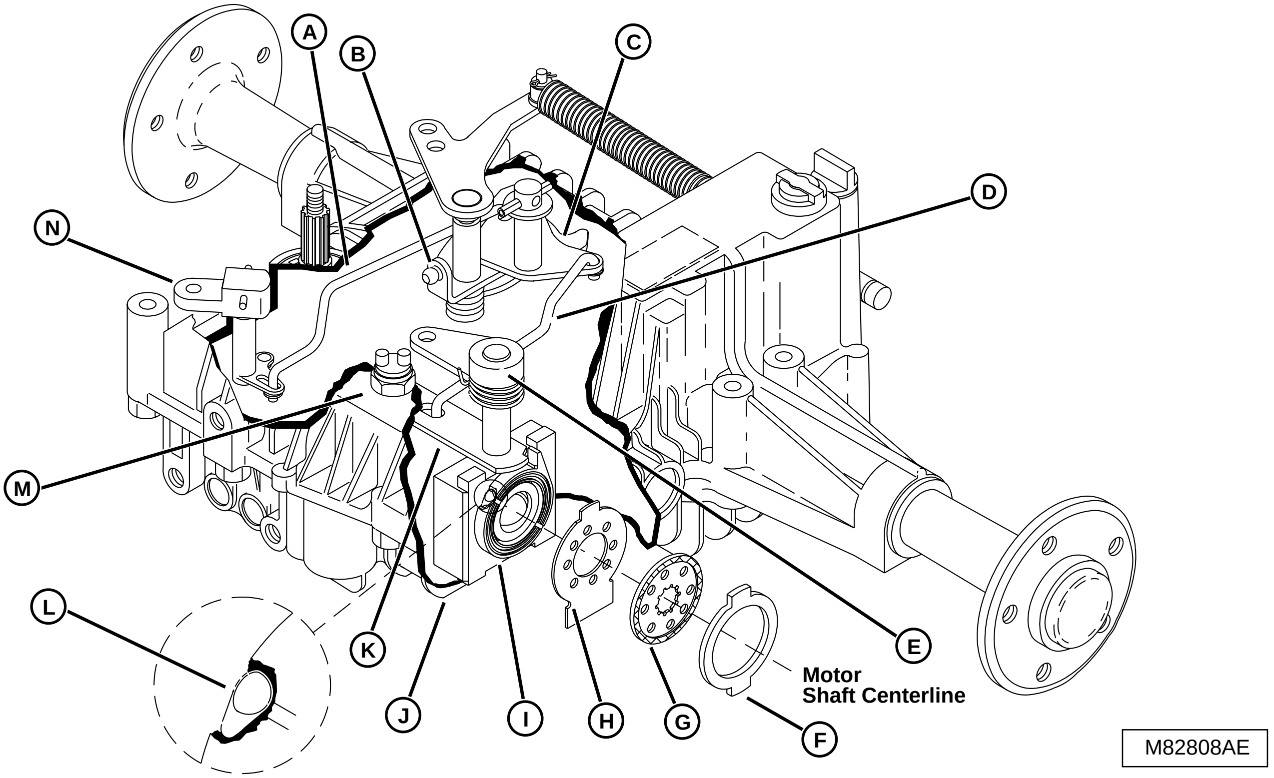
Theory of Operation:

When the brake pedal is applied, the linkage pulls the brake actuator arm (E) forward and rotates the brake actuator lever (K). The lever makes contact with the brake actuator plate (I), causing it to rotate. As the plate rotates, balls (L) located in recesses in the plate are forced out against the housing (J). This forces the actuator plate to travel out along the motor shaft applying pressure against steel plate (H). Steel plates (F and H) are keyed to the housing and cannot rotate, but can travel parallel to the motor shaft. Friction plate (G) is connected by splines to the motor shaft. As pressure is applied to the steel plate by the actuator plate, the friction plate and fixed steel plates make contact placing drag on the motor shaft which slows down the differential ring gear and axles, thus slowing the machine.

When the brake is applied, the brake actuator arm (E) rotates and actuator lever (K) contacts the neutral start switch (M), closing the switch allowing the engine to be cranked when the key switch is turned to the “start” position. With the brakes released, the actuator lever releases the neutral start switch, opening the switch and interrupting the crank circuit.

At the same time, rod (D) connected to the brake actuator arm, pulls the neutral interlock arm (C), causing it to rotate. As the lever rotates, a lobe on the lever forces the pump swashplate control cam (B) to return the swashplate to the neutral position.

When the free wheel valve is disengaging the transmission, free wheel valve link (A) is pulled rearward to the end of the slot in the neutral interlock arm (C). When the brake is applied, free wheel valve link (A) rotates the free wheel valve actuator arm (N) deactivating the free wheel valve plungers.



A— Free Wheel Valve Link
B— Pump Swashplate Control Cam
C— Neutral Interlock Arm
D— Return-to Neutral Link Rod
E— Brake Actuator Arm
F— Steel Plate (Thick)
G— Friction Disc
H— Steel Plate (Thin)
I— Brake Actuator Plate
J— Housing
K— Actuator Lever
L— Actuating Ball (3 used)
M— Neutral Start Switch
N— Free Wheel Valve Actuator Arm

BRAKE COMPONENTS AND BRAKE LINKAGE OPERATION - GT242 & GT262

Function:

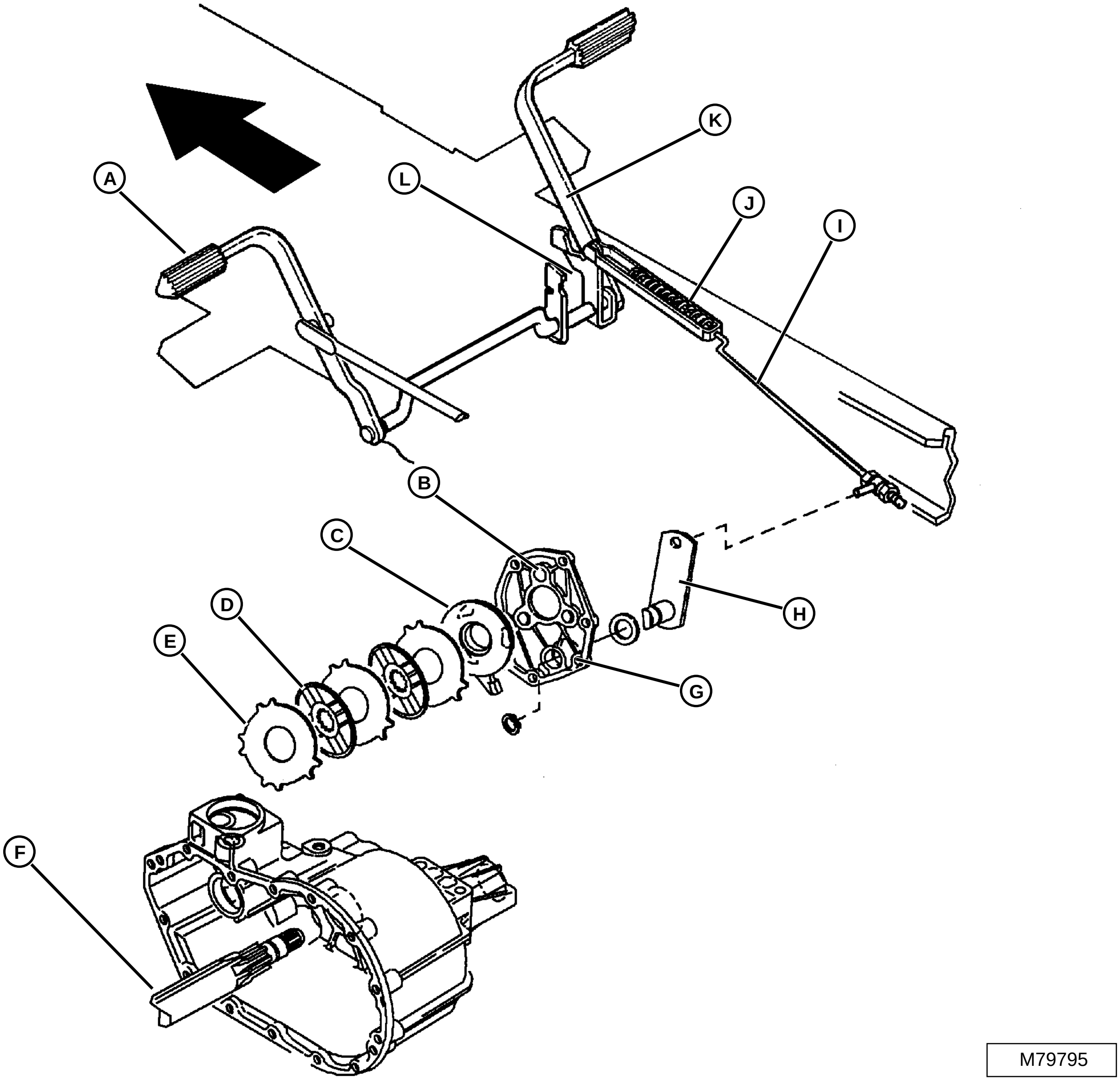
Slow down or stop the tractor.

Major Components:

- Brake Pedal
- Linkage
- Discs
- Pads
- Spring

Theory of Operation:

The brake system is mounted on the transaxle. It is a multipad/disc wet system. (The brakes are immersed in the transaxle lubricant.) When the brake pedal (K) is depressed, the brake actuating spring (J) assembly moves forward which starts to compress the spring. The spring force pulls the brake rod (I) forward and rotates the brake cam lever (H). The brake lever cam moves the actuator (C). There are ramps on the actuator that ride on balls (B). As the actuator turns, the ramps force it against the brake plates (E) and brake discs (D). The friction slows or stops the unit. The brake discs are splined to the transaxle shift shaft (F). The interlock (L) connects the brake linkage to the clutch linkage (A) so that when the brake is depressed, the clutch disengages. This reduces the loading on the brake system.



A— Clutch Pedal	**E— Brake Plates**	**I— Brake Rod**
B— Ball (3 used)	**F— Transaxle Shift Shaft**	**J— Brake Spring**
C— Actuator	**G— Cover**	**K— Brake Pedal**
D— Brake Discs	**H— Cam Lever**	**L— Interlock**

HYDROSTATIC TRANSMISSION TROUBLESHOOTING CHART - GT275

PROBLEM OR SYMPTOM CHECK OR SOLUTION	Machine will not move in forward or reverse. [b]	Brakes do not engage when pedal depressed. [b]	Parking brake does not hold machine on hill. [b]	Transmission noisy. [b]	Erratic speed. [b]	Machine does not achieve full ground speed. [b]	Machine will not move in forward or is slow in forward. [b]	Machine is slow in reverse. [b]	Neutral start switch does not engage when depressing brake pedal. [b]	Engine can be started without depressing brake pedal. [b]
Parking brake engaged.	●			●			●	●		
Brake linkage damaged.	●	●	●	●	●	●	●	●	●	●
Brake linkage out of adjustment.		●	●	●	●	●	●	●	●	●
Belt idler assembly return spring weak or damaged.	●					●	●	●		
Brake return spring weak or broken.						●	●	●	●	
Steel plates damaged. [a]		●	●						●	
Internal brake actuator lever damaged. [a]		●							●	●
Friction disc damaged or worn. [a]		●	●						●	
Actuator plate binding or damaged. [a]		●	●			●	●	●		
Faulty neutral start switch.									●	●

---

[a] Requires removal of transmission from machine and disassembly.

[b] May have other causes not directly related to brake system. See POWER TRAIN for further information.

GEAR TRANSMISSION TROUBLESHOOTING CHART - GT242 & GT262

PROBLEM OR SYMPTOM / CHECK OR SOLUTION	Machine will not move in forward or reverse. [b]	Brakes do not engage when pedal depressed.	Parking brake does not hold machine on hill. [b]	Transmission noisy. [b]	Erratic speed. [b]	Machine does not achieve full ground speed. [b]	Machine will not move in forward or is slow in forward. [b]	Machine is slow in reverse. [b]	Neutral start switch does not engage when depressing brake pedal. [b]	Engine can be started without depressing brake pedal. [b]
Parking brake engaged.	●			●			●	●		
Brake/Clutch linkage damaged.	●	●	●	●	●	●	●	●	●	
Brake/Clutch linkage out of adjustment.		●	●	●	●	●	●	●	●	
Belt idler assembly return spring weak or damaged.	●					●	●	●		
Brake return spring weak or broken.						●	●	●	●	●
Brake plate(s) damaged or worn. [a]		●	●						●	
Brake disc(s) damaged or worn. [a]		●							●	
Cam lever damaged. [a]		●	●						●	
Actuator plate binding or damaged. [a]		●	●			●	●	●		
Faulty neutral start switch. [a]									●	●

---

[a] Requires removal of transmission from machine and disassembly.

[b] May have other causes not directly related to brake system. See GEAR TRANSMISSION for further information.

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MACHINE WILL NOT MOVE IN FORWARD OR REVERSE [b]

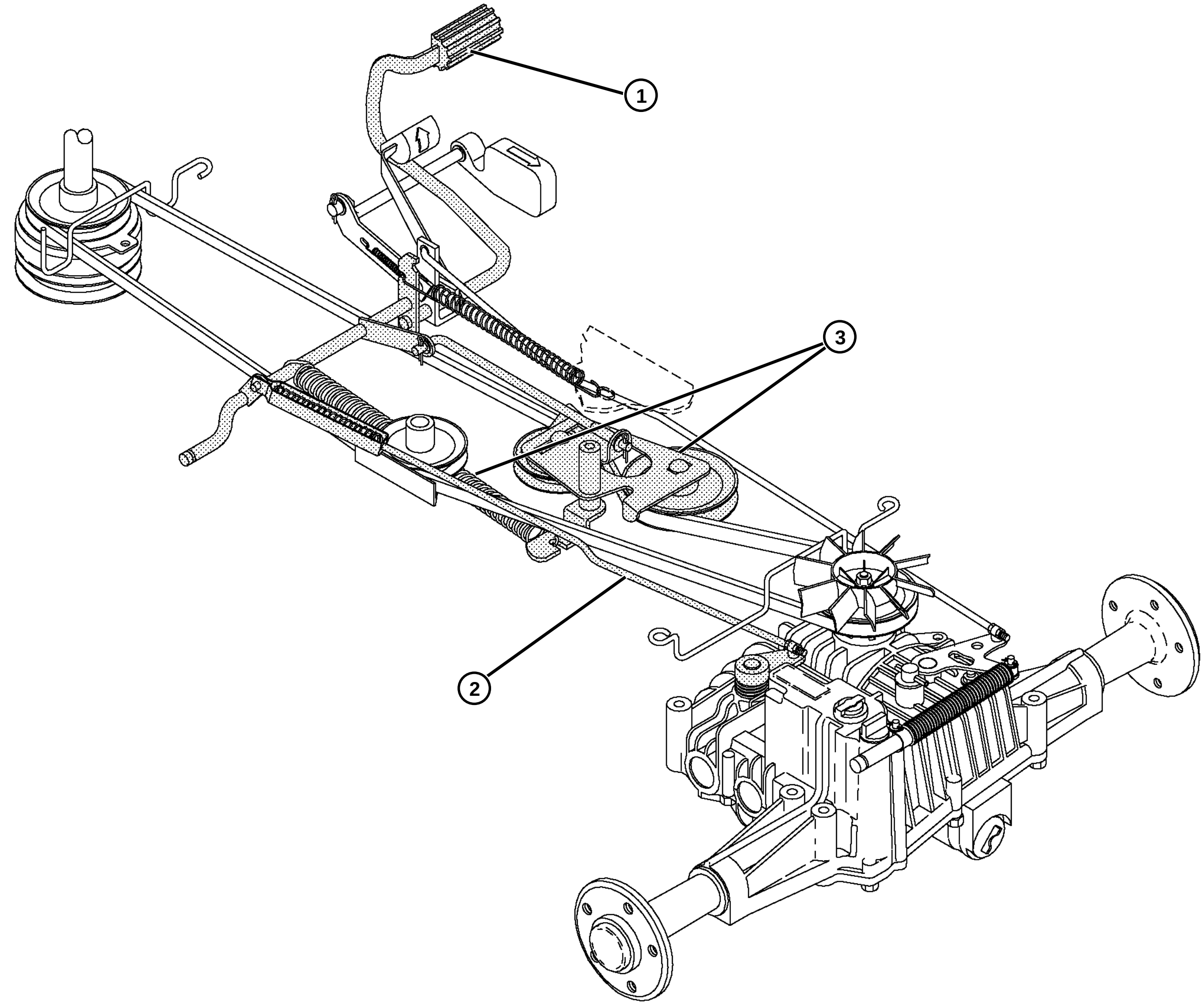
Test Conditions:

- Machine stationary on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Parking brake.	Pedal released and linkage not locked.	Release parking brake.
2. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment.
3. Belt idler assembly tension spring.	Spring returns idler assembly tension to traction drive belt when brake pedal is released.	Replace stretched or broken spring.

[a] Requires removal of transmission from machine and disassembly.
[b] May have other causes not directly related to brake system. See POWER TRAIN for further information.

MACHINE WILL NOT MOVE IN FORWARD OR REVERSE



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BRAKES DO NOT ENGAGE WHEN PEDAL DEPRESSED

Test Conditions:

- Machine stationary on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

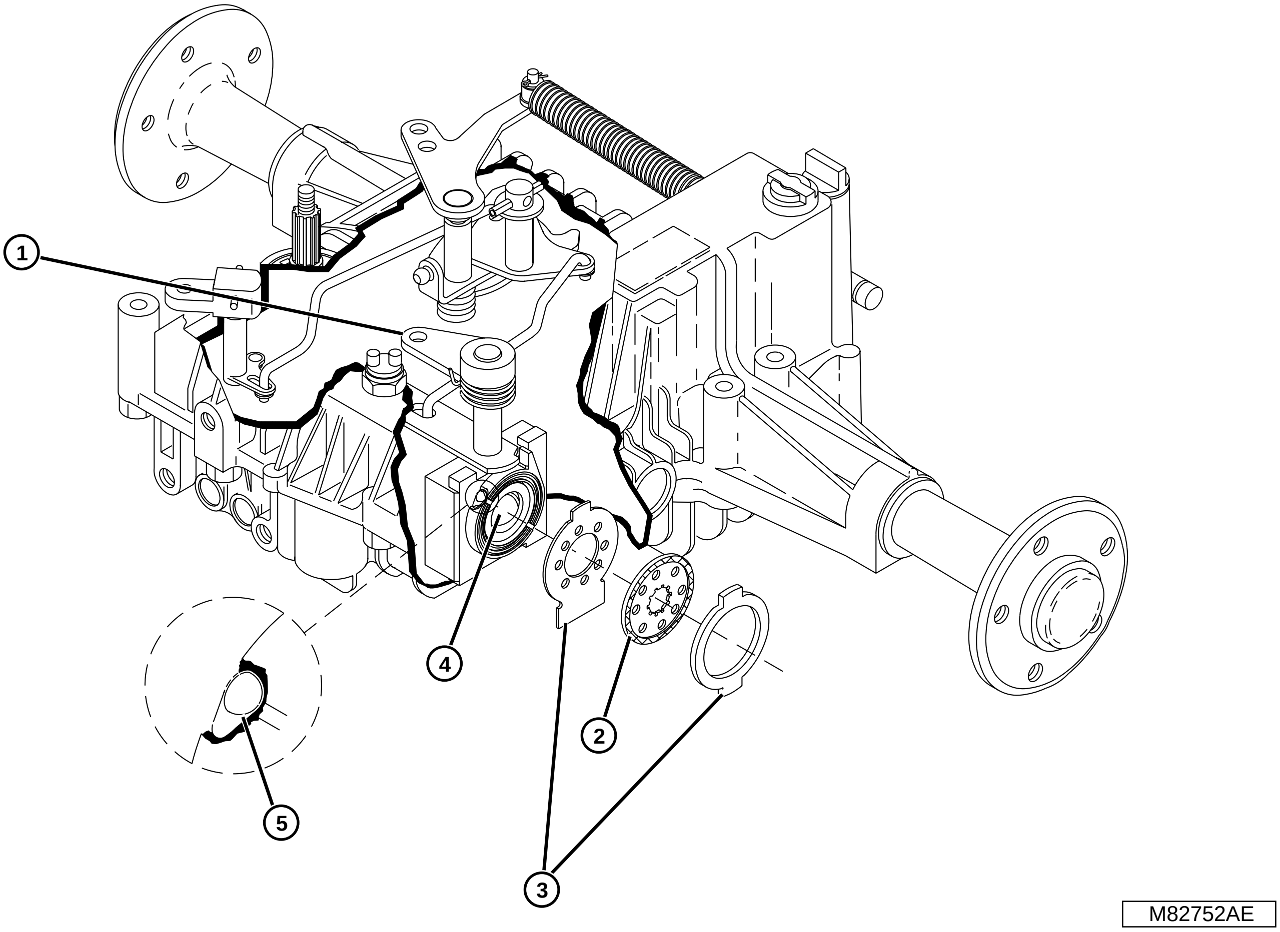
Test Location	Normal	If Not Normal
1. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment
2. Friction disc. [a]	Splines between disc and motor shaft not damaged or worn. Friction material not worn or damaged.	Replace worn or damaged friction disc and/or motor shaft.
3. Steel plates. [a]	Plates do not rotate when properly installed in transmission housing. Not damaged.	Replace damaged plates.
4. Internal brake actuator lever. [a]	Engages brake actuator plate when brakes applied.	Replace if damaged or worn.
5. Actuator plate/ balls. [a]	Actuator plate rotates and applies pressure to steel plates/friction disc when activated by lever. Parts not binding, damaged or missing.	Replace binding, damaged or missing parts.

---

[a] Requires removal of transmission from machine and disassembly.

[b] May have other causes not directly related to brake system. See POWER TRAIN for further information.

BRAKES DO NOT ENGAGE WHEN PEDAL DEPRESSED - GT275



PARKING BRAKE DOES NOT HOLD MACHINE ON HILL

Test Conditions:

- Machine stationary on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

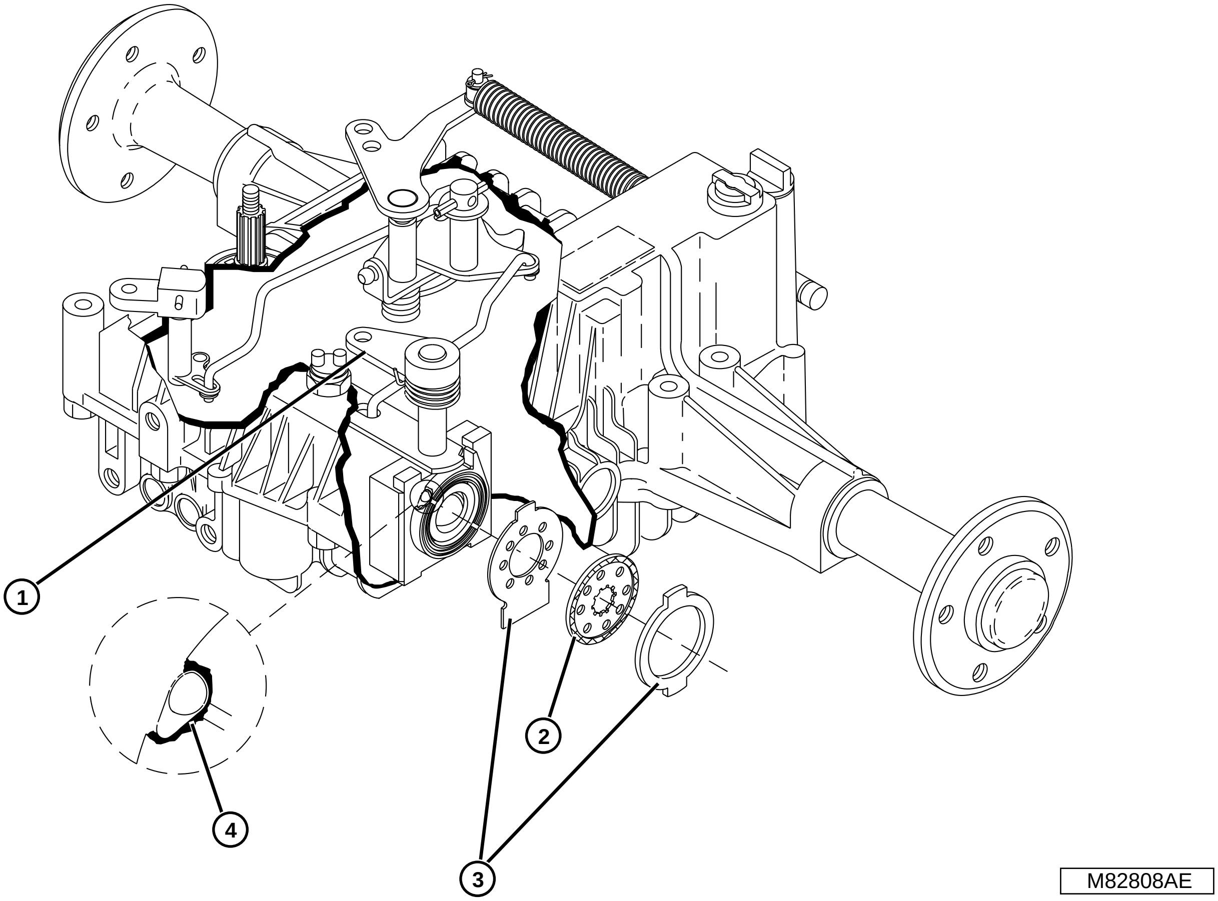
Test Location	Normal	If Not Normal
1. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment.
2. Friction disc. [a]	Splines between disc and motor shaft not damaged or worn. Friction material not worn or damaged.	Replace worn or damaged friction disc and/or motor shaft.
3. Steel plates. [a]	Plates do not rotate when installed in transmission housing. Not damaged.	Replace damaged plates.
4. Actuator plate/ balls. [a]	Actuator plate rotates and applies pressure to steel plates/friction disc when activated by lever. Parts not binding, damaged or missing.	Replace binding, damaged or missing parts.

---

[a] Requires removal of transmission from machine and disassembly.

[b] May have other causes not directly related to brake system. See POWER TRAIN for further information.

PARKING BRAKE DOES NOT HOLD MACHINE ON HILL



TRANSMISSION NOISY [b]

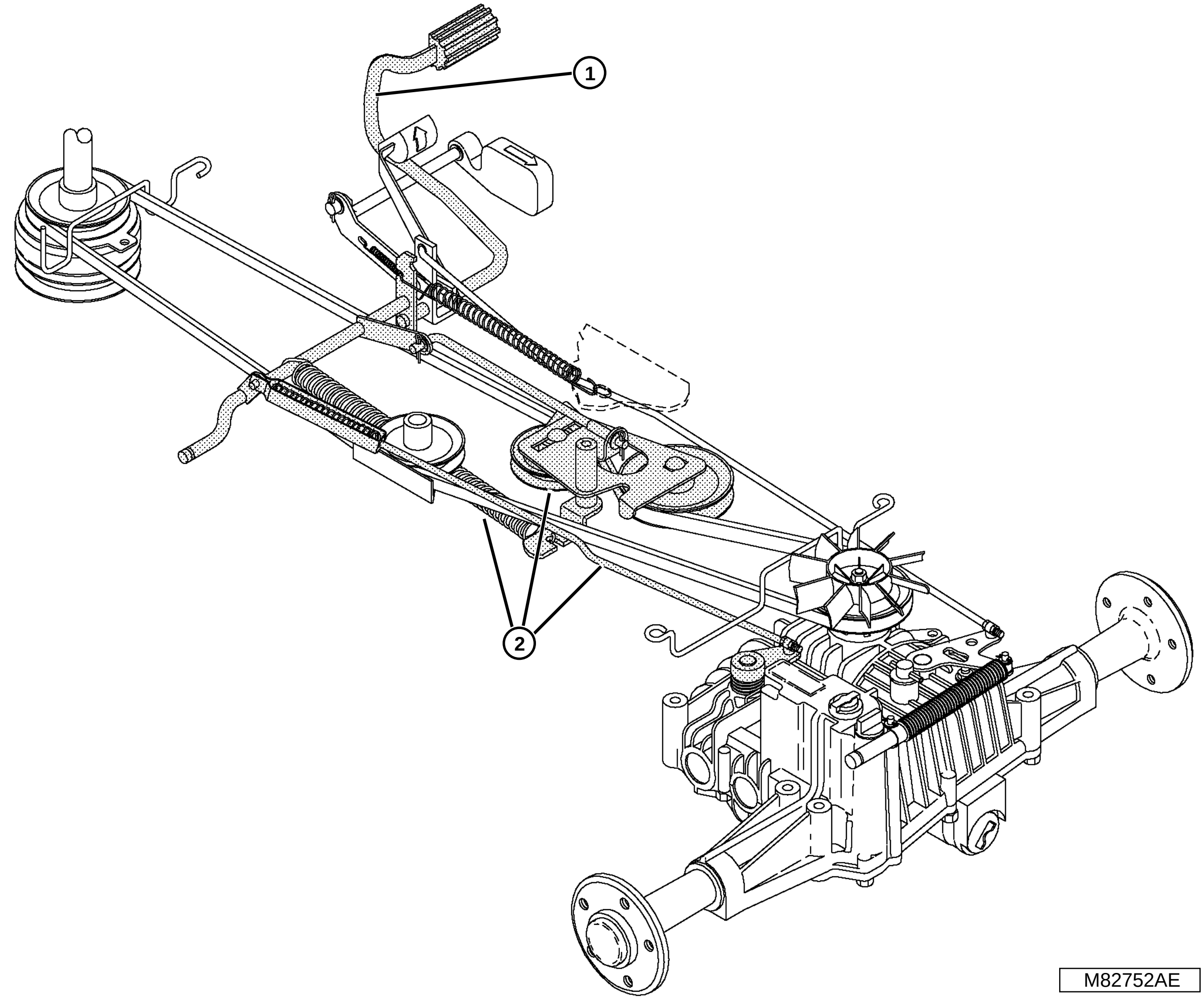
Test Conditions:

- Machine stationary on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Parking brake.	Pedal released and linkage not locked.	Release parking brake.
2. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment.

[a] Requires removal of transmission from machine and disassembly.
[b] May have other causes not directly related to brake system. See POWER TRAIN for further information.

TRANSMISSION NOISY - GT275



ERRATIC SPEED [b]

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment.

MACHINE DOES NOT ACHIEVE FULL GROUND SPEED [b]

Test Conditions:

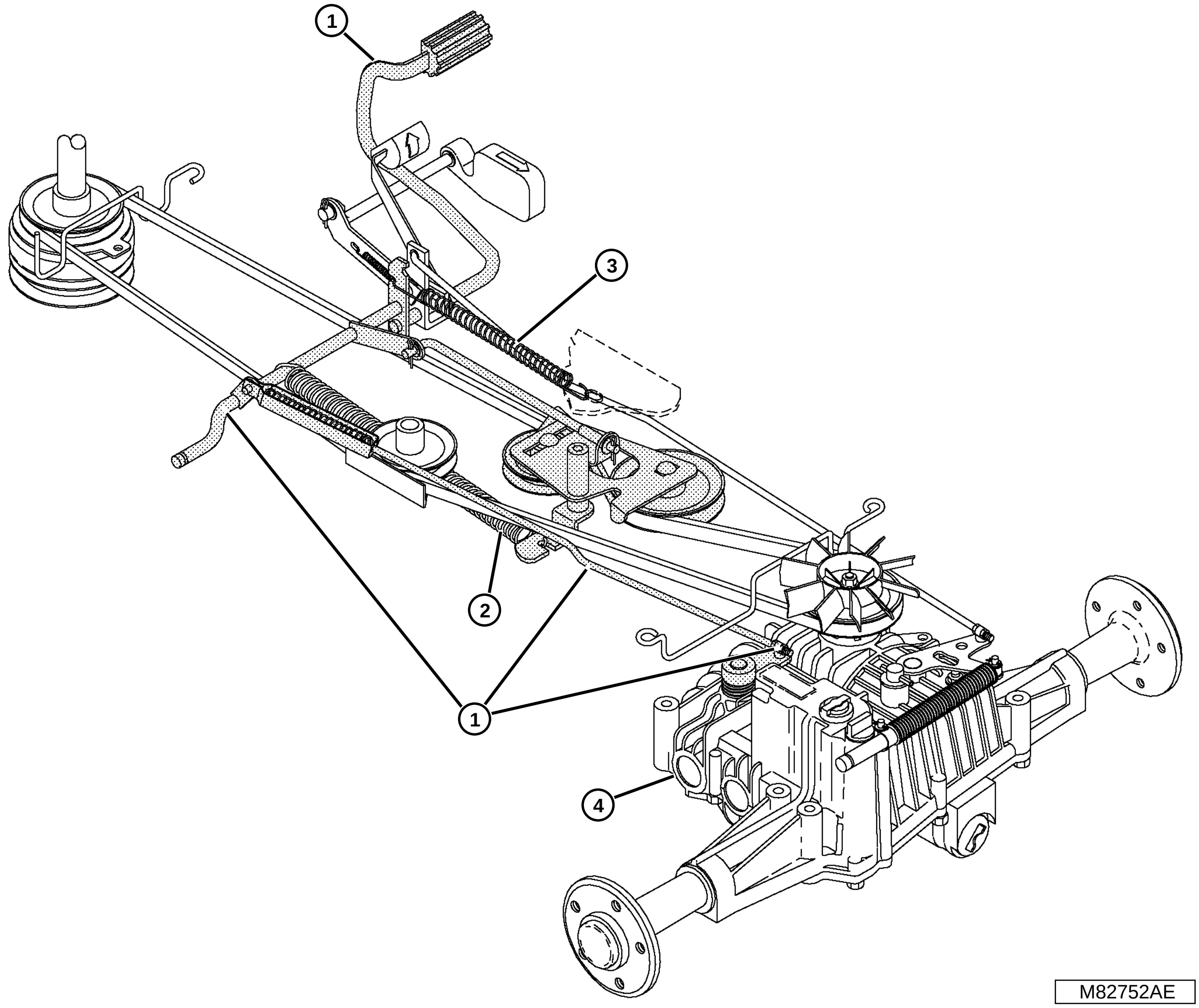
- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment.
2. Belt idler assembly return spring.	Spring returns idler assembly to tension traction drive belt when brake pedal is released.	Replace stretched or damaged spring.
3. Brake return spring.	Returns brake pedal and linkage to rest position when brake pedal is released.	Replace stretched or damaged spring.
4. Actuator plate/ balls. [a]	Actuator plate rotates and applies pressure to steel plates/friction disc when activated by lever. Parts not binding, damaged or missing.	Replace binding, damaged or missing parts.

---

[a] Requires removal of transmission from machine and disassembly.
[b] May have other causes not directly related to brake system. See POWER TRAIN for further information.

ERRATIC SPEED MACHINE DOES NOT ACHIEVE FULL GROUND SPEED



MACHINE WILL NOT MOVE IN FORWARD DIRECTION OR IS SLOW IN FORWARD [b]

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Parking brake.	Pedal released and linkage not locked.	Release parking brake.
2. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment.
3. Belt idler assembly return spring.	Spring returns idler assembly to tension traction drive belt when brake pedal is released.	Replace stretched or damaged spring.
4. Brake return spring.	Returns brake pedal and linkage to rest position when brake pedal is released.	Replace stretched or damaged spring.

MACHINE IS SLOW IN REVERSE [b]

Test Conditions:

- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

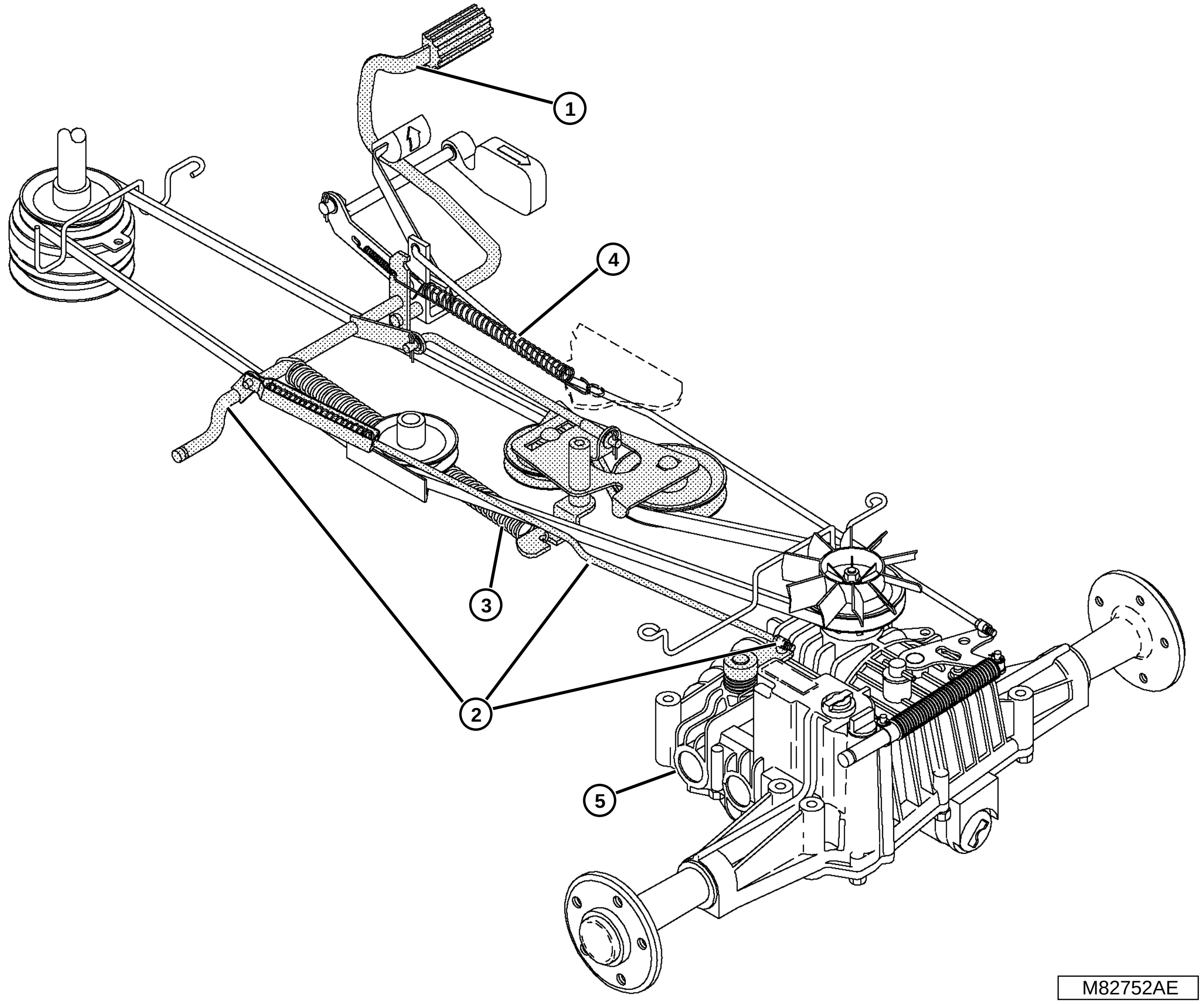
Test Location	Normal	If Not Normal
1. Parking brake.	Pedal released and linkage not locked.	Release parking brake.
2. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment.
3. Belt idler assembly return spring.	Spring returns idler assembly to tension traction drive belt when brake pedal is released.	Replace stretched or damaged spring.
4. Brake return spring.	Returns brake pedal and linkage to rest position when brake pedal is released.	Replace stretched or damaged spring.
5. Actuator plate/ balls. [a]	Actuator plate rotates and applies pressure to steel plates/friction disc when activated by lever. Parts not binding, damaged or missing.	Replace binding, damaged or missing parts.

---

[a] Requires removal of transmission from machine and disassembly.

[b] May have other causes not directly related to brake system. See POWER TRAIN for further information.

MACHINE WILL NOT MOVE IN FORWARD DIRECTION OR IS SLOW IN FORWARD [b] MACHINE IS SLOW IN REVERSE



NEUTRAL START SWITCH DOES NOT ENGAGE WHEN DEPRESSING BRAKE PEDAL [b]

Test Conditions:

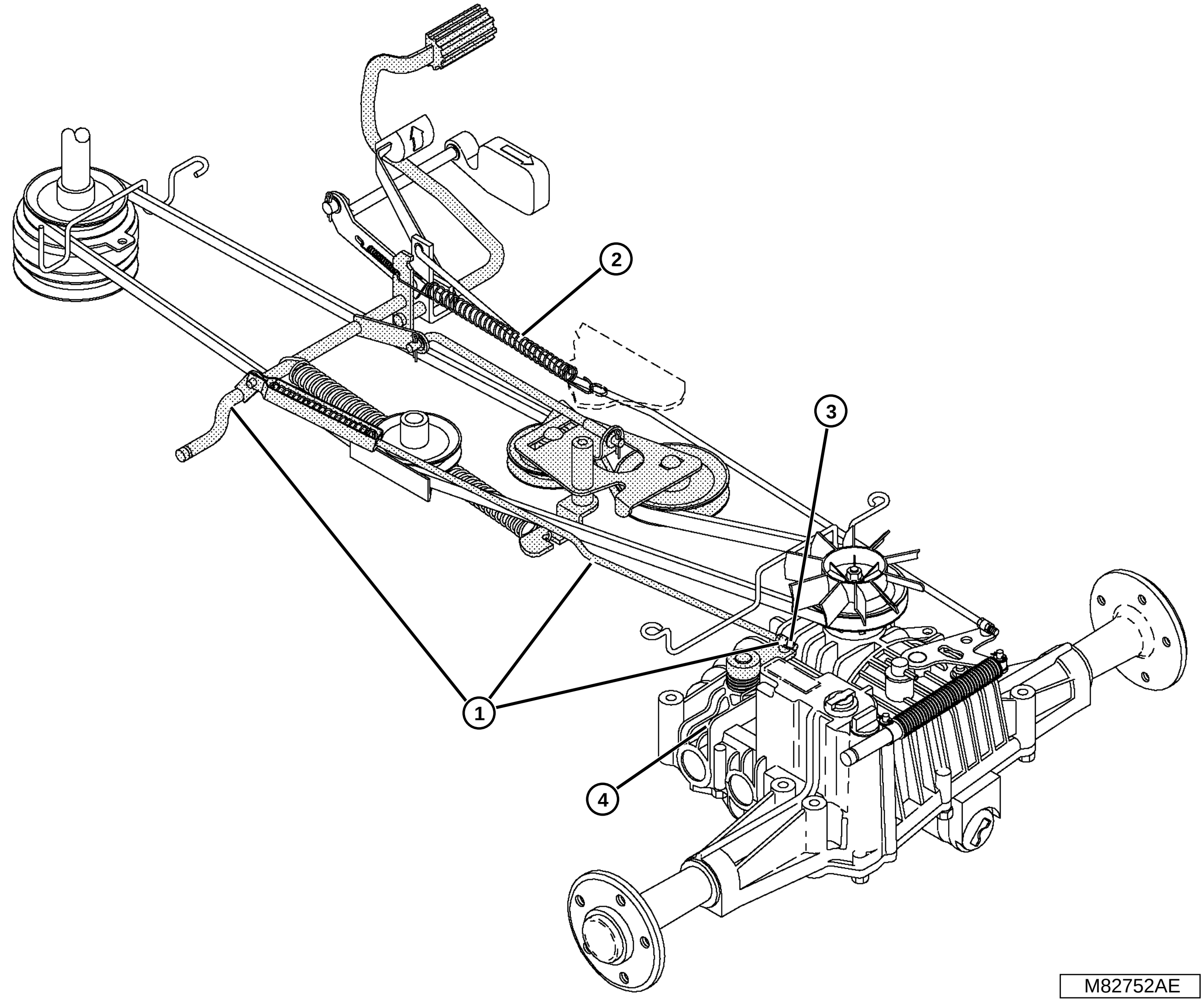
- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment.
2. Brake return spring.	Returns brake pedal and linkage to rest position when brake pedal is released.	Replace stretched or damaged spring.
3. Neutral start switch.	Continuity across terminals when activated by linkage.	Test neutral start switch. (See procedure in ELECTRICAL section.)
4. Internal brake actuator lever. [a]	Engages neutral start switch when brakes applied.	Replace if damaged or worn.

---

[a] Requires removal of transmission from machine and disassembly.
[b] May have other causes not directly related to brake system. See POWER TRAIN for further information.

NEUTRAL START SWITCH DOES NOT ENGAGE WHEN DEPRESSING BRAKE PEDAL



ENGINE CAN BE STARTED WITHOUT DEPRESSING BRAKE PEDAL [b]

Test Conditions:

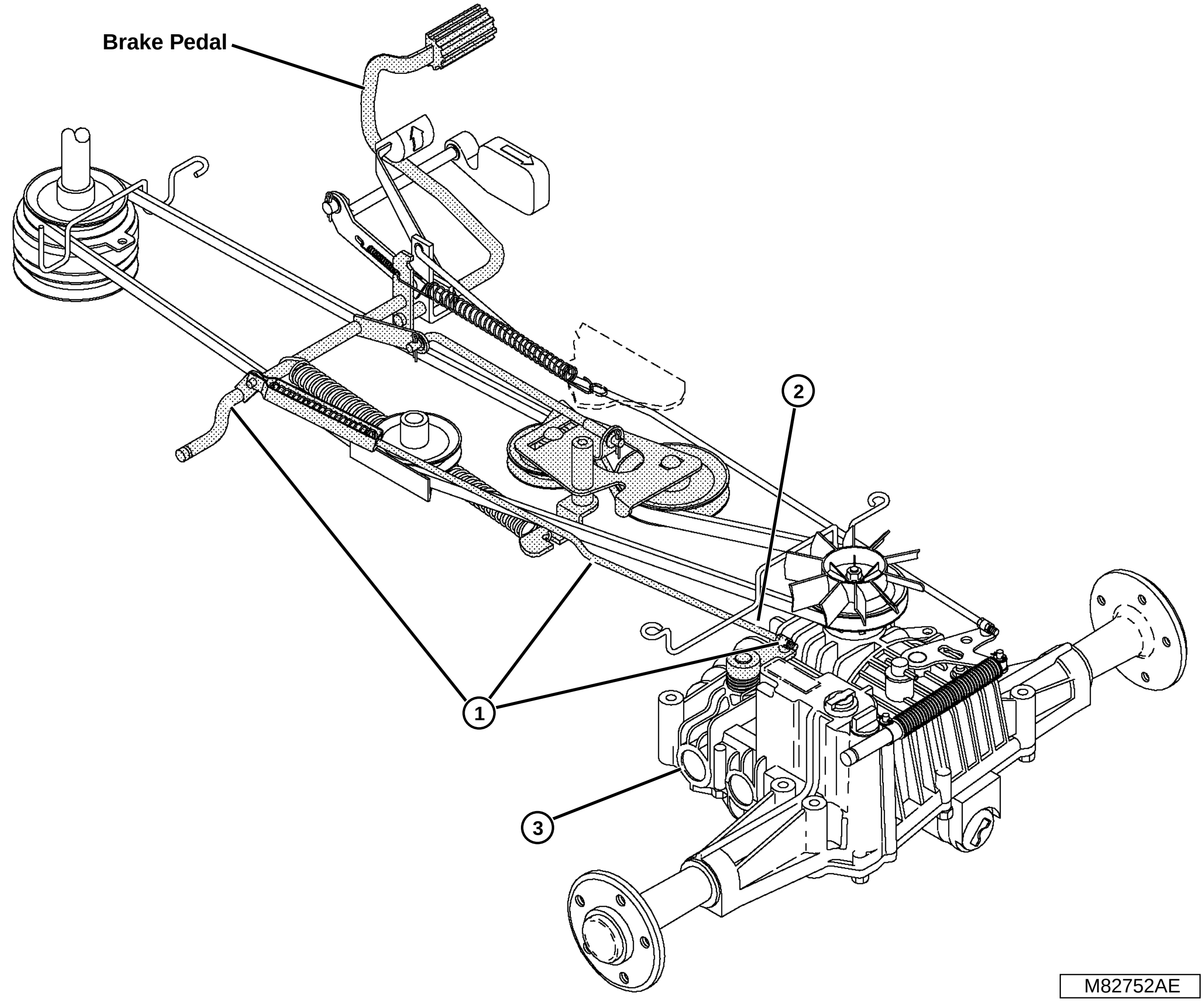
- Machine parked on level surface.
- Key switch in OFF position.
- Parking brake DISENGAGED.
- Transmission in NEUTRAL.

Test Location	Normal	If Not Normal
1. Brake linkage.	Brake rod and lever not damaged or binding. Brake linkage properly adjusted.	Eliminate binding, replace damaged components. Perform Brake Linkage Check And Adjustment.
2. Neutral start switch.	Continuity across terminals when activated by linkage.	Test neutral start switch. (See procedure in ELECTRICAL section.)
3. Internal brake actuator lever. [a]	Engages neutral start switch when brakes applied.	Replace if damaged or worn.

---

[a] Requires removal of transmission from machine and disassembly.
[b] May have other causes not directly related to brake system. See POWER TRAIN for further information.

ENGINE CAN BE STARTED WITHOUT DEPRESSING BRAKE PEDAL



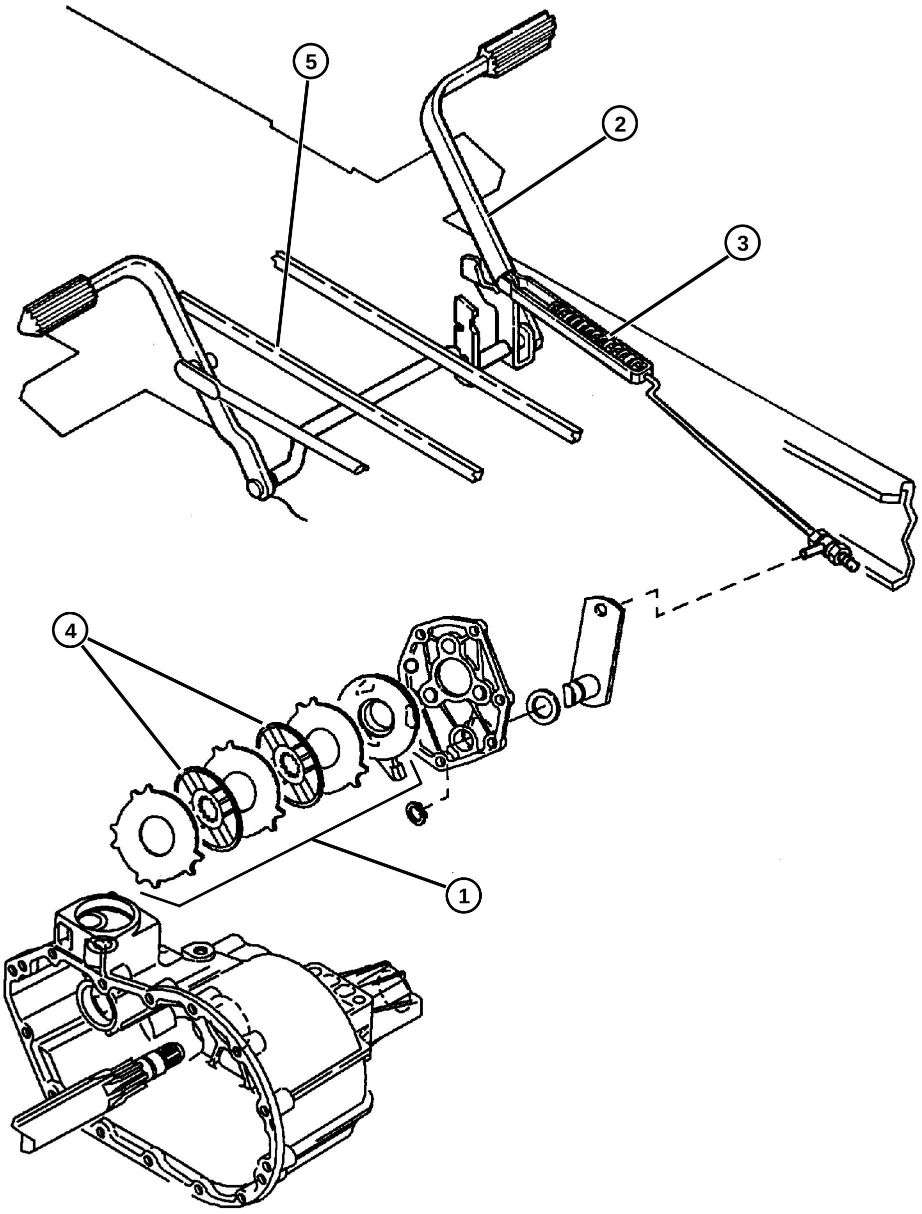
BRAKE LINKAGE TESTS

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Brake assembly.	Properly adjusted. Cam and balls not dirty or binding. Discs and plates not worn or damaged. Brake lever not binding or bent. Lever connected to brake linkage.	Adjust. Repair or replace as needed. Repair or replace as needed. Repair or replace as needed. Install.
2. Brake pedal and linkage.	Not worn or damaged.	Repair or replace linkage.
	Return spring not damaged or weak-linkage returns to disengaged position after pedal is released.	Replace return spring.
3. Brake activating spring.	Not damaged or weak-compressed when pedal depressed.	Replace actuating spring assembly.
4. Brake discs.	Splines between discs and shifter shaft not damaged or worn.	Repair or replace as needed.
5. Traction drive belt.	Installed correctly, not damaged or turned over or correct belt installed. Belt guides correctly adjusted. Belt tension correct.	Repair or replace as needed. Adjust. Adjust.

BRAKE LINKAGE TESTS



M49999

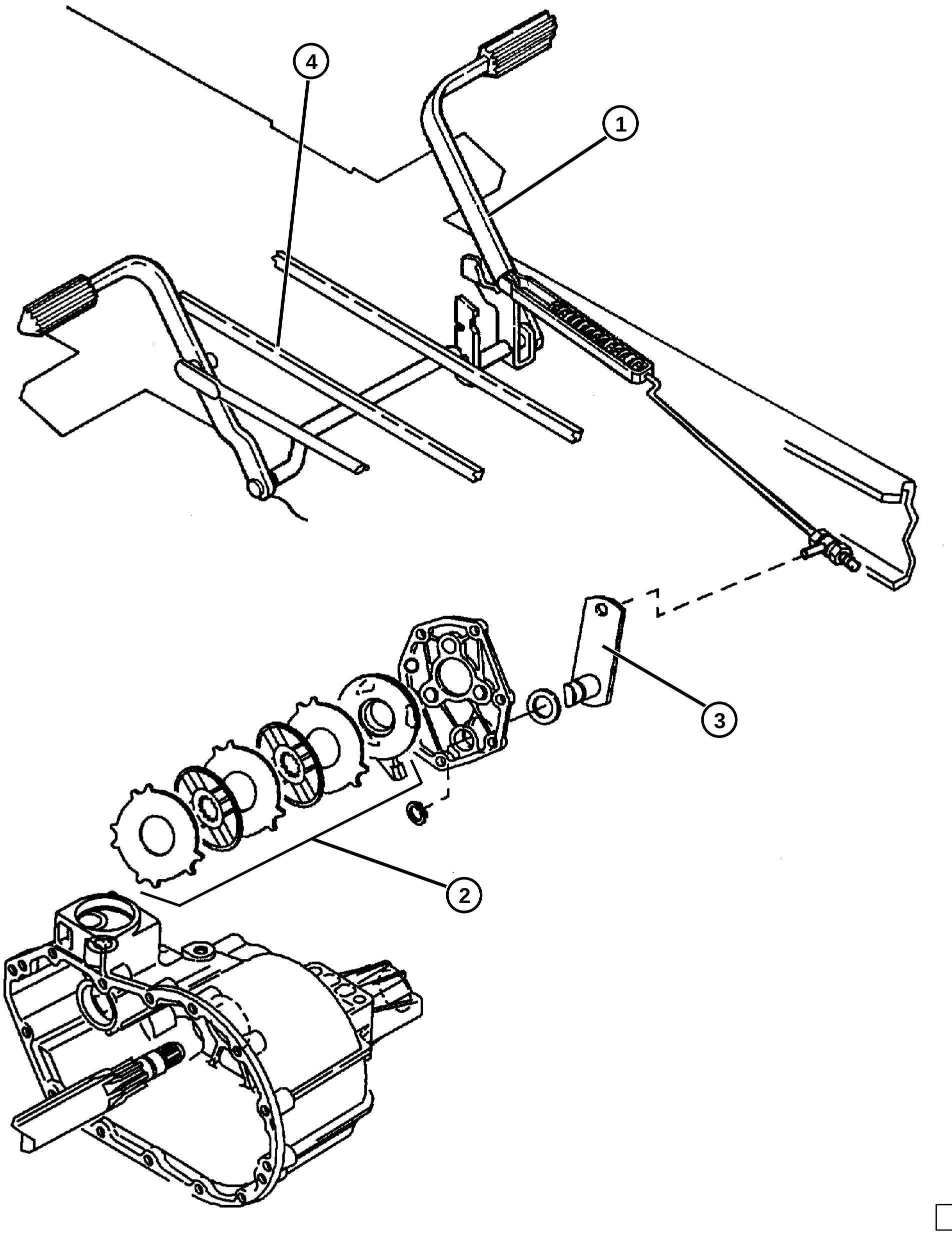
MACHINE WILL NOT MOVE IN FORWARD OR REVERSE

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Parking Brake.	Pedal released and linkage not locked.	Release parking brake.
2. Brake assembly.	Properly adjusted. Cam and balls not dirty or binding. Discs and plates not worn or damaged.	Adjust brake assembly. Repair or replace as needed. Repair or replace as needed.
3. Brake cam lever.	Brake lever not binding or bent. Lever connected to brake linkage.	Repair or replace as needed. Install lever to brake linkage.
4. Traction drive belt.	Installed correctly, not damaged or turned over or correct belt installed. Belt guides correctly adjusted. Belt tension correct.	Repair or replace as needed. Adjust belt guide. Adjust belt tension.

MACHINE WILL NOT MOVE IN FORWARD OR REVERSE



M49999

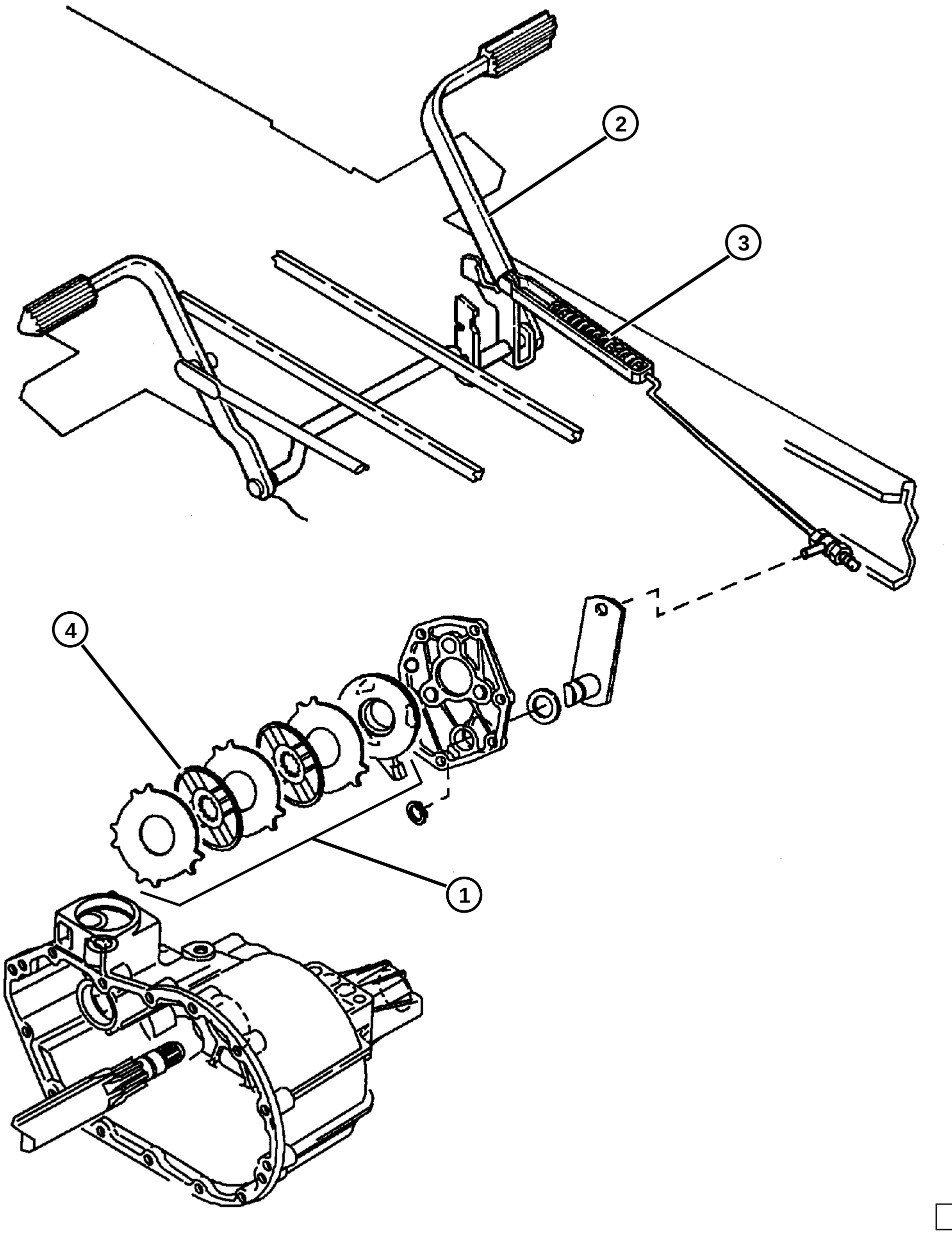
BRAKES DO NOT ENGAGE WHEN PEDAL IS DEPRESSED

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Brake assembly.	Properly adjusted. Cam and balls not dirty or binding. Discs and plates not worn or damaged.	Adjust brake assembly. Repair or replace as needed. Repair or replace as needed.
2. Brake pedal and linkage.	Not worn or damaged.	Repair or replace linkage.
	Return spring not damaged or weak - linkage returns to disengaged position after pedal is released.	Replace return spring.
3. Brake activating spring.	Not damaged or weak - compressed when pedal depressed.	Replace actuating spring assembly.
4. Brake discs	Splines between discs and shifter shaft not damaged or worn.	Repair or replace as needed.

BRAKES DO NOT ENGAGE WHEN PEDAL IS DEPRESSED



M49999

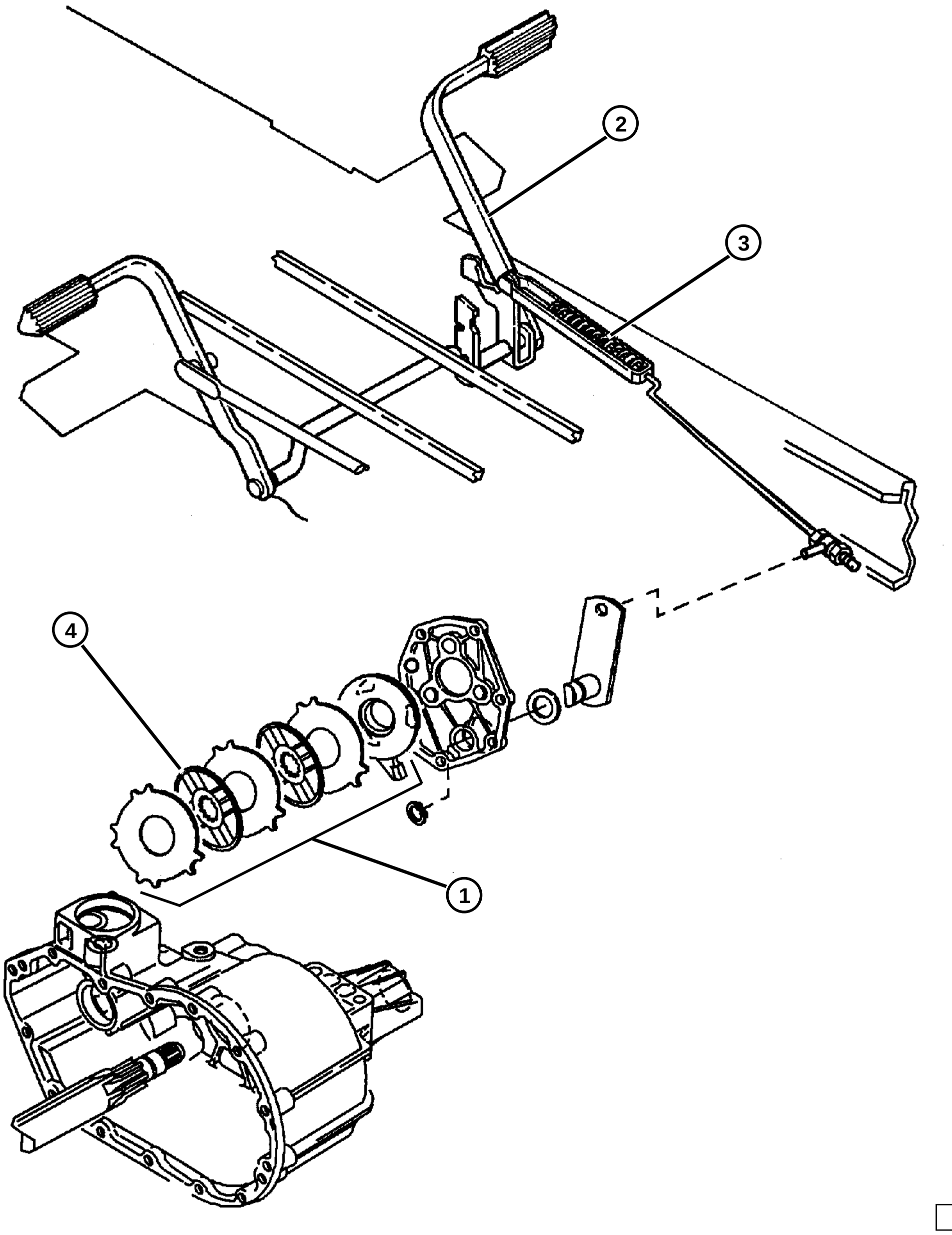
PARKING BRAKE DOES NOT HOLD MACHINE ON HILL - GT242 & GT262

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Brake pedal and linkage.	Not worn or damaged.	Repair or replace linkage.
	Return spring not damaged or weak-linkage returns to disengaged position after pedal is released.	Replace return spring.
2. Brake activating spring.	Not damaged or weak-compressed when pedal released.	Replace actuating spring assembly.
3. Brake discs.	Splines between discs and shifter shaft not damaged or worn.	Repair or replace as needed.

PARKING BRAKE DOES NOT HOLD MACHINE ON HILL



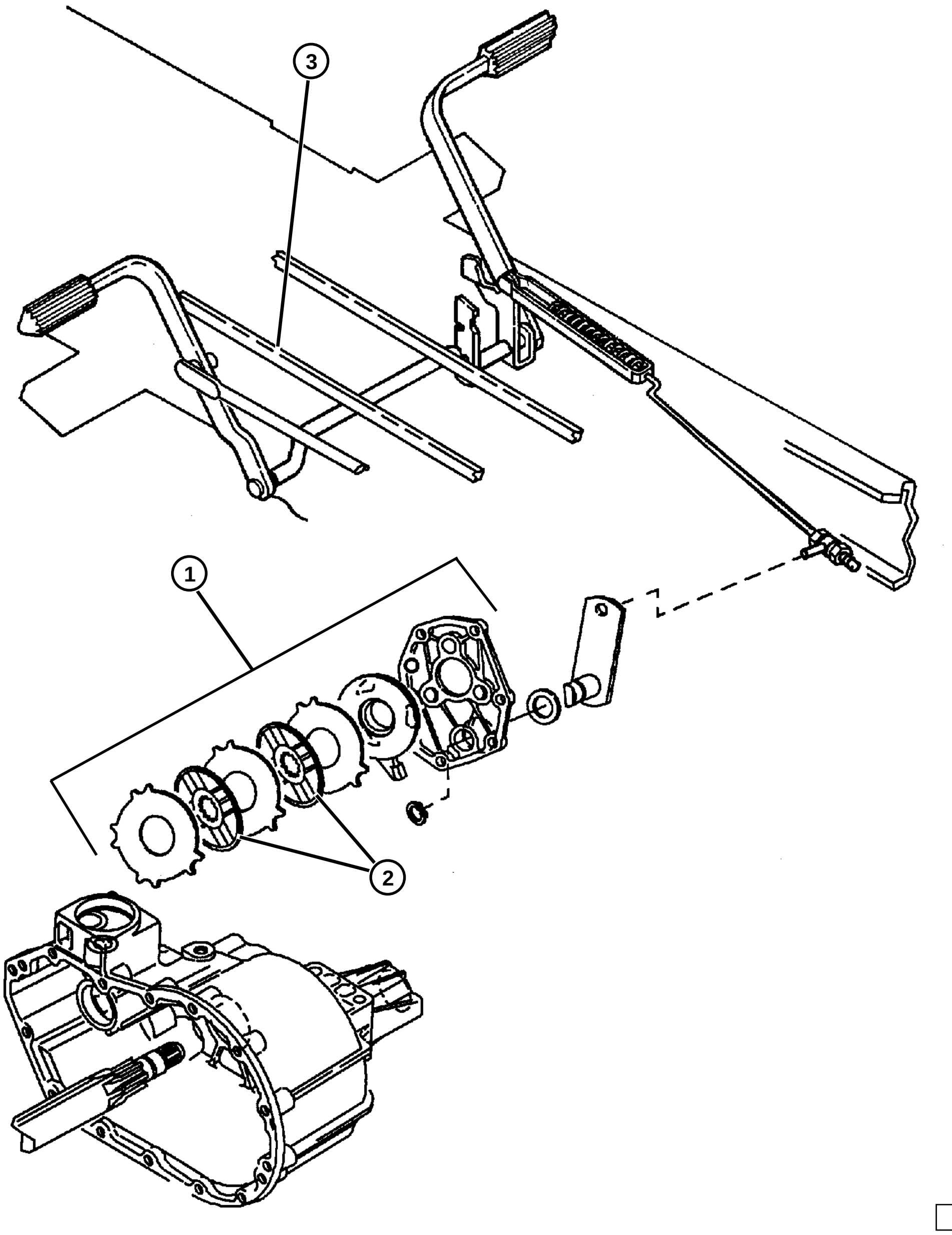
TRANSMISSION NOISY

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Brake assembly.	Properly adjusted. Cam and balls not dirty or binding. Discs and plates not worn or damaged.	Adjust brake assembly. Repair or replace as needed. Repair or replace as needed.
2. Brake discs.	Splines between discs and shifter shaft not damaged or worn.	Repair or replace as needed.
3. Traction drive belt.	Belt tension correct.	Adjust belt tension.

TRANSMISSION NOISY



M49999

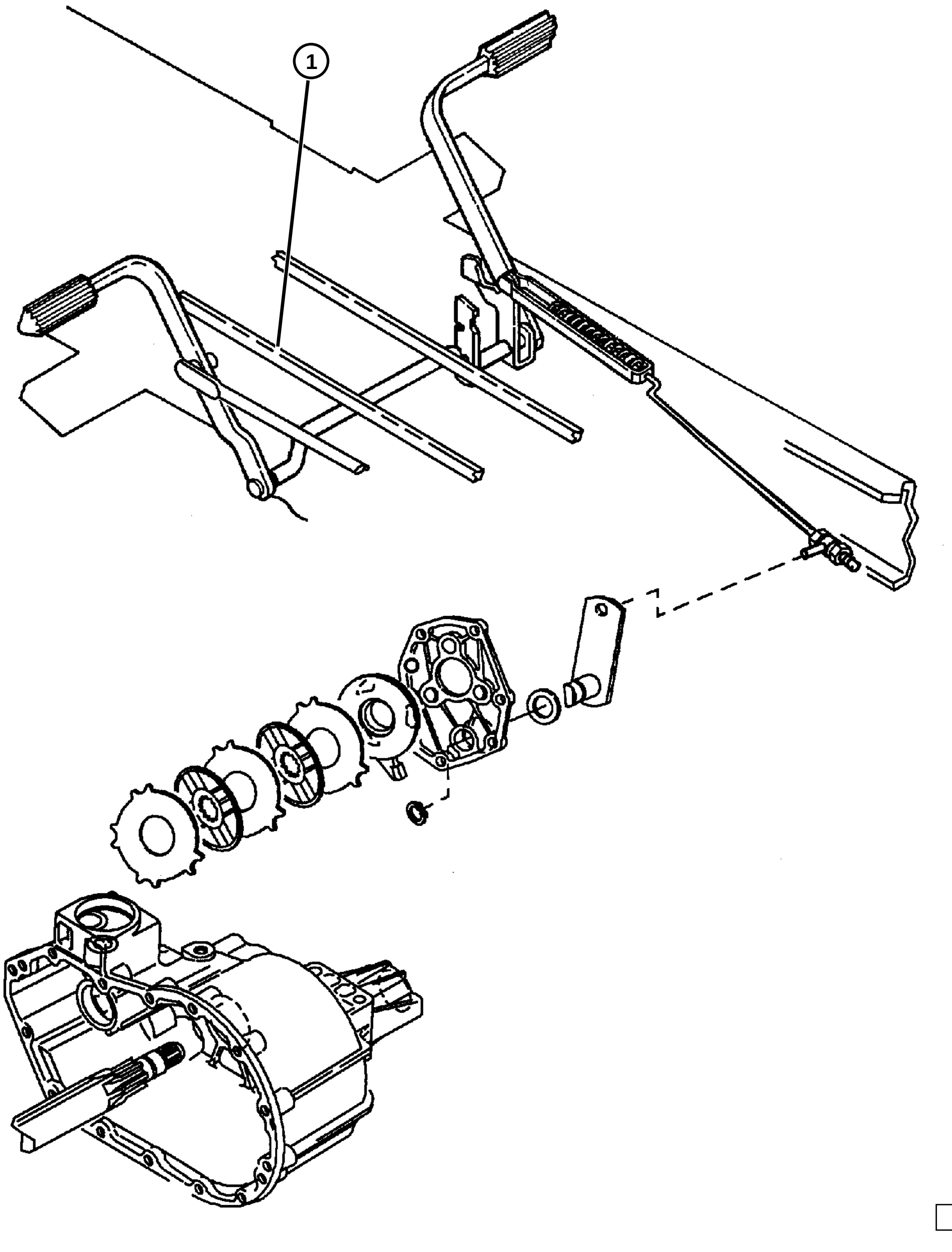
ERRATIC SPEED

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Traction drive belt.	Installed correctly, not damaged or turned over/ Correct belt installed. Belt tension correct.	Repair or replace as needed. Adjust belt tension.

ERRATIC SPEED



M49999

MACHINE DOES NOT ACHIEVE RATED GROUND SPEED

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Traction drive belt.	Installed correctly, not damaged or turned over/ Correct belt installed. Belt tension correct.	Repair or replace as needed. Adjust belt tension.
2. Gear selector lever out of adjustment.	Linkage floats freely and effortlessly when clutch is depressed.	Check linkage alignment. Replace damaged or worn components.

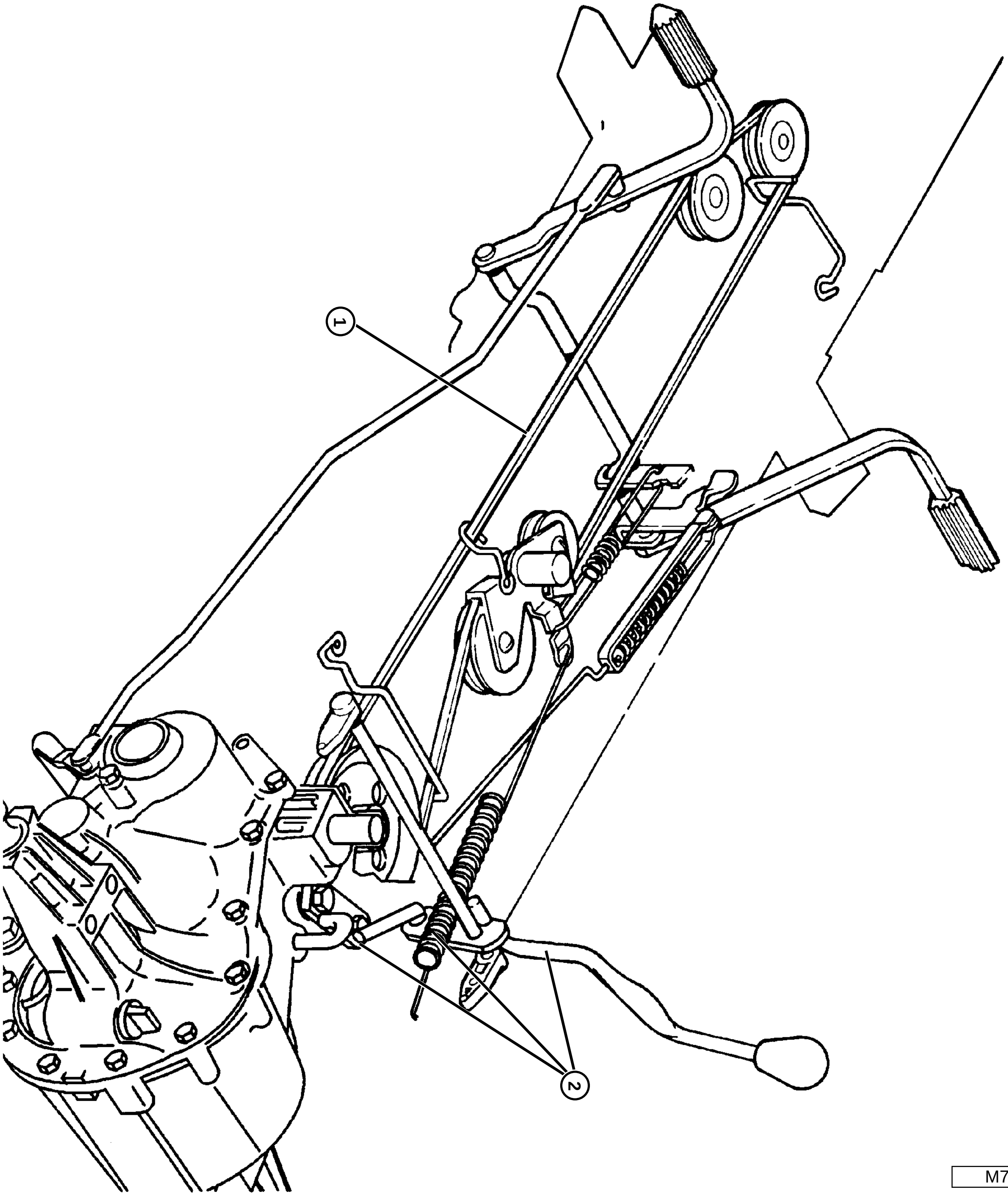
MACHINE WILL NOT MOVE IN FORWARD OR IS SLOW IN FORWARD

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Traction drive belt.	Installed correctly, not damaged or turned over/ Correct belt installed. Belt tension correct.	Repair or replace as needed. Adjust belt tension.

MACHINE WILL NOT MOVE IN FORWARD OR IS SLOW IN FORWARD



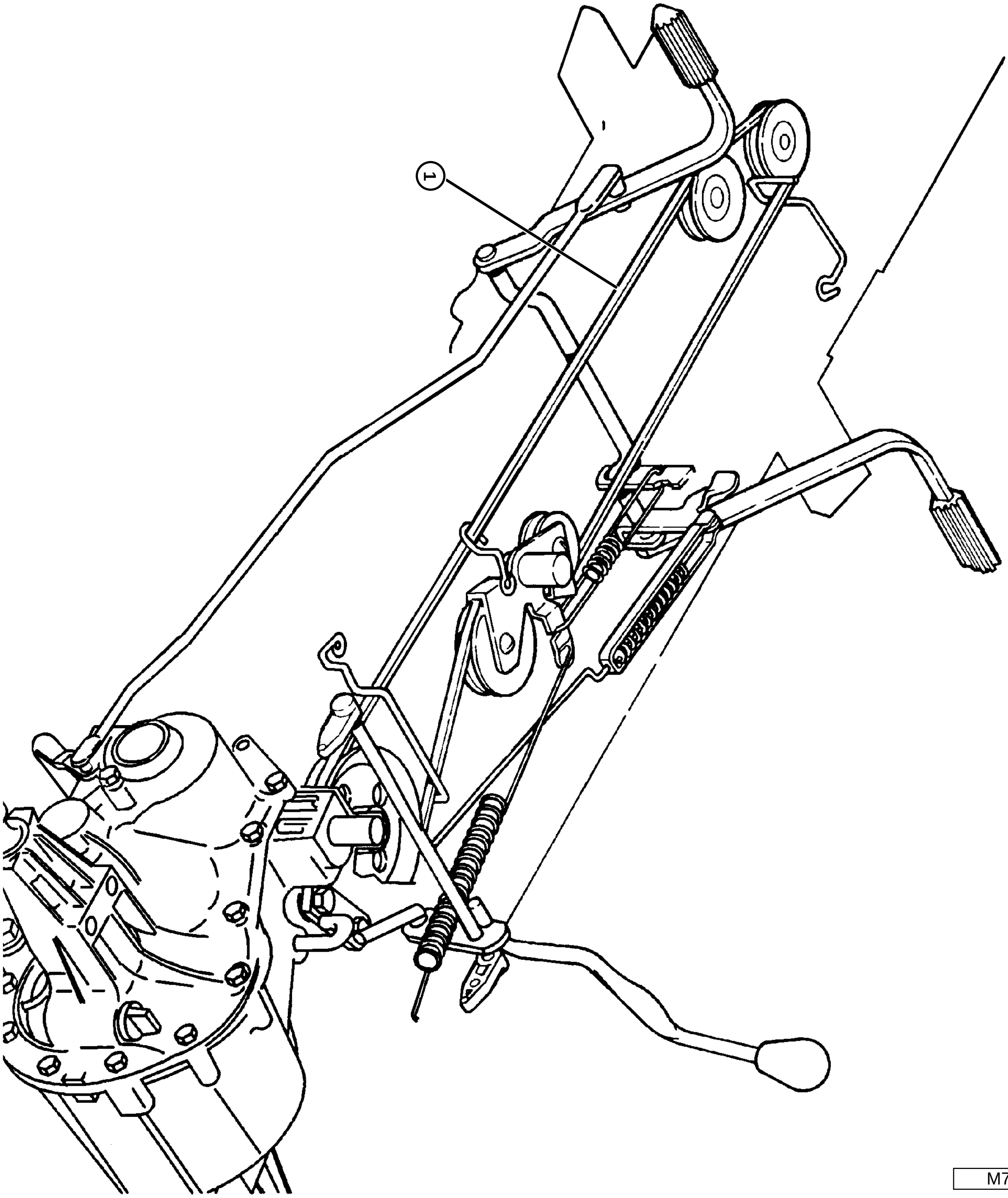
M79797

MACHINE IS SLOW IN REVERSE

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Traction drive belt.	Installed correctly, not damaged or turned over/ Correct belt installed. Belt tension correct.	Repair or replace as needed. Adjust belt tension.



M79797

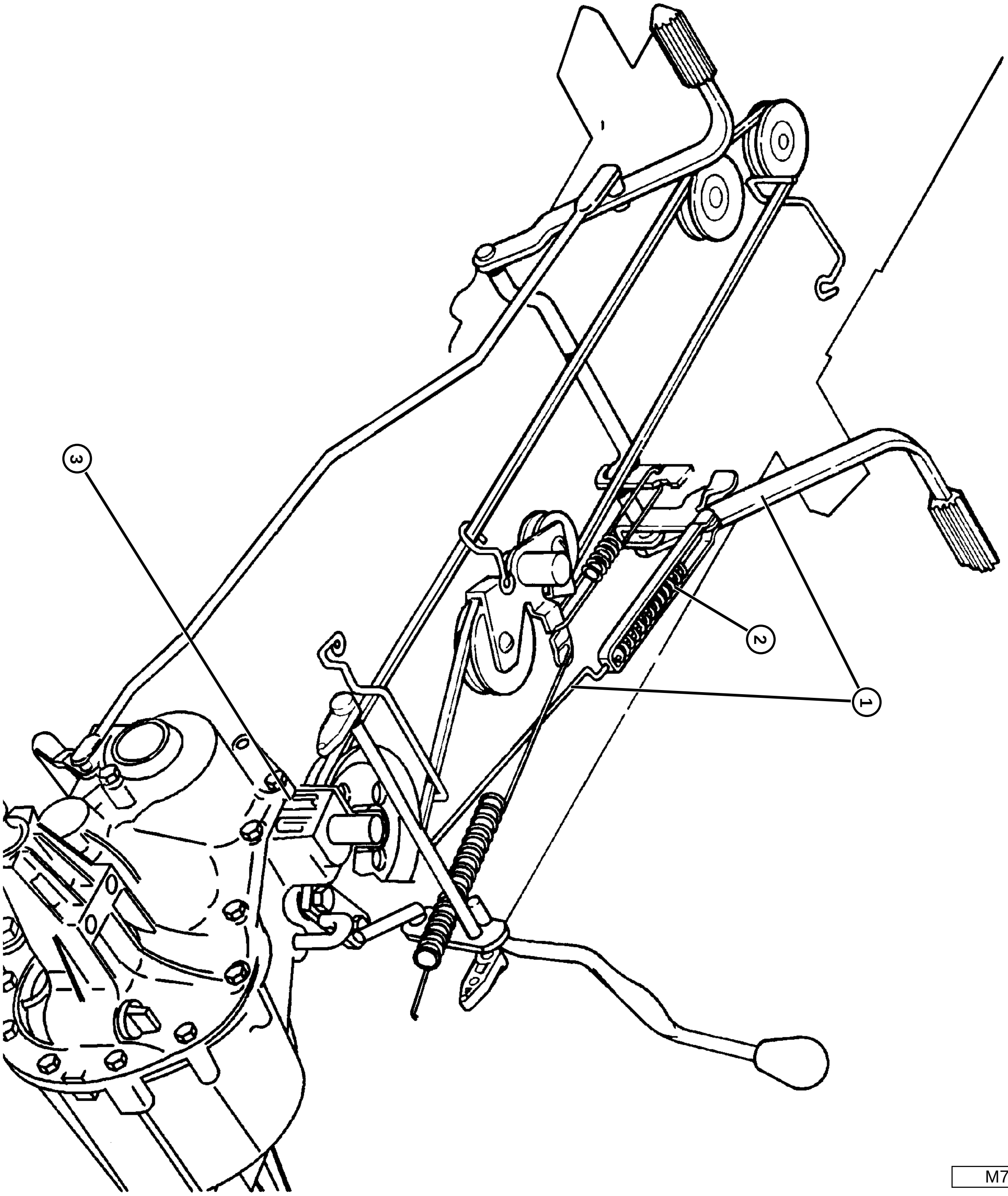
NEUTRAL START SWITCH DOES NOT ENGAGE WHEN DEPRESSING BRAKE PEDAL

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Brake linkage.	Not worn or damaged.	Repair or replace linkage.
2. Brake return spring and linkage.	Return spring not damaged or weak. Linkage returns to disengaged position after pedal is released.	Replace return spring.
3. Neutral Start Switch.	Continuity across terminals when activated by linkage.	Test neutral start switch. (See procedure in ELECTRICAL section.)

NEUTRAL START SWITCH DOES NOT ENGAGE WHEN DEPRESSING BRAKE PEDAL



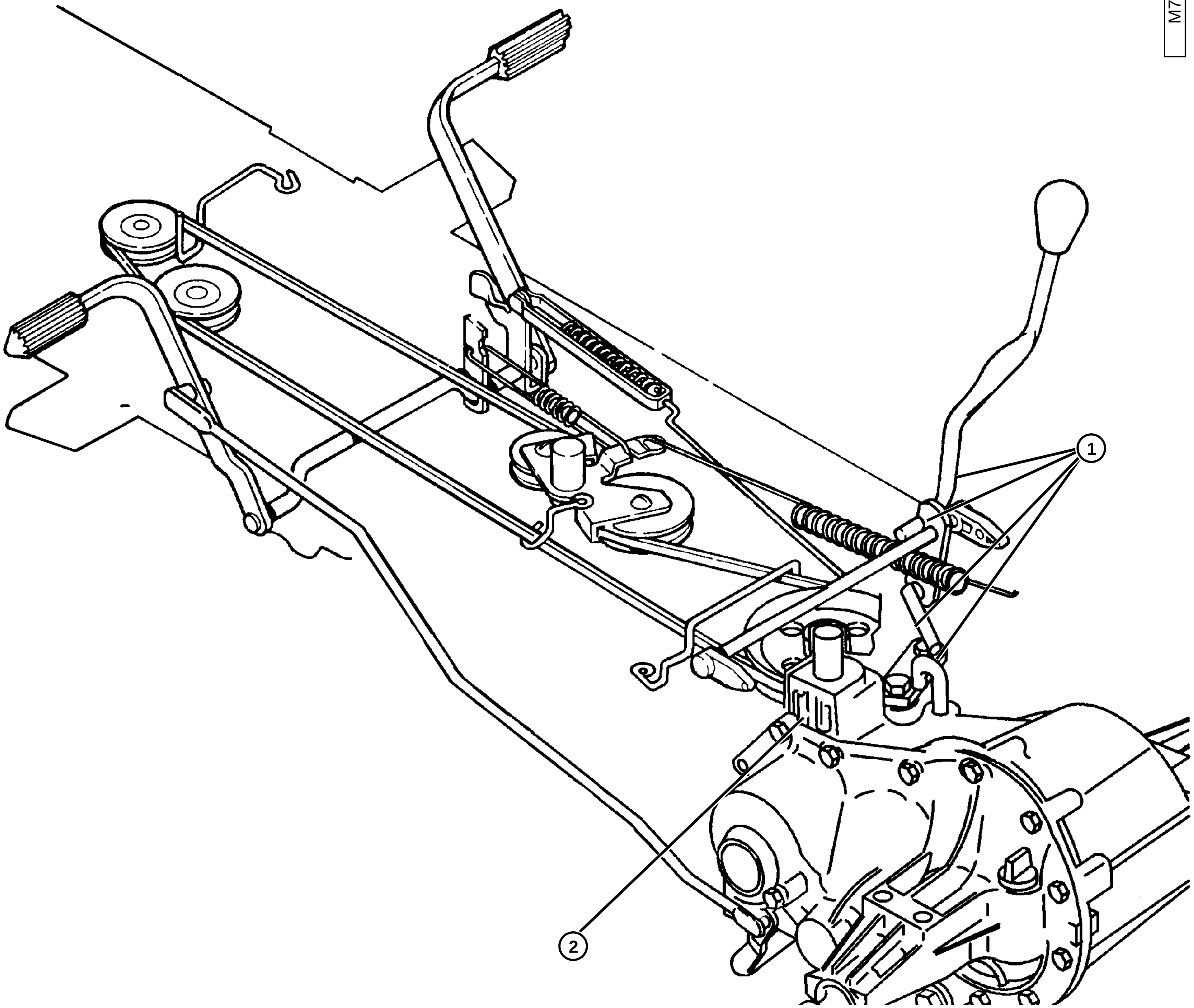
ENGINE CAN BE STARTED WITHOUT GEAR SELECTOR IN NEUTRAL

Test Conditions:

- Machine parked on level surface.
- Park brake DISENGAGED.
- Transaxle in any gear.
- Key switch in OFF position.

Test Location	Normal	If Not Normal
1. Gear linkage.	Not worn or damaged.	Repair or replace linkage.
2. Neutral Start Switch.	Continuity across terminals when activated by linkage.	Test neutral start switch. (See procedure in ELECTRICAL section.)

ENGINE CAN BE STARTED WITHOUT GEAR SELECTOR IN NEUTRAL



M79797

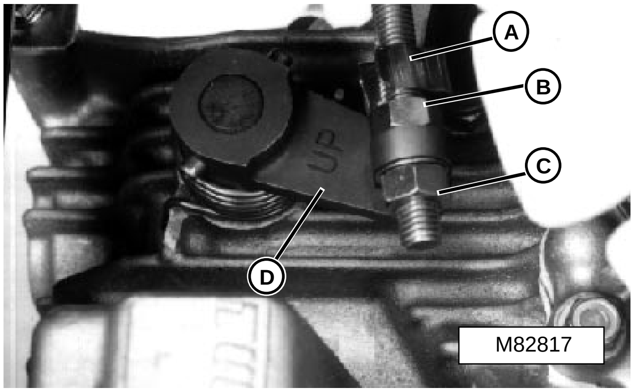
BRAKE LINKAGE CHECK AND ADJUSTMENT - GT275

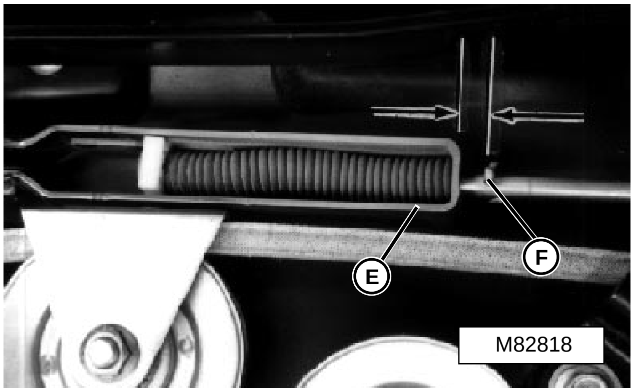
Reason:

To ensure proper brake operation.

Procedure:

1. Park machine on level surface.
2. Turn key switch OFF.
3. Move forward/reverse pedals to NEUTRAL position.
4. Block wheels to prevent machine from moving.
5. Remove fender deck to gain access to brake linkage.
6. Check linkage for wear, binding, or dirt.
7. Brake pedal should be released in “OFF” position.





8. Disconnect clip (A).
9. Loosen nuts (B and C).
10. Pull rearward on brake actuator arm (D) to full “OFF” position.
11. Adjust and tighten nuts (B and C) to ensure that brake arm is in full “OFF” position when brake pedal is released.

CHECK ADJUSTMENT

12. Depress brake pedal and engage parking brake.
13. Check “clearance” between bracket (E) and cotter pin (F). **Clearance should be 3 mm (0.118 in.) minimum**.
14. If clearance is not **3 mm (0.118 in.)** or more, repeat steps 7 through 10 and adjust nuts so transmission brake arm is adjusted **3—5 mm (0.118—0.197 in.)** forward from full “OFF” position when brake pedal is released. (This method eliminates of free play in brake arm travel.)
15. Repeat steps 11 and 12 and check for proper adjustment.

After adjusting brake, check the following for correct function:

- With brake pedal released, engine cannot be cranked over and started. Brake pedal must be depressed before engine will start.
- With brake pedal released, forward and reverse pedals pivot freely and return to neutral without binding.
- With brake pedal released, free wheeling valve can be actuated and tractor will roll freely without brake drag.

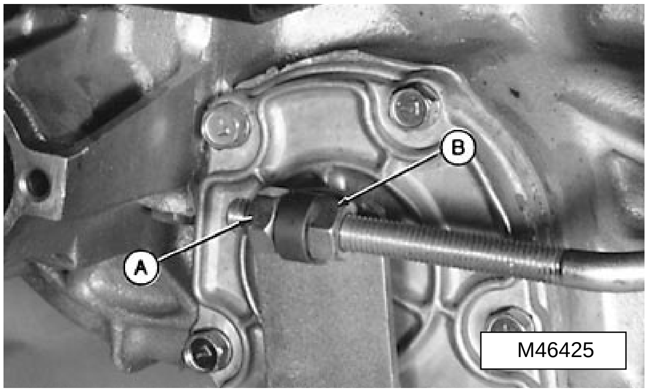
BRAKE ADJUSTMENT - GT242 & GT262

Reason:

Adjust brake for proper operation.

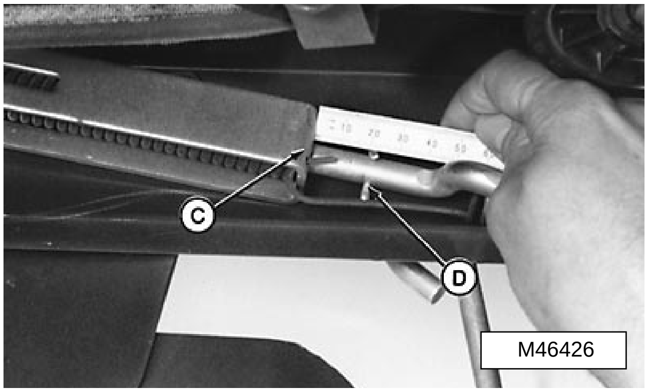
Equipment:

Feeler gauge



Procedure:

1. Turn key switch to “OFF” position.
2. Block wheels to prevent machine from moving.
3. Remove mower deck for access to brake linkage.
4. Check linkage for wear, binding or dirt.
5. Depress brake and clutch pedals and set park brake.
6. Loosen nuts (A) and (B).
7. Adjust nuts (A) and (B) as needed to get **18—20 mm (0.71—0.79 in.)** clearance between bracket (C) and cotter pin (D).



8. Tighten nuts.

Specifications:

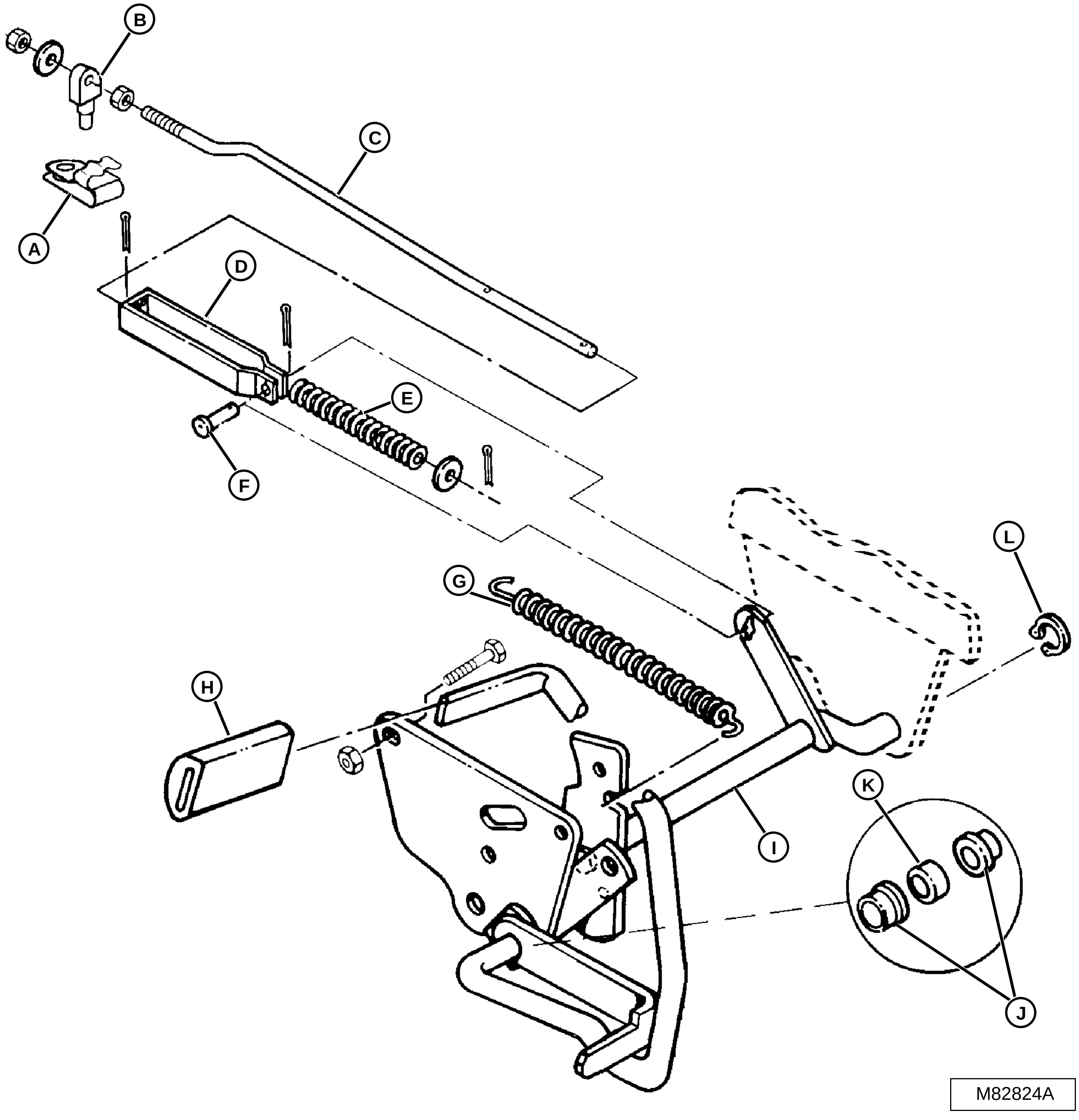
Brake clearance: **18—20 mm (0.71—0.79 in.)**

BRAKE PEDAL AND LINKAGE

1. Remove:

- Mower deck. (See procedure in ATTACHMENTS section.)
- Fuel tank. (See procedure in ENGINE section.)

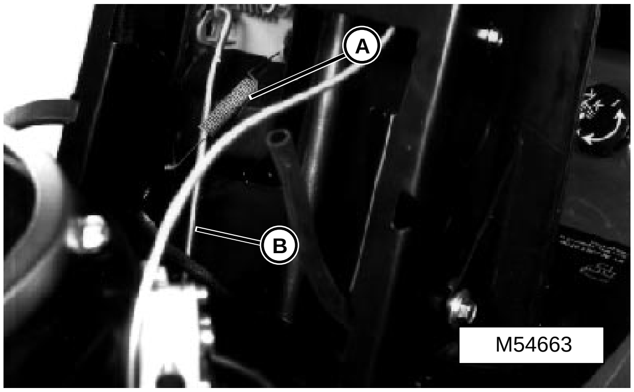
2. Inspect all parts for wear or damage. Replace parts as necessary.
3. Adjust brake linkage. (See Adjustments.)

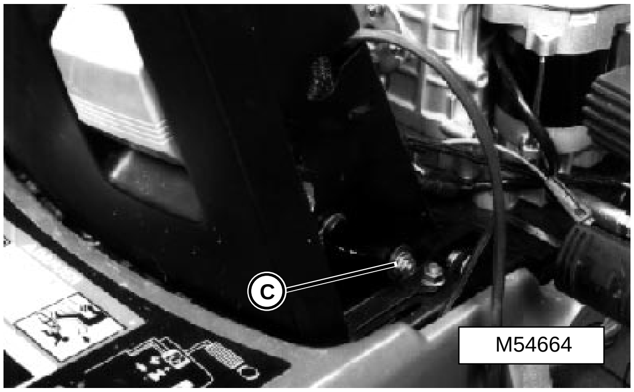


A— Clip
B— Pivot
C— Brake Rod
D— Retainer
E— Compression Spring
F— Pin
G— Return Spring
H— Pad
I— Brake Pedal Shaft
J— Bushings
K— Spacer
L— Snap Ring

PARK BRAKE LEVER AND LINKAGE

1. Raise hood.
2. Remove battery.
3. Remove spring (A).
4. Remove carriage bolt, nut, and bushing (C).
5. Disconnect linkage rod (B).





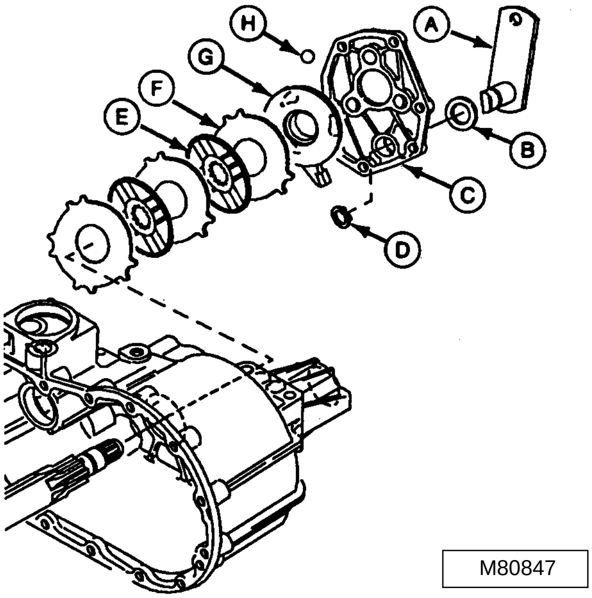
6. Remove lever and linkage.
7. Inspect all parts for wear or damage. Replace parts as necessary.

Installation is done in the reverse order of removal.

BRAKE ASSEMBLY

The brake assembly is an internal feature of the hydrostatic transmission. Inspection and repair of the brake assembly requires disassembly of the transmission. (See HYDROSTATIC TRANSMISSION) section.)

REMOVE AND INSPECT BRAKE ASSEMBLY

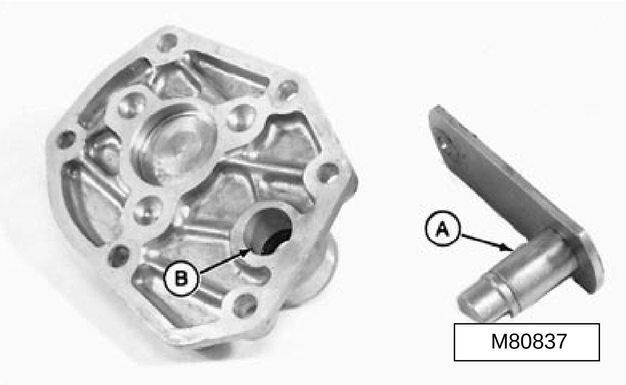


A— Cam Lever	**E— Brake Disc (2 used)**
B— Seal	**F— Brake Plate (3 used)**
C— Cover	**G— Actuator**
D— Snap Ring	**H— Ball (3 used)**

1. Drain transaxle oil.
2. Disconnect brake linkage rod.

NOTE: Balls (H) may fall out when cover (C) is removed.

3. Remove five cap screws and cover (C).
4. Remove parts (E—H).
5. Inspect disks (E) for excessive wear or damage. Replace disks if radial grooves are worn smooth.
6. Remove snap ring (D) and lever (A).
7. Pry out seal (B) using a screwdriver.
8. Inspect all parts for wear or damage. Replace as necessary.



9. Measure ID of cam lever shaft bore (B). Replace cover if not within specifications.
10. Measure OD of cam lever shaft (A). Replace lever if not within specifications.

    Subtract lever shaft OD from bore ID. Replace lever and cover if measurement is more than specifications.

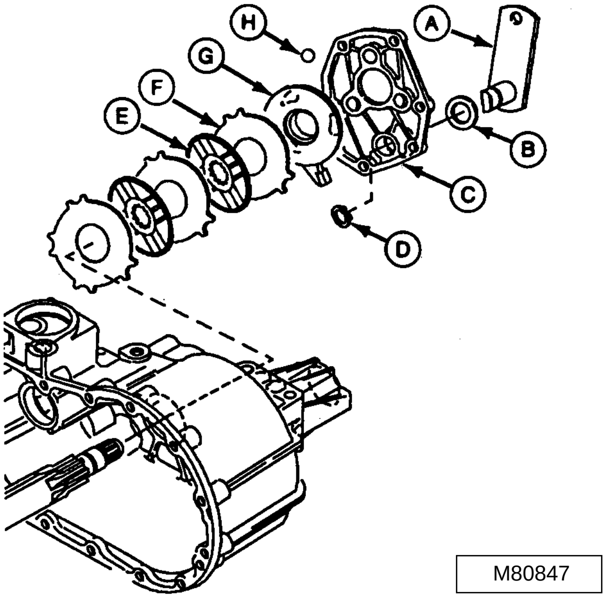
Specifications:

Cover Bore ID: **......20.02-20.05 mm (0.788—0.789 in.)**

Lever Shaft OD:**.....19.95-20.00 mm (0.785—0.787 in.)**

Shaft-to-Bore Clearance (MAX): **... 0.50 mm (0.020 in.)**

INSTALL BRAKE ASSEMBLY



A— Cam Lever
B— Seal
C— Cover
D— Snap Ring
E— Brake Disc (2 used)
F— Brake Plate (3 used)
G— Actuator
H— Ball (3 used)

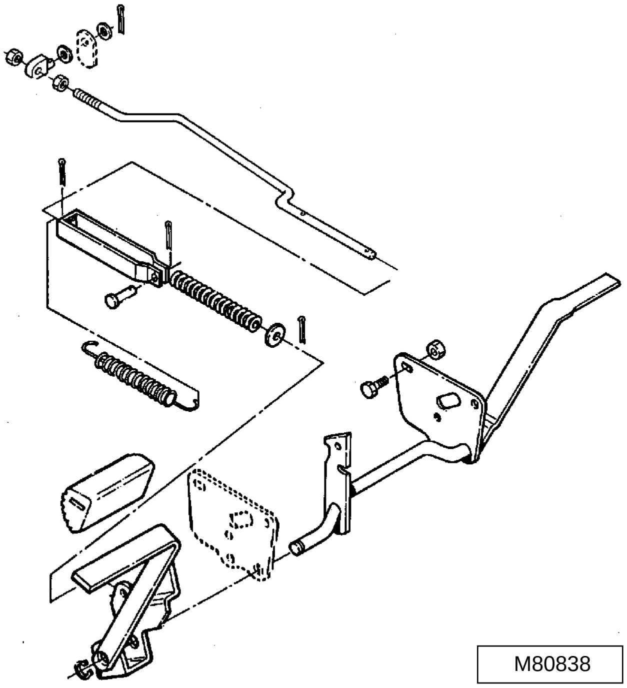
IMPORTANT: Install a new seal during assembly. A damaged or used seal may leak.

1. Apply multipurpose grease into inside lips of seal (B).
2. Install seal flush to cover (C) using a busing, bearing and seal driver set.
3. Install lever (A) and snap ring (D).
4. Apply multipurpose grease on balls (H) to hold in place on actuator (G).
5. Install parts (E—H).
6. Clean mating surfaces of cover and transaxle housing using Clean and Cure Primer. Apply a coat of John Deere Form-In-Place Gasket Sealant or an equivalent to cover and transaxle housing.
7. Apply thread lock and sealer (medium strength) to threads of cap screws.
8. Install cover (C) and cap screws. Tighten cap screws to specifications.
9. Connect brake linkage rod.

*NOTE: Approximate transaxle oil capacity is **3.6 L (3.8 U.S. qt)**.*

10. Fill transaxle to full mark of dipstick with proper oil.

INSPECT AND REPAIR BRAKE PEDAL AND LINKAGE



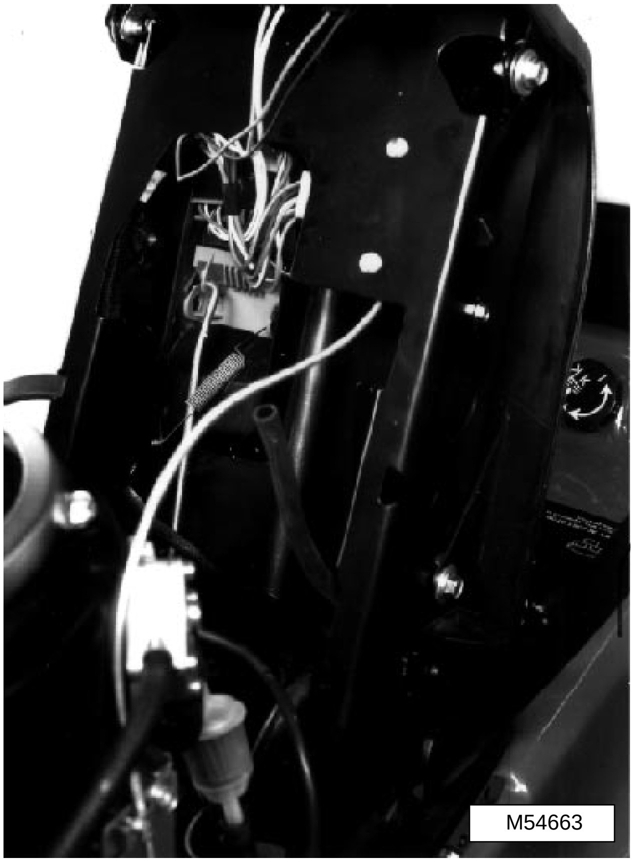
A— Pivot
B— Brake Rod
C— Retainer
D— Compression Spring
E— Pin
F— Return Spring
G— Pad
H— Snap Ring
I— Pedal Assembly
J— Shaft

1. Remove mower deck.
2. Remove right side rear wheel
3. Disconnect spring (F).
4. Remove parts (A—I).
5. Inspect parts for wear or damage. Replace as necessary.

NOTE: To remove shaft (J), remove clutch pedal linkage.

6. Install all parts.
7. Connect return spring.
8. Install rear wheel.
9. Adjust brake linkage.

INSPECT AND REPAIR PARK BRAKE LEVER AND LINKAGE


M54663


M54664

1. Remove battery
2. Remove spring (A).
3. Remove carriage bolt, nut and bushing (C).
4. Disconnect linkage rod (B).
5. Remove lever and linkage.
6. Inspect parts for wear or damage. Replace as necessary.
7. Install lever and linkage.
8. Install bushing, nut and carriage bolt.
9. Install spring.
10. Install battery.

CONTENTS

SPECIFICATIONS

ADJUSTMENT SPECIFICATIONS

- Side-to-Side Blade Height Difference (Maximum). . . . . 3 mm (0.125 in.)
- Front-to-Rear Blade Height Difference
  - 38 and 48-Inch . . . . .3—10 mm (0.125—0.375 in.) front lower than rear
  - 44-Inch . . . . 0—6 mm (0—0.250 in.) front lower than rear

REPAIR SPECIFICATIONS

38-Inch Mower Deck

- Spindle
  - Mounting Nut Torque . . . . 26 N•m (230 lb-in.)
  - Sheave Nut Torque . . . . 140 N•m (103 lb-ft)
- Blade
  - Blade Cap Screw Torque . . . . 75 N•m (55 lb-ft)
  - Cutting Edge Width . . . . .0.40 mm (0.016 in.)

44-Inch Rear Discharge Mower Deck

- Spindle
  - Mounting Nut Torque . . . . 26 N•m (230 lb-in.)
  - Sheave Nut Torque . . . . 163 N•m (120 lb-ft)
  - Lower Seal Installation Position. . . . . .7.8 mm (0.31 in.) below hub flange
- Blade
  - Blade Cap Screw Torque . . . . 68 N•m (50 lb-ft)
  - Cutting Edge Width . . . . .0.40 mm (0.016 in.)

48-Inch Mower Deck

- Gauge Wheels
  - Roller Shaft Nut Torque . . . . 30 N•m (22 lb-ft)
- Idlers and Sheaves
  - Jack Sheave Nut Torque . . . . 136 N•m (100 lb-ft)
  - Tensioning Idler Sheave Nut Torque . . . . 27 N•m (20 lb-ft)
- Spindle
  - Mounting Nut Torque . . . . 26 N•m (230 lb-in.)
  - Sheave Nut Torque . . . . 163 N•m (120 lb-ft)
  - Lower Seal Installation Position. . . . . .7.8 mm (0.31 in.) below hub flange
- Blade
  - Blade Cap Screw Torque . . . . 68 N•m (50 lb-ft)
  - Cutting Edge Width . . . . .0.40 mm (0.016 in.)

SPECIAL OR ESSENTIAL TOOLS

NOTE: Order tools according to information given in the U.S. SERVICEGARD^{TM} Catalog or in the European Microfiche Tool Catalog (MTC).

TY15272 Blade Height Gauge
Use to check mower side-to-side level.

SERVICE PARTS KITS

The following kits are available through your parts catalog:

38-Inch Mower Deck

- Rear Draft Pin Kit
- Gauge Wheel Kit
- Jack Sheave Kit
- Front Draft Rod Kit

44-Inch Rear Discharge Mower Deck

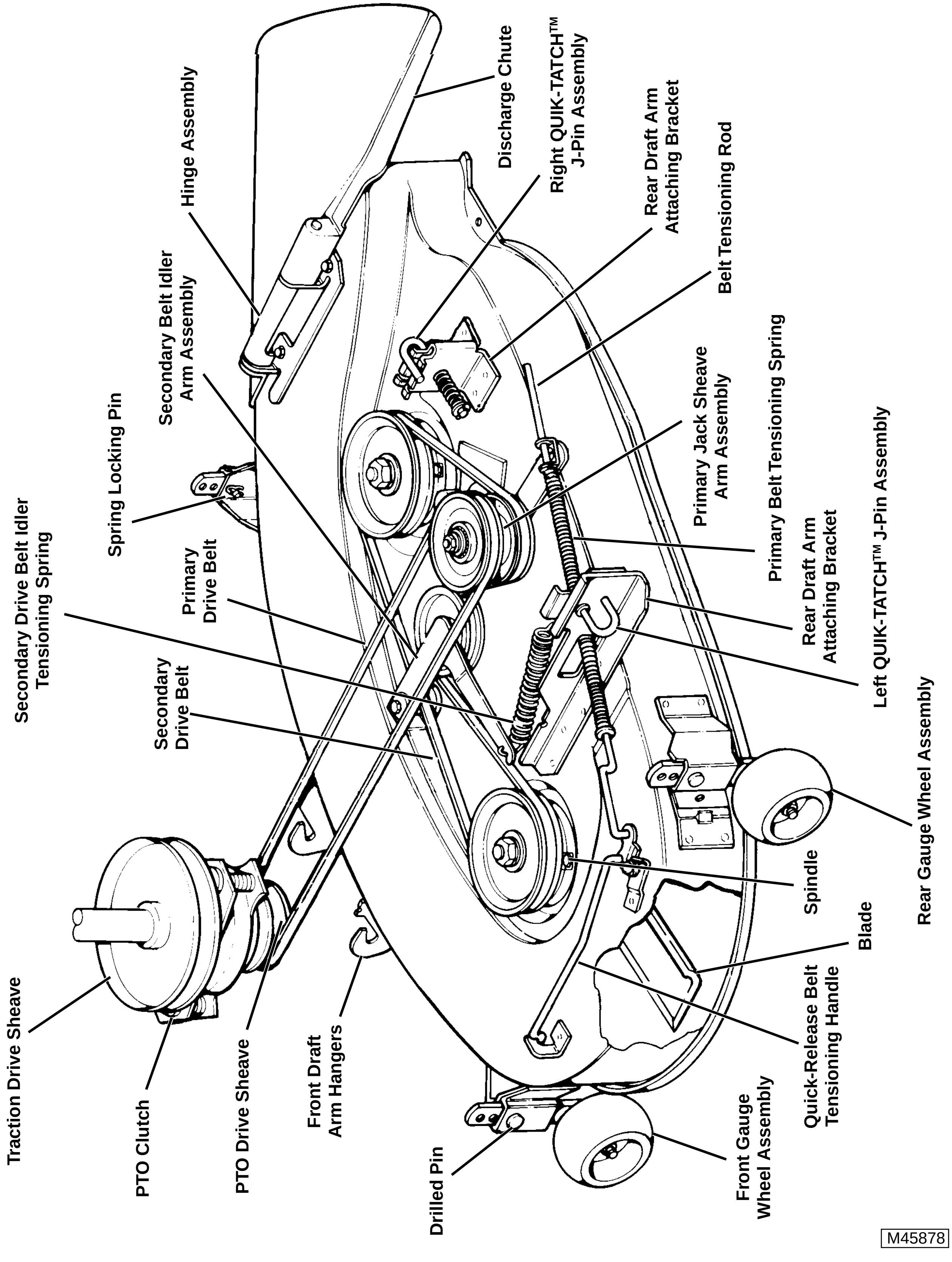
- QUIK-TATCH^{TM} J-Pin Kit
- Spindle Bearing Replacement Kit
- Spindle Housing Kit
- Tensioner Assembly Kit
- Gauge Wheel Kit

48-Inch Mower Deck

- QUIK-TATCH^{TM} J-Pin Kit
- Bushing Replacement Kit
- Spindle Bearing Kit
- Rear Draft Kit
- Gauge Wheel Kit

COMPONENT LOCATION

38-INCH MOWER DECK COMPONENTS



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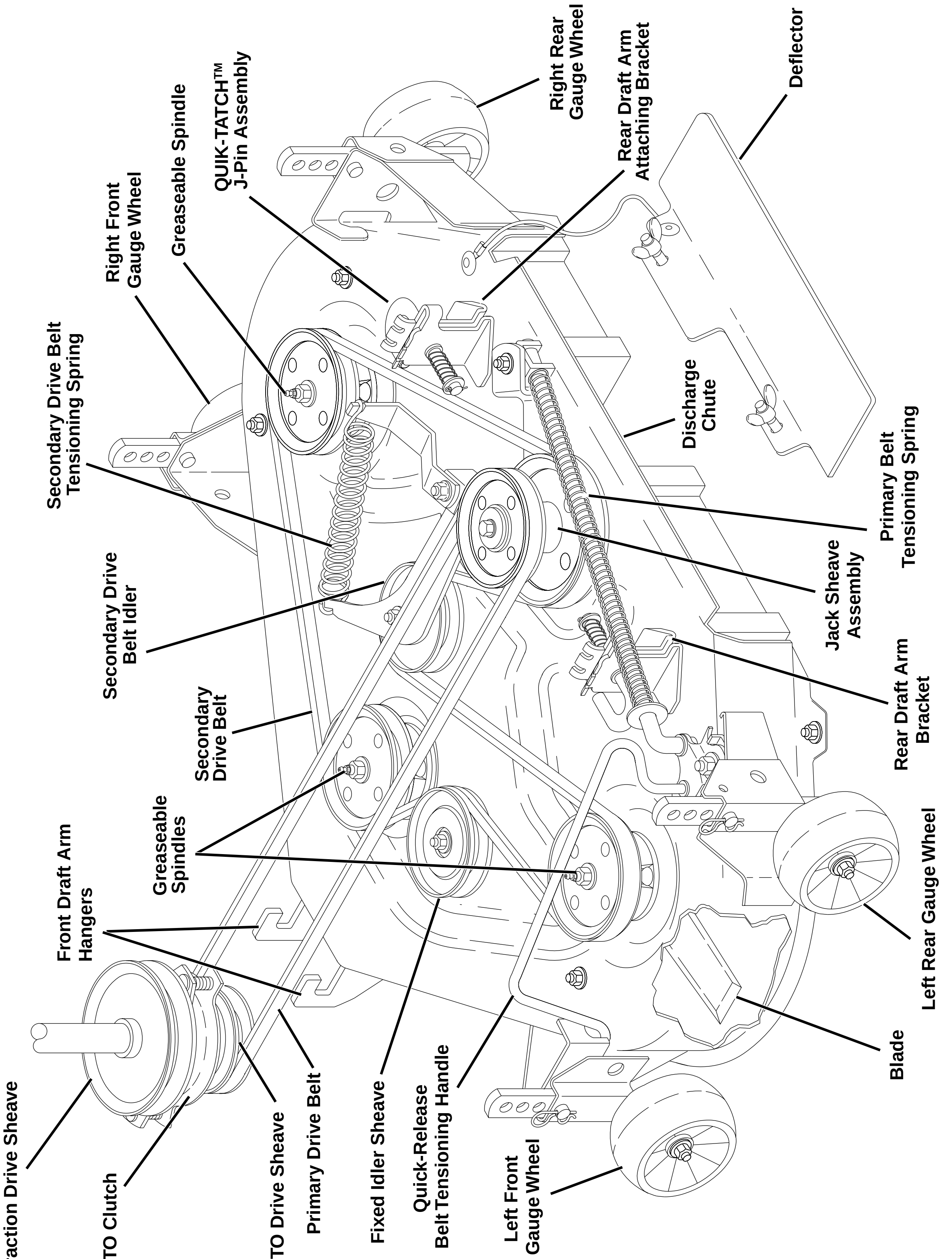
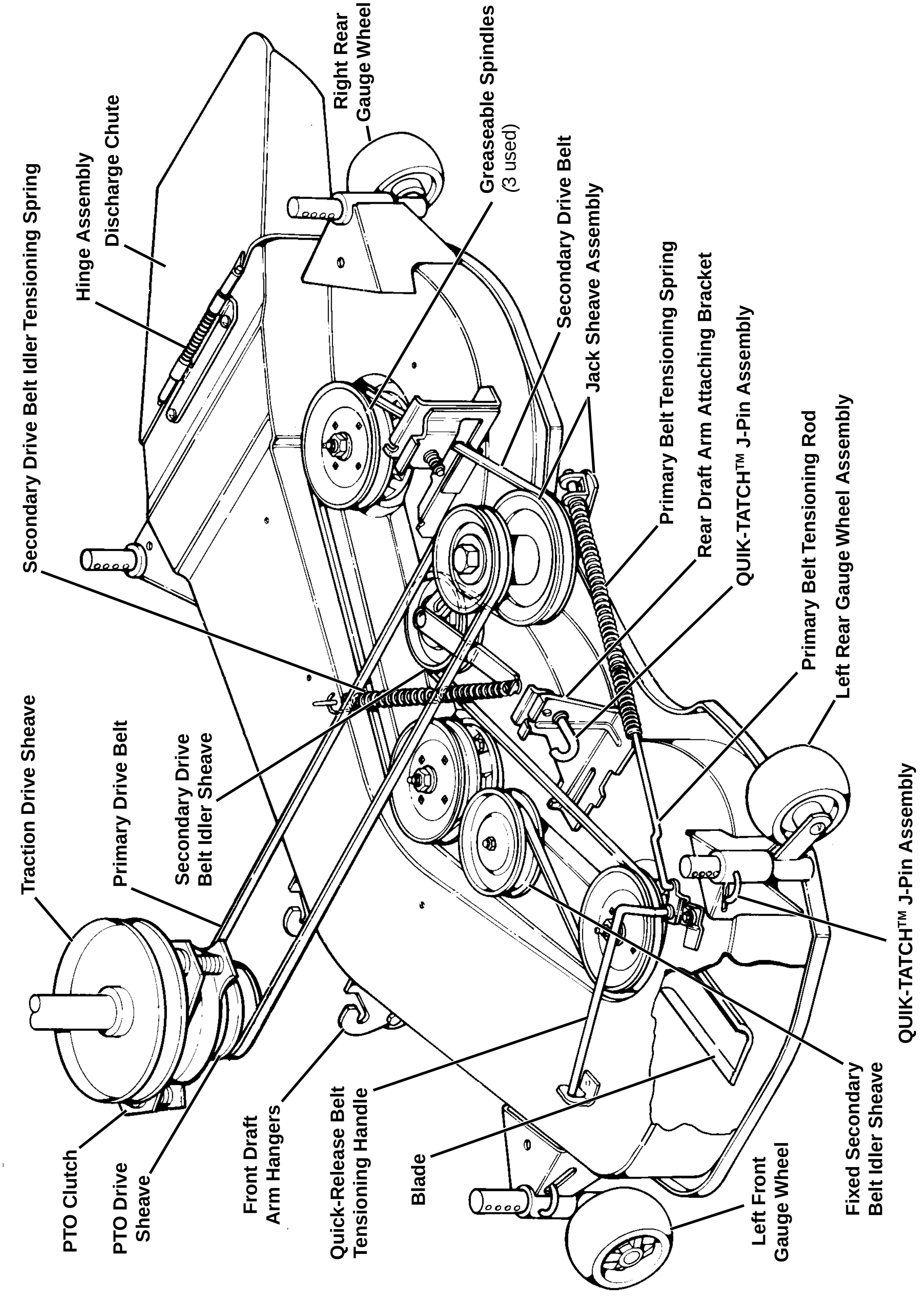
44-INCH MOWER DECK COMPONENTS



48-INCH MOWER DECK COMPONENTS



TROUBLESHOOTING

MOWER DECK TROUBLESHOOTING CHART

Problem or Symptom Check or Solution	Mower deck will not run.	Mower deck vibrates.	Cuts unevenly	Belt squeals.
PTO clutch and sheave will not engage.	●			
Primary drive belt broken, worn, frayed, glazed, stretched or wrong belt.	●	●		●
Secondary drive belt broken, worn, frayed, glazed, stretched or wrong belt.	●	●		●
Primary belt Quick-Release belt tensioning handle not locked in place, weak spring, spring unhooked or broken.	●			●
Secondary drive belt tensioning spring weak, unhooked or broken.	●	●		●
Blades out of balance.		●		
Blades bent.		●	●	
Blade level side-to-side out of adjustment.			●	
Blade level front-to-rear out of adjustment.			●	
Blades dull.			●	
Gauge wheels not adjusted correctly.			●	
Drive sheaves and idlers loose, damaged, dry or locked-up.	●	●	●	●

DIAGNOSIS

MOWER DRIVE CHECKS

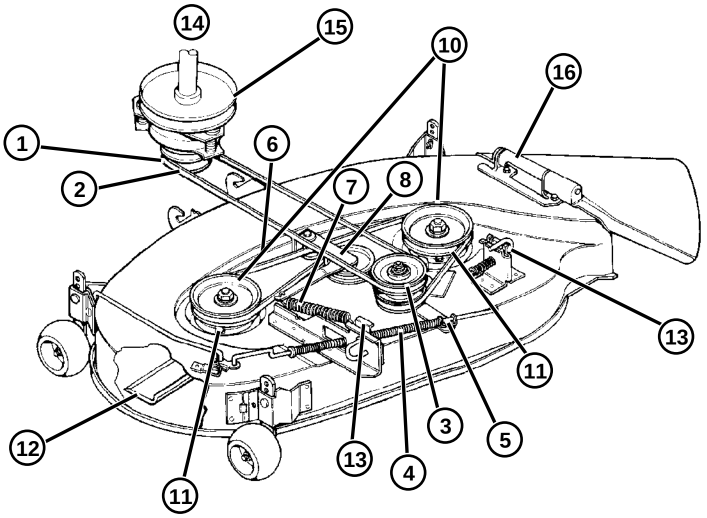
Test Conditions:

- Machine parked on a clean, level surface.
- PTO disengaged.
- Key switch in STOP position.

Test/Check Point	Normal	If Not Normal
1. PTO clutch and drive sheave.	Tight on crankshaft and key not damaged or missing. Air gap properly adjusted. Belt on sheave. Sheave not binding, damaged or worn. Sheave angle matching belt angle.	Tighten cap screw. Replace key. Repair and adjust as needed. Install belt. Replace sheave. Check jack sheave and PTO sheave.
2. Primary drive belt.	Correct belt installed. Not damaged, worn, or broken. Not turned over.	Replace belt.
3. Jack sheave.	Belt on sheave. Sheave not binding, damaged or worn. Sheave angle matching belt angle. Nut at correct torque.	Install belt. Replace sheave and bearing. Check jack sheave and PTO sheave. Tighten nut to specifications.
4. Primary belt tension spring and rod	Not damaged, worn or weak. Belt tensioning handle in tension position.	Replace spring or rod. Move to tension position.
5. Jack sheave arm.	Not binding, damaged or worn.	Replace jack sheave arm.
6. Secondary drive belt.	Correct belt installed Not damaged, worn or broken. Not turned over.	Replace belt.
7. Secondary drive belt tensioning spring.	Not damaged, worn or weak.	Replace spring.
8. Secondary drive belt idler and pivot arm.	Not binding, damaged or worn. Belt in place. Pivot arm not bent, locating idler parallel to belt.	Replace idler. Install belt. Replace pivot arm.
9. Fixed idler—44 and 48-inch only.	Not binding, damaged or worn. Belt in place.	Replace idler. Install belt.
10. Spindle sheave.	Tight on spindle and key in place. Not damaged or bent. Running straight. Belt on sheave. Sheave angle matches belt angle.	Tighten nut and install key as needed. Repair, or replace as needed. Install belt. Replace sheave. Install belt.
11. Spindle and housing.	Bearings not failed, full of grease. Blade tight on spindle.	Replace as needed, fill with grease. Tighten hardware to specifications.

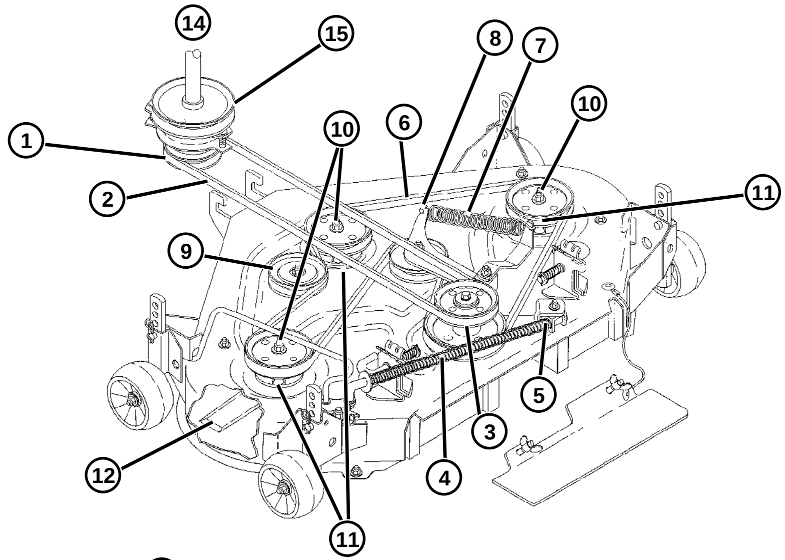
MOWER DRIVE CHECKS

38"



⑨ **Not used on 38" Model**

44"



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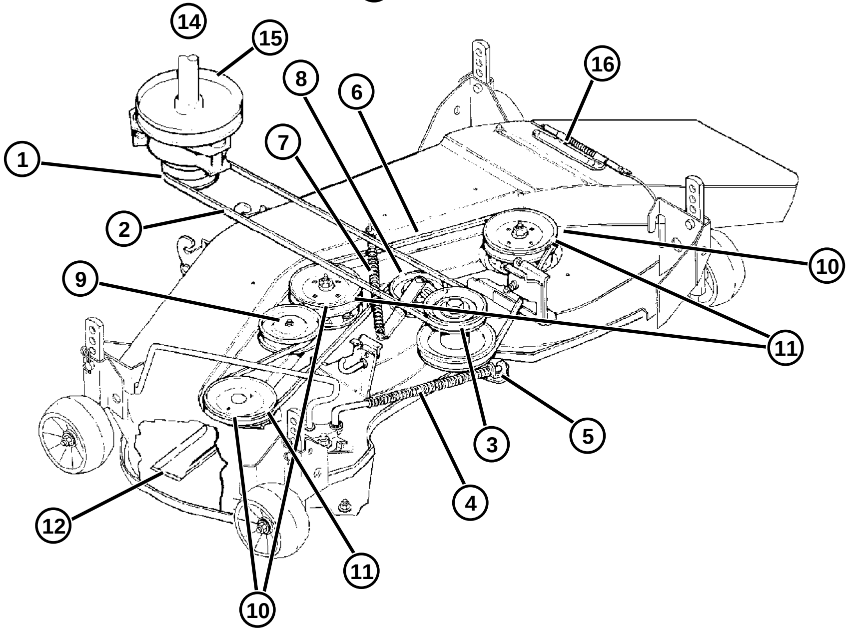

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MOWER DRIVE CHECKS, continued

Test Conditions:

- Machine parked on a level surface.
- PTO disengaged.
- Key switch in STOP position.

Test/Check Point	Normal	If Not Normal
12. Blade.	Not bent, worn or damaged. Sharp and balanced. Level side-to-side. Correctly adjusted front-to-rear.	Replace blade and tighten to specifications. Sharpen and balance. Adjust. Adjust.
13. Mower deck lift linkage.	Mounting hardware tight, not worn or binding.	Tighten or replace as needed.
14. Engine.	Check that engine is running at correct rpm.	Adjust engine fast idle and governor. Check engine adjustments and condition. Inform operator that engine should be running at fast idle when mowing.

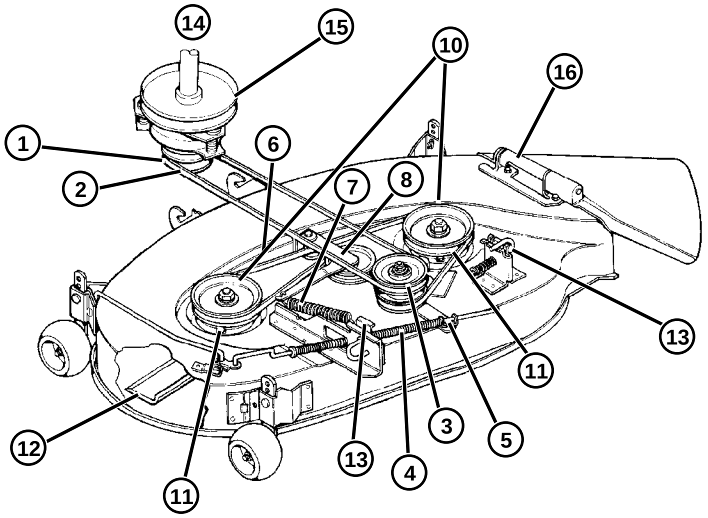
Test Conditions:

- Machine parked on a clean, level surface, away from people and objects.
- Engine at operating temperature.
- Engine running at FAST idle.
- Perform PTO clutch break-in procedure.

Test/Check Point	Normal	If Not Normal
15. PTO clutch and drive sheave.	Functioning properly.	Repair or replace components.
16. Mower deck.	Operating smoothly without any unusual noises and stops quickly.	Slowly reduce rpm and listen for problem area—stop PTO and engine, repair or replace faulty components.

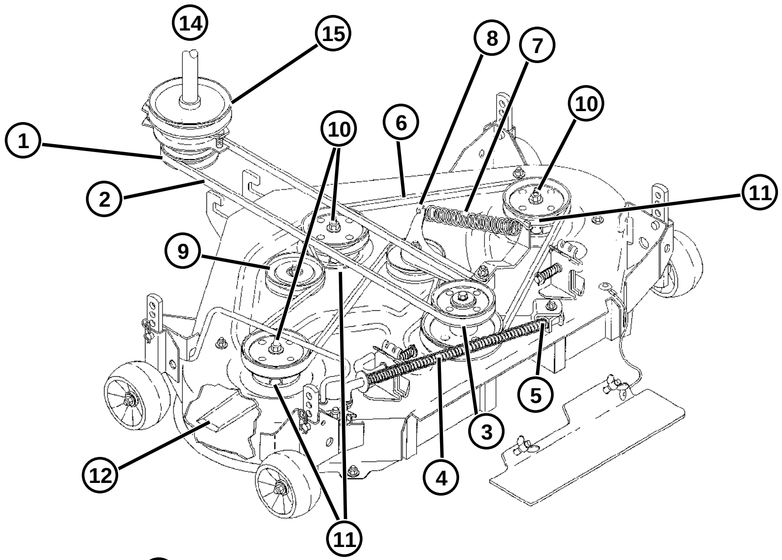
MOWER DRIVE CHECKS

38"



⑨ Not used
on 38" Model

44"



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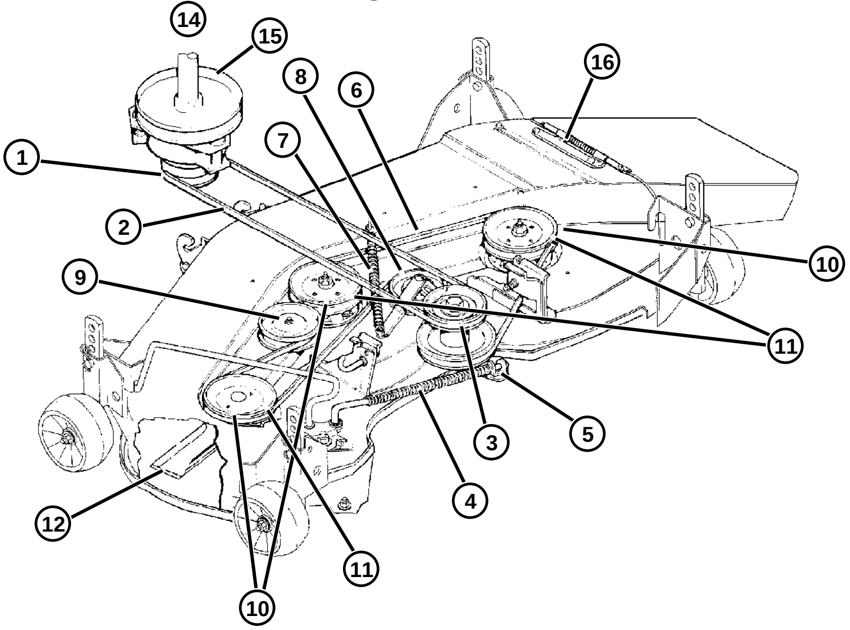


M79796

MOWER DECK WILL NOT RUN

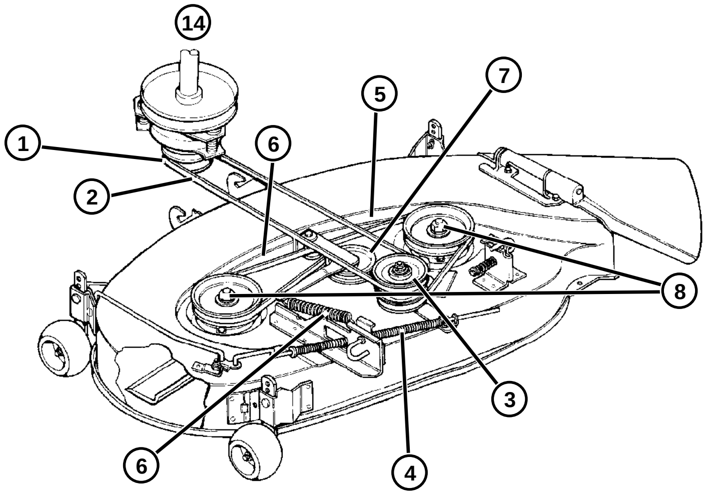
Test Conditions:

- Machine parked on a clean, level surface.
- PTO disengaged.
- Key switch in STOP position.

Test/Check Point	Normal	If Not Normal
1. PTO clutch and drive sheave.	PTO circuit operating properly. Tight on crankshaft and key not damaged or missing. Air gap properly adjusted. Belt on sheave. Sheave not binding, damaged or worn.	Test PTO circuit. (See PTO CIRCUIT DIAGNOSIS on pages 5-68 [LX172/LX176/LX186], 5-10 [LX178/LX188] or 5-158 [LX173]) Tighten cap screw. Replace key. Repair and adjust as needed. Install belt. Replace sheave.
2. Primary drive belt.	Correct belt installed. Not damaged, worn, or broken. Not turned over.	Replace with correct belt.
3. Jack sheave.	Belt on sheave. Sheave not bent or locked.	Install belt. Replace jack sheave.
4. Primary belt tension spring and rod.	Not damaged, worn, or weak. Belt tensioning handle in tension position.	Replace spring or rod. Move to tension position.
5. Secondary drive belt.	Correct belt installed. Not damaged, worn, or broken. Not turned over.	Replace with correct belt.
6. Secondary drive belt tensioning spring.	Not damaged, worn, or weak.	Replace spring.
7. Secondary drive belt idler.	Belt in place. Idler not bent or locked up.	Install belt. Replace idler.
8. Spindles and drive sheaves.	Belt in place. Spindles and drive sheaves not bent or locked up.	Install correct belt. Replace spindles and drive sheaves.

MOWER DECK WILL NOT RUN

38"



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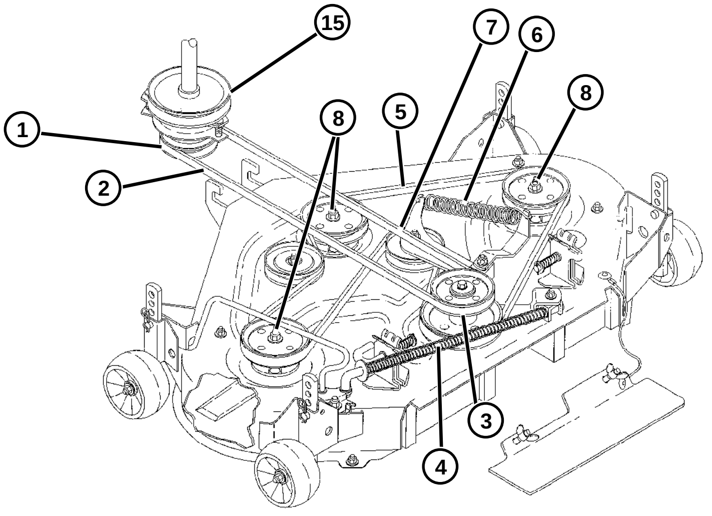

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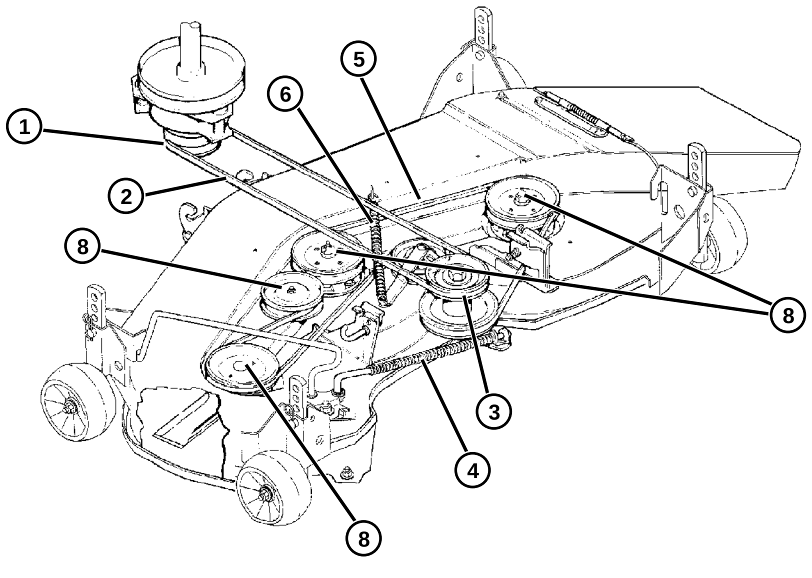

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MOWER DECK VIBRATES

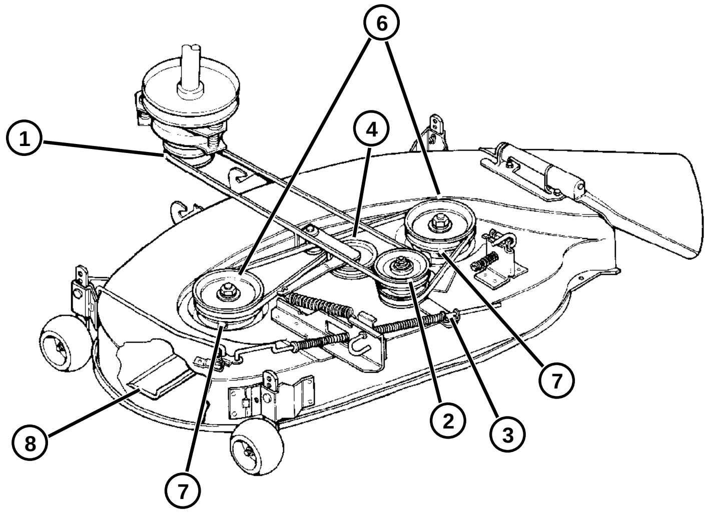
Test Conditions:

- Machine parked on a level surface.
- PTO disengaged.
- Key switch in STOP position.

Test/Check Point	Normal	If Not Normal
1. PTO clutch and drive sheave.	Sheave angle matching belt angle.	Check jack sheave and PTO sheave.
2. Jack sheave.	Sheave not binding, damaged or worn. Sheave angle matching belt angle. Nut at correct torque.	Replace sheave and bearing. Check jack sheave and PTO sheave. Tighten nut to specifications.
3. Jack sheave arm.	Not damaged, binding or worn.	Replace jack sheave arm.
4. Secondary drive belt idler and pivot arm.	Not damaged, binding or worn. Pivot arm not bent, locating idler parallel to belt.	Replace idler. Replace pivot arm.
5. Fixed idler—44- and 48-inch only.	Not binding, damaged or worn.	Replace idler.
6. Spindle sheave.	Tight on spindle and key in place. Not damaged or bent. Running straight. Sheave angle matches belt angle.	Tighten nut and install key as needed. Repair or replace as needed. Replace sheave.
7. Spindle and housing.	Bearings not failed. Blade tight on spindle.	Replace as needed. Tighten hardware to specifications.
8. Blade.	Not bent, worn or damaged.	Replace blade. Balance blade.

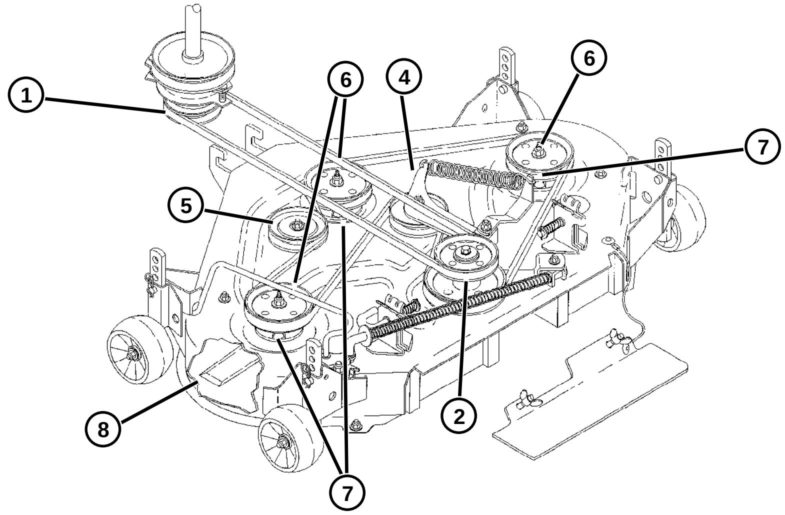
MOWER DECK VIBRATES

38"



⑤ **Not used on 38" Model**

44"



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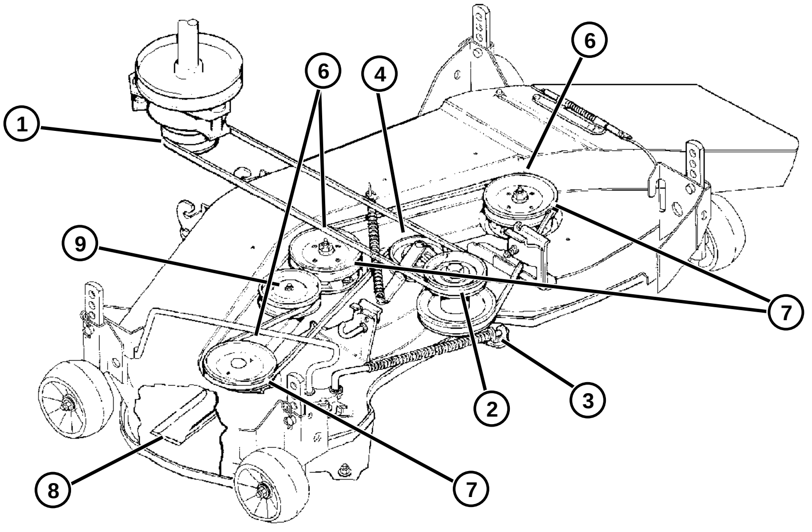


M79796

CUTS UNEVENLY

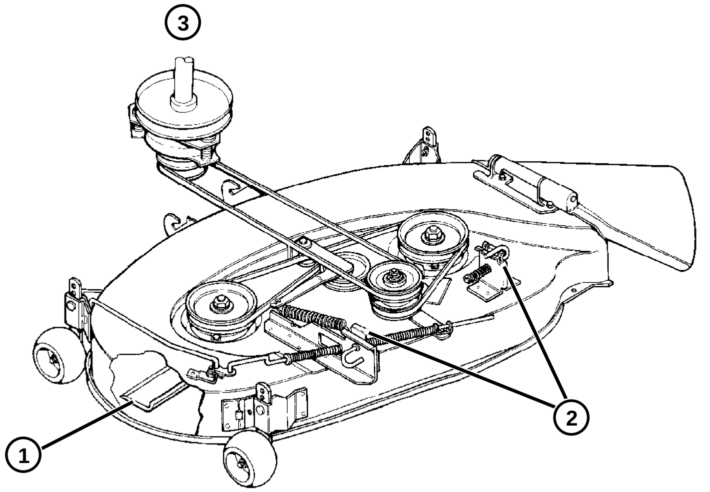
Test Conditions:

- Machine parked on a level surface.
- PTO disengaged.
- Key switch in STOP position.

Test/Check Point	Normal	If Not Normal
1. Blade.	Sharp. Level side-to-side. Correctly adjusted front-to-back.	Sharpen. Adjust. Adjust.
2. Mower deck lift linkage.	Mounting hardware tight, not worn.	Tighten or replace as needed.
3. Engine.	Check that engine is running at correct rpm.	Adjust engine fast idle and governor. Check engine adjustments and condition. Inform operator that engine should be running at fast idle when mowing.

CUTS UNEVENLY

38"



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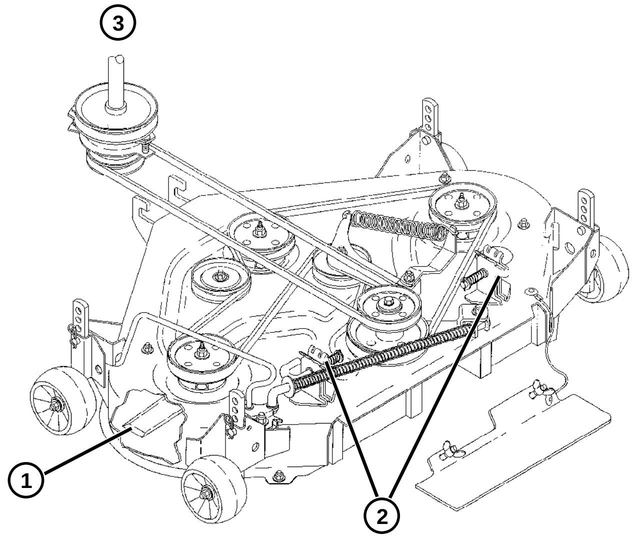

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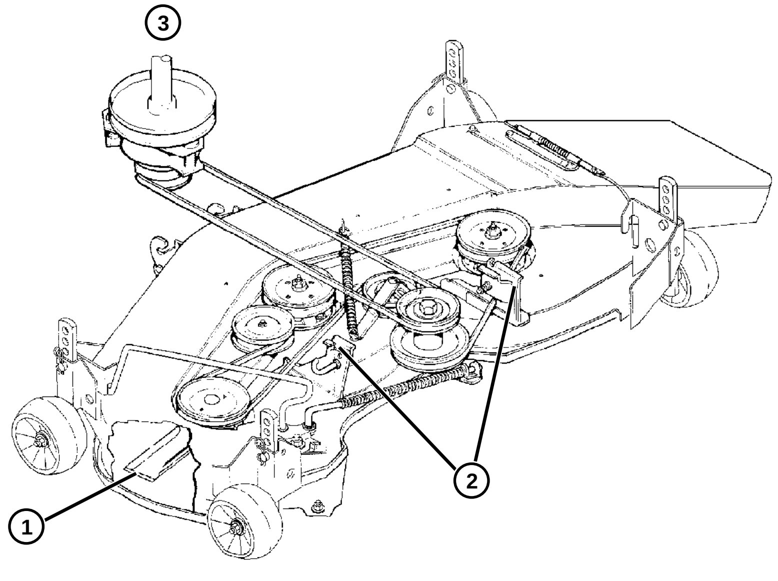

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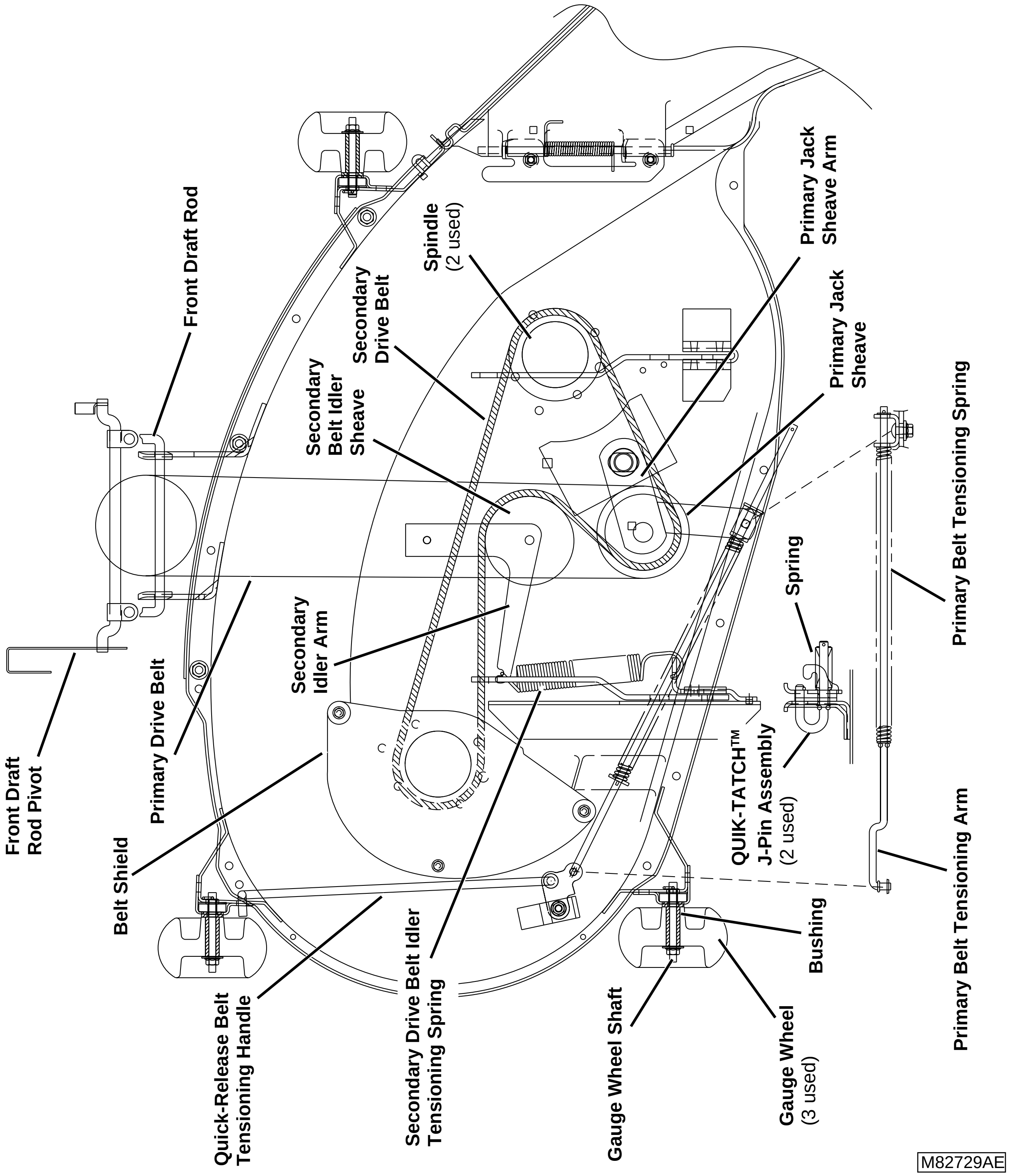
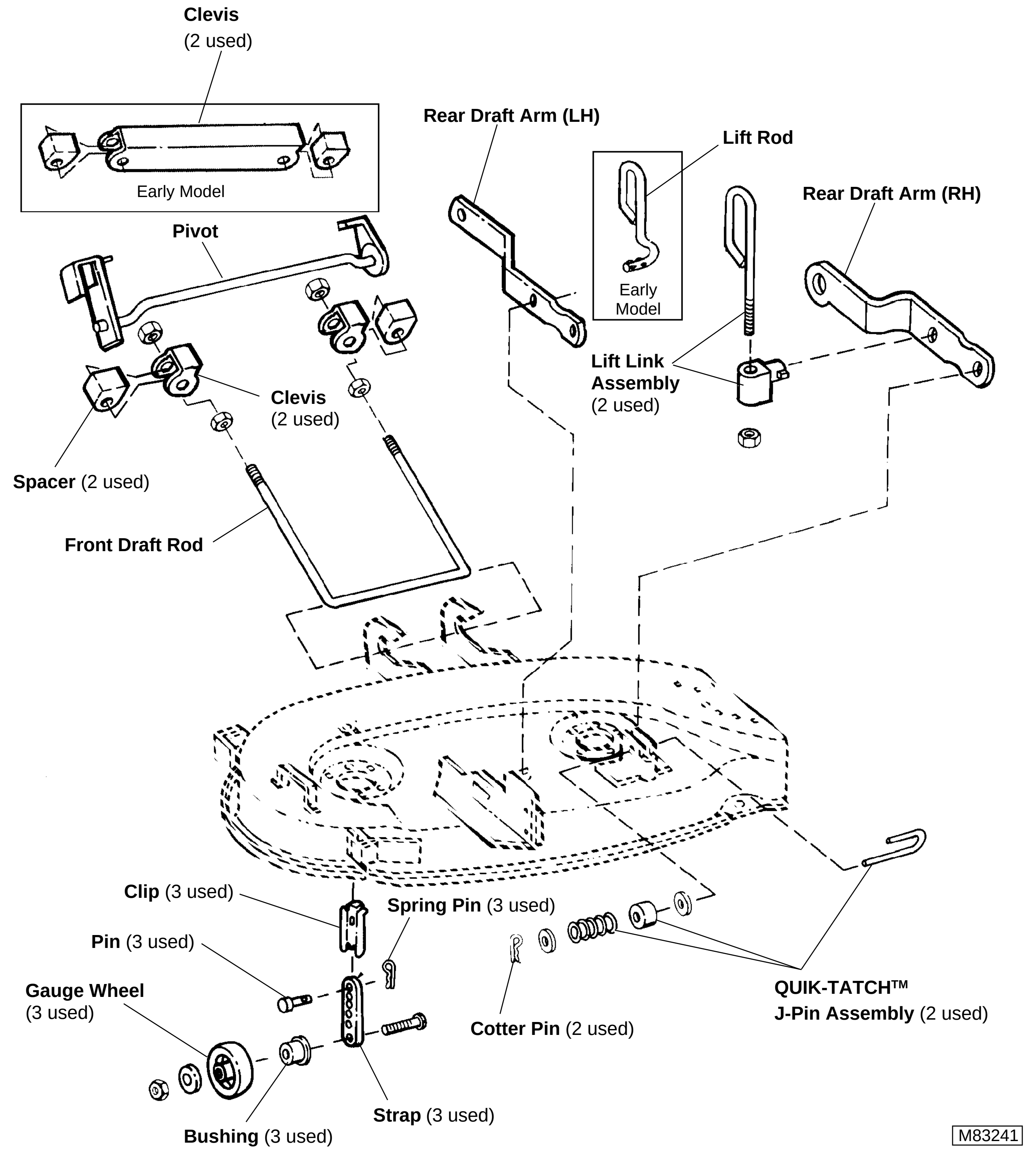
REPAIR—38-INCH MOWER DECK

OVERALL VIEW



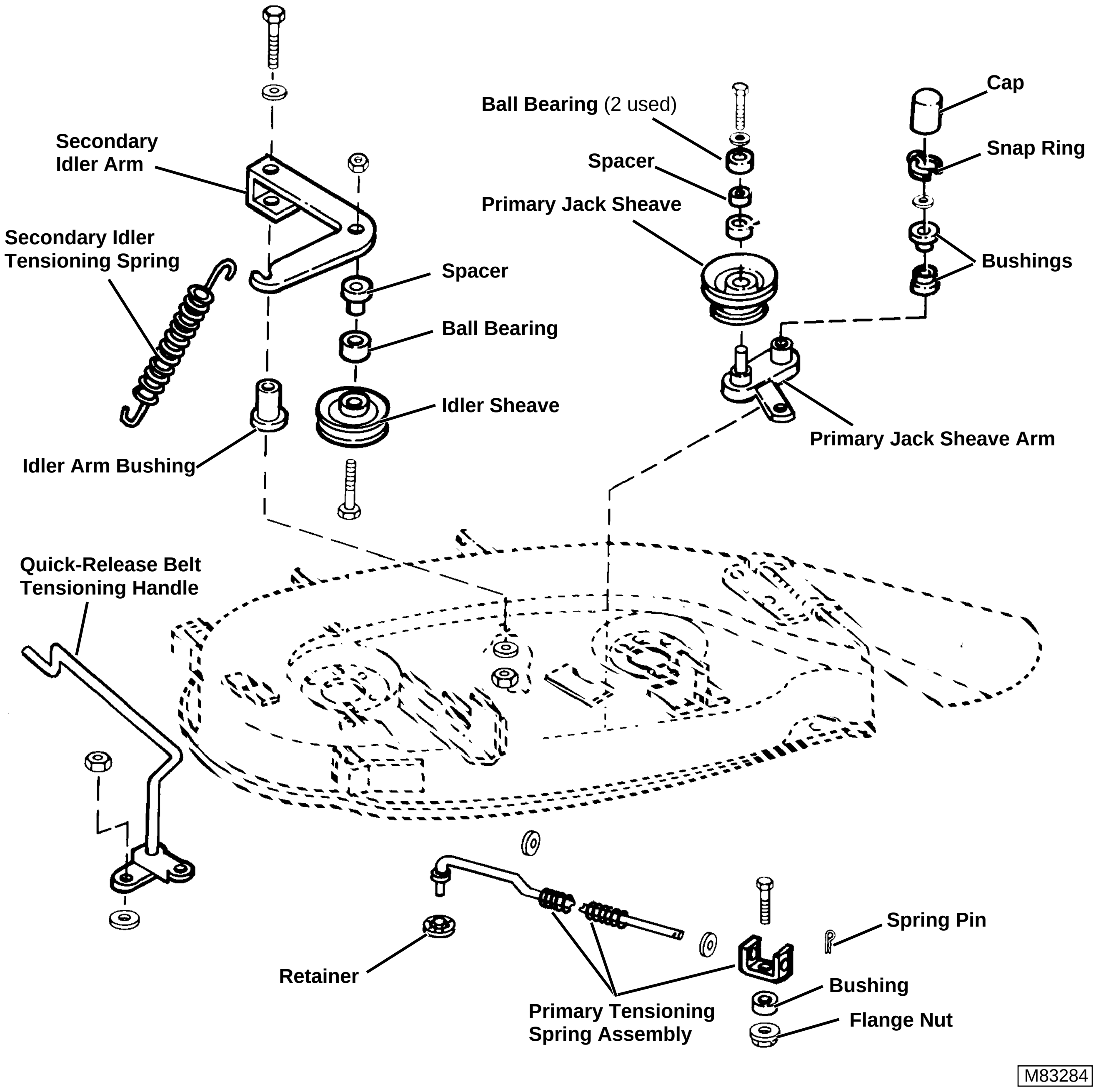
DRAFT ARMS AND GAUGE WHEELS



NOTE: On early models only, one lift link assembly is used. Lift rod is connected to opposite draft arm.

- Check mower deck side-to-side and front-to-rear adjustment after assembly. (See MOWER LEVEL SIDE-TO-SIDE adjustment on page 10-13 and MOWER LEVEL FRONT-TO-REAR adjustment on page10-14.)

IDLERS AND SHEAVES



- Inspect all parts for wear or damage. Replace as necessary.

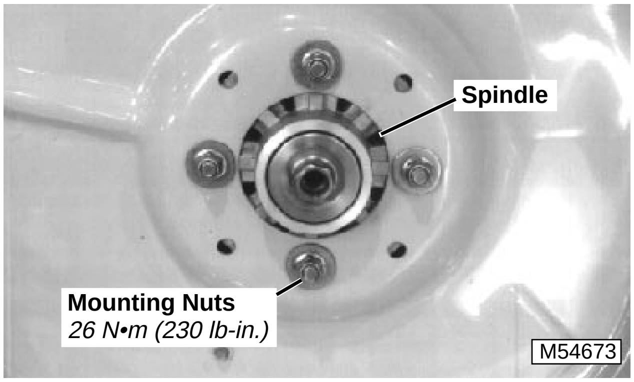
NOTE: Bearings are press-fit in primary jack sheave. Remove bearings only if replacement is necessary.

- Inspect jack sheave bearings for wear or damage. Replace if necessary:
  - Remove one jack sheave bearing from either end using a punch.
  - Remove jack sheave spacer and remaining bearing using a driver set.
  - Install new bearings tight against shoulders of primary jack sheave using a press.

SPINDLES

Removal/Installation

1. Remove mower blade. (See MOWER BLADES—Removal/Installation on page 10-20.)
2. Remove mower drive belt. (See MOWER DRIVE BELT—Removal/Installation.)

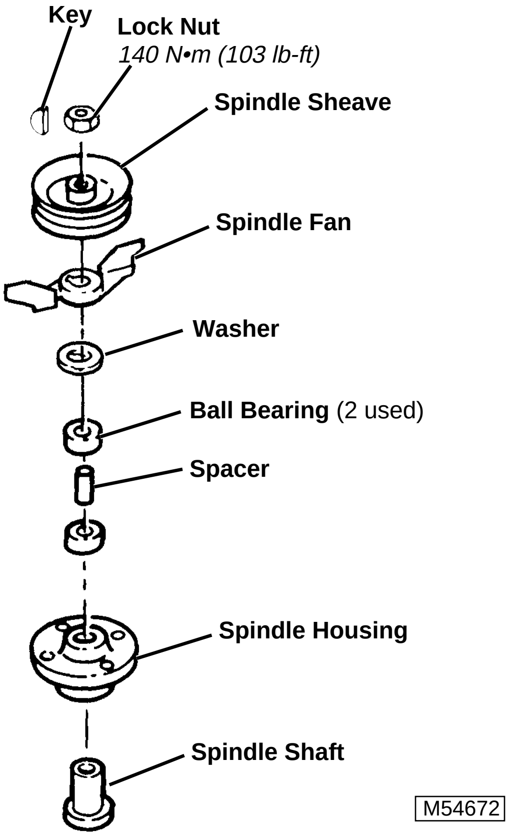


3. Remove four nuts, washers and spindle.
4. Make repairs as necessary. (See Disassembly/Assembly procedures.)

Installation is done in the reverse order of removal.

- Tighten spindle mounting nuts to **26 N•m (230 lb-in.)**.

Disassembly/Assembly



1. Remove key, lock nut, sheave, fan and washer.

NOTE: Spindle shaft and bearings are press-fit in housing. Remove bearings only if replacement is necessary.

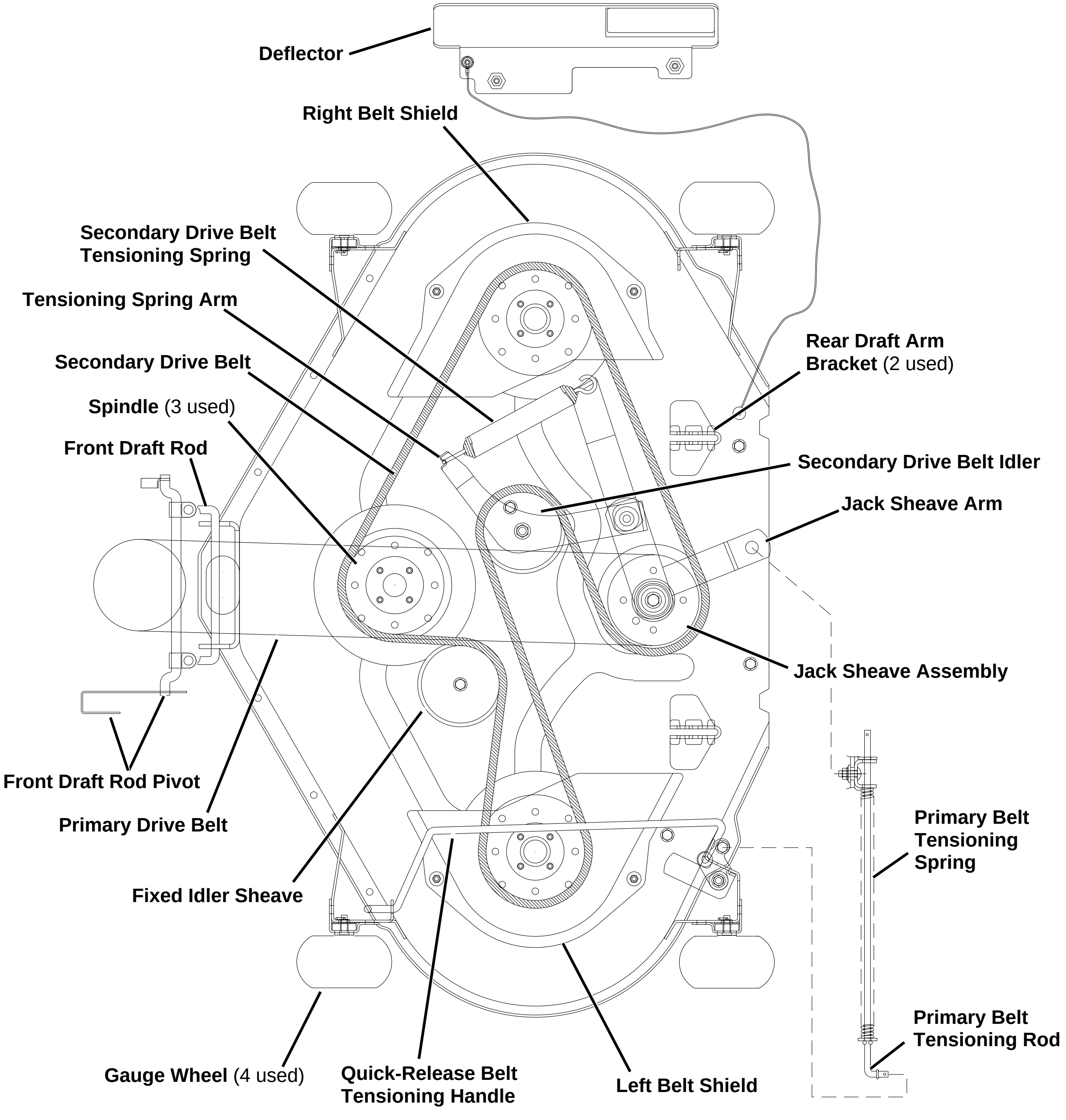
2. Remove spindle shaft using a driver set and press.
3. Replace bearings and spacer, if necessary, using a driver set and press.
4. Inspect all parts for wear or damage. Replace parts as necessary.

Installation is done in the reverse order of removal.

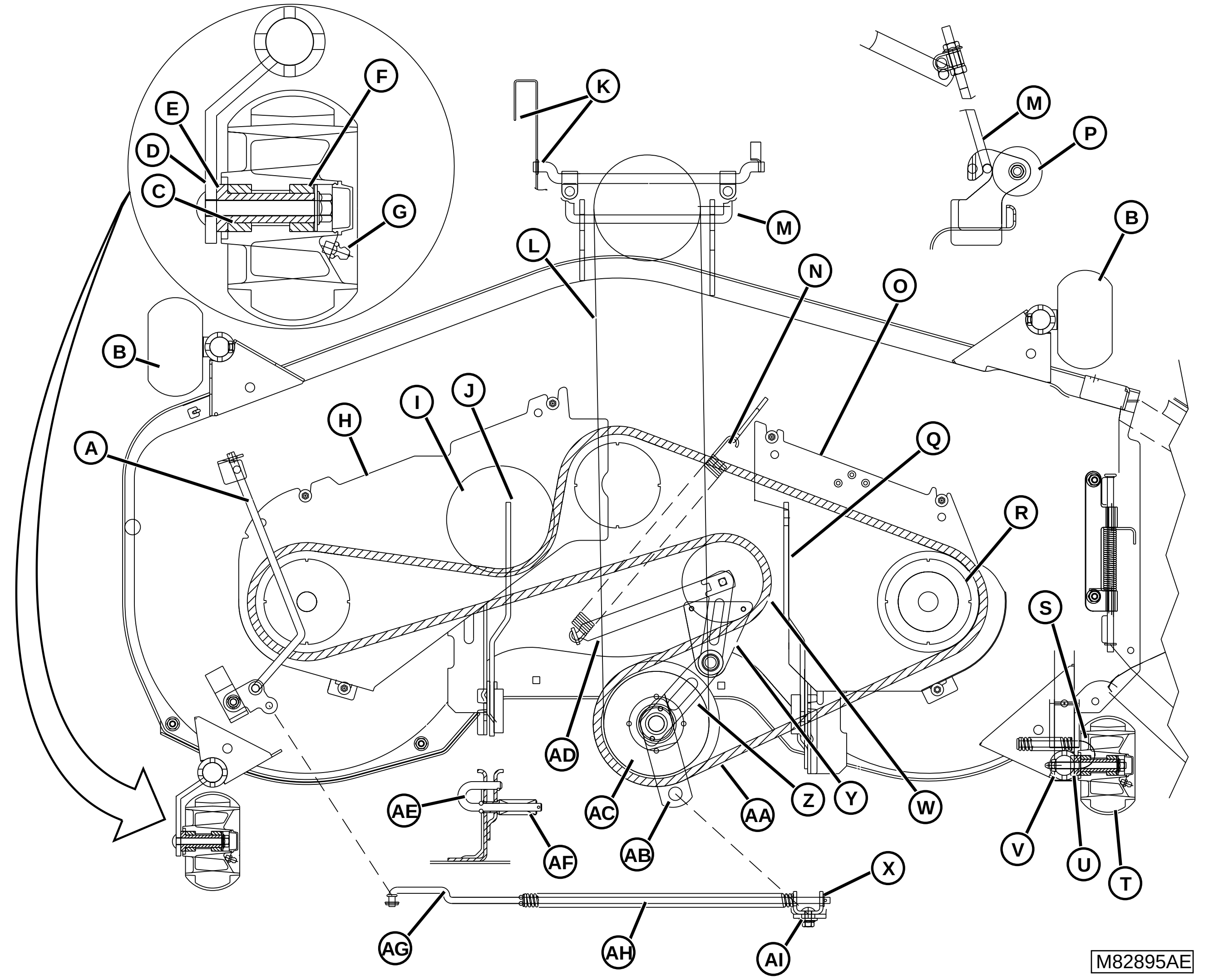
- Apply multipurpose grease to lubrication fitting in spindle housing.
- Tighten spindle sheave lock nut to **140 N•m (103 lb-ft)**.

REPAIR—44-INCH AND 48-INCH MOWER DECKS

OVERALL VIEW 44-INCH MOWER DECK

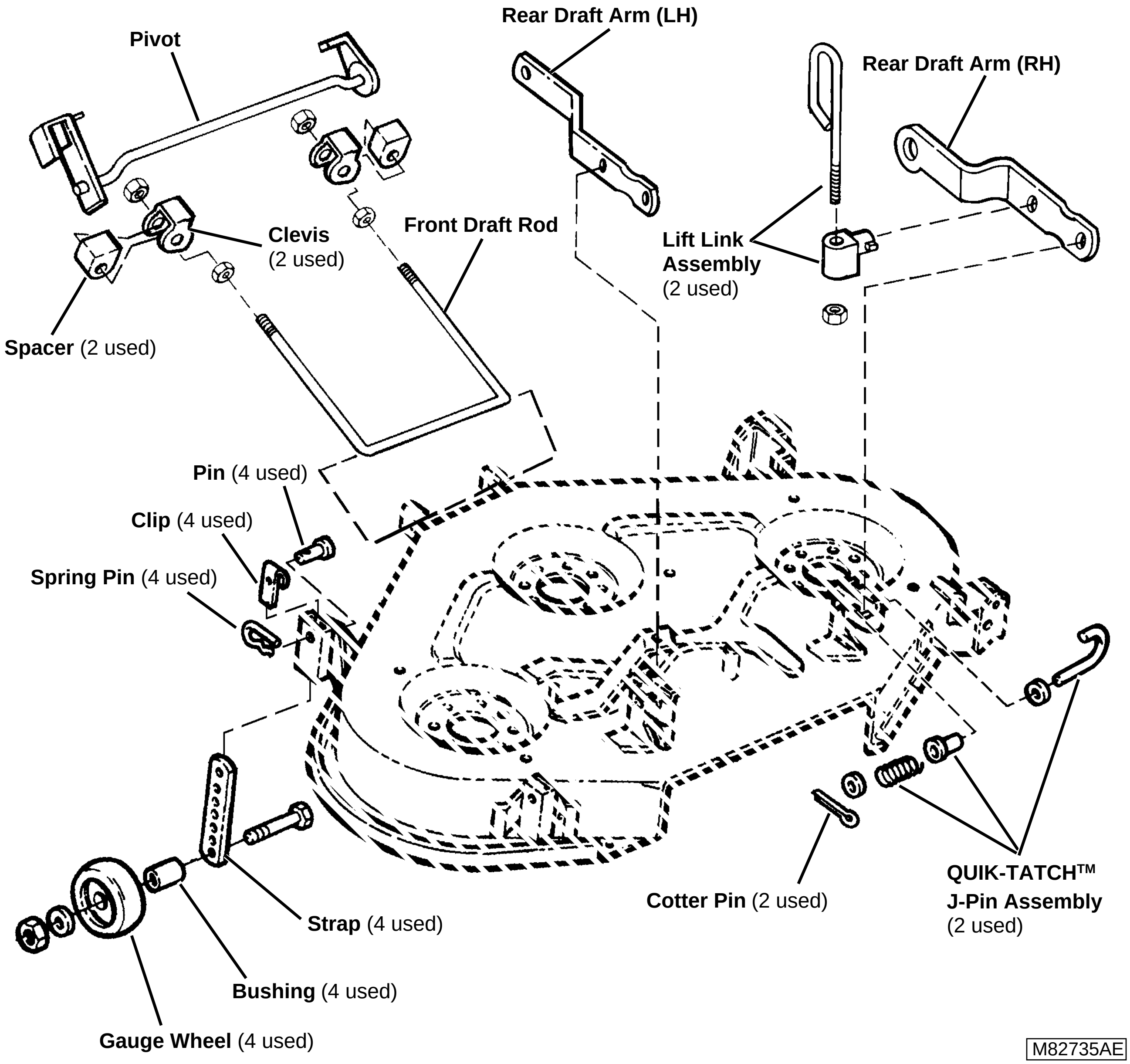


OVERALL VIEW 48-INCH MOWER DECK



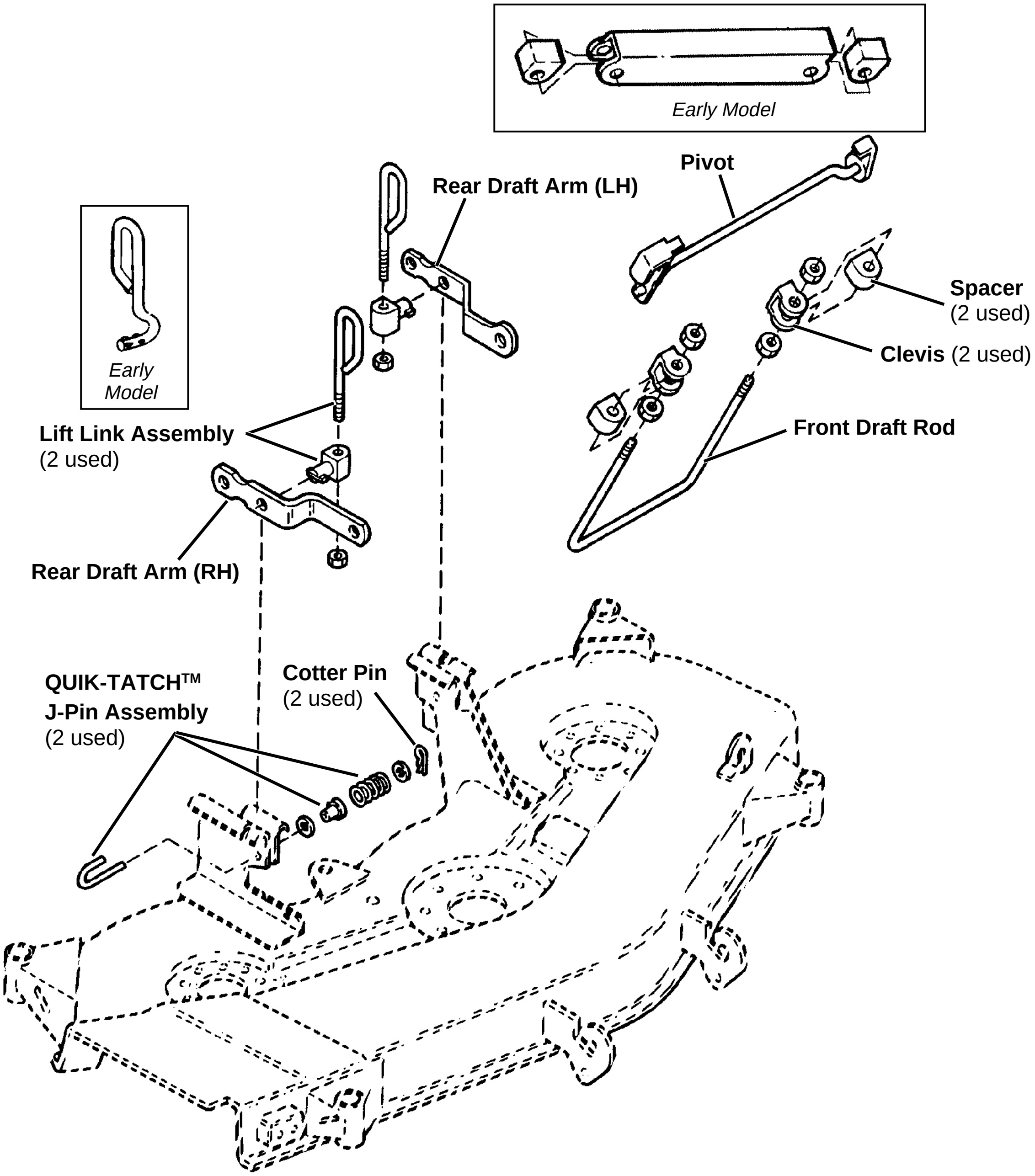
A—Quick Release Belt Tensioning Handle
B—Front Gauge Wheel (2 used)
C—Seal
D—Gauge Wheel Arm
E—Bushing
F—Bushing
G—Grease Fitting
H—Left Belt Shield
I—Fixed Idler Sheave
J—Left Rear Draft Arm
K—Front Draft Rod Pivot
L—Primary Drive Belt
M—Front Draft Rod
N—Secondary Drive Belt Idler Tensioning Spring
O—Right Belt Shield
P—Front Rollers
Q—Right Rear Draft Arm
R—Spindle (3 used)
S—QUIK-TATCH™ J-Pin Assembly
T—Rear Gauge Wheel (2 used)
U—Bushing (3 used)
V—Gauge Wheel Shaft (Bolt)
W—Secondary Drive Belt Idler Sheave
X—Clevis
Y—Secondary Idler Sheave Arm
Z—Jack Sheave Arm
AA—Secondary Drive Belt
AB—Jack Sheave Tensioning Arm
AC—Jack Sheave
AD—Tensioning Spring Arm
AE—QUIK-TATCH™ J-Pin Assembly
AF—Spring
AG—Primary Belt Tensioning Rod
AH—Primary Belt Tensioning Spring
AI—Bushing

DRAFT ARMS AND GAUGE WHEELS 44-INCH MOWER DECK



- Inspect all parts for wear or damage. Replace as necessary.
- Check mower deck side-to-side and front-to-rear adjustment after assembly.

DRAFT ARMS AND GAUGE WHEELS 48-INCH MOWER DECK



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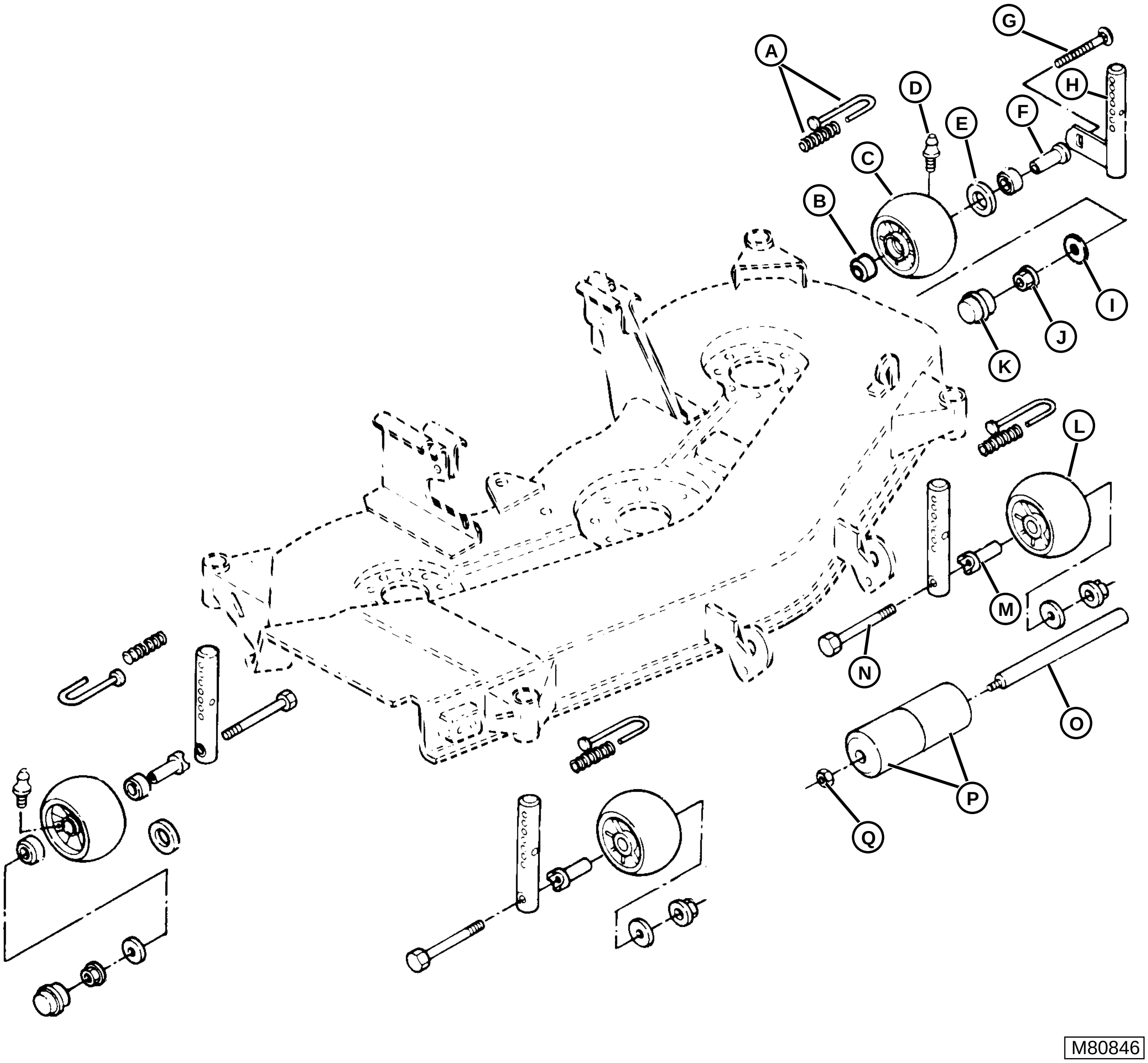
- Check mower deck side-to-side and front-to-rear adjustment after assembly.

DRAFT ARMS AND GAUGE WHEELS 48-INCH MOWER DECK



A—QUIK-TATCH™ J-Pin Assembly (4 used)
B—Bushing (4 used)
C—Rear Gauge Wheel (2 used)
D—Grease Fitting (2 used)
E—Seal (2 used)
F—Bushing
G—Carriage Bolt
H—Gauge Wheel Arm
I—Washer (4 used)
J—Flange Nut (4 used)
K—Cap
L—Front Gauge Wheel (2 used)
M—Bushing (3 used)
N—Gauge Wheel Shaft (3 used)
O—Roller Shaft
P—Front Rollers
Q—Nut

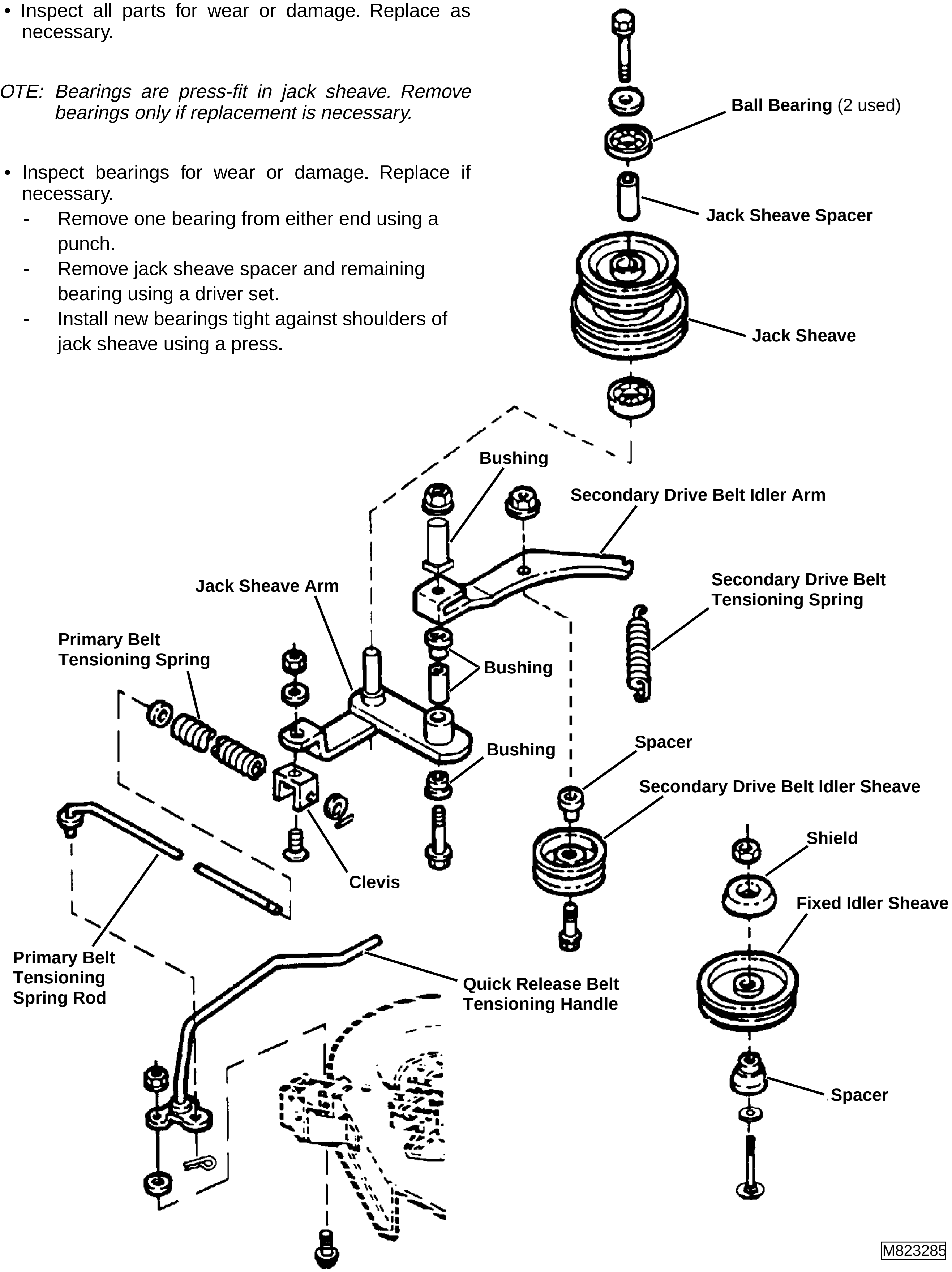
- Inspect all parts for wear or damage. Replace parts if necessary.
- Apply multipurpose grease to grease fittings (D).
- Tighten roller shaft nut (Q) to **30 N•m (22 lb-ft)**.

IDLERS AND SHEAVES 44-INCH MOWER DECK

- Inspect all parts for wear or damage. Replace as necessary.

NOTE: Bearings are press-fit in jack sheave. Remove bearings only if replacement is necessary.

- Inspect bearings for wear or damage. Replace if necessary.
  - Remove one bearing from either end using a punch.
  - Remove jack sheave spacer and remaining bearing using a driver set.
  - Install new bearings tight against shoulders of jack sheave using a press.

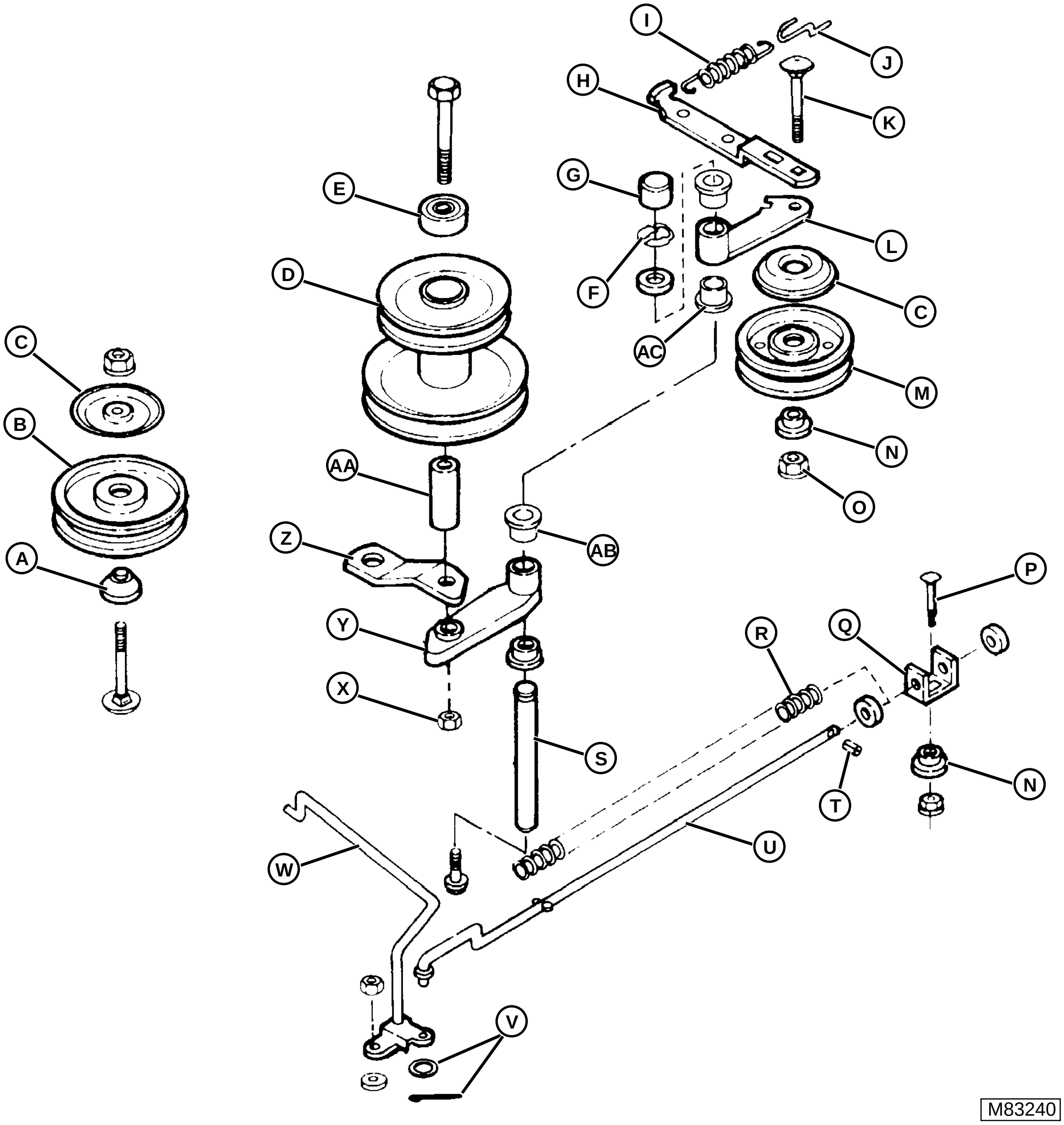


IDLERS AND SHEAVES 48-INCH MOWER DECK

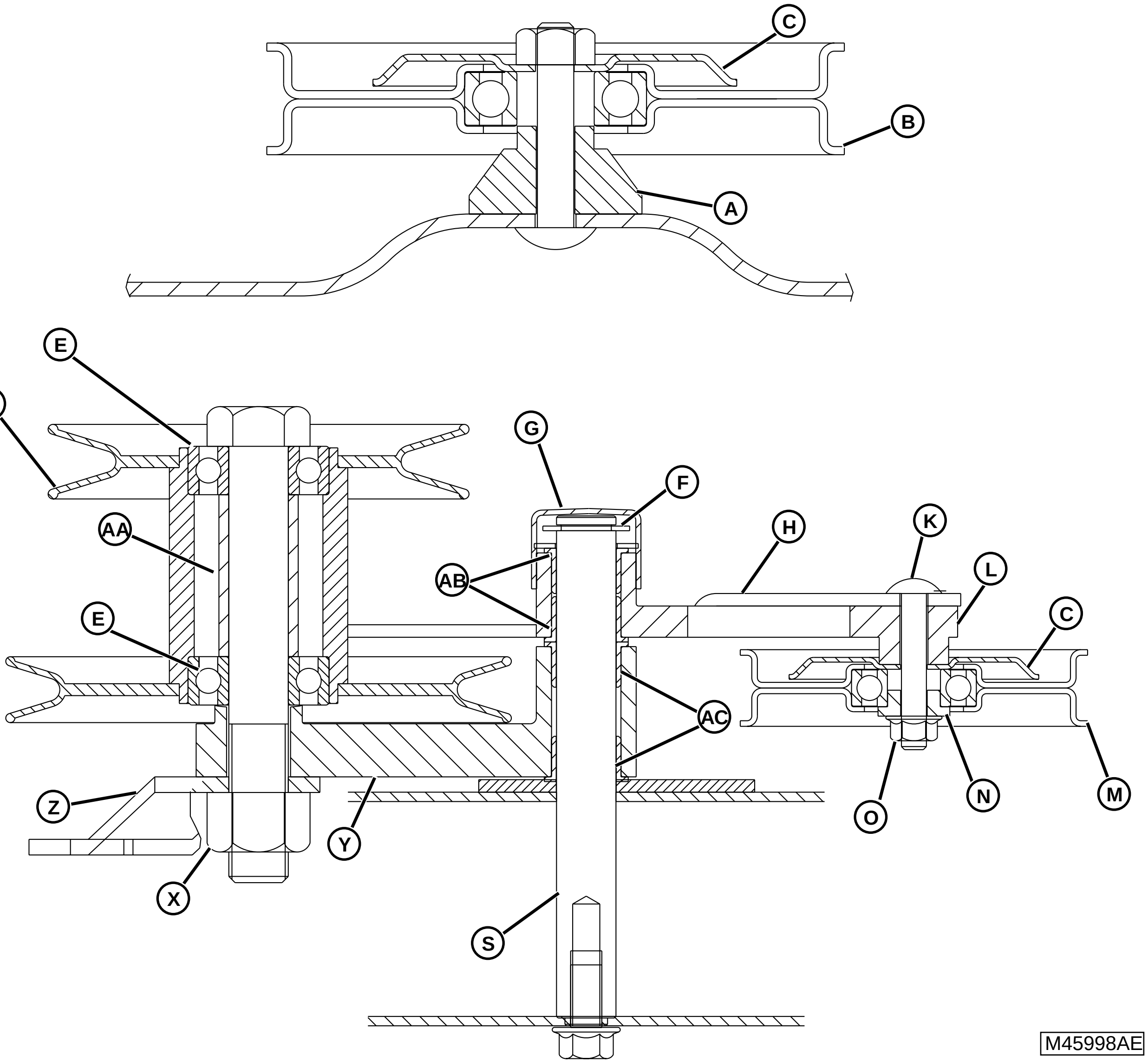
- Inspect all parts for wear or damage. Replace parts if necessary.

NOTE: Bearings (E) are press-fit in jack sheave (D). Remove bearings only if replacement is necessary.

- Inspect bearings (E) for wear or damage. Replace if necessary:
  - Remove one bearing (E) from either end, using a punch.
  - Remove spacer (AA) and remaining bearing using a driver set.
  - Install new bearings tight against shoulders of jack sheave (D) using a press.
- Tighten jack sheave nut (X) to **136 N•m (100 lb-ft)**.
- Tighten tensioning idler sheave nut (O) to **27 N•m (20 lb-ft)**.



IDLERS AND SHEAVES 48-INCH MOWER DECK

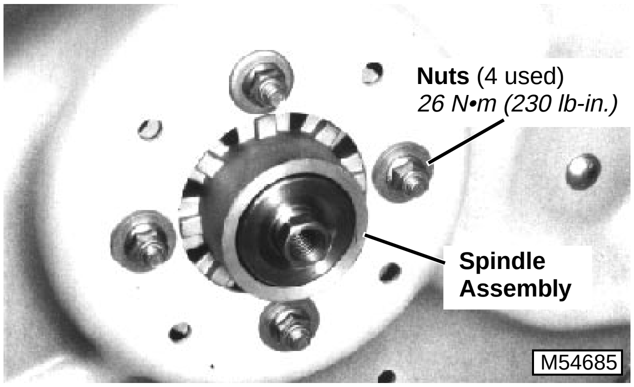


A—Spacer
B—Fixed Idler Sheave
C—Shield
D—Jack Sheave
E—Ball Bearing (2 used)
F—Snap Ring
G—Plug
H—Tensioning Spring Arm (Secondary)
I—Tensioning Idler Sheave Spring
J—Hook
K—Carriage Bolt
L—Tensioning Idler Sheave Arm (Secondary)
M—Tensioning Idler Sheave
N—Bushing
O—Nut
P—Carriage Bolt
Q—Clevis
R—Primary Belt Tensioning Spring
S—Shaft
T—Spring Pin
U—Primary Belt Tensioning Rod
V—Cotter Pin and Washer
W—Quick Release Belt Tensioning Handle
X—Nut
Y—Jack Sheave Arm
Z—Jack Sheave Tensioning Arm
AA—Spacer
AB—Bushing (4 used)

SPINDLES

Removal/Installation

1. Remove mower blade(s).
2. Remove mower drive belt.



3. Remove four nuts and washers and spindle assembly.
4. Make repairs as necessary. (See Disassembly/ Inspection procedure.)

Installation is done in the reverse order of removal.

- Tighten spindle mounting nuts to **26 N•m (230 lb-in.).**

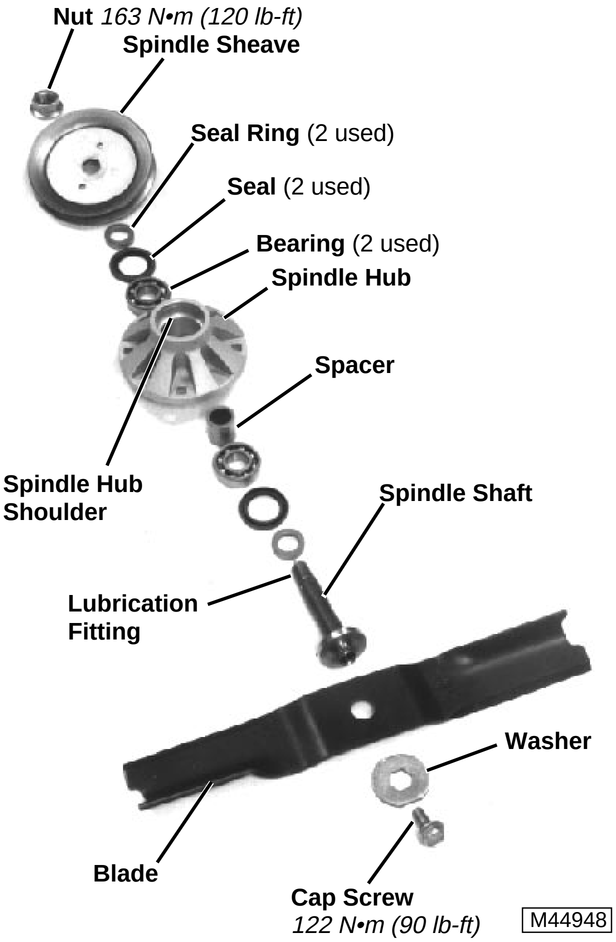
Disassembly/Inspection

> ⚠ **CAUTION**
>
> **Wear gloves or wrap blade with rag to prevent personal injury.**

IMPORTANT: Do not install hexagon end of spindle shaft in a vise to remove spindle sheave nut. The hexagon end of the spindle shaft will be damaged resulting in improper blade operation.

NOTE: *Early model 44-inch mower decks were available in either 2-blade mulching or single blade (with spacer) rear discharge configurations. Late model 44-inch decks are 2-blade rear discharge mulching. The 48-inch deck is single blade without spacer.*

1. Install blade(s) or spacer and blade, washer, and cap screw on spindle shaft. On late model decks, make sure that the concave side of the washer faces the blade. On early model decks, make sure that hole in washer is aligned with hexagon portion of spindle. If only the nut or spindle sheave need to be replaced, and the spindle is still in the deck, use a block of wood to prevent the blade from turning. If spindle is not in the deck, put blade in a soft jaw vise. Tighten cap screw to **122 N•m (90 lb-ft)**.



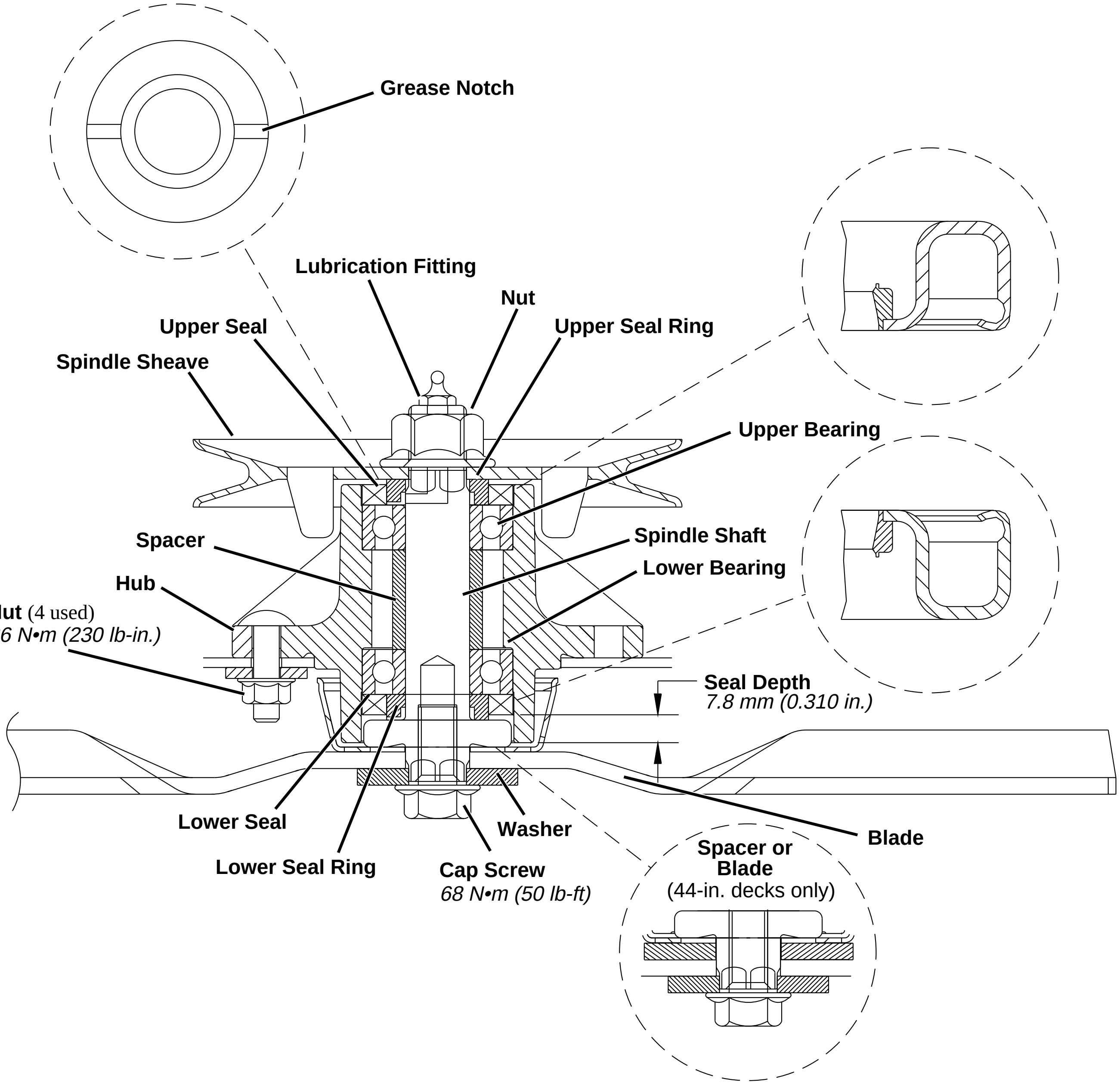
48-Inch Mower Deck Shown

2. Hold the blade with a vise or a block of wood. Remove nut, spindle sheave, and lubrication fitting.
3. Remove cap screw, washer and blade(s) or spacer and blade.
4. Pull spindle shaft out of spindle hub.
5. Remove seal rings, noting location of notched side.

NOTE: *Remove bearings only if replacement is necessary.*

6. Bearings are seated against hub shoulder and cannot be removed with a press. Remove seals and bearings using a punch.
7. Remove spacer.
8. Inspect all parts for wear or damage. Replace parts as necessary.

Cross Section



48-Inch Mower Deck Shown

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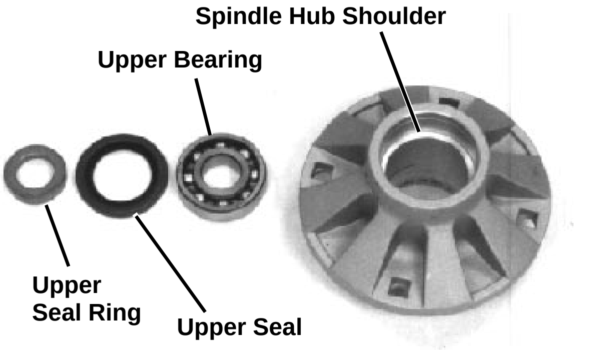
NOTE: Upper seal ring is installed with grease notch facing toward upper bearing.

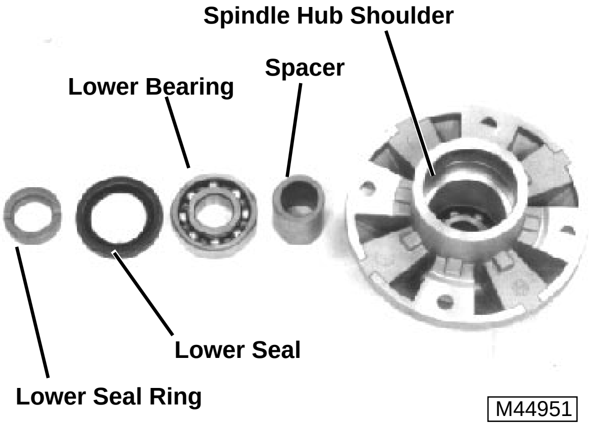
Early model 44-inch mower decks were available in either 2-blade mulching or single blade (with spacer) rear discharge configurations. Late model 44-inch decks are 2-blade rear discharge mulching. The 48-inch deck is single blade without spacer.

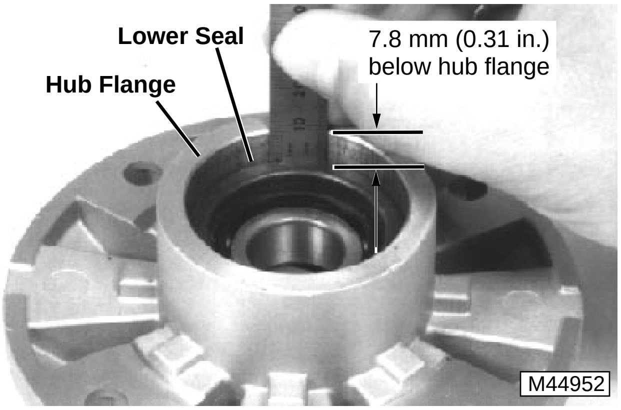
Assembly

NOTE: Upper seal ring is installed with grease notch facing toward upper bearing.



1. Install upper bearing tight against spindle hub shoulder using a 1-13/16 in. disk and press.
2. Install upper seal with lip toward bearing, tight against bearing using a 1-13/16 in. disk and press.
3. Install upper seal ring, with grease notch toward bearing, inside seal lip.

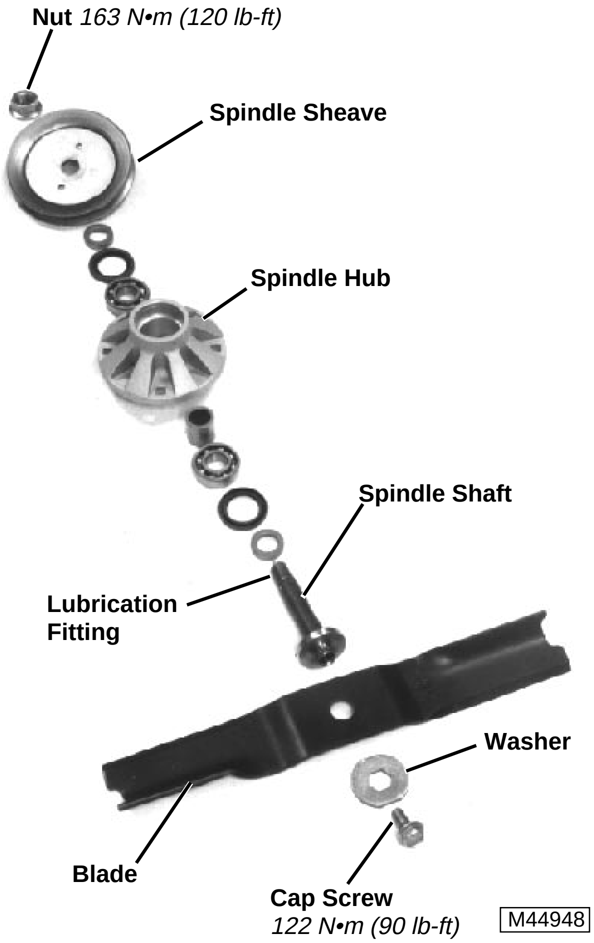




4. Install spacer.

IMPORTANT: Do not press lower bearing tight against hub shoulder. The bearing and seal must be installed to a specific dimension for proper sealing of spindle.

5. Install lower bearing in hub using a 1-13/16 in. disk and press, just enough so the lower seal can be installed.
6. Install lower seal with lip toward bearing using a 1-13/16 in. disk and a press.
7. Install lower seal ring, with grease notch away from bearing, inside seal lip.



8. Install spindle shaft.

IMPORTANT: Do not install hexagon end of spindle shaft in a vise to install spindle sheave nut. The hexagon end of the spindle shaft will be damaged resulting in improper blade operation.

9. Install blade(s) or spacer and blade, washer, and cap screw on spindle shaft. On late model decks, make sure that the concave side of washer faces the blade. On early model decks, make sure that the hole in washer is aligned with hexagon portion of spindle.

IMPORTANT: Make sure the hexagon shaped hole in spindle sheave is aligned with the hexagon portion of the spindle shaft.

10. Hold the blade with a soft-jaw vise or if spindle is in the mower deck, with a block of wood. Install spindle sheave, nut, and lubrication fitting. Tighten nut to **163 N•m (120 lb-ft)**.
11. Remove cap screw, washer, blade(s) or spacer and blade.
12. Lubricate spindle with multipurpose grease at lubrication fitting.

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CONTENTS

TORQUE SPECIFICATIONS

Pivot Anchor Cap Screw Torque	25 N•m (228 lb-in.)
Tie Rod Lock Nut Torque	23 N•m (200 lb-in.)
Drag Link Lock Nut Torque	37 N•m (27 lb-ft)
Rear Wheel Cap Screw Torque	88 N•m (65 lb-ft)

SERVICE PARTS KITS

The following kits are available through your parts catalog:

- Lift Grip Kit
- Lift Latch Kit
- Height Control Kit

LIFT ASSIST AND DEPTH STOP COMPONENTS AND OPERATION

Function:

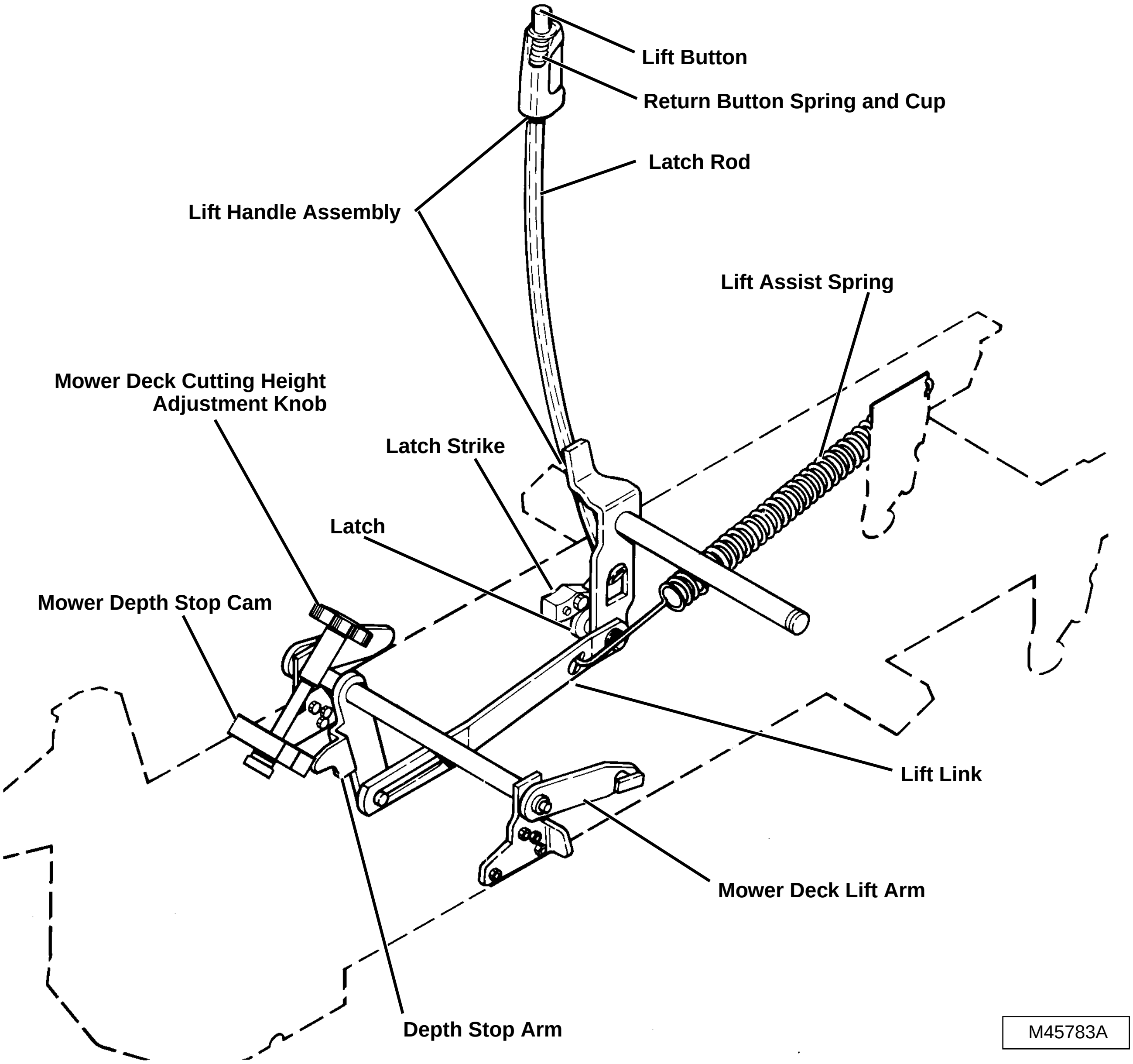
To counterbalance the weight of the attachment to reduce operator effort.

Theory of Operation:

As the lift lever is pulled rearward (to raise attachment), it pulls the lift link forward. The lift link is attached to the lift shaft. The lift shaft rotates forward raising the lift arms and attachment. Also attached to the lift link is the lift assist spring. Spring tension helps pull the link forward, reducing the effort required to lift the attachment. The lift handle locks in the fully raised position with a latch and strike.

When the lift handle is lowered, the lift arms lower the attachment until the depth stop arm on the lift shaft contacts the depth stop cam. The depth stop cam has different cam heights which are selected by using the cutting height knob. This allows the attachment to return to a specific height each time the attachment is lowered.

The lift assist spring can be locked out by pushing the lift handle fully forward. A slot in the lift link allows the lift shaft and arms that hold the attachment to move without any effect from the lift assist spring. This results in full implement weight on the ground.

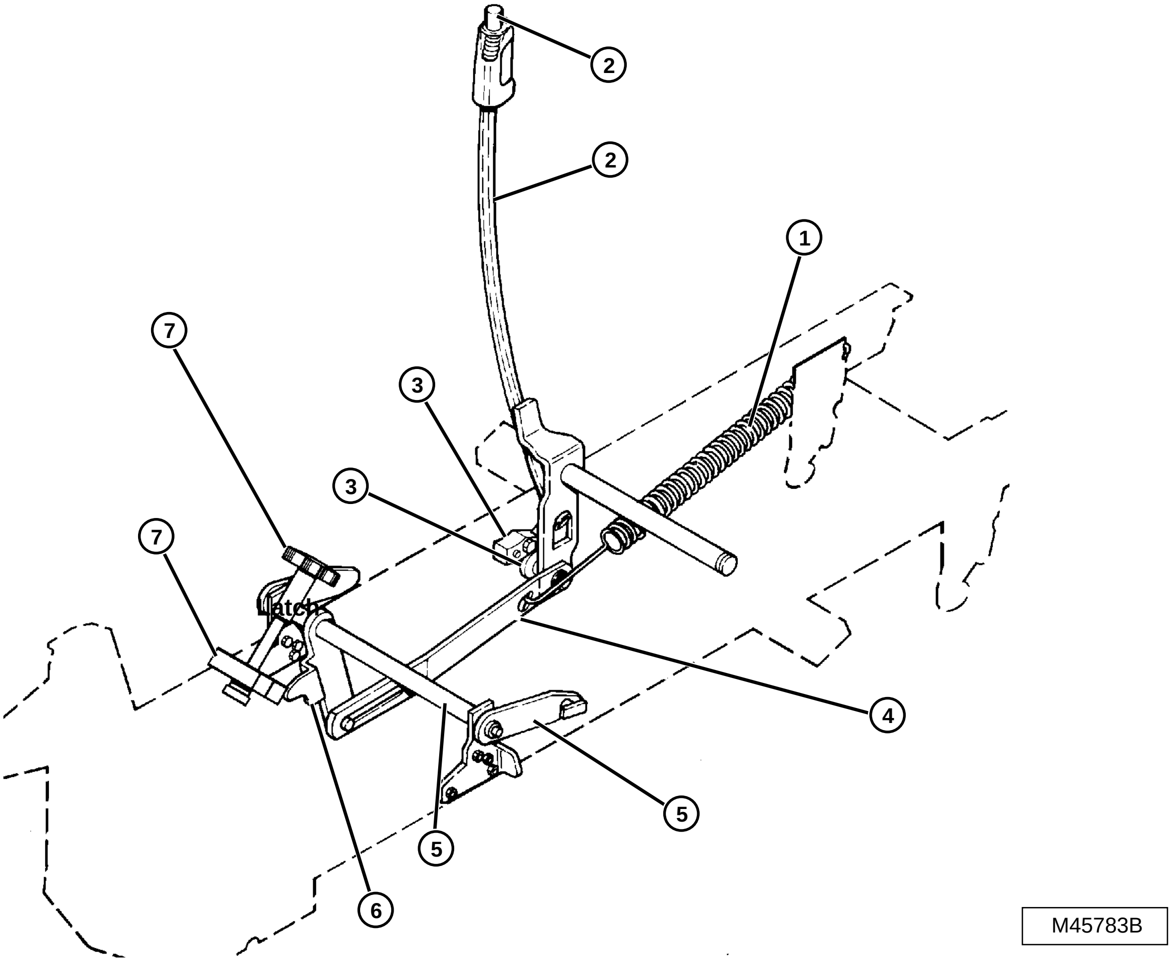


LIFT ASSIST CHECKS

Test Conditions:

- Machine parked on a level surface.
- Parking brake engaged.
- PTO disengaged.
- Key switch in OFF position.

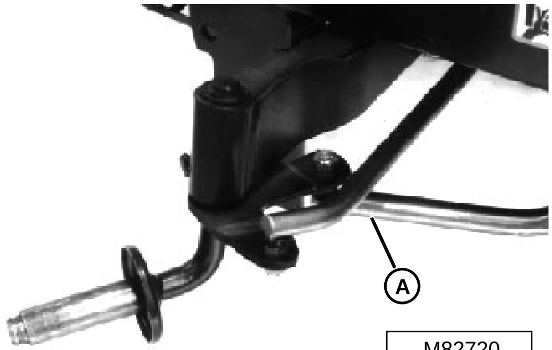
Test Location	Normal	If Not Normal
1. Lift assist spring.	Not weak or damaged.	Replace spring.
2. Lift lever and button.	Not binding, damaged or worn. Spring returns button when released.	Replace components. Replace spring.
3. Latch and strike.	Not binding, damaged or worn. Holds lift lever in position.	Replace.
4. Lift link.	Not bent, binding or damaged.	Replace.
5. Lift shaft and arm	Not bent, binding, damaged or worn.	Replace
6. Depth stop arm.	Not bent, damaged or worn. Contacts depth stop cam when lowered.	Replace.
7. Depth stop cam and knob.	Not binding, damaged or worn. Knob not slipping.	Replace.



FRONT AXLE

Removal/Installation

1. Remove muffler (See procedure in ENGINE section.)
2. Remove mower deck (See procedure in ATTACHMENTS section.)
3. Remove PTO clutch (See procedure in ELECTRICAL section.)
4. Remove crankshaft drive sheave.
5. Remove front wheels. (See *FRONT WHEELS - Removal/Installation* procedure.)
6. Disconnect drag link (A).



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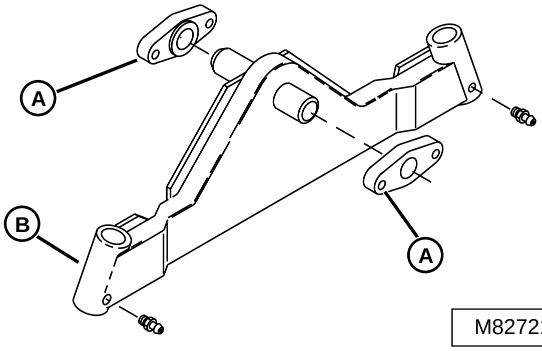
7. Remove pivot anchor cap screws. Turn pivot anchors (A) onto pivot shaft.
8. Remove axle (B).



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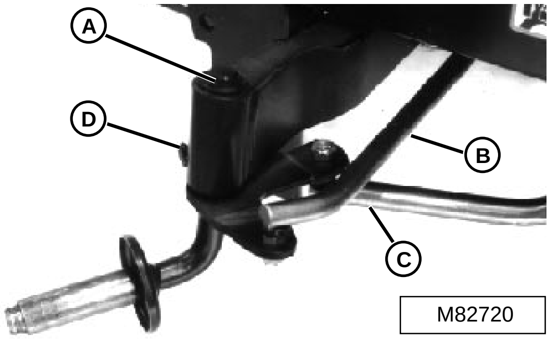
Installation is done in the reverse order of removal.

- Turn anchors (A) out until axle is secure and fore/aft movement is eliminated.
- Tighten pivot anchor cap screws to **25 N•m (228 lb-in.)**.
- Tighten drag link lock nuts to **37 N•m (27 lb-ft)**.

SPINDLE SHAFTS

Removal/Inspection/Installation

1. Raise and support machine.
2. Remove front wheels. (See *FRONT WHEELS - Removal/Installation* procedure.)
3. Left-hand spindle: Disconnect drag link (C).
4. Disconnect tie rod (B).
5. Remove snap ring (A) and spindle shaft.



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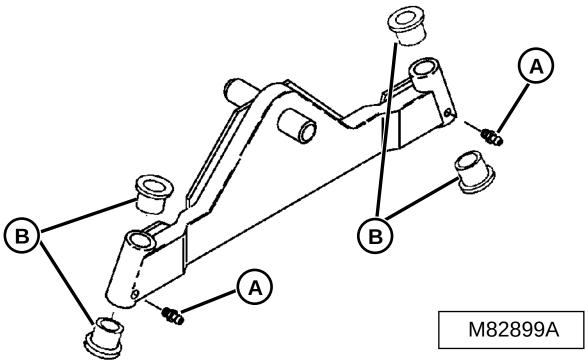
A— Snap Ring
B— Tie Rod
C— Drag Link
D— Lubrication Fitting

6. Inspect spindle shaft and bearing for wear or damage. Replace parts if necessary.
7. Inspect bushings for wear or damage. Replace if necessary. (See *Bushing Replacement* procedure.)

Installation is done in the reverse order of removal.

- Tighten tie rod lock nuts to **23 N•m (200 lb-in.)**.
- Tighten drag link lock nut to **37 N•m (27 lb-ft)**.
- Apply multipurpose grease to lubrication fittings (D).

Bushing Replacement



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- Inspect bushings for wear or damage.
- Bushings (B) are press-fit. Replace using a bushing driver set.
- Apply multipurpose grease to lubrication fittings (A).

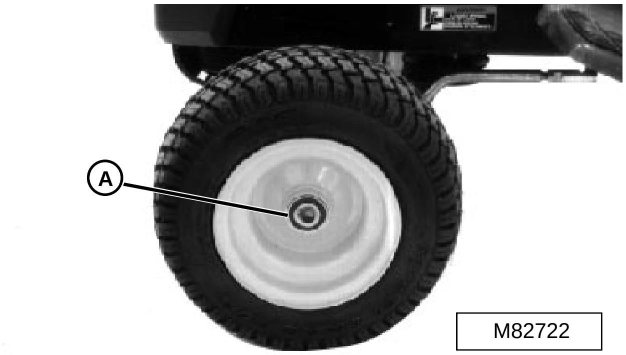
FRONT WHEELS

Removal/Installation

1. Lift machine high enough to remove weight from wheels. Place jackstands under machine frame.
2. Remove hub cap.
3. Remove snap ring (A), washer and wheel.
4. Inspect and replace wheel bearing, if necessary. (See *Front Wheel Bearings Inspection/ Replacement* procedure.)

Installation is done in the reverse order of removal.

- Install wheels with valve stems facing toward machine.

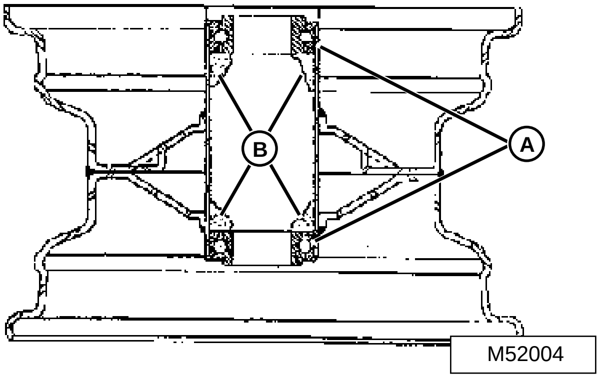


Wheel Bearings Inspection/Replacement

NOTE: Remove bearings only if replacement is necessary.

Inspect bearings for wear or damage. Replace if necessary.

- Remove one bearing (A) using a slide hammer and inside puller.
- Remove bearing on opposite end using a bearing, bushing and seal driver set and a press.
- Install bearings flush to wheel hub.
- Pack areas (B) with multipurpose grease.



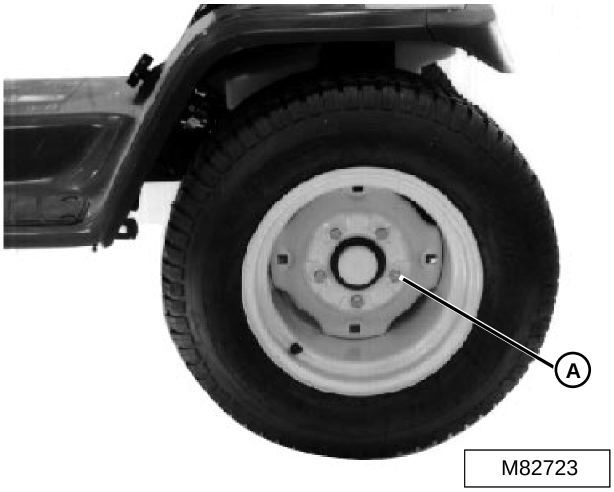
REAR WHEELS

Removal/Installation

1. Lift machine high enough to remove weight from wheels. Place jackstands under machine frame.
2. Remove cap screws (A) and rear wheel.

Installation is done in the reverse order of removal.

- Install wheels with valve stems facing away from machine.
- Tighten cap screws to **88 N•m (68 lb-ft)**.



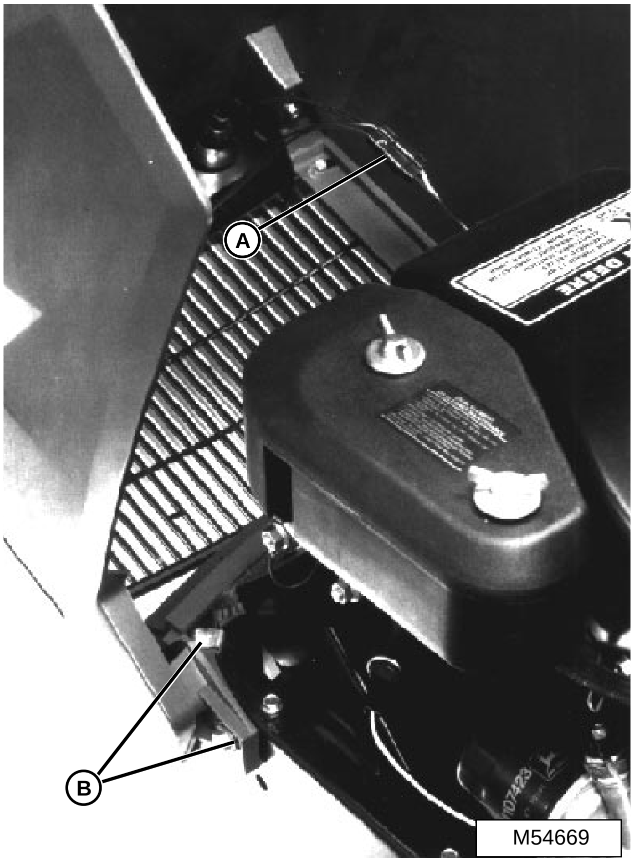
ENGINE HOOD

Removal/Installation

1. Raise hood.
2. Disconnect wiring connector (A).
3. Remove cap screws (B) on both sides.
4. Remove engine hood.

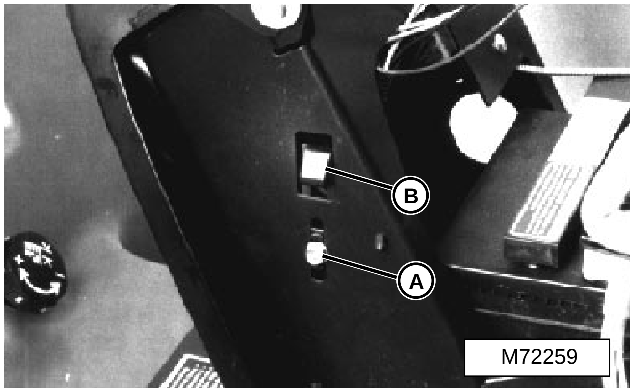
Installation is done in the reverse order of removal.

- Adjust hood if necessary. (See *Adjustment* procedure.)



Hood Adjustment

1. Loosen cap screw (A) on both sides of machine.
2. Move latch (B) for proper adjustment.
3. Tighten cap screw.



SEAT AND SUPPORT

Removal/Installation

1. Lift seat and disconnect seat switch wiring connector (A).
2. Remove seat adjustment knobs (B).
3. Remove seat and support.

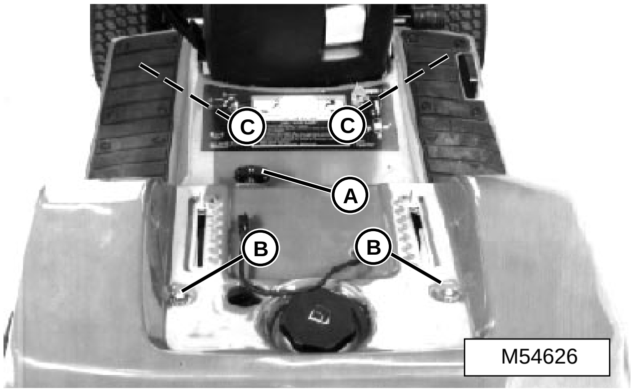
Installation is done in the reverse order of removal.

FENDER DECK

Removal/Installation

1. Remove seat and support. (See *SEAT AND SUPPORT* - *Removal/Installation*.)
2. Remove height adjustment knob (A).
3. Remove gear shift knob (GT242 and GT262).
4. Remove cap screws (B and C).
5. Remove fender deck.

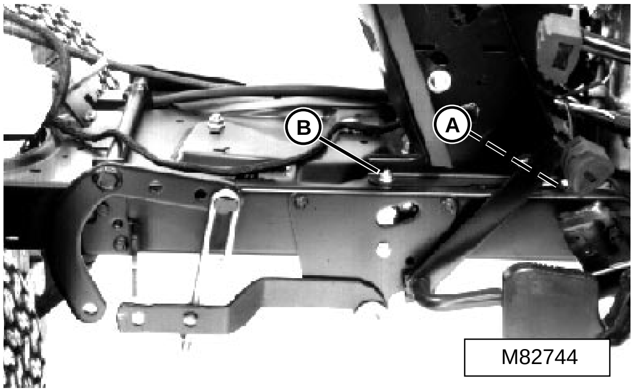
Installation is done in the reverse order of removal.



MOWER DECK LIFT LINKAGE

Lift Lever and Linkage

1. Remove mower deck. (See procedure in ATTACHMENTS section.)
2. Remove fuel tank. (See procedure in ENGINE section.)
3. Remove engine hood. (See *ENGINE HOOD Removal/Installation*.)
4. Remove battery.
5. Remove cotter pin from steering shaft at pinion gear.
6. Remove parking brake lever bushing (A).
7. Remove four pedestal mounting nuts (B).

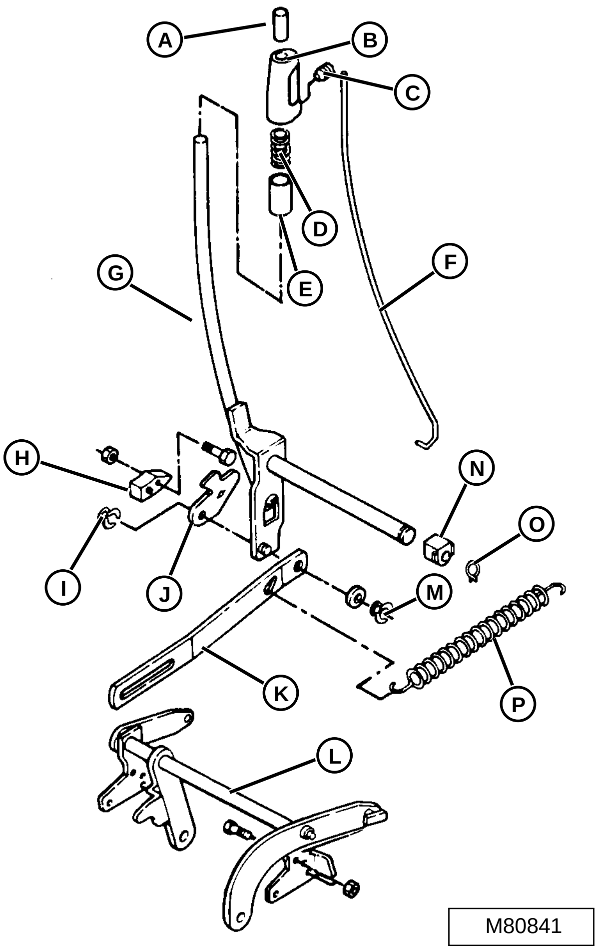


8. Disconnect neutral start switch wiring connector at transmission and loom hold-down tab.
9. Remove spring (P) from machine frame.
10. Remove parts (G, H, K, L, M and P).
11. Disassemble lift lever, if necessary.
12. Remove parts (A—F).

NOTE: Parts (H and J) are serviced as a kit.

13. Inspect all parts for wear or damage. Replace parts as necessary.

Installation is done in the reverse order of removal.



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A— Button

B— Grip

C— Set Screw

D— Spring

E— Spring Retainer

F— Rod

G— Lift Lever

H— Latch Block

I— Ring Clip

J— Latch

K— Lift Link

L— Rear Lift Shaft

M— Ring Clip

N— Bearing Block

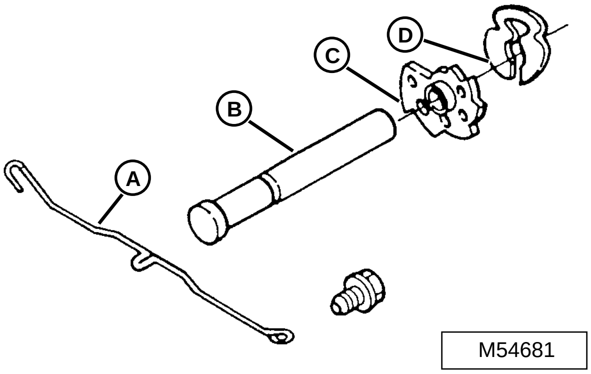
O— Snap Ring

P— Spring

Height Adjuster

1. Remove fender deck. (See *Fender Deck Removal/Installation*.)
2. Remove parts (A—D).
3. Inspect all parts for wear or damage. Replace parts as necessary.

Installation is done in the reverse order of removal.



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A— Detent Wire

B— Shaft

C— Adjuster

D— Clip

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